

Sustainable Sites

Required

SS Prerequisite 1

Construction Activity Pollution Prevention

Intent

Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation.

Health Issues

Controlling erosion retains soil resources on site, preventing run-off from entering aquatic bodies with potential for sedimentation and human exposure to waterborne pollutants and toxic chemicals, and dispersion of dust and particulate matter that can exacerbate respiratory illnesses.

Credit Goals

- Create and implement an Erosion and Sedimentation Control (ESC) Plan for all construction activities associated with the project. The ESC Plan shall conform to the erosion and sedimentation requirements of the 2003 EPA Construction General Permit OR local erosion and sedimentation control standards and codes, whichever is more stringent. The Plan shall describe the measures implemented to accomplish the following objectives:
 - Prevent loss of soil during construction by stormwater run-off and/or wind erosion, including protecting topsoil by stockpiling for reuse.
 - Prevent sedimentation of storm sewer or receiving streams.
 - Prevent polluting the air with dust and particulate matter.
- The Construction General Permit (CGP) outlines the provisions necessary to comply with Phase I and Phase II of the National Pollutant Discharge Elimination System (NPDES) program. While the CGP only applies to construction sites greater than 1 acre, the requirements are applied to all projects for the purposes of this prerequisite. Information on the EPA CGP is available at: <http://cfpub.epa.gov/npdes/stormwater/cgp.cfm>.
- Site Utilization
 - Compile a site access plan to minimize site disruption associated with the project's construction phase.
 - Plan temporary construction facilities, designated staging areas, access roads and construction parking within new building and paving footprints to minimize site disturbance.
 - Establish measures to protect priority sensitive areas of the site, including prohibiting staging, stockpiling and soil compaction.
 - Prevent disturbance to natural resources, protected wetlands and endangered species.
 - Handle and store fuels to prevent spills and discharges into waterways.

SS Prerequisite 1 continued

Construction Activity Pollution Prevention

Suggested Documentation

- ❑ Prepare an Erosion and Sedimentation Control (ESC) Plan and specifications, by a civil engineer or other responsible party, noting how the project complies with the credit goals and identifying the limits of construction and disturbance and protection measures, including erosion control measures.
- ❑ Prepare a Site Access and Utilization Plan in compliance with the Credit Goals.

Reference Standards

United States Environmental Protection Agency (EPA) Office of Water, www.epa.gov/OW. Download site, <http://yosemite.epa.gov/water/owrccatalog.nsf>. Search by title index. Hardcopy or microfiche: National Technical Information Service (order # PB92-235951), <http://www.ntis.gov>, 800-553-6847.

United States Environmental Protection Agency (EPA) Storm Water Management for Construction Activities (USEPA Document No. EPA 832R92005), Chapter 3, http://www.epa.gov/npdes/pubs/chap03_conguide.pdf.

Potential Technologies & Strategies

- Adopt an erosion and sedimentation control plan for the project site during construction that employs strategies such as:
 - Temporary and permanent seeding
 - Mulching
 - Earth dikes
 - Silt fencing
 - Sediment traps
 - Sediment basins
- Minimize unnecessary ground disturbance (topsoil stripping) and removal of existing groundcover by protecting existing vegetation, including clusters or groupings of existing trees or shrub masses. Avoid planting isolated plant material.

GGHC Construction Credit Synergies

- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect

GGHC Operations Credit Synergies

- WE Credit 1: Water Efficient Landscaping
- ES Credit 1: Outdoor Grounds & Building Exterior Management

1 point

SS Credit 1
Site Selection**Intent**

Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.

Health Issues

Sustainable site selection criteria contribute to healthy ecosystems – clean air and clean water – thereby enhancing the public health by protecting wetlands, agricultural lands and open spaces. Biodiversity protects ecosystems, water systems and endangered and threatened species.

Credit Goals

Do not develop buildings, hardscape, roads or parking areas on portions of sites that meet any one of the following criteria:

- Prime farmland as defined by the United States Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5).
- Previously undeveloped land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by the Federal Emergency Management Agency (FEMA).
- Land that is specifically identified as habitat for any species on Federal or State threatened or endangered lists.
- Within 100 feet of any wetlands as defined by United States Code of Federal Regulations 40 CFR, Parts 230-233 and Part 22, and isolated wetlands or areas of special concern identified by state or local rule, OR within setback distances from wetlands prescribed in state or local regulations, as defined by local or state rule or law, whichever is more stringent.
- Previously undeveloped land that is within 50 feet of a water body, defined as seas, lakes, rivers, streams, and tributaries which support or could support fish, recreation or industrial use, consistent with the terminology of the Clean Water Act.
- Land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (Park Authority projects are exempt).

Suggested Documentation

- Obtain verification from the civil engineer that the project site meets the credit goals.

Reference Standards

American Farmland Trust Definition of Prime Agricultural Land, <http://www.farmland.org>.

U.S. Code of Federal Regulations 40 CFR, Parts 230-233, and Part 22, <http://www.gpoaccess.gov/cfr/index.html>

SS Credit 1 continued

Site Selection

U.S. Department of Agriculture Definition of Prime Agricultural Land as stated in U.S. code of Federal Regulations Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5), <http://www.gpoaccess.gov/cfr/index.html>; Identification of Important Farmlands, http://a257.g.akamaitech.net/7/257/2422/11feb20051500/edocket.access.gpo.gov/cfr_2005/janqtr/pdf/7cfr657.5.pdf.

U.S. Federal Emergency Management Agency (FEMA) 100-Year Flood Definition, <http://www.fema.gov>.

U.S. Fish and Wildlife Service, List of Threatened and Endangered Species, <http://www.fws.gov/endangered/>.

U.S. National Marine Fisheries Service, List of Endangered Marine Species, http://www.nmfs.noaa.gov/pr/species/esa_species.htm.

Potential Technologies & Strategies

- During the site selection process, give preference to those sites that do not include sensitive site elements and restricted land types.
- Select a suitable building location and design the building with the minimal footprint to minimize site disruption of those environmentally sensitive areas identified above. Strategies include:
 - Stacking the building program
 - Tuck-under parking
 - Shared facilities with neighboring buildings

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect
- SS Credit 8: Light Pollution Reduction
- MR Credit 1: Building Reuse
- EQ Credit 8: Daylight & Views

GGHC Operations Credit Synergies

- TO Credit 1: Alternative Transportation
- EP Credit 1: Food

1 point

SS Credit 2**Development Density & Community Connectivity****Intent**

Channel development to urban areas with existing infrastructure, protect greenfields and preserve habitat and natural resources. In rural areas, increase development density on existing or previously developed sites rather than undeveloped rural land.

Health Issues

Siting decisions for hospitals and health care facilities reflect regional health care needs. This may lead to a rural site selection to keep pace with shifting population patterns. Adhering to integrated land use and development planning helps to contain sprawl and the associated development patterns that influence it (transportation, air quality, exercise, obesity, blood pressure, etc.) and the resulting unhealthy air quality and sedentary lifestyle indicators associated with auto-dependence and transportation-related air pollution. Several studies show that increased sprawl correlates with obesity and high blood pressure.

Credit Goals**OPTION 1 – DEVELOPMENT DENSITY**

Construct or renovate building on a previously developed site AND in a community with a minimum density of 60,000 square feet per acre net (Note: density calculation must include the area of the project being built and is based on a typical two-story downtown development).

OR

OPTION 2 – COMMUNITY CONNECTIVITY

Construct or renovate building on a previously developed site AND within ½ mile of a residential zone or neighborhood with an average density of 10 units per acre net AND within ½ mile of at least 10 Basic Services AND with pedestrian access between the building and the services.

Basic Services include, but are not limited to:

1) Bank; 2) Place of Worship; 3) Convenience Grocery; 4) Day Care; 5) Cleaners; 6) Fire Station; 7) Beauty; 8) Hardware; 9) Laundry; 10) Library; 11) Medical/Dental; 12) Senior Care Facility; 13) Park; 14) Pharmacy; 15) Post Office; 16) Restaurant; 17) School; 18) Supermarket; 19) Theater; 20) Community Center; 21) Fitness Center; 22) Museum; 23) Hotel; 24) Prosthetic and other medical devices store; 25) Gift Shop; and 26) Other supportive health care services.

Proximity is determined by drawing a 1/2 mile radius around the main building entrance on a site map and counting the services within that radius. *(Note: These services may be contained within the medical center. Addressing this issue by master planning for future provision of Basic Services does not meet the credit requirement unless within a five-year projected planned build-out.)*

OR

OPTION 3 – EXISTING RURAL SITES

For previously developed rural sites, increase density of the existing site to a minimum development density of 30,000 square feet per acre.

SS Credit 2 continued

Development Density & Community Connectivity

Suggested Documentation

- ❑ Prepare a calculation demonstrating that the project has achieved the required development densities. Where applicable, obtain density calculations for the project site and for the surrounding area.
- ❑ Prepare an area plan with the project location and appropriate surrounding services highlighted in compliance with credit goals.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- During the site selection process, give preference to urban sites with pedestrian access to a variety of services.
- Increase development density on previously developed sites rather than achieving expansion through acquisition of undeveloped rural land.

Resources

Natural Resources Defense Council, <http://www.nrdc.org>.

Smart Growth America, <http://www.smartgrowthamerica.com/health.html>.

Urban Land Institute, <http://www.washington.uli.org>, a non-profit organization that promotes the responsible use of land to enhance the environment.

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 3: Brownfield Redevelopment
- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect
- MR Prerequisite 1: Storage & Collection of Recyclables
- MR Credit 1: Building Reuse
- MR Credit 2: Construction Waste Management
- MR Credit 3: Sustainably Sourced Materials
- EQ Prerequisite 1: Minimum IAQ Performance
- EQ Credit 2: Natural Ventilation
- EQ Credit 8: Daylight & Views

GGHC Operations Credit Synergies

- TO Credit 1: Alternative Transportation

1 point

SS Credit 3.1**Brownfield Redevelopment: Basic Remediation Level****Intent**

Rehabilitate damaged sites and buildings where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land and protecting the health of the populations occupying a health care facility.

Health Issues

With appropriate remediation, brownfield redevelopment has the potential to protect public health by safely removing health hazards from communities and restoring degraded land to productive use.

Credit Goals

- Develop on a site or in a building documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local Voluntary Cleanup Program) OR on a site defined as a brownfield by a local, state or federal government agency.
- Effectively remediate site contamination.

Suggested Documentation

- Obtain documentation from a local, state or federal regulator agency confirming that the site and/or building is documented as contaminated or defined as a brownfield by that agency.
- Obtain documentation, including test results, declaring the type of damage that existed on the site and/or building and describing the remediation performed.
- Obtain a copy of state agency clearance certification (or other regulatory authority) allowing for construction of a health care facility on the remediated site.

Reference Standards

ASTM E1903-97 Phase II Environmental Site Assessment, <http://www.astm.org>.

Potential Technologies & Strategies

- During the site selection process, give preference to brownfield sites and contaminated buildings. Consider opportunities and risks associated with these sites.
- Coordinate site development plans with remediation activity, as appropriate.
- Identify tax incentives and property cost savings by selecting a brownfield site.
- Develop and implement a site and/or building remediation plan and remediate using strategies such as pump-and-treat, bioreactors, land farming, and in-situ remediation.
- There are many remediation techniques available to developers, depending upon the contaminant(s), the nature of the soil involved, the receptor pathway, and the individuals to be protected. Avoid remediation methods with negative environmental side effects such as incinerating the material or dumping the contaminated material off-site.

SS Credit 3.1 continued

Brownfield Redevelopment: **Basic Remediation Level**

- Specify and plant species that have a natural capacity to absorb and filter out pollutants.

Resources

Davis, Todd S., *Brownfields, A Comprehensive Guide to Redeveloping Contaminated Property*, 2002.

Rafson, Harold JI, and Rafson, Robert N., *Brownfields, Redeveloping Environmentally Distressed Properties*, 1999.

Russ, Thomas A., *Redeveloping Brownfields*, 2000.

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- MR Credit 1: Building Reuse
- MR Credit 2: Construction Waste Management
- EQ Prerequisite 3: Hazardous Material Removal or Encapsulation
- EQ Credit 5: Chemical & Pollutant Source Control

GGHC Operations Credit Synergies

- IO Prerequisite 2: Integrated Operations & Maintenance Program
- IO Credit 1: Building Operations & Maintenance
- CM Credit 1: Community Contaminant Prevention
- ES Credit 1: Outdoor Grounds & Building Exterior Management

1 point

SS Credit 3.2**Brownfield Redevelopment: Residential Remediation Level****Intent**

Rehabilitate damaged sites and buildings where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land and protecting the health of the populations occupying a health care facility.

Health Issues

Redeveloping brownfields can be an effective strategy to lessen environmental and health risks associated with contaminated sites and restore land to productive use. Stringent remediation is required in brownfield rehabilitation to protect the health and safety of all people residing and working in a health care facility, some of whom are particularly vulnerable to exposure to environmental contaminants.

Existing brownfield regulations are inconsistent and differ in their requirements. Healthcare facilities that locate on brownfield sites can help insure protection of public health through rigorous remediation and consistent compliance with chemical cleanup standards intended to protect vulnerable individuals and populations.

Credit Goals

- Achieve SS Credit 3.1

AND

- Remediate the site to the residential level as defined by the EPA Region 9 Preliminary Remediation Guidelines.

Suggested Documentation

- Obtain documentation, including test results, demonstrating compliance with the EPA Region 9 Preliminary Remediation Guidelines.

Reference Standards

EPA Sustainable Redevelopment of Brownfields Program, <http://www.epa.gov/brownfields>

EPA Region 9 Preliminary Remediation Guidelines,
<http://www.epa.gov/region9/waste/sfund/prg>

Potential Technologies & Strategies

- See GGHC SS Credit 3.1 Potential Technologies & Strategies and Credit Synergies.

Resources

See GGHC SS Credit 3.1 Resources section.

1 point

SS Credit 3.3

Brownfield Redevelopment: **Minimizing Future Hazards**

Intent

Rehabilitate damaged sites and buildings where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land and protecting the health of the populations occupying a health care facility.

Health Issues

Redeveloping brownfields can be an effective strategy to lessen environmental and health risks associated with contaminated sites and restore land to productive use. Stringent remediation is required in brownfield rehabilitation to protect the health and safety of all people residing and working in a health care facility, some of whom are particularly vulnerable to exposure to environmental contaminants.

Existing brownfield regulations are inconsistent and differ in their requirements. Healthcare facilities that locate on brownfield sites can help insure protection of public health through rigorous remediation and consistent compliance with chemical cleanup standards intended to protect vulnerable individuals and populations.

Note that remediation of a single site may leave adjacent properties with problematic levels of contamination, thus potentially subjecting patients, workers, and the surrounding community to unhealthy levels of exposure.

Credit Goals

Remediation of a single site may leave adjacent properties with problematic levels of contamination, thus potentially subjecting patients or the surrounding community to unhealthful exposure. In addition to the rehabilitation achieved in credits 3.1 and/or 3.2, ensure continued safety of the project site to better provide for the protection of the occupants.

- Achieve SS Credit 3.1 OR SS Credit 3.2

AND

- Verify that the site is more than 2,000 feet from another site classified as a brownfield by a local, state, or federal government agency.

OR

- Establish and implement preventative measures that protect the project site from re-contamination from other proximate sites.

Suggested Documentation

- Obtain verification from the civil engineer or authorized party that the adjacent properties have been surveyed and determined not to be sources of potential hazards.

OR

- Obtain documentation, including test results, demonstrating that the project site is effectively protected from contamination by proximate sites.

SS Credit 3.3 continued

Brownfield Redevelopment: **Minimizing Future Hazards**

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

See GGHC SS Credit 3.1 Potential Technologies & Strategies and Credit Synergies.

Resources

See GGHC SS Credit 3.1 Resources section.

1 point

SS Credit 4.1

Alternative Transportation: **Public Transportation Access**

Intent

Reduce pollution and land development impacts from automobile use.

Health Issues

Motor vehicles represent the largest single source of atmospheric pollution including nitrogen oxides (a precursor of smog); benzene (a carcinogen); particulate matter (a trigger of respiratory and cardiovascular illnesses and symptoms); volatile organic compounds (some of which are potentially hazardous and precursors of smog); carbon dioxide (a greenhouse gas); and carbon monoxide (a contributor to heart disease).

Credit Goals

- Locate project within 1/2 mile of an existing, or planned and funded, commuter rail, light rail or subway station.

OR

- Locate project within 1/4 mile of one or more stops for two or more public or campus bus lines usable by building occupants.

Suggested Documentation

- Prepare an area drawing or transit map highlighting the building location and the fixed rail stations and bus lines, and indicate the distances between them. Include a scale bar for distance measurement.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Perform a transportation survey of future building occupants to identify transportation needs.
- Site the building near mass transit, or establish shuttle services to encourage use of mass transit options.
- Provide clear pedestrian access paths between the main building entrance(s) and public transportation stops.
- If public transportation stops are on the project site, provide adequate shelter and proper security measures at the transportation stops to encourage their use.

SS Credit 4.1 continued

Alternative Transportation: **Public Transportation Access**

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect
- SS Credit 8: Light Pollution Reduction
- WE Credit 2: Potable Water Use Reduction
- EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems
- EA Credit 1: Optimize Energy Performance
- EA Credit 3: Enhanced Commissioning
- EA Credit 5: Measurement & Verification
- MR Credit 1: Building Reuse
- EQ Prerequisite 1: Minimum IAQ Performance

GGHC Operations Credit Synergies

- TO Credit 1: Alternative Transportation

1 point

SS Credit 4.2**Alternative Transportation: Bicycle Storage & Changing Rooms****Intent**

Reduce pollution and land development impacts from automobile use.

Health Issues

Encouraging bicycling to work contributes to a healthy lifestyle, while offsetting reliance on motorized transport, and the associated chemical and particulate emissions, and land use dedicated for parking and other vehicular infrastructure. According to the World Health Organization, bicycling may be an important contributor to delayed mortality.

Credit Goals

- For institutional buildings, provide secure bicycle racks and/or storage (within 200 yards of a building entrance) for 3% or more of peak building day shift staff, AND, provide shower and changing facilities in the building, or within 200 yards of a building entrance, for 0.5% of peak building day shift staff. *(Note: Base calculation on primary day shift FTE hospital staff and on-site out-sourced labor, but not visiting clergy or physicians. Staff shower facilities within the building may be incorporated into the calculation.)*

OR

- For residential buildings, provide covered storage facilities for securing bicycles for 15% or more of building occupants in lieu of changing/shower facilities.

Suggested Documentation

- Compile site drawings and documents highlighting bicycle storage and changing and shower facilities. Include calculations demonstrating compliance with Credit Goals.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Design the building with transportation amenities such as bicycle storage and showering/changing facilities. Share shower and changing facilities with Staff Locker facilities.
- Ideal bicycle storage for staff includes enclosed lockers or other secure systems, conveniently located near staff entries.
- Consider the abilities of patients using the specific facility being designed. Some patients treated in medical office buildings, hospitals and other health care facilities may be capable of commuting by bicycle, consistent with an emphasis on preventative medicine.
- Conduct annual reviews of commute modes and preferences and increase bicycle storage capacity as needed to meet potential demand.
- Consider the placement of showers to provide availability for all staff members.

SS Credit 4.2 continued

Alternative Transportation: **Bicycle Storage & Changing Rooms**

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect
- SS Credit 8: Light Pollution Reduction
- WE Credit 2: Potable Water Use Reduction
- EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems
- EA Credit 1: Optimize Energy Performance
- EA Credit 3: Enhanced Commissioning
- EA Credit 5: Measurement & Verification
- MR Credit 1: Building Reuse
- EQ Prerequisite 1: Minimum IAQ Performance

GGHC Operations Credit Synergies

- TO Credit 1: Alternative Transportation

1 point

SS Credit 4.3**Alternative Transportation: Low-Emitting & Fuel Efficient Vehicles****Intent**

Reduce pollution and land development impacts from automobile use.

Health Issues

Health care facilities normally operate fleets of vehicles for the purposes of maintaining and operating their facilities. These vehicles range from ambulances to delivery vans to shuttle buses, which often operate continuously and relatively locally.

Motor vehicles represent the largest single source of atmospheric pollution including nitrogen oxides (a precursor of smog); benzene (a carcinogen); particulate matter (a trigger of respiratory and cardiovascular illnesses and symptoms); volatile organic compounds (some of which are potentially hazardous and precursors of smog; carbon dioxide (a greenhouse gas); and carbon monoxide (a contributor to heart disease). By reducing emissions, alternative fuel fleets contribute to healthier air quality, benefiting the health of the building occupants and the surrounding and global communities.

Credit Goals

OPTION 1

Provide low-emitting and fuel-efficient vehicles for 3% of peak building day-shift FTE (Full-time Equivalent) occupants AND provide preferred parking for these vehicles.

OR

OPTION 2

Provide preferred parking for low-emitting and fuel-efficient vehicles for 5% of the total vehicle parking capacity of the site.

OR

OPTION 3

Install alternative-fuel refueling stations for 3% of the total vehicle parking capacity of the site (liquid or gaseous fueling facilities must be separately ventilated or located outdoors).

Note: The definition of FTE occupants for this credit calculation includes all primary day shift FTE hospital staff and on-site out-sourced labor, but not visiting clergy or physicians.

For the purposes of this credit, low-emitting and fuel-efficient vehicles are defined as vehicles that are either classified as Zero Emission Vehicles (ZEV) by the California Air Resources Board or have achieved a minimum green score of 40 on the American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating guide.

"Preferred parking" refers to the parking spots that are closest to the main entrance of the project (exclusive of spaces designated for handicapped) or parking passes provided at a discounted price.

SS Credit 4.3 continued

Alternative Transportation: **Low-Emitting & Fuel Efficient Vehicles**

Suggested Documentation

- Prepare calculations indicating that low-emitting and/or fuel efficient vehicles have been provided for 3% of FTE staff AND provide a parking plan highlighting preferred parking.

OR

- Prepare calculations indicating that preferred parking for hybrid, low-emitting, fuel-efficient, and/or alternative fuel vehicles is being provided for at least 5% of the total vehicle parking capacity. Provide site drawings or parking plan highlighting preferred parking for hybrid and/or alternative fuel vehicles.

OR

- Compile site drawings highlighting alternative fuel refueling stations. Provide calculations demonstrating that these facilities accommodate at least 3% of the total vehicle parking capacity. Provide documentation that the alternative fuel refueling stations proposed will serve current available street legal vehicles.

Reference Standards

American Council for and Energy Efficient Economy (ACEEE), <http://www.aceee.org>.

Zero Emission Vehicles (ZEV), California Air Resources Board,
<http://www.arb.ca.gov/msprog/zevprog/zevprog.htm>

Potential Technologies & Strategies

- Retain existing preferred handicapped parking areas. Handicapped parking is inclusive of any patient population that is designated by the hospital as weak.
- Alternative fuel vehicle fleets can be used to provide on campus transportation or between campus transportation, transportation to remote parking and staff housing, ambulance and ambulette fleets, and carpool/vanpool programs.
- Low sulfur diesel fuel and biodiesel are becoming available in many markets nationwide, particularly in regions designated as non-attainment areas or where there are high levels of ground level ozone. Low sulfur diesel fuels can be used in all diesel engines without modifications. Biodiesel is usable in most diesel engines as well, although in some older engines may require changing of rubber gaskets and more frequent changing of filters during initial use as it cleans the system.

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect
- SS Credit 8: Light Pollution Reduction

SS Credit 4.3 continued

Alternative Transportation: **Low-Emitting & Fuel Efficient Vehicles**

- WE Credit 2: Potable Water Use Reduction
- EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems
- EA Credit 1: Optimize Energy Performance
- EA Credit 3: Enhanced Commissioning
- EA Credit 5: Measurement & Verification
- MR Credit 1: Building Reuse
- EQ Prerequisite 1: Minimum IAQ Performance

GGHC Operations Credit Synergies

- TO Credit 1: Alternative Transportation

1 point

SS Credit 4.4**Alternative Transportation: Parking Capacity****Intent**

Reduce pollution and land development impacts from single occupancy vehicle use.

Health Issues

Motor vehicles represent the largest single source of atmospheric pollution including nitrogen oxides (a precursor of smog); benzene (a carcinogen); particulate matter (a trigger of respiratory and cardiovascular illnesses and symptoms); volatile organic compounds (some of which are potentially hazardous and precursors of smog; carbon dioxide (a greenhouse gas); and carbon monoxide (a contributor to heart disease).

Credit Goals**OPTION 1 – NON-RESIDENTIAL**

- Size parking capacity to meet, but not exceed, minimum local zoning requirements OR health department regulatory authority, whichever is the overriding requirement, AND provide preferred parking for carpools or vanpools for 5% of the total provided parking spaces.

OR

OPTION 2 – NON-RESIDENTIAL

For projects that provide parking for less than 5% of FTE building occupants:

- Provide preferred parking for carpools or vanpools, marked as such, for 5% of total provided parking spaces.

OR

OPTION 3 – RESIDENTIAL

Size parking capacity to not exceed minimum local zoning requirements, AND, provide infrastructure and support programs to facilitate shared vehicle usage such as carpool drop-off areas, designated parking for vanpools, or car-share services, ride boards, and shuttle services to mass transit.

OR

OPTION 4 – ALL

- Provide no new parking

OR

OPTION 5 – EXPANSIONS/RENOVATIONS

- For renovation projects, provide preferred parking and implement/document programs and policies for carpools and/or vanpools capable of serving 5% of the total building staff and add no parking beyond what is required by the authorities having jurisdiction.

Note: "Preferred parking" refers to the parking spots that are closest to the main entrance of the project (exclusive of spaces designated for handicapped) or parking passes provided at a discounted price.

SS Credit 4.4 continued

Alternative Transportation: **Parking Capacity**

Suggested Documentation

- ❑ Document local zoning or health department requirements, as applicable.
- ❑ If providing no new parking, document the existing site plan and project site plan highlighting parking capacity in each and illustrating that no new parking capacity has been added.
- ❑ Compile a description, parking plan, and supporting public outreach literature describing carpool and/or vanpool programs in compliance with Credit Goals. Prepare an annual summary on carpool and vanpool usage.
- ❑ For renovation projects, prepare a pre-renovation parking plan and a post-renovation parking plan demonstrating that no new parking capacity was added beyond what is required by the authorities having jurisdiction and that preferred parking policies for carpools and/or vanpools capable of serving 5% of the total building staff have been adopted.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Retain existing preferred handicapped parking areas. Handicapped parking is inclusive of any patient population that is designated by the hospital as weak.
- Minimize parking lot and garage size.
- Share parking facilities with adjacent buildings and implement shared staff carpool and vanpool programs.
- Institute shuttle bus services for staff members who live in the neighborhood, or to link with bus or rail lines.

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect
- SS Credit 8: Light Pollution Reduction
- WE Credit 2: Potable Water Use Reduction
- EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems
- EA Credit 1: Optimize Energy Performance
- EA Credit 3: Enhanced Commissioning
- EA Credit 5: Measurement & Verification
- MR Credit 1: Building Reuse
- EQ Prerequisite 1: Minimum IAQ Performance

GGHC Operations Credit Synergies

TO Credit 1: Alternative Transportation

1 point

SS Credit 5.1**Site Development: Protect or Restore Open Space or Habitat****Intent**

Conserve, preserve and enhance existing natural areas and restore damaged areas to provide habitat for native flora and fauna and to promote biodiversity. Reduce the development footprint to reserve site area for future development.

Health Issues

Healthy ecosystems contribute to the health of people in many ways, including the health-promoting qualities of clean air and water systems as well as significant social, psychological and physical benefits derived from physical and visual connections to the natural environment. By minimizing site disruption associated with construction practices, the health of these ecosystems can be protected. Health care facilities should protect and enhance the site's existing natural areas as a therapeutic resource for patients, staff, and visitors.

Credit Goals

- On both greenfield and previously developed sites, limit all site disturbance including earthwork and clearing of vegetation to 40 feet beyond the building perimeter, 10 feet beyond surface walkways, patios, surface parking and utilities greater than 12 inches in diameter; and, 15 feet beyond primary roadway curbs and main utility branch trenches.
- Implement measures to avoid reducing the permeability of the sub-surface below a future permeable lot (such as pervious paving areas, stormwater detention facilities and playing fields).

AND

- On both greenfield and previously developed sites, protect or restore natural habitat area as follows:

$$\text{Natural Habitat Area Required} = (\text{Site Area}) (.15 - \text{Site Size Factor}) \div (\text{Floor Space Ratio})$$

For the above formula:

Floor Space Ratio = the constructed building gross floor building area including all service spaces, excluding parking areas, divided by the site area.

Site Size Factor = $(\sqrt{\text{Site Area}/\text{Site Area}})(10)$

Notes:

- *For the purpose of this credit, all "greenfield" sites are those that were not previously developed or graded and remain in a natural state; remediated "brownfield" sites; and, previously developed sites on which all existing buildings have been or will be demolished. "Previously developed" sites are those that contain existing buildings, roadways, and/or parking lots, or were graded or altered by direct human activities.*

Credit 5.1 continued

Site Development: **Protect or Restore Open Space or Habitat**

- *The Natural Habitat Area formula requires larger areas of habitat for less densely developed sites.*
- *Natural habitat area may include vegetated roof area at any building level and non-native vegetation if required to survive the reduced sunlight if the area's irrigation system uses a non-potable water source, is high-efficiency, or if no permanent irrigation system is installed.*
- *Native plants are plants indigenous to a locality or cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds. Projects pursuing GGHC SS Credit 2 and using vegetated roof surfaces may apply the vegetated roof surface to this calculation if the plants meet the definition of native/adapted.*
- Rows of street trees spaced at or less than 1.0 x mature diameter apart qualify as natural habitat area, equal to mature diameter x length of row.
- *Sample calculation: For 100,000 gsf site with a 200,000 gsf building; Floor Space Ratio = 2; Site Size Factor is $(316/100,000) * 10 = 0.0316$. The natural habitat area required by formula is: $100,000 * (.15 - 0.0316) / 2 = 5,920$ gsf.*

Suggested Documentation

- Prepare a Site Protection Plan and specifications, by a civil engineer or responsible party, noting limits of construction, disturbance, protection and enhancement measures.
- Prepare highlighted site drawings with area calculations demonstrating the percentage of the site that has been provided/restored with native vegetation.
- Provide a narrative describing restoration and re-vegetation of degraded habitat areas, including use of native and non-invasive adapted vegetation.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Perform a site survey to identify site elements and adopt a master plan for development of the project site.
- Establish clearly marked construction boundaries and provide adequate protection measures to minimize disturbance of existing site and restore previously degraded areas to their natural state.
- Minimize unnecessary ground disturbance (topsoil stripping) and removal of existing groundcover by protecting existing vegetation, including clusters or groupings of existing trees or shrub masses. Avoid planting isolated plant material.
- Coordinate habitat, wetland, and stream preservation programs with erosion control and stormwater management goals, including soil bioengineering technologies.
- Adopt rehabilitation, restoration, and reclamation strategies for the site's watershed management.

Credit 5.1 continued

Site Development: **Protect or Restore Open Space or Habitat**

- Restore or provide natural vegetated area with emphasis on native and limited use of adapted vegetation. Ensure that no adapted vegetation is a known invasive species. Native plants are those species that occur naturally in the particular region, state, ecosystem, and habitat without direct or indirect human actions.
- Protect and encourage the development of native vegetation.
- Protect permeable lots on the construction site by building the area up with granular material to distribute the load and then salvaging the material when the staging area is no longer required.

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- SS Credit 4: Alternative Transportation
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect
- WE Credit 1: Water Efficient Landscaping
- WE Credit 2: Potable Water Use Reduction
- MR Credit 2: Construction Waste Management
- EQ Credit 8: Daylight & Views

GGHC Operations Credit Synergies

- ES Credit 1: Outdoor Grounds & Building Exterior Management

1 point

SS Credit 5.2**Site Development: Reduce Development Footprint****Intent**

Reduce the development footprint to reduce site disturbance and to reserve site area for future development.

Health Issues

Healthy ecosystems promote healthy people by maintaining balance in air and water systems, and by minimizing construction site disruption. Health care facilities can protect and enhance the site's existing natural areas as a therapeutic resource. Research shows that physical and visual connections to the natural environment provide social, psychological and physical benefits for patients, staff and visitors.

Credit Goals

- Achieve GGHC SS Credit 5.1

AND

- On both greenfield and previously developed sites, limit the building footprint as follows:

Gross Building Area	Maximum Building Footprint (MBF)
≤ 62,500 SF	MBF = 1.0 x Gross Floor Area
62,501 – 999,999 SF	MBF = square root of Gross Floor Area x 250
≥1,000,000SF	MBF = 0.25 x Gross Floor Area

For the above formulae:

Building Footprint = ground floor area, including area over basements and area under fixed canopies and overhanging floors, but excluding area over below-grade parking extending beyond building footprint.

The footprint of parking structures count as parking area, not as building footprint. Below or above building parking area counts neither as parking area nor building footprint.

The Maximum Building Footprint formula allows larger footprints relative to Gross Floor Area for smaller buildings. For less densely developed sites, the minimum habitat area from GGHC SS Credit 5.1, plus the maximum building footprint plus the maximum area of on-grade parking and access road may be less than the area of the site, generating a reserve area that may not be used for surface parking. Conversely more densely developed sites may not be large enough to accommodate the minimum habitat area plus the maximum building footprint plus the maximum area of on-grade parking and access road area, requiring some combination of a smaller footprint, vegetated roof area as habitat area or a higher percentage of structured parking.

Plan-enclosed courtyards are not considered as building footprint if they are on ground or at ground level above below grade parking. Courtyards on sloping sites are considered at ground level if there is a patient, staff or service entrance from grade at the level of the courtyard.

Credit 5.2 continued

Site Development: **Reduce Development Footprint**

Suggested Documentation

- Prepare highlighted site drawings with area calculations demonstrating area of the maximum building footprint demonstrating compliance with credit goals.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Perform a site survey to identify site elements and adopt a master plan for development of the project site.
- Select a suitable building location and design the building with the minimal footprint to minimize site disruption. Strategies include:
 - Stacking the building program
 - Tuck-under parking
 - Sharing facilities with neighbors
 - Locating the loading dock underneath the building
 - Locating helipads on top of the building or as a component of other paved surface areas, such as a section of the parking lot. Coordinate placement of helipads with GGHC EQ c5.1: Chemical and Pollutant Source Control: Outdoor.
- See GGHC SS c5.1 Credit Synergies.

1 point

SS Credit 5.3

Site Development: **Structured Parking**

Intent

Reduce the development footprint to reduce site disturbance and to reserve site area for future development.

Health Issues

Healthy ecosystems promote healthy people by maintaining balance in air and water systems, and by minimizing construction site disruption. Health care facilities can protect and enhance the site's existing natural areas as a therapeutic resource. Research shows that physical and visual connections to the natural environment provide social, psychological and physical benefits for patients, staff and visitors.

Credit Goals

- Achieve GGHC SS Credit 5.1

AND

- Provide structured parking for 50% or more of total parking spaces. A minimum of 100 spaces must be provided in structured parking to achieve this credit.

Suggested Documentation

- Prepare highlighted site drawings with parking calculations demonstrating compliance with credit goals.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

See GGHC SS Credit 5.1 and 5.2 Potential Technologies & Strategies and Credit Synergies.

1 point

SS Credit 6.1**Stormwater Design: Quantity Control****Intent**

Limit disruption of natural water hydrology by reducing impervious cover, increasing on-site infiltration, reducing or eliminating pollution from stormwater runoff, and eliminating contaminants.

Health Issues

Controlling stormwater run-off lessens contamination of receiving waters thereby safeguarding people and wildlife from exposure to waterborne pollutants, including bacteria, toxic chemicals, and lawn care nutrients that degrade water quality and increase risks of cancer, birth defects, and nervous system disorders.

Credit Goals**OPTION 1 – EXISTING IMPERVIOUSNESS IS LESS THAN OR EQUAL TO 50%**

- Implement a stormwater management plan that prevents the post-development peak discharge rate and quantity from exceeding the pre-development peak discharge rate and quantity for the one- (1) and two- (2) year 24-hour design storms.

OR

- Implement a stormwater management plan that protects receiving stream channels from excessive erosion by implementing a stream channel protection strategy and quantity control strategies.

OR

OPTION 2 – EXISTING IMPERVIOUSNESS IS GREATER THAN 50%

- Implement a stormwater management plan that results in a 25% decrease in the volume of stormwater run-off from the two- (2) year, 24-hour design storm.

Suggested Documentation

- Prepare calculations demonstrating that: (1) existing site imperviousness is less than or equal to 50%; and, (2) a stormwater management plan that complies with the credit goals has been implemented. Identify the recognizing authority.
- Prepare calculations demonstrating that (1) existing site imperviousness is greater than 50%; and, (2) the stormwater management plan complies with the credit goals. Identify the recognizing authority.

Reference Standards

United States Environmental Protection Agency's (EPA's) Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, January 1993 (Document No. EPA-840-B-92-002), <http://www.epa.gov/OW>.

Credit 6.1 continued

Stormwater Design: **Quantity Control**

Potential Technologies & Strategies

- Design the project to maintain natural stormwater flows by promoting infiltration.
- Specify vegetated roofs, pervious paving, and other measures to minimize impervious surfaces.
- Reuse stormwater volumes generated for non-potable uses such as landscape irrigation, toilet and urinal flushing and custodial uses.

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 7: Heat Island Effect
- WE Credit 1: Water Efficient Landscaping
- WE Credit 2: Potable Water Use Reduction
- MR Credit 1: Building Reuse

GGHC Operations Credit Synergies

- WC Credit 1: Water Efficient Landscaping
- CM Credit 1: Community Contaminant Prevention
- ES Credit 1: Outdoor Grounds & Building Exterior Management

1 point

SS Credit 6.2**Stormwater Design: Quality Control****Intent**

Limit disruption and pollution of natural water flows by managing stormwater run-off.

Health Issues

Controlling stormwater run-off lessens contamination of receiving waters thereby safeguarding people and wildlife from exposure to waterborne pollutants, including bacteria, toxic chemicals, and lawn care nutrients that degrade water quality and increase risks of cancer, birth defects, and nervous system disorders.

Credit Goals

- Implement a stormwater management plan that reduces impervious cover, promotes infiltration, and captures and treats the stormwater runoff from 90% of the average rainfall¹ using acceptable best management practices (BMPs).
- BMPs used to treat runoff must be capable of removing 80% of the average annual post development total suspended solids (TSS) load based on existing monitoring reports. BMPs are considered to meet these criteria if: (1) they are designed in accordance with standards and specifications from a state or local program that has adopted these performance standards; or (2) there exists in-field performance monitoring data demonstrating compliance with the criteria. Data must conform to an accepted protocol (e.g., Technology Acceptance Reciprocity Partnership [TARP], Washington State Department of Ecology) for BMP monitoring.

Suggested Documentation

- Compile plans, drawings, and calculations demonstrating that the stormwater management plan complies with the credit goals.

Reference Standard

Guidance Specifying Management Measures for Sources of Non-Point Pollution in Coastal Water, January 1993 (Document No. EPA 840B92002), <http://www.epa.gov/owow/nps/MMGI>.

¹ In the United States, there are three distinct climates that influence the nature and amount of rainfall occurring on an annual basis. Humid watersheds are defined as those that receive at least 40 inches of rainfall each year, Semi-arid watersheds receive between 20 and 40 inches of rainfall per year, and Arid watersheds receive less than 20 inches of rainfall per year. For this credit, 90% of the average annual rainfall is equivalent to treating the runoff from:

- (a) Humid Watersheds – 1 inch of rainfall;
- (b) Semi-arid Watersheds – 0.75 inches of rainfall; and
- (c) Arid Watersheds – 0.5 inches of rainfall

Credit 6.2 continued

Stormwater Design: **Quality Control**

Potential Technologies & Strategies

- Use alternative surfaces (e.g., vegetated roofs, pervious pavement or grid pavers) and nonstructural techniques (e.g., rain gardens, vegetated swales, disconnection of imperviousness, rainwater recycling) to reduce imperviousness and promote infiltration.
- Use environmentally sensitive design strategies (e.g., Low Impact Development, Maryland Stormwater Design Manual) to design mechanical or natural treatment systems to treat the site's stormwater.
- Utilize biologically-based and innovative stormwater management features to reduce and treat pollutant loads such as constructed wetlands, filters and open channels.
- Coordinate habitat, wetland, and stream preservation programs with erosion control and stormwater management goals, including soil bioengineering technologies.
- Adopt rehabilitation, restoration, and reclamation strategies for the site's watershed management.

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 7: Heat Island Effect
- WE Credit 1: Water Efficient Landscaping
- WE Credit 2: Potable Water Use Reduction
- MR Credit 1: Building Reuse

GGHC Operations Credit Synergies

- WC Credit 1: Water Efficient Landscaping
- CM Credit 1: Community Contaminant Prevention
- ES Credit 1: Outdoor Grounds & Building Exterior Management

1 point

SS Credit 7.1Heat Island Effect: **Non-Roof****Intent**

Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimates and human and wildlife habitat.

Health Issues

Mitigating the heat island effect results in lowering ground level temperatures near buildings thereby reducing conditions favorable for ground-level ozone (smog) formation that can lead to respiratory symptoms and illness. In addition, a cooler microclimate reduces a building's cooling load, thereby reducing energy costs, curbing reliance on fossil-fuel generated electricity, and reducing associated particulate and greenhouse gas emissions.

Credit Goals

OPTION 1

- Provide any combination of the following strategies for 50% of the site hardscape (including roads, sidewalks, courtyards, and parking lots):
 - Shade (within 5 years of occupancy)
 - Paving materials with a Solar Reflectance Index (SRI)² of at least 29
 - Open grid pavement system

OR

OPTION 2

- Place a minimum of 50% of parking spaces under cover (defined as underground, under deck, under roof, or under a building). Any roof used to shade or cover parking must have an SRI of at least 29.

Suggested Documentation

- Compile a site plan and develop calculations demonstrating areas of hardscape (including paving, walking areas, plazas, fire lanes, etc.), landscaping (list species) and building footprint, and demonstrating compliance with the credit goals.

² The Solar Reflectance Index (SRI) is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980-01. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

Credit 7.1 continuedHeat Island Effect: **Non-Roof**

Table 1

Material	Emissivity	Reflectance	SRI
Typical New Gray Concrete	0.9	0.35	35
Typical Weathered* Gray Concrete	0.9	0.2	19
Typical New White Concrete	0.9	0.7	86
Typical Weathered* White Concrete	0.9	0.4	45
New Asphalt	0.9	0.05	0
Weathered* Asphalt	0.9	0.10	6

*Reflectance of surfaces can be maintained with cleaning. Typical pressure washing of cementitious materials can restore reflectance close to original value. Weathered values are based on no cleaning.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Employ strategies, materials and landscaping techniques to reduce heat absorption of exterior materials.
- Shade constructed surfaces on the site with landscape features and utilize high-reflectance materials for hardscape.
- Consider replacing constructed surfaces (e.g., roof, roads, sidewalks, etc.) with vegetated surfaces such as vegetated roofs and open grid paving or specify high-albedo materials to reduce the heat absorption.

Resources

NASA ASTER spectral library, <http://speclib.jpl.nasa.gov/>

Pomerantz, M., Akbari, H., and Chang, S.C., "The Effect of Pavements' Temperature on Air Temperatures in Large Cities," Lawrence Berkeley National Laboratory Report No. LBNL- 43442, Berkeley, CA.

USGS Spectroscopy Lab, <http://speclab.cr.usgs.gov/>

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- WE Credit 1: Water Efficient Landscaping
- EA Credit 1: Optimize Energy Performance
- MR Credit 1: Building Reuse
- EQ Credit 7: Thermal Comfort

GGHC Operations Credit Synergies

- WC Credit 1: Water Efficient Landscaping

1 point

SS Credit 7.2Heat Island Effect: **Roof****Intent**

Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

Health Issues

Mitigating the heat island effect results in lowering ground level temperatures near buildings thereby reducing conditions favorable for ground-level ozone (smog) formation that can lead to respiratory symptoms and illness. In addition, a cooler microclimate reduces a building's cooling load, thereby reducing energy costs, curbing reliance on fossil-fuel generated electricity, and reducing associated particulate and greenhouse gas emissions.

Credit Goals

OPTION 1

- Use roofing materials having a Solar Reflectance Index (SRI)³ equal to or greater than the values in the table below for a minimum of 75% of the roof surface.

Note: Reflectance values used to calculate SRI are based on values from product ratings from the Cool Roof Rating Council's (CRRC) Directory of Rated Products or the U.S. EPA Energy Star Program's Rated Products list or Independent Laboratory testing in accordance with ASTM E903-96 for homogeneous, non-patterned materials having both specular and diffused optical properties OR ASTM E1084 for inhomogeneous, patterned, or corrugated materials OR field measurements using ASTM E1918-97 procedure.

Note: Emissivity values used to calculate SRI are based upon product ratings from the CRRC's Directory of Rated Products OR field measurements using ASTM E 408-71 procedure.

OR

OPTION 2

- Install a vegetated roof for at least 50% of the roof area.

OR

OPTION 3

- Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria:

$$\text{(Area of SRI Roof/0.75)} + \text{(Area of vegetated roof/0.5)} \geq \text{Total Roof Area}$$

³ The Solar Reflectance Index (SRI) is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

SS Credit 7.2 continued

Heat Island Effect: Roof

Roof Type	Slope	SRI
Low-Sloped Roof	≤ 2:12	78
Steep-Sloped Roof	> 2:12	29

Suggested Documentation

- Document that the roofing materials have a Solar Reflectance Index (SRI) in compliance with the credit goals.

OR

- Prepare photographs and calculations demonstrating that vegetated roof areas constitute at least 50% of the total roof area, and prepare a maintenance plan for the vegetated roof system.
- Provide documentation of the vegetated roof's irrigation system: no potable water, high-efficiency irrigation, or no permanently installed irrigation system.

OR

- Prepare a calculation indicating that the Total Roof Area complies with the credit goals using combined approaches.

Reference Standards

ASTM Standard E1084 – Standard Test Method for Solar Transmittance (terrestrial) of Sheet Materials Using Sunlight, <http://www.astm.org>.

ASTM Standard E408-71(1996)e1 - Standard Test Method For Total Normal Emittance Of Surfaces Using Inspection-Meter Techniques, <http://www.astm.org>.

ASTM Standard E903-96 – Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres, <http://www.astm.org>.

ASTM Standard E1918-97 – Standard Test Method for Measuring Solar Reflectance of Horizontal And Low-Sloped Surfaces in the Field, <http://www.astm.org>.

SS Credit 7.2 continued

Heat Island Effect: Roof

Potential Technologies & Strategies

- Consider installing high-albedo and vegetated roofs to reduce heat absorption. Solar Reflectance Index (SRI) is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or STM C 1371. The following table of typical SRI values for common roofing materials taken from the Lawrence Berkeley National Laboratory Cool Roofing Materials Database are for reference only.

Example SRI Values for Generic Roofing Materials	Solar Reflectance	Infrared Emittance	Temperature Rise	Solar Reflectance Index (SRI)
Gray EPDM	0.23	0.87	68F	21
Gray Asphalt Shingle	0.22	0.91	67F	22
Unpainted Cement Tile	0.25	0.9	65F	25
White Granular Surface Bitumen	0.26	0.92	63F	28
Red Clay Tile	0.33	0.9	58F	36
Light Gravel on Built-Up Roof	0.34	0.9	57F	37
Aluminum	0.61	0.25	48F	56
White-Coated Gravel on Built-Up	0.65	0.9	28F	79
White Coating on Metal Roof	0.67	0.85	28F	82
White EPDM	0.69	0.87	25F	84
White Cement Tile	0.73	0.9	21F	90
White Coating – 1 Coat, 8 mils	0.8	0.91	14F	100
PVC White	0.83	0.92	11F	104
White Coating – 2 Coats, 20 mils	0.85	0.91	9F	107

- Employ strategies, materials and landscaping techniques that reduce heat absorption of exterior materials.
- Consider new coatings, roof materials and colorants to achieve reflectance and emissivity values.
- Install photovoltaic cells to shade roof areas.

SS Credit 7.2 continued

Heat Island Effect: **Roof**

Resources

Cool Roof Rating Council, <http://www.coolroofs.org>.

Lawrence Berkeley National Laboratory Cool Roofing Materials Database, <http://eetd.lbl.gov/CoolRoofs/>.

U.S. EPA Energy Star Roofing Guidelines, United States Environmental Protection Agency, Energy Star®, <http://www.energystar.gov>.

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- WE Credit 1: Water Efficient Landscaping
- EA Credit 1: Optimize Energy Performance
- MR Credit 1: Building Reuse
- EQ Credit 7: Thermal Comfort

GGHC Operations Credit Synergies

- WC Credit 1: Water Efficient Landscaping

1 point

SS Credit 8**Light Pollution Reduction****Intent**

Minimize light trespass from the building and site, reduce sky-glow to increase night sky access, improve nighttime visibility through glare reduction, and reduce development impact on nocturnal environments.

Health Issues

Studies have found a potential link between light pollution and hormone production, specifically related to melatonin and estrogen levels in women. Light at night reduces melatonin levels, which can be causally related to elevated estrogen levels in women and increased responsiveness of estrogen-dependent tissues to cellular proliferation. Collectively, these changes are linked to increased breast cancer risk. Light-related decreases in melatonin may also increase the risk of other kinds of cancer.

Credit Goals

FOR INTERIOR LIGHTING

- The angle of maximum candela from each interior luminaire as located in the building should be designed to intersect opaque building interior surfaces and not exit out through the windows.
- OR
- All non-emergency interior lighting should be automatically controlled to turn off during non-business hours. Provide manual override capability for after hours use.

Note: Interior lighting requirements only apply to spaces that do not function 24/7.

AND

FOR EXTERIOR LIGHTING

- Zone and control lights to allow for limiting night-time lighting to the Emergency Department, a small employee parking area, a small visitor parking area, pedestrian walkways, and circulation routes.
- Only light areas as required for safety and comfort. Do not exceed 80% of the lighting power densities for exterior areas and 50% for building facades and landscape features as defined in ASHRAE/IESNA Standard 90.1-2004, Exterior Lighting Section, without amendments.
- All projects shall be classified under one of the following zones, as defined in IESNA RP-33, and shall follow all of the requirements for that specific zone:

LZ1 — Dark (Park and Rural Settings)

Design exterior lighting so that all site and building mounted luminaires produce a maximum initial illuminance value no greater than 0.01 horizontal and vertical footcandles at the site boundary and beyond. Document that 0% of the total initial designed fixture lumens are emitted at an angle of 90 degrees or higher from nadir (straight down).

SS Credit 8 continued**Light Pollution Reduction****LZ2 — Low (Residential areas)**

Design exterior lighting so that all site and building mounted luminaires produce a maximum initial illuminance value no greater than 0.10 horizontal and vertical footcandles at the site boundary and no greater than 0.01 horizontal footcandles 10 feet beyond the site boundary. Document that no more than 2% of the total initial designed fixture lumens are emitted at an angle of 90 degrees or higher from nadir (straight down). For site boundaries that abut public rights-of-way, light trespass requirements may be met relative to the curb line instead of the site boundary.

LZ3 — Medium (Commercial/Industrial, High-Density Residential)

Design exterior lighting so that all site and building mounted luminaires produce a maximum initial illuminance value no greater than 0.20 horizontal and vertical footcandles at the site boundary and no greater than 0.01 horizontal footcandles 15 feet beyond the site. Document that no more than 5% of the total initial designed fixture lumens are emitted at an angle of 90 degrees or higher from nadir (straight down). For site boundaries that abut public rights-of-way, light trespass requirements may be met relative to the curb line instead of the site boundary.

LZ4 — High (Major City Centers, Entertainment Districts)

Design exterior lighting so that all site and building mounted luminaires produce a maximum initial illuminance value no greater than 0.60 horizontal and vertical footcandles at the site boundary and no greater than 0.01 horizontal footcandles 15 feet beyond the site. Document that no more than 10% of the total initial designed site lumens are emitted at an angle of 90 degrees or higher from nadir (straight down). For site boundaries that abut public rights-of-way, light trespass requirements may be met relative to the curb line instead of the site boundary.

Suggested Documentation

- Compile a brief exterior lighting system narrative describing the lighting objectives and the measures taken to meet the ambient light and direct beam illumination requirements.
- Compile an electrical site plan showing the zoning of the light fixtures and the control system for the fixtures.

Reference Standards

Illuminating Engineering Society of North America (IESNA) Recommended Practice Manual: Lighting for Exterior Environments (RP-33-99), <http://www.iesna.org>.

Potential Technologies & Strategies

- Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution.
- Minimize site lighting where possible and model the site lighting using a computer model.
- Technologies to reduce light pollution include:
 - Full cutoff luminaires
 - Low-reflectance surfaces
 - Low-angle spotlights

SS Credit 8 continued

Light Pollution Reduction

GGHC Construction Credit Synergies

- SS Credit 1: Site Selection
- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 7: Heat Island Effect
- EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems
- EA Credit 1: Optimize Energy Performance
- EA Credit 3: Enhanced Commissioning
- EA Credit 5: Measurement & Verification
- MR Prerequisite 1: Storage & Collection of Recyclables
- MR Prerequisite 2: Mercury Elimination
- MR Credit 4: PBT Elimination

GGHC Operations Credit Synergies

- EE Prerequisite 2: Minimum Energy Performance
- EE Credit 1: Optimize Energy Performance
- EE Credit 3: Energy Efficient Equipment
- WM Prerequisite 1: Waste Stream Audit
- WM Credit 2: Regulated Medical Waste Reduction
- EP Credit 4: Toxic Reduction

1 point

SS Credit 9.1**Connection to the Natural World: Outdoor Places of Respite****Intent**

Provide outdoor places of respite on the health care campus to connect health care patients, staff, and visitors to the health benefits of the natural environment.

Health Issues

Health care facility design should address the physical, emotional, and spiritual needs of the patients and/or residents, staff, family members, and visitors that inhabit these buildings. Privacy, confidentiality, security, dignity, comfort, orientation, and connection to nature are key elements and issues that need to be addressed in the design of supportive environments.

Places of respite connected to the natural environment are key elements in defining a supportive, high performance, healing environment with proven effects on patient, staff, and visitor well-being and improved clinical outcomes. A growing body of research indicates that patients and medical staff experience positive health benefits from access to daylight and landscape views. Providing a variety of spaces for patients, families, and caregivers to pause and experience their natural surroundings is an important programming and design objective.

Credit Goals

- Provide patient, staff, and visitor accessible outdoor places of respite at 5% of the net usable program area. Qualifying spaces should be universally accessible and provide a variety of seating areas for both ambulatory and wheelchair users.

AND

- Provide additional dedicated outdoor place(s) of respite for staff at 2% of the net usable program area.

Design exterior places of respite located within 200 feet of a building entrance or access point, and where no medical intervention or direct medical care is delivered. Design areas to be open to fresh air, the sky and the natural elements, including seasonal weather. In addition, design qualifying areas to reflect the following considerations:

- Provide shade or indirect sun options for seating areas including, but not limited to, shade structures, a trellis or tree-shaded wheelchair accessible seating areas at a minimum of 1 space/ 200 sf of garden area with 1 wheelchair space per 5 seating spaces.
- Horticultural therapy or other specific clinical special use gardens (e.g., Cancer Healing Garden), unavailable to all building occupants may be used to meet up to 50% of the credit goal.
- Consider universal access natural trails with places to pause, available to staff and/or patients. (Nature trails may comprise up to 30% of the required area, provided trail access is available within 200 feet of a building entrance.)
- Existing exterior places of respite on the hospital campus may be used to comply with this credit, provided that the location of the existing spaces meets the credit goals.

SS Credit 9.1 continued

Connection to the Natural World: **Outdoor Places of Respite**

Suggested Documentation

- Provide net program summary.
- Compile site plans highlighting public outdoor places of respite equal to 5% of project net program area.
- Compile floor plans and site plans highlighting outdoor places of respite dedicated for staff use equal to an additional 2% of project net program area.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Select appropriate locations for places of respite, taking into account:
 - Environmental factors (e.g., winds, orientation, views)
 - Programs of care (e.g., Horticultural Therapy)
 - Needs of specific patient populations (e.g., immune suppression, sunlight sensitivity)
 - Realistic maintenance requirements
- Consider issues of wayfinding and orientation, accessibility, strength and stamina, activity and interest, privacy and security, independence.
- Provide choice and variety in the design of spaces (for example, spaces that engage all the senses but also areas with limited sensory stimulation). Consider a variety of smaller spaces conveniently located throughout the facility rather than one large space. Also consider integrating these exterior spaces with interior public spaces to enhance the connection to nature throughout the facility.
- Design considerations should include freedom from distractions, such as noise from mechanical systems, facility administrative activities and medical treatments.
- Direct connection to the natural environment includes views of distant and nearby nature (such as inaccessible rooftop spaces with “green” (vegetated) roofs and mature street trees). Positive views and vistas should be considered and visual barriers into patient rooms, treatment rooms and mechanical systems should be implemented.
- Coordinate the integration of gardens and nature for exterior environments with the facility’s Infectious Disease Control Specialist. This includes addressing concerns of chemical sensitivities and allergens with certain high-pollen plant materials.
- Specify and install plant materials that are natural, appropriate to sun/shade requirements and hardiness zone, and able to display seasonal habitat and change.
- Qualifying areas should not be used for regularly scheduled physical rehabilitation.
- Consider the development of on-grade gardens and green spaces that will also help integrate the facility into the surrounding community.

SS Credit 9.1 continued

Connection to the Natural World: **Outdoor Places of Respite**

- For building atria and greenhouses, see GGHC EQ Credit 8.2.
- For dedicated protected/preserved natural site area, see GGHC SS Credit 5.1.

GGHC Construction Credit Synergies

- SS Credit 5: Site Development
- WE Credit 1: Water Efficient Landscaping
- EQ Credit 8.2: Daylight & Views: Indoor Places of Respite

GGHC Operations Credit Synergies

- WC Credit 1: Water Efficient Landscaping

1 point

SS Credit 9.2**Connection to the Natural World: Exterior Access for Patients****Intent**

Provide inpatients and outpatients with a greater than 4-hour length of stay (LOS) with direct access from their unit/department to secure, supervised, and sun-oriented outdoor space.

Health Issues

Health care facility design should address the physical, emotional, and spiritual needs of the patients and/or residents, staff, family members, and visitors that inhabit these buildings. Privacy, confidentiality, security, dignity, comfort, orientation, and connection to nature are key elements and issues that need to be addressed in the design of supportive environments.

Places of respite connected to the natural environment are key elements in defining a supportive, high performance healing environment with proven effects on patient, staff, and visitor well-being and improved clinical outcomes. A growing body of research indicates that patients and medical staff experience positive benefits from direct access to nature. Providing direct access to exterior spaces for patients, families, and caregivers is an important programming and design objective in all health care construction and renovation.

Credit Goals

- Provide direct access to an exterior courtyard, terrace or balcony with a minimum area of 5 square feet/patient served for 75% of all inpatients and 75% of qualifying outpatients with clinical length of stay (LOS) greater than 4 hours.
- Design balcony edges to ensure patient safety.
- Include exterior areas in the credit calculation only if their vegetated areas (including planters) use a non-potable water irrigation system, a high-efficiency irrigation system, or no permanent irrigation system.
- Patients with LOS > 4hrs whose treatment restricts their ability to move, such as patients in Emergency, Stage 1 surgical recovery, and critical care, may be excluded.
- Qualifying outpatients may include Outpatient Renal Dialysis, Chemotherapy, Ambulatory Surgery Intake, and Stage 2 Recovery.
- Direct access to outdoor places of respite, as defined by GGHC SS Credit 9.1, may be used to meet this goal.

Suggested Documentation

- ☐ Compile diagrams describing and demonstrating that 75% of all inpatients and 75% of qualifying outpatients with >4 hour LOS have access to secure and supervised outdoor space in compliance with the credit goals.

SS Credit 9.2 continued

Connection to the Natural World: **Exterior Access for Patients**

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Locate patient accessible outdoor spaces in direct line of sight from the most continuously occupied staff workstation.
- Provide appropriate safety barriers to secure upper level patient accessible outdoor spaces.
- Locate patient accessible outdoor spaces facing south, east or west in priority order, ideally within or with views over exterior places of respite and other natural site amenities.
- Provide planting where possible.
- Provide the majority of seating and wheelchair space in filtered sunlight. Provide additional full sunlit areas where possible.
- Provide medical services support, such as oxygen outlets, to allow extended use.

Resources

Ulrich, R., Zimring, C., Quan, X., Joseph, A., "The Environment's Impact on Stress", pg. 37, in Marberry, S., Ed., "Improving Healthcare with Better Building Design", The Center for Health Design, 2005

GGHC Construction Credit Synergies

- ID Prerequisite 1: Integrated Design Process
- ID Prerequisite 2: Health Mission Statement & Program
- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 5: Site Development
- SS Credit 9: Connection to the Natural World
- WE Credit 1: Water Efficient Landscaping

GGHC Operations Credit Synergies

- WC Credit 1: Water Efficient Landscaping
- ES Credit 1: Outdoor Grounds & Building Exterior Management

1 point

SS Credit 10.1**Community Contaminant Prevention: Airborne Releases****Intent**

Prevent contaminant releases to air, land and water.

Health Issues

Health care facilities include laboratories, pharmacies, and diagnostic services, and often are designed with back-up emergency generators. These activities generate substances toxic to patients, physicians, staff, visitors, and the neighboring communities. Human health effects associated with exposure to airborne toxicants, particulates, gases, and bioaerosols may include respiratory diseases (e.g., asthma, hypersensitivity pneumonitis, bronchitis); cardiovascular events (e.g., sudden death associated with particulate air pollution), among others, depending on exposure levels.

Credit Goals

- Meet California South Coast Air Quality Management District standards for all products of combustion.

Suggested Documentation

- Obtain documentation from the mechanical engineer of record verifying that California South Coast Air Quality Management District standards for products of combustion have been met.

Reference Standards

California South Coast Air Quality Management District, <http://www.aqmd.gov>. See especially, Rules 1110 Emissions from stationary internal combustion engines; 1111 NO_x from natural gas forced, fan-type furnaces; 1146.1 and 1146.2 Emissions of NO_x from industrial institutional and commercial boilers, steam generators, and process heaters.

Potential Technologies & Strategies

- Provide scrubbers and filters for boilers and diesel generators.
- Test and certify all filters as installed prior to occupancy and placard them for at least annual recertification.
- Burn diesel fuels low in sulfur content.
- Provide air quality abatement equipment for equipment that burns fossil fuels.
- Burn bio-diesel fuels in lieu of fossil fuels.
- Substitute a ground-cooled heat exchanger for the cooling tower to eliminate biohazard from cooling water.

SS Credit 10.1 continued

Community Contaminant Prevention: Airborne Releases

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 4: Alternative Transportation
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect

GGHC Operations Credit Synergies

- IO Prerequisite 4: Outside Air Introduction & Exhaust Systems
- TO Credit 1: Alternative Transportation
- CM Credit 1: Community Contaminant Prevention
- CM Credit 3: Chemical Discharge

1 point

SS Credit 10.2**Community Contaminant Prevention: Leaks & Spills****Intent**

Prevent contaminant releases to air, land and water.

Health Issues

Health care facilities store and manage chemicals in both underground tanks and other outdoor facilities. Along with run-off from parking areas, these are significant potential sources of surface and groundwater contamination. By minimizing potential exposure, health care facilities can contribute to protecting the health of the surrounding community.

The reference standards cited below are more stringent than many local and state regulatory thresholds and are designed to ensure that contamination risks associated with chemical storage are reduced.

Credit Goals

- Establish oil interceptors at all drains from parking areas and central plant areas as described in the Potential Technologies and Strategies section of this credit or as described in local regulations, whichever is more stringent.
- For underground fuel-oil storage tanks, comply with U.S. EPA Title 40, Code of Federal Regulations, Part 112, or local regulations, whichever is more stringent. Where local regulations do not require double-containment and monitoring of such tanks, provide them, as described in the Potential Technologies and Strategies section of this credit.

Suggested Documentation

- Compile design documentation of on-site fuel oil storage system(s) verifying compliance with the credit goals.
- Compile a plan indicating the location of all storage facilities, and a narrative describing secondary containment provisions verifying compliance with the credit goals.

Reference Standards

National Fire Protection Association (NFPA) 30, Flammable and Combustible Liquids Code, <http://www.nfpa.org>.

U.S. EPA, Title 40, Code of Federal Regulations, Part 112 (for spill control and countermeasures), <http://www.epa.gov/oilspill/pdfs/40cfr112.pdf>.

Potential Technologies & Strategies

- Ensure that storage facilities include secondary containment provisions to prevent unintentional spills and leakage from contaminating aquifers and site stormwater.

SS Credit 10.2 continued**Community Contaminant Prevention: Leaks & Spills**

- Provide oil interceptors at all drains from parking areas and from central plant areas in accordance with the following performance standards, as a minimum:
 1. Vent each interceptor to the outer air with a minimum 2" vent.
 2. Provide each interceptor with a readily accessible gastight cleanout cover.
 3. Provide either a waste line not less than 6 inches in diameter with a full-sized cleanout to grade, or a two-inch pump-out connection at grade.
- Ensure that storage facilities include secondary containment provisions in accordance with the following performance standards:
 1. Secondary containment must be constructed, operated, and maintained product tight. The secondary containment must also be constructed, operated, and maintained in a manner that prevents structural weakening as a result of contact with any hazardous substances released from the primary containment, and be capable of storing the hazardous substances for the maximum anticipated period of time necessary for the recovery of any released hazardous substance.
 2. Secondary containment must be constructed, operated, and maintained to prevent any water intrusion into the system by precipitation, infiltration, or surface runoff.
 3. In the case of an installation with multiple primary tanks, provide the secondary containment sized to hold 150 percent of the volume of the largest primary tank placed in it, or 10 percent of the aggregate internal volume of all primary tanks, whichever is greater.
 - Provide a continuous monitoring system for the tank system. The monitoring system must be capable of detecting both the entry of the liquid- or vapor-phase of the fuel oil and water into the secondary containment.
 - The interstitial space of the underground storage tank must be maintained under constant vacuum or pressure such that a breach in the primary or secondary containment is detected before the liquid or vapor phase of the fuel oil is released into the environment.
 - Provide equipment in the underground storage tank to prevent spills and overfills from the primary tank.
 - Equip underground pressurized piping that conveys the fuel with an automatic line leak detector.
 - Before covering or placing the underground storage tank in use, test it using the standard installation testing requirements for underground storage systems specified in Section 2.4 of the Flammable and Combustible Liquids Code, adopted by the National Fire Protection Association (NFPA 30).

GGHC Construction Credit Synergies

- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 4: Alternative Transportation
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect

GGHC Operations Credit Synergies

- IO Prerequisite 4: Outside Air Introduction & Exhaust Systems
- TO Credit 1: Alternative Transportation
- CM Credit 1: Community Contaminant Prevention
- CM Credit 3: Chemical Discharge