

3.6 CONSERVATION OF NATURAL RESOURCES

The Tier I Final EIS evaluated the effects of the Massing Alternatives on surface water resources, floodplains and flooding, and water quality impacts associated with stormwater runoff. It also analyzed the potential effects to air quality. These potential effects are summarized in Section 1.8 of this Tier II Draft EIS. Energy consumption and the availability of sufficient energy supplies were addressed in the Tier I Final EIS under Infrastructure and Utilities. A summary of the analysis from Tier I is also provided in Section 1.8 of this Tier II analysis.

This section of the Tier II EIS addresses potential changes in on-site open space resources, site performance, and global climate change from implementation of the action alternatives. Included in the analysis of site performance is a description of sustainability features that would be implemented as part of the action alternatives, and the effect these features would have on minimizing effects on natural resources.

3.6.1 What are the site's current open space resources?

The NMAAHC site is part of the Washington Monument Grounds on the National Mall. It is a public open space that is part of a larger commemorative landscape that is designated as parkland for a variety of uses, including recreation, special events and celebrations. The project site is owned by the United States and is maintained by NPS.

NPS completed an administrative land transfer of the site to the Smithsonian Institution on June 1, 2007, for the operation of the NMAAHC. During the land transfer, the boundaries of the project site were established as the inside of the curb. At this time, a Memorandum of Agreement was developed to allow NPS to continue to operate the site until 2010 or construction of the NMAAHC, whichever comes first. The Smithsonian Institution and NPS are currently developing a new agreement for maintenance of the site until construction activities begin.

The project site consists of a five-acre parcel bound by Constitution Avenue to the north, 14th Street to the east, Madison Drive to the south, and 15th Street to the west. Until recently, the only "structure" on the project site was a blue concessionaire's temporary tent near Madison Drive. This was replaced in March 2010 with a temporary trailer. The trailer is located in the same area as the blue concessionaire's tent near the curbside lay by on Madison Drive. There is a patio made of pavers located west of the temporary trailer that includes picnic tables. Other paved surfaces include sidewalks that surround the project site and two walkways that cross through the middle of the NMAAHC site. One walkway connects the corner of 14th Street and Constitution Avenue with the mid-block of 15th Street. A second walkway connects the corner of 15th Street and Constitution Avenue with approximately the mid-block of 14th Street. The project site also features a Bulfinch Gatepost located in the northwest corner of the site at 15th Street and Constitution. Based on a review of maps and site diagrams, approximately 81 percent of the site consists of pervious ground cover and approximately 96 percent open space. As such, the project site is almost entirely public open space.

The site provides little habitat value to wildlife due to its urban setting and degree of human activity at the site. Additionally, the site is in close proximity to highly utilized roads with associated vehicle noise. There are no wetlands located on the site. In a letter dated March 20, 2007, the U.S. Fish and Wildlife Service confirmed that no proposed or federally-listed endangered or threatened species are known to occur within the project area (Smithsonian Institution, 2008a).

The remainder of the site contains open space resources. Trees are concentrated in the northeast corner of the site and along Constitution Avenue and 14th Street. Three types of trees are currently located on-site: American elm (*Ulmus americana*), Norway maple (*Acer platanoides*), and sugar maple (*Acer saccharum*). A single row of four American elms is located in a grassy median between the sidewalk and Constitution Avenue. These trees range in size from approximately 5 inches diameter at breast height (dbh) to approximately 11 inches dbh. There is a single row of five American elms located along 14th Street measuring approximately 8 to 9 inches dbh. Clusters of American elms parallel the street trees in an irregular pattern along Constitution Avenue and 14th Street ranging in size from approximately 3 inches dbh to approximately 28 dbh. The cluster of three trees located near the southwest portion of the site consists of two sugar maple trees (approximately 18 and 21 inches dbh) and one Norway maple (6 inches dbh). All 38 trees on-site are considered to be in good condition, or healthy (Casey Trees, 2006). Fourteen existing site trees meet the District’s definition of a special tree because they have a circumference of at least 55 inches (17.5 inches dbh). The remainder of the open space area is lawn. In total, more than 81 percent of the site is landscaped.

The topography of the site slopes up from Constitution Avenue towards the southern boundary along Madison Drive and the National Mall. The elevation of the site changes by approximately 13 feet. Because the majority of the site consists of pervious surfaces, stormwater runoff from the project site is entirely contained within the site boundaries and percolates into the ground surface. Figure 3.6.1 shows the site topography.

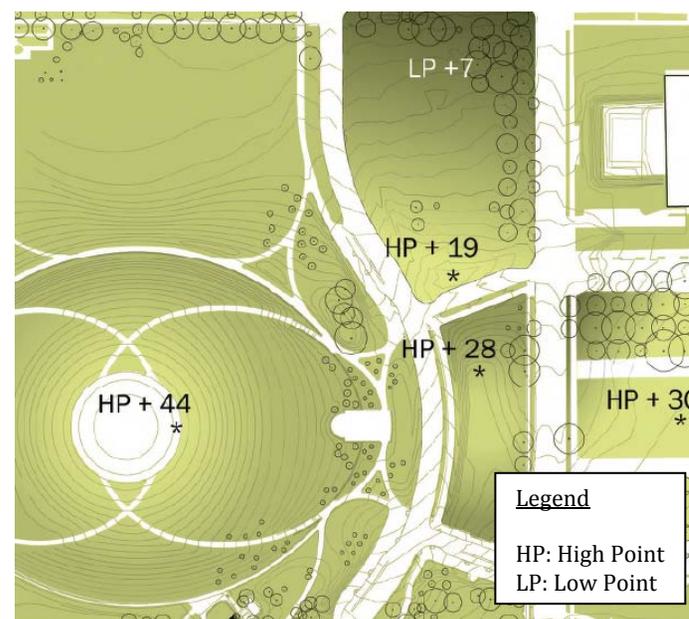


Figure 3.6.1 Site Elevations

Source: Freelon Adjaye Bond/SmithGroup, 2010

3.6.2 What issues are addressed as part of site performance?

The issues addressed as part of site performance include the amount of impervious surface on-site, sustainability measures, stormwater, and energy. A change in the impervious surface would affect vegetation, infiltration and the amount of stormwater runoff. Sustainable design strategies would be selected and implemented in order to improve the environmental impact of the construction and operation of the facility. The sustainability approach would be finalized during detailed design and would include a comprehensive listing of the LEED points that could be obtained. Compliance with federal mandates and LEED requirements would ensure that there would be no increase in stormwater runoff from the project site during operation of the museum. In order to achieve the required number of points to obtain LEED certification, the building would be designed to implement specific energy conservation strategies. These strategies are discussed for the four action alternatives.

3.6.3 What are greenhouse gases and why is climate change important?

Various gases in the Earth's atmosphere, classified as atmospheric greenhouse gases (GHGs), play a critical role in determining the Earth's surface temperature. Solar radiation enters the Earth's atmosphere from space, and a portion of the radiation is absorbed by the Earth's surface. The Earth emits this radiation back to space, but the properties of the radiation have changed from high-frequency solar radiation, to lower-frequency infrared radiation. GHGs, which are transparent to solar radiation, are effective in absorbing infrared radiation. This radiation that would have otherwise escaped back to space is now "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the Greenhouse Effect, is responsible for maintaining a habitable climate. Without the Greenhouse Effect, Earth would not be able to support life.

Prominent GHGs contributing to the Greenhouse Effect include carbon dioxide (CO₂), methane (CH₄), ozone (O₃), water vapor, nitrous oxide (N₂O), and chlorofluorocarbons (CFCs). Human-caused emissions of these GHGs in excess of natural ambient concentrations are considered to be responsible for an increase in the Greenhouse Effect, which has led to significant change in measures of climate referred to as global climate change.

Emissions of GHGs contributing to global climate change have been attributed in large part to human activities associated with industrial/manufacturing, utility, transportation, residential, and agricultural sectors. Emissions of CO₂ are byproducts of fossil fuel combustion. Methane, a highly potent GHG, results from off-gassing associated with agricultural practices and landfills. Processes that absorb CO₂, are often referred to as sinks, include uptake by vegetation and dissolution into the ocean.

Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants, which are pollutants of regional and local concern, respectively. The scientific community generally agrees that global warming will lead to adverse climate change effects around the globe and that the phenomenon is anthropogenic, i.e., caused by humans. Thus, it is the increased accumulation of GHGs in the atmosphere that may result in global climate change that causes adverse environmental effects.

Various local and federal initiatives to reduce contributions to GHG emissions have raised awareness that, even though the various contributors to and consequences of global climate change are not yet fully understood, global climate change is under way and there is a real potential for severe adverse environmental, social, and economic effects over the long term. Because every nation is an emitter of GHGs, and therefore makes an incremental cumulative contribution to global climate change, cooperation on a global scale will be required to reduce the rate of GHG emissions to a level that can help slow or stop human-caused increase in average global temperatures and associated changes in climatic conditions.

3.6.4 What is Executive Order 13514 and what does it require?

The *Executive Order 13514 Federal Leadership in Environmental, Energy, and Economic Performance* was signed on October 5, 2009. The purpose of Executive Order 13514 is to establish an integrated strategy towards sustainability in the federal government and to make reduction of GHGs a priority for federal agencies. Executive Order 13514 expands on the energy reduction and environmental performance requirements for federal agencies identified in *Executive Order 13423 Strengthening Federal Environmental, Energy and Transportation Management*.

Executive Order 13514 lays out the following numerical targets for federal agencies:

- Reduce petroleum consumption by 2 percent per year through fiscal year 2020 (applies to agencies with fleets of more than 20 vehicles) (assumes a baseline fiscal year 2005).
- Reduce by 2 percent annually:
 - Potable water intensity by fiscal year 2020 (26 percent total reduction) (assumes a baseline fiscal year 2007).
 - Industrial, landscaping, and agricultural water intensity by fiscal year 2020 (20 percent total reduction) (assumes a baseline fiscal year 2010).
- Achieve 50 percent or higher diversion rate:
 - Non-hazardous solid waste by fiscal year 2015.
 - Construction and demolition materials and debris by fiscal year 2015.

- Ensure at least 15 percent of existing buildings and leases (>5,000 gross square feet) meet the Guiding Principles by fiscal year 2015, with continued progress towards 100 percent.
- Ensure 95 percent of all new contracts, including non-exempt contract modifications, require products and services that are energy-efficient, water-efficient, biobased, environmentally preferable, non-ozone depleting, contain recycled-content, non-toxic or less-toxic alternatives.

Executive Order 13514 also sets non-numerical targets that federal agencies must reach, including:

- Increase renewable energy and renewable energy generation on agency property.
- Pursue opportunities with vendors and contractors to reduce GHG emissions (i.e., transportation options and supply chain activities).
- Reduce building energy intensity.
- Ensure all new federal buildings that enter the planning process in 2020 and thereafter are designed to achieve zero-net-energy standards by 2030.
- Use low GHG emitting vehicles, including alternative fueled vehicles, and optimize the number of vehicles in agency fleets.
- Implement water management strategies including water-efficient and low-flow fixtures.
- Implement source reduction to minimize waste and pollutant generation.
- Decrease use of chemicals directly associated with GHG emissions.

- Participate in transportation planning and recognize existing infrastructure in regions/communities.
- Ensure procurement preference for Electronic Product Environmental Assessment Tool (EPEAT)-registered electronic products.

In addition to these targets, Executive Order 13514 calls for specific management strategies to improve sustainability including:

- Develop and implement innovative, agency-specific policies and practices to reduce scope 3 GHG emissions in agency operations.
- Manage existing buildings to reduce energy, water, and materials consumption.
- Implement and achieve objectives in EPA's Stormwater Management Guidance (§14).
- Reduce paper use and acquire paper containing at least 30 percent postconsumer fiber.
- Minimize the acquisition, use, and disposal of toxic and hazardous materials.
- Employ environmentally sound practices for the disposition of all agency excess or surplus electronic products.
- Procure Energy Star and Federal Energy Management Program (FEMP)-designated electronic equipment.
- Continue implementation of existing Environmental Management System (EMS) programs.

3.6.5 What affect would construction and operation of the NMAAHC have on Conservation of Natural Resources?

For the purpose of defining whether any of the proposed alternatives could potentially affect the geology and soils of the site, several criteria are considered.

No Impact: The natural resources of the site would not be impacted or the impact to these resources would be below or at the lower levels of detection.

No Significant Impact: Impacts would be detectable. Mitigation would be needed to offset adverse impacts and would be relatively simple to implement and would likely be successful.

Significant Impacts: Impacts would be readily apparent and result in a change to the character of the resource over a relatively wide area. Mitigation needed to offset adverse impacts may or may not be successful.

Short-term impacts would occur during construction of the proposed action. Long-term impacts would occur during operation of the NMAAHC.

No Action Alternative

The No Action Alternative would not result in any changes to the project site or new development on the site. As part of the No Action Alternative, the project site would continue to be an open space resource operated by NPS. Maintenance and landscape activities would continue to occur. The site would remain largely landscaped and contain pervious surfaces. There would be no removal of the existing trees on the site; however, it is assumed that the NPS-approved planting plan for the Washington Monument Grounds would be implemented here and in other nearby areas. As such, there would be no short- or long-term adverse impacts on open space resources.

No impacts would occur on site performance. There would be no increase in energy use or incremental increase in GHG emissions from the construction and operation of a new museum. Landscape and public open space activities would be expected to continue, as under current conditions and current management of the site. Therefore, the No Action Alternative would have no impact on global climate change.

Action Alternative 1: Plinth Concept

Open Space Resources

The Plinth Alternative would involve construction of an approximately 360,000 gross square feet of building space on the project site. The maximum building coverage area would be approximately 85,804 square feet (approximately 36.8 percent) of the five-acre parcel site. However, because of the below grade programming and engineering requirements for the site's soil and groundwater conditions, the majority of the site would be cleared, excavated and re-graded. For the purpose of this analysis, it is assumed that all of the 38 existing trees on-site and other existing site landscaping would be removed at the start of the construction process. This is 493.5" of total caliper inches at diameter breast height (dbh). The proposed removal of 14 mature trees from the project site would constitute a significant impact.

Replacement of mature trees with one or more trees whose aggregate circumference equals the circumference of the mature trees to be removed would minimize the long-term adverse impact. As part of the landscape design for the Plinth Alternative (see Figures 2.4 and 2.6), a single row of street trees would be planted between the curb and the sidewalk on Constitution Avenue running the length of the site and between the curb and the sidewalk on 14th Street south of the service and loading driveway. Trees would be planted along the sidewalk at Madison Drive on either side of the grass terrace leading to the museum's primary entrance to the museum. A cluster of trees would be planted at the northeast corner to mask the staff entrance that would be located on 14th Street. In addition, clusters of trees would be planted along 15th Street and used to frame views of the Washington Monument. Approximately

44 new trees would be planted as part of the Plinth Alternative to minimize the adverse effect. Mitigation measures would be required to further minimize the impacts of tree removal. In order to replace the aggregate 493.5" dbh of the trees lost due to development, the 44 new site trees included as part of Alternative 1 would have to average approximately 11.2" dbh each, unless additional trees are planted.

Development of the Plinth Alternative would modify the total amount of open space located within the site boundaries from approximately 96 percent to approximately 63. percent of the total site area.

Although this would be a significant change from the current condition, the Plinth Alternative would actually provide more site open space than all of the other museums on the north side of the National Mall. Further, this open space calculation does not take into account the rooftop terrace and the outdoor terraces that would be created on top of the plinth. However, converting the site from landscaped open space to development would result in a significant impact.

Site Performance

In addition to the building coverage area, Plinth Alternative would include a driveway, sidewalks, walkways, water features and other hardscape features. With the Plinth Alternative, approximately 65 percent of the site would be impermeable surfaces, including the building and other hardscape surfaces. Because approximately 81 percent of the existing site is covered with permeable surfaces, this would result in a net increase in impermeable surfaces of approximately 46 percent as a result of the Plinth Alternative.

In accordance with federal mandates *and Executive Order 13514*, the Plinth Alternative would incorporate a number of sustainable features to minimize the adverse effects of additional impervious surfaces at the project site. As discussed in Chapter 2, the Smithsonian Institution has committed to building a minimum level of Gold for the building as certified by the U.S. Green Building Council under the LEED program. In order to achieve LEED Gold certification, the Plinth Alternative could incorporate the following features that would minimize the adverse impacts of a net increase in impermeable surfaces (Freelon Adjaye Bond/SmithGroup, 2010):

- Use pervious paving materials where possible in lieu of impervious hardscape
- Balance pervious surfaces (infiltration) with areas for collection (rainwater) to ensure no net increase in stormwater runoff to WASA, now known as DC Water, storm drains
- Bio-retention – collect stormwater on-site and potentially from surrounding streets for reuse in on-site irrigation and water features
- Harvest rainwater for reuse in irrigation and water features
- Use native and low-water plants to reduce irrigation and create cultural/natural interest
- Use good soil mixes that retain moisture in order to reduce irrigation
- Use ultra-low flow fixtures in public areas and consider near zero (0.1 gallons per flush) or waterless urinals in staff areas
- Reuse water from site de-watering for nonpotable water sources or for use in the heat exchange system

- Install tree box filters to treat runoff from surrounding streets
- Consider purchasing recycled water from DC Water,
- Integrated systems – use a rainwater cistern combined with structural support for existing trees, water systems connect to water feature
- Use no potable water during building construction

Sustainable design strategies would be selected and implemented in order to improve the environmental impact of the construction and operation of the facility. The sustainability approach would be finalized during detailed design and would include a comprehensive listing of the LEED points that could be obtained. However, compliance with federal mandates and LEED requirements would ensure that there would be no increase in stormwater runoff from the project site during operation of the Plinth Alternative.

In addition to stormwater management, site performance relates to the overall efficiency of the building operations, including energy use. Currently, the project site contains a temporary concessions trailer to serve visitors to the National Mall and the Washington Monument Grounds. The Plinth Alternative would involve construction of an approximately 360,000 gross square feet on the project site.

Due the requirements of Smithsonian facilities, the Plinth Alternative would not only be a larger structure than the temporary concession stand trailer, it would be operational for longer daily durations. Development of the site with the Plinth Alternative would substantially increase energy demand at the site.

As discussed above, the Plinth Alternative would be constructed to meet LEED Gold certification criteria. In order to achieve the required number of points, the Plinth Alternative would be designed to implement specific energy conservation strategies. To meet the criteria for LEED Gold, the Plinth Alternative would also incorporate the following strategies: passive heating and cooling, daylighting, and energy conservation. The Corona feature would be designed to block heat and sunlight on hot days, and to let in additional light and heat when it is cooler outside. To minimize energy use for lighting, approximately 50 percent of lighting of the public space would come from sunlight. This would be achieved by using skylights, top lighting, high ceilings, and interior glazing to allow daylight to penetrate deeper into the interior spaces. To minimize the use of artificial lighting on the concourse level, the exhibit and other public spaces would be located around the sunken courtyards located on the north side of the site where natural light would be able to reach the lower level of the building interior. Other energy conservation strategies that may be implemented during building operation include the following (Freelon Adjaye Bond/SmithGroup, 2010):

- Purchase renewable energy
- Incorporate thermal mass – provides opportunities for moderating temperature swings, shifting peak loads, and engaging the mass with mechanical systems
- Recover waste heat
- Include atrium space in building design as an opportunity to get more daylight into deep spaces and to display large three-dimensional artifacts
- Implement a comprehensive humidity control strategy
- Use technologies that reduce the amount of air needing treatment

- Utilize, energy management in office furniture and task lighting
- Install LED's or fiber optics when a small point source of light would be required
- Use non-incandescent lighting where appropriate and motion detecting light sensors
- Use non-toxic and low VOC materials for building construction and exhibit cases
- Reduce or eliminate off-gassing concerns and negative impacts on collections

The Smithsonian Institution's sustainability approach would be finalized during detailed design and would include a comprehensive listing of the LEED points that could be obtained. Compliance with federal mandates and LEED requirements would ensure that there would be no significant impact on energy use or site performance.

Global Climate Change

Construction and operation of the Plinth Alternative would generate incremental short- and long-term sources of GHGs. Short-term sources of project-generated GHG emissions would be the off-road construction equipment and on-road vehicles used for site preparation, grading, and construction. Construction emissions would be short-term in nature and would not persist following completion of construction. As discussed in Section 3.1.1 of the Tier I Final EIS (Smithsonian Institution, 2008a) required implementation of the mitigation measures during construction of the NMAAHC would minimize adverse impacts on air quality. Implementation of these mitigation measures during project construction would also minimize the amount of short-term GHG emissions generated during site clearing, grading, and building

construction resulting in no significant impacts on global climate change during construction of the Plinth Alternative.

Compared to the operation of the existing temporary concession trailer, there would be a net increase in GHG emissions produced at the project site during operation of the Plinth Alternative. The consumption of fossil fuels to generate electricity and to provide heating and hot water for the Plinth Alternative, as well as fuel consumption by on-road mobile vehicles associated with vehicle deliveries, would be the primary sources of long-term GHG emissions. As discussed above, the Plinth Alternative would include a number of sustainability features designed to minimize energy and water consumption on-site and increase the overall efficiency of the site operations. These measures would minimize the amount of GHG emissions that would be produced during operation of the new museum.

Further, due to the location of the project site within the National Mall, visitors would be expected to access the site primarily through public transit. The closest Metro stations to the project site includes the Smithsonian and Federal Triangle. Metrobus stops are located on the north side of Constitution Avenue near 15th Street, on the 14th Street side of the site approximately mid-block, on the south side of Constitution Avenue near 14th Street, and on 14th Street on the east and west sides north of Constitution Avenue. A DC Circulator stop is located on the south side of Constitution Avenue just east of 14th Street. There is a bus and taxi vehicle drop-off area at the project site on Madison Drive that is also used as a Tourmobile stop. In addition, the Smithsonian Institution would provide public bicycle parking on-site.

As discussed in Chapter 2, the Plinth Alternative would not include parking for staff. As with visitors, staff would be expected to travel to the site using public transportation, or by walking or biking. Bicycle racks would be provided for use by staff in the below grade loading/servicing area. Showers would also be provided for staff use to encourage walking or biking. Thus, the only additional vehicle traffic to the project site would be from service and delivery trucks. The limited number of vehicle trips to and from the site would minimize the amount of GHG emissions that would be produced during long-term operation of the Plinth Alternative.

Although there would be an incremental increase in GHG emissions produced on-site, the combination of energy efficiency and water conservation measures with the use of alternative forms of transportation for visitors and staff would substantially reduce the amount of GHG emissions produced compared to traditional building operations. Further, as mentioned above, global climate change is a worldwide problem. Because every nation is an emitter of GHGs, and therefore makes a cumulative contribution to global climate change, strategies implemented at the local and building-scale level would help to incrementally reduce the nation's overall contribution of GHGs. The Plinth Alternative's incremental contribution to global climate change would be reduced to no significant impact through project sustainability strategies.

Action Alternative 2: Plaza Concept

Open Space Resources

The Plaza Alternative would involve construction of an approximately 370,000 gross square feet of building space on the project site. The point of maximum building coverage would be approximately 80,559 square feet (approximately 34.5 percent) of the five-acre parcel site. However, because of the below grade programming and engineering requirements for the site's soil and groundwater conditions, the site would be cleared, excavated and re-graded. Therefore, implementation of the Plaza Alternative would involve the removal of 38 trees (493.5" of total caliper inches) from the site. The proposed removal of 14 mature trees from the project site would constitute a significant impact.

Replacement of mature trees with one or more trees whose aggregate circumference equals the circumference of the mature trees to be removed would minimize the long-term adverse effect. As part of the landscape design for the Plaza Alternative (see Figures 2.9 and 2.11), a single row of street trees would be planted between the curb and the sidewalk on Constitution Avenue, 14th Street and 15th Street running the length of the site. Clusters of trees would be planted at the east and west sides of the Corona and Office building and also along Madison Drive. Approximately 48 new trees would be planted as part of the Plaza Alternative to minimize the adverse impact. Mitigation measures would be required to further minimize the impacts of tree removal. In order to replace the aggregate 493.5" dbh of the trees lost due to development, the 44 new site trees included as part of Alternative 2 would have to average approximately 10.28" dbh each, unless additional trees are planted.

Development of the Plaza Alternative would modify the total amount of open space located within the site boundaries from approximately 96 percent undeveloped open space to approximately 65 percent of the total site area. Although this would be a significant change from the current condition, the Plaza Alternative would actually provide substantially more site open space than the other museums on the north side of the National Mall. Further, this open space calculation does not take into account the rooftop terrace that would be created on top of the Corona. However, converting the site from landscaped open space to development would result in a significant impact.

Site Performance

In addition to the building coverage area, the Plaza Alternative would include a plaza, driveway, sidewalks, walkways, water features and other hardscape features. With the Plaza Alternative, approximately 69 percent of the site would be impermeable surfaces, including both buildings and other hardscape surfaces. Because approximately 81 percent of the existing site is covered with permeable surfaces, this would result in a net increase in impermeable surfaces of approximately 50 percent as a result of the Plaza Alternative.

As with the Plinth Alternative, the Plaza Alternative would incorporate a number of sustainable features to minimize the adverse effects of additional impervious surfaces at the project site. Sustainable design strategies would be selected and implemented in order to improve the environmental impact of the construction and operation of the facility. The sustainability approach would be finalized during detailed design and would include a comprehensive listing of the LEED points that could be obtained. However,

compliance with federal mandates and LEED requirements would ensure that there would be no increase in stormwater runoff from the project site during operation of the Pavilion Alternative.

Currently, the project site contains a temporary concessions trailer to serve visitors to the National Mall and the Washington Monument Grounds. The Plaza Alternative would involve construction of an approximately 370,000 gross square feet on the project site. Due to the requirements of Smithsonian facilities, the Plaza Alternative would not only be a larger structure than the temporary concession stand trailer, it would have longer hours of operation. The development of the site with the Plaza Alternative would substantially increase energy demand at the site.

The Plaza Alternative would be constructed to meet LEED Gold certification criteria. In order to achieve the required number of points, the Plaza Alternative would be designed to implement specific energy conservation strategies similar to the Plinth Alternative. To minimize the use of artificial lighting on the concourse level, the exhibit and other public spaces would be located around a sky light located along 15th Street. A large oculus in the center of the plaza would provide light to reveal exhibit space below and provide natural light to subgrade levels. Compliance with federal mandates and LEED requirements would ensure that there would be no significant impact on energy use or site performance during operation of the Plaza Alternative.

Global Climate Change

As with the Plinth Alternative, construction and operation of the Plaza Alternative would incrementally increase GHG emissions compared to the existing temporary concession trailer that is

currently operating on-site. Implementation of air quality mitigation measures during construction of the Plaza Alternative would minimize the amount of short-term GHG emissions. Further, construction emissions would be short-term and would not persist following completion of construction activities. There would be no significant impact on global climate change during construction of the Plaza Alternative.

Operation of the Plaza Alternative would incorporate the same sustainability features described for the Plinth Alternative. In addition, visitors and staff would be expected to use alternative forms of transportation to access the site. These operational requirements of the Plaza Alternative would substantially reduce the amount of GHG emissions produced compared to traditional building operation. Because every nation is an emitter of GHGs, and therefore makes a cumulative contribution to global climate change, strategies implemented at the local and building-scale level would help to incrementally reduce the nation's overall contribution of GHGs. Thus, the Plaza Alternative's incremental contribution to global climate change from operation of the museum would be reduced to no significant impact through project sustainability strategies.

Action Alternative 3: Pavilion Concept

Open Space Resources

The Pavilion Alternative would involve construction of an approximately 330,000 gross square of building space feet on the project site. The maximum building coverage would be approximately 60,229 square feet (approximately 25.8 percent) of the five-acre parcel site. However, because of the below grade programming and engineering requirements for the site's soil and groundwater conditions, the majority of the site would be cleared, excavated and re-graded. Therefore, implementation of the Pavilion Alternative would involve the removal of 38 trees (493.5" of total caliper inches) from the site. The removal of 14 mature trees from the project site would constitute a significant impact.

Replacement of mature trees with one or more trees whose aggregate circumference equals the circumference of the mature trees to be removed would minimize the long-term adverse effect. As part of the landscape design for the Pavilion Alternative (see Figures 2.14 and 2.16), a single row of street trees would be planted between the curb and the sidewalk on Constitution Avenue, 14th Street and 15th Street running the length of the site. Clusters of trees would be planted at the east and west sides of the building Corona. Approximately 46 new trees would be planted as part of the Pavilion Alternative to minimize the adverse impact. Mitigation measures would be required to further minimize the impacts of tree removal. In order to replace the aggregate 493.5" dbh of the trees lost due to development, the 44 new site trees included as part of Alternative 3 would have to average approximately 10.73" dbh, each unless additional trees are planted.

Development of the Pavilion Alternative would modify the total amount of open space located within the site boundaries from approximately 96 percent undeveloped open to approximately 74 percent of the total site area. Although this would be a change from the current condition, the Pavilion Alternative would actually provide substantially more site open space than all of the other museums on the north side of the National Mall. Further, this open space calculation does not take into account the rooftop terrace that would be created on top of the Corona. However, converting the site from landscaped open space to development would result in a significant impact.

Site Performance

In addition to the building coverage area, the Pavilion Alternative would include a driveway, sidewalks, walkways, water features and other hardscape features. With the Pavilion Alternative, approximately 49 percent of the site would be impermeable surfaces, including the building and other hardscape surfaces. Because more than 81 percent of the existing site is covered with permeable surfaces, this would result in a net increase in impermeable surfaces of approximately 30 percent as a result of the Pavilion Alternative.

As with the Plinth and Plaza Alternatives, the Pavilion Alternative would incorporate a number of sustainable features to minimize the adverse effects of additional impervious surfaces at the project site. Sustainable design strategies would be selected and implemented in order to improve the environmental impact of the construction and operation of the facility.

The sustainability approach would be finalized during detailed design and would include a comprehensive listing of the LEED points that could be obtained. However, compliance with federal mandates and LEED requirements would ensure that there would be no increase in stormwater runoff from the project site during operation of the Pavilion Alternative.

Currently, the project site contains a temporary concessions trailer to serve visitors to the National Mall and the Washington Monument Grounds. The Pavilion Alternative would involve construction of an approximately 330,000 gross square feet on the project site. Due to the requirements of Smithsonian facilities, the Pavilion Alternative would not only be a larger structure than the temporary concession stand trailer, it would have longer hours of operation. The development of the site with the Pavilion Alternative would substantially increase energy demand at the site.

The Pavilion Alternative would be constructed to meet LEED Gold certification criteria. In order to achieve the required number of points, the Pavilion Alternative would be designed to implement specific energy conservation strategies similar to the Plinth and Plaza Alternatives. Daylight would be brought into the west facing program areas on Level -1 by a sky light that would open outward to the west, providing views of the Washington Monument Grounds. Compliance with federal mandates and LEED requirements would ensure that there would be no significant impact on energy use and site performance during operation of the Pavilion Alternative.

Global Climate Change

As with the Plinth and Plaza Alternatives, construction and operation of the Pavilion Alternative would incrementally increase GHG emissions compared to the emissions from the existing temporary concessions trailer that is currently operating on-site. Implementation of air quality mitigation measures during construction of the Pavilion Alternative would minimize the amount of short-term GHG emissions. Further, construction emissions would be short-term and would not continue following completion of construction activities. There would be no significant impact on global climate change during construction of the Pavilion Alternative.

Operation of the Pavilion Alternative would incorporate the same sustainability features described for the Plinth and Plaza Alternatives. In addition, visitors and staff would be expected to use alternative forms of transportation to access the site. These operational requirements of the Pavilion Alternative would substantially reduce the amount of GHG emissions produced compared to traditional building operation. Because every nation is an emitter of GHGs, and therefore makes an incremental cumulative contribution to global climate change, strategies implemented at the local and building-scale level would help to incrementally reduce the nation's overall contribution of GHGs. Thus, the Pavilion Alternative's incremental contribution to global climate change during its operation would be reduced to no significant impact through project sustainability strategies.

Action Alternative 4: Refined Pavilion Concept

Open Space Resources

The Refined Pavilion Alternative would involve construction of an approximately 240,000 gross square feet of building space on the project site. The point of maximum building coverage would be approximately 53,750 square feet (approximately 23 percent) of the five-acre parcel site. However, because of the below grade programming and engineering requirements for the site's soil and groundwater conditions, the majority of the site would be cleared, excavated and re-graded. Therefore, implementation of the Pavilion Alternative would involve the removal of approximately 38 trees from the site. The proposed removal of 14 mature trees from the project site would constitute a significant impact.

Replacement of mature trees with one or more trees whose aggregate circumference equals the circumference of the mature trees to be removed would minimize the long-term adverse effect. As part of the landscape design for the Pavilion Alternative (see Figures 2.19 and 2.21), a single row of street trees would be planted between the curb and the sidewalk on Constitution Avenue, 14th Street and 15th Street running the length of the site. Clusters of trees would be planted at the north, east and west sides of the building Corona, and within the plaza along Madison Drive. Approximately 52 new trees would be planted as part of the Refined Pavilion Alternative to minimize the adverse impact. Mitigation measures would be required to further minimize the impacts of tree removal. In order to replace the aggregate 493.5" dbh of all the trees lost due to development, the 44 new site trees included as a part of Alternative 4 would have to average approximately 9.49" dbh each, unless additional trees are planted.

Development of the Pavilion Alternative would modify the total amount of open space located within the site boundaries. The site is currently approximately 96 percent undeveloped open space, which would be reduced approximately 77 percent of the total site area. Although this would be a change from the current condition, the Refined Pavilion Alternative would actually provide substantially more site open space than all of the other museums on the north side of the National Mall. Further, this open space calculation does not take into account the rooftop terrace that would be created on top of the Corona. However, converting the site from landscaped open space to development would result in a significant impact.

Site Performance

The point of maximum building coverage with the Pavilion Alternative would occupy approximately 23 percent of the site area. In addition, the Pavilion Alternative would include a driveway, sidewalks, walkways, water features and other hardscape features. On the south side of the site (National Mall side), visitors would enter the Refined Pavilion Alternative through a plaza featuring landscaped areas and trees. A hardscape plaza featuring a shallow reflecting pool would be created at the south entry and provide outdoor museum space. There would be a large water feature on the north side of the site along Constitution Avenue for stormwater treatment. Additionally, two pathways provide access to the museum and the south side of the site.

The sidewalks would be made of a concrete aggregate consistent with the existing sidewalks and all of the sidewalks surrounding the National Mall. With the Refined Pavilion Alternative, approximately 52 percent of the site would be impermeable surfaces, including the building and other hardscape surfaces. Because more than 81 percent of the existing site is covered with permeable surfaces, this would result in a net increase in impermeable surfaces of more than 33 percent as a result of the Refined Pavilion Alternative.

As with the other action alternatives, the Refined Pavilion Alternative would incorporate a number of sustainable features to minimize the adverse effects of additional impervious surfaces at the project site. Sustainable design strategies would be selected and implemented in order to improve the environmental impact of the construction and operation of the facility. The sustainability approach would be finalized during detailed design and would include a comprehensive listing of the LEED points that could be obtained. However, compliance with federal mandates and LEED requirements would ensure that there would be no increase in stormwater runoff from the project site during operation of the Refined Pavilion Alternative.

Currently, the project site contains a temporary concessions trailer to serve visitors to the National Mall and the Washington Monument Grounds. The Refined Pavilion Alternative would involve construction of an approximately 240,000 gross square feet on the project site. Due to the requirements of Smithsonian facilities, the Refined Pavilion Alternative would not only be a larger structure than the temporary concession stand trailer, it would have longer hours of operation. The development of the site with the Refined Pavilion Alternative would substantially increase energy demand at the site.

The Refined Pavilion Alternative would be constructed to meet LEED Gold certification criteria. In order to achieve the required number of points, the Refined Pavilion Alternative would be designed to implement specific energy conservation strategies similar to the Plinth Alternative. Daylight would be brought into the west facing program areas on Level -1 by a light well that would open outward to the west, providing views of the Washington Monument Grounds. Compliance with federal mandates and LEED requirements would ensure that there would be no significant impact on energy use during operation of the Refined Pavilion Alternative.

Global Climate Change

As with the other action alternatives, construction and operation of the Refined Pavilion Alternative would increase GHG emissions compared to emissions from the existing temporary concession trailer that is currently operating on-site. Implementation of air quality mitigation measures during construction of the Refined Pavilion Alternative would minimize the amount of short-term GHG emissions. Further, construction emissions would be short-term and would not continue following completion of construction activities. There would be no significant impact on global climate change during construction of the Refined Pavilion Alternative.

Operation of the Refined Pavilion Alternative would incorporate the same sustainability features described for other action alternatives. Visitors and staff would be expected to use alternative forms of transportation to access the site. These operational requirements of the Refined Pavilion Alternative would substantially reduce the amount of GHG emissions produced compared to traditional building operation. Because every nation is an emitter of GHGs, and therefore makes a cumulative contribution to global climate change, strategies implemented at the local and building-scale level would help to incrementally reduce the nation's overall contribution of GHGs. Thus, the Refined Pavilion Alternative's incremental contribution to global climate change during its operation would be reduced to no significant impact through project sustainability strategies.

3.6.6 What efforts would be taken to minimize the impacts on Natural Resources?

The following mitigation measure is recommended to minimize construction and operational effects of the action alternatives on open space and natural resources:

- To minimize adverse effects associated with the loss of mature trees, the Smithsonian should retain existing site trees to the extent possible. The drip lines of mature trees that can be retained in place should be fenced by a certified arborist prior to the start of construction. Mature trees that cannot be retained in place should be salvaged and reused within site landscaping to the extent feasible. If it is not feasible to retain the trees on-site, salvaged trees should be relocated within the National Mall in coordination with NPS.

- To minimize the loss of mature trees, new trees should be planted on site that total the aggregate dbh of trees lost during construction.

The Tier I Final EIS (Smithsonian Institution, 2008a) required implementation of the mitigation measures during construction of the NMAAHC to minimize adverse effects associated with criteria air pollutant emissions:

- Use ultra low sulfur diesel fuel in construction equipment.
- Limit unnecessary idling times on diesel powered engines to three to five minutes.
- Locate diesel powered exhausts away from fresh air intakes.

These mitigation measures would also be required to reduce the contribution of GHG emissions during construction.

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