4.0 ENVIRONMENTAL CONSEQUENCES

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4.1 Introduction to Impacts Analysis

In the analysis, impacts are characterized by several factors including intensity, type, and duration. Definitions of these terms and related assumptions are provided below:

Intensity – The intensity of an impact describes the magnitude of change that the impact generates. For the majority of the resource areas, the intensity thresholds are as follows:

> **Negligible**: There would be no impact, or the impact does not result in a noticeable change in the resource;
>
> **Minor:** The impact would be slight, but detectable, resulting in a small but measurable change in the resource;
>
> **Moderate**: The impact would be readily apparent and/or easily detectable;
>
> **Major**: The impact would be widespread and would substantially alter the resource. A major adverse impact would be considered significant.
>
> For specific resource areas, such as visual resources, more specific thresholds are necessary. In such cases, the applicable thresholds are outlined at the beginning of the resource analysis.

Type – The impact type refers to whether it is adverse (negative) or beneficial (positive). Adverse impacts would potentially harm resources, while beneficial impacts would improve resource conditions. Within the analysis, impacts are assumed to be adverse unless identified as beneficial.

Duration – The duration of an impact identifies whether it occurs over a restricted period of time (short-term), or persists over a longer period (long-term). For the purposes of this analysis, it is assumed that short-term impacts would occur during the construction of the improvements, while long-term impacts would persist once the construction is complete. For the purposes of this analysis, impacts are assumed to be long-term unless identified otherwise.

In addition to the factors detailed above, impacts may be characterized as direct, indirect, or cumulative. A direct impact is caused by the action and occurs at the same time and place. An indirect impact is caused by the action, but occurs later in time, or farther removed in distance. A cumulative impact occurs when the proposed action is considered together with other past, ongoing, or planned actions.

4.2 Socio-Economic Resources

4.2.1 Land Use Impacts

Stadium Alternative

Project Site

The redevelopment of the project site as a soccer stadium would change the uses of the parcels comprising the site from industrial, transport/communications/utilities, and institutional to a recreational sports and entertainment use. Because the entire site would be devoted to that use, no land use incompatibilities or conflicts would be created on the site. No residential units or desirable commercial uses would be displaced from the project site. Therefore, the redevelopment of the site would have minimal administrative impacts, such as updating official DCOP land use maps.

Adjacent Properties

During the construction of the stadium, the actual land use of the project site would change from its current light industrial and institutional uses to that of an active construction site. Construction activities on the site, such as the operation of heavy equipment and the storage of project-related materials, would generate additional noise, dust, traffic, and visual disruption that would have the potential to cause annoyance or irritation to uses on adjacent parcels. These effects would vary in intensity and duration throughout the construction campaign, expected to last 1.5 to 2 years, but would cease entirely following the completion of construction activities. Comparatively, nearby industrial uses such as the adjacent concrete/gravel processing facility would continue throughout the construction period and would not be particularly distinct from the construction activities on the project site.

In the long term, the construction and subsequent operation of the stadium would change the current light industrial and institutional uses on the project site to a recreational sports and entertainment use. This would generally be a less-intrusive use on adjacent properties than the activities currently on the site, because activities occurring at the stadium would generally occur only about once a week on weekends or on weekday evenings, after the normal business hours of activities and uses on the adjacent properties. The operation of the stadium would not require the cessation of, or prevent the continued operation of uses on adjacent properties and, therefore, would not create land use incompatibilities or conflicts.

Development of the stadium may indirectly induce redevelopment of complementary uses, such as hotels, restaurants, retail stores, and medium- and high-density residential buildings, but such development is desirable according to the Generalized Land Use Plan, and would not be incompatible with the operation of the stadium.

<u>Surrounding Area</u>

In the short term, the construction of the soccer stadium may generate additional dust, noise, and traffic on the project site. However, those issues would be similar to other large-scale construction projects in the District and would cease upon the completion of the stadium.

The operation of and activities at the new soccer stadium would be similar to those occurring at nearby Nationals Park. However, the activities at the new stadium would be less intense, since the soccer stadium would be smaller and have approximately half of the capacity of Nationals Park, and DC United games would occur less frequently, since home games only occur approximately once per week (as opposed to Nationals baseball games, which may occur every night for a period of one week or more throughout the baseball season). Effects from activities occurring at the new soccer stadium, such as the glow of stadium lights and crowd noise, may be noticeable to the residential uses less than 0.25 mile north of the project site; however, these effects would not be specifically directed toward those uses, and would be attenuated to a certain degree by distance. In addition, such effects would only occur approximately once per week during DC United's playing season, and occasionally for other events that may occur at the stadium throughout the year. In the context of one year, these effects would generally be infrequent; the operation of the stadium would not prevent nearby residential uses from continuing or prevent the development of other compatible land uses in the surrounding area.

Activities occurring at the new stadium would not prevent the continuation of current land uses in the surrounding area or create land use incompatibilities. Most activities occurring at the stadium would take place in the evenings after the normal daytime business hours of many of the activities and businesses in the surrounding area.

Overall, the proposed action would result in short-term minor adverse impacts on land uses due to construction. Long-term direct impacts would be beneficial due to the potential change of use at the project site. The development of the stadium would likely indirectly induce complementary development, such as hotels, restaurants, retail stores, and medium- and high-density housing, but such development is desirable according to the Generalized Land Use Plan and would not be incompatible with the stadium use. For these reasons, indirect impacts on land use would be beneficial.

No Action Alternative

Under the No Action Alternative, the existing light industrial uses at the project site would continue and there would be no beneficial redevelopment of these parcels and the surrounding area. As a result, there would be an adverse impact on land use under this alternative.

4.2.2 Zoning

Stadium Alternative

Project Site

The development of the soccer stadium on the project site would not be specifically permitted or prohibited as a matter of right and would be subject to the requirements for mixed-use development under the provisions of the CG overlay district. The proposed project would further the goals of the CG overlay district by establishing a visitor-related use and encouraging pedestrian activity on and around the stadium site. Further, the project would require Zoning Commission review and approval in accordance with CG overlay district requirements. It is expected that the soccer stadium would be designed to be respectful of its neighborhood context and consistent with the applicable siting, architectural design, site plan, landscaping, and sidewalk treatment guidelines.

Adjacent Properties and Surrounding Area

With the exception of Fort McNair, which as a federal facility is not subject to District zoning, and the majority of residential properties north of Q Street, parcels adjacent to and in the area surrounding the project site are located within the CG Overlay District. Any redevelopment induced by, but not directly related to, the soccer stadium project would be subject to the provisions of the CG overlay district and would require review and approval by the DC Zoning Commission. It is expected that any future housing development occurring in the residential zoning districts north of Q Street would be intended to upgrade the quality of the housing that is currently located there but would remain of a similar character and context, and would not be directly or indirectly induced by the development of the soccer stadium. The construction and operation of the soccer stadium would not adversely affect the operation of the Camden South Capitol PUD, nor would it adversely affect the development of the Florida Rock or Forest City PUDs (although the presence of the soccer stadium may indirectly encourage the developers to proceed with the redevelopment of those parcels sooner).

Overall, the construction of the soccer stadium would not alter zoning within Buzzard Point, resulting in no short-term impacts. Over the long term, because the proposed soccer stadium would be designed and operated to be sensitive to the urban context, operation of the soccer stadium would have no direct or indirect impacts on the zoning of properties adjacent to or in the area surrounding the project site.

Zoning Mitigation

Because no adverse impacts would occur under the Stadium Alternative, no mitigation would be necessary.

No Action Alternative

Under the No Action Alternative, the site would maintain its existing land use. Therefore, there would be no impacts on zoning under this alternative.

4.2.3 Community Facilities Impacts

Stadium Alternative

Educational Facilities

Construction of the proposed soccer stadium would be unlikely to have short-term construction-related impacts on educational facilities, such as increased traffic, noise, and dust, due to their distance from the project site as presented in Table 3-2. No increases in school enrollment would occur because the project would not increase the resident population of the District or the surrounding region. Thus, the operation of the soccer stadium would not have a long-term impact on educational facilities in Washington, DC or the surrounding region.

Recreational Facilities

The construction of the soccer stadium could have short-term impacts on the King Greenleaf Recreation Center as a result of increases in noise. Increased construction-related traffic could also have a short-term impact on visitors to Nationals Park. While these impacts would be adverse, all construction activities on the project site and their associated activities would cease following the completion of the stadium.

In the long term, visitors to the new soccer stadium could incorporate visits to nearby parks and recreational facilities on their way to or from events at the stadium, thereby increasing the demand on services and staff at those facilities. Any such increases could occur approximately once per week or less between March and October (the approximate frequency of DC United home games during their season schedule) as well as before or after other activities that would occasionally be held at the stadium (such as concerts or festivals). However, it is anticipated that increases in park and recreational facility visitation related to DC United home games or other events at the stadium would be within the capacity of nearby recreational facilities to accommodate them.

Medical Facilities

The construction of the soccer stadium could result in an increase in the number of patients visiting nearby medical facilities due to construction-related injuries. However, the adherence to safe workplace practices as required by the Occupational Safety and Health Administration (OSHA) during the construction campaign would minimize the number of injuries requiring medical attention.

In the long term, the operation of the stadium may cause an increase in the number of patient visits to local medical facilities due to injuries to soccer players or spectator issues such as exposure to heat or cold and injuries from slips, trips or falls. Additional spectator injuries could also occur during other non-soccer events that would occasionally be held at the stadium. Overall, such visits would be infrequent, since the DC United play approximately one home game each week during their season schedule between March and October, and other non-soccer events would only be held periodically throughout the year. Any increases in patient visits to local medical facilities would be small and within the capacity of those facilities to treat patients.

Public Safety

Police

It is anticipated that an equivalent number of police and private security personnel would be required to work DC United games at the new stadium as are currently required for games played at RFK Stadium. The number of police and security personnel needed for the new stadium could actually be less, since the new stadium would be a smaller facility than RFK Stadium and thus somewhat easier to secure. The burden of providing officers to work games would not be shifted to another police district, since RFK Stadium and the new stadium are both located in the First Police District; however, the burden would be shifted from Police Service Area 108, where RFK Stadium is located, to Police Service Area 105, which contains the project site. In addition, concerts, festivals and non-DC United events that are proposed to be held at the new soccer stadium may increase the demand for officers and security personnel at the new facility.

Fire and Emergency Medical Services

As with police services described above, the operation of the new stadium would shift the demands on fire and EMS personnel from stations located near RFK Stadium to stations near the project site. Although the number of DC United games played each season would remain similar to the number currently played at RFK Stadium, the new facility would potentially host additional, non-DC United events (such as concerts and festivals), thereby increasing demand for fire and EMS services on those nearby stations. However, it is anticipated that any such increase in calls for fire and EMS services generated by events held at the new stadium would be infrequent and within the response capabilities of nearby fire and EMS stations. DC United would continue to contract with a private ambulance company to ensure that an appropriate number of EMS personnel would be on hand to respond to any medical emergencies that would occur during soccer games and other events held at the stadium.

Overall, the proposed action would result in short-term minor adverse impacts on recreation as a result of increased noise at a recreation facility. The proposed action would result in long-term minor adverse impacts on community facilities due to the increased demand on public safety officers.

Community Facilities Mitigation

- Short-term construction impacts should be mitigated through the coordination of construction routes and activities with the surrounding communities. A transportation management plan should be completed to address any long-term operational impacts.
- The District Government, DC Fire and EMS, the DC Sports and Entertainment Commission, and DC United should prepare and implement a plan that identifies and mobilizes the personnel needed for medical services during soccer games and other events to be held at the new stadium.
- The District Government, the Metropolitan Police Department, the DC Sports and Entertainment Commission, and DC United should develop a security plan that identifies and mobilizes the personnel needed for public safety and security at DC United games and other events that would be held at the new stadium.

No Action Alternative

Under the No Action Alternative, existing community facilities would maintain their existing facilities and operations. As a result, there would be no impacts on community facilities under this alternative.

4.2.4 Demographics and Housing Impacts

Stadium Alternative

There are no residences located at the project site or immediately adjacent to it; therefore, no direct long-term impacts to residential areas or housing units would be anticipated. Residential areas to the north of the project site would continue to be protected by existing zoning restrictions and buffered by the low-rise light-industrial and commercial “transitional uses” immediately north of the project site.

Construction activities related to the development of the stadium would have the potential to create short-term adverse impacts on immediately surrounding residential communities from the generation of additional dust, noise, and traffic at the project site. The impacts would be similar to other large-scale construction projects in the District and would cease upon the completion of the stadium. The nearby residential areas would be separated from site construction activities by the low-rise light-industrial and commercial uses to the north of the project site. Protocols to minimize noise and dust would be followed during construction and Best Management Practices (BMPs) would be utilized to minimize potential effects. In addition, construction impacts would be limited in duration.

Once the stadium is operational, stadium lights and crowd noise may be noticeable from nearby residential areas. However, these effects would be attenuated to a certain degree by distance. In addition, the stadium would be designed using industry standards and best practices to minimize noise and light in adjacent residential areas. Increases in noise, light and traffic (pedestrian and vehicular) would be relatively infrequent and limited duration, based on DC United's regular season home schedule and other events that may occur throughout the year. In the context of one year, these effects would generally be infrequent.

The operation of the stadium would not likely alter the demographic composition of the area. However, the development of the stadium would likely induce complementary development in nearby areas primarily to the south and east of the project site, including medium- and high-density housing in adjacent areas, and therefore increase the population of Southwest and potentially alter the demographic profile of surrounding neighborhoods over time. Additional redevelopment could make the area more attractive to home-buyers and renters due to new retail and site amenities, which could increase housing demand, and rents, in the area. Development of the stadium would not displace or remove existing public housing and any new residential development would be subject to the District's inclusionary zoning requirements targeted at increasing affordable housing opportunities and creating mixed income neighborhoods.

Potential future redevelopment of the Buzzard Point area would need to include proposed uses and design elements to buffer the existing residential units in close proximity to new development. In order to avoid adverse impacts related to new development of incompatible height, massing, or scale adjacent to existing modestly scaled residential building, potential redevelopments would need to step down from larger-scale new development to more modestly scaled residential buildings.

New sidewalks, bicycle routes, and streetscape enhancements would make the area more pedestrian and bicycle friendly, increasing amenities for area residents. Site improvements would likely improve perceived public safety in the area through better lighting and increased pedestrian activity, resulting in beneficial impacts

The construction and operation of the stadium would create jobs at the stadium (such as construction-related jobs, ticket takers, guest services, ushers, food service, etc.). Provisions to meet goals for District resident hiring and District-based business contracts for construction and operation of the stadium would be implemented. This could increase incomes in the surrounding residential communities, creating beneficial impacts. Fiscal and employment impacts are discussed in further detail in the Economic and Fiscal impacts section.

Overall, the Stadium Alternative would result in minor short-term adverse impacts on demographics and housing due to additional noise at the project site. Over the long term, the proposed project would result in direct minor adverse impacts as a result of stadium light and crowd noise and indirect beneficial impacts as a result of potential inducement of redevelopment of the existing light industrial sites near the stadium into housing.

Demographics and Housing Mitigation

- Best Management Practices should be implemented to minimize noise disruptions related to construction activities.
- The stadium design and development should incorporate the use of the highest lighting design standards and the use of light fixtures that reduce light pollution to control light from spilling up to the sky or beyond the boundaries of the stadium.
- Recommendations generated from the Buzzard Point Urban Design Framework Plan currently being developed by the District should be implemented to guide decision-making related to development, the public realm, and other infrastructure in the area. These would include designing the soccer stadium in context with development and redevelopment of the surrounding area; adhering to development guidelines and requirements to include a robust mix of uses and housing, protecting existing affordable housing units, and meeting accessibility and neighborhood compatibility goals established during the public planning process. The proposed Urban Design Framework Plan summary is in Appendix A.

No Action Alternative

Under the No Action Alternative, the site would maintain its existing land use. Therefore, there would be no impacts on demographics or housing under this alternative.

4.2.5 Environmental Justice Impacts

The purpose of an environmental justice analysis is to identity any potential disproportionately high adverse human health or environmental impacts on minority and low-income populations and identify mitigation measures to address any disproportionately high and adverse effects impacts. As described in Section 3.1.5, Census Tracts 64, 72, and 105 are considered potential environmental justice communities of concern. In addition, Census Tract 110 includes several affordable housing developments adjacent to Census Tract 64. Tract 64 may be considered the most vulnerable subarea due to the concentration of minority and low-income populations and the proximity to the proposed stadium.

The assessment of environmental justice includes other environmental topics analyzed in the EMS and conclusions regarding health and environmental effects to minority populations and low-income communities are based on the analyses presented in the EMS.

Stadium Alternative

Construction activities related to the development of the stadium would have the potential to create short-term adverse impacts on immediately surrounding residential communities due to increases in noise and air pollution from the generation of additional dust, noise, and traffic at the project site. BMPs would be utilized to minimize potential effects and the impacts would be limited in duration. Fugitive dust that could be generated during site remediation activities would utilize great care and best management practices (BMPs) to control dust and minimize the exposure of residents in nearby areas to contaminants on and underlying the site. Therefore, impacts would be minor.

Operational impacts would include increased vehicular and pedestrian volumes in the surrounding area. Crowd disruptions, such as noise and littering, would likely be somewhat confined to the area south of Potomac Avenue towards the river, away from existing residential communities. Stadium lights may be noticeable from nearby residential areas; however, industry lighting standards and best practices would be used to minimize light in adjacent residential areas. Due to increases in vehicular and pedestrian traffic during stadium events, updated residential parking restrictions, signage, and other restrictions on non-local pedestrian and vehicular traffic may be needed in residential areas during stadium events. The operational impacts generated by the stadium would be relatively infrequent and limited in duration, based on stadium events that occur throughout the year.

Beneficial impacts from stadium operations would also occur. Site improvements, an overall increase in pedestrian circulation and connections, and the presence of transportation control officers would improve real and perceived security in the area, creating long-term beneficial impacts for area residents. Stadium construction and operations could provide beneficial impacts for area minority and low-income residents and business owners due to increased job opportunities and stadium contracts. According to the stadium term agreement, District resident and small and disadvantaged District-based business employment and contract requirements would be implemented for construction and operation of the stadium. In addition, development of the stadium would provide long-term public health benefits due to site remediation that would eliminate potential health risks from existing hazardous materials and substances.

The proposed stadium would help to accelerate the pace of future development in the area. This could increase housing demand, and rents in the area. Existing public housing in the area would be preserved and any new residential development would be subject to the District's inclusionary zoning requirements targeted at increasing affordable housing opportunities and creating mixed income neighborhoods.

Overall, while short- and long-term impacts from the construction and operation of the stadium would occur within environmental justice areas, the impacts would not be appreciably greater in magnitude in minority or low-income communities. Therefore, no disproportionately high or adverse impacts would occur in minority or low-income populations. There would be short- and long-term minor adverse impacts, as we as long-term beneficial impacts.

Environmental Justice Mitigation

- Consider environmental justice communities of concern when developing and implementing transportation mitigation recommendations for residential areas generated by the Transportation Operation Plan (TOP).
- Work with the DC Housing Authority to ensure any necessary mitigation for public housing units, such as the provision of air filters, is implemented.
- Develop construction truck routes that avoid residential areas to minimize the generation of fugitive dust.

No Action Alternative

No changes to the site would occur under the No Action Alternative, and therefore there would be no impacts to minority or low-income populations.

4.2.6 Economic and Fiscal Impacts

Stadium Alternative

Both short- and long-term economic impacts would occur due to the construction and operation of a soccer stadium in Buzzard Point. Short-term impacts from construction-related spending would occur only during the construction of the stadium and would be considered one-time economic impacts. Once complete, long-term impacts due to the operation of the soccer stadium would occur annually from visitor and local spending, job creation, and earnings.

The EMS analysis is based on the June 2014 Draft Buzzard Point Stadium Market and Economic Benefit Analysis report by Brailsford & Dunlavey (B&D Venues 2014). The Brailsford & Dunlavey estimates are based on development costs, construction timeframes, tenant operations, event schedules, and annual attendance assumptions made using best available information at the time the estimates were generated, as well as the terms of the initial 30-year term ground lease between the Government of the District of Columbia and DC United. The market analyzed in the report is the District of Columbia. The report provides estimates in 2015 dollars and assumes a two-year timeframe for construction. Once operational, the report anticipates a baseline event schedule of 44 total events per year at the stadium beginning in 2017, with a total yearly attendance of over 670,500.

The report estimates both direct and indirect impacts of the facility (see Figure 4-1) while accounting for leakage to jurisdictions outside of the District, or services and jobs that may be provided by out-of-market companies or residents. Money spent to construct and operate the stadium and money spent by stadium patrons is considered a direct impact. Indirect impacts are new economic demands created by the direct spending (e.g. the purchase of goods related to stadium events such as catering, which in turn creates new employment and additional earnings for other businesses).

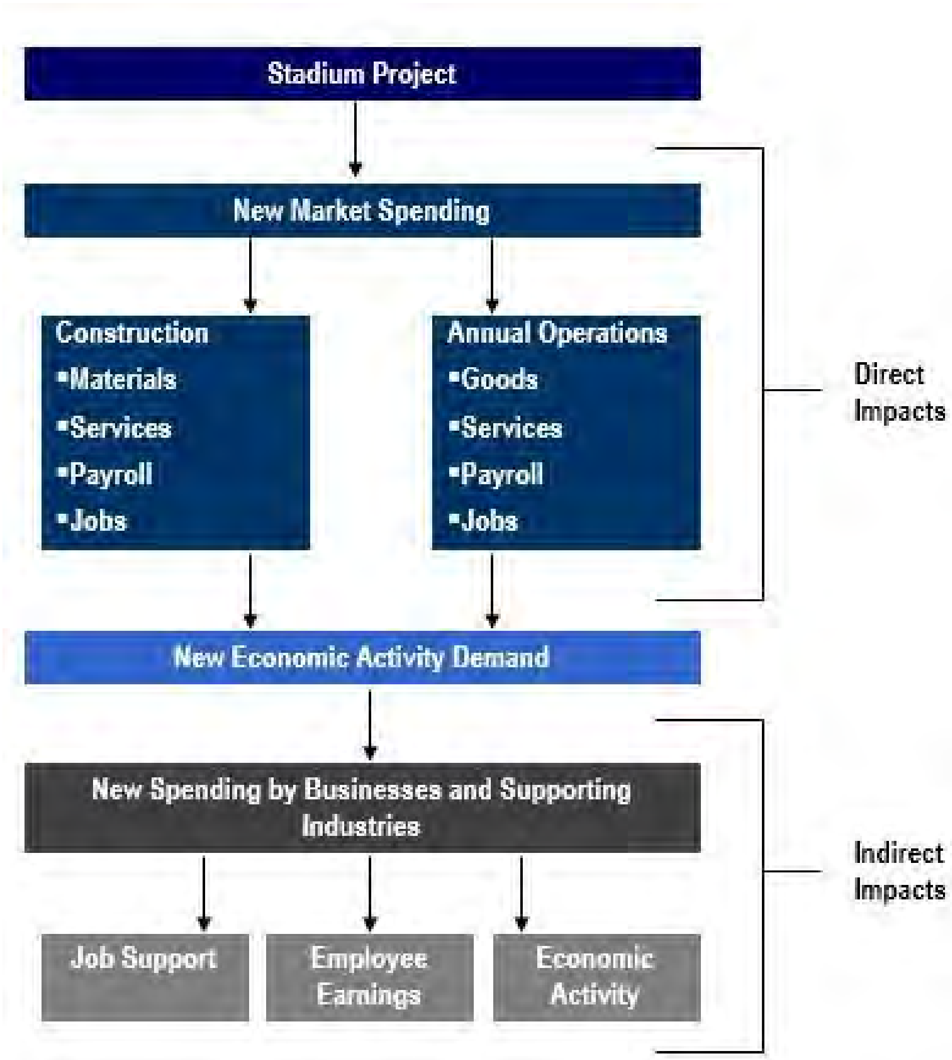

Figure 4-1: Direct and indirect impacts flow chart
Source: B&D Venues 2014

Construction-related (One-Time) Economic and Fiscal Impacts

Direct, construction-related impacts would occur from the procurement of labor, purchase of materials and contracting of soft cost services (such as those services provided by architects, engineers, program managers, and financiers) within the District. These activities would have a one-time impact. Development costs, not inclusive of land acquisition costs, would be approximately $182 million. Due to the multiplier effect as the $182 million is spent and re-spent in the District, the result would be a one-time economic impact to the District of over $92 million in economic activity, over $57 million in wages, and supporting over 1,100 full-time equivalent jobs within the District.

One-time, tax revenue fiscal impacts from construction spending would also occur from direct spending during construction on materials, supplies, and employee salaries. Assuming all construction material purchases are taxable, direct spending would be projected to generate approximately $4.7 million in fiscal (tax) benefits over the two-year construction period. Indirect jobs supported by the project would generate approximately $2.6 million in personal income taxes. Overall, the one-time fiscal benefits would amount to approximately $7.2 million in net new tax revenue (see Table 4-1).

Type	One-Time Fiscal Benefits*
Personal Income Taxes	$2,287,600
Sales & Use Taxes	$2,063,400
Business Franchise Taxes	$355,600
Indirect Job Creation (personal income taxes)	$2,581,000
TOTAL	**$7,267,600**
***Includes direct and indirect taxes generated from stadium construction**	

Table 4-1: One-time fiscal benefits summary
Source: B&D Venues 2014

Recurring Economic and Fiscal Impacts
Operations and visitor spending related to the completed stadium would create long-term direct and indirect beneficial economic impacts within the District as repeated spending would occur from events held at the stadium. Based on an estimated event calendar that would include a total of 44 events and 670,500 annual attendees (DC United Games, concerts, rugby matches, soccer exhibitions, and community events), the stadium would be anticipated to introduce over $51 million in total economic activity on an annual basis, support $16 million in payroll, and support 452 full-time equivalent jobs in the District. Much of this economic activity would be generated by stadium expenditures and tenant operations, which would require purchase of goods and services from the local market economy.

Tax revenues generated from stadium operations would also create long-term fiscal benefits. These tax revenues would include those from sales taxes and business franchise taxes, along with off-site fiscal benefits resulting from visitor and team spending, income tax from indirect job creation; and real estate tax revenue. The estimated net present value of the recurring fiscal benefits are summarized in Table 4-2 below, and total over $197 million calculated as a 30-year net present value. In addition, the stadium would help to accelerate the pace of future development in the area, which would encourage the development of new economic activity and increase area land values in the future, increasing the city's tax base over time.

Over the estimated construction and operation periods, the stadium would be projected to introduce over $1.3 billion in total economic activity and support $454 million in earnings in the District. The stadium would also be anticipated to generate $204 million in fiscal benefits over the construction and operation periods.

Type	30-Year NPV of Recurring Fiscal Benefits^
Personal Income Taxes	$10,427,000
Stadium sales & use taxes, net abatements*	$50,714,000
Business franchise taxes	$3,312,000
Visiting team spending	$3,797,000
Visitor spending	$38,092,000
Indirect job creation (personal income tax)	$29,680,000
Property taxes, net abatements	$49,924,000
Ticket Fee	$11,242,000
TOTAL	**$197,188,000**
***Sales and use taxes generated from stadium operations, tickets, concessions, merchandise, catering, and parking; ^Includes direct and indirect taxes generated from stadium operations.**	

Table 4-2: Recurring fiscal benefits summary (net present value)
Source: B&D Venues 2014

Existing employers in the area include Fort McNair, the U.S. Navy, two marinas, the gravel plant, a salvage yard, Capital Bikeshare maintenance, an office building, and small automotive-oriented commercial and industrial businesses. Existing employment sites adjacent to the project site are anticipated to remain.

Two existing businesses on the site, Capital Bikeshare (a subsidiary of Alta Bicycle Share) and Super Salvage Inc., would need to relocate to a different location, which would result in the relocation or elimination of approximately 60-65 full- and part-time jobs (an estimated 37-42 full time equivalents). Displacement of businesses on the site would slightly decrease the net increase in economic activity, jobs, and fiscal benefits attributable to the new stadium. To the extent that these businesses could be relocated within the District, the entire revenues generated by the stadium would be a net gain.

Overall, the project would result in a net fiscal gain and net employment for the District. As a result, the Stadium Alternative would result in long-term beneficial impacts on fiscal resources.

Economic/Fiscal Mitigation

- The contracts for the stadium construction and operations should work to include goals for the inclusion of local businesses and small disadvantaged businesses. In addition, hiring for stadium operations should include outreach efforts within the local community.
- The District should provide relocation assistance to businesses that would be displaced by the new stadium. Such assistance may include technical assistance in identifying suitable new locations for those uses, with priority given to locations within the District, and/or subsidizing their relocation.

No Action Alternative

Under the No Action Alternative, the existing businesses would remain on the site and no new economic activity would be introduced. Therefore, there would be no economic or fiscal impacts under this alternative.

4.3 Effects on Cultural Resources

The preliminary site plan used to analyze cultural resources impacts in this document is used as an example of the approximate massing, height, and location of the proposed stadium and associated mixed use development. The impacts described and photo simulations shown that are based on this site plan are representative of how the visual character of the project site, adjacent views and vistas, and historic resources would be affected by the development of a soccer stadium on the site.

4.3.1 Potential Effects on Archaeological Resources

Stadium Alternative

Archaeological Potential

The potential for prehistoric and archaeological sites to be found in the study area can be assessed on the basis of its topographic setting, distribution of known archaeological sites and prehistoric settlement pattern models and the history of historic use of the property. The study area is located on fast land and although one historic map resource (Boschke 1857) indicates that at least a portion of the study area may have been low or wet land, historic topographic data suggest that the original elevation of the study area was between 10 and 20 feet above mean sea level (Lydecker 1884). Also pertinent to this evaluation are the results of geomorphological investigations conducted for the Fort McNair Metro Bus Garage just outside the study area to the west (LeeDecker 1982) (Figure 4-2).That investigation reported variable soil conditions, but in some locations did find intact, upland soils suitable for human habitation beneath fill. An upland river terrace proximate to the confluence of James Creek and the Anacostia River would be a favored location for prehistoric settlement from the Middle Archaic Period onward. In fact, one prehistoric site has been reported within 250 feet of the study area. Based on these findings, the study area should be considered to have moderate to high potential to contain prehistoric archaeological deposits.

No seventeenth or eighteenth-century historic occupation has been documented in the study area. Two plantation houses are known to have stood outside the study area to the northeast (Charles Carroll's house) and east (Johnson House), but no substantial human activity associated with those residences is anticipated in the study area. The Federal Arsenal (estab. 1794) stood on Greenleaf Point across the James Creek from the study area. The 1814 British attack on the arsenal came from the Potomac River, not from the east. No historic maps from this time period depict a bridge across the creek in the vicinity and there is no anticipation that activities associated with the arsenal would have occurred in the study area and consequently little potential for associated archaeological remains.

Nineteenth/early twentieth-century development within the study area appears to have been minimal, but a number of residential structures stood within the study area into the first quarter of the twentieth century. These house lots and immediately surrounding areas should be considered archaeologically sensitive for domestic remains. No significant industrial or commercial activity is known to have occurred in the study area during this period, for which reason no archaeological remains associated with related activities are anticipated. Similarly, there appears to be little potential for archaeological deposits in the study area associated with military-related activities at near-by Fort McNair. The James Creek/City Canal would have been an effective barrier between the two, at least until it was in-filled in the 1870s. During the period of heaviest military activity (the Civil War), troops and materials accessed the Fort from the north, following the east bank of the Potomac River down from the railhead and depot at the foot of Maryland Street. A military hospital was also situated between the creek/canal and the Potomac River.

Mid-twentieth century and more recent development in the study area probably did more to adversely impact the integrity of earlier archaeological deposits than add additional archeological potential. The extent to which urban renewal impacted the landscape and soil stratigraphy is unknown at the current time, although the temporary nature of the housing that was erected in the study area in the 1940s disturbed the archaeological resources that may have been present. Later twentieth and twenty-first century land use in the study area may not have adversely affected earlier archaeological deposits, other than adding contaminants to the soils.

Overall, the entire study area for archaeology is assessed to have moderate potential for prehistoric and historic archaeological deposits. Areas of high potential for nineteenth-century domestic archaeological deposits, defined as an area within 50 feet of a historic structure in the study area, is depicted in Figure 4-2. As a result, there could be long-term moderate adverse impacts on archaeology.

<u>Archaeological Mitigation</u>

In the event that below-ground historic properties are identified in the archaeological study area and project engineering concludes that avoidance is not feasible, measures would be taken to minimize and mitigate adverse impacts to the effected archaeological resource(s). Those measures may include (but are not limited to) one or more of the following measures:

- **Preservation In-Place.** If avoidance is not feasible, the first option to be considered is intentional site burial, or preservation-in-place. Preservation in-place is the preferred form of mitigation for archaeological resources because it retains the relationships between artifact and context, and may avoid conflicts with groups associated with the site. The decision to adopt this mitigation measure, and the specific means by which it would be achieved, would be developed on a site-by-site basis in consultation with the DCHPO.

- **Archaeological Monitoring of Construction.** Ground-disturbing activities that have the potential to affect archaeological remains may occur in areas that have been identified as sensitive for the presence of below-ground cultural resources. In areas where it would not be feasible to conduct identification (Phase I) or evaluation-level (Phase II) archaeological testing, archaeological monitoring of construction would be a measure to minimize and mitigate adverse impacts to archaeological deposits. This mitigation measure would be coordinated and approved by the DCHPO and appropriate parties.
- **Data Recovery.** If one or more NRHP-eligible below-ground historic properties are found in the study area and cannot be avoided, a Data Recovery investigation would be the appropriate mitigation measure. A Data Recovery plan would be developed and submitted to the DCHPO prior to implementation. The Data Recovery Plan would describe in detail the excavation and analytical methodologies to be employed and the research issues to be addressed by the investigation. Construction activities within the effected site area would not begin until the Data Recovery field investigation was completed according to the Data Recovery plan and upon approval by the DCHPO.

No Action Alternative

Under the No Action Alternative, no soils would be disturbed and no archaeological resources would be disturbed. As a result, there would be no impacts on archaeological resources.

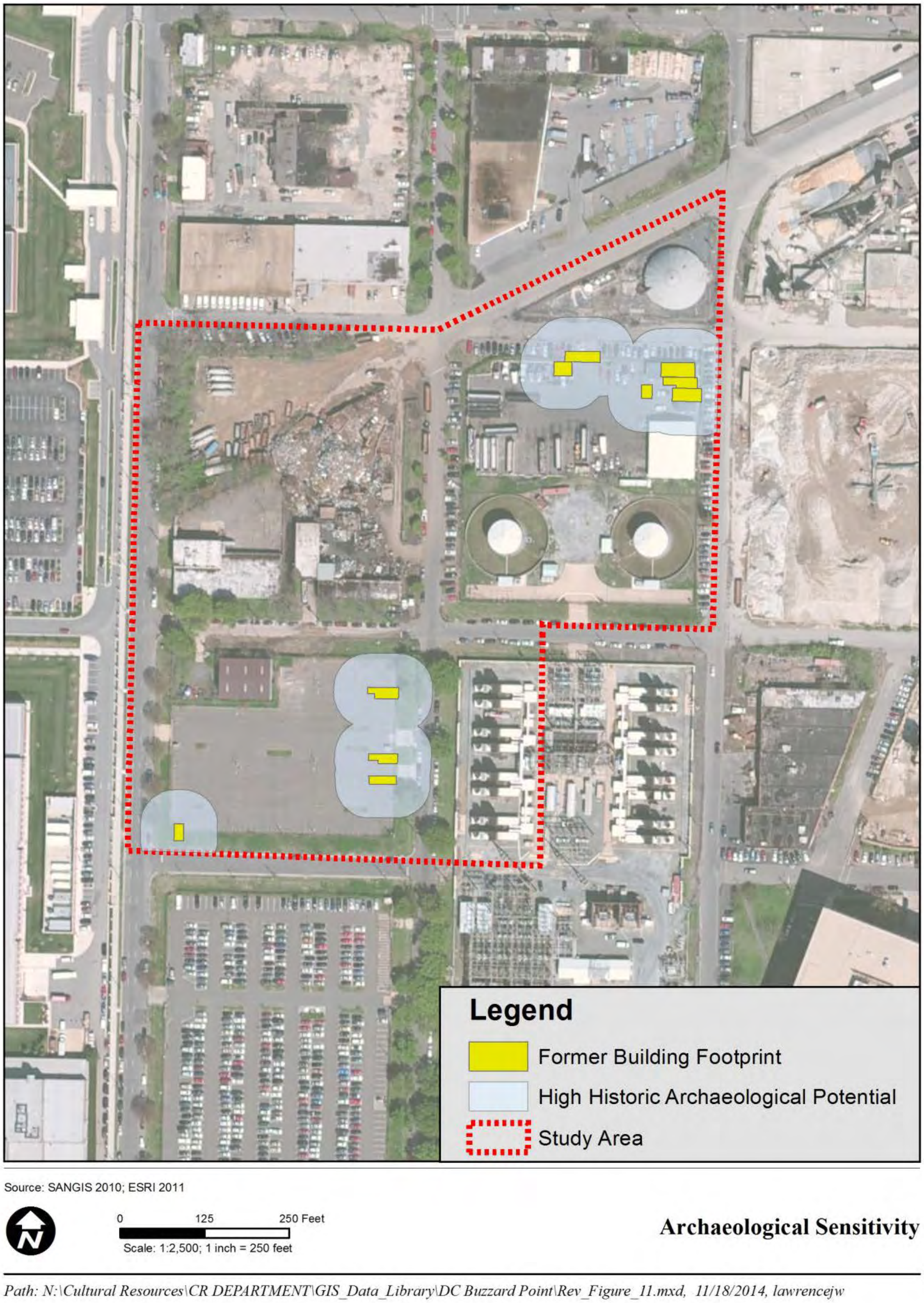

Figure 4-2: Archaeological sensitivity

4.3.2 Potential Effects on Historic Resources

Stadium Alternative

The historic resources located in the vicinity of the project site that are listed in, or potentially eligible for listing in the NRHP and the DC Inventory of Historic Sites, were identified through the cultural resources investigation that established the study area (described in Section 3.2). A determination of effect was made regarding each of the resources identified in the study area. Potential effects to these historic properties can be characterized as either a direct or an indirect effect. Direct effects include physical changes to or the demolition of a resource. Changes in use, operation or character of the resource can be either direct or indirect. Changes to the visual context of a resource's historic setting would be considered an indirect effect.

As described in the historic context (Section 3.2.2), the site's character has changed over time from sparsely populated open space, to a residential area, to commercial and industrial uses. The project site is currently comprised of materials and salvage storage, surface parking, utilities infrastructure, and several structures that have low architectural integrity. There are no historic properties located within the project site and the site is not part of a National Register- or DC-listed historic district. The site is bound and intersected by streets that were planned by Pierre L'Enfant as part of the Plan for the City of Washington, listed on the NRHP.

The proposed stadium development would result in the closure of portions of three original L'Enfant Plan streets to vehicular traffic: 1st Street (two blocks), S Street (one and a half blocks), and R Street (one block). These closures would encroach on L'Enfant vistas and have a direct adverse effect on portions of the Plan of the City of Washington. The stadium development would be visible from, but would not interrupt or encroach on the historic rights-of-way and associated view corridors of the other L'Enfant streets surrounding the site. Reservations 243 and 244 would be incorporated into the project site plan and could include built structures or open, public space. The Reservations are both currently occupied by non-compatible structures and materials storage. Changes in use to these Reservations would have a beneficial effect if the change is consistent with the open space envisions in the L'Enfant Plan, but would have a direct adverse effect if the Reservations were to be permanently altered by built structures. The stadium development's installation of a consistent street edge and streetscaping along Potomac Avenue, would have a beneficial effect on the L'Enfant Plan. Therefore, the effect on these L'Enfant Plan resources would be moderate due to the limited contribution of these segments, with beneficial impacts to Potomac Avenue.

The stadium development would introduce built forms reaching between 80 and 90 feet high that would be evident in views to the site from these adjacent resources: Fort McNair Historic District, the National War College, the PEPCO Power Plant, and the James C. Dent Residence. The stadium development could have indirect visual and noise-related effects on these historic resources; however, the development would not affect the historic character of these resources. Additionally, the stadium development would be seen as a background element from the William Syphax School and the upper levels of the Harbour Square and Tiber Island residential complexes. While the stadium development would be visible from these resources, it would not directly or indirectly affect the properties' character defining features. The stadium development would not likely be visible from the Thomas Law House, the Duncanson-Cranch House, the Edward Simon Lewis House, Wheat Row, or the Titanic Memorial. Therefore, there would be no effect on these resources.

Overall the stadium development would have a long-term moderate adverse impact on historic resources, primarily due to impacts to the L'Enfant Plan. In order to reduce adverse effects, mitigation measures, as described below, would be implemented.

<u>Historic Resource Mitigation</u>

- The stadium site plan design should explore options to make closed L'Enfant Plan streets and reservations recognizable, and to physically acknowledge their historic function and location through demarcation, such as ground plane treatment, curb cuts, or other design elements.
- The stadium development plan should work to include pedestrian access and preserve vistas where feasible along L'Enfant Plan streets closed by the stadium development.
- The stadium development should explore design options that help to reduce potential indirect noise and visual effects on adjacent historic resources, such as lighting elements, sound buffers, street trees and other site landscaping.
- The District should promote protection and preservation of historic resources in the area around the stadium development, and support listing of eligible resources in the DC Inventory of Historic Sites to further the understanding, community knowledge, and documentation of the history of lower Southwest.

No Action Alternative

Under the No Action Alternative, no changes would be made to the site. As a result, there would be no impacts on historic resources.

4.3.3 Visual Resources

The viewsheds and visual character areas described in the Visual Resources Affected Environment (Section 3.2.4) provide the context for assessing aesthetic and visual impacts related to the stadium development. The study area of visual influence, which extends approximately three to four blocks in each direction and includes distant views, was determined by using some basic assumptions and estimates about the probable visibility of the proposed stadium development.

Impacts on views and vistas are determined based on an analysis of the existing quality of the view, the sensitivity of the view (including important views from historic and cultural sites), anticipated development, estimated changes to the existing visual environment of areas surrounding the proposed stadium site and the anticipated relationship of the scale and massing of the proposed structure to the existing visual environment.

The visual impacts are described using the following criteria:

- **No impact:** the proposed project would not be visible, or visual changes would not be noticeable.
- **Minor impact:** the proposed project would be partially visible (such as a background element in a view or vista that includes buildings or other site features of similar mass and scale), but would not interfere with important views.
- **Moderate impact:** the proposed project would be partially visible and would interfere with an important view.
- **Major impact:** the proposed project would be largely visible (such as an element that would dominate the existing site features) and would interfere with, or completely block, an important view.
- **Positive impact:** the proposed project would improve a view or the visual appearance of an area.

Stadium Alternative

The proposed stadium development would be comprised of several distinct visual components, including: the stadium, ancillary mixed-use development on the project site, and pedestrian area improvements. Visible structural stadium elements would include the façade supporting spectator seating, a roof canopy or sun shield over seating area, and pedestrian entrances. These elements would contribute to the mass and height of the structure. It is expected that the stadium would reach approximately 80 feet in height, and would be within the 90-foot limit established by the zoning regulations. Its massing would span an area approximately two blocks north-south by one and a half blocks east-west. Stadium lighting and signage would also be incorporated. Ancillary retail and mixed use development, limited parking , pedestrian areas, and new streetscapes would be installed with the stadium in the four-block project site. As permitted by the zoning code, ancillary development could be up to 90 feet tall.

<u>Visual Character Areas</u>

Proposed Project Site and Adjacent Area

The industrial uses and materials storage and handling facilities on the project site would be replaced with the stadium development, significantly altering the visual qualities of the project site and improving the visual character and physical appearance of the site. The stadium development would replace surface parking lots and multiple low-scale industrial uses situated on four individual blocks and one Reservation with a cohesive site plan and several large distinctive architectural elements. Streetscaping (such as sidewalks, street trees, street lights, benches, etc.), as well as landscaping and pavement treatments in newly established pedestrian areas would be added to provide a welcoming character and encourage pedestrian activity to contribute a beneficial impact to the visual character of the project area.

Potential additional development in the surrounding area could result in additional structures on adjacent parcels that could be up to 90 feet in height under existing zoning regulations. The redevelopment of adjacent industrial properties would have a beneficial impact on visual quality; until then, these parcels would continue to have an adverse impact on the visual character of the area, as existing architecturally insignificant structures and industrial uses would remain in contrast to the stadium and its ancillary development.

The lighting of outdoor gathering spaces, circulation around the site, ancillary development, and the stadium would transform a largely dark site to one with visible light at night. While the stadium development would increase the lighting in the area, and would be illuminated during nighttime games, lighting would be consistent with other developed urban contexts within Washington, DC, and would employ measures to mitigate nighttime lighting (see Mitigation Measures section below). The lighting would not obstruct distant views to key Washington landmarks.

In the short-term, views to and from the site and the visual character of the site would experience changes due to the increased presence of construction equipment, materials, and related activities. These activities could include excavation, foundation and structural construction, the removal and replacement of streetscape elements and street trees, and the stockpiling of construction equipment and materials. These visual changes are anticipated to be minor to moderate, due to the existing characteristics of the site.

Overall, the replacement of the existing outdoor materials and salvage storage, paved areas, and small industrial structures with a large, modern facility with mixed-use retail and pedestrian areas would have a beneficial impact on the visual character of the area.

Fort McNair

The stadium and ancillary development would create a new visual element adjacent to Fort McNair. The stadium development would not alter the visual character of the historic installation, but its massing and scale would substantially change the view from the installation, looking east towards the site by incorporating a new, dominant element in the viewshed. However, there is not a strong visual connection between the installation and areas to the east, towards the project site and the Anacostia River. The development on Fort McNair closest to the project site includes surface parking and two larger scale brick buildings. The project site is located away from smaller scale uses on Fort McNair, separated by the fence line, surface parking and larger buildings. The stadium development would remove the existing non-compatible industrial uses adjacent to Fort McNair and install a consistent urban design framework at the project site. The consistent streetscape and site edge that would be established by the stadium development would complement the consistency of the Fort McNair fence line running along 2nd Street. Views from the stadium development into Fort McNair would be limited by mitigation measures, as described below. The stadium development would have long-term minor adverse impacts on views from Fort McNair, but it would not interfere with important views from Fort McNair. Long-term beneficial impacts to the visual character of the streetscape along 2nd Street adjacent to Fort McNair would occur.

Commercial and Riverfront

The visual character of the commercial development and riverfront activities south of the project site would not be directly altered by the soccer stadium development. The stadium would be a dominant element in the viewshed looking north from this area, replacing the existing low-scale industrial development. The stadium development's height and larger scale would be compatible with the existing large commercial structures and the PEPCO power plant in this area. Views to the river from the stadium across the commercial and riverfront area would be limited by these large structures.

Residential

The stadium development would be visible as a background element in the distance from the low-rise residential structures north of the project site. This area is not visually well-connected to the project site and the stadium development would primarily appear as a background element south of the residential character. Direct views to the stadium from the residential area along Q Street across existing industrial parcels would be available. Potential development of parcels adjacent to the project site could reach heights of up to 90 feet, which would limit views of the stadium in the future. The stadium development would also likely be visible from some higher floor units in the taller residential complexes (such as Harbor Square and Tiber Island), located north and west of the project site, and from this vantage point the stadium development would, although architecturally distinct, appear similar in mass and height to the existing large scale structures to the south of the project site.

Nationals Park

The stadium development would be a substantial visual change and a dominant element in the viewshed from Nationals Park. The replacement of the existing industrial character of the project site with a modern stadium would have a beneficial impact on the views from Nationals Park to the proposed stadium development. The views to and from the proposed stadium and the existing ballpark, as well as the consistent streetscape and site edge that would be established by the stadium development would help to visually connect the two venues along Potomac Avenue. Impacts to Potomac Avenue are discussed in greater detail below.

Distant Views

Views to and from the stadium development and Joint Base Anacostia-Bolling across the Anacostia River would continue to be limited by the two large office buildings, the PEPCO power plant, and trees along the riverfront. Views between the stadium development and Anacostia Park and the Washington Navy Yard across the Anacostia River would occur in the distance over the South Capitol Street Corridor and the Frederick Douglass Memorial Bridge, both the existing bridge and the proposed replacement. Views to and from the project site and East Potomac Park across the Potomac are primarily obscured by Fort McNair; however, the stadium development would be visible over the top of existing buildings as an element in the distance. Depending on the placement of openings in the stadium's façade, views to the Capitol Building and the Washington Monument could be seen to the northeast and northwest, respectively. From these landmarks, the stadium development would be a new, distant visual element, and would appear much like the large scale structures to the south of the project site.

<u>Impacts to View Corridors</u>

Key view corridors and L'Enfant streets are adjacent to the project site. Each of the streets within and adjacent to the project site are L'Enfant streets, planned as part of the original city. These vistas include north-south views along Half, 1^{st} and 2^{nd} Streets, east-west views along R, S, and T Streets, and the axial view along Potomac Avenue. The views to and from the project site along the north-south and east-west corridors are tightly defined and limited by existing structures, trees, and changes in elevation. Impacts to the historic L'Enfant Plan are discussed in Section 4.3.2.

The primary character of the viewsheds along each of these corridors would be altered with the addition of an urban context, while maintaining the visual lines of the tree-lined rights-of-ways. The removal of individual industrial elements, overgrown vegetation, and irregularly placed low-scale buildings and the replacement with a consistent street edge and streetscaping would help unify the visual line of each viewshed.

Potomac Avenue

Views along Potomac Avenue would remain unobstructed between the project site to the west and the DC Water Main Pumping Station to the east. The view to the west from South Capitol Street would terminate at the stadium development, replacing the existing view terminus of overgrown vegetation and materials storage with an architecturally distinctive element (Figure 4-3). Views along the avenue would be framed by both the existing Nationals Park and the new stadium development, further highlighting the significance of Potomac Avenue as intended in the L'Enfant Plan. The proposed South Capitol Street Corridor traffic oval improvements would increase green space and provide an additional prominent visual element on Potomac Avenue. These three elements would provide visually connected points of interest along Potomac Avenue. The stadium development would provide a consistent street edge and an activated pedestrian environment along the avenue, enhancing the broad, open visual character.

Figure 4-3: View looking southwest on Potomac Avenue from South Capitol Street
Note: Arrow indicates stadium location

North-South Streets

Views along 1st Street from the north and the south would change significantly as they would terminate at the stadium development. This view, which currently narrows and ends when the street trees obscure more distant views, would be interrupted by the stadium development (Figure 4-4). Views along Half Street and 2nd Street would remain unobstructed. The stadium development would alter the physical street frontage for two blocks along these streets and would provide a consistent street edge and an activated pedestrian environment, enhancing the visual character of these streets (Figure 4-5).

Figure 4-4: View looking south on 1st Street from Q Street
Note: Arrow indicates stadium location

Figure 4-5: View looking north on 2nd Street from T Street
Note: Arrow indicates stadium location

East-West Streets

The view along S Street, which currently runs for four blocks in lower Southwest, would be interrupted by and terminate at the stadium development, substantially changing the existing view. The physical street frontage along R and T Streets would be physically altered; however, the views would remain unobstructed and the consistent street edge and an activated pedestrian environment would enhance the visual character of these streets.

Overall, the proposed stadium would have beneficial impacts on visual resources.

<u>Visual Resources Mitigation</u>

To further enhance the visual environment, the following mitigation measures should be implemented.

- The stadium design and development should utilize the highest aesthetic standards to strengthen the architectural and urban design quality of the stadium and ancillary development.
- The stadium design and development should incorporate the use of the highest lighting design standards and the use of light fixtures that reduce light pollution to control light from spilling up to the sky or beyond the boundaries of the stadium.
- The stadium site plan should maintain the view corridor and broad, open characteristics of Potomac Avenue through the use of appropriate building setbacks and placement of streetscape elements.
- The stadium design should explore options to offset the visual impacts to street closures through design elements such as façade detailing or other design elements that could be used to recognize the original locations of these streets.
- To the extent possible, views and vistas to and from the project site should be enhanced by minimizing visual obstructions, planting street trees, and applying appropriate streetscape elements as outlined in the Comprehensive Plan.
- The stadium and other building facades facing Fort McNair should utilize materials that provide daylight to the stadium but screen views into Fort McNair from the stadium.
- The stadium design should explore materials and street trees to screen existing adjacent industrial uses such as the PEPCO yard and the Rock Plant.

No Action Alternative

Under the No Action Alternative, no changes would be made to the site or its structures. As a result, there would be no impacts on visual resources.

4.4 Natural Resource Impacts

4.4.1 Geophysical Resources Impacts

Stadium Alternative

Due to the unconsolidated nature of the Coastal Plain region and the variability of the soil materials on the site, significant geotechnical studies would have to be conducted to determine suitable site conditions for construction. Depth to groundwater would be determined. Environmental testing for soil contamination would be done to determine suitability for use as material to be left onsite, or the type of disposal that would be needed after excavation.

Construction of the soccer stadium would involve a limited amount of excavation, structural fill, and installation of foundation systems. Based on geotechnical studies within Buzzard Point, structural fill and piles would provide foundation support of the stadium and parking structures. Portions of the site may need to be dewatered in order to build.

Existing soils on the site would be displaced. It is estimated that approximately 18,000 cubic yards of soil would be removed from the stadium site, or a depth of approximately 1.5 feet across a 325,000 s.f. site. Soils would most likely be excavated and trucked off-site to be processed as potentially contaminated materials. In most places, the current soils would be replaced with structural fill that would help support the proposed stadium structure. In areas such as the plaza or tree wells, an engineered loamy soil with properties consistent with plant growth would be installed to establish landscaping plants such as trees, shrubs, ornamental grasses, and flowers.

Site topography would be affected by the construction of the Stadium. The natural topography of the site has been severely altered from its original grade though years of development and filling. The pedestrian areas outside of the stadium would stay generally similar to the current street grade elevation at the site.

Overall, the proposed action would result in short-term minor impacts due to the amount of excavation. In the long-term, the proposed action would result in beneficial impacts as a result of improved soils.

<u>Geophysical Mitigation</u>

- Use best management practices to minimize soil erosion during construction.

No Action Alternative

Under the No Action Alternative, no changes would occur to geophysical resources. Therefore, there would be no impact on geophysical resources under the No Action Alternative.

4.4.2 Water Resources Impacts

Stadium Alternative

Surface Water

The lack of natural surface water features would reduce potential effects on surface waters in the surrounding area, most notably the Anacostia River. Stormwater runoff from the site would be minimized using Low Impact Design elements such as bioretention, rain gardens, and permeable pavement where uncontaminated soils with suitable transmissive qualities make it possible. More conventional BMP structures such as underground stormwater detention systems, bioretention cells, oil and water separators, and grit chambers would also be used. Eventually, some amount of stormwater would be discharged into the District's storm sewer system (MS4) in the vicinity. The construction of the stadium would result in a net beneficial effect on the stormwater that eventually discharges to Anacostia River.

Water Quality

The site would be designed using the District's 2013 Stormwater Rule and Guidebook, which would help to manage water being discharged from the site to be compliant with TMDLs that have been applied to the Anacostia to improve water quality. Land disturbing activities are regulated for erosion and sediment control by the DDOE. Approved sediment control and storm water management plans would have to be designed as part of the building permit approval process and would identify specific steps to ensure consistency with the Chesapeake Bay TMDL requirements and the District's Watershed Implementation Plan. Due to the fact that existing soils and fill material have a high potential for contamination, much of the soil excavated would have to be collected and disposed of off-site, thus potentially improving the water quality in the area.

Wetlands

There are no naturally occurring wetlands on-site. Therefore, there is no need to obtain permits from the USACE or District regulatory agencies for impacts to wetlands or surface waters of the U.S.

Floodplains

According to FEMA's Flood Insurance Rate Map, a small portion of the project site is within the 500-year floodplain. There are no federal restrictions on developing within the 500-year floodplain, but the plans may be reviewed by the District's Watershed Protection Division as part of the site plan approval process. It is not anticipated that mitigation would be required to protect the Stadium site from flooding or storm surge from the Anacostia or Potomac Rivers.

Stormwater

Stormwater impacts are addressed under Section 4.5.2: Sanitary Sewer and Stormwater Infrastructure Impacts.

Groundwater

Because the groundwater table is located as shallow as El -8, there is a high potential for groundwater to be encountered during the site preparation, foundation installation, stadium construction, and operation. Because the existing groundwater sampling is not comrpehsnive for the site, additional groundwater testing would occur. Soil dewatering techniques would most likely be required during the excavation and construction phases. An underdrainage system would likely be required to adequately manage groundwater on-site. Depending on the quality of the groundwater, the water captured in the underdrainage system would be discharged to either the sanitary or storm sewer systems in the area.

Overall, the proposed action would result in long-term beneficial impacts on surface water resources and water quality and minor adverse impacts on groundwater. No impacts on floodplains or wetlands would occur.

Water Resources Mitigation

- A stormwater audit would include site and utility plans according to the District's 2013 *Stormwater Rule and Guidebook.*
- While the exact location and capacity of low impact design (LID) techniques is unknown at this time because the site plan has not been finalized, the project should use LID measures in uncontaminated areas. The LID techniques incorporated into the design would be coordinated as appropriate with the District and DDOE.
- During construction and operations, the project should use conventional BMPs to improve quality of water discharged from site. In addition, the following BMPs should be implemented during construction and operation:
    - fuel and chemical storage best practices
    - stabilized construction entrances
    - super silt fence
    - inlet protection
    - covering soil and fill stockpiles
- Once further developed, the Buzzard Point Soccer Stadium site plan should be reviewed by the Watershed Protection Division under the Floodplain Management service.

- Additional permits for water resources may be necessary, such as a water quality certification and well permit applications for groundwater and soil testing. Such permits shall be obtained as needed in coordination with DDOE.
- Additional groundwater testing should occur in order to comply with DDOE permitting regulations.

No Action Alternative

Under the No Action Alternative, there would be no changes to the site. As a result, there would be no impacts on water resources.

4.4.3 Vegetation and Wildlife Impacts

Stadium Alternative

All natural vegetation, street trees, and wildlife habitat would be cleared for the development of the proposed stadium. During construction, little to no vegetation would be present. All trees within the public right-of-way would require a Public Space Tree Permit from DDOT to be removed. All trees greater than 55" in circumference (17.5" in diameter) on any property would require a special tree permit from DDOT to be removed. Through the site design process, there would be a net gain in street trees on the site. Species would be selected for their ability to survive in a high traffic urban area. Tree wells may be designed to also act as stormwater bioretention areas. In general, there would be a net gain of urban wildlife habitat on the site as a result of the site design required for the proposed stadium. Overall, the Stadium Alternative would result in short-term minor adverse impacts during construction and long-term beneficial impacts.

<u>Vegetation and Wildlife Mitigation</u>

- In compliance with DDOT's Urban Forestry Administration (DDOT-UFA), existing street trees removed would be mitigated through payment or replacement. Payment must be made for the loss of a healthy street tree and is based on the total number of inches diameter to be removed. Replacement planting is used when trees in poor condition, dying, or dead are removed; replacement trees would be planted at a 1:1 ratio as per current DDOT standards.
- The number of street trees would increase as part of the site design. The streetscape would follow applicable DDOT guidelines.
- Off-site mitigation planting along waterfront of Anacostia would mitigate loss of habitat on-site.
- Good condition street trees would be preserved through the construction process if possible. Such preservation would utilize tree protection fencing, which is required around all existing street trees within or directly adjacent to the limits of disturbance. In coordination

with DDOT-UFA, additional tree preservation methods could be used to protect roots, branches, and trunks throughout construction.

- A rodent management plan would be developed for the proposed stadium site to minimize the population of rodents in the area.
- Coordination with DDOT regarding permitting for the removal of trees with a circumference of 55 inches or greater, known as special trees would occur.

No Action Alternative

Under the No Action Alternative, existing vegetation and animal habitat would remain. As a result, there would be no adverse impacts on vegetation and wildlife.

4.5 Urban Systems Impacts

4.5.1 Water Supply Impacts

Stadium Alternative

It is estimated that the construction of the new soccer stadium would require the demolition of 1,700 feet of water lines and eight manholes (DCDGS 2013). It is likely that the demolition and relocation of water infrastructure would be accomplished without impacting service to DC Water customers by diverting flows to other supply lines outside the project site. Service would continue without reductions in water quality, pressure, or volume. Thus, the relocation of water infrastructure would have no short-term impacts on DC Water customers. Similarly, it is unlikely that the relocated water infrastructure would have a long-term adverse impact on DC Water customers because water service would remain at the same levels as prior to the stadium project. Reconstruction of the water supply infrastructure on and around the project site could have a long-term beneficial impact because aging infrastructure would be replaced with new, more reliable systems.

The operation of the stadium would not increase the demand for potable water in the District because a similar level of demand currently exists during DC United games at RFK Stadium. Impacts on the District's water supply that would result from additional events that would be held at the new stadium, such as festivals and concerts, would be negligible. The use of water-efficient plumbing fixtures at the new stadium could somewhat lessen the demand for potable water from current levels, thereby resulting in a beneficial impact.

No Action Alternative

Under the No Action Alternative, no changes would be made to the site and the demand for water. As a result, there would be no impacts on water resources.

4.5.2 Sanitary Sewer and Stormwater Infrastructure Impacts

Stadium Alternative

The construction of the soccer stadium would require the demolition of more than 1,750 feet of sewer line, 11 manholes and 10 catch basins. The demolition and relocation work would be phased prior to and concurrently with the construction of the new stadium, and sewage and stormwater flows would be diverted to existing piping not affected by the stadium construction. The operation of the stadium would not increase flows of sewage to Blue Plains because a similar level of sewage is currently generated by DC United games held at RFK stadium. The use of low impact development (LID) techniques on the site of the new stadium, such as bioswales, green roofs, and permeable pavement, would result in a reduction of stormwater runoff from the site in accordance with the District's stormwater management regulations. Thus, the new stadium would have no long-term adverse impacts on sewage and beneficial impacts on stormwater.

No Acton Alternative

Under the No Action alternative, no changes would be made to the site or its environs. As a result, there would be no impacts on stormwater.

4.5.3 Solid Waste Disposal Impacts

Stadium Alternative

It is anticipated that the new soccer stadium would generate an equivalent amount of solid waste as is currently generated at DC United games held at RFK Stadium. Solid waste would be collected from the new stadium by a licensed contractor and disposed of at a permitted solid waste receiving facility or landfill. Thus, the new stadium would have no impacts on solid waste.

Solid Waste Disposal Mitigation

- The District and utilities providers should coordinate to develop infrastructure relocation plans so as to avoid or minimize service outages during the relocation and reconstruction of utilities infrastructure on and in the vicinity of the project site.
- The new stadium should be designed and built to achieve LEED (or similar) certification and reduce the use of water, electrical, and natural gas, minimize stormwater runoff, and achieve recycling efficiencies to the maximum extent practicable.

No Action Alternative

Under the No Action Alternative, there would be no changes to solid waste generation or disposal. As a result, there would be no impacts on solid waste disposal.

4.5.4 Energy Systems Impacts

Stadium Alternative

Electrical

Development of the project site as a soccer stadium would require the following electrical utility demolitions at minimum (all dimensions are approximate):

- A one-acre portion of the PEPCO substation on the western side of the block bounded by S Street on the north, Half Street on the east, T Street on the south, and First Street on the west;
- 1,650 linear feet of utility lines (DCDGS 2013);
- Over 90 utility poles on the project site (AECOM estimate).

Other demolitions may be required as the design of the project and the logistics of relocating the electrical utility infrastructure progresses. During construction of the stadium and/or relocation of the electrical utilities, there would be a possibility of short-term, scheduled outages of electrical service to PEPCO customers while the utilities are being relocated. At this stage of planning, it is unknown how many scheduled outages would occur, how long they would last, or how many customers and their locations in PEPCO's service area would be affected. It is likely that the temporary outages would cause some annoyance to a small percentage of customers who would be inconvenienced by the outages. However, the temporary outages would be planned to be of limited duration as project safety conditions allow, and to affect the least number of people (i.e., scheduling outages overnight when most people are asleep and businesses are closed). The reliability of electrical service would return to pre-project levels following the completion of the relocations and stadium construction, and may even improve somewhat since additional lines would be buried and protected from the elements and accidents.

Relocating and burying electrical utility lines in the project area would have no long-term adverse impacts. Electrical service would return to pre-project conditions following the completion of the project. Service reliability may improve somewhat, since additional lines would be buried and protected from the elements and potential accidents, thereby resulting in a long-term beneficial impact.

As with the other utilities described above, natural gas supply lines underlying and in the vicinity of the project site would be identified and relocated as necessary as part of the stadium site preparation and construction. Service outages to other Washington Gas customers would be unlikely because service would be rerouted to other supply lines during the construction period. The new stadium would not create a new demand for natural gas but rather shift that demand from RFK Stadium. Natural gas demand at the new stadium may be reduced somewhat through the use of newer, more efficient fixtures. For these reasons, the new stadium would have no adverse impacts on natural gas utilities in Washington, DC.

Overall, the new stadium would have short-term minor adverse impacts on electrical service. No long-term adverse impacts on electoral or natural gas service would occur.

No Action Alternative

Under the No Action Alternative, there would be no changes to energy demand or usage at the project site. As a result, there would be no impacts on energy systems.

4.5.5 Communications and Data

Action Alternative

As described above for electrical utilities, the relocation of communications and data utilities could result in temporary service outages for Verizon customers and customers of other service providers who use Verizon's equipment. This would cause annoyance and inconvenience to at least a small percentage of those carriers' customers. The burial of communications and data lines under street rights-of-way could disrupt traffic patterns, cause additional traffic congestion and annoy drivers. However, these impacts would be short-term, since conditions would return to pre-project levels upon the completion of the utility relocations.

Service would continue as it was prior to the infrastructure relocations. Service reliability may be improved somewhat by placing the utilities underground where they would be protected from the elements, thus resulting in a beneficial impact.

Overall, short-term adverse impacts resulting from the relocation of communications and data utilities would be minor. In the long term, the relocation of communications and data utilities would have no adverse impacts.

No Action Alternative

Under the No Action Alternative, there would be no change to communications and data facilities. As a result, there would be no impacts on communications and data facilities.

4.6 Transportation System Impacts

This section assesses the impacts of the Stadium on traffic, parking, transit, pedestrian, and bicycle infrastructure. Many of the assumptions used in this analysis are from analyses and discussions with DC United, summarized in the draft *DC United Transportation Management Plan* (TMP) prepared by Gorove/Slade, including trip generation, traffic routing, and parking demand. The results of this analysis would also help shape the Transportation Operations Plan (TOP), to be assembled closer to the Stadium's opening.

In addition to the transportation documents prepared specifically for the DC United Stadium, the District recently completed the *SE/SW Special Events Study,* which reviewed the long-term impacts of the new soccer stadium in conjunction with other large event venues for the year 2035. The study analyzed several scenarios events at the new DC United stadium alone and in conjunction with other events. As it was a long-term study, it assumed the North-South Streetcar to be constructed, with a stop within Buzzard Point. In addition it included the planned improvements South Capitol Street and M Street from the *South Capitol Street EIS*. In short, the study found that when there are simultaneous events on weeknights at all venues, the roadway and transit systems would be over capacity. However, when events occur individually they would generate a manageable amount of congestion with use of Traffic Control Officers (TCOs) stationed at critical intersections.

Since the *SE/SW Special Events Study* focused on the long-range impacts, the analysis within this document focused on the opening year, slated for 2017. This provides a separate perspective of potential impacts, and would form the basis of analyses that would conclude with the 2017 season TOP. This study also focuses on the weekday PM peak, as the *SE/SW Special Events Study* concluded that it presented the worst-case conditions traffic-wise, and thus would be the best time frame to analyze in this document to determine potential impacts.

The majority of events at the stadium are expected to occur on weekends. A summary of the 2014 DC United season, shown in Table 4-3, indicates that only 25% of games occur on weeknights. Even though that is the case, this study focuses on the weeknight PM peak hour as this time period accounts for the most congested game-time scenario, combining DC United patron traffic with evening commuter traffic.

Game-day Schedule	Number	Percentage
Wednesday, 7:00 p.m.	2	10%
Wednesday, 8:00 p.m.	2	11%
Friday, 8:00 p.m.	1	5%
Saturday, 3:00 p.m.	1	5%
Saturday, 4:00 p.m.	1	5%
Saturday, 6:00 p.m.	1	5%
Saturday, 6:30 p.m.	1	5%
Saturday, 7:00 p.m.	1	5%
Saturday, 7:30 p.m.	8	40%
Sunday, 1:30 p.m.	1	5%
Sunday, 8:00 p.m.	2	10%

Table 4-3: Summary of 2014 game schedule

In addition to DC United games, the Stadium would host a handful of other events. Table 4-4 displays a list, provided by DC United, of possible events and their preliminary level of activity expected during a given year. Some of these events expect a sell-out condition and some would be much smaller events.

Events	Season				
	2017	2018	2019	2020	2021
DC United					
Number of Games	23	23	23	23	23
Average Attendance	19,200	19,200	19,200	19,200	19,200
Other Men's Soccer Matches					
Number of Games	1	1	1	1	1
Average Attendance	20,000	20,000	20,000	20,000	20,000
International Soccer Matches					
Number of Games	5	5	5	5	5
Average Attendance	15,625	19,262	20,000	20,000	20,000
Concerts					
Number of Concerts	8	8	8	8	8
Average Attendance	20,000	20,000	20,000	20,000	20,000
Community Events					
Number of Events	10	10	10	10	10
Average Attendance	4,000	4,000	4,000	4,000	4,000
Other Events (NCAA Lacrosse/Rugby/etc…)					
Number of Events	12	12	12	12	12
Average Attendance	6,000	6,000	6,000	6,000	6,000

Table 4-4: Expected DC United stadium events schedule
Source: DC United

Mode Split

Spectator mode split was determined using data provided by DC United and WMATA including game-day attendance, parking pass sales, and Metrorail usage, using the following steps:

- For every game in the 2012 season, spectator attendance was determined using data provided by DC United on scanned tickets upon stadium entry. Scanned tickets upon entry are used instead of tickets sold since actual attendance differs, mostly due to patrons with tickets not showing up to games. DC United has indicated that the current amount of ticketed patrons that do not show-up is well over 10%, and expect a smaller but significant amount of "no-shows" at the new stadium.
- Then, using information provided by WMATA, Metrorail usage was obtained by comparing the individual game-day ridership to the average ridership on a typical non game-day (categorized by day of week) at the Stadium Armory Metrorail Station.
- An assumption was applied that 5% of patrons would arrive by means other than Metrorail or vehicle, i.e. bus, walk, and bike. Subtracting the Metrorail and 'Other' patrons from the total tickets scanned resulted in the total number of patrons assumed to have arrived by vehicle.
- This number of spectators arriving by vehicle was then compared to the number of vehicles parked in the parking lot to determine the vehicle occupancy for each game. The number of vehicles parked was derived using parking pass sales information provided by DC United.
- Because there was an extensive amount of Metrorail track work during 2012, games that occurred on heavy track work days (usually Saturdays and Sundays) were discounted from the data set when determining the average weekday and weekend mode.

The results of the mode split analysis are displayed in Table 4-5 for typical weekday games and weekend games.

Day of Week	Mode Split Percentage						Estimated Car Occupancy
	Metrorail	Automobile	Bike	Walk	Taxi/Uber	Charter Bus/Other	
Weeknight	36%	59%	2%	1%	1%	1%	3.15
Weekend	32%	63%	2%	1%	1%	1%	3.30

Table 4-5: 2012 RFK mode split (weeknight vs weekend)

A closer examination of the mode split analysis led to the conclusion that DC United spectators are very flexible in their travel mode, because:

- When track work was in effect the average transit mode split significantly decreased. The average Metrorail mode split during heavy track work days were 25% on weekdays and 18% on weekends.

- Higher Metrorail mode splits were observed on games with higher attendance. The two highest attended games in 2012 had transit mode splits of 48% and 51%, respectively, drawing the conclusion that DC United patrons are more likely to take public transportation for a bigger game assuming that driving and parking would be more difficult.

These observations indicate that DC United spectators have access to multiple modes of travel and decide prior to the game which mode to take, taking into account travel advisories (i.e. planned Metrorail delays) and games where higher levels of traffic are anticipated. Thus, it is likely that during games at the new stadium, spectators would likely have mode splits similar to those observed at highly attended games during the 2012 season, with equal amounts taking Metrorail and driving to games. The influence of transportation demand management measures could increase the transit mode split to over 50%, and DC United has indicated they plan to enhance their encouragement of transit and cycling to games in the new stadium to help improve the spectator experience with an overall goal of 55 percent transit and 10 percent other alternative modes (bicycle, walking, taxi/Uber, charter bus, water taxi, pedicabs, etc.). In addition, the current situation at RFK Stadium, where parking is plentiful and located adjacent to the stadium likely encourages driving as a mode, whereas a similar situation would not exist at the new stadium. Parking at the new stadium would likely be more expensive. Parking at RFK costs $20 whereas most parking within a 15 minute walk from Nationals Park ranges from $27 to $37.

Although this is the case, the analyses in this report would use a more conservative estimate of transit mode split in order to identify a 'worst-case' condition for potential traffic impacts, as presented in Table 4-6. Not only are these assumptions conservative because they use a lower than expected transit mode split, they also assume that all ticket holders attend the match, even though DC United predicts games would have a "no-show" factor of approximately 10%. The amount of vehicles arriving during the peak hour was assumed as 60% of the total vehicles arriving for a game.

Scenario	Mode Split						Capacity
	Transit	Auto	Bike	Walk	Taxi/ Uber	Charter Bus/ Other	
Weeknight	40%	55%	2%	2%	2%	2%	20,000

Table 4-6: Trip generation assumptions used in analyses

Scenario	Patrons by Mode								
	Transit	Auto	Bike	Walk	Taxi/ Uber	Charter Bus/ Other	Auto Occupancy	Parking Demand	Peak Hour Vehicular Trip Generation
Weeknight	8,000	11,000	400	200	200	200	3.15	3,500	2,100

Table 4-7: Trip generation assumptions used in analyses

4.6.1 Traffic System Impacts

The traffic analysis contained in this document focuses on determining potential mitigation measures needed to support the stadium during the 2017 season. The analysis was performed knowing that prior to the 2017 season a TOP would be produced to refine and detail operational solutions on game day (i.e. signal timing strategies, locations of traffic officers, etc.). Thus, this analysis attempts to identify mitigation measures that have a longer lead time to implement, such as physical improvements, while establishing analyses that would form the basis of the detailed operational solutions in the TOP.

The main traffic analysis, presented below, compares three future scenarios. Each is a projection of the weeknight PM commuter peak hour in the year 2017, and are as follows

- Year 2017 Weeknight PM commuter peak hour: No event (also known as background conditions)
- Year 2017 Weeknight PM commuter peak hour: Event with basic trip distribution (vehicular routing based on the shortest travel routes, the shortest distance between parking zones and the Stadium, and the overall availability of parking).
- Year 2017 Weeknight PM commuter peak hour: Event with influenced trip distribution (based routing on an improved dispersal of traffic and the avoidance of intersections with existing capacity concerns).

The difference between these three scenarios is used to determine the list of traffic mitigation measures, presented at the end of this section. The following is a summary of analysis assumptions and methodology.

<u>Future Roadway Improvements</u>

No planned and funded improvements in the study area are expected to be constructed and operational prior to the 2017 DC United season, thus no improvements were taken into account for the future analysis. The South Capitol Street Corridor project will implement several transportation improvements that would alter the operations of the Stadium; however, these improvements are not expected to be complete until the end of 2018 at the earliest. Thus, this study focuses on the future conditions prior to the improvements to ensure that traffic generated by the Stadium would be manageable under year 2017 conditions.

<u>Future Background Conditions</u>

Background Developments

The proposed DC United Stadium is located near an area of anticipated growth and development. There are several approved developments that are projected to be completed (or have parcels completed) and occupied by 2017. Table 4-8 outlines these developments including their development plans and estimated date of completion and Figure 4-6 shows the locations of the background developments.

Development Name	Development Plan	Estimated Completion Date
1. Akridge Half Street/Square 700	280 residential units, 371,000 square feet office, and 54,000 square feet retail	2016
2. Arthur Capper/Carrolsburg and Capitol Quarter	Multi-family Square 882: 195 residential units in 2016 250 M: 213,000 square feet office and 12,000 square feet retail in 2016 Multi-family 1 Square 769: 171 residential units and 4,090 square feet retail in 2016 600 M: 484,780 square feet office and 15,000 square feet retail in 2017	Phases complete in 2016/2017 Full completion in 2019
3. The Yards at Southeast Federal Center	Parcel D: 225 residential units and 110,000 square feet retail in 2014 Park Pavilions P2A: 7,600 square feet retail in 2015 Parcel N: 327 residential units and 20,000 square feet retail in 2016 Park Pavilions P2B: 15,200 square feet retail in 2017	Phases complete in 2014-2017 Full completion in 2027
4. The Plaza on K/Square 696, Phase 1	290,000 square feet office and 14,000 square feet retail	2016
5. Florida Rock/RiverFront on the Anacostia, Phase 1	324 residential units and 18,650 square feet retail	2016
6. Square 0699N (Velocity), Phase 2	287 residential units	2014
7. Square 737	Phase 1: 432 residential units Phase 2: 336 residential units and 35,000 square feet retail	2014/2017
8. 1111 New Jersey Avenue	324 residential units and 11,000 square feet retail	2016
9. Half Street (Monumental Properties), Phase 2	340 residential units, 196 hotel rooms, and 35,000 square feet retail	2015/2017
10. 50 M Street	195 hotel rooms and 5,000 square feet retail	2016
11. 1 M Street	310,000 square feet office and 15,000 square feet retail	2017
12. Square 701	289 residential units, 180 hotel rooms, 234,693 square feet office, and 42,500 square feet retail	2015
13. 1000 South Capitol Street	320,000 square feet office	2017
1414. WMATA Chiller Plant Apartments	84 residential units and 5,300 square feet retail	2017
15. Admiral at Barracks Row	19,000 square feet office and 3,000 square feet retail	2017
16. Historic Car Barn	94,400 square feet retail	2017

Development Name	Development Plan	Estimated Completion Date
17. The Wharf, Phase 1	901 residential units, 278 hotel rooms, 218,200 square feet office, 140,943 square feet retail, 6,000 person theatre, 15,500 square foot church, and a 208 berth marina	2017
18. Randall School	550 residential units, 16,000 square feet retail and 40,000 square feet museum	2016
19. L'Enfant Plaza	370 hotel rooms, 2,038,957 square feet office, and 158,651 square feet retail	2015
20. Homewood Suites	234 hotel rooms	2014
21. Parcel 69 (400 E Street SW)	214 hotel rooms	2015
22. Square 494	290,000 square feet office and 17,500 square feet retail	2016
23. Building 170	7,000 square feet retail	2016
24. Ballpark Hotel	167 Hotel Rooms	2015
25. 20 K Street SE	400 residential units	2016

Table 4-8: Background developments

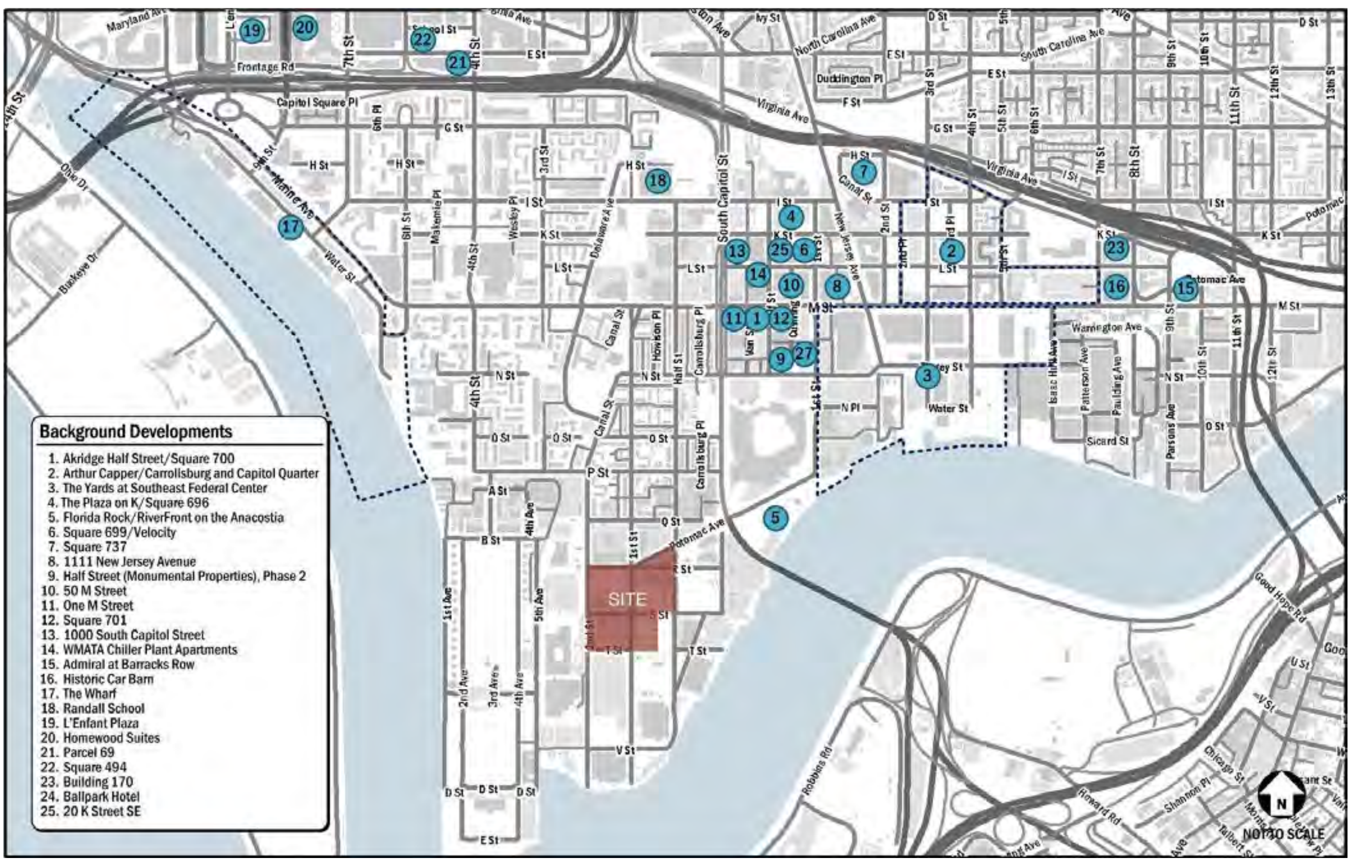

Figure 4-6: Background development map

Background Trip Generation

Available background development traffic studies were used to determine the number of trips added for the background developments. This includes the following studies:

- "Monument Ballpark – Square 700 & 701 Transportation Impact Study" performed by Wells + Associates in December 2006
- "Square 700 Development Traffic Impact Assessment" performed by Gorove/Slade in January 2009
- "RiverFront on the Anacostia PUD Transportation Impact Study" performed by Gorove/Slade in August 2012
- "Square 701 Development Transportation Impact Study" performed by Gorove/Slade in September 2012
- "Ballpark Hotel Transportation Impact Study" performed by Gorove/Slade in October 2012
- "Square 737 Traffic Impact Study" performed by Gorove/Slade in June 2011
- "DC Water Occupied Sites PUD Transportation Impact Study" performed by Gorove/Slade in October 2013
- "Southwest Waterfront Stage 1 PUD Transportation Impact Study" performed by Gorove/Slade in June 2013
- "One M Street Development Transportation Impact Study" performed by Gorove/Slade in December 2012.

These documents were used to determine the number of trips generated by the aforementioned background developments, the mode split percentages, and the trip routing. Trip generation for the other background developments was calculated based on the methodology outlined in the Institute of Transportation Engineers' (ITE) *Trip Generation*, 9th Edition.

Land Use	Size		PM Peak Hour		
			In	Out	Total
Residential	23,789	dwelling units	759	416	1,174
Office	4,789,630	square feet	485	2,377	2,862
Retail	886,408	square feet	586	590	1,177
Hotel	1,834	rooms	276	268	545
Church	15,500	square feet	2	2	4
Marina	208	berths	7	5	12
Theater	6,000	persons	23	24	47
Museum	40,000	square feet	1	3	4
Total			2,139	3,685	5,825

Table 4-9: Background trip generation

Background Growth

In addition to the background developments, other traffic increases due to inherent growth on the study area roadways were accounted for with a 0.44% per year growth rate compounded annually over the study period (2014-2017). This rate was based on a comparison of the existing volumes (2002) and projected "No Build" scenario volumes (2030) from the *South Capitol Street Final Environmental Impact Statement.* This growth rate represents a weighted average of the growth rates experienced along South Capitol Street between I-695 and I-295. The growth rate was applied to the through movements of all study intersections.

Future Background Volumes

The traffic volumes generated by the background development and the inherent growth were added to the existing traffic volumes in order to establish the future traffic volumes without the proposed development. Trip assignments and distributions were based on previous studies performed in the area. The traffic volumes for the 2017 Background Conditions are included in the Technical Appendix (Appendix C).

Total Future Conditions

As discussed previously, this analysis assumes a mode split of 55 percent automobile, 40 percent transit, and 5 percent other (including walking, biking, and other transit). This amounts to an overall parking demand of 3,500 vehicles with 2,100 of those vehicles arriving during the one peak hour for the proposed stadium. The following section discusses how these trips were distributed through the network.

Trip Distribution

Potential mitigation measures for the stadium are likely to focus on operational solutions, as infrastructure improvements are not feasible and most of the study area has already been extensively studied for infrastructure improvements. Thus, this study seeks mainly to identify operational solutions that would have the most benefit. Foremost among these is the potential to influence drivers to take routes to the stadium that avoid the existing areas of congestion identified in Section 3.5. To illustrate the magnitude of manipulating route choices, two trip distribution scenarios were analyzed:

- A basic trip distribution that based routing on the fastest travel routes, the distance between parking zones and the stadium, and the overall availability of parking.
- An influenced trip distribution that based routing on an improved dispersal of traffic and the avoidance of intersections with existing capacity concerns.

Patrons driving to and from the stadium would utilize the many regional connections to reach their parking destination. In order to determine the approach routes for the stadium, zip code data was obtained from DC United; this data consisted of zip codes for plan holders (season-ticket purchasers), game-day sales at DC United, sales for International games, and online Ticketmaster sales. The zip codes were organized and plotted to determine the areas of concentration of DCU patrons. Figure 4-7 shows the zip code data for the plan holders.

In order to determine the amount of drivers per approach route, the zip code data for each type of ticket purchaser was grouped based on the most-likely route that they would use to travel to the new stadium. Figure 4-8 shows the zip codes of these four ticket groups. The zip codes are color-coded based on the route that patrons are expected to use to access the stadium.

The basic trip distribution utilizes the distribution of parking shown previously in Figure 4-10. For the purpose of the capacity analyses, it was assumed that 60 percent of patrons would arrive during a single peak hour. This assumption is based on transit fare gate counts and traffic counts at parking lot entries during baseball events at RFK stadium, prior to the opening of Nationals Park. This is similar to the 55 percent used in recent analysis conducted by DDOT (DDOT 2014). This amounts to 510 vehicles traveling to Zone A, 960 traveling to Zone B, 90 traveling to Zone C, 90 traveling to Zone D, and 60 traveling to Zone E. The routing for this distribution assumed that patrons try to park closest to the stadium and do not take into account intersections and routes that are typically busy. It also assumes that patrons use the routes typically suggested by mapping services such as Google Maps and Mapquest. The overall trip routing for the basic distribution is shown on Table 4-10.

Route	Parking Zone					Percent/Route
	A	B	C	D	E	
I-395/14th St Bridge	11.2%	21.0%	2.0%	10.5%	1.3%	**46.0%**
Maine Ave	1.7%	2.6%	1.4%	1.3%	0.2%	**7.2%**
12th/9th St Expressway	0.2%	0.3%	0.2%	0.2%	0.0%	**0.8%**
7th St/4th Street	0.1%	0.2%	0.1%	0.1%	0.0%	**0.5%**
3rd St Tunnel via S Capitol	2.9%	5.5%	0.4%	2.8%	0.4%	**12.1%**
Capitol Hill	0.6%	1.1%	0.0%	0.5%	0.1%	**2.4%**
11th St Bridges	5.0%	9.9%	0.1%	5.0%	0.6%	**20.6%**
South Capitol Street	2.5%	5.1%	0.1%	2.5%	0.2%	**10.4%**
Percent/Zone	**24.3%**	**45.7%**	**4.3%**	**22.9%**	**2.8%**	**100.0%**

Table 4-10: Basic trip distribution and routing

The influenced trip distribution utilizes the distribution of parking shown in Figure 4-11. Similar to above, it was assumed that 60 percent of patrons would arrive during a single peak hour. This amounts to 510 vehicles traveling to Zone A, 810 traveling to Zone B, 270 traveling to zone C, 390 traveling to Zone D, and 120 traveling to Zone E. Vehicles were routed to avoid areas of congestion determined during the existing conditions capacity analysis. This method also aimed to disperse

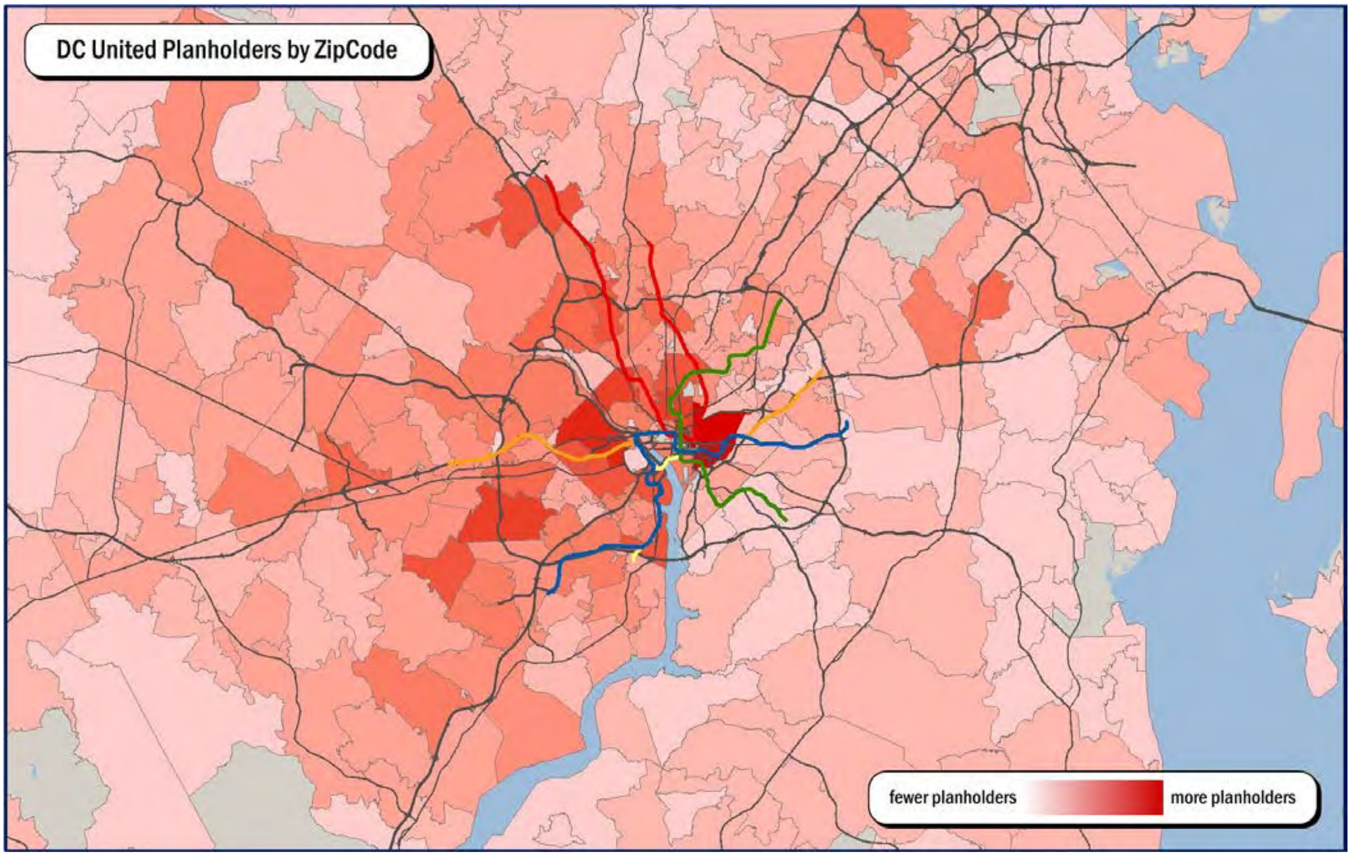

Figure 4-7: DC United planholders by zip code

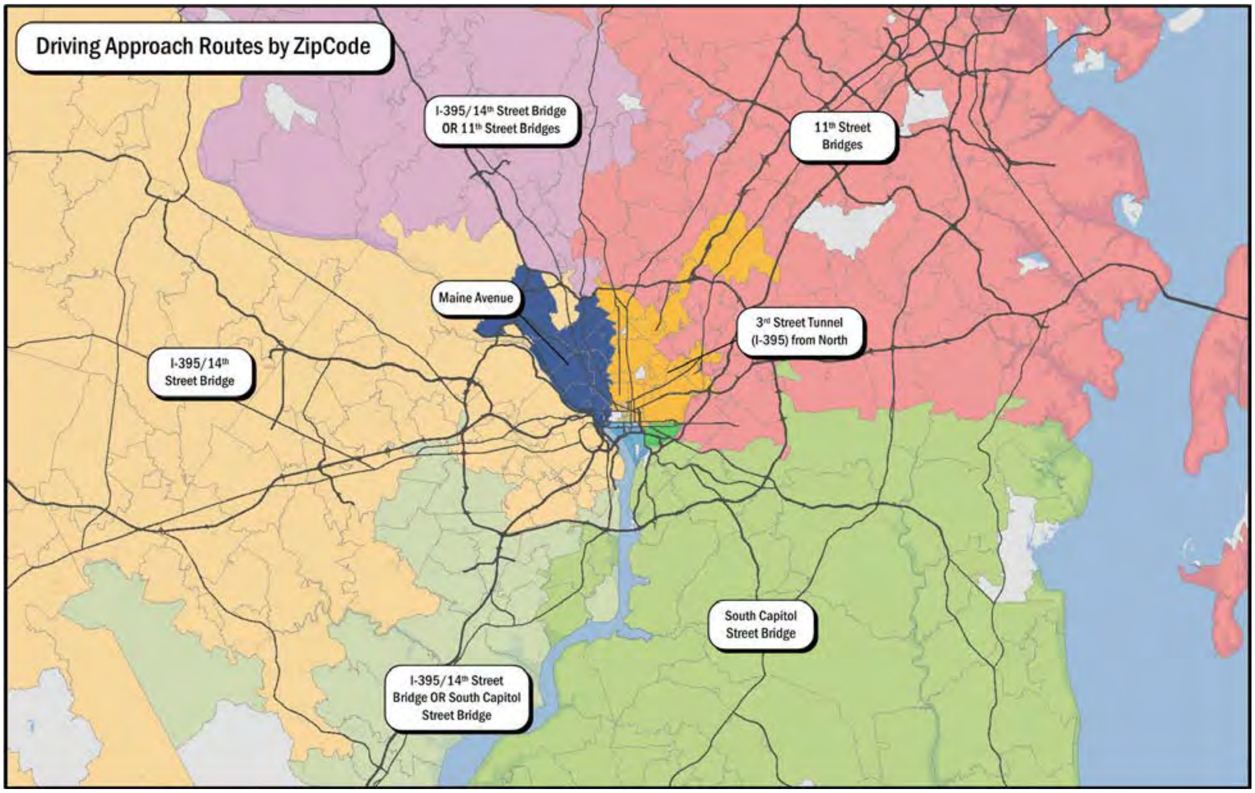

Figure 4-8: Driving approach routes by zip code

traffic over a larger area to avoid congesting singular intersections, while leaving some areas underutilized. The overall trip routing for the influenced distribution is shown on Table 4-11.

Route	Parking Zone					Percent/Route
	A	B	C	D	E	
I-395/14th St Bridge	11.2%	17.7%	5.9%	8.5%	2.6%	**46.0%**
Maine Ave	1.7%	0.7%	4.2%	0.3%	0.1%	**7.1%**
12th/9th St Expressway	0.2%	0.1%	0.5%	0.0%	0.0%	**0.8%**
7th St/4th Street	0.1%	0.1%	0.3%	0.0%	0.0%	**0.5%**
3rd St Tunnel via S Capitol	2.9%	4.7%	1.2%	2.2%	1.0%	**12.1%**
Capitol Hill	0.6%	1.0%	0.1%	0.5%	0.2%	**2.4%**
11th St Bridges	5.0%	9.4%	0.4%	4.5%	1.4%	**20.6%**
South Capitol Street	2.5%	4.9%	0.2%	2.4%	0.4%	**10.5%**
Percent/Zone	**24.3%**	**38.6%**	**12.9%**	**18.6%**	**5.7%**	**100.0%**

Table 4-11: Influenced trip distribution and routing

Game-Day Intersection Operations

To facilitate more efficient pre-game vehicular travel and to minimize the potential for vehicular and pedestrian conflicts, some operational enhancements were applied to the intersection of South Capitol Street and Potomac Avenue, including way-finding signage, traffic cones, and consolidated traffic movements. These operational enhancements primarily keep the lane configuration the same as existing conditions; however, to improve the efficiency of right-turning traffic traveling northbound along South Capitol Street, the right-most lane would be coned off to serve as a right-turn only lane. Under existing conditions this approach operates as two thru lanes and one thru-right lane. This lane configuration was used in both total future capacity analyses and is illustrated in Figure 4-9.

<u>Total Future Volumes</u>

The traffic volumes generated by DC United for both trip distribution scenarios were added to the existing traffic volumes in order to establish two potential future traffic volume outcomes with the proposed development. The traffic volumes for the 2017 Total Future Conditions are included in Appendix C.

Capacity Analysis Results

Based on the assumed 2017 roadway network and the peak hour volumes assembled, capacity analyses were performed for the Future Background and Total Future Conditions (with the Basic and Influenced Distributions). These capacity analyses used the same methodology as those performed for the existing conditions capacity analysis. The results of the capacity analyses are shown in Table 4-12. Detailed worksheets of the calculations in addition to the queueing analysis results for the study intersections can be found in Appendix C.

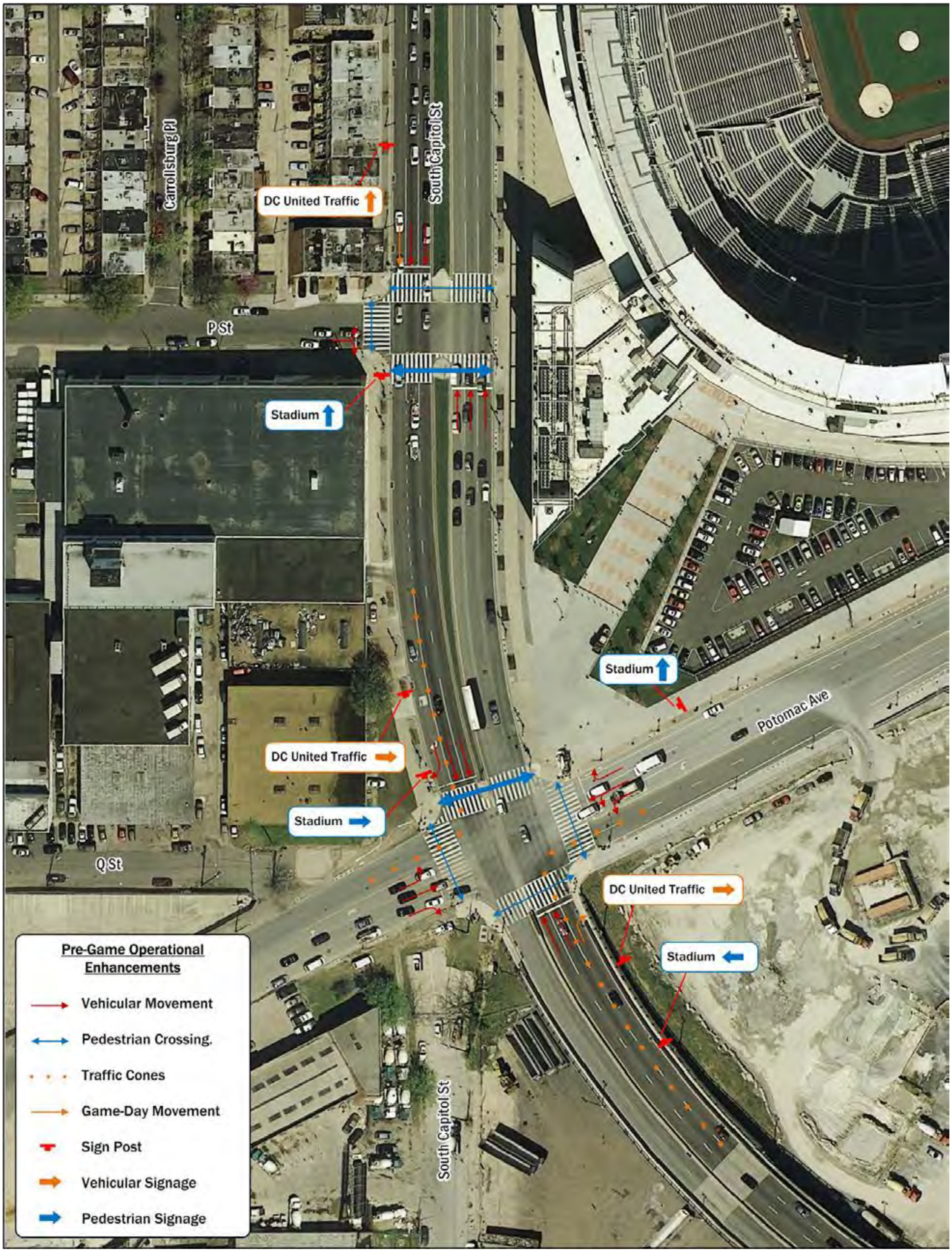

Figure 4-9: Pre-game operational enhancements

Intersection	PM Peak Hour Capacity Analysis Results									
	Overall		Eastbound		Westbound		Northbound		Southbound	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
South Capitol Street & I Street										
BG Conditions	**272.8**	**F**	1728.5	F	296.2	F	12.6	B	27.5	C
TF Conditions - Basic Distribution	**281.2**	**F**	1733.8	F	296.2	F	13.4	B	87.9	F
TF Conditions - Influenced Distribution	**279.3**	**F**	1728.8	F	296.2	F	13.4	B	84.0	F
South Capitol Street SB & M Street										
BG Conditions	**62.6**	**E**	61.7	E	7.8	A	--	--	129.9	F
TF Conditions - Basic Distribution	**134.4**	**F**	129.6	F	8.2	A	--	--	262.4	F
TF Conditions - Influenced Distribution	**122.2**	**F**	104.8	F	8.6	A	--	--	258.0	F
South Capitol Street NB & M Street										
BG Conditions	**29.0**	**C**	6.4	A	46.6	D	73.0	E	--	--
TF Conditions - Basic Distribution	**70.0**	**E**	78.4	E	47.1	D	75.3	E	--	--
TF Conditions - Influenced Distribution	**54.7**	**D**	52.8	D	47.5	D	75.0	E	--	--
South Capitol Street & N Street										
BG Conditions	**272.8**	**F**	--	--	407.5	F	39.4	D	424.4	F
TF Conditions - Basic Distribution	**428.4**	**F**	--	--	181.9	F	52.0	D	847.2	F
TF Conditions - Influenced Distribution	**408.0**	**F**	--	--	181.9	F	52.0	D	805.1	F
South Capitol Street & P Street										
BG Conditions	**45.6**	**D**	172.4	F	--	--	62.7	E	12.2	B
TF Conditions - Basic Distribution	**65.9**	**E**	172.4	F	--	--	72.8	E	45.3	D
TF Conditions - Influenced Distribution	**66.0**	**E**	172.4	F	--	--	72.8	E	45.7	D
South Capitol Street & Potomac Avenue										
BG Conditions	**336.6**	**F**	546.4	F	232.2	F	54.6	D	489.3	F
TF Conditions - Basic Distribution	**342.3**	**F**	546.4	F	359.0	F	91.8	F	454.4	F
TF Conditions - Influenced Distribution	**342.2**	**F**	546.4	F	359.0	F	91.8	F	454.4	F
1st Street & P Street SW										
BG Conditions	**22.9**	**C**	28.2	D	8.6	A	11.1	B	9.6	A
TF Conditions - Basic Distribution	**33.4**	**D**	42.7	E	8.9	A	11.6	B	10.3	B
TF Conditions - Influenced Distribution	**33.4**	**D**	42.7	E	8.9	A	11.6	B	10.3	B

Intersection	PM Peak Hour Capacity Analysis Results									
	Overall		Eastbound		Westbound		Northbound		Southbound	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Maine Avenue & 9th Street SW										
BG Conditions	**119.7**	**F**	27.9	C	15.4	B	67.7	E	364.0	F
TF Conditions - Basic Distribution	**204.3**	**F**	43.1	D	15.7	B	67.7	E	616.9	F
TF Conditions - Influenced Distribution	**218.1**	**F**	45.7	D	15.7	B	67.7	E	653.4	F
Maine Avenue & 7th Street SW										
BG Conditions	**27.7**	**C**	17.2	B	34.2	C	37.8	D	42.3	D
TF Conditions - Basic Distribution	**73.8**	**E**	106.4	F	34.1	C	37.8	D	42.5	D
TF Conditions - Influenced Distribution	**81.1**	**F**	119.2	F	34.1	C	37.8	D	42.4	D
M Street & 4th Street SW										
BG Conditions	**123.3**	**F**	153.6	F	35.9	D	216.5	F	44.8	D
TF Conditions - Basic Distribution	**214.9**	**F**	308.0	F	35.1	D	216.5	F	45.0	D
TF Conditions - Influenced Distribution	**233.1**	**F**	339.1	F	34.8	C	216.5	F	44.9	D
M Street & 1st Street SW										
BG Conditions	**27.7**	**C**	31.4	C	15.1	B	35.5	D	88.5	F
TF Conditions - Basic Distribution	**48.1**	**D**	66.1	E	15.7	B	35.6	D	88.5	F
TF Conditions - Influenced Distribution	**40.8**	**D**	54.2	D	15.4	B	35.6	D	88.5	F
M Street & 1st Street SE										
BG Conditions	**97.6**	**F**	187.0	F	15.9	B	32.2	C	28.8	C
TF Conditions - Basic Distribution	**247.1**	**F**	494.8	F	21.7	C	35.0	C	30.3	C
TF Conditions - Influenced Distribution	**214.6**	**F**	435.2	F	21.4	C	35.4	D	30.4	C
M Street & New Jersey Avenue SE										
BG Conditions	**29.8**	**C**	35.7	D	24.5	C	22.9	C	26.0	C
TF Conditions - Basic Distribution	**49.2**	**D**	76.3	E	30.3	C	22.9	C	26.0	C
TF Conditions - Influenced Distribution	**52.9**	**D**	84.2	F	20.5	C	22.9	C	26.0	C
M Street & 4th Street SE										
BG Conditions	**25.3**	**C**	32.7	C	14.8	B	32.2	C	23.9	C
TF Conditions - Basic Distribution	**35.8**	**D**	33.0	C	23.3	C	112.3	F	28.6	C
TF Conditions - Influenced Distribution	**33.6**	**D**	32.7	C	23.5	C	90.4	F	27.7	C

Intersection	PM Peak Hour Capacity Analysis Results									
	Overall		Eastbound		Westbound		Northbound		Southbound	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
M Street & 8th Street SE										
BG Conditions	**14.6**	**B**	11.0	B	5.5	A	--	--	50.0	D
TF Conditions - Basic Distribution	**15.6**	**B**	11.3	B	9.9	A	--	--	50.0	D
TF Conditions - Influenced Distribution	**15.6**	**B**	11.3	B	9.9	A	--	--	50.0	D
M Street & 11th Street Bridge										
BG Conditions	**43.2**	**D**	30.1	C	12.0	B	57.5	E	--	--
TF Conditions - Basic Distribution	**206.5**	**F**	29.7	C	12.0	B	266.5	F	--	--
TF Conditions - Influenced Distribution	**207.4**	**F**	29.7	C	12.0	B	267.5	F	--	--
4th Street & Virginia Avenue EB SE										
BG Conditions	--	--	94.9	F	--	--	--	--	1.6	A
TF Conditions - Basic Distribution	--	--	Err	F	--	--	--	--	3.6	A
TF Conditions - Influenced Distribution	--	--	Err	F	--	--	--	--	3.1	A
4th Street & Virginia Avenue WB SE										
BG Conditions	**56.4**	**E**	--	--	10.1	B	--	--	259.5	F
TF Conditions - Basic Distribution	**72.8**	**E**	--	--	16.3	B	--	--	330.9	F
TF Conditions - Influenced Distribution	**71.8**	**E**	--	--	15.2	B	--	--	328.1	F
6th Street & Ramp from I-695 SE										
BG Conditions	**289.8**	**F**	152.9	F	--	--	703.8	F	--	--
TF Conditions - Basic Distribution	**330.0**	**F**	230.7	F	--	--	703.8	F	--	--
TF Conditions - Influenced Distribution	**321.1**	**F**	217.3	F	--	--	703.8	F	--	--
6th Street & Virginia Avenue WB SE										
BG Conditions	**35.4**	**D**	--	--	38.3	D	33.2	C	--	--
TF Conditions - Basic Distribution	**272.8**	**F**	1728.5	F	296.2	F	12.6	B	27.5	C
TF Conditions - Influenced Distribution	**281.2**	**F**	1733.8	F	296.2	F	13.4	B	87.9	F

Table 4-12: Future capacity analysis results

Summary of Future Capacity Concerns

Based on the capacity analyses, there are four main conclusions drawn in regards to the study area and the impacts of the Buzzard Point soccer stadium upon the study area:

- The study area is congested under existing conditions and becomes even more so with the addition of background developments and stadium traffic. As can be seen in the table above, most intersections that operate at an unacceptable level of service do so regardless of whether an event occurs at the new stadium. Exceptions to this include the northbound South Capitol Street ramp at M Street, P Street at South Capitol Street, 7th Street at Maine Avenue, and the 11th Street Bridge ramp at M Street, which degrade to an overall LOS of E or F with the addition of stadium traffic.
- The influenced distribution improves some intersections, particularly along South Capitol Street. It causes some increase in delay at intersections along Maine Avenue, but overall, it has a beneficial effect. Due to the exacerbated system, however, the influenced distribution only brings one intersection to an acceptable level of service when compared to the basic distribution. Many intersections show a decrease in delay, but an LOS E or F is still projected at many intersections. It should also be noted that the basic distribution does not take into account additional circulation of traffic. Without any influence on patron routing, it is much more likely that patrons would spend time circulating within the study area in order to find available parking.
- Infrastructure changes within the area are largely infeasible due to roadway constraints and the overall plan for the area. Several major changes are expected to be implemented along South Capitol Street and M Street to help mitigate some of these capacity issues, thus it would not be practical to make changes along these roadways. A more practical solution to some of these capacity issues would be dynamic signal timing. This would require DDOT personnel to determine whether or not a signal timing at a particular intersection should be adjusted during game days. Some intersections may even be manually operated by Traffic Control Officers (TCOs) to manage the conflicting movements of vehicles and pedestrians.

- During construction of the stadium temporary road closures would occur along adjacent streets in Buzzard Point. However, these streets do not receive high volumes of traffic.

The stadium site, and the parcels surrounding it on Buzzard Point, is located on land currently zoned for high-density mixed-use development. Although this is the case, no significant development has occurred on Buzzard Point since the parcels were rezoned years ago. Part of the reasoning for locating the new stadium on Buzzard Point is for the stadium to serve as a catalyst for development.

The stadium would generate a different type of transportation demand than the potential envelope of development on its component parcels. The demand generated by the stadium would be concentrated and occur at predetermined intervals, while a mixed-use development would generate regular traffic including significant amounts of traffic that overlaps with the commuter peak hours. The overall transportation impact from the stadium would be far less in aggregate than an equivalent amount of high-density mixed use development, especially during the times when the transportation network is used the most.

Thus, building the stadium in Buzzard Point would generate an indirect beneficial effect during weekday commuter hour traffic. All of the long-range traffic models that have analyzed this area of the District have included a projected amount of development based on the current zoning on Buzzard Point, thus with the stadium in place all of these models would have overestimated commuter traffic going to/from Buzzard Point.

The levels of development included in long-range models are based on information from the Metropolitan Washington Council of Governments (COG), summarized by geographical areas known as Traffic Analysis Zones (TAZ). The table below shows projections for the Buzzard Point TAZ, which is bounded by the Anacostia River to the south, South Capitol Street to the east, Q Street SW to the north, and Fort McNair to the west.

Year	Employment Forecast	Households Forecast
2010	4,934	17
2015	4,934	18
2020	4,934	62
2025	13,672	62
2030	13,672	62
2035	13,672	63
2040	14,003	66

Table 4-13: Buzzard Point TAZ projections
Source: Round 8.2 Cooperative Forecasting, MWCOG, July 2013

The COG forecasts show a large increase in development, focused on new employment, between 2020 and 2025. This fits the zoning of the current parcels and the slow timeframe of current development. The stadium site would have two indirect impacts to these projections. First, the stadium may accelerate new development to occur prior to 2025. Second, the stadium would decrease the overall amount of new employees that can be added to Buzzard Point.

A conservative estimate of development potential on the stadium parcels is 2.32 million square feet of commercial space. A standard estimate of employees per square feet is three per thousand. Thus, constructing the stadium decreases the amount of potential new commuting employees by 773. This equates to 8.5% of all new employees projected to be added to Buzzard Point between now and 2040. It is possible that this indirect impact of reducing the everyday commuting traffic generated by Buzzard Point would offset potential negative impacts associated with stadium generated traffic.

Overall, there would be short-term minor adverse impact due to potential road closures on adjacent streets. In the long term, the proposed stadium would result in direct moderate adverse impacts due to the increased traffic during game-time events on weekdays and beneficial indirect impacts on traffic.

Traffic Mitigation

- *Promote Non-Auto Modes.* DC United should promote modes such as Metrorail, existing and new bus/Circulator routes, potential water taxi service, bicycling, and walking. Extensive information should be outlined on the DC United website to inform patrons about available non-auto travel modes.

- *Information Dissemination.* Because weeknight games would overlap with the commuter peak hour, the commuting public surrounding the stadium should be made aware of the stadium's event schedule. DC United should participate in a joint information campaign with Nationals Park and other event spaces nearby could be used to help commuters make transportation decisions to help alleviate traffic.

- *Influencing Routing of Spectators*. DC United should provide information to spectators that drive to games on appropriate parking and routing decisions that help achieve less congestion, as demonstrated in this report's comparison of basic and influenced routing scenarios. This could be achieved through various methods, including information provided during ticketing, information compiled on a website, and through mobile applications.

- *Signal Timing.* Enhanced signal timing strategies, using dynamic timing patterns during events, could help reduce congestions spots where game-day traffic overlaps with commuter traffic. This report recommends that during development of the TOP, DC United should develop various signal timing strategies (such as separate ones for weeknight and Saturday games) in collaboration with DDOT for use on game days.

- *Game-day operational measures.* Some intersections and parking garage access points may need game day specific operational measures, such as short street closings, limitations of some turning movements, and barriers. Since these measures are highly influenced by the expected parking locations and stadium design, this report recommends that during the development of the TOP, DC United should explore the usefulness of operational measures and develop plans for various game day scenarios. Furthermore, DC United should develop customized TOPs for each game time scenario (e.g. weekday evening, weekend daytime, weekend evening, etc.) that respond to the particular transportation conditions for each time period. Similarly, the TOP would identify additional operational mitigations for the intersections that operate as failing under both background and future conditions.

- *Coordination with South Capitol Street Corridor project.* DC United would coordinate the mitigation measures outlined above within the context of the South Capitol Street Corridor project and its construction schedule. This effort would be included in the TOP.

- *Management of loading operations.* Until the design of the new stadium has advanced further, a detailed review of loading is unavailable. Variables include technology, food vendors, and other factors. DC United should include loading operations into the TOP.

No Action Alternative

The No Action Alternative would reflect the background conditions described above without the addition of a stadium. Under the No Action Alternative, numerous development projects would add additional weekday vehicular trips, as summarized in Table 4-9. In addition, other traffic increases due to inherent growth on roadways in the study area would be expected at a rate of 0.44 percent per year, compounded annually. As illustrated in Table 4-12, conditions at nine intersections would function at LOS E or F, an increase of three intersections over the existing conditions. As a result, the No Action Alternative would result in long-term moderate adverse impacts on traffic.

4.6.2 Parking System Impacts

Stadium Alternative

<u>Off-Street Parking</u>

The majority of game-day patron parking would be off-street within privately owned parking lots and garages. Most of the parking lots inventoried in Section 3.5 are used by office workers during the day and/or by Nationals patrons on game days. Therefore, this parking would be readily available for all game-time scenarios on weeknights and weekends, assuming no direct scheduling conflicts with Nationals games.

As discussed above, the expected vehicular demand for a weeknight game would be approximately 3,500 vehicles. Although some people are likely to utilize the non-residential on-street parking within Buzzard Point, the adequacy of the existing off-street parking was analyzed based on 3,500 vehicles to maintain a conservative analysis. When determining the number of spaces that need to be provided, a 10% circulation factor should be included to accommodate for vehicles searching for spaces and any parking that may not be available that normally is. Therefore, the estimated parking demand is 3,900 spaces.

As discussed in Section 3.5, there are approximately 6,441 off-street parking spaces expected to be available for the 2017 opening season. Because the improvements to the Frederick Douglass Memorial Bridge will not be complete by 2017, this analysis worked under the assumption that patrons would not park until the completion of improvements in the Anacostia Metro Station parking garage, which brings the off-street parking total down to 5,633 spaces. This amount of parking exceeds the 3,900 spaces necessary for a game.

This parking total does not take into account potential parking at the stadium itself or office parking as a result of redevelopment in the area between now and 2017. Additional parking located on Buzzard Point is recommended as it would help spread out demand, increase the amount of parking within a short walk of the stadium, ensure that smaller events could have an independent parking supply, and reduce pedestrian crossings at South Capitol Street. Assuming that some additional parking would be provided at or near the stadium, two game-day parking distributions were developed:

- A **Basic** Distribution that based routing on the fastest travel routes, the shortest distance between parking zones and the stadium, and the overall availability of parking.
- An **Influenced** Distribution that more evenly distributes vehicles throughout the parking areas and avoids areas of existing congestion.

These distributions are shown in Figure 4-10 and Figure 4-11. The basic distribution focuses more vehicles to the parking areas closest to the stadium, particularly Zone B and some areas of Zone C and D. It should be noted that the amount of parking in Zone A, directly adjacent to the site, does not change as it is assumed that much of this parking would be pre allocated to season ticket holders.

On-Street Parking

On-Street parking is expected to be used less than off-street parking, as there are fewer spaces available. The project site is surrounded by unrestricted and metered spaces. Additional metered parking and a limited amount of unrestricted parking is available north of M Street and east of South Capitol Street. A total of 363 metered spaces and 258 unrestricted spaces are expected to be available during weeknight games.

In addition to the metered and unrestricted parking near the stadium, there is a large amount of Residential Permit Parking (RPP) spaces in the residential neighborhood north or the stadium, as discussed in Section 3.5. These RPP spaces are currently broken down into general RPP and enhanced RPP. Enhanced RPP does not have a 2-hour grace period for drivers without Zone specific permits.

Overall, the stadium Alternative would result in long-term minor adverse impacts on parking due to the potential for patrons to park within existing residential neighborhoods.

Parking Mitigation

Off-Street Parking

As stated above, parking on Buzzard Point would increase the amount of parking within a short walk of the stadium, ensure that smaller events could have an independent parking supply, and help disperse overall vehicular demand. Some of this parking could be a source for ADA parking and other priority parking, such as carpool/HOV vehicles.

DC United should work with owners, operators, and developers of existing parking facilities and undeveloped surface lots to determine which parking locations would be available. This list should be revised and updated leading up to and beyond opening day.

On-Street Parking

The on-street parking inventory found a mix of metered, residential permit parking, and unrestricted parking. The following changes should be made to on-street parking restrictions to better serve the stadium and protect the surrounding neighborhood:

- *Metered Parking.* DDOT should convert existing meters in Buzzard Point that do not serve residential uses to multi-space meters with the option of implementing special game day rates. The use of multi-space meters allows for more cars to park in the metered areas thus increasing the overall parking capacity.
- *Residential Permit Parking.* Much of the RPP parking was reviewed and enhanced prior to Nationals Park opening; however some areas closer to the stadium may require additional changes to deter patron parking. Currently, the majority of residential blocks implement general RPP on one side and enhanced RPP on the other side, with restrictions that require RPP permits from 7:00 a.m. to midnight every day of the week. Some blocks, however, have less stringent restrictions. These spaces are only restricted from 7:00 a.m. to 9:30 p.m. on Monday through Saturday and are generally located closer to the stadium site. It is suggested that all spaces with these restrictions be further protected to at least include Sunday RPP restrictions since some games would take place on Sundays. The residential neighborhood may be best served if all residential blocks required RPP permits from 7:00 a.m. to midnight, seven days a week. In addition to curbside restrictions, signs along M Street restrict non-local vehicles from entering the neighborhood streets during Nationals games. In consultation with the community, DDOT should

modify the signs to include DC United games. In addition, signs such as this may be needed at the south end of the neighborhood to deter vehicles from exiting the stadium through the neighborhood as well. DDOT would likely place such signs at the intersections of Q Street with 1st Street and Half Street SW. Signs could also be supplemented with use of game-day barricades at these locations, placed near the end of the game to help control the flow of vehicles leaving the stadium.

- *Unrestricted Parking.* The majority of unrestricted parking near the stadium is found in Buzzard Point. This report recommends that DDOT convert the unrestricted parking to multi-space meters with the option of implementing game day rates. Blocks that serve as primary walking routes, however, should be restricted to parking on game days to allow for improved pedestrian flow. For example, operational measures to expand pedestrian space, such as barriers placed in the streets to convert the parking lane to a walkway, could be used to widen the effective walkway width of high flow pedestrian routes. The specific blocks where this strategy should be implemented would be analyzed further when a more detailed stadium design is realized.

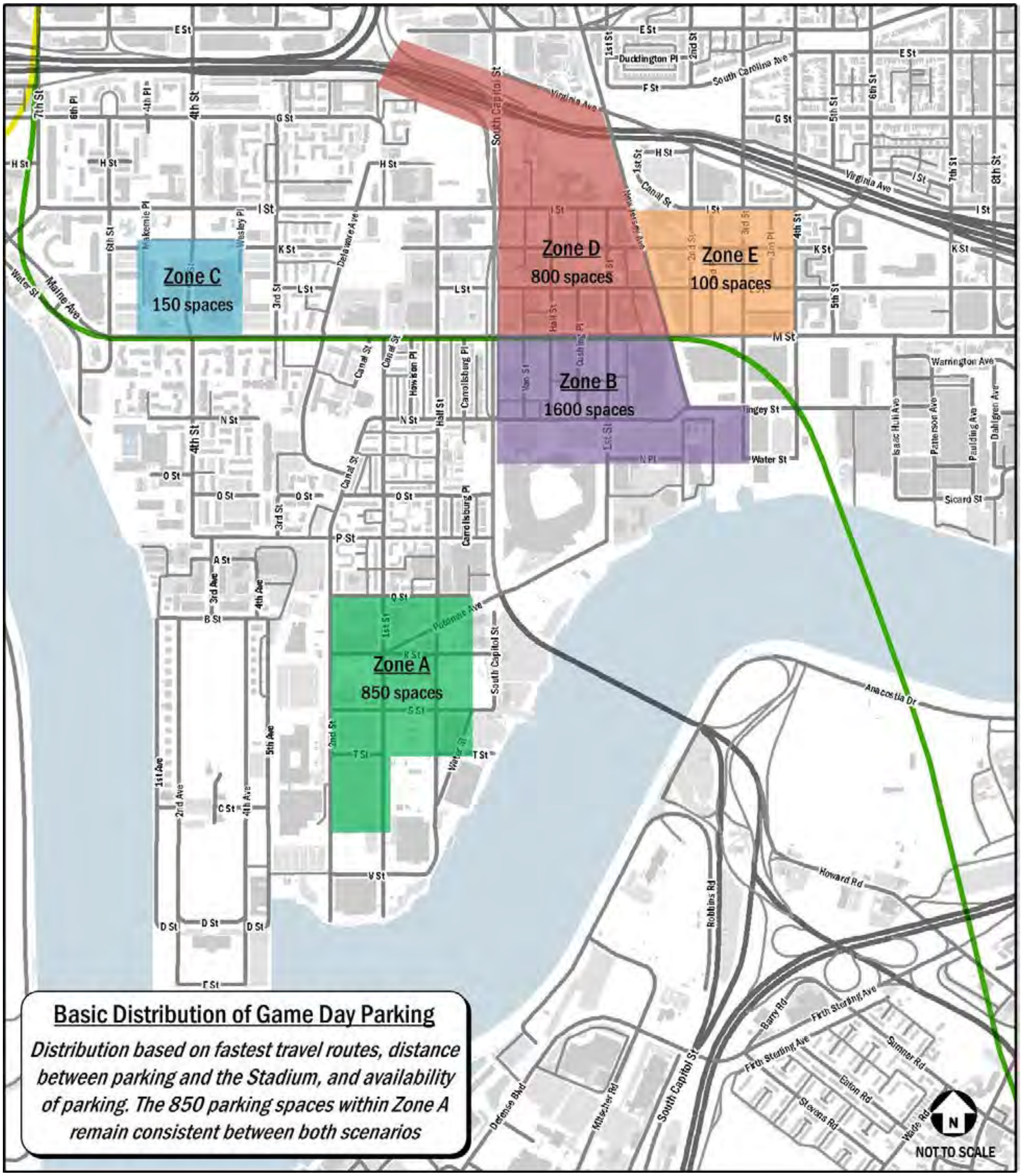

Figure 4-10: Basic distribution of game day parking

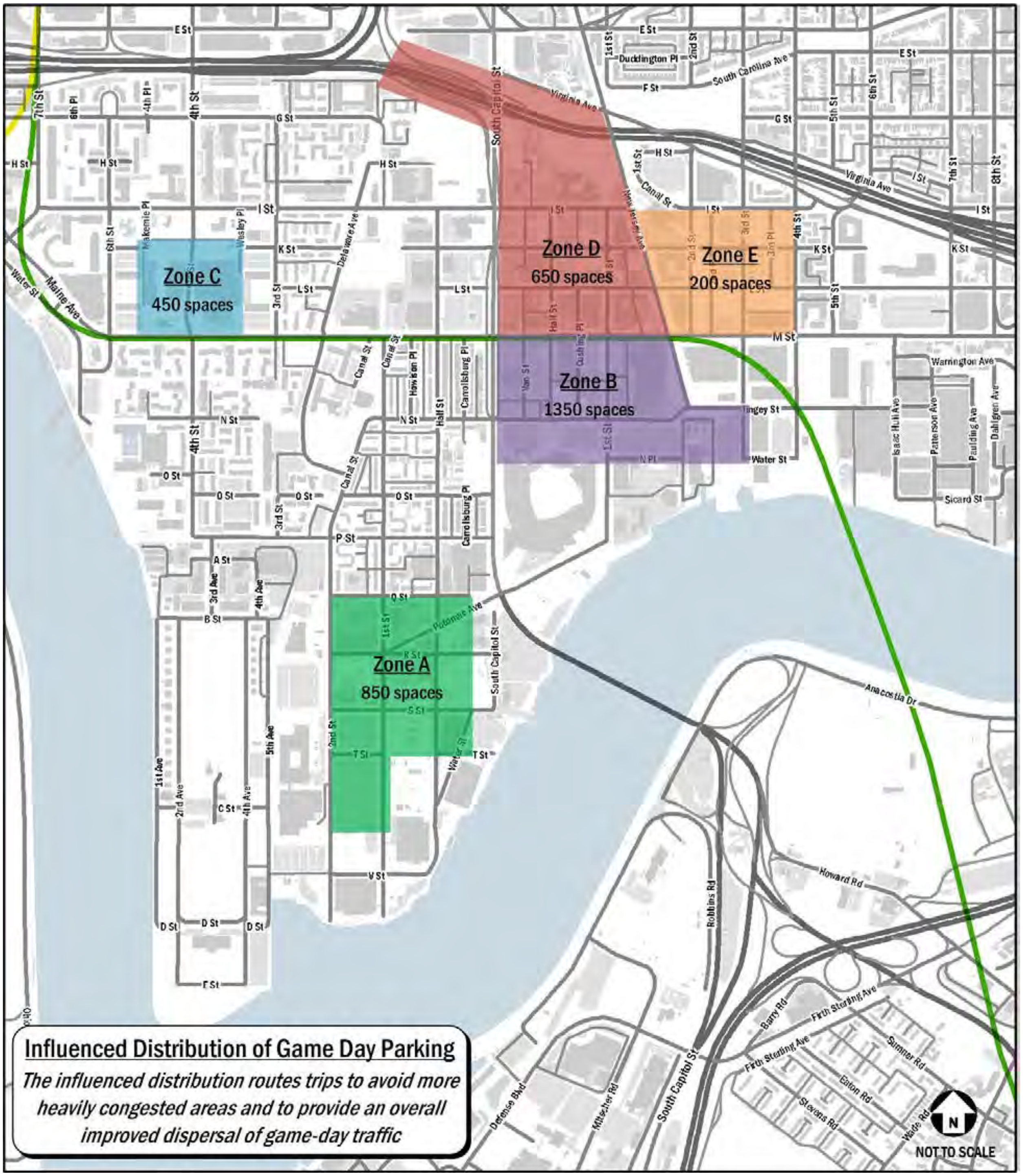

Figure 4-11: Influenced distribution of game day parking

4.6.3 Public Transit System Impacts

Stadium Alternative

Planned Transit Improvements

The District plans to implement several transit improvements in the southwest/southeast waterfront area over the next several years. Such projects include an extension of an existing Circulator route, two additional Circulator routes that are expected to end near the Waterfront Metro station and two Streetcar Lines that would terminate in Buzzard Point. Although the routes are not finalized at this time, the proposed routes are depicted in Figure 4-12.

The Union Station-Navy Yard Circulator route is planned to be extended from the Navy Yard Metro to the Waterfront Metro, likely adding one or two stops that are closer to the new stadium than under existing conditions. The two proposed Circulator routes are expected to travel between the Convention Center and the southwest waterfront and between Dupont Circle and the southwest waterfront. This would provide links to areas such as Metro Center, Farragut Square, and the Tidal Basin. According to the *DC Circulator 2014 Transit Development Plan* (DDOT, Draft: September 2014) the Union Station-Navy Yard route is part of the Phase 1 improvements that are expected to be complete by 2017 in time for the DC United inaugural season. The Convention Center route is part of Phase 2 with a timeline of 2018-2020 and the Dupont Circle route is part of Phase 3 with a timeline of 2021-2024. Although only one of these routes is expected to be added prior to the inaugural season, the additional Circulator routes would add transit capacity to the Buzzard Point area over time and allow for direct transit service to reach a wider range of the city.

The District's streetcar plan, as discussed in DC's *Transit Future System Plan* (DDOT, April 2010), includes two planned lines that are expected to terminate in Buzzard Point. The planned routes for these lines would connect Buzzard Point with Takoma to the north and with Anacostia to the south. They are part of the 22 mile priority system that also includes the Georgetown Waterfront to Benning Road Line. All three lines are expected to be completed between 2018 and 2020. Therefore, streetcar service would not be available as a transit option during the inaugural season. While the exact routes and stops of the Circulator and Streetcar routes are unknown at this time, it is likely that stops would be located closer to the project site than the Metrorail Station. Although Streetcar would be advantageous to have in the future, it is anticipated that Metrorail would continue to act as the primary transit option to and from the stadium. Metrorail provides an overall higher capacity than Metrobus, Circulator, and Streetcar systems due to shorter headways and the high capacity per train. The Navy Yard station has already been enhanced to adequately serve game-day transit volumes and would continue to do so in the future.

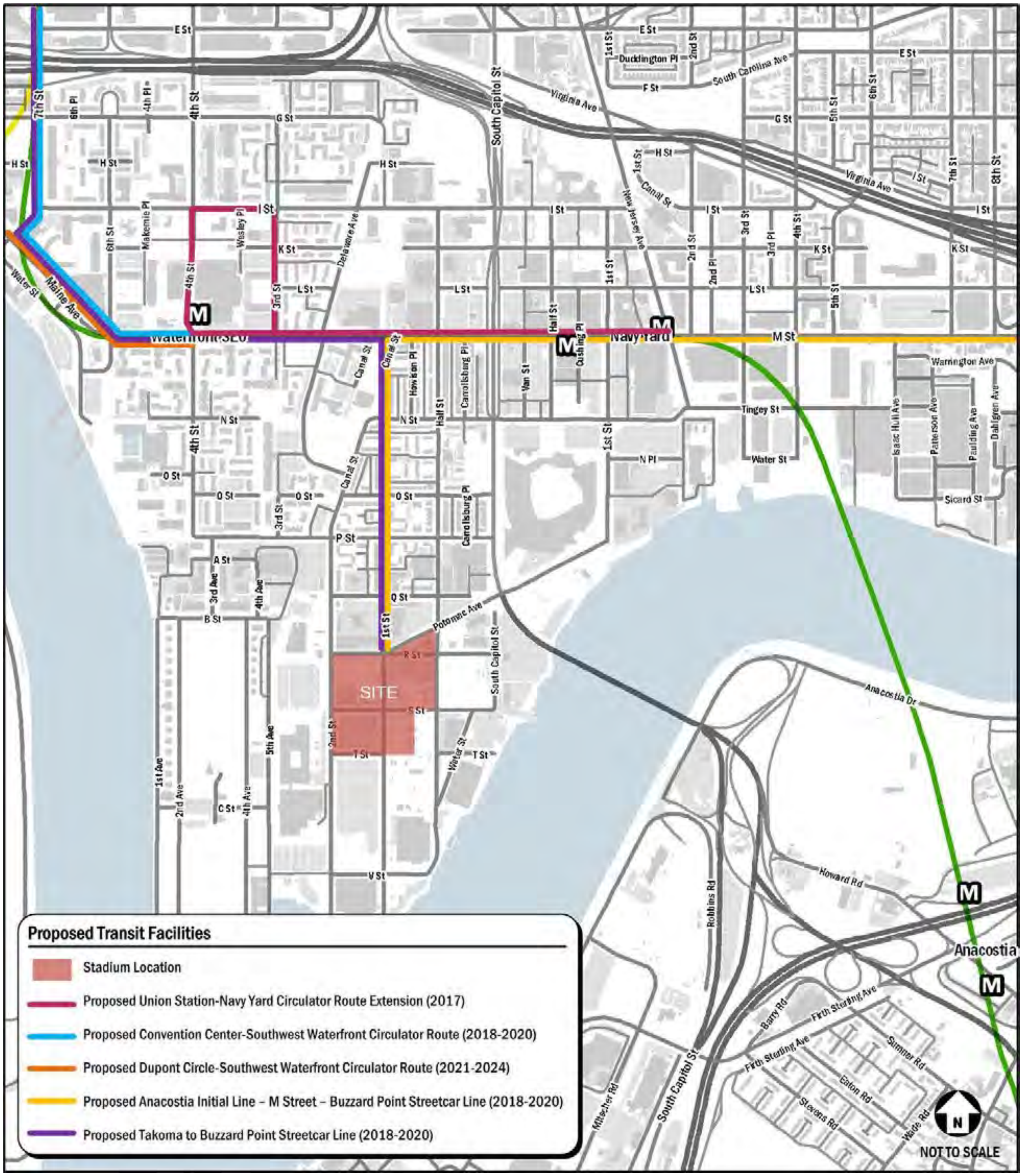

Figure 4-12: Proposed transit facilities

Future Transit Demand

Future Metrorail volumes were assembled for the Navy Yard and Waterfront stations using the following methodology:

- Transit trips generated by Future Background developments were estimated based on the mode split assumptions contained in their traffic impact studies.
- Similar to the traffic analyses, a growth factor was applied. According to the Metrorail Station Access and Capacity Study performed by WMATA in April 2008, trend forecasts predict an average annual growth of 1.7 percent between the years 2005 and 2035. Thus a 1.7 percent annual growth rate was applied over the study period (2014 – 2017).
- Total future transit trips for the weeknight game day traffic were estimated based on the assumptions outlined previously in Table 4-7. Similar to vehicular trips, it was assumed that 60 percent of transit trips would be taken during the peak arrival hour, which amounts to 4,800 arrival trips. Of these trips, it is assumed that 80 percent would arrive and depart from the Navy Yard station and 20 percent from the Waterfront station. Use of the Navy Yard Metro station would be emphasized because of its familiarity with District residents, its design to handle game-day transit capacity, and its location outside of a primarily residential area. The perception of walking time would be enhanced from the Navy Yard Metro station due to the greater sidewalk capacity and an enhanced sense of arrival due to the proximity to restaurants and the Nationals Park.
- All future transit volumes were summed with the existing volumes to determine the future Metrorail volume estimates shown in Table 4-14.

PM Peak Volumes (riders/hour)	Navy Yard (East)			Navy Yard (West)			Waterfront		
	Entries	Exits	Total	Entries	Exits	Total	Entries	Exits	Total
Existing Volumes	1077	260	1337	252	116	368	468	469	937
Background Growth	55	13	68	13	6	19	24	24	48
Background Developments	892	784	1676	1317	833	2150	252	265	517
Future Background Traffic	947	797	1744	1330	839	2169	276	289	565
Game-Day Arrivals	0	192	192	0	3648	3648	0	960	960
Total Future Traffic	2024	1249	3273	1582	4603	6185	744	1718	2462

Table 4-14: Future Metrorail volumes

The ability of the Metrorail system to accommodate these riders was evaluated by calculating the future line and station capacity with and without DC United stadium traffic. The station capacity calculations, shown in Table 4-15, provide a volume-to-capacity ratio for the stations. Of note, it was assumed that two of the three escalators at the Navy Yard west portal would be traveling upwards as opposed to typical PM peak hour conditions where only one escalator travels upwards, in order to accommodate the additional exiting traffic associated with game days.

Station	Future Background Conditions (weeknight PM peak hour)			Game Day Conditions (weeknight PM peak hour)		
	PM Peak Hour Volume	**Station Capacity (per hour)**	**V/C Ratio**	**PM Peak Hour Volume**	**Station Capacity (per hour)**	**V/C Ratio**
Navy Yard (East Portal)						
Peak Direction (Entering)	2,024	5,600	0.36	2,024	5,600	0.36
Off-Peak Direction (Exiting)	1,057	3,000	0.35	1,249	3,000	0.42
Total	3,081	8,600	0.36	3,273	8,600	0.38
Navy Yard (West Portal)						
Peak Direction (Entering)	1,582	10,000	0.16	1,582	5,000	0.32
Off-Peak Direction (Exiting)	955	5,000	0.19	4,603	10,000	0.46
Total	2,537	15,000	0.17	6,185	15,000	0.41
Waterfront						
Peak Direction (Entering)	744	5,000	0.15	744	5,000	0.15
Off-Peak Direction (Exiting)	758	5,000	0.15	1,718	5,000	0.34
Total	1,502	10,000	0.15	2,462	10,000	0.25

Table 4-15: Future Metrorail station capacity analysis

The line capacity calculations, shown in Table 4-16 , provide a volume to capacity ratio for the Green line. DC United patrons were distributed between the two lines based on WMATA origin and destination data.

As shown in the tables, there would be adequate capacity at the Navy Yard and Waterfront Metrorail stations to accommodate existing, future background, and DC United Metrorail demand. The recent updates made to the Navy Yard west portal to accommodate Nationals Park transit traffic, would more than suffice in handling DC United game-day traffic.

	Green Line			
	Future Background Conditions (weeknight PM peak hour)		**Game Day Conditions (weeknight PM peak hour)**	
Volume (per hour)				
Volume entering Navy Yard station	2,675	8,782	2,675	12,046
Riders exiting trains	878	1710	878	4974
Riders boarding trains	3,065	302	3,065	541
Volume departing station	4,862	7,374	4,862	7,613
Peak Volume	4,862	8,782	4,862	12,046
"Special Event" Capacity (per hour)				
Cars per hour	70	70	70	70
Riders per Car	155	155	155	155
Total Capacity	10,850	10,850	10,850	10,850
Volume/Capacity Ratio	0.45	0.81	0.45	1.11

Table 4-16: Future Metrorail line capacity analysis

Only one portion of the Metrorail system would be constrained from stadium operations, the section of the Green line traveling to Navy Yard from downtown during the PM peak hour prior to a sold-out weeknight game. According to estimates of how many riders can fit onto a single Metrorail car, during the peak hour of travel prior to a sold-out weeknight game, every car on trains between L'Enfant and Navy Yard would be completely full with commuters and DC United patrons. It should be noted, however, that this analysis assumed that the peak hour of both commuters and stadium patrons occurs at the same time. It is likely that these peaks would be at least slightly offset from each other. It is also likely that commuters in particular may choose to travel by transit at different times in order to avoid the peak rush of game-day patrons or choose another transit option, if available.

Overall, the long-term impacts on transit would be adverse and minor as a result of increased ridership due to transit use by stadium patrons. However, new District transit projects would continue to be implemented.

Public Transit Mitigation

Because the nearest Metro stations are not directly adjacent to the site, DC United should coordinate with WMATA to install DC United signage within the Metro System to direct patrons to the stadium. It is vital to create a "sense of place" for patrons in order to enhance the perceived walk-time between the proposed stadium and the Navy Yard Metrorail Station. This may include temporary markers such as DC United-branded flags and vendors/food trucks prior to games, or more permanent amenities including decorative pavers and enhanced lighting.

In addition, DDOT should coordinate with the stadium architect to ensure that new streetcar service can be accommodated within the site design. This may include designing some sidewalks to include a raised streetcar platform and ensuring that there would be enough room for a streetcar turnaround at the terminus of the lines. Similarly, DDDOT and DC United should coordinate potential transit lines, and consider the potential impacts on pedestrian routing and conflicts, as well as strategies to minimize the potential conflicts and impacts. These factors should be included in the TOP, as appropriate.

Coordination between DC United and WMATA in regards to the projected number of attendees and riders during the season would be essential. Scheduled construction disruptions that may take place on weekends during game days must be discussed to ensure that game day operations would not be drastically impacted. Coordination with WMATA would be necessary to review overall operation considerations at the Buzzard Point region and the new stadium and to assess site impacts while the system is being constructed. Although the new streetcar system may provide service directly adjacent to the stadium, Metrorail would still serve as the highest capacity transit option in the area. Therefore, as the new stadium is located over half a mile from the nearest transit options, it may be necessary to implement a handicap accessible shuttle between the Metro station and stadium. These practices should be monitored during the season and continually modified to determine the best practices for game day transit.

The available transit options for the new stadium should be adequately promoted to ensure that people are aware of all potential transportation options to the stadium. Marketing by DC United, in coordination with WMATA, within the Metro system itself would be necessary. This may include adding DC United logos or specific stadium-branding to Metro maps and signage. The nearest Metro station is currently branded as the Navy Yard – Ball Park station. Given the addition of the stadium to the area, the name may be altered to market it as the primary station for DC United patrons in addition to Nationals patrons. In addition to marketing within the Metro system, DC United should encourage use of transit by providing Metro subsidies to season ticket holders equal to any parking subsidies that are typically provided.

No Action Alternative

Under the No Action Alternative, existing transit service would continue to operate. The District would continue to implement new transit projects. Therefore, this alternative would result in beneficial impacts on transit.

4.6.4 Pedestrian Circulation Impacts

Stadium Alternative

This section discusses the expected game-day pedestrian volumes, how they impact the existing pedestrian infrastructure, and what permanent and temporary mitigation measures are necessary for adequate game-day operations.

Pedestrian Routing

Pedestrians walking to and from the stadium would primarily be traveling in between the site and the parking zones outlined previously and nearby Metrorail stations, focusing on the Navy Yard Metro station and to a lesser extent the Waterfront Metro station. A smaller number of trips generated by the stadium would be walking trips from residential areas.

In order to determine the pedestrian routing for the stadium, the number of trips generated by the stadium during a typical weeknight game were distributed on the most-likely walking routes between the site and the Metrorail and parking zones previously shown on Figure 4-11 for the influenced distribution, while attempting to utilize the existing wide sidewalks near the Nationals Park and avoid the residential neighborhood north of the stadium. Generally, the pedestrian routing follows similar roadways as the vehicular routing, including South Capitol Street, Potomac Avenue, 1st Street SE, M Street SE/SW, and 4th Street SW; roadways that are avoided include those between South Capitol Street and 4th Street SW north of P Street SW and south of M Street SW within the residential neighborhood north of the stadium.

The total number of pedestrian trips assumed as a combination of the patrons riding transit and traveling in vehicles was used in order to determine the maximum pedestrians per route. Based on the trip generation established for the stadium, approximately 10,000 pedestrians would be accessing the site during the peak arrival hour. Patrons expected to park at or adjacent to the stadium were not included in the pedestrian routing volumes. For routing purposes, it was assumed that 20 percent of Metrorail riders use the Waterfront station and 80 percent use the Navy Yard station. For those using the Navy Yard station, it was assumed that 95 percent would use the west portal (which would be advertised as the stadium exit) and 5 percent would use the east portal (to account for those at the front of the train and/or those attempting to avoid the crowds at the west portal). The total number of pedestrian trips projected on each roadway during the single peak hour is shown on Figure 4-13. Although other pedestrian routes may be used, pedestrian way-finding signage would direct patrons along these routes. Other routes would only generate small amounts of pedestrian traffic and are not analyzed as a part of this study.

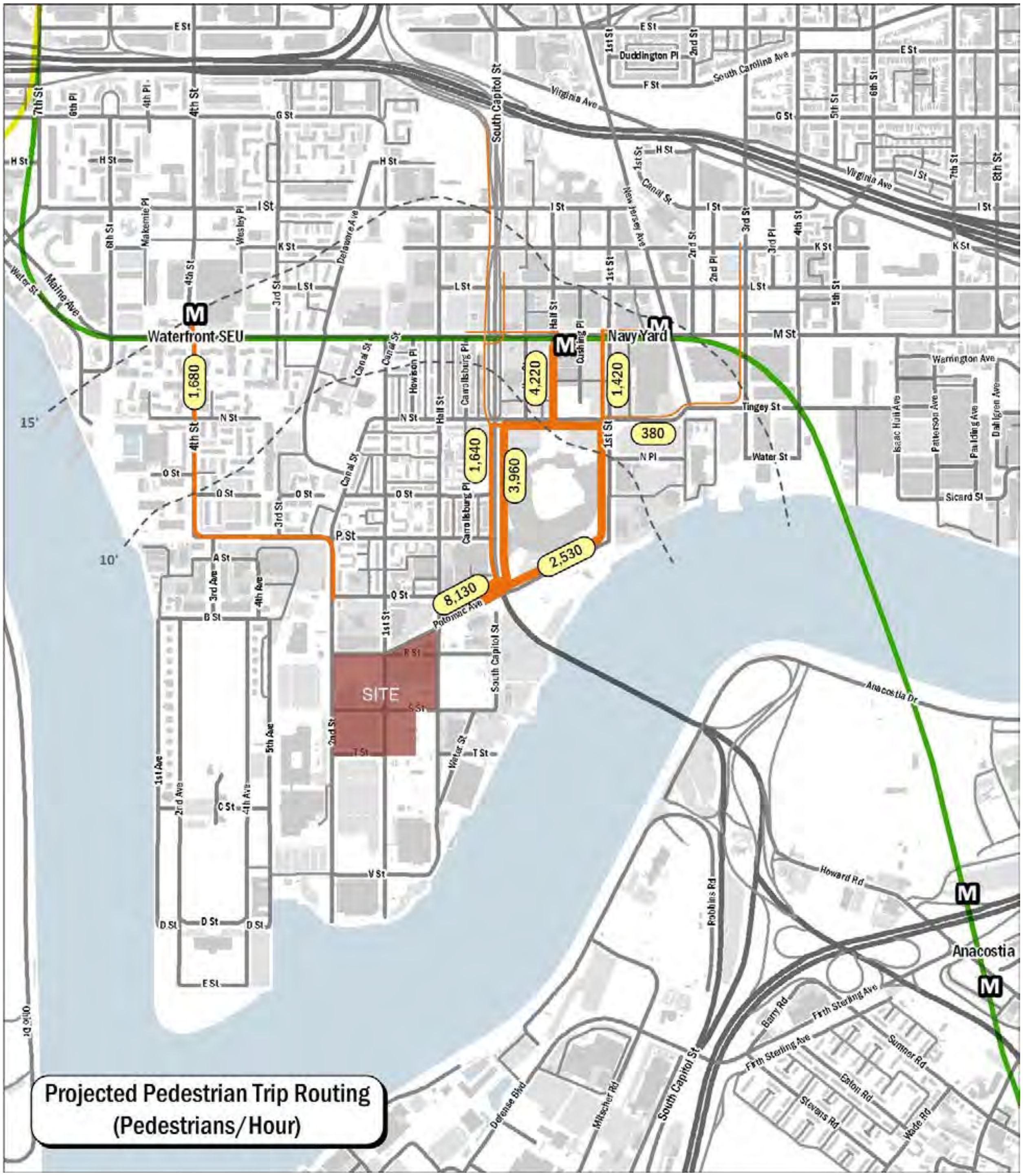

Figure 4-13: Projected pedestrian trip routing

Multiple methodologies were utilized to analyze the capacity and level of service of the existing pedestrian system with the addition of game-day pedestrian traffic. These include the following:

- HCM 2010 link analysis, which provides a level of service for pedestrian segments based on the perceived quality of the segment
- HCM 2010 capacity analyses for all major walking routes (over 200 pedestrians/hour)
- HCM 2010 pedestrian service time and crosswalk LOS at signalized intersections within the study area expected to generate a significant amount of pedestrian traffic (over 500 pedestrians/hour)
- HCM 2010 pedestrian space analysis at corners with high pedestrian volumes (limited to the intersection of South Capitol Street and Potomac Avenue)

<u>HCM 2010 Pedestrian Link Analysis</u>
"Chapter 17: Urban Street Segments" of the <u>Highway Capacity Manual 2010</u> (HCM) outlines a methodology for evaluating the performance of an urban street segment in terms of its service to pedestrians. The HCM link analysis provides an evaluation of the pedestrian perception of service along a roadway as opposed to the sidewalks compliance with standards.

<u>Methodology</u>
Due to data collection constraints, the overall methodology outlined in HCM 2010 was simplified slightly. The modified step-by-step methodology is outlined below:

Step 1: Determine Free-Flow Walking Speed

The average free-flow speed reflects conditions in which there are negligible pedestrian-to-pedestrian conflicts and primarily takes into account pedestrian age and sidewalk grade. For the purpose of this analysis, a free-flow walking speed of 4.4 feet/second was used. This value is used for a pedestrian population that is less than 20% elderly (i.e. 65 years of age or older), which is consistent with US Census age distribution data for the census tract of the site. It was assumed that sidewalks in the area do not have a significant enough upgrade (10% or greater) to reduce the average free-flow speed.

Step 2: Determine Average Pedestrian Space

Average pedestrian space indicates if a pedestrian has an adequate amount of space to maneuver along the sidewalk and avoid fellow pedestrians and obstacles. The average pedestrian space is determined based on the effective sidewalk width, pedestrian flow rate, and walking speed. For this report, this step was replaced with a more detailed examination of sidewalk capacity, a discussion of which follows this section.

Step 3: Determine Pedestrian Level of Service (LOS) Score

The pedestrian LOS score takes into account the overall cross section of the roadway and sidewalk, including the width of travel lanes, parking lanes, bike lanes, sidewalk buffers, and sidewalks. The link score has high sensitivity to the separation between pedestrians and moving vehicles in addition to the speed and volume of vehicles along the adjacent roadway. Collected traffic counts were used to determine the volumes along many roadways. For roadways without available data, a volume was assumed based on the functional classification of the roadway. AADT volumes provided by the district were inventoried by functional classification and used to determine an appropriate average volume based on functional class.

Step 4: Determine Link LOS

The link LOS is determined based on the LOS score and the average pedestrian space. As discussed above, the average pedestrian space was assumed to be above 60 square feet per person; thus, the pedestrian LOS is determined based on the pedestrian LOS score shown in Table 4-17: Pedestrian LOS Parameters. LOS results range from “A” being the best to “F” being the worst, based on the pedestrian traveling experience and perception of service quality along the sidewalk segment.

Pedestrian LOS Score	Pedestrian LOS
<2.00	A
>2.00-2.75	B
>2.75-3.5	C
>3.5-4.25	D
>4.25-5.0	E
>5.0	F

Table 4-17: Pedestrian LOS parameters

Results

To perform the pedestrian link analysis, extensive data was collected at every sidewalk segment in the pedestrian study area. This data was collected on Wednesday, May 28, 2014, Monday, June 2, 2014, Monday, June 23, 2014, Wednesday, July 2, 2014, and Thursday, July 10, 2014. A full inventory of data collection and analysis results is included in the Technical Attachments. Figure 4-14 summarizes the pedestrian link LOS results for the PM peak hour scenario.

The analysis concludes that the majority of study segments in the study area, with the exception of those that do not have sidewalks, are perceived as acceptable based on an LOS

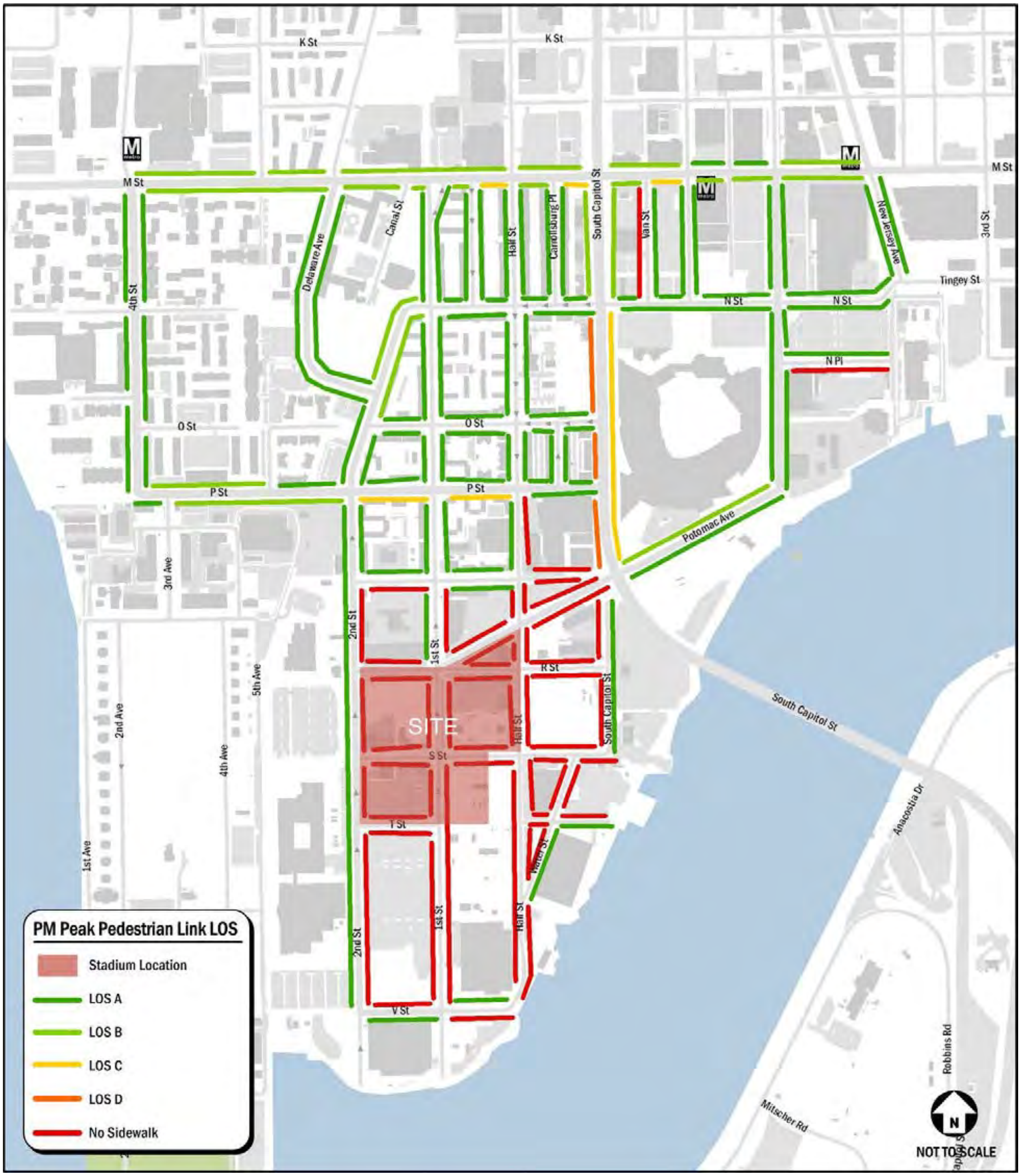

Figure 4-14: PM Peak pedestrian link LOS

of C or better. The west side of South Capitol Street between Potomac Avenue and N Street is the only section with an LOS D. This is due in large part to the extremely high southbound volumes along South Capitol Street during the PM peak hour and the relatively higher speed, compared to the remainder of the study area. Although these sidewalks provide an ample amount of space, the high volume along South Capitol Street leads to a degraded perception of the pedestrian environment. Overall, the remainder of the blocks that provide sidewalks have an overall positive perception from those walking on them.

Those blocks that do not provide sidewalks are primarily situated in Buzzard Point surrounding the stadium site. A large portion of the blocks without sidewalks would be upgraded as a direct impact of stadium. Construction of the stadium would result in enhanced sidewalk facilities along the entire perimeter of the stadium in addition to some blocks north and east of the site. Although there are areas south of the stadium that do not provide sidewalks, these are not expected to be enhanced in conjunction with the stadium as they do not function as primary pedestrian access routes. Eventually, as the area develops, it is likely that the sidewalk conditions in these locations would improve.

Link Capacity Analysis

Capacity analyses were performed for all major walking routes that are expected to carry over 200 event spectators per hour. These routes primarily stem from Metrorail stations and parking garages. The preliminary breakdown of pedestrian volumes shown previously in Figure 4-13 was broken down further for pedestrians accessing the site west of South Capitol Street and east of South Capitol Street. Figure 4-15 and Figure 4-16 show the more detailed pedestrian routes and their projected volumes.

In addition to pedestrian volumes, these graphics also outline the hourly pedestrian capacity. Sidewalk capacity is determined based on the methodologies laid out in Chapter 23: Off-Street Pedestrian and Bicycle Facilities of the Highway Capacity Manual 2010. According to Exhibit 23-2, the level of service for walkways (under a platooning condition) does not reach LOS E until the flow rate reaches 660 pedestrians/hour/foot (of effective walking space).

As shown in the figures, there is only one block in the study area in which the peak pedestrian flow would exceed the capacity: north side of Potomac Avenue between South Capitol Street and Half Street SW, which currently has no sidewalk. However, construction of a sidewalk is part of the proposed action. It is anticipated that the sidewalk would be fifteen feet wide in order to provide enough capacity for the amount of pedestrians expected to travel along this route. The existing right of way allows for this width; however, the parking lane along the north side of Potomac Avenue could be restricted during game days and blocked with jersey barriers to further extend the effective pedestrian walkway.

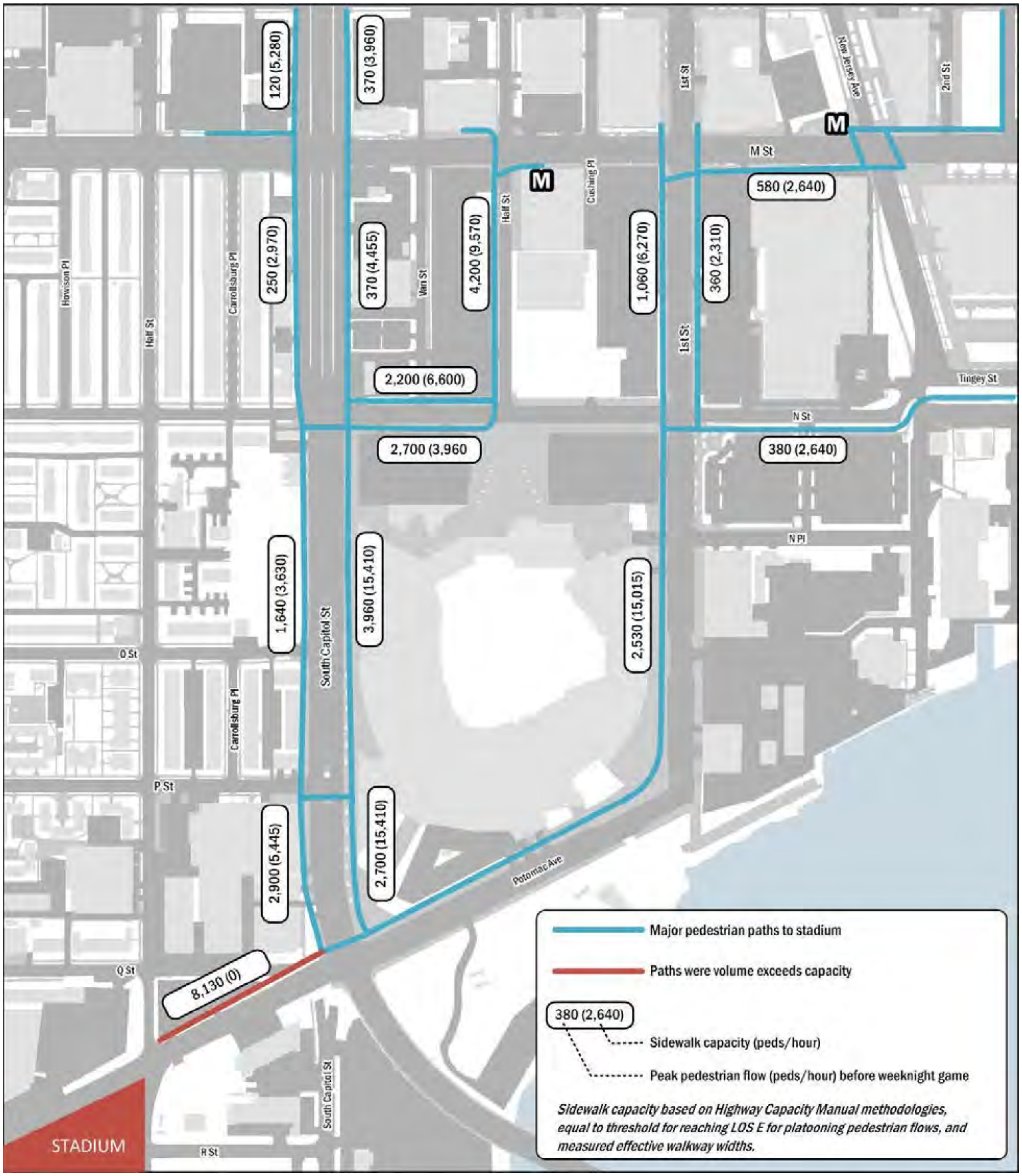

Figure 4-15: Pedestrian link analysis - east of the stadium

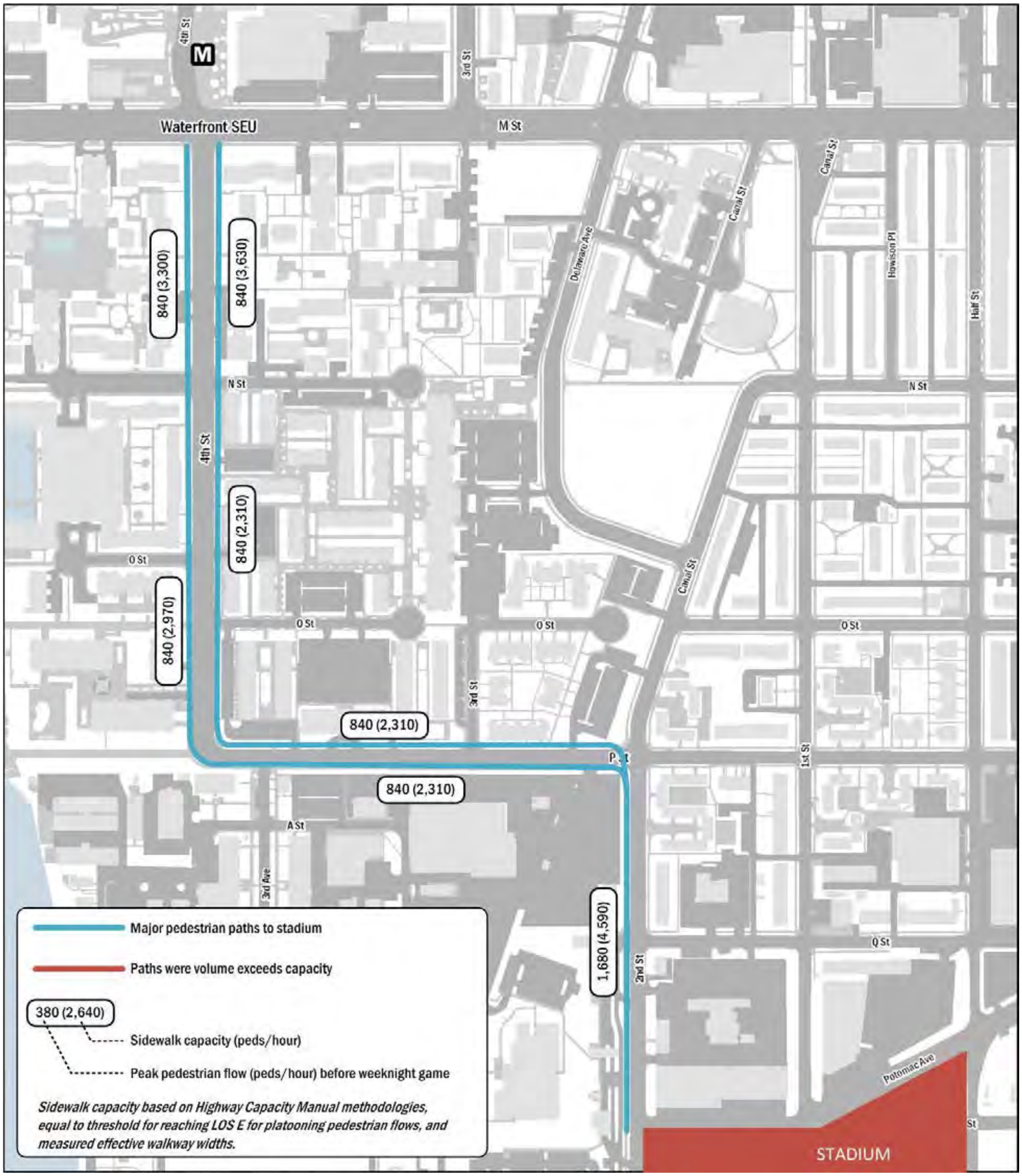

Figure 4-16: Pedestrian link analysis - west of the stadium

Pedestrian Capacity at Signalized Intersections

This section evaluates pedestrian operations at the intersection level. Pedestrian delay at crossings, crosswalk level of service, and crosswalk service time were evaluated at all signalized intersections with over 500 expected pedestrian crossings per hour based on methodologies outlined in Chapter 18: Signalized Intersections of the Highway Capacity Manual 2010 (HCM).

Crosswalk Level of Service Analysis

Crosswalk level of service (LOS) was determined for each individual crosswalk at all signalized intersections with over 500 expected pedestrian crossings per hour. All unsignalized intersections within the study area that are expected to generate significant pedestrian traffic are 4-way stop-controlled intersections. 4-way stop-controlled intersections are assumed to result in negligible delay for pedestrians, as vehicles are required to stop and wait for conflicting vehicular and pedestrian traffic. Therefore, they were not included in this analysis.

Crosswalk delay and LOS is based on several factors including walk time, lane configurations, vehicular volumes, and vehicular speeds. Based on field measurements and Synchro files provided by DDOT, the crosswalk LOS for all applicable crossings was determined as shown in Table 4-18. It should be noted, however, that crosswalk LOS does not take into account pedestrian flow rates as pedestrian delay is not typically constrained by capacity unless the pedestrian flow rate exceeds 5,000 passengers per hour. This is only the case at the intersection of South Capitol Street and Potomac Avenue as shown on Figure 4-18.

Crosswalk Service Time

Crosswalk service time represents the elapsed time starting with the first pedestrian's departure from the corner to the last pedestrian's arrival at the far side of the crosswalk, thus accounting for platooning pedestrian patterns. The methodology for determining service time takes into account the length and width of the crosswalk, signal timings, and pedestrian flow rate. Service time is determined for both directions of travel separately with this methodology, but for the purpose of this analysis, only crosswalks and directions of travel that are expected to generate significant pedestrian traffic as a result of the stadium were included.

Pedestrian volumes used in the analysis are projected future volumes along the preferred and expected pedestrian routes. Existing pedestrian volumes from the DDOT provided Synchro files were not incorporated into the analysis since they did not include the directionality of pedestrians are very low in comparison with the game-day pedestrian traffic (their inclusion would not have altered the results of the analysis).

Intersection	Crosswalk Location at Intersection	Crosswalk Length (ft)	Cycle Length (s)	Effective Ped Green Time (s)	Ped Delay (s)	Ped LOS Score	Ped LOS
South Capitol Street & Potomac Avenue	Southern Side	66	150	23	53.8	3.9	D
	Northern Side	85	150	30	48.0	3.6	D
	Eastern Side	65	150	25	52.1	2.5	B
	Western Side	69	150	26	51.3	2.4	B
South Capitol Street & P Street	Southern Side	90	150	33	45.6	3.5	D
	Northern Side	88	150	33	45.6	3.6	D
	Western Side	43	150	20	56.3	1.9	A
South Capitol Street & N Street	Southern Side	90	150	33	45.6	3.6	D
	Eastern Side	47	150	21	55.5	2.0	B
	Western Side	31	150	21	55.5	1.5	A
South Capitol Street (SB) & M Street	Southern Side	43	120	13	47.7	2.1	B
	Northern Side	30	120	14	46.8	2.1	B
	Western Side	91	120	30	33.8	3.3	C
South Capitol Street (NB) & M Street	Southern Side	27	120	17	44.2	2.0	B
	Northern Side	32	120	19	42.5	1.8	A
	Eastern Side	72	120	26	36.8	2.8	C
M Street & New Jersey Avenue, SE	Southern Side	55	80	19	23.3	2.2	B
	Northern Side	45	80	19	23.3	2.0	B
	Eastern Side	85	80	28	16.9	2.7	B
	Western Side	71	80	28	16.9	2.7	B
M Street & 1st Street, SE	Southern Side	52	80	23	20.3	2.4	B
	Northern Side	54	80	23	20.3	2.2	B
	Eastern Side	69	80	27	17.6	2.7	B
	Western Side	67	80	27	17.6	3.0	C
M Street & 4th Street, SW	Southern Side	56	120	20	41.7	2.4	B
	Northern Side	51	120	20	41.7	2.1	B
	Eastern Side	89	120	24	38.4	2.8	C
	Western Side	89	120	28	35.3	3.3	C

Table 4-18: Signalized intersection crosswalk LOS results

Only the crosswalk on the southern side of South Capitol Street and Potomac Avenue results in an LOS E and three intersections total have one or more crosswalk with an LOS D. All of the crosswalks with an LOS of D or E involve crossing South Capitol Street at Potomac Avenue, P Street, and N Street.

Overall Results

Based on the crosswalk level of service and crosswalk service time analyses there are four intersections that should provide require operational mitigations based on a crosswalk LOS of D or a crosswalk service time that exceeds the effective pedestrian green time. These mitigation options are as described below:

- *South Capitol Street and Potomac Avenue.* At least two traffic control officers should be placed at this intersection to help direct pedestrian and vehicular traffic and avoid any potential conflicts. This intersection would also benefit from additional pedestrian green time along the South Capitol Street crossing.
- *South Capitol Street and P Street.* One traffic control officer should be placed at this intersection to avoid conflicts between pedestrian and vehicular traffic. The service time crossing P Street is only slightly higher than the allotted pedestrian green time therefore it may not be necessary to increase the pedestrian green time.
- *South Capitol Street and N Street.* This intersection would benefit from one traffic control officer and additional pedestrian green time along the South Capitol Street crossing.
- *M Street and 4th Street, SW.* This intersection would benefit from one traffic control officer and additional pedestrian green time along the M Street crossing.

South Capitol Street and Potomac Avenue

Due to high pedestrian volumes, high vehicular volumes, and some deficiencies with the existing pedestrian facilities, the intersection of South Capitol Street and Potomac Avenue was evaluated further to determine more extensive mitigation options and game-day operations. This evaluation looks at both pre- and post-game scenarios to ensure that queuing and circulation space is adequate.

Pedestrian circulation area at high pedestrian volume corners was determined as a baseline for potential mitigations or operational provisions. Pedestrian circulation area at the intersection corners was based on methodologies outlined in Chapter 18: Signalized Intersections of the 2010 HCM. The methodology takes into account sidewalk geometry, signal timings, and pedestrian flow rates to determine the circulation area per pedestrian. The 2010 HCM describes pedestrian conditions based on circulation space as shown in Table 4-19.

Pedestrian Space (ft^2/ped)	Description	LOS Equivalent
>60	Ability to move in desired path, no need to alter movements	A
>40-60	Occasional need to adjust path to avoid conflicts	B
>24-40	Frequent need to adjust path to avoid conflicts	C
>15-24	Speed and ability to pass slower pedestrians restricted	D
>8-15	Speed restricted, very limited ability to pass slow pedestrians	E
≤8	Speed severely restricted, frequent contact with other users	F

Table 4-19: Pedestrian space descriptions

Pre-Game Conditions

As stated previously, 60 percent of patrons are expected to arrive during the peak hour. This amounts to the pedestrian flow rates shown in Figure 4-13. Based on the arrival routing patterns, the most constrained pedestrian area under pre-game conditions is expected to be the northeast corner of South Capitol Street and Potomac Avenue. At this corner, 5,320 pedestrians during the peak hour could lead to excessive queues. Circulation was also evaluated at the northwest corner as many pedestrians are expected to walk along the west side of South Capitol Street to access the site. Under existing conditions there is no sidewalk along the north side of Potomac Avenue west of South Capitol Street. Therefore, the corner circulation analysis was used to determine the minimum effective sidewalk width to be constructed along this section in order to accommodate game-day pedestrian traffic. Results from this analysis are shown in Table 4-20. As shown, both corners provide an adequate amount of pedestrian circulation space as long as a sidewalk with an effective width of 15 feet is constructed along Potomac Avenue. Further adjustments in excess of providing traffic control officers to help facilitate vehicular and pedestrian interactions would not be necessary during pre-game conditions. In addition, the circulation space would increase if additional pedestrian green time is added to the South Capitol Street crossing. An overview of vehicular and pedestrian operations along South Capitol Street is shown in Figure 4-17.

Pre-Game Conditions									
Intersection	Corner Location	Sidewalk Width 1 (ft)	Sidewalk Width 2 (ft)	Radius (ft)	Cycle Length (s)	Major Roadway Effective Ped Green Time (s)	Minor Roadway Effective Ped Green Time (s)	Circulating Pedestrians per Cycle	Corner Circulation Space (ft^2/ped)
South Capitol Street & Potomac Avenue	Northwest	70	74	28	150	30	25	218	814.5
	Northeast	15	21	24	150	30	26	339	26.9

Table 4-20: Pre-game corner circulation analysis results

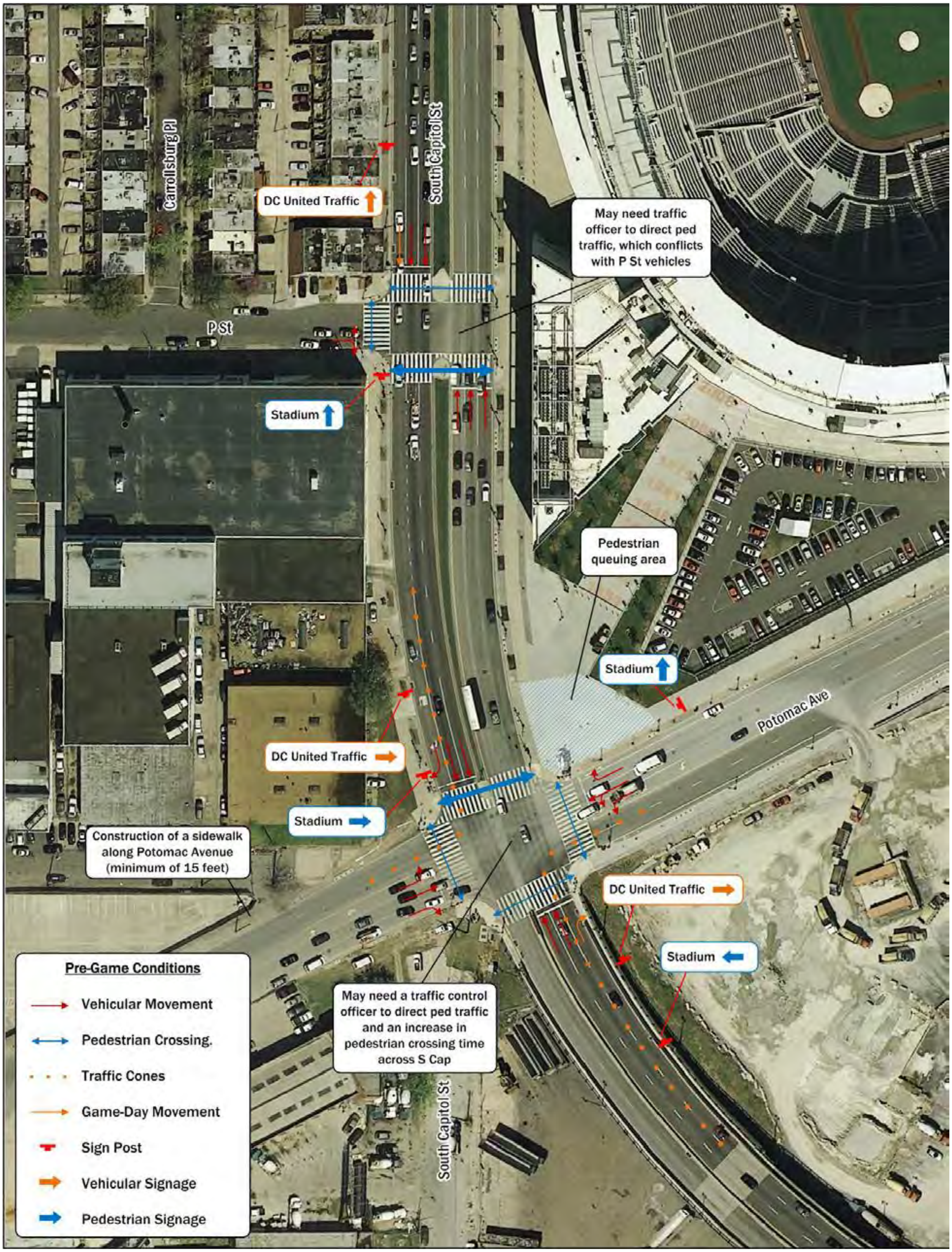

Figure 4-17: Pre-game pedestrian conditions (South Capitol Street and Potomac Avenue)

Post-Game Conditions

Although a post-game routing scenario was not compiled as a part of this report, it is anticipated that approximately 75 percent of patrons would exit the stadium within the first half hour. This amounts to a pedestrian flow rate of 24,525 patrons per hour leaving the stadium. It should be noted that this high flow rate indicates that all patrons have exited the stadium in less than one hour and that the flow rate is higher than the amount of patrons in attendance. The high flow rate is intended to represent the worst-case scenario within the first half hour after the game ends. The post-game routing was altered slightly from the pre-game routing to align with the sidewalk capacity along South Capitol Street. The expected pedestrian flow rates and the routing distribution result in the pedestrian flow rates shown in Figure 4-18.

Because there is an ample amount of space on the northeast corner, and no queueing is expected there, the post-game scenario only analyzed the northwest corner. Under existing conditions (and assuming the additional sidewalk along Potomac Avenue) the corner does not have enough capacity to serve the expected number of pedestrians, as shown in Table 4-21.

Existing Post-Game Conditions									
Intersection	**Corner Location**	**Sidewalk Width 1 (ft)**	**Sidewalk Width 2 (ft)**	**Radius (ft)**	**Cycle Length (s)**	**Major Roadway Effective Ped Green Time (s)**	**Minor Roadway Effective Ped Green Time (s)**	**Circulating Pedestrians per Cycle**	**Corner Circulation Space (ft^2/ped)**
South Capitol Street & Potomac Avenue	Northwest	15	21	24	150	30	26	847	-27.8

Table 4-21: Post-game corner circulation conditions - existing conditions

Therefore, several mitigation measures and operational provisions should be made during post-game conditions as described below and shown in Figure 4-19.

- Potomac Avenue west of South Capitol Street would be limited to outbound traffic only allowing the westbound traffic lanes to be coned off for pedestrian use. At a minimum, cones should designate 18 feet of roadway for pedestrians.
- The two west-most southbound travel lanes along South Capitol Street north of Potomac Avenue would be tapered off using cones and the additional space would be used for pedestrians. Again a minimum of 18 feet of roadway should be designated for pedestrians. Tapering the southbound movement down to one lane at this intersection also allows for the vehicular operations benefits. As shown, the westbound right turn lane of Potomac Avenue would be coned off to allow for a more efficient movement of vehicles out of the site.

- Traffic control officers should be placed at both Potomac Avenue and P Street along South Capitol Street. If pedestrian volumes become too high they can coordinate to clear the roadway segment between Potomac Avenue and P Street to allow for a mass pedestrian crossing.

By implementing these recommendations, the pedestrian circulation at the northwest corner greatly increases and allows for a more effective movement of pedestrians, as shown in Table 4-22.

Post-Game Conditions with Operational Enhancements									
Intersection	Corner Location	Sidewalk Width 1 (ft)	Sidewalk Width 2 (ft)	Radius (ft)	Cycle Length (s)	Major Roadway Effective Ped Green Time (s)	Minor Roadway Effective Ped Green Time (s)	Circulating Pedestrians per Cycle	Corner Circulation Space (ft^2/ped)
South Capitol Street & Potomac Avenue	Northwest	33	39	24	150	30	26	847	15.2

Table 4-22: Post-game corner circulation conditions - with operational enhancements

Overall, the stadium Alternative would improve pedestrian facilities in the areas around the soccer stadium. As a result, the proposed stadium would result in long-term beneficial impacts on pedestrian activity.

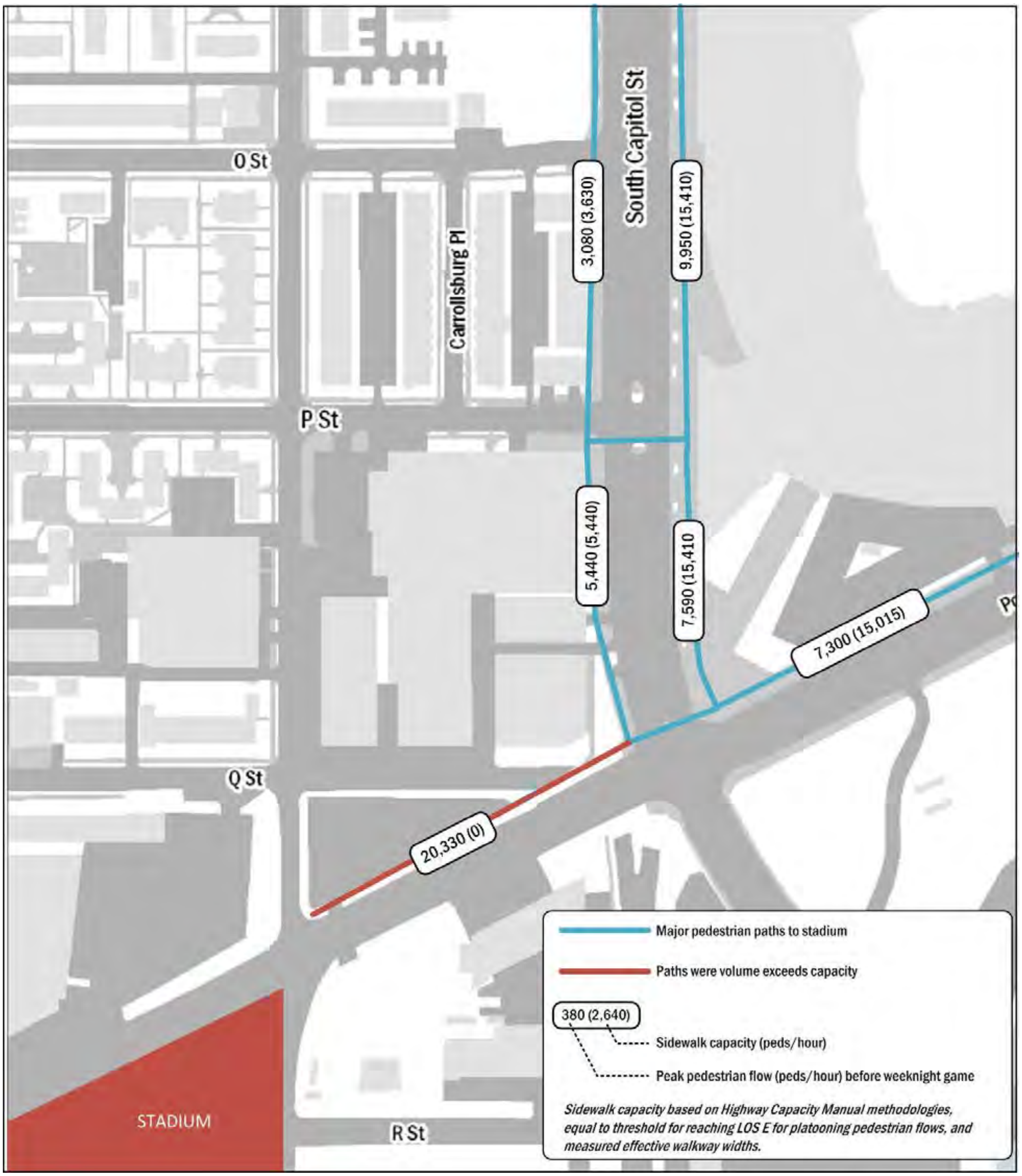

Figure 4-18: Post-game pedestrian volumes

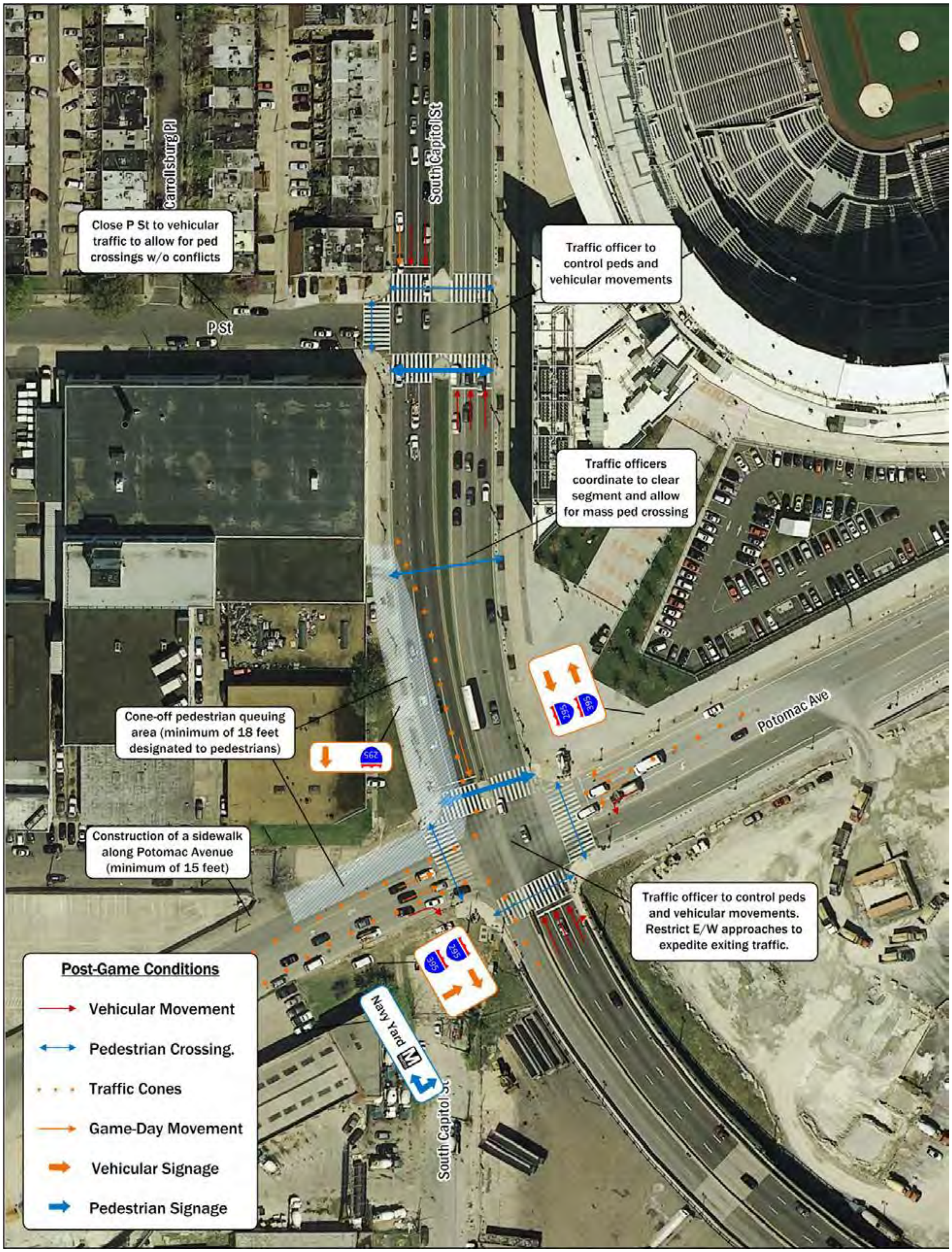

Figure 4-19: Post-game pedestrian conditions (South Capitol Street and Potomac Avenue)

Pedestrian Mitigation

Based on the analyses above several mitigation and game-day operation strategies are suggested to improve the overall pedestrian environment at and approaching the stadium.

Sidewalk Construction

There are several areas surrounding the stadium that currently do not provide sidewalks. As part of stadium construction sidewalks along the perimeter and within the stadium footprint would be constructed to properly accommodate the expected pedestrian volumes at the stadium. Sidewalks would also be constructed along Potomac Avenue west of South Capitol Street leading up to the stadium as part of the stadium project. In addition, The District should provide pedestrian accommodations along 1st Street and Half Street south of Q Street where none currently exist. It would also be desirable for the District to add sidewalks to the east side of 2nd Street south of Q Street, although this is not completely necessary as long as pedestrians are directed to use the sidewalk on the west side of the street.

Traffic Control Officers

Traffic Control Officers (TCOs) should be placed at intersections that result in significant pedestrian crossings, particularly at areas that have high vehicular volumes as well. These areas are called out in Figure 4-20 and Figure 4-21. TCOs would mainly be responsible for preventing and resolving conflicts between pedestrians and vehicles.

Way-finding Signage

Pedestrian-oriented way-finding signage should be installed on roadways leading to the stadium. Specific locations where way-finding signage would be necessary are shown on Figure 4-20 and Figure 4-21. Signage should also be placed within the Navy Yard Metro station to direct patrons to the west portal, which has been upgraded to handle game-day transit traffic.

Pedestrian and Traffic Barriers

In addition to TCOs, temporary traffic barriers such as cones or Jersey barriers may be used to control the vehicular flow and ensure separation between vehicles and pedestrians at the high conflict intersections. In addition, barriers should be placed at sidewalks along the perimeter of the residential neighborhood to deter patrons from walking through the neighborhood before and after the game, as shown on Figure 4-20 and Figure 4-21. This would also help corral pedestrians to the designated pedestrian routes that provide TCOs.

Additional Post-Game Analysis

The TOP should develop more detailed analysis of post-game pedestrian traffic to identify operation strategies to lessen impacts. Potential operation strategies could include on-field youth events that would delay departure times and spread out post-game traffic.

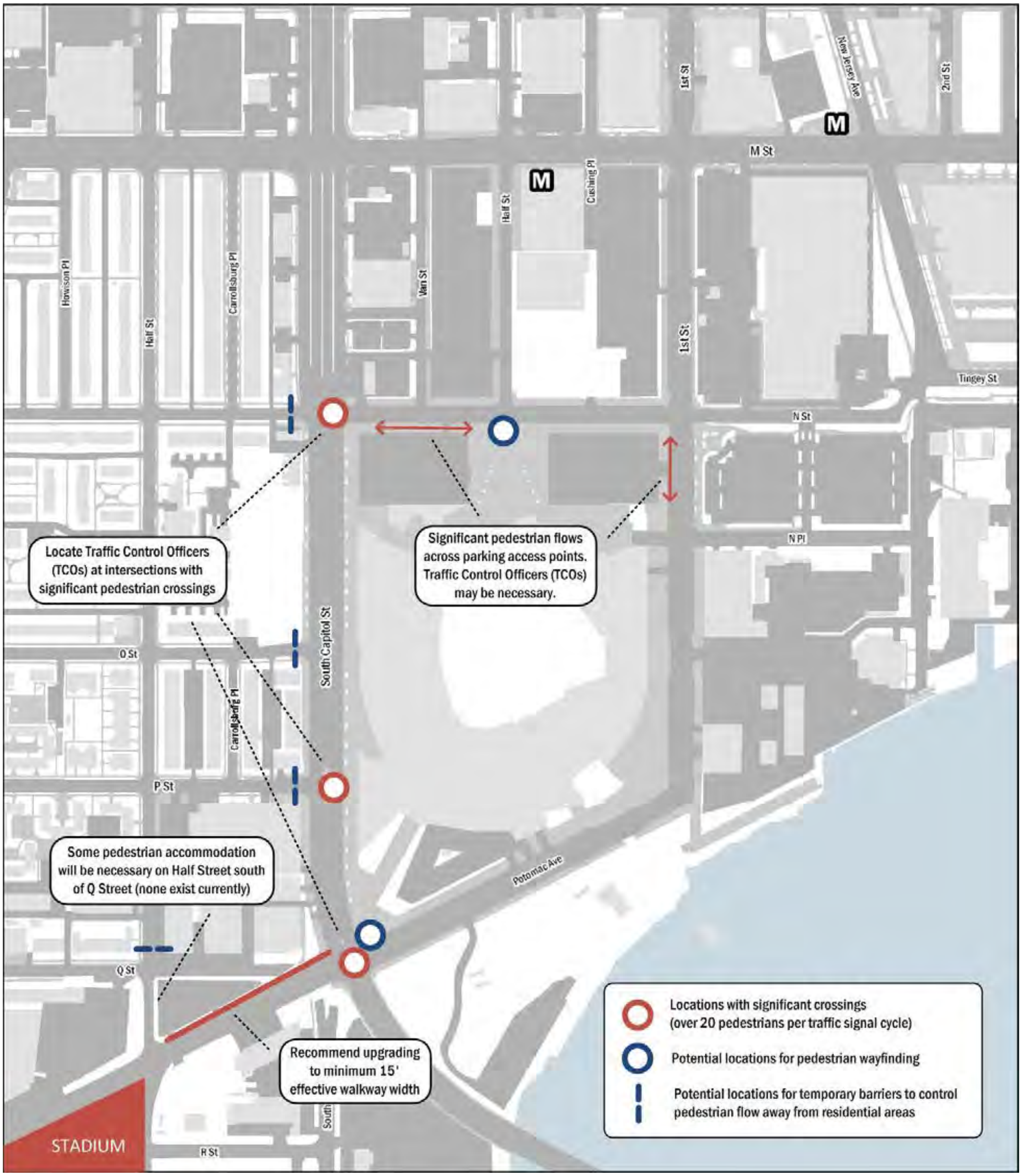

Figure 4-20: Pedestrian mitigation strategies – east of the stadium

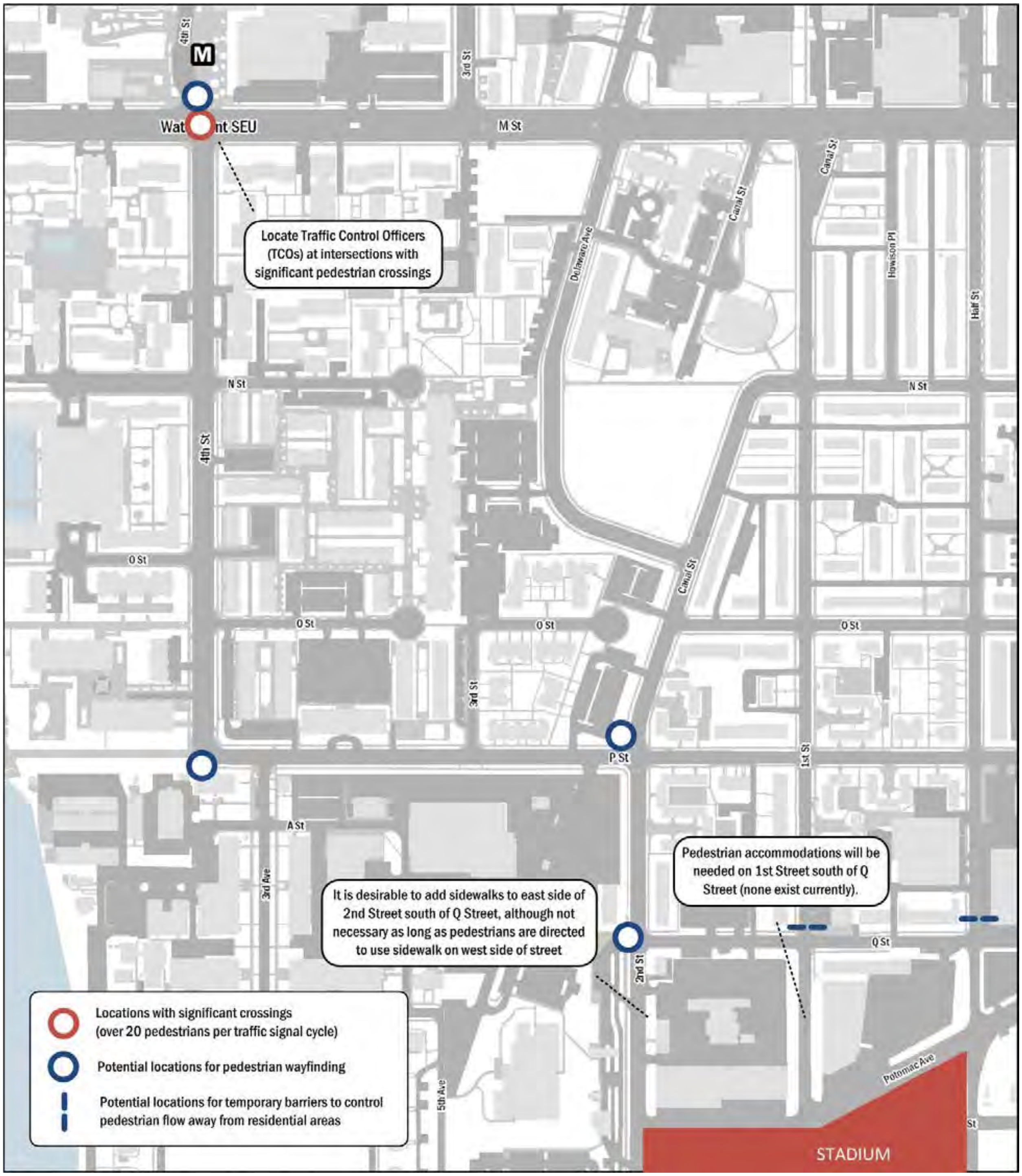

Figure 4-21: Pedestrian mitigation strategies - west of the stadium

No Action Alternative

Under the No Action Alternative, new pedestrian facilities would not be installed and no changes to pedestrian volume would occur as a result of the implementation of the stadium. As a result, there would be no impacts on pedestrian circulation.

4.6.5 Bicycle Circulation Impacts

Stadium Alternative

For the purpose of accessing the stadium, cyclists have access to multi-use trails, on-street bike facilities, signed bike routes, and local and residential streets that facilitate cycling. Although there are no planned improvements anticipated to be complete prior to the opening season, the existing bicycle network provides good accessibility to the stadium. This section discusses the suggested routes, qualitatively analyzes the bicycle conditions near the stadium, and discusses on-site improvements that would help improve the overall bicycle environment around the stadium.

Review of Routes

Five primary routes to and from the stadium utilize the existing facilities ranging from low- to high-quality, as summarized in Figure 4-22. Two routes along 4th Street SW and 4th/6th Street SE can be categorized as high quality routes. Portions of 4th Street SW contain bike lanes and all other areas along the roadway provide a safe bicycling environment. 4th Street SW also has the advantage of connecting the site to the Pennsylvania Avenue cycle track and the downtown DC area. Although there are some areas in which the pavement quality is poor, the width of the bicycle facilities in these areas allow for cyclists to have a clear, smooth path.

Southbound and northbound bike lanes are provided on 4th and 6th Street SE, respectively. The bike lanes extend from G Street SE to Florida Avenue NE providing 1.8 miles of bike lanes in both directions. Nearby, New Jersey Avenue also serves as a good bike route and has bike lanes along a portion of it. New Jersey Avenue may be particularly useful for the northbound traffic as access to the 6th Street bike lane from Virginia Avenue can be tricky for novice cyclists. This system of bike lanes and routes creates excellent connectivity with many of the residential neighborhoods in Capitol Hill and the surrounding areas, and links fairly seamlessly with bicycle facilities in Southeast and Southwest DC near the site such as the I Street SE/SW bike lane and the 1st Street/Potomac Avenue SE bike lanes. Both bike lanes are in very good condition, with parts of the I Street bike lane having just been repaved within the last year.

The bicycle routes along Maine Avenue and the 11th Street Bridge are categorized as moderate quality routes due to some deficiencies along the routes. Maine Avenue connects

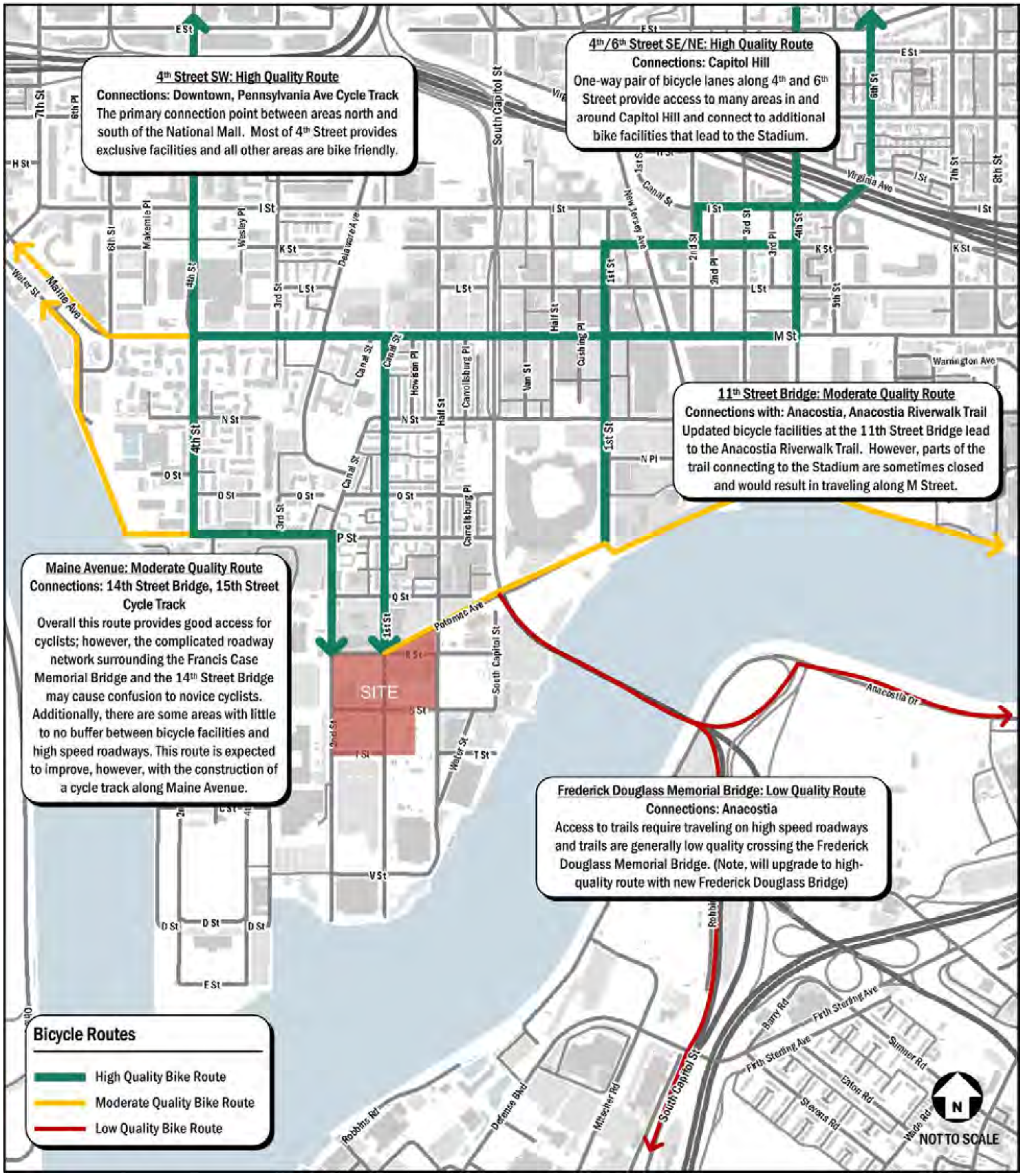

Figure 4-22: Bicycle routes

the stadium with the 14th Street Bridge and the 15th Street cycle track; however, the complicated roadway network surrounding the Francis Case Memorial Bridge and the 14th Street Bridge combined with the lack of clear cycling routes may create confusion for novice cyclists. Additionally there are areas with little to no buffer between bicycle facilities and high speed roadways.

The 11th Street Bridges have recently been reconstructed in which updated bicycle facilities have been implemented that provide an important connection to areas of the District on either side of the Anacostia River. The 11th Street Bridges connect to the Anacostia Riverwalk Trail which leads to the stadium. For the most part this route provides excellent connectivity; however, parts of the trail connecting to the stadium are sometimes closed and would result in traveling along M Street, which does not provide as good of cycling conditions. Additionally, the Anacostia Riverwalk Trail would likely serve as a major pedestrian route during games; thus it is likely that near the stadium, bicycles would need to dismount their bikes and walk along the trail to avoid conflicts.

The route along the Frederick Douglass Memorial Bridge, which connects the stadium with Anacostia, is currently a low quality route. Although the bridge and some connections across the river are considered multi-use trails, they are in poor quality and require enhancements. The proposed improvements to South Capitol Street and the Frederick Douglass Bridge will greatly enhance bicycle routes to the south.

Although there are several existing bicycle facilities in the area, Buzzard Point lacks bicycle facilities due to the lack of a roadway grid and little development in the area thus far. Another issue that arises in the area is high-volume and high-speed roadway crossings, primarily along South Capitol Street. These may prove challenging for novice cyclists, but likely would not be seen as a problem to most cyclists in the area.

Bicycle Link Analysis

"Chapter 17: Urban Street Segments" of the Highway Capacity Manual 2010 (HCM 2010) outlines a methodology for evaluating the performance of an urban street segment in terms of its service to bicyclists.

Methodology

The methodology for bike link analyses involves a six step process; however, two of these steps can be used as a stand-alone method requiring less-intensive data collection. This approach is often taken by local, regional, and state transportation agencies. Thus, the two-stop process was used in lieu of the six-step process and continued to provide the desired quantitative level of service (LOS) results.

Step 1: Determine Bicycle LOS Score for Link

The bicycle link LOS score is determined through several inputs that primarily consist of the vehicular profile of the roadway, cross-section of the roadway (including if an exclusive bicycle facility is provided), and the pavement condition.

Similar to the methodology used for the pedestrian link analysis, collected traffic counts were used to determine the vehicular volumes along many roadways. For roadways without available data, a volume was assumed based on the functional classification of the roadway. AADT volumes provided by the District were inventoried by functional classification and used to determine an appropriate average volume based on functional class. A similar method was used to determine the heavy vehicle percentage along each roadway. AADT volumes categorize the type of vehicles counted; thus, an average heavy vehicle percentage was determined for each functional classification and applied to the study area links.

Pavement condition rating is expressed on a scale of 0 to 5, 0 being the worst and 5 being the best. For the purpose of this analysis, and to eliminate subjectivity within the data collection process, a pavement condition of 3 was assumed for all roadways, consistent with a roadway that has some rutting and patching and provides an acceptable ride for low-speed traffic.

Step 2: Determine Link LOS

The bicycle link LOS is determined exclusively from the bicycle link LOS score determined in Step 1. This score is compared to the thresholds shown in Table 4-23 to determine the bicycle link LOS. LOS results range from "A" being the best to "F" being the worst on the basis of the cyclists traveling experience and perception of service quality along the roadway segment.

Bicycle LOS Score	Bicycle LOS
<2.00	A
>2.00-2.75	B
>2.75-3.5	C
>3.5-4.25	D
>4.25-5.0	E
>5.0	F

Table 4-23: Bicycle LOS parameters

Results

Data collected for the bicycle link analysis was collected in conjunction with data collected for the pedestrian link analysis. This data was collected on Wednesday, May 28, 2014, Monday, June 2, 2014, Monday, June 23, 2014, Wednesday, July 2, 2014, Thursday, and July 10, 2014. A full inventory of data collection and analysis results is included in the Technical Attachments. Figure 4-23 summarizes the bicycle link LOS results for the PM peak hour scenario.

The analysis concludes that most roadways in the study area are perceived as an LOS C or better; thus, most cyclists feel comfortable riding on the roadways surrounding the site. Primary exceptions to this finding are segments of M Street and North Capitol Street. This is expected due to high volumes on these roadways and, in some cases, slightly higher speeds. Additionally, some segments of 4th Street, P Street, and Potomac Avenue are also perceived as an LOS D. Although these streets may be intimidating to novice cyclists, the majority of roadways provide acceptable cycling conditions to experienced cyclists.

Overall, the Stadium Alternative would have long-term beneficial impacts on bicycles due to the street improvements included as part of the proposed action.

Bicycle Mitigation

Bicycle specific infrastructure that should be incorporated into the stadium and surrounding area includes bike racks, a bike valet system, one or more Capital Bikeshare stations, way-finding signage along the bike routes, and improved surface conditions through repaving. Based on the approximate cycling mode share that was experienced at Nationals Park during playoffs, it is estimated that typically 1 to 2 percent of game-day trips would arrive by bike. This amounts to approximately 400 bike trips per game on the high end.

Therefore, it would be essential to provide ample bicycle parking at the stadium to account for these trips. It is suggested that approximately 60 percent of parking spaces are accommodated by bike racks and the remainder accommodated by the bike valet system. The racks should be placed all along the perimeter of the stadium; however they should be centralized along the north and east sides of the stadium as more cyclists are likely to be traveling from these directions.

The bike valet system would be best located along the north side of the stadium to serve the largest amount of people. At least one new Capital Bikeshare station would have to be added to Buzzard Point as all existing Bikeshare stations are located north of M Street and east of South Capitol Street. Again, the location of a station would be most valuably served on the north side of the stadium and incorporated into the site design as such. To direct people to the stadium, way-finding signs should be placed along the bike facilities that direct cyclists towards Buzzard Point. Because there are no current bike facilities in Buzzard Point, these signs would act as a way to direct bikes along the suggested routes, including 4th Street, P Street, 2nd Street, 1st Street, and Potomac Avenue.

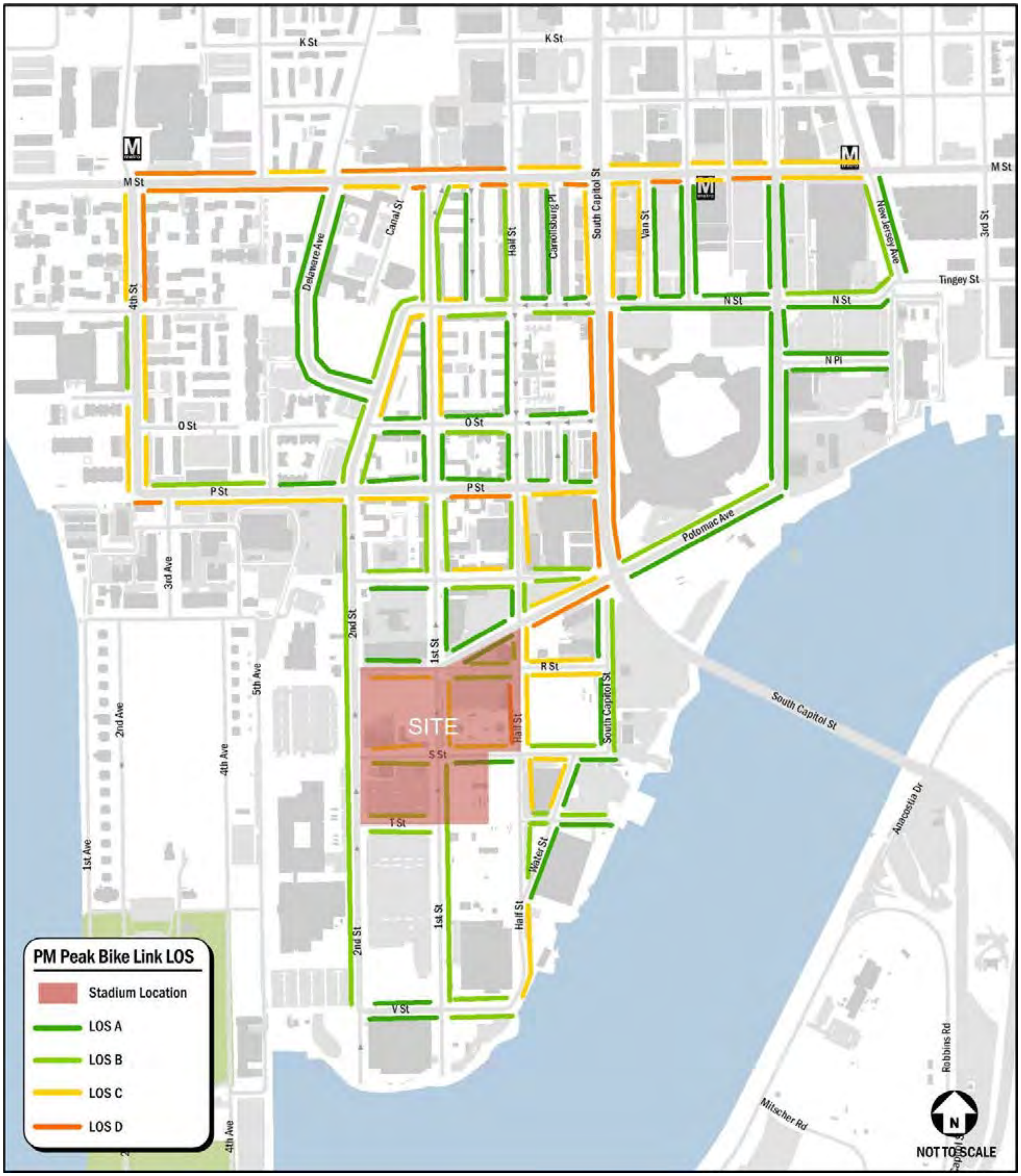

Figure 4-23: PM Peak bike link LOS

DC United should also promote and market available bicycle routes and parking for the new stadium, including encouraging use of cycling by providing benefits to season ticket holders in a similar manner to parking/transit benefits

Temporary way-finding signage should also be used specifically on game days to direct people towards the bike valet location and to other bike parking locations. Temporary cones and barriers could also be used along the access routes to direct bicycle traffic to the stadium before the match and away from the stadium at the end. To provide a safer environment for both bicycles and pedestrians, DC United should coordinate with DC Police to employ traffic control officers at adjacent intersections pre- and post-game, particularly at some of the busier intersections. Overall, the new stadium should become one of, if not the most bike friendly soccer stadium in the country. Therefore DC United should coordinate with the Washington Area Bicyclist Associated (WABA) on strategies to create a bike friendly environment at the stadium.

Based on the bicycle data collection efforts, a few infrastructure improvements are suggested to improve the quality of the expected bicycle routes:

- Improvements should be made to the L curve at 4th and P Street where it connects with the Anacostia Riverwalk Trail. Under existing conditions, there is only "Stop For Pedestrian" signage with no signage in regards to the interaction between vehicles and bikes. Currently cars drive through this L curve without slowing much making it a relatively difficult place for bikes to cross. This route is regarded as a bike route thus signage should be installed that warns vehicles about potential bike traffic. This would provide for safer interactions between bicycles and vehicles.

- Pavement improvements should be made along First Street between the stadium and P Street. This would likely be a main bicycle route and is currently in very poor condition.

No Action Alternative

Under the No Action Alternative, the District projects identified under the stadium Alternative would occur, including the South Capitol Street improvements and the implementation of a cycle track along M Street. As a result, there would be long-term beneficial impacts on bicyclists.

4.7 Environmental Health Impacts

4.7.1 Visitor Activity Impacts

Stadium Alternative

During the demolition of existing structures and the construction of the soccer stadium, visitation to the site would involve the transport of construction materials and equipment to the site, in addition to employee activity within the stadium site. Major thoroughfares in the area, South Capitol and Half Streets, would serve as the primary transportation routes for trucks and construction workers. Noise and air quality impacts resulting from construction activities are discussed in other sections.

Redevelopment of the current industrial uses would aid in the revitalization of Buzzard Point and provide positive impacts to soccer stadium visitors and the community through improved pedestrian connections to Buzzard Point. Site improvements, an overall increase in pedestrian circulation, and the presence of transportation control officers would improve real and perceived security in the area.

Indirectly, it is anticipated that the currently underutilized areas along the Anacostia River would be improved with mixed-use development, civic parks, and a river trail system, consistent with the Anacostia Waterfront Initiative and the draft Buzzard Point Urban Design Framework. Pedestrian friendly mixed-use development along the waterfront would benefit the Southwest neighborhoods and improving waterfront access would provide a beneficial impact.

Gameday Event

Major League Soccer games are primarily scheduled on Saturday night at 7:00 pm. Occasional games can also occur on Wednesday, Friday, or Sunday evenings, as well as Saturday or Sunday afternoon. Such games typically start at 3:00 p.m. Unlike many other sports, soccer games are generally predictable in their duration. Regular season games last two hours with no overtime. Therefore, most evening games are completed by 9:00 p.m., and most afternoon games are completed by 5:00 p.m.

Fan behavior can vary based on the day and time of the game. Weeknight games may see most of the fans arrive near game start due to leaving work and rush hour traffic. Weekend day and night games may see fans arriving early to the game at their leisure.

Once the stadium is in operation, there would be an increase in overall pedestrian activity near the stadium and within nearby areas. Peak visitor activity would be expected in association with game day events; primarily during weekday afternoons and evenings, or on weekends. Just prior to and immediately following games, there would be a large amount of pedestrian and vehicular activity in and around the stadium as people move between their cars and the stadium's entrances, and between the Navy Yard/Ballpark Metrorail station entrances and the stadium along Potomac Avenue or along the Riverwalk.

As a result, crowd behavior can vary by game and can be somewhat unpredictable. Attendance is influenced by many factors including the day and time of the game, weather conditions, team performance, and who the opposing team is. Impacts on surrounding areas may result from crowd disruptions and may include elevated vocal behavior and littering. Potential crowd disturbances would likely be somewhat confined to the area south of Potomac Avenue towards the river.

Indirectly, increased activity in the area would be expected on non-game days as a result of the retail and entertainment establishments within and around the ballpark.

Site improvements and an overall increase in pedestrian presence would likely improve perceived security in the area. Improved security at the site may also have indirect benefits on the security of the nearby residential neighborhoods. Impacts on the surrounding areas would primarily be a result of transportation control officers.

Overall, the proposed action would result in minor adverse impacts due to the intermittent increases in pedestrian activity, traffic, and crowd behavior.

Visitor Activity Mitigation

- The District should design and locate appropriate signage to guide pedestrian movement within and around the stadium site, and to move people along major thoroughfares and away from quiet residential streets. Traffic and pedestrian movement would be managed by police officers to ensure circulation and safety.
- The District should patrol residential streets during ballgames to minimize littering and other visitor-generated nuisances.

No Action Alternative

Under the No Action Alternative, no new visitors would be drawn to the site and its environs. Therefore, there would be no impacts.

4.7.2 Noise Impacts

Stadium Alternative

During Construction

Construction activities would generate noise impact from both the operation of construction equipment and the movement of trucks and other vehicles to and from the site. Typical construction equipment reference noise levels are summarized in Table 4-24.

Construction-noise is likely to create annoyance among the projects' neighbors. This adverse impact is unavoidable. However, it should be noted that although the construction campaign can be expected to last for approximately two years, the specific location and character of construction activities would vary considerably over this period, and so would noise levels. No single location or land use would be continuously affected over the entire period.

Overall, the project is not expected to generate substantially greater noise levels than other similar medium or large-scale urban development projects.

Equipment Type	Typical Noise Levels
Earthmoving:	
Loaders	85
Backhoes	80
Dozers	85
Scrapers	89
Graders	85
Truck	88
Pavers	89
Roller	74
Material Handling:	
Concrete Mixers	85
Concrete Pumps	82
Cranes	83
Derricks	88
Stationary:	
Pumps	76
Generators	81
Air Compressors	81
Impact:	
Pile Drivers (impact)	101
Pile Drivers (Sonic)	96
Jack Hammers	88
Pneumatic Tools	85
Other:	
Saws	76
Rock Drill	98

Table 4-24: Typical construction equipment noise levels (dBA at 15 Meters)
Source: Federal Transit Administration, 2006.

<u>During Operation</u>

Mobile Source Impact

As discussed above, if the future traffic cumulative volume would double the existing condition at a given intersection, noise levels would increase by 3 dBA. Based on this fundamental acoustical principle and traffic forecasts around each analyzed intersection around the project site, the threshold for a substantial noise increase of 10 dBA over the existing condition would not be exceeded at any analyzed intersection (Table 4-25). Therefore the contributions to the future noise levels from the proposed project would not result in substantial noise increases and would result in no significant mobile source noise impacts.

Stadium Crowd Impact

Noise from the proposed new stadium was predicted based on the conservative measurement data at Nationals Park and fundamental acoustical principle discussed above as summarized in Table 4-26. The noise from speaker and crowd during the game time would not result in substantial noise increase (a 10 dBA noise increase over the existing ambient level) at the measured sensitive receptor locations. Therefore the game time stadium crowd noise would unlikely result in significant noise impacts.

Overall, the project would result in short-term minor adverse impacts due to noise generated during construction. Over the long-term, minor adverse impacts would occur due to the increased traffic volume and stadium growth.

<u>Noise Mitigation</u>

The construction contractor would be required to make every reasonable effort to minimize construction noise through abatement measures, which would be incorporated in the construction plans.

Typical abatement measures that could be implemented include:

- Construction activities and schedule would be communicated to the affected community prior to beginning to identify and resolve potential issues.
- Major construction equipment powered by internal combustion engines would be equipped with properly-maintained mufflers.
- New construction equipment would be utilized as much as possible, since it is generally quieter than older equipment.
- Construction activities would only occur during daytime.

No Action Alternative

Under the No Action Alternative, noise levels can be expected to increase as compared to the existing condition as traffic, the main source of noise in the study area, increases as a natural growth.

Intersection	Total Existing Traffic Volume	Total Future Traffic Volume	Doubling of Existing Traffic?	Noise Increment (dBA)	Substantial Noise Increase of 10 dBA
M Street & 4th St SW	3099	4564	No	2	No
M Street & 3rd St SW	2046	3158	No	2	No
M Street & Delaware Ave	2006	3120	No	2	No
M Street & 1st St SW	2196	3299	No	2	No
P St & 1st St SW	838	950	No	1	No
M Street & Half St SW	2296	3355	No	2	No
M Street & S Capitol ramp	2668	4324	No	2	No
M Street & S Capitol ramp	2312	4079	No	2	No
N St & S Capitol ramp	4592	5868	No	1	No
P St & S Capitol St	4917	5959	No	1	No
Potomac Ave SE & S Capitol St	6432	8188	No	1	No
S Capitol St & S Capitol ramp	3999	5401	No	1	No
P St & 3rd Ave SW	1068	1154	No	0	No
L Street SW & 3rd St SW	325	328	No	0	No
O St SW & S Capitol St	4507	5326	No	1	No
1st St SW &	265	297	No	0	No

Table 4-25: Traffic noise increments

Receptor	Proposed DC United Stadium Noise			
	Distance from Proposed Stadium Site Boundary (ft)	Noise Level from Proposed Stadium at Receptor (dBA)	Total Noise Level Combined with Measured Ambient Noise (dBA)	Net Increment Over Existing Level (dBA)
N1	1120	64	66	6
N2	1100	65	65	8
N3	1670	61	64	3
N4[1]	500	71	72	14
N5	2300	58	72	0
N6	3700	54	60	1

Table 4-26: Stadium noise increments at measured noise sensitive receptors

Note: [1] N4 is not a noise sensitive receptor.

4.7.3 Lighting Conditions Impacts

Stadium Alternative

During nighttime events, the soccer stadium would provide lighting for on-field activities. This would occur through light fixtures mounted above the stadium, estimated to be approximately 80 feet above grade. The stadium lights would provide an average of at least 75 foot-candles across the field, consistent with the Lighting Standards of the US Soccer Foundation (US Soccer Foundation 2007). While in use, the stadium would increase the lighting in the vicinity of the project site. However, existing street lights and security lighting already illuminate intersections near the project area at night. The nearest residences are located one block from the proposed stadium location, with low-rise light industrial development between the stadium and the residences. It is anticipated that the fixtures of the proposed stadium lighting system would be angled downward and include mechanisms to direct the light down onto the field and minimize the amount of spill light onto the adjacent land uses.

In order to evaluate possible light spill effects due to the soccer stadium, this document uses the new San Jose Earthquakes stadium as a benchmark. This soccer-specific stadium in San Jose, California, which will be utilized by the San Jose Earthquakes MLS team, is designed to accommodate approximately 18,000 patrons, similar to the 20,000-seat stadium at Buzzard Point. It is anticipated that the light spillage "at distances ranging from zero feet to approximately 560 feet from the perimeter of the stadium ranged from 0.1 to 43.7 foot-candles, with an average of 1.21 foot-candles" (San Jose 2009). The nearest residential properties along Q Street are approximately 450 feet from the perimeter of the stadium, and it is therefore anticipated that the lighting resulting from the stadium would be consistent with existing street and security lighting. As a result, long-term impacts due to lighting would be adverse and minor.

<u>Lighting Conditions Mitigation</u>

- The lighting system should be designed in a way to minimize light spill and glare. This could include the use of equipment that minimizes the amount of light spill, such as light visors or light hoods.
- If the stadium design includes a roof or canopy, the lighting should be located under the covering.
- The stadium lights should not be turned on more than two hours before and event and turned off no more than two hours after an event.

No Action Alternative

Under the No Action Alternative, no changes to the existing lighting at the site would occur, resulting in no impacts on lighting conditions.

4.7.4 Air Quality Impacts

Methodology and Analysis

The air quality impact analysis for this environmental documentation was conducted according to the *Air Quality Policy and Regulations* and the *Draft Hot-Spot Analysis Guide* developed by DDOT and includes:

- A CO hot-spot screening based on worst-case traffic level of service (LOS) and traffic volume was conducted at each project-affected intersection to select the worst-case intersections that are subject to a further hot-spot dispersion modeling analysis.
- A CO hot-spot modeling analysis at the worst-case intersections because these intersections would have the worst effects as a result of change in traffic pattern due the proposed project.
- A qualitative PM2.5 and PM10 analysis.
- A qualitative MSAT analysis.
- A qualitative construction period impact analysis.

Additional guidance was provided by DDOE's *Guidance for the Analysis of Air Quality Studies Performed as a Result of the Environmental Impact Screening Form (EISF) Process* (DDOE 2013).

<u>CO Hot-Spot Screening</u>

The traffic analysis as described in Section 4.5 serves as a tool to determine if a quantitative CO hot-spot analysis is necessary. The traffic analysis considers the project's location, traffic volumes, traffic and operating characteristics, and roadway configurations and geometry. A CO screening analysis was performed (Table 4-27) based on the available traffic analysis results by selecting the top three intersections based on the highest traffic volume and the worst LOS under the future 2017 condition for a further project-level hot-spot modeling analysis. The selected intersections are:

- I Street and South Capitol Street
- P Street and South Capitol Street
- Potomac Street and South Capitol Street

Intersection	Existing Approaching Volume	Existing LOS	Future Approaching Volume	Future LOS	Top 3 Ranked Traffic Volume	LOS of D, E, or F
Maine Ave & 9th St SW	4794	F	4851	F	No	Yes
G St & 7th St SW	2023	C	2021	C	No	No
I St & 7th St SW	2019	B	2018	B	No	No
Maine Ave & 7th St SW	4740	E	4796	F	No	Yes
Maine Ave & 6th St SW	4140	F	4196	F	No	Yes
G St & 4th St SW	1168	B	1169	B	No	No
I St & 4th St SW	1876	F	1876	F	No	Yes
M Street & 4th St SW	4489	F	4564	F	No	Yes
M Street & 3rd St SW	3198	D	3158	D	No	Yes
M Street & Delaware Ave	3159	B	3120	A	No	No
M Street & 1st St SW	3339	D	3299	D	No	Yes
M Street & Half St SW	3388	A	3355	A	No	No
I St & S Capitol St	**6961**	**F**	**6932**	**F**	**Yes**	**Yes**
M Street & South Capitol ramp	4418	F	4324	F	No	Yes
M Street & South Capitol ramp	4194	E	4079	D	No	Yes
N St & South Capitol ramp	5887	F	5868	F	No	Yes
P St & S Capitol St	**5959**	**E**	**5959**	**E**	**Yes**	**Yes**
Potomac Ave SE & S Capitol St	**8186**	**F**	**8188**	**F**	**Yes**	**Yes**
M Street & Half St SE	4322	F	4203	F	No	Yes
M Street & 1st St SE	4506	F	4408	F	No	Yes
N St & 1st St SE	2857	E	2731	D	No	Yes
M Street & New Jersey Ave	3283	D	3301	D	No	Yes
M Street & 3rd St SE	3065	B	3086	B	No	No
M Street & 4th St SE	3674	D	3646	C	No	No
M Street & Navy Yard	3103	B	3105	B	No	No
M Street & 8th St SE	3100	B	3102	B	No	No
I St & 6th St SW	1430	B	1430	B	No	No
I St & Delaware Ave	1462	B	1462	B	No	No
P St & 3rd Ave SW	1154	B	1154	B	No	No
I St & 3rd St SW	1427	B	1427	B	No	No
Ramp from I-695 & 6th St SE	1929	F	1898	F	No	Yes
Virginia Ave & 4th St SE	2614	E	2581	E	No	Yes
Virginia Ave & 6th St SE	2612	D	2581	D	No	Yes
Ramp to I-695 & 3rd St SE	2371	F	2372	F	No	Yes
I St SE & 8th St SE	1760	C	1760	C	No	No
Virginia Ave & 7th St SE	1160	A	1160	A	No	No
M Street & 12th St SE	1484	F	1486	F	No	Yes

Intersection	Existing Approaching Volume	Existing LOS	Future Approaching Volume	Future LOS	Top 3 Ranked Traffic Volume	LOS of D, E, or F
Virginia Ave & 5th St SE	609	C	609	C	No	No
Virginia Ave & 7th St SE	824	B	824	B	No	No
M Street & 9th St SE	2813	C	2815	C	No	No
O St SW & S Capitol St	5326	A	5326	A	No	No

Table 4-27: CO screening for signal intersections

CO Hot-Spot Analysis

The CO hot-spot impact modeling analysis evaluated potential CO concentrations at the intersection. The predicted CO concentration levels were then compared with the CO NAAQS.

The CO hot-spot analysis was conducted by following the guidelines and procedures established by the USEPA and DDOT:

- Draft Hot-Spot Analysis Guide (DDOT, December 2013)
- CLA3QHC User's guide (USEPA, September 1995)
- Guideline for Modeling Carbon Monoxide from Roadway Intersections (USEPA, November 1992).
- Using MOVES in Project-Level Carbon Monoxide Analyses (USEPA, December 2010).
- MOVES2010b User's Guide (USEPA, June 2012).

Analysis Years and Emission Factors

Based on traffic forecasts prepared for the project, the analysis was conducted for the AM and PM peak periods for the build year (Year 2017) using MOVES associated with the DDOT-provided model input files to predict vehicular emission factors for each travel link at the studied intersections (Figure 4-24 and Figure 4-25).

In predicting travel link specific emission factors using MOVES, the free flow travel speed at the intersection was conservatively assumed to be 5 miles per hour to reflect traffic congestion and the idling queue speed was assumed 0 miles per hour.

CO Concentration Modeling

The CO hot-spot analysis was performed using CAL3QHC (Version 2), the USEPA guideline dispersion model for estimating CO concentrations near intersections. The CAL3QHC model was used to calculate the AM and PM peak hour CO concentrations for 2017 based on the traffic data developed for the project. The CO modeling incorporated the emission factors discussed above, the projected traffic volumes, intersection phasing data, and worst-case meteorological conditions. The dispersion parameters used in CAL3QHC include:

- Stability: D
- Surface Roughness Height: 175 cm
- Wind Speed: 1 m/s
- Wind Direction: 1-degree interval for 360 degree wind angles
- Source height: 0.0 m
- Mixing Height: 1,000 m

Modeled Receptors

As shown in Figure 4-24and Figure 4-25, receptor locations for CO concentration modeling were placed at the modeled intersection's corners, along sidewalks at least three meters from roadways, and nearby sensitive receptors.

CO Background Levels

The most recent monitored CO background concentration levels recorded at the closest monitoring site, 2500 1st Street NW, and published by USEPA were added to the CAL3QHC-predicted CO concentration levels predicted at the studied intersection to determine the total cumulative CO levels. The monitored CO background levels are for the one-hour averaging level, 2.1 ppm; and for the eight-hour averaging level, 1.2 ppm. DDOE guidance identifies CO background levels as 4.9 ppm for the one-hour averaging level and for 3.1 ppm for the eight-hour averaging level.

Persistence Factor

Based on DDOT's guidance, a persistence factor of 0.7 was used to convert the one-hour CO concentration calculated by CAL3QHC to an eight-hour CO concentration. The persistence factor represents the variability in both traffic and meteorological conditions.

Impact Threshold

According to the USEPA and DDOT guidelines, a project is defined as having a significant air quality impact if it causes a new violation of the CO NAAQS of 35 ppm for the one-hour average or 9 ppm for the eight-hour average at the intersection subject for a CO hot-spot analysis.

$PM_{2.5}$ and PM_{10} Impact Analysis

The $PM_{2.5}$ and PM_{10} impact analysis was performed based on the guideline and procedures outlined by the USEPA in the following document:

- Draft Hot-Spot Analysis Guide (DDOT, December 2013).
- Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas (USEPA, December 2010).

- Because the project area is an attainment area for PM_{10}, PM_{10} hot-spot analysis is not required for DDOT projects.

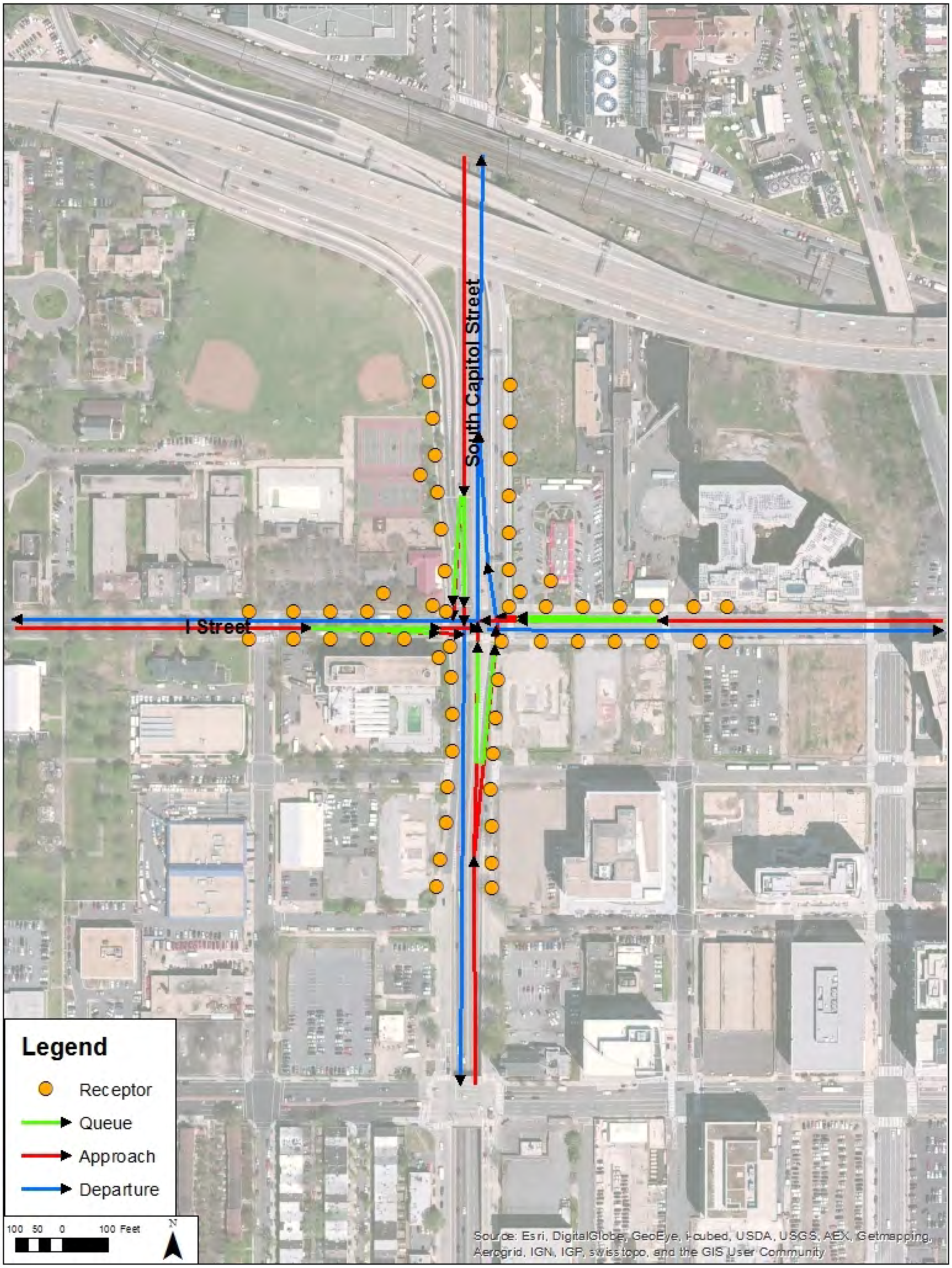

Figure 4-24: I Street and South Capitol Street intersection

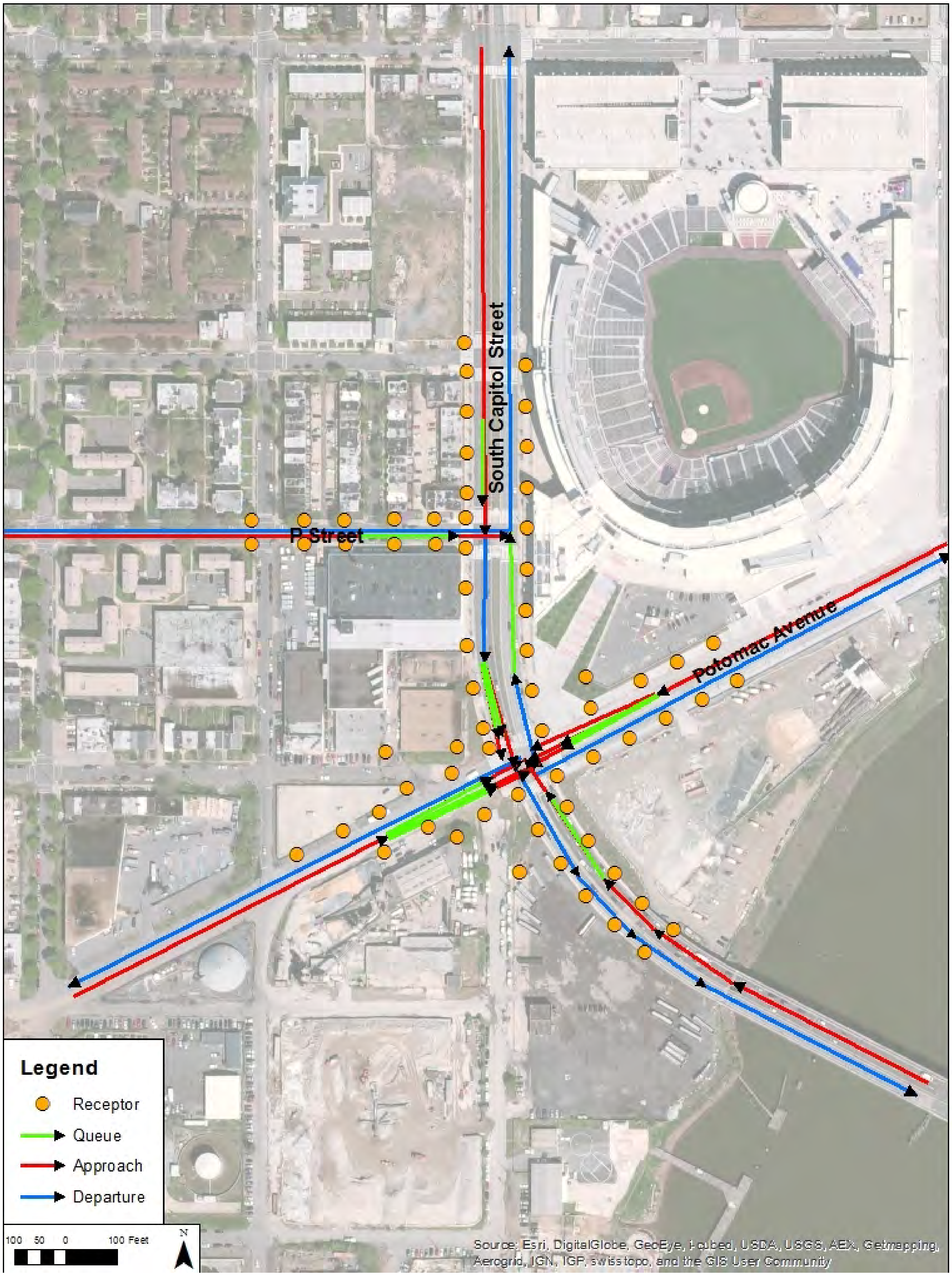

Figure 4-25: P Street, Potomac Avenue and South Capitol Street intersections

Consistent with the guideline, traffic conditions at analyzed intersections were first evaluated to determine whether the proposed action requires a hot-spot analysis for $PM_{2.5}$. The guideline identifies five categories of such projects (40 CFR 93.123[b][1]):

- New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.
- Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles, or those that would change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project.
- New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location.
- Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location.
- Projects in or affecting locations, areas, or categories of sites that are identified in the applicable PM2.5 and PM10 implementation plan or implementation plan submission, as appropriate, as the sites of violation or possible violation.

Furthermore, typical sample projects of air quality concern defined by 40 CFR 93.123(b)(1)(i), (iii) and (iv) include:

- A project on a new highway or expressway that serves a significant volume of diesel truck traffic, such as facilities with greater than 125,000 annual average daily traffic (AADT) and 8 percent or more of such AADT is diesel truck traffic.
- New exit ramps and other highway facility improvements to connect a highway or expressway to a major freight, bus, or intermodal terminal.
- Expansion of an existing highway or other facility that affects a congested intersection (operated at LOS D, E, or F) that has a significant increase in the number of diesel trucks.
- Similar highway projects that involve a significant increase in the number of diesel transit busses and/or diesel trucks.
- A major new bus or intermodal terminal that is considered to be a "regionally significant project" under 40 CFR 93.1019.
- An existing bus or intermodal terminal that has a large vehicle fleet where the number of diesel buses increases by 50% or more, as measured by bus arrivals.

The proposed action evaluated in this NEPA document would not involve any geometric modifications to the affected intersections. The number of diesel vehicles traveling through each intersection would not change because of the proposed action. Therefore, it can be concluded that the proposed action would not be one of the typical projects of air quality concern defined by 40 CFR 93.123(b)(1)(i), (iii) and (iv). The proposed action would not cause or contribute to a $PM_{2.5}$ violation; or increase the frequency or severity of an existing violation; or delay timely attainment of the $PM_{2.5}$ NAAQS. Consequently, no further hot-spot analysis for $PM_{2.5}$ is warranted.

Air Toxic Pollutants Impact Analysis

FHWA's Interim Guidance establishes a three-tiered approach to determine the level of MSAT analysis required by a project-level study. Project requirements are assessed following the Guidance. According to the Guidance, the category of exempt projects or projects with no meaningful potential MSAT effects includes:

- Projects qualifying as a categorical exclusion under 23 CFR 771.117(c);
- Projects exempt under the Clean Air Act conformity rule under 40 CFR 93.126; or
- Other projects with no meaningful impacts on traffic volumes or vehicle mix.

Additionally, the guidance indicates that "for projects with negligible traffic impacts, regardless of the class of NEPA environmental document, no MSAT analysis is required." It is further noted in the guidance that "the types of projects categorically excluded under 23 CFR 771.117(d) or exempt from conformity rule under 40 CFR 93.127 do not warrant an automatic exemption from an MSAT analysis, but they usually will have no meaningful impact."

Projects in this category do not require either a qualitative or a quantitative analysis for MSATS, although documentation of the project category is required.

Since the proposed project falls into the category of resulting in no meaningful impacts on traffic volumes or vehicle mix, it does not warrant either a qualitative or a quantitative analysis for MSATs.

Stadium Alternative

The construction activities associated with Proposed Action would result in emissions from the operation of construction equipment and vehicle, although the primary air quality concern would be fugitive dust emissions from ground-disturbing activities. Such construction effects are unavoidable but are also temporary. Although the construction campaign is expected to last approximately two years, emission levels would vary and the highest levels would last for a much shorter time particularly during the initial ground breaking phase. Additionally, these impacts would be minimized through the implementation of standard best management practices such as the sweeping or wetting exposed soils; or minimization of idling times. In general, impacts would be typical of those development projects in Washington, DC and are not expected to be significant.

Predicted worst-case CO levels using DDOE guidelines under the build conditions in 2017 are shown in Table 4-28 and they are well below the one-hour average CO NAAQS of 35 ppm or eight-hour average CO NAAQS of 9 ppm.

Intersection	CO Concentration (ppm)	
	PM Peak 1-hour	8-hour
South Capitol Street and I Street	10.0	6.7
South Capitol Street and P Street	11.4	7.7
South Capitol Street and Potomac Avenue	11.4	7.7

Table 4-28: Predicted worst case CO concentration levels under Stadium Alternative
Note: CO levels include background concentrations of 4.9 ppm (one-hour) and 3.1 ppm (eight-hour).

Additional CO contributions would occur due to on-site parking. Although specific analysis was not conducted because the exact configuration of the parking is yet unknown, such contributions are anticipated to be minimal for several reasons. First, the hot-spot intersections were selected primarily due to the current high volume of travel within the neighborhood traffic network. None of these selected worst-case intersections for the CO hot-spot modeling are located close to the project site. Therefore, CO contributions from the on-site parking would likely be negligible at these intersections because long distance dispersion would cause minimal cumulative impacts. Also, over an eight-hour period, the on-site parking itself would be unlikely to generate high 8-hour average CO concentrations because parking vehicles within the on-site parking would travel/idle only for a very short duration when entering and exiting the parking lot for the game. The CO impacts from traffic movements modeled at those selected intersections would occur continuously over the 8-hour period. Finally, the proposed 300 on-site parking spaces would replace the estimated 335 on- and off-street parking spaces found within the current site, and would therefore generate no net new parking spaces.

Based on the discussions and analysis results presented in this section, the Stadium Alternative would have no significant project-level adverse impacts on air quality with respect to CO, $PM_{2.5}$, PM_{10}, and MSATs. However, measures to mitigate potential impacts that would be less than significant are identified below under the heading Mitigation Measures.

Overall, the proposed action would result in short-term minor adverse impacts on air quality as a result of construction activity and long-term minor adverse impacts due to increased vehicle trips to and from the stadium.

Air Quality Mitigation

- Additional analysis may be required as part of DDOE's review of the project. If determined necessary, additional studies would be undertaken in accordance with applicable regulations.
- The District and DC United would work with DDOE to address necessary air quality permitting prior to construction. Such coordination would include obtaining necessary air quality construction and operating permits, such as those for construction equipment and permanent boilers and emergency generators.
- Construction equipment may need air quality construction and operating perm
- To minimize erosion by wind and the generation of fugitive dust and therefore the contribution of PM2.5, soil-disturbing activities on the project site such as excavation and grading should employ appropriate best management practices (BMPs) such as the wetting and/or covering of soils, vegetating soils that would be exposed for extended periods, erecting silt fences and using storm drain dams to minimize sediment runoff in stormwater, as appropriate. To the maximum extent practicable, excavated soils would be removed from the site immediately rather than being stockpiled for extended periods.
- Existing regulations concerning anti-idling would be followed by vehicles at the construction site. The use of automatic idling shutoff controls on the construction equipment at the site should also be explored.

No Action Alternative

The No Action Alternative would have negligible effect on air quality. Emissions would increase with future traffic volume growth. More efficient and cleaner vehicles as well as the long-term effect of relevant regulations and measures can be expected to have some offsetting effect.

4.7.5 Hazardous Waste Impacts

Stadium Alternative

With specified limits to control risk, the District would accept responsibility for remediating contaminants on and underlying the project site once it has finalized the purchase of the individual parcels from their current owners (Hayley & Aldrich 2013). Remediation actions would include the attenuation or removal of all existing ASTs, USTs, LUSTs, structures and equipment containing ACM, LBP, and/or PCBs, and any other buildings, structures, substances and materials that would pose a health risk to occupants of or visitors to the project site (including the construction workers who would prepare the site and build the new stadium) as well as persons living or working near the site. Given that the proposed stadium would be primarily at-grade, it is estimated that as much as 80 percent of the approximately 18,000 cubic yards of earth that would be excavated for construction of the stadium would be considered contaminated and unavailable for reuse at the site (Hayley & Aldrich 2013). For context, 10,000 cubic yards represents a depth of 1.5 feet across the site. Soil dewatering may be required to remediate contaminated groundwater. Remediation and site preparation activities, such as grading and excavation, could generate fugitive dust generated by wind erosion and sediment runoff in stormwater. However, early and ongoing coordination with DDOE and the adherence to best management practices (BMPs), such as the ones described below (see *Mitigation*), would minimize the exposure of construction workers and residents and workers in nearby areas to contaminants on and underlying the site.

In the short term, remediation of the site would have beneficial impacts by eliminating risks posed by contaminants to the health of the workers who would build the new stadium. Remediation of the site would result in the delisting of individual parcels as RCRA small quantity generators and brownfield sites (see Section 3.6.5, *CERCLIS Sites*). Overall, remediation of the project site would have beneficial long term impacts on hazardous materials and hazardous substances by eliminating health risks to the general public who would attend events at, or live and work near, the stadium site.

It is likely that multiple types of paints, solvents, cleaners, petroleum products, lubricants, and other hazardous substances would be used and stored on the project site, in quantities typical of small or medium-sized construction sites. Following completion of the stadium, hazardous construction-related substances would be removed from the project site. In the long term, it is likely that some maintenance-oriented hazardous substances such as paints, solvents, degreasers, lubricants, fertilizers, pesticides, and rodenticides would be stored and utilized at the stadium. The quantities that would be kept at the stadium would be small, and their use, storage, handling and disposal would be in accordance with the mitigation methods outlined below (see *Mitigation,* below).

Overall, short-term impacts from contaminants and hazardous substances on and underlying the project site would be negligible. The remediation of the project site and its redevelopment as a soccer stadium would have two-fold impacts on the site and its surrounding area: the site would be remediated of existing contaminant sources, eliminating risks to public health, and the current uses generating contaminants would be replaced by a facility that would maintain negligible amounts of hazardous substances and generate negligible amounts of hazardous wastes. For these reasons, long-term impacts on hazardous substances resulting from the proposed soccer stadium would be beneficial.

<u>Mitigation</u>

- Additional testing of the parcels comprising the project site and the stormwater outfalls they drain to would be conducted to fully determine the nature and extent of contamination and identify appropriate remediation methods.
- Health and safety plans would be prepared to identify health risks posed by hazardous substances to construction workers on the site and appropriate response and treatment methods in case of accidental exposure.
- Work plans would be prepared by the construction contractor(s) to document how applicable standards and requirements for excavating, handling, removing and disposing of contaminated soils, structures and equipment would be adhered to during construction activities.
- ASTs, USTS, LUSTs, and structures or equipment containing ACM, LBP, PCBs, or other hazardous materials would be attenuated or removed and disposed of in accordance with all applicable federal, District, and state (if disposed of outside the District) laws and regulations.
- All excavated soils would be characterized prior to off-site disposal. All contaminated soils removed from the site would be disposed of at a permitted facility in accordance with all federal, District and state (if the facility is located outside the District) laws and regulations.
- The construction contractor(s) would prepare soil management plans to address proper handling and disposal of excavated soil and proper handling procedures for construction dewatering if groundwater is encountered.
- To minimize erosion by wind and the generation of fugitive dust, soil-disturbing activities on the project site such as excavation and grading should employ appropriate best management practices (BMPs) such as the wetting and/or covering of soils, vegetating soils that would be exposed for extended periods, erecting silt fences and using storm drain dams to minimize sediment runoff in stormwater, as appropriate. To the maximum extent practicable, excavated soils would be removed from the site immediately rather than being stockpiled for extended periods.
- Hazardous substances used during construction activities would be stored on the project site during the construction of the stadium. When not in use, such substances would be stored on the site in secured cabinets, lockers, or storage containers that would be inaccessible to the general public. Material safety data

sheets, which provide composition, first aid, and firefighting information, would be maintained for all hazardous substances used on the site, and the general contractor would prepare a spill prevention and containment plan. Empty product containers would be collected by a licensed contractor and disposed of in accordance with all applicable federal, District, and state regulations. Fertilizers, pesticides and rodenticides used at the stadium would be applied periodically and in accordance with the manufacturer's instructions and guidelines, and would be stored in areas inaccessible to the general public.

- Remediation and/or other actions should be developed for nearby hazardous sites that have the potential to impact the project site.

No Action Alternative

Under the No Action Alternative, no hazardous materials would be disturbed or removed from the site. As a result, there would be no impacts on hazardous materials.

4.8 Sustainability

Stadium Alternative

<u>Existing site to a future condition with a new stadium</u>

The Stadium Alternative would replace the existing light industrial uses with a new stadium and some mixed-use development. Per the development agreement between the District and DC United, the stadium would be required to be LEED-certified. Leadership in Energy and Environmental Design (LEED) is a program that provides third-party verification that a building or community was designed and built using strategies aimed at achieving high performance in key categories of human and environmental health such as sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. Achievement of LEED certification requires building projects to meet prerequisites and earn credits. Credits are allocated based on the environmental impacts and human benefits addressed by drawing from a prescribed menu of tools and strategies. LEED's rating system is continuing to evolve as standards are updated, new technologies emerge, and markets transform (USGBC 2013, LEED 2009 for New Construction and Major Renovation).

For the purpose of this assessment, in the absence of a proposed stadium design it is assumed that the stadium design would be consistent with the DC Green Building Law which requires new buildings to meet LEED standards. It is also assumed that the proposed stadium would likely implement best practice sustainable operations similar to other stadiums and consistent with MLS Works Green Goals that would increase levels of resource efficiency with decreasing levels of consumption over time (MLS Soccer).

Based on a review of existing site uses, it is anticipated that the future condition of the site with a stadium would result in roughly similar energy consumption but less water consumption over time compared to the current site's demand. Despite compliance with the DC Green Building Act and LEED rating system, the construction phase of the proposed stadium would result in a short-term increase in energy, water and material consumption.

However, the proposed stadium would bring potentially substantial benefits over the long term that enhance the District's sustainability such as an improved stormwater management system for the site; potential for growing the District's renewable energy capacity; demonstration of sustainable design and operations and awareness-raising about sustainable stadium practices such as water conservation, recycling, composting,

LEED 2009 for New Construction and Major Renovations
Project Checklist

Project Name
Date

Y	?	N		Sustainable Sites	Possible Points: 26
Y			Prereq 1	Construction Activity Pollution Prevention	
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	5
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation—Public Transportation Access	6
			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
			Credit 4.4	Alternative Transportation—Parking Capacity	2
			Credit 5.1	Site Development—Protect or Restore Habitat	1
			Credit 5.2	Site Development—Maximize Open Space	1
			Credit 6.1	Stormwater Design—Quantity Control	1
			Credit 6.2	Stormwater Design—Quality Control	1
			Credit 7.1	Heat Island Effect—Non-roof	1
			Credit 7.2	Heat Island Effect—Roof	1
			Credit 8	Light Pollution Reduction	1

Y	?	N		Water Efficiency	Possible Points: 10
Y			Prereq 1	Water Use Reduction—20% Reduction	
			Credit 1	Water Efficient Landscaping	2 to 4
			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4

Y	?	N		Energy and Atmosphere	Possible Points: 35
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
			Credit 1	Optimize Energy Performance	1 to 19
			Credit 2	On-Site Renewable Energy	1 to 7
			Credit 3	Enhanced Commissioning	2
			Credit 4	Enhanced Refrigerant Management	2
			Credit 5	Measurement and Verification	3
			Credit 6	Green Power	2

Y	?	N		Materials and Resources	Possible Points: 14
Y			Prereq 1	Storage and Collection of Recyclables	
			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
			Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
			Credit 2	Construction Waste Management	1 to 2
			Credit 3	Materials Reuse	1 to 2

Y	?	N		Materials and Resources, Continued	
			Credit 4	Recycled Content	1 to 2
			Credit 5	Regional Materials	1 to 2
			Credit 6	Rapidly Renewable Materials	1
			Credit 7	Certified Wood	1

Y	?	N		Indoor Environmental Quality	Possible Points: 15
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
			Credit 1	Outdoor Air Delivery Monitoring	1
			Credit 2	Increased Ventilation	1
			Credit 3.1	Construction IAQ Management Plan—During Construction	1
			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
			Credit 5	Indoor Chemical and Pollutant Source Control	1
			Credit 6.1	Controllability of Systems—Lighting	1
			Credit 6.2	Controllability of Systems—Thermal Comfort	1
			Credit 7.1	Thermal Comfort—Design	1
			Credit 7.2	Thermal Comfort—Verification	1
			Credit 8.1	Daylight and Views—Daylight	1
			Credit 8.2	Daylight and Views—Views	1

Y	?	N		Innovation and Design Process	Possible Points: 6
			Credit 1.1	Innovation in Design: Specific Title	1
			Credit 1.2	Innovation in Design: Specific Title	1
			Credit 1.3	Innovation in Design: Specific Title	1
			Credit 1.4	Innovation in Design: Specific Title	1
			Credit 1.5	Innovation in Design: Specific Title	1
			Credit 2	LEED Accredited Professional	1

Y	?	N		Regional Priority Credits	Possible Points: 4
			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1

Y	?	N		Total	Possible Points: 110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Figure 4-26: Overview of LEED rating system categories, prerequisites and credits
Source: U.S. Green Building Council

concession waste reduction and alternative transportation. These sustainable stadium approaches would help advance the District's policy, action plans and goals articulated through Sustainable DC and the DC Green Building Act.

The proposed stadium's improvements to the already-developed site would also provide local neighborhood benefits through expanding tree cover that can help to mitigate anticipated climate change impacts, providing outdoor community gathering and open spaces and expanding opportunities for local economic development. A newly designed stadium at Buzzard Point would be required to achieve LEED Standards, which for new construction would require design of a minimum 10% improvement in building energy use compared to the national standard for stadium energy use.

The current light industrial uses on site are estimated to consume roughly 10 kwh per square foot on average per year (MGE 2012). It is assumed that a newer, typical large stadium might also consume roughly 10 kwh per square foot per year (Dietrich and Melville 2011). However, a new stadium built with an emphasis on energy efficient design and operations consistent with the District's Green Building Act, could consume less energy than a typical stadium. The national average source energy use and performance or source energy use intensity (EUI) for a typical stadium is 85.1 Kbtu/Sqft (USEPA 2013e), including electricity and natural gas.

Regarding water consumption, it appears that a new stadium would consume less water than the current site uses over the course of the year. While the new stadium would need to be designed to perform a minimum of 10% better than fixture standards the achievement of LEED silver is not a guarantee of actual performance. However, it can be assumed that a stadium meeting LEED design standards would likely exceed building performance when compared to a "typical" stadium's design and operations. It is anticipated that the existing site consumes approximately 2 gallons per square foot (USEPA 2012), or approximately 242,000 gallons per day of operations. A stadium is anticipated to use approximately 5 gallons per seat or, for the proposed stadium, approximately 100,000 gallons per event (assuming a 20,000 seat event).

In order for the proposed stadium project to become eligible to pursue LEED and strive for Silver (50-59 points) status, the project would need to satisfy LEED prerequisites. For the purpose of establishing a baseline of sustainability performance for this sustainability assessment, it is assumed that the stadium project would achieve the prerequisites required by LEED and achieve some combination of LEED credits in order to obtain a LEED silver rating. Below is a listing of some of the LEED prerequisites and credits which would likely be achieved by the stadium project.

Energy

At a minimum, the stadium would need to demonstrate a 10% improvement in building performance compared with the baseline for a stadium. Additionally, the stadium could pursue credits that would require generation of on-site renewables and/or purchase of renewable energy for providing at least 35% of the stadium's electricity.

<u>Materials and Resources</u>

The stadium's compliance with LEED prerequisites and potential credits could establish a baseline of using recycled content and regional materials in the stadium's construction. In addition, the stadium might aim to recycle or salvage construction waste materials. As a benchmark, the Philadelphia Eagles (see Appendix D) have found significant benefits from achieving approximately 99% of waste diversion from landfills such as reducing operating costs; sending positive messages to spectators about the team's social and environmental responsibility; promoting composting; increasing recycling and, creating a high quality stadium experience for fans.

Water Resources

In order to meet LEED Silver requirements, the stadium would need to satisfy prerequisite requirements for using 20 percent less water than the water use baseline calculated for the building (not including irrigation). Items included in the stadium's baseline are toilets, urinals, lavatories, faucets, shower heads, and pre-rinse spray valves used in concession operations.

In addition to the water prerequisite and in order for the stadium to achieve the Silver level (50-59 points), the stadium design team may likely pursue come credits for reducing by 50% or eliminating the use of potable water in landscaping; reducing wastewater generation and potable water demand; and, promoting water efficiency that reduces water consumption more than 30% below the baseline condition.

Furthermore, the project would likely pursue credits that demonstrate implementation of stormwater quantity controls which reduce or eliminate stormwater runoff, capture and treat 90% of the average annual rainfall as part of the LEED certification. In addition, the Anacostia Waterfront Environmental Standards require treatment of the 95 percentile storm and the District-wide 1.2-inch retention standard.

Land/Transportation

In order to meet LEED Silver requirements, the stadium would need to satisfy the pre-requisite of preparing a construction activity pollution prevention plan that describes measures to control erosion, waterway sedimentation and airborne dust generation. Also, in order to attain LEED Silver, strategies implemented by the stadium project would likely include reducing vehicle miles travelled through use of preferred parking for carpool and low emitting vehicles, bike racks, and shower and changing facilities. Additional credits which might be pursued include use of shading and reflective surfaces to reduce the stadium's contributions to the urban heat island effect.

For the purpose of this analysis, it is also assumed that a new stadium at Buzzard Point would aim to achieve some comparable sustainability performance goals to other recent stadium projects in the region such as Nationals Park, FedEx Field, M&T Bank Stadium and Lincoln Field (see Appendix D), as well as recently constructed and renovated urban, LEED MLS stadiums in Houston, Portland and Seattle (see Appendix D).

Overall, the Stadium Alternative would increase materials consumption during the construction of the stadium, resulting in short-term minor adverse impacts on sustainability. Once in operation, the facility would use less energy and resources that the existing operations at RFK and the existing light industrial operations at the project site. Furthermore, the Stadium Alternative would support sustainable infrastructure. As a result, there would be beneficial impacts on sustainability.

Sustainability Mitigation

- Implement fixtures and design features, such as a translucent roof to capture light during dusk and thus reducing the time needed for stadium-wide lighting, to support sustainability.
- Mandate recycling and diversion of 90% of wastes during construction.
- Establish stadium-wide systems for collecting and transport of composting and recycling.
- Promote tree canopy to maintain climate control and mitigate heat island effect.
- Increase use of green infrastructure along right of way and throughout property
- Offer incentives for metro and bike travel—free valet parking for example

No Action Alternative

Under the No Action Alternative, the existing site would be built out as a commercial development accommodating up to approximately two million square feet. For the purpose of this analysis, the office space is assumed to generate approximately 4,250,000 person visits per year, compared to the anticipated 750,000 person-visits per year for the proposed stadium.

Per the Green Building Law, the same LEED rating system and Silver achievement level would apply to the commercial development and the stadium. In terms of energy use, the commercial would also be required to achieve a LEED pre-requisite minimum of 10 percent better building performance for energy than the standard in addition to other.

In general, a commercial office build-out of the site would consume more energy than the site's current light industrial operations. Measured in terms of kilowatt hour per square foot, office buildings average approximately 17.3 kwh per square foot (USEIA 2010) while the existing site's light industrial uses could be estimated to consume approximately 10 kwh per square foot on average per year (MGE 2012). Measured in terms of Energy Use Intensity (EUI) based on a national median benchmark survey of building types, a typical office space consumes approximately 148.1 Kbtu/Sqft (USEPA 2013e) while the national median benchmark for a typical light industrial use such as warehousing ranges from 47 Kbtu/Sqft to 60 Kbtu/Sqft (USEPA 2013e).

This significantly higher EUI for an office complex would correlate directly into significantly higher emissions of Greenhouse Gas Emissions compared to the stadium. However, if both the office and the stadium were equally committed to using 100 percent wind or solar energy sources, GHG impacts from their energy sources would likely be roughly equivalent for both the office and stadium. Including transportation within this comparison would suggest that the office yields significantly more GHGs per year than a proposed stadium since there would be many more cumulative person trips, each requiring a level of GHG emissions regardless of mode split. If the number of person trips to the office and to the stadium were equal, the modal split for commuters and stadium attendees suggests the GHG impacts would be much higher for office workers given the small portion of transit use[1].

A typical office worker consumes approximately 13 gallons per water per day (USEPA 2012) while a typical stadium attendee consumes approximately 5 gallons per event (NCDENR). The typical office's higher per person level of consumption and greater number of workers (4,425,000) compared to the proposed stadium (750,000 person visits per year) would result in significantly more water consumption.

Overall, the No Action Alternative would result in more intense use of the site and would use more energy and resources than the current operations of the site. However, redevelopment would be in keeping with LEED guidelines. As a result, there would be long-term negligible impacts on sustainability.

[1] The US Census Bureau data for public transportation from American Community Survey 2009 shows that approximately 14.1% of commuters from the Washington DC, Arlington, Alexandria Metro Area use public transit. The DC United draft transportation management plan uses a low-end transit assumption of 30% for stadium events.

4.9 Cumulative Impacts

Land Use

The land use of the stadium site would change as a result of the proposed action, but would not prevent the continuance of other land uses in the surrounding area or inhibit the future development or redevelopment of land for new uses such as those that would occur as a result of the reasonably foreseeable past, present and future projects described in Chapter 1. Although the development of the stadium may induce changes to some land uses in the surrounding area sooner than if the stadium was not developed, any such changes would be manageable under the regulations and through the processes currently administered by the District. Similarly, the new uses resulting from the cumulative projects would generally be more desirable than the existing uses. Thus, the construction and operation of the proposed soccer stadium would have a beneficial cumulative effect on land use in Buzzard Point and the surrounding area.

Community Facilities

The development of the proposed soccer stadium would have no adverse cumulative effects on educational facilities because no changes in the resident population of the District or the surrounding region associated with the construction and operation of the stadium would occur. When considered with the reasonably foreseeable past, present and future projects described in Chapter 1, the proposed stadium could contribute to adverse cumulative effects on nearby recreational facilities by generating additional visitors; medical facilities by generating additional patients; and police and fire and emergency medical services by creating situations that require responses from those services. However, any such increases resulting from the construction and operation of the proposed soccer stadium would be within the capacity of those facilities and services to accommodate and manage them. Therefore, adverse cumulative effects on public facilities resulting from the development of the proposed soccer stadium would be negligible.

Demographics

The proposed stadium would have minor adverse impacts as a result of stadium light and crowd noise, as well as beneficial impacts from increasing amenities for area residents. Proposed future development at the Yards, further redevelopment of the Arthur Capper/Carrollsburg public housing, and the expected redevelopment of the Buzzard Point industrial area, in conjunction with the proposed stadium, would contribute to beneficial cumulative impacts.

Environmental Justice

While short- and long-term impacts from the construction and operation of the stadium would occur within environmental justice areas, no disproportionately high or adverse impacts would occur in minority or low-income populations. Therefore, no cumulative impacts would occur.

Economic and Fiscal

The proposed stadium would result in a net fiscal and net employment gain for the District, resulting in beneficial impacts on economic and fiscal resources. The construction elements of proposed projects in the vicinity of the proposed stadium could generate additional jobs and revenue in the District, and with the potential fiscal benefits generated by redevelopment of underutilized industrial areas, could have the potential to generate beneficial cumulative impacts.

Archaeological Resources

The archaeology study area for the proposed stadium is assessed to have moderate potential for prehistoric and historic archaeological deposits. Therefore, there could be long-term moderate adverse impacts if resources are disturbed. Other proposed projects in the vicinity of the proposed stadium could also potentially disturb archaeological resources, including the expected redevelopment of the Buzzard Point industrial area. Therefore, there is a potential for moderate adverse cumulative impacts.

Historic Resources

The proposed stadium, which would have a moderate adverse impact on the L'Enfant Plan, along with positive impacts to Potomac Avenue, would cumulative impacts. When considered together with the South Capitol Street corridor project, which would have an adverse impact on the L'Enfant Plan, there would be a moderate adverse cumulative impact on historic resources.

Visual Resources

The proposed stadium would have positive impacts on the visual character of the area due to a cohesive design, distinctive architectural elements, and a consistent streetscape. The South Capitol Street corridor (increased greenspace and prominent visual element on Potomac Avenue); Frederick Douglass bridge replacement; Anacostia waterfront improvements at Poplar Point; the expected redevelopment of the Buzzard Point industrial area; and the future revitalization of James Creek and Syphax Village would all improve visual character and/or add architectural elements and a sense of cohesive design. When considered together with other proposed projects in the area, beneficial cumulative impacts would occur.

Urban Systems

When considered with the reasonably foreseeable past, present and future projects described in Chapter 1, the development of the proposed soccer stadium would have no adverse cumulative effects on urban systems because the new stadium would not contribute to any additional demands on those systems beyond what is already required for D.C. United games occurring at RFK Stadium. Overall, when considered with the other cumulative development and redevelopment projects listed in Chapter 1, cumulative impacts on urban systems resulting from the long-term operation of the proposed stadium would be generally beneficial as a result of the more-efficient plumbing, electrical, and sanitary fixtures and systems that would be installed and used in the facility.

Transportation

When considered with the reasonably foreseeable past, present and future projects described in Chapter 1, the development of the proposed soccer stadium would result in minor adverse impacts. When calculating the transportation in the study area, the projects were included in the calculations regarding service. As a result, there would be no additional cumulative impacts.

Air Quality

The Stadium Alternative would result in minor air quality impacts on the site due to disturbance of the ground during construction. Over the long-term, the proposed action would not increase CO concentrations to a level that would exceed standards. The reasonably foreseeable past, present and future projects could result in adverse impacts on air quality. However, they would not represent a level that exceeds regulations. Therefore, there would be minor cumulative adverse impacts on air quality.

Noise

The Stadium Alternative would result in minor noise impacts due to increase vehicular activity and by stadium noise. Over the long-term, the proposed action would not increase the ambient to a level that would exceed standards. The reasonably foreseeable past, present and future projects could result in adverse impacts on noise. However, they would not represent a level that exceeds regulations. Therefore, there would be minor cumulative adverse impacts on noise.

Lighting Conditions

The Stadium Alternative would result in minor impacts on lighting conditions due to the lighting at the proposed stadium affecting nearby properties. The cumulative project that could affect light conditions in the Buzzard Point area is the expected redevelopment of the Buzzard Point industrial area. However, the lighting associated with such redevelopment would likely be consistent with nearby residential streets and existing conditions. Therefore, there would be minor cumulative adverse impacts on lighting conditions as a result of the Stadium Alternative.

Hazardous Materials

Although small quantities of hazardous substances would be used and similar quantities of hazardous wastes would be generated during the construction and long-term operation of the proposed soccer stadium, those quantities would be proportional to and in some cases less than those generated by the reasonably foreseeable past, present and future projects described in Chapter 1. Further, the quantities of these substances generated as a result of the proposed stadium development would not exceed the capacity of existing agencies and processes to handle, manage, store and dispose of them. The development of the proposed stadium would also result in the remediation of hazardous substances on and underlying the project site, thereby substantially contributing to remediation efforts in the predominantly-industrial Buzzard Point area. Thus, when considered with other reasonably foreseeable past, present and future cumulative projects, the development of the proposed soccer stadium would have negligible adverse and moderately beneficial cumulative impacts on hazardous materials in Buzzard Point and the surrounding area.

4.10 Summary of Impacts

A summary of each alternative's impacts is provided in the following table by resource area.

Resource Area	Stadium Alternative	No Action Alternative
Land Use	Short-term minor adverse; Long-term beneficial	Long-term minor adverse
Zoning	No impacts	No impacts
Community Facilities	Short-term negligible to minor adverse; Long-term negligible, with minor impacts on police services	No impacts
Demographics and Housing	Short-term minor adverse; minor direct long-term adverse impacts, indirect minor adverse, and beneficial	No impacts
Environmental Justice	Short-term minor adverse; Long-term indirect minor adverse, and beneficial	No impacts
Economic and Fiscal Resources	Short and long-term beneficial	No impacts
Archaeological Resources	Moderate adverse impact on archaeological deposits	No impacts
Historic Resources	Long-term moderate adverse	No impacts
Visual Resources	Short-term minor to moderate adverse; Long-term minor adverse, and beneficial	No impacts
Geophysical Resources	Short-term minor adverse; Long-term beneficial	No impacts
Water Resources	Short-term minor adverse; Long-term beneficial and minor adverse impacts on stormwater	No impacts
Vegetation and Wildlife	Short-term minor adverse; Long-term beneficial	No impacts
Water Supply	Short-term negligible; Long-term beneficial	No impacts
Sanitary Sewer and Stormwater Infrastructure	Long-term beneficial	No impacts
Solid Waste	No impacts	No impacts
Energy Systems	Short-term minor adverse; Long-term beneficial	No impacts
Communications and	Short-term minor adverse;	No impacts

Resource Area	Stadium Alternative	No Action Alternative
Data	Long-term beneficial	
Traffic Systems	Short- and long-term moderate adverse	No impacts
Parking Systems	Long-term minor	No impacts
Public Transportation Systems	Long-term negligible adverse and direct beneficial	No impacts
Pedestrian Circulation	Short- and long-term minor adverse, and beneficial	No impacts
Bicycle Circulation	Short- and long-term minor adverse, and beneficial	No impacts
Visitor Activity	Short-term minor adverse; long-term minor adverse, and beneficial	No impacts
Noise	Short-term minor; minor long-term adverse impacts	No impacts
Lighting Conditions	Long-term minor adverse impacts	No impacts
Air Quality	Minor short- or long-term adverse impacts	Negligible
Hazardous Waste	Short-term negligible; Long-term negligible, and beneficial	No impacts
Sustainability	Short-term minor adverse; Long-term beneficial	No impacts

Table 4-29: Summary of impacts

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A. APPENDIX:

Buzzard Point
Urban Design Framework Plan
Summary

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B. APPENDIX:

DC United Draft Transportation Management Plan

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C. APPENDIX:

DC United Transportation Impact Study

Transportation Technical Attachments

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D. APPENDIX

Sustainability Best Mangement Practices

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Best Management Practices for Stadium Sustainability

Below is a menu of sustainability best management practices, drawn from lessons learned through stadium design; operations and maintenance; and fan behavior. A variety of these practices can save operating costs throughout the life cycle of the stadium. Once early cost-saving practices are successful, a broader program can be supported and implemented that would likely yield a variety of non-monetary benefits such as strengthened fan loyalty, brand recognition, and fiscal support. In addition, the efforts of stadia in the Mid-Atlantic region and within Major League Soccer (MLS) are also included.

30 Best Management and Operations Practices for Stadium Sustainability

Stadium Design: Integration of capital-intensive sustainability practices during the design phase through decisions about energy systems, materials and land use can enable cost savings spread through the life cycle of the stadium. Furthermore, these initial sustainability investments can yield cost savings that are enhanced by operations and maintenance practices. Also, sustainable considerations implemented during the design phase can be significantly less expensive than retrofits and renovations following stadium construction.

Operations and Maintenance (O&M): Practices implemented during stadium operations such as monitoring of energy and water consumption, can yield incremental savings with every monthly utility bill. Over the course of three to five years, the aggregate savings can be quite significant, particularly given a stadium's large demand for water, electricity, gas, etc. Furthermore, these types of monitoring systems generally require very limited capital and can be effective ways to yield real cost savings that can be measured and demonstrated through every monthly utility bill. O&M best practices, such as working with concessionaires to reduce packaging, can also yield additional savings through reduced labor needed for collecting and transporting waste or light bulbs that need to be changed less frequently.

Influencing Fan Behavior: Practices such as the Atlanta Falcons' "get caught in the act of recycling" camera can enhance the fan experience and demonstrate that the team cares about its community and local environment. In addition, campaigns to modify fan behavior can also help to reduce operating costs, such as the Philadelphia Eagle's efforts to keep its tailgating lots clear of litter and recyclables. By enlisting tailgating volunteers to promote recycling and parking lot clean-up, in exchange for tickets to the game, the Eagles grow fan loyalty and improve the overall quality of the fan experience while also reducing their waste management costs.

Below is a menu of best management practices that can be implemented during the design phase; operations and maintenance; or through fan behavior:

Building Energy

1. Monitor and track data about monthly energy and water consumption in order to reduce resource consumption.
2. Consider using energy efficient light fixtures and explore technologies like Red Bull Arena's translucent roof that help capture light during dusk, reducing time needed for stadium-wide lighting (http://greensportsblog.com/2013/08/27/red-bull-arena-tourfollow-up-to-how-green-is-your-nynj-sports-team-post/)
3. Consider establishment of metrics and targets for measuring, documenting and publicly communicating/reporting sustainability efforts (GHGs, waste, recycling, energy, etc.).
4. Consider making renewable energy commitments that include helping to create a community solar project that strengthens relations with local communities.

Water Resources

5. Design landscape to adapt to flooding through stormwater capture and to adapt to river flooding. Increase use of green infrastructure along right of way and throughout property
6. Consider implementing water saving approaches such as; US EPA WaterSense-certified fixtures and fixture fittings
7. Consider using alternative on-site sources of water (e.g., rainwater, stormwater, and air conditioner condensate) and, graywater for non-potable applications such as custodial uses and toilet and urinal flushing.

Materials and Resources

8. Mandate recycling and diversion of 90% of wastes during construction
9. Work with MLS Green Works MLS Works, Major League Soccer's community outreach initiative, that has partnered with Natural Resources Defense Council to identify ways to reduce carbon footprint and raise awareness about environmental issues throughout the soccer community. The Natural Resources Defense Council's Greening Advisor Toolkit for Major League Soccer (http://mls.greensports.org/) helps MLS teams implement eco-intelligent practices in their hometowns to keep our nation's air and water clean, reduce their contribution to global warming and see cost saving benefits. The toolkit includes green guidance for stadium construction, concessions, suppliers, front office and travel operations.

10. Consider establishing a Business Improvement District to help reduce litter which can enter the Anacostia
11. Join city's green purchasing program, promote DC businesses
12. Support District's product stewardship approach to minimize waste
13. Engage the parking lot staff in recycling efforts by treating them to games (like the Philadelphia Eagles program)
14. Consider teaming with Sustainable Waste Solutions, a nonprofit that works with large companies to get to zero-landfill. They help with the tailgate component—the part we can't control. We talked to people in the industry to determine the best way to deal with that waste. We now have a waste-to-energy component of our program (Philadelphia Eagles, lessons from the field).
15. The "Go Green" campaign launched by the Philadelphia Eagles in the mid-2000's addressed waste generation by requesting that its food and beverage vendor Aramark reduce the amount of packaging and switch to recyclable and compostable packaging materials. This led to dramatic changes in how Aramark operated its concessions, significantly reduced the amount of waste generated, lowered waste disposal costs, diverted more waste from landfills and did not negatively impact the customer experience.
16. Work with concessionaires to procure local food can help reduce the amount of packaging needed for shorter transport times and distances.
17. Consider working with concessionaires and operations staff to establish contractual guidelines for minimizing the amount of packaging brought into the stadium; requiring the use of compostable items for serving; requiring local composting of 90% of food wastes and setting targets for other waste streams to be recycled and otherwise diverted from landfills.
18. Consider adopting waste management policies similar to the Nationals, who use a single-stream recycling program that diverts about 80 percent of the stadium's waste from landfills[1]. Exploring cost-sharing opportunities for compost and recycling services with the Nationals and considering working with the District to establish a new organics transfer station may help create more cost-effective waste management and would be compliant with actions identified in Sustainable DC.

Reducing risks to flooding events can include:

19. Design landscape to adapt to flooding through stormwater capture and to adapt to river flooding. Increase use of green infrastructure along right of way and throughout property

[1] NRDC, Game Changer: How the Sports Industry is Saving the Environment. NRDC, 2012.

20. Promote use of green roofs and other vegetated features that capture, retain, clean and slowly release stormwater;
21. Expanding tree canopy coverage and number of trees planted for increasing vegetative water demand;
22. Minimizing the amount of loose litter, outdoor furniture, trash and recycle bins, etc. that might become carried away via water and wind during severe weather events

Reducing risks from the higher anticipated temperatures in the summer can include:

23. Design extensive tree planting coverage throughout open spaces to provide micro climate control for stadium users;
24. Use grass pave and other soft/vegetated parking surfaces that can minimize heat gain during high temperatures and mitigate urban heat island effect.
25. Provide plenty of outdoor shading devices;
26. Use highly reflective finishes and surfaces;

Land Use and Transportation

27. Promote tree canopy to maintain climate control and mitigate heat island effect. Establish maintenance partnership with community group to ensure trees continue to yield benefits for many years by reducing mortality rates.
28. Promote anti-idling campaign near stadium—saves gas and can reduce asthma (1 in 6 DC kids affected by asthma according to the DC Sustainability Plan 2011)

Education and Outreach

29. Offer incentives for metro and bike travel—free valet parking for example
30. Promote sustainable fan behavior such as the “caught in the act” camera from the Atlanta Falcons, which promotes recycling at the stadium. The Atlanta Falcons organization and associates with the Georgia Dome created an incentive program for their fans to recycle, titled "Get Caught in the Act," in which who fans get "caught" on camera recycling a can or bottle. The video is shown on the stadium big screen for all to see, and that lucky fan receives a big prize and recognition from fellow fans.

Approaches to Stadium Operational Sustainability

Behavioral

- Educating janitorial staff and security to turn off lights when not in use
- Closing concession stands based on # of attendees and optimizing building controls
- Increasing preventative maintenance to ensure efficient operation

Technical

- Weatherization of building
- Occupancy and motion sensors
- Optimized building controls
- On-site generation to shave peak load

Source: Duke University, Dietrich Andrew and Corinne Melville, Energy Demand Characteristics and the Potential for Energy Efficiency in Sports Stadiums and Arenas. 2011.

Regional Examples of Sustainability Outcomes Achieved in Professional Sports Stadia

The process of evaluating stadiums within the Mid-Atlantic region that have achieved sustainability outcomes has identified the following table of achievements. These benchmarks are grounded in precedent examples, rather than remaining as aspirational goals and targets. This reflection of feasible achievements can be used to inform sustainability goals and targets by other stadiums.

Stadium (General)	Energy	Materials	Water	Land
Nationals Park - nation's first major professional stadium to become LEED Silver [2][3],[4],[5]	6,300 square foot green roof; contract to purchase renewable energy to cover 70% of expected consumption over two years; Reduced energy performance 14% in 2011 compared to 2010 via energy management system during non-game days and in unoccupied spaces; Regular analysis of utility bills;	Content of building materials contain a minimum of 10 percent recycled content in building; 5,500 tons of construction waste were recycled	conserving fixtures save an estimated 3.6 million gallons of water per year, reducing water consumption30 percent; filtration system that separates water for cleaning from rainwater falling on the ballpark and treats before release to sanitary and stormwater systems; screen organic debris such as peanut shells	The ballpark site was enrolled in the DC DOE Voluntary Clean Up Program and therefore provides an opportunity to leave the roughly 25-acre site a much better environment then when it was received. Environmental remediation efforts are ongoing

[2] http://mlb.mlb.com/was/ballpark/information/index.jsp?content=green_ballpark (accessed 1/20/14)
[3] http://mls.greensports.org/greener-building/leed/ (accessed 1/20/14)
[4] Stadium Managers Association SMA Energy Bowl Competition 2012 http://www.energystar.gov/ia/business/newsletters/entertainment/newsletter_10-02-2011.html (accessed 1/21/14)
[5] Rocky Mountain Institute http://blog.rmi.org/blog_2013_02_04_Greening_the_Superbowl (accessed 1/21/14)

Stadium (General)	Energy	Materials	Water	Land
Philadelphia Eagles (Lincoln Financial)[6,7]	Philadelphia Eagles' Lincoln Financial Field, decreased energy use 21 percent 2009–2010;' NRG system where 30% of stadium's energy is powered by solar and wind; 11,000 solar panels; 14 wind turbines; 33% reduction in electricity from start of campaign; employees get reimbursed for switching to wind energy; remaining energy is from purchased wind power Saving $32M over next 20 years	Recycling bins every 46 steps; donate unsold food; 99% waste diverted; collect tailgaters' waste; humorous outreach campaign- "recycle beer here and plastics outside"; 3,288 tons diverted from LF; used cooking oil recycled into bio-diesel; Aramark serves food in corn-based and sugarcane based cups, plates, bowls and trays Saved $300,000 since 2004	21% reduction in water consumption;	Created a 6.5 acre forest with 4,000 tree plantings in a state park
FedEx Field (Washington Redskins)[8,9]	8,000 solar panels that generate approximately 15% of the stadium's annual electricity and provide shade for the parking area; Solar panels generate appx 2 MW; piloting 10 electric vehicle charging stations	by disposing of the waste at a waste-to-energy facility, each event held at the stadium will provide enough energy to power 57 homes for a month.	n/a	n/a
M&T Bank Stadium (Baltimore Ravens) LEED Gold[10]	27% above the national average for energy efficiency	All purchases for the Stadium follow Sustainable Purchasing Policy; "Green Cleaning" program improves air quality and reduces wastes by using eco-friendly cleaning products	Installed 400 waterless urinals and water efficient restroom fixtures	n/a

6 USGBC Greenbuild, 2013, Presentation. Philadelphia, PA, November 20, 2013.
7 Go Green Playbook v11
8 http://www.esiwaste.com/envirosolutions-inc-signs-fedex-field-contract-for-waste-collection-services/ (accessed 1/20/14)
9 http://www.redskins.com/news-and-events/article-1/Redskins-Bring-Solar-Power-to-FedExField/9faf61f7-3878-4402-aba3-42be39ed2dfd Accessed 1/20/14 at Redskins.com
10 http://www.examiner.com/article/the-baltimore-ravens-m-t-bank-stadium-recognized-for-being-green (accessed 1/20/14)

MLS Examples of Sustainability Outcomes Achieved at MLS Sports Stadia

Below is a listing of sustainability outcomes that have been achieved by MLS stadiums. This listing can be used to help stadium design and operation teams see what can be feasible at the scale of MLS stadium operations.

MLS Stadium	Energy	Materials	Water	Land/Transportation
Jeld-Wen Field (Portland Timbers)[11] LEED Silver Existing Building (2011)	Improved electrical efficiency by more than 40 percent compared to baseline.	Divert 20% of all waste; using green certified materials	n/a	n/a
BBVA Compass Stadium (Houston Dynamo)[12] LEED Silver New Construction (2012?)	Reducing energy use 20.41% using the ASHRAE 90.1-2007 baseline calculation methodology	Sourcing 98.42% of the total wood-based building materials from FSC certified forest;	Reducing water use by 41% from a calculated baseline through the installation of high-energy toilets and non-water;	Providing preferred parking spaces for low-emitting and fuel-efficient vehicles;
Seattle Sounders FC[13] CenturyLink Field, home of the Seattle Seahawks and Seattle Sounders FC	n/a	The teams invested in new composting equipment and a cardboard baler, increasing cardboard recycling by 16 percent. They also launched a composting program and added 200 new recycling bins	N/a	n/a

[11] http://mls.greensports.org/greener-building/leed/ (accessed 1/20/14)
[12] http://www.houstondynamo.com/news/2012/12/bbva-compass-stadium-earns-leed%C2%AE-silver-certification-us-green-building-council (accessed 1/20/14)
[13] http://www.energydigital.com/top_ten/top-10-energy-efficient-stadiums (accessed 1/29/14)