District of Columbia Office of Planning

Office of the Director

June 9, 2011

RE: NoMa Public Space and Water Management Study, Final Report

Dear NoMa Stakeholder:

The Office of Planning recently completed the *NoMa Public Space and Water Management Study*. The project was undertaken in order to find a 'nexus of opportunity' between the rapidly occurring development within NoMa, an aging storm water infrastructure, impending storm water management regulations, with the goal of creating a park for this neighborhood. The analysis undertaken throughout the project showed that, while there is an important relationship between storm water management strategies and the potential to provide new parks in NoMa, it does not appear that economies associated with storm water will cover the cost of a site for a new neighborhood park. Property owners and developers believe they can meet the new, stricter storm water management requirements—adopted in response to DC's storm water permits negotiated with the U.S. Environmental Protection Agency—on private property. They concluded that they have little incentive to consider a more complicated storm water management solution that could include an off-site storm water facility that would also serve a shared, publicly accessible open space and neighborhood park.

The study does, however, provide a roadmap for ways the public and private sectors can take the lead in incorporating Low Impact Development strategies into streetscape plans. It also highlights storm water management best practices for private property. The document is an effective tool for promoting "green" development practices in NoMa and in other high-density urban neighborhoods. It also furthers the discussion on progressive strategies that combine park space with storm water storage facilities—even as it outlines the challenges that need to be overcome in creating these kinds of public assets.

Addressing storm water issues in ultra-urban settings is a challenge facing cities across the country. Throughout the District we have ample green spaces lining our wide streets that can be used effectively to absorb storm water. Our history of using part of the street right-of-way as a component of our park system gives us an advantage in addressing this challenge. In NoMa, streetscape guidelines reinforce this idea and set aside part of the sidewalk pedestrian area as green space.

The *NoMa Public Space and Water Management Study* is available on the Office of Planning's website at www.planning.dc.gov. Should you have any questions, please contact Chris Shaheen of my staff at (202) 442-7616 or chris.shaheen@dc.gov .

Sincerely,

Harriet Tregoning
Director

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NoMa

NORTH of MASSACHUSETTS AVENUE

PUBLIC SPACE and WATER MANAGEMENT STUDY

FINAL REPORT
JANUARY 26, 2011

Government of the District of Columbia

Vincent C. Gray, Mayor

ACKNOWLEDGEMENTS

District of Columbia

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EXECUTIVE SUMMARY

The NoMa Vision and Development Strategy (2006) envisioned NoMa as an emerging "green" neighborhood that would showcase the best practices for sustainable development in the District of Columbia. Storm water management is a key component of the District of Columbia's sustainable development strategy that warrants further evaluation, and this document represents an effort to find a nexus between storm water management and other opportunities and challenges facing NoMa. Specifically, this study sought to find a nexus between the projected development trends within NoMa, an aging storm water infrastructure and impending storm water management regulations, and the need to provide a park space for this rapidly developing neighborhood.

To determine shared opportunities for park spaces and storm water in NoMa, the study completes a comprehensive evaluation of the project area's existing and built environment and proposed storm water regulations and fees. It identifies storm water practices most practical in an ultra-urban environment, and reviews best practices for providing park spaces in dense urban neighborhoods. It recommends financing mechanisms that are most viable for acquiring park land and implementing sustainable storm water strategies. Finally, the document includes possible scenarios for how sustainable storm water practices could be used to create parks and open spaces in NoMa, and how these improvements could be funded.

Figure 1: The NoMa District

The report views open space and storm water management as critical components of infrastructure design that need to be integrated with more traditional streetscape design and building construction. As a way to rethink the form of the built environment and its relationship with storm water, the report strongly encourages that new infrastructure be thought of in terms as "gray", "green", and "blue". This is a more descriptive way to consider the difference between systems such as impervious parking lots, roofs, and roadways; parks, greenways, and conservation areas; and water resources and storm water respectively. It highlights the importance of public/private partnerships to achieve quality open spaces that can also treat storm water and provide multiple benefits to the overall community.

In terms of financial feasibility, the report looks at three separate elements in five potential scenarios for creating a park and open space network in NoMa that also manages storm water: (1) sources and uses of funding for one-time capital costs, (2) revenues and expenses for annual operations and (3) cost-benefit analysis for the property owner, neighboring owners and public bodies (DC Government and DC Water). Numerous research studies cited in the study have shown a positive relationship between, for example, the creation of a well-maintained park and an increase in neighboring property values or between decreased operating expenses and increased property value. However, since it is not possible to precisely calculate these results, the report employs a break-even approach to quantify the level of initial funding, annual revenue and/or increased property value that would be required to offset the cost of carrying out the specific set of improvements proposed within each scenario.

EXECUTIVE SUMMARY

Analysis shows that while there is a connection between storm water management strategies and providing parks and open space, in NoMa it is not as strong as had been hoped for. Property owners and developers believe they can meet new, more strict storm water management requirements on private property – requirements adopted in response to the DC's storm water permits negotiated with the EPA - and have little incentive to consider a more complicated storm water management solution that could include an off-site storm water facility also serving as a shared, publicly accessible open space. Initial ideas for using fees being collected to fund compliance measures required as part of the DC's storm water permits to acquire park land also failed to produce a strong connection. Funds raised through the Impervious Area Charge will raise money to implement DC Water's Long Term Control Plan and are already allocated. The District of Columbia's Impervious Area Charge is slated to be used in areas covered by the MS4 permit, and NoMa is outside of the area covered by this permit.

However, this study has shown that there are many options for handling and reusing storm water in NoMa on both private property and in public space. Several sustainable practices are being used in NoMa currently, and there are others that have not yet been incorporated into development. Despite NoMa's ultra-urban environment, its wide street rights-of-way offer a distinct opportunity for this area to incorporate storm water management practices in public space. These storm water management facilities can treat water from the public right-of-way as well as providing amenities for a linear park system along 1st Street and K Street. Research also shows that increases in property value resulting from establishing a park in NoMa is a likely reality that opens up other means for financing park land acquisition.

The study provides various NoMa-specific scenarios that can then be applied to any development or public work project across the District.

Figure 2: Park (Parcel) used for passive recreation and stormwater management

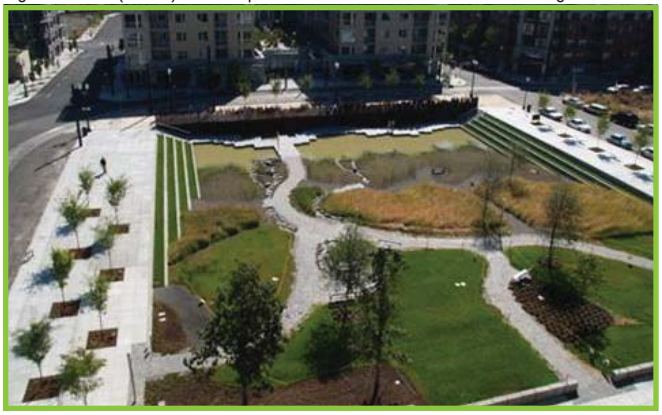

Figure 3: Greenspace (Network) used to link parcels while creating a pedestrian friendly environment.

INTRODUCTION

The urban environment can be divided into three distinct infrastructure networks. These networks have historically been nearly independent of one another. This separation is due to the focus on the automobile in urban planning since World War II when America shifted its focus from civic pride to speed of travel. As a result, the gray infrastructure network, which supports transportation and utilities, has been the main factor in urban planning for the last half century. The emphasis on the necessity of roads and parking lots has stunted the green network, which supports social and cultural uses, as well as environmental functions. Open space has been treated as an afterthought in the urban environment and most often consists of disconnected and blighted parcels that are separated by heavily trafficked roadways and concrete drainage structures. The blue infrastructure network, which consists of natural systems and stormwater management, most often is relegated to an underground pipe system that deposits untreated stormwater into receiving bodies of water.

The separation of the three networks as well as the subordination of the green and blue networks to the gray has led to major problems that are affecting urban areas around the country. The Blue network is susceptible to flooding because its current design can be overwhelmed by major storms. Studies have shown that the general lack of green space in the urban environment is a serious health problem.

In order to correct these problems urban planning needs to be approached as a holistic endeavor with an emphasis on green infrastructure. A focus should be placed on creating “multifunctional landscapes” in public spaces which help to interlace these networks together by functioning as a part of multiple infrastructure systems. For example, a weir or lowhead dam which is commonly used to slow down and raise the level of a stream in a fenced off parcel of land can be unattractive. However, by incorporating a pedestrian bridge with a trail system in a publicly accessible green and park like environment, the aesthetic value of the space increases and combines multiple infrastructure needs. By serving multiple functions, these types of solutions help to capitalize on the limited space available in urban areas, reduce cost of construction and increase the value of properties.

Stormwater is currently collected and conveyed through DC’s sewer system. Part of DC’s stormwater drains to a combined sewer system where stormwater and sanitary sewage are combined in the same sewer conveyance system and sent to the Blue Plains Wastewater Treatment Facility. Other parts of DC drain to a separate storm sewer system that releases stormwater runoff to the local creeks and rivers. During larger storm events, the combined sewer system is inundated and excess flows of stormwater and sanitary sewage are released untreated to the Potomac River, Anacostia River, and Rock Creek. The North of Massachusetts Avenue (NoMa) study area is located within a combined sewer area though efforts are underway to separate these sewers over time.

Past development occurred prior to the DC’s environmentally conscious stormwater management and open space requirements that require the use of green space and pervious areas for infiltrating precipitation. The result is that the existing land use has converted most space to impervious cover. The District of Columbia’s environmental, stormwater management, and natural space goals are to sustain built functionality while expanding the pervious open space as redevelopment progresses.

Space is at a premium within the NoMa area, which consists mostly of privately owned land. This report seeks to integrate and emphasize the multifunctional landscapes within the bounds of NoMa, by outlining the reduced costs and the increased values if multifunctional landscapes are strategically integrated into the urban fabric.

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NoMa

NORTH of MASSACHUSETTS AVENUE

Analysis

1

Amber Real Estate L.L.C.
Baker
District of Columbia Office of Planning
dc op

FINAL REPORT
2011.01.26

1.1 OVERVIEW

Vast impervious surfaces in the urban environment can lead to local and regional environmental degradation; the problems can range from old underground pipes bursting from overuse or downstream flooding as bodies of water receive uncontrolled stormwater. Design solutions for developments in urban areas will need to address new on-site control regulations and quality of life issues for the immediate surrounding community.

1.1.1 OPEN SPACE

The District of Columbia has benefited from numerous far-sighted master plans that recognized the importance of open spaces and parklands, as well as how these could enhance the overall architecture and urban fabric of the nation's capital. A "sense of place" in DC's neighborhoods is a function of its cultural history, physical features, and visual qualities. Neighborhoods with the strongest identity tend to share certain characteristics, such as walkablity, well-defined edges, attractive streets, and character-defining architecture.

With a ratio of 12.9 acres of parkland per 1,000 residents, DC appears to have an adequate supply of parks and open spaces. However, much of DC is covered with very large parcels of land that are considered natural resource areas under the control of the National Park Service (NPS). Active recreation facilities are primarily managed by the DC Department of Parks and Recreation and are heavily used. Parks are sometimes disconnected from a community because of physical barriers such as roadways, railroad tracks, or unsafe dilapidated properties. In many communities, especially ones with significant redevelopment like NoMa, existing parks are too small to meet the needs of the growing population that, in most cases, is living in dense conditions that may provide private green space, but not publicly accessible open spaces.

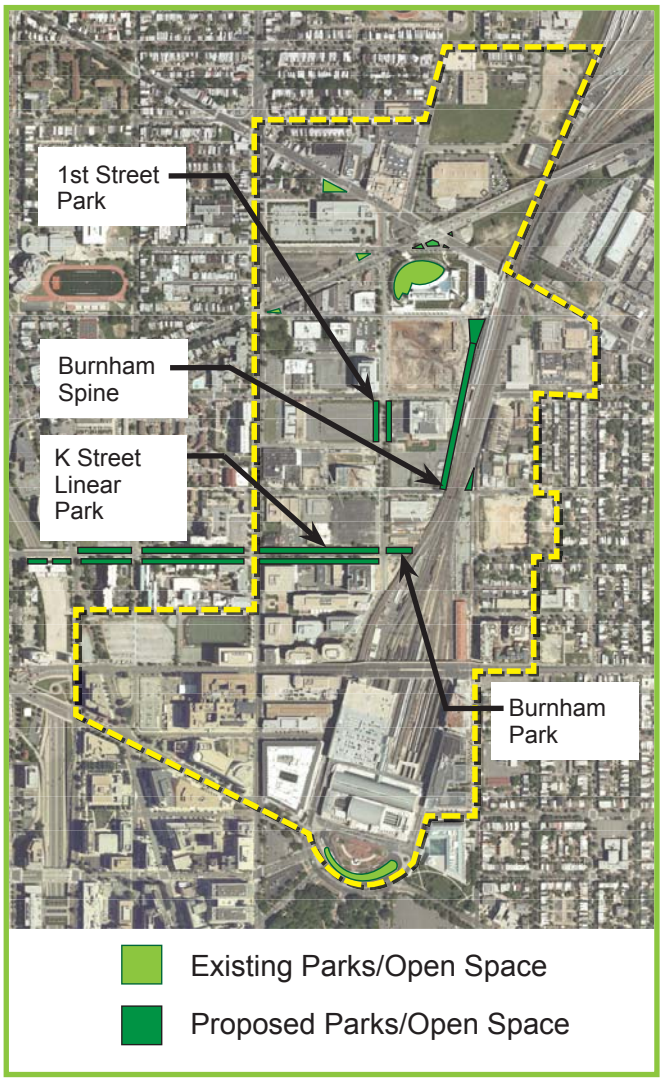


Figure 4: Parks and Open Space within NoMa

Currently, residents in certain areas lack adequate open space for their daily needs, including NoMa. As DC's population increases over the next 20 years, more spaces will be needed to meet the demands for programmed parks, open spaces, and recreational activities. Given the built-out character of the city, finding land whether from existing publicly held public properties, or from private sources for parks will be difficult and expensive. Creative financing mechanisms and coordinated public/private partnerships will be necessary to achieve the full potential of communities in NoMa's dense urban environment. This study will identify potential financial and economic tools that will help create successful open spaces that are part of a revenue-generating model, rather than viewed as a competing interest for valuable real estate.

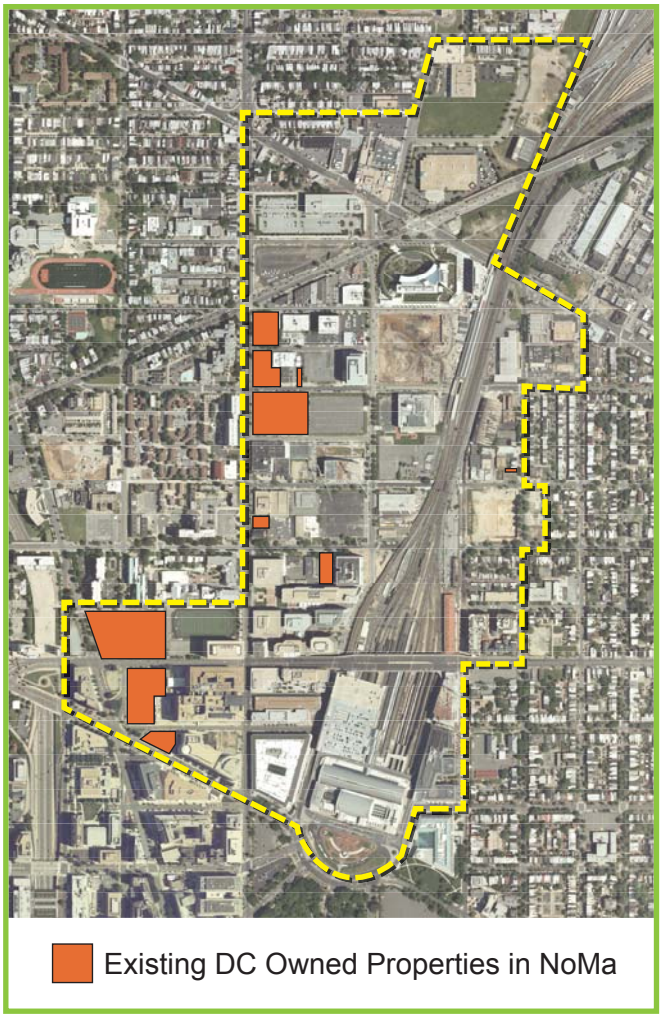


Figure 5: The District of Columbia currently owns a limited number of sites within NoMa which range from vacant lots to fully constructed buildings. Some of these sites may be appropriate for open space development while others are subject to long-term lease or development plans that have already been approved for other uses.

1.1.2 STORMWATER

The District of Columbia manages a stormwater program that must comply with US Environmental Protection Agency (EPA) requirements for the runoff of precipitation that drains to the ground, streams, and sewer system. The EPA Office of Wastewater Management regulates stormwater runoff through two separate programs that are differentiated by the type of sewer collection system involved. Sewer systems that are designed to collect and discharge only stormwater are managed through an EPA approved Municipal Separate Storm Sewer System (MS4) permit. Sewer systems that collect both stormwater and sanitary wastewater, otherwise known as combined sewer system (CSS), are managed through a wastewater treatment plant operating permit. DC stormwater programs operate under two permits and divide their management between two agencies; this results in distinct and coordinated stormwater management programs.

> Stormwater regulations generally only impact properties seeking new permits, which does not account for most land use types or for properties grandfathered in under older and less environmentally protective requirements. For example, Philadelphia predicts that only 20 percent of its lands will be managed through land-based controls in the form of stormwater management regulations, and that 20 percent is affected only after the new regulations have been in place for 20 years. Vacant properties, public lands, streets and waterfront areas will all need to be addressed through other policy approaches. (EPA, 2010)

DC Water (Water and Sewer Authority) operated both permits until 2007, when the newly created District Department of the Environment (DDOE) took over management of the MS4 permit for the separate storm sewer system. While different agencies control different sewer systems, they do have common objectives for stormwater management. The extent of each agency's permit responsibility is defined by the limits of the drainage areas that flow to the combined (operating permit) or separate (MS4 permit) sewers.

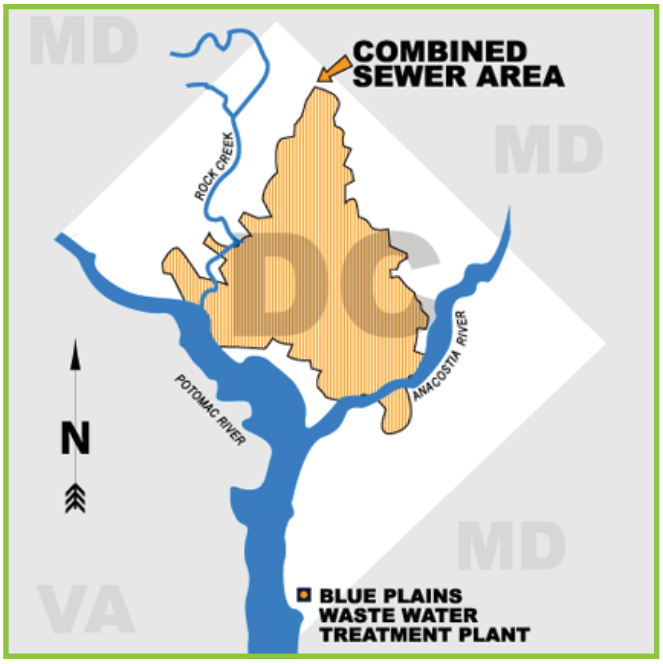


Figure 6: Map of Combine Sewer Area in DC (NoMa Falls Within this Area)

DC Water manages a combined sewer system that flows through the Blue Plains Advanced Wastewater Treatment Facility before discharging to the Potomac River at the southern end of DC. The combined sewer system was designed to collect sanitary and stormwater runoff and convey it away from inhabited areas to the Blue Plains Waste Water Treatment Plant. As originally designed, when runoff from larger storm events causes the capacity of the combined sewers to exceed a specified elevation, the excess volume is diverted to combined sewer overflows (CSOs)

> The District of Columbia is not unlike many older urban areas, such as Philadelphia and Chicago. Separating sanitary and stormwater is a relatively new concept in urban infrastructure design starting around the early 20th Century. Long-term planning strategies require new infrastructure improvements that include the installation of a separate sanitary and storm conveyance and collection system. However, it is not uncommon for new conveyance systems to enter a larger combined system. This may seem counter-productive, but the long term goal is for the two systems to be completely separated as further infrastructure improvements are carried out.

that discharge untreated sanitary sewage and stormwater to the local rivers. The surcharge elevation that corresponds to the excess capacity is set at a level to maintain public health of property connected to the sewer systems and to prevent sewage from rising up through indoor plumbing or from manholes and onto the land surface. The overflows degrade river quality and DC has signed a Long Term Control Plan (LTCP) with the EPA that was estimated to cost $2.2 billion over twenty years to dramatically reduce CSO occurrence by 96 percent. In 2010, DC Water raised the LTCP estimated cost to $2.4 billion. The LTCP will add capacity to the combined sewer system and Blue Plains to temporarily store the excess volume of stormwater that otherwise would cause CSOs.

Blue Plains is the largest advanced wastewater treatment plant in the world, treats sanitary waste from 1.6 million people, and is the largest point source contributor of phosphorus and nitrogen to the Potomac River and Chesapeake Bay. To manage the nutrient loads, Blue Plains was the first large sewage treatment plant to reduce phosphorus loads to the limits of technology in the 1980s and also attained a forty percent reduction in total nitrogen loads before other treatment plants. And Blue Plains has continued to enhance treatment as technology improves. For example, because of efforts to mitigate degradation of the Chesapeake Bay, EPA approved a new operating permit for Blue Plains in September 2010 that requires them to reduce nitrogen loads by another 45 percent by 2014 at a cost of nearly $1 billion.

DDOE manages the separate storm sewer system (MS4). By definition, this includes all separate stormwater conveyance such as storm sewers, swales, and conveyance channels that drain to separate sewers and groundwater, streams, and rivers. The MS4 permit sets standards for the quantity and quality of stormwater released to the environment. For example, the revised MS4 permit that is currently under negotiations with EPA specifies that an increase in infiltration of stormwater to groundwater is required, as is retention of the 1.2 inch to 1.7 inch storm event on site to the maximum extent practical. The 1.2 inch retention is for non-federal property and the 1.7 inch retention is for federal property. The MS4 permit also establishes requirements for reducing pollutant loads released to open water bodies and for retrofitting twenty percent of impervious areas that currently are under managed, with twenty percent of that area to be in public rights of way.

A requirement of the MS4 permit is to revise Title 21, Chapter 5 of the DC Municipal Regulations (“Water Quality and Pollution”) that govern management requirements of stormwater. Once these regulations are finalized, all new development and redevelopment will be required to meet stricter, more environmentally responsible stormwater management requirements. Because developers meet at a minimum the stormwater requirements in place at the time of their design, older developments are most always under managed compared to current and future regulations. All new development, whether in the combined or separate sewer areas, must meet the latest stormwater requirements. Regarding NoMa, if the stormwater regulations are revised by roughly the end of 2011, all development designed thereafter would be required to meet the stricter standards. Existing development can voluntarily improve management up to or beyond the latest requirements. One incentive for voluntary improvement is discussed later regarding stormwater fees and potential discounts to reduce the fee amount.

1.2 MOVING FORWARD: MULTI-PURPOSE INFRASTRUCTURE PROJECTS

Although EPA authorizes two distinct permits that regulate the minimum requirements for the District of Columbia, DC's stormwater management program should be considered as one city-wide goal towards improving the management of stormwater quantity and quality. This goal would be to minimize the volume of water that reaches any sewer (combined or separate) and reduce the pollutant loads that enter DC's streams and rivers. DC's management of stormwater should be considered a comprehensive program that achieves the combined objectives of the MS4 permit, the Blue Plains National Pollutant Discharge Elimination System operating permit, and additional community goals and objectives.

An alternative way of approaching infrastructure improvements is through a combined infrastructure approach. Public works projects often serve a single purpose and resolve an immediate need. The alternative approach combines various long term improvements as part of an overall multi-purpose solution. In this approach, projects are more complicated because they impact a more diverse group of stakeholders and require cross-agency coordination. For these multi-purpose approaches to become successful, amenities which in the past have been considered a luxury need to be considered a requirement much like utility relocation or transportation improvements.

There are three types of infrastructure in the urban environment:

- Gray Infrastructure – the type that support transportation, developments, parking, and utilities. Most utilities can be considered part of this system, which transports the "movement" of goods such as electricity, water service, sewer, gas, and others.
- Green Infrastructure – the type that supports natural systems, parks, greenways, conservation land, and recreational facilities.
- Blue Infrastructure – the type that controls stormwater, flood control, and stream and river habitats.

Interim changes in 2007 to the City's 2004 MS4 permit that included more multi-purpose infrastructure projects and enhanced stormwater management were estimated to increase the cost of management of the separate sewer drainage areas by $3.4 million per year. The annual increase in costs will be greater with the next MS4 permit, particularly because of the requirements to retrofit twenty percent of under managed impervious areas. Increased implementation and current observation of multi-purpose infrastructure project

Philadelphia gradually established policies for stormwater banking and trading to accommodate developers and institutional landholders who prefer to build larger green infrastructure projects that connect multiple sites. Based on their experience, the City recommends establishing the parameters of banking and trading programs upon promulgation of new stormwater rules, instead of taking a gradual approach. (IEc, 2010)

Figure 7: Examples of the impacts of Single Purpose Infrastructure Projects

Gray Infrastructure – transportation projects and utilities focusing on the movement of single occupancy vehicles can cause increased traffic congestion.

Green Infrastructure – lack of adequate funding for landscaping creates erosion problems.

Blue Infrastructure – lack of adequate stormwater management controls pollute downstream bodies of water.

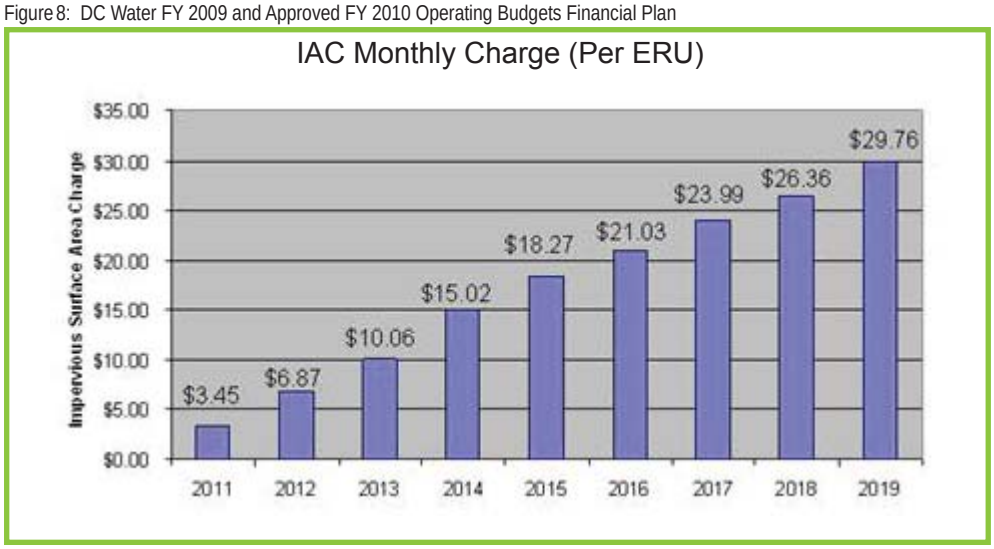
measures will demonstrate the degree to which these measures reduce stormwater flows during large storm events to the combined sewers. This knowledge can then be used, where feasible, to determine if there can be a related decrease in the additional capacity specified in the LTCP to reduce CSOs. Several demonstration projects using on-site stormwater controls that fit into the multi-purpose infrastructure category are to be implemented within the Rock Creek watershed to determine their effectiveness at reducing storm-water flows to combined sewers.

Costs for compliance with the September 2010 Blue Plains operating permit that requires further reduction of the nitrogen that is discharged into the Potomac River will be extraordinarily expensive. These program costs will increase in the near future as two new stormwater programs are implemented over the next few years by EPA. One is the creation of an implementation plan for the Chesapeake Bay Total Maximum Daily Load in December 2010. The other will be the federal implementation of a rule to require more stringent stormwater management for post development. This could result in additional revisions to Title 21, Chapter 5 of the DC Municipal Regulations to those currently being considered that are similar to or more strict than those revisions necessary to comply with the new MS4 permit.

For the past 40 years, infrastructure planning for automobiles has dominated the shape of the urban fabric. The emphasis on the movement of cars and the transportation of goods has degraded other aspects of the built environment. Today, the systems represented by the green and the blue infrastructures are in need of dramatic transformation and repair. Roadways present a major obstacle for pedestrian accessibility and connectivity to open spaces, as well as interfering with wildlife habitat and the natural hydrologic processes critical for a balanced ecosystem and ground water recharge.

In order to correct these problems, urban planning needs to support an integrated infrastructure improvement program that weaves together multiple goals and engages various public agencies. The relationship between public agencies and the private sector also needs to be strengthened as land in urban environments becomes more scarce. Innovative approaches involving hybridized gray, green and blue systems should be explored through demonstration projects, grants, incentives, and outreach programs, as well as capital improvement projects. While improvements to interim conditions may be necessary, emphasis should be placed on moving beyond short-term projects and investing in long-term and wide ranging multi-purpose infrastructure improvements.

Figure 8: DC Water FY 2009 and Approved FY 2010 Operating Budgets Financial Plan



1.3 STORMWATER FUNDING PROGRAMS IN DC

Municipal programs that require long term commitments, especially those that are regulated by law, are most efficiently operated when a dedicated monetary flow is guaranteed. DC has developed enterprise funds to provide these monetary flows for the MS4 program and the LTCP. Enterprise funds can only collect funds for a dedicated purpose and the funds must only be collected to cover anticipated expenditures. The two enterprise funds are the:

- Impervious Area Charge (IAC), managed by DC Water, to cover the expenses of implementing the LTCP
- Stormwater Fee, managed by DDOE, to fund compliance with activities required by DC's MS4 permit.

1.3.1 IMPERVIOUS AREA CHARGE (IAC)

The FY10 Impervious Area Charge (IAC) is $2.20 per Equivalent Residential Unit (ERU)/month, rising to $3.45 per ERU in FY 2011. An ERU is defined as 1,000 square feet of impervious area and is based on a median area of a single family residential property.

The DC Water FY09 and Approved FY10 Operating Budget projects that the IAC will increase dramatically as outlays for the federally mandated CSO LTCP increase. By 2013, the Operating Budget projects the monthly charge to be $10.06, and by 2017 the monthly charge is estimated to be $23.99. DC Water has proposed further increases after 2017.

DC Water and the DC Government are considering a system of discounts for property owners that take measures on their properties to reduce the cost of the public stormwater-related programs. The discounts can be associated with measures to reduce stormwater runoff beyond that already required or to reduce the amount of peak stormwater runoff.

DC Water bills each customer within the NoMa study area for this fee and has data on the amount of impervious area for each customer to enable individual IACs to be calculated.

Since the current IAC amount billed for each parcel is directly related to the impervious area in square feet this study uses either the billed amount for existing developments or the calculation derived from impervious area for modeling purposes within the NoMA project boundaries.

1.3.2 DC GOVERNMENT STORMWATER FEE

For FY 2010, the DC Government Stormwater Fee is $2.57 per ERU/month rising to $2.67 per ERU/month in FY 2011. As of May 1, 2009, the stormwater fee structure was revised to better associate the charges to the DC Government's cost of treating stormwater runoff; this is accomplished by using the impervious area as a surrogate measure of stormwater runoff and is the basis for the ERU that is used to calculate each property owner's fee. The stormwater fee is collected through DC Water's monthly water/sewer service bill to property owners. Impervious parcels that had not received a DC Water bill prior to the May 1, 2009 implementation of the stormwater fee (such as parking lots or vacant lots with impervious cover) now have a DC Water account established precisely for collecting the IAC and stormwater fees.

Future increases in this fee are projected to fund DDOE's stormwater-related expenditures, but are not yet specified.

HOW TO DETERMINE STORMWATER CHARGES FOR NON-SINGLE FAMILY RESIDENTIAL PROPERTIES

The monthly fee in 2010 per ERU (1000 S.Y.) is:
- $2.20 per month for the IAC
- $2.57 per month for the Stormwater Fee

Determine the parcel impervious area in sq. feet
Multiply the parcel impervious area by:
- $0.0022 for the IAC
- $0.00257 for the stormwater fee

1.4 CURRENT AND EXPECTED CHARGES AND FEES

Using the NoMa Business Improvement District (BID) boundary to define the extents of the study area, the fiscal impacts of existing DC stormwater fees/regulations and the new fee structure/regulations proposed for DC were evaluated. DC Water billing data on the Impervious Area Charge (IAC) fees currently charged for properties within NoMa was used to provide the impervious area for each currently billed parcel. IAC charges are levied per ERU, which is defined as 1,000 square feet of impervious area and is based on the median area of a single family residential property. The IAC considers all driveways and the building footprint of any parcel to be impervious, and therefore chargeable. The difference between the total lot size and the impervious area is considered "permeable" and therefore not subject to the IAC fee.

For the purposes of this analysis, future IAC charge metrics over the study time line have been based on charge data in the DC Water FY 2009 and Approved FY 2010 Operating Budgets Financial Plan, shown in Figure 8.

The separate DC Government Stormwater Fee is assessed based on ERUs. The same criteria as the IAC are used for calculating ERUs. Based on discussions with DDOE representatives, the Stormwater Fee for each lot was assumed to remain at the level of $2.57 plus annual escalations to allow for inflation over the study period.

The proposed discount scheme is likely to be administered through an application and review process, and the metrics associated with fee reductions have yet to be developed. No IAC or Stormwater Fee discounts were factored into fee estimates produced for this exercise since the purpose was to estimate the total fees that would be generated within the NoMa study area. Federal, public, and non-profit property owners all were assumed to pay both the IAC and Stormwater Fee at the same rate as other property owners through 2017.

Property addresses and SSL (Square/Suffix/Lot) IDs from the NoMa BID and developed from the DC Office of Tax and Revenue data (lot area data) were validated against DC Water data to provide a 2010 plot benchmark for the study area, from which future IAC projections could be calculated. Once this benchmark had been established, the NoMa BID anticipated development delivery schedule (Shown in Figure 9) was validated in conjunction with the Office of Planning, and the following time line was developed for the likely build out of future parcels:

DC Water, DDOE, and the DC Government are considering a system of discounts for individual property owners that take measures on their properties to reduce the impacts on public stormwater infrastructure. The discounts will be associated with measures to reduce stormwater runoff beyond that already required, or to reduce the amount of peak stormwater runoff, and may be applied to both IAC and Stormwater Fee charges separately.

- 2010 – Current conditions (Light Blue)
- 2013 – The completion of any projects currently under construction (Yellow)
- 2017 – Full build out of all projects in NoMa development pipeline (Dark Blue)
- Beyond 2017 – The completion of development on additional, currently undeveloped sites identified by Office of Planning within NoMa

The IAC for major construction projects in the pipeline were estimated assuming a 90% imperviousness ratio, which was based on analysis of available NoMa development plans and validated against model DDOE Development Stormwater Scenarios. Projected lot coverage data was then combined with estimated future IAC charge rates to develop future user fee projections for the different development scenarios.

1.5 STORMWATER PROGRAM DISCOUNTS

The District of Columbia has been developing a discount program that provides landholders an opportunity to reduce the fees that they pay for the IAC and Stormwater Fee. DC Water is developing the discount policy for the IAC and DDOE for the Stormwater Fee; both agencies have coordinated the development of their discount policies so that they are reasonably similar. The DDOE Stormwater Fee discount policy is anticipated to be authorized in late 2010. While not final, the Stormwater Fee discount policy proposes the following features:

Figure 9: NoMa Development Delivery Plan - see timeline/key on page 9 for likely build out of future parcels

- The maximum fee reduction will be 30 percent;
- Properties that install stormwater management practices that reduce the volume of stormwater runoff from their properties will be eligible for stormwater discounts; and,
- Non-residential properties are initially eligible with residential properties planned to be phased in at a later date.

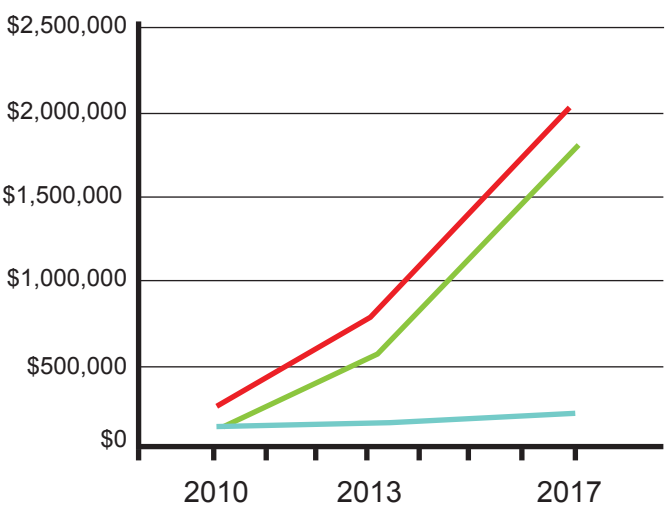
A corollary but separate program is being considered that would also offer financial benefits to property owners through the use of the following opportunities:

- Undeveloped land can implement stormwater management and bank the accrued management for trade to others; and,
- Adjoining properties owned by the same landholder can distribute stormwater management across both parcels in a reasonable manner to meet stormwater management requirements as if they are one large parcel.

The discounts are awarded based on reduced impervious area or stormwater practices that provide an equivalent reduction in stormwater runoff. The ability to trade banked stormwater management discounts allows landholders to jointly purchase open space and install stormwater management practices that they can then use to offset stormwater management shortfalls on their properties. How this is implemented still needs to be gauged since the MS4 permit and the revisions to the stormwater requirements will require landholders to prove that they cannot meet all stormwater requirements on-site before waivers are allowed. Without a waiver, it may not be permissible to purchase banked stormwater discounts to meet the minimum stormwater requirements.

1.6 FUTURE OUTCOMES OF CHARGES AND FEES IN NOMA

The development time line associated with these scenarios has been derived in coordination with the NoMa BID and Office of Planning (OP) and is reflective of prevailing market conditions and the anticipated development delivery schedule. Figure 10 and Figure 11 show the expected revenue in NoMa for the IAC and the Stormwater Fee. The assumptions associated with the revenue estimate metrics have been developed and are presented below:

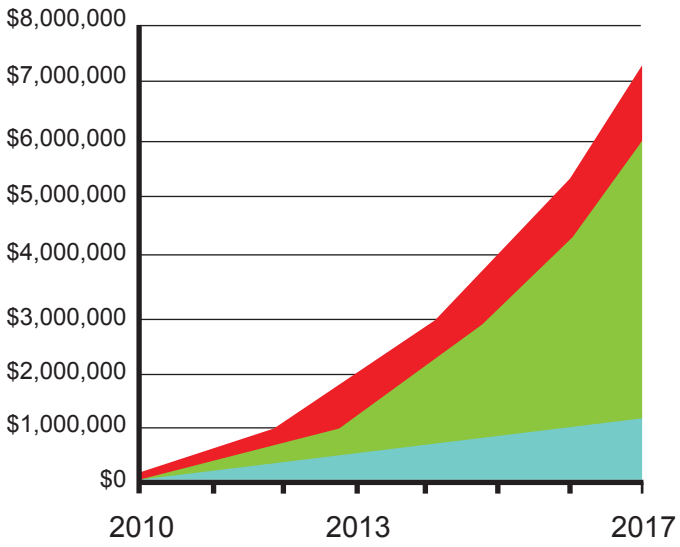


Estimated Annual Stormwater Fee (SW Fee)	
2010	$ 143,128
2013	$ 175,202
2017	$ 240,737
Beyond	TBA

Estimated Annual Impervious Area Charge (IAC)	
2010	$ 122,522
2013	$ 565,510
2017	$ 1,827,621
Beyond	TBA

Estimated Annual Combined Total	
2010	$ 265,651
2013	$ 740,712
2017	$ 2,068,358
Beyond	TBA

Figure 10: Total Annual IAC and Stormwater Fees for NoMa Properties



Estimated Cumulative Stormwater Fee (SW Fee)	
2010	$ 143,128
2013	$ 598,796
2017	$1,272,746
Beyond	TBA

Estimated Cumulative Impervious Area Charge (IAC)	
2010	$ 122,522
2013	$ 1,224,902
2017	$6,104,529
Beyond	TBA

Estimated Cumulative Combined Total	
2010	$ 265,651
2013	$ 1,823,698
2017	$7,377,275
Beyond	TBA

Figure 11: Estimated Cumulative IAC and Stormwater Fees for NoMa Properties

Year	Impervious Areas (acres)	Percentage Change from Impervious Area in 2010	Impervious Area as a Percentage of Total NoMa Property Sites
2010	107.21	-	66%
2013	119.90	12%	73%
2017	146.42	37%	90%

Figure 12: Anticipated changes in Impervious Cover within NoMa

- Future Impervious Area Charge (IAC) metrics over the study time line have been based on charge data in the DC Water FY 2009 and approved DC Water FY 2010 Operating Budgets Financial Plan.
- Information on the projected escalation of the DC Water Stormwater Fee was not available at the time this study was produced, and has been estimated with an annual escalation of 3% to allow for inflation over the study period.
- As highlighted in the methodology portion of this study, a system of discounts for individual property owners that is mandated in the authorizing legislation for the DC Water Stormwater Fee and IAC has not yet been introduced by DDOE and DC Water, and can not be incorporated into this analysis.
- Estimates developed assume no discounts and full collection.
- All remaining sites that are part of the NoMa development construction schedule are estimated to be completed by 2017. All of these future development sites have similarly been benchmarked at an average imperviousness of 90%.

Based on these assumptions, the Stormwater Fee and IAC revenues for 2010, 2013, and 2017 for the NoMa area are estimated as follows: the revenue increase for 2010 through 2013 is being directed by both an increase in stormwater fees; (in particular those associated with the IAC) and the introduction of large currently un-billed sites to the revenue stream. The emergence of these un-billed sites is a reflection of the ongoing development of properties in the study area, which typifies much of NoMa. The change in impervious cover within the study area is presented in Figure 12.

When the DC Water data was developed, a number of the larger lots had their imperviousness benchmarked as construction sites from satellite imagery. Based on the data received for the most recent NoMa area IAC charges, impervious area calculations for such sites were administered when nothing impervious (pavement/building) was there and consequently no charge was levied. Depending upon the frequency of updates to impervious area estimates, these sites will likely not be charged until new aerial imagery has been developed. This is shown between 2010 and 2013 when development currently under construction, but not subject to stormwater charges, enters the revenue stream. It is recommended that in the future, IAC charges should be more effectively leveled against such developing sites throughout the District of Columbia.

Depending upon how the future stormwater discounts scheme is structured, large lots within NoMa such as government and commercial uses could likely save fees by installing on-site stormwater Best Management Practices (BMP). In addition to generating future IAC and stormwater fee reductions, BMPs could also be supported by grants DDOE currently has available. The life cycle cost of BMP investments and maintenance requirements associated with such techniques will be developed in a later section of this study.

If the creation of a separate stormwater district for NoMa was considered, in which a portion of funds could be placed in an account ear-marked for comprehensive funding for BMP projects and/

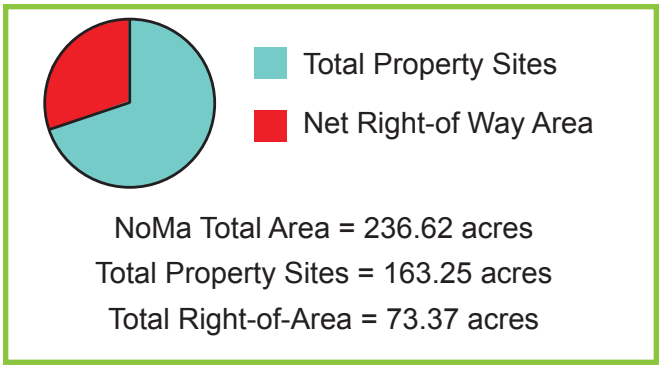


Figure 13: Breakdown of Land Use within NoMa

or possible land acquisition for a park/open space, this estimate of the cumulative stormwater fees collected shown in Figure 11 could be considered for use to fund a bond for such an initiative. The implementation of such a scheme would be challenging however, as funds would likely have to come from the IAC, which is already earmarked for DC Water construction expenses. Unless future capital expenditures for the LTCP can be reduced or modified, any IAC funds set aside for a project other than what is currently earmarked would need to be raised from an alternative source or fee increase. In addition, Stormwater Fee revenue would typically not be eligible to fund projects in NoMa. In order to achieve MS4 compliance, Stormwater Fee revenues are used to fund projects in the separated storm and sanitary sewer areas within DC, and NoMa is outside of this area. Funds would only likely be eligible to fund one time incentive/grant opportunities that are stormwater related.

1.7 STORMWATER ON PUBLIC LAND

The total size of the NoMa BID study area is 236.62 acres, with approximately one third of the study area estimated to be within the public Right-of-Way (ROW) shown in Figure 13. The ROW is not subject to stormwater fees or IAC, but DC has committed to treating approximately 20% of that area.

The majority of the public ROW (roadways and sidewalks) are impervious and roadway runoff in particular is likely amongst the most polluted, containing heavy metals and petroleum products from vehicles. The DC Comprehensive Stormwater Management Act (2008) requires DDOT, the agency responsible for the ROW, to develop an incentive based program and incorporate Low Impact Development (LID) practices in the public ROW. In accordance with this, permit fee incentives for incorporating LID features on public space to treat stormwater from the public space and fees for certain impervious surfaces or the excessive installation of impervious surfaces should be implemented. The NoMa Vision Plan and Development Strategy streetscape guidelines result in a decrease in the amount of paving in the existing sidewalks of approximately 30%. This decrease is being implemented throughout the neighborhood as properties redevelop and will help to address sidewalk-based runoff.

Treating and more effectively detaining runoff from the ROW of NoMa would lead to no reduction in stormwater fees charged to property owners or revenues for DC Water, unless a system of shared public/private treatment that provides a discount on developers' stormwater expenditure is proposed. However, the implementation of any such stormwater facility that combines and treats runoff from both sources, could be challenging. Parcel based performance targets exist for private sites, and treating excess ROW runoff on private property is not currently an attractive option for a private owner from a financial and liability perspective. Concerns also exist on a municipal level over treating public space water in a private system. For example, the enforcement of required maintenance and monitoring responsibilities and development of a long term commitment to the land for a stormwater facility are likely to be complicated. Nevertheless, this does not preclude private developers from making improvements in public space that will treat stormwater runoff from the ROW. In fact, some developers in NoMa have on their own initiative installed stormwater management improvements in the ROW which treat and slow ROW runoff.

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NoMa

NORTH of MASSACHUSETTS AVENUE

Recommended Best Practices

2

2.1 OVERVIEW

Washington, DC, has an extensive network of parks and public open spaces, but NoMa is currently not well served in that realm. Establishing a balance between development and open space in NoMa will be essential to its growth as a community. The value of open space may not only be measured in its success in meeting recreational needs, but also in creating a distinct urban form. Future open spaces will need to be multi-functional and may feature flexible-use spaces, large trees, water features, seating areas, and lawns. Retaining public access to these open spaces will be important for enhancing the livability of the surrounding neighborhoods. In many cases, agreements between DC and private developments should be sought where green spaces on private properties could be open to the public during the day and closed at night. Liability, security and operation issues would have to be resolved for property owners to become comfortable with such a scenario. Even where public access is not possible, the role of green spaces in improving the physical environment and shaping the visual quality of a neighborhood would be beneficial.

While individual sites provide a location for residents to congregate, networks weave open spaces together and provide a pleasant transition from one site to the next. The District of Columbia is served by four extremely large and well-known networks; the Monument Core, Rock Creek Park, Fort Circle Parks, and Anacostia and Potomac parklands. DC's public Right-of-Way (ROW) is not as high profile as these, but it contains over 30% of the DC's total land area. Animating this land is a crucial step in creating a vibrant urban experience. In fact, legislation known as the Parking Act, passed by Congress in 1870, first identified this goal in DC one hundred and forty years ago. It specifically designated a strip of land in the ROW immediately adjacent to the private property line as parkland. Originally the strip was used for plantings, though over time other elements were permitted, including bay windows and other projections. The land is still required to be maintained by the adjacent property owner for the benefit of the public and legally considered parkland.

In many cities renowned for successful street life, there is an active relationship between interior and exterior environments where lively sidewalk cafes, vending, and sidewalk entertainment create a sense of energy and repeatedly draw people back. Improving the public realm, whether through private or public funds, can send a powerful message to residents and businesses and encourage further investment.

Figure 14: Outdoor Chess Area in Harvard Square, Cambridge, MA

2.2 OPEN SPACE BEST PRACTICES

Numerous studies related to providing quality open space in the District of Columbia have been completed by various local and federal agencies, non-profit organizations, and private sector stakeholders. This study applies many of these recommendations to NoMa. Often hybridized versions of standards can be created to meet NoMa-specific needs. For example, the District Department of Parks and Recreation (DPR) developed a classification system for its parks and recreational facilities in its Five-Year Comprehensive Parks and Recreation Master Plan. The NoMa study adopts park classifications for Mini Parks and Neighborhood Parks from this plan with slight modifications such as service area and size. The NoMa study also creates a hybrid park classification - City Park - because a Community Park would not be suitable for the

conditions in NoMa since it is defined as a space between 5 and 15 acres. Another example study is the District Department of Transportation's (DDOT) classification system for roadways developed for the Anacostia Waterfront Transportation Architecture Design Guidelines (AWTADG). As part of this effort, DDOT modified standard roadway functional classifications, such as arterials and collectors, into Major Urban Streets. Although the AWTADG was developed for an area outside of this study, many of the recommendations of the AWTADG are considered for DC-wide projects focused on improving the public realm. This study therefore applies these recommendations to NoMa whenever possible. Other studies with relevant recommendations including the NoMa Vision Plan and Development Strategy, the NoMa Streetscape Design Guidelines, and the Comprehensive Plan for the National Capital are also used to support the recommendations in this study.

2.2.1 MINI PARK

NoMa would benefit from the creation of any park space, including mini-parks. Mini parks or triangle parks range from landscaped "islands" to places for socializing, playing chess, and small gatherings. Examples include courtyards open to the public, landscaped entrances into buildings, public commons, play lots, and green spaces with special uses. The NoMa BID has utilized the sidewalk plaza outside the N Street entrance of the New York Avenue Metro station as a location for lunchtime concerts and other public gatherings. These types of activities could be expanded if a larger open space were created.

Figure 15: Example of Mini Park-like open space (1/4 Acre in size), Outdoor Eating area in Harvard Square, Cambirdge, MA

- Few Mini Parks currently exist in NoMa
- Typical open space service area: Less 500 foot radius
- 1/4 acre

2.2.2 NEIGHBORHOOD PARK

Neighborhood parks provide informal, centrally located settings for neighborhood-based recreational uses such as mid-sized social gatherings. Examples include large courtyards open to the public, playgrounds, small athletic courts, formal parks planned for programmed events, and green spaces with furnishings and focal points. No Neighborhood Parks currently exist in NoMa.

Figure 16: Example of Neighborhood Park, 1/2 Acre in Size. Louise Kahn, Philadelphia, PA

- Typical open space service area: 1000 foot radius
- 1/2 acre

2.2.3 CITY PARK

Because of it's size and proximity to commercial and residential areas, a City Park would be a major destination used for events and community programs. Examples would be plazas used for markets, art exhibits, concerts, and planned or impromptu large social gatherings.

- No City Park currently exists in NoMa.
- Typical open space service area: 2000 foot radius
- 1 acre

Figure 17: Example of a City Park (1 Acre in Size): Daley Plaza,Chicago, IL

INTERIM IMPROVEMENTS TO SITES

NoMa, as many areas in DC, has been impacted by the slow economy which has stalled new development and multi-phased developments. The result is a disconnected landscape that features new construction next to vacant lots. Some property owners have converted these vacant parcels into temporary open spaces and even green infrastructure demonstration projects. This temporary treatment of an interim condition is becoming popular throughout the United States, especially during this slow economic climate, and is generally called "Temporary Urbanism". The size of some of the parcels in NoMa are large enough to support sizable open spaces that can be considered for instant parks, outdoor markets, short-term retail outlets, and special events. Short-term improvements in interim areas may be part of the overall long-term solution of creating a more livable community for the next ten years. Encouraging property owners to develop adjacent undeveloped areas would improve the potential for increasing rents in their own developments, as well as creating an environment that inspires new ideas for urban living. The goal of a coordinated effort involving private and public stakeholders would be to look beyond the temporary use and consider how the surrounding landscape can evolve over time without negatively impacting urban life in NoMa.

Figure 18: Interim Site Improvement

Green Parking Lot: A parking lot can be designed to provide amenity value and storm-water treatment and retain a private, revenue generating, parking provisions. A portion of the land could be left as a green open space with the hardscape area available for events.

Green Park-Like Open Spaces: Land to be developed in future phases should be attractive so surrounding land value and rents are not negatively impacted. Simple "greens" may include landscape-based stormwater management solutions or recreational spaces.

An example of an interim park solution exists between Pierce and L Streets on First Street.

2.2.4 PUBLIC RIGHT-OF-WAY IMPROVEMENTS

As previously noted, the Right-of-Way (ROW) comprises over 30% of the total land area of Washington, DC; this is the case in NoMA. The value of the right-of way is in exposing, controlling and highlighting views; providing a buffer between adjacent land uses and activities which may not be compatible; and, maintaining a recurring and recognizable connection between buildings, open spaces, and neighborhoods. The ROW also includes public green space adjacent to private property or "public parking". Creating improvements within NoMa's ROW will serve to solidify the neighborhood's identity and image.

MAJOR URBAN STREETS

These corridors direct people and potentially water towards the network of open spaces. Their ROW is wide enough to support landscaped-based stormwater management as part of the sidewalk and often act as linear parks and plazas supporting businesses.

Figure 19: Major Urban Street: First Street NE

- First Street, NE; M Street, NE; K Street, NE; H Street, NE; and New York Avenue
- 110-155 ft. ROW
- Typical open space services integral to city wide transportation network

LOCAL STREETS/ALLEYS

Minor streets provide access to each parcel of land either directly or through alleys, providing access for productive use of property. Local traffic should be encouraged while cut through traffic should be limited and discouraged.

Figure 20: Local Street: L Street NE

- All other streets and alleys within NoMa
- 50-90 ft ROW
- Typical open space services: Local neighborhood and property access

TRAILS

Hard or soft paved paths providing linkages within or between parks, facilitating access and exploration.

Figure 21: Trail: Metropolitan Branch Trail

- Metropolitan Branch Trail
- 1/4 to 1/2 mile between access points typical
- Typical open space services: part of a city-wide trail network with local park and open space benefits

2.2.5 SITE WORK ON PRIVATE PROPERTY

Within NoMa, nearly 70% of all land is composed of privately owned parcels rather than public ROW. Creating open space for public use on these private parcels serves to enrich the community as well as potentially increase property values. Public open space on private property also serves to provide a pivotal link between components of the surrounding open space network constructed on public properties and ROWs. Several properties within NoMa have taken this step, and created vibrant, well used public spaces on private property. Some of these projects include the Loree Grand phase II space used for outdoor community events and the NoMa Summer Screen; and the plaza at the N Street exit of the New York Avenue Metro which hosts public concerts and gatherings.

2.3 STORMWATER BEST PRACTICES

Stormwater will run off of most urban features unless properly managed. Impervious surfaces release most of the precipitation that lands on them as runoff. Not as obvious is that pervious surfaces like lawns, vegetated parkland, and gravel parking that have been compacted by construction equipment and post construction vehicular and pedestrian traffic generate far more stormwater runoff than natural woodlands and meadows. Stormwater best practices can be applied to pervious and impervious surfaces. A number of practices applicable to the types of ultra-urban conditions that exist within NoMa are presented below. For each practice, the following are provided: Description, Challenges and Opportunities, and Typical Maintenance.

Stormwater systems can be designed as stand-alone devices to meet regulatory requirements, or they can be combined into a “treatment train.” For example, a green roof can retain precipitation from smaller storms, while cisterns and ground level bioretention strips can treat the excess flow from the green roof that results during larger storm events. The selection of the best practice depends on the preference of the developer and designer, the pollutant sources, and the regulatory requirements. Runoff from a roof system will typically have lower sediment and pollutant loads than ground level sources. For example, runoff from roads will have higher particulate loads and pollutants like oil and grease and usually higher trash loads. Best practices must be selected for the volume of runoff anticipated as well as the types and concentrations of pollutants expected.

2.3.1 INTEGRATING STORMWATER IN OPEN SPACES

Most of these best practices apply whether the open space is vegetated or hardscape. While open space may not necessarily need stormwater best practices, the open space provides the opportunity to multipurpose land use and incorporate stormwater management. The open space, as described in the stormwater discount section, offers opportunities for combining resources among adjacent property owners to meet stormwater requirement and objectives. It also offers the opportunity to support the MS4 permit obligations to implement stormwater management that manages runoff from public ROWs.

LID BEST PRACTICES

Hardscape BMPs (2.3.2)

- Aeration strips under sidewalk (2.3.2.1)
- Permeable pavements (2.3.2.2)
- Porous pavers (2.3.2.3)
- Street trees continuous root zones (2.3.2.4)

Structural BMPs (2.3.3)

- Cisterns (2.3.3.1)
- Green roofs (2.3.3.2)
- Underground storage facility (2.3.3.3)

Vegetative BMPs (2.3.4)

- Bioretention cells (2.3.4.1)
- Conservation landscaping (2.3.4.2)
- Shade tree planting (2.3.4.3)
- Soil amendments (2.3.4.4)
- Stormwater management pond (2.3.4.5)
- Vegetative filter strips (2.3.4.6)

2.3.2 HARDSCAPE BMPS

2.3.2.1 AERATION STRIP UNDER SIDEWALK

DESCRIPTION:

A perforated sub-surface strip to extend root growth area. Aeration strips enable trees to safely maximize their root zone, resulting in larger trees with greater canopy cover. Studies have shown

Figure 22: Aeration Strip Under Sidewalk

that greater tree canopy cover can reduce stormwater runoff.

OPPORTUNITIES AND CHALLENGES:

Provides a broad range of opportunities to commingle hardscape cover and shade trees without sacrificing pedestrian passage in the ROW. The practice is flexible to varying site conditions and feasible in most environments. Typical challenges include avoiding buried utilities and sizing the aeration strip to the tree species needs.

TYPICAL MAINTENANCE:

- None

2.3.2.2 PERMEABLE PAVEMENT

DESCRIPTION:

Poured in place pavement surfaces designed with voids to allow stormwater to infiltrate and reduce runoff.

OPPORTUNITIES AND CHALLENGES:

Permeable pavement works best in lower traffic areas where vehicles will not make sharp turns or sudden stops that can create stresses that deforms pavement (even standard impermeable pavement develops a waving form at intersections from repeated vehicle stopping). It can be used on roads, parking lots, and sidewalks and provides the benefit of infiltrating water while maintaining a flat surface with a high structural bearing capacity for vehicles and pedestrian traffic. Because water infiltrates though the pavement rather than ponding on top, it has an added benefit in the winter of disposing quickly of ice – even in winter, sunlight can cause ice to melt and drain through the permeable pavement before nightfall can refreeze the melt water. Challenges are that permeable pavement more than most best practices can fail if not properly and frequently maintained.

TYPICAL MAINTENANCE:

- Joint filtering material would need to be replaced occasionally
- Maintain planting materials away from pavements
- Underdrain monitoring and flushing is required
- Periodic vacuuming of debris is required to maintain infiltration rates. Frequency of maintenance will be determined on a case by case basis.
- A lower level of winter maintenance is required
- Surface sealants should not be used

2.3.2.3 POROUS PAVERS

DESCRIPTION:

Pavers installed with voids to allow stormwater to infiltrate and reduce runoff.

Figure 23: Porous Pavers

OPPORTUNITIES AND CHALLENGES:

Similar to porous pavement but more feasible for lighter traffic areas including pedestrian ways such as sidewalks and overflow parking areas. The smaller size of the pavers makes them both easier to replace if damaged but also easier to be dislodged under higher stress conditions.

TYPICAL MAINTENANCE:

- A lower level of winter maintenance is required
- Maintain planting materials away from pavements
- Occasional replacement of joint material and weeding are required
- Sweeping of debris is required to maintain infiltration rates
- Underdrain monitoring and flushing is required
- ADA issues in areas with primary pedestrian circulation

2.3.2.4 STREET TREE CONTINUOUS ROOT ZONE

DESCRIPTION:

Continuous root zones as landscape strip, unit pavers or a slab structure to promote healthy street trees allowing for the uninterrupted growth of tree roots. Studies have shown that greater tree canopy cover can reduce stormwater runoff.

Figure 24: Street Trees in Continuous Root Zone

OPPORTUNITIES AND CHALLENGES:

This takes advantage of a longer and larger potential tree growth area than the aeration strip and could support a higher number of trees or larger trees with longer root systems. Since applications are typically in ROWs, a continuous feature means that it is more likely to be in conflict with utilities. Both design of the continuous root zone and management during utility maintenance need to be considered.

TYPICAL MAINTENANCE:

- Periodic replacement of missing unit pavers and landscaping
- Sweeping or vacuuming of sediment between joints
- Weeding

2.3.3 STRUCTURAL BMPS

2.3.3.1 CISTERN (RAINWATER HARVEST & REUSE)

DESCRIPTION:

Sub-surface or surface storage tanks designed to accommodate excess stormwater quantity. Water reuse opportunities could include irrigation, toilet flushing or exterior washing (e.g. car washing).

Figure 25: Cistern

OPPORTUNITIES AND CHALLENGES:

These systems can be fit into many areas and shapes including above ground, below ground, inside buildings, on roofs and beside buildings. Outdoor, above ground cisterns reduce the need for pumping, if any, to reuse the harvested storm-water for irrigation on internal building uses like toilet flushing, dishwashing or laundries. But water within above ground systems can freeze in colder seasons. Below ground and indoor systems may be protected from the cold but can require higher pumping costs to remove water from the system. It can be a challenge to have a water reuse plan that removes enough water from the cistern so that adequate volume is created to capture runoff from the next precipitation event.

TYPICAL MAINTENANCE:

- Periodic inspection
- Periodic removal of sediment build up
- Regular use of harvested water is required

2.3.3.2 GREEN ROOF

DESCRIPTION

Vegetated/planted building roof surface to promote stormwater retention and filtering.

Figure 26: Green Roof

OPPORTUNITIES AND CHALLENGES:

Green roofs can be intensive or extensive. The intensive system has a higher substrate volume and weight that can capture more water and support larger, lusher plantings. The higher weight of the extensive system requires a stronger roof system but also provides more insulation to reduce heating and cooling costs.

An extensive system typically consists of succulents that are lighter and could even be placed atop existing buildings that were not previously designed to support a green roof. The upfront capital costs are higher for a green roof while the long term costs are lower because the design requirements result in a sturdier roof that lasts longer than a typical roof system.

TYPICAL MAINTENANCE:

- Periodic watering
- Protection and monitoring to prevent vandalism
- Replacement of dead vegetation
- Weeding and removal of invasive plants

2.3.3.3 UNDERGROUND STORAGE FACILITY

DESCRIPTION:

Underground stormwater retention/detention facilities capture and store stormwater collected from surrounding impervious areas. Design can be combined with green space at ground level with storage below.

Figure 27: Underground Storage Facility

OPPORTUNITIES AND CHALLENGES:

Underground storage facilities are the most common stormwater treatment system in use in urban environments. Combined with sand filters, these systems can provide a cost effective management of stormwater quality and quantity. They do not provide the same level of pollutant removal as the other stormwater best practices described here and, because they are out of sight and therefore too often out of mind, they are prone to failure if a regular maintenance program is not enforced. Since green infrastructure and infiltration are objectives of the new MS4 permit, these systems are out of favor for future development as the sole source for stormwater management. Also, underground storage facilities that manage stormwater from private property need to be located on private property - not in the public ROW.

TYPICAL MAINTENANCE:

- Period inspection
- Periodic removal of sediment build up

2.3.4 VEGETATIVE BMPS

2.3.4.1 BIORETENTION

DESCRIPTION:

Small scale soil and plant based devices located

Figure 28: Bioretention Cell

curbside, within sidewalks or in parks that promote stormwater infiltration and filtration.

OPPORTUNITIES AND CHALLENGES:

They fit into most open spaces and ROWs and provide stormwater quantity and quality control and green infrastructure aesthetics. Underdrains are recommended in these systems for urban areas, which can make them infeasible if storm sewers or alternative outfall sources for the under-drain pipe are too shallow. They need regular maintenance to retain their green aesthetics and to remove unsightly trash and sediments that can reduce the infiltration capacity of the system.

TYPICAL MAINTENANCE:

- Periodic removal of sediment build up
- Replacement of dead vegetation
- Trash removal
- Underdrain monitoring and flushing
- Weeding and removal of invasive plants

2.3.4.2 CONSERVATION LANDSCAPING

DESCRIPTION:

A type of landscape that minimizes maintenance and promotes the use of native species to improve air and water quality, create habitat and enhance species diversity. This type of landscape can slow the volume of water into the stormwater system as well as provide rudimentary filtration.

Figure 29: Conservation Landscaping

OPPORTUNITIES AND CHALLENGES:

Reduced maintenance and disease resistance lowers costs and promotes healthy long term growth of plantings. The higher stress placed on urban plantings means that the number of native tolerant species may be reduced and therefore diversity is reduced. Introduction of some non-native and non-invasive species that will not spread is an option.

TYPICAL MAINTENANCE:

- Controlling invasive plants
- Periodic watering during drought conditions
- Protection and monitoring to prevent vandalism
- Trash removal
- Weeding

2.3.4.3 SHADE TREE PLANTING

DESCRIPTION:

Trees provide a first interception of precipitation to help reduce stormwater quantity and heat island effects.

Figure 30: Shade Tree Planting

OPPORTUNITIES AND CHALLENGES:

Trees that provide a shade canopy increase community desire to traverse and linger, which is good for community spirit and business development. Shade cover reduces the heat island effect and, if trees are larger and contiguous across longer reaches, can support natural habitat for song bird populations. The rate at which rainwater enters the stormwater system is slowed by tree canopies that capture water prior to landing on impervious surfaces. Some of this rainwater can be taken in by the tree itself, while other portions can be directed into the planting strip where it can be utilized by groundcover plantings. In these ways, shade tree plantings reduce the quantity of stormwater going into the system, as well as improve overall water quality through simple filtration.

TYPICAL MAINTENANCE:

- Aeration of soil
- Fertilizing
- Pruning
- Watering

2.3.4.4 SOIL AMENDMENTS

DESCRIPTION:

The addition of any substance to the soil that helps to promote plant growth. Examples of amendments include peat, yard compost, and wood chips. Soil amendments directly affect the ability of water to either flow over or percolate into the soil.

Figure 31: Soil Amendments

OPPORTUNITIES AND CHALLENGES:

Compacted soils reduce the volume of stormwater that can infiltrate, sometimes to the extent that they behave almost like impervious surfaces. Soil amendments restore infiltration capacities, promote healthy and sustained plant growth, and improve the pollutant removal capacity of the soil and vegetated system. Amended soils need to be protected so that they do not become compacted by future vehicle or pedestrian traffic and are most beneficial when placed where they will receive frequent precipitation and stormwater flow.

TYPICAL MAINTENANCE:

- Mechanical aeration
- Organic amendments
- Maintaining soil stability

2.3.4.5 STORMWATER MANAGEMENT POND

DESCRIPTION:

Water body designed and located to store stormwater.

Figure 32: Stormwater Management Pond

OPPORTUNITIES AND CHALLENGES:

Not a typical feature in an urban area unless part of a large park system. Ponds can maximize the ability to manage water quantity and quality from areas that were not previously managed adequately. However, in an ultra-urban environment, these systems dominate limited open space and reduce its use for other purposes. In large spaces where it does not dominate the available space, it can provide a water amenity.

TYPICAL MAINTENANCE:

- Control and remove invasive species (plants and animals)
- Protection and monitoring to prevent vandalism
- Replacement of dead vegetation (shoreline and submerged aquatic vegetation)
- Trash removal

2.3.4.6 VEGETATED FILTER STRIP

DESCRIPTION:

Dense permanent vegetation with a gentle slope to provide water quality pre-treatment between impervious surfaces and stormwater management devices.

Figure 33: Vegetated Filter Strip

OPPORTUNITIES AND CHALLENGES:

Vegetation can serve as a mechanical filter to remove pollutants and sediments from stormwater. These systems can prefilter water before they flow into the other ground level practices or they can serve as a stand alone water quality system for smaller flows or as a grassed swale configuration. Depending on the vegetation type, the filter strip may require regular plant maintenance or, if grassed, then regular mowing.

TYPICAL MAINTENANCE:

- Periodic removal of sediment build up
- Replacement of dead vegetation
- Trash removal
- Watering and monitoring
- Weeding and removal of invasive plants

2.4 FINANCIAL BEST PRACTICES

It is clear from the analysis of potential fees and discounts above in Chapter 1 that additional funding mechanisms will be required in order to create a shared open space and stormwater system in NoMa. Funding mechanisms will need to be identified for:

- Site Acquisition and construction of open space amenities; and,
- Construction and maintenance of stormwater Best Management Practice (BMP) improvements.

In accordance with the goals of the NoMa Public Space and Water Management Study, the following economic tools have been reviewed and analyzed for their suitability for implementation within the NoMa neighborhood.

2.4.1 SITE ACQUISITION AND CONSTRUCTION

Since publicly-owned parcels are rare in NoMa, creation of significant additional public open space would require acquisition or control of private parcels, or a public/private redevelopment of a publicly held property. Several financing tools have been used in other cities for these purposes.

COMMUNITY LAND TRUSTS

Community Land Trusts (CLTs) can provide NoMa with a mechanism for ownership of public open space acquired from a private owner.

CLTs are 501(c)3 nonprofit organizations that act as a long-term steward of land or property held to provide public benefits such as the preservation of open space and/or provision of affordable housing. There are nearly 200 CLTs active in 31 states, including the District of Columbia.

Site(s) used for BMP systems could be donated to the CLT or purchased by the CLT. A developer could also lease a portion of land held by the CLT for a period of 99 years (a lifetime) to construct residential or commercial buildings, with the prospect of this lease potentially being renewed at the end of its term should this be desired. A CLT could allow for the construction of underground BMP improvements with the above-ground area maintained as a designated public open space area. It is important to note that land within the CLT need not be contiguous – CLT's may include one large development or a series of specific sites with a common purpose.

Case Study: Baltimore Green Space, a CLT formed in 2007, acquired sites from the City of Baltimore for use as community gardens. The CLT provides insurance and management assistance for smaller neighborhood groups that take on the clean-up and maintenance of land at sites across the city.

(See www.baltimoregreenspace.org)

Figure 34: Baltimore, Maryland

CLTs are governed by a board of directors made up of members, which typically include community residents, lessees of property within the CLT, and/or public officials. Staffing can be provided by public agencies or affiliated community/business improvement groups. The NoMa BID would be an ideal candidate to serve in this role.

CONSERVATION SUBDIVISIONS

Conservation subdivisions are areas specifically zoned to remain as open space. The footprint of land to be developed is limited and a specific portion of undeveloped land is allowed to remain in a "natural" conservation state. This open space is typically concentrated in one large area, rather than spread in a series of smaller green spaces.

This tool is most typically used in urban fringe/ rural areas to provide public land that can be "shared" by the surrounding developed sites. Within an urban setting, a similar principle could be applied for the creation of a "conservation" area that is a public park.

This tool would not be suitable for NoMa, since there is no way to increase density on the developed portion of the land to compensate for lost density on the preserved open space. There is no open space requirement in the existing matter-of-right zoning and no opportunity to impose such a requirement.

OPEN SPACE EASEMENTS

Case Study: Zoning regulations in Athens, Georgia permit units to be clustered on smaller lots where a conservation subdivision is in place to concentrate open space on one publicly-accessible lot, thereby creating open space without lowering overall development.

All property ownership includes a "bundle" of property rights. Rather than donating an entire property together with all of its rights, an owner could choose to designate an easement on a portion of the property to allow access to a planned open space and/or public recreational space. This easement could occur either in perpetuity or for a specified time period (term easement). The property owner would retain ownership of the property as well as the right to develop the remainder of the property outside of the easement area as they would normally.

The donation of an easement could earn the donor an income tax discount based on the difference in the value of the property, relative to before and after the creation of the easement. The donation of an easement may also reduce real estate taxes due to a decrease in the "fair market value" of the property. The property itself, however, would remain subject to property taxes.

If this technique were considered within NoMa it

Case Study: In San Diego open space easements have been granted for natural areas as well as developed urban areas including neighborhood parks comprised of outdoor areas and recreational buildings. Sites may include private properties with linkages through easements to allow for public access.

is recommended that the easement be donated to a designated organization such as a CLT that would assume responsibility for maintaining its public purpose and would assume public liability associated with the easement.

TRANSFER OF DEVELOPMENT RIGHTS

The central NoMa area is designated as a receiving area for Transfer of Development Rights (TDRs) acquired by developers from other parcels. TDRs allow property owners to maximize the potential FAR on their sites above and beyond the existing zoning. Thus, while the receiving area of central NoMa is zoned C-3-C with an FAR of 6.5, parcels may achieve an FAR of up to 10.0 by using TDRs. In cases where a developable property in NoMa could be used instead for open space, it may also be possible to use TDRs in reverse to enable the potential FAR to be transferred to a site located outside of the NoMa boundaries. Sale or transfer of the TDRs could thereby enable a NoMa property owner to recover a portion of the market value of his undeveloped property. However, an improvement in the current limited market demand for speculative developments in other designated receiving areas within DC may be necessary before this could become a viable future option for NoMa.

LAND SWAPS

Another tool to consider for acquiring land for a public park or open space within NoMa could be a swap of publicly-owned land located inside or outside of NoMa. Due to the limited number and size of DC-owned parcels within NoMa, it may be necessary to investigate a broader range of alternative sites to consider what would be equivalent in value and attractiveness to NoMa property owners and developers who

might consider such an option. This tool could be considered as part of a solution rather than a viable alternative on its own; and, as with TDRs, the overall market for speculative new development in other DC-owned locations may need to improve in order for this option to be considered viable.

MIXED-USE OPEN SPACE DEVELOPMENT

Another option to consider for NoMa would be to combine the creation of open space with the development of additional uses on the same site.

Case Study: In San Jose, California, residential developers must provide parkland in the ratio of 3 acres for each 1,000 new residents, or make a payment-in-lieu at an equivalent rate based on the annual fair market value of land. For single-family homes, with 3 residents per unit, this equates to approximately $15,000 per housing unit; while for multi-family apartments, with 2 residents per unit, the price per unit is $10,000.

For example, funding to construct Boston's $80 million Post Office Square, a 1.7 acre open space atop an underground parking deck was provided from a $50 million loan from the Bank of New England and the sale of $30 million in shares in the parking garage. In NoMa, construction of an extensive underground parking lot may not be cost efficient, but some allocation of space for paid parking could contribute towards the construction and/or operation of a public open space.

IMPACT FEES

Recognizing that certain forms of new public infrastructure will be required to support future development, municipalities have often assessed impact fees on surrounding property owners most likely to benefit from these investments. Typically, fees are assessed on a per square foot basis or as a percentage of the value of the property. Such fees are established by law for all properties within a given jurisdiction.

For NoMa, it would be difficult to create such a requirement to donate land or pay a compensating fee for acquisition of public space since existing zoning allows matter of right development without such restrictions; and it would be hard to apply a new requirement evenly to completed developments and future projects.

Case Study: Within NoMa, construction of the New York Avenue–Florida Avenue–Gallaudet University Metro Station offers an example of best practice infrastructure funding, with a combination of public and private dollars. The new Metro station cost a total of $110 million, of which $35 million was provided by local property owners through $10 million in land donations and a $25 million bond issued by DC with a 30-year amortization. A Special Assessment to pay off the bond was developed that applies to all non-residential properties within 2,500 feet of the new station. This raises approximately $1.85 million per year over the lifetime of the bond. It is important to note that for the land donation to be considered tax-exempt, it had to be made to a 501(c)3 nonprofit corporation, in this case called "Action 29", which was dissolved upon completion of the construction of the Metro station.

Figure 35: NY Ave. Metro Station

SPECIAL ASSESSMENTS

To fund a particular public amenity or infrastructure that will clearly add value to surrounding property owners, municipalities have applied special tax assessments within a fixed radius or service area to repay bonds used to fund the initial

Case Study: If a 20,000 GSF parcel is worth $500 per SF and its fair market value were to increase by 1.5 percent, then the market value of the land would increase by $150,000. It is notable that similar reasoning was effective in convincing NoMa property owners to fund a portion of the New York Avenue–Florida Avenue–Gallaudet University Metro Station, as cited previously in this memorandum. As part of a smaller scale initiative, NoMa property owners could be encouraged to contribute land and/or funding for a nearby park containing BMP systems with an increase in property value likely as a result.

Figure 36: NY Ave Metro Station

investment. Such a tax could be applied evenly to all properties – both developed and undeveloped – since the increase in value would apply to all properties.

REAL ESTATE TAX INCREMENTS

Municipalities may simply decide to fund infrastructure improvements themselves from general obligation bonds in the anticipation that these investments will pay off in the form of increased property taxes based on increased property values.

A joint study by Ernst & Young and New Yorkers for Parks (NY4P) documented that land in the study adjacent to public parks in New York has typically increased in value to a greater extent than similar land not adjacent to a park. The study showed this increase in value to be true for both residential and commercial property. The study concluded that land located within 2,500 feet of a park in general was worth approximately 1.5 percent more than land without a park within similar proximity.

A study of the impact of community gardens (median size 6,000 s.f.) also found that residential properties within a 500 foot radius showed an increased value of 2.5% to 5% , while properties within a 1,000 foot radius demonstrated an increased value of 1.5% to 2% over similar properties without a park.

In a similar study in Philadelphia, homes located next to an untended vacant lot were calculated to be worth approximately 20% less than lots within built-up blocks, while homes located next to community gardens were typically valued 35% more than homes without such an amenity.

In NoMa an increase in the value of the properties adjacent to park/open spaces could result in increased real estate taxes that in turn could be used to repay DC for the cost of the initial improvements that created the park/open space. The creation of a Tax Increment Financing (TIF) District could provide a mechanism for quantifying the amount of increased taxes to be allocated for this purpose.

REAL ESTATE ABATEMENTS

Within NoMa in 2010, a typical developable site within the central TDR Zone is assessed, for property tax purposes, at approximately $488 per square foot. For a one-acre (43,560 GSF) unimproved lot taxed at 1.85%, the site's assessed value would be approximately $20.7 million and the annual real estate taxes would be approximately $380,000.

The District of Columbia could consider offering temporary real estate tax abatements as an incentive to owners to install larger BMP systems that exceed DC stormwater management requirements, and/or treat stormwater from sources off

of their property such as under managed public or private spaces. Exemptions or abatements could remain in place as long as BMPs were in operation. This may help facilitate the longer-term use and maintenance of what could be considered "temporary BMP solutions."

However, some NoMa sites are already subject to reductions in property taxes due to existing incentives designed to encourage the development of residential units. In 2008, the DC Council approved legislation granting developers who build the first 3,000 units in NoMa a 10-year reduction in property taxes. For the entire NoMa area, the limit on the abatements is capped at $5 million per year for a total of $50 million.

VALUE CAPTURE FINANCE

Value Capture Finance describes a variety of methods whereby investments in public infrastructure and on underdeveloped sites can initiate a virtuous circle of "Value Creation, Value Realization and Value Capture" for private owners and public organizations. The goal of these systems is to localize the impact of new investment so that it has the greatest multiplier effect in the area where it is used.

An increase in value is "created" by public and/or private investment, leading to increased property values that can be "captured" by private owners through increased rents and/or sales prices and could also be "captured" by public authorities through increased taxes and special assessments.

In NoMa, the term "Value Capture Finance" could include the example of the Public-Private Partnership (PPP) used to fund the development of the New York Avenue–Florida Avenue–Gallaudet University Metro Station. A similar logic might combine a series of the financing tools noted previously in this memorandum to fund stormwater management BMPs.

For NoMa, creation of a public green space could clearly create added value for surrounding property owners, who could capture that value in the form of higher rents, sales proceeds and faster lease-up of rental properties. By capturing a portion of this increased value through a Special Assessment and/or increased tax revenue, DC could help to fund these improvements.

Case Study: Hafen City, Hamburg, is Europe's largest inner city urban development zone and comprises 400 acres in a former industrial port zone that is being redeveloped with up to 20 million square feet of residential, commercial, and institutional uses. Twenty percent of the area is reserved for public open space and an additional twenty percent of privately-owned areas require public access, with topography used to separate public and private areas. Construction of required infrastructure and amenities is being financed from the proceeds of sales of publicly-owned land as well as increased tax revenues from private development.

Figure 37: Hafen City, Hamberg

2.4.2 CONSTRUCTION AND MAINTENANCE OF BMP IMPROVEMENTS

STORMWATER FEE DISCOUNT PROGRAM

The District of Columbia Municipal Regulations (Water Quality and Pollution) amendment, which authorized the Impervious Area Charge (IAC) and amendments to the DC Stormwater Fee, also required that a discount system be established for individual property owners that take measures on their properties to reduce the cost of the public stormwater related programs. The discounts are to be associated with measures to reduce the

quantity of stormwater runoff and entrained pollutants loads beyond that already required, and can be used to cover or offset additional cost to maintain BMPs (if there are any).

Discounts are most commonly provided for properties that have on-site stormwater management. A 2007 Stormwater Utility Survey by Black & Veatch found that 46 percent of the Stormwater Utilities (SWUs) that participated in the survey provided discounts for private detention/retention facilities. Such facilities could include ponds, bioretention, green roofs, and cisterns that reduce the capacity requirements of downstream/downpipe systems and/or enhance water quality. A one-time discount could also be provided for an innovative retention activity that serves as a demonstration project.

A 2006 report by the National Association of Flood and Stormwater Agencies (NAFSMA) entitled "Guidance for Municipal Stormwater Funding" states that discounts are typically conditional, i.e., they are premised on continuing specified performance by the customer. If the specified performance is not maintained, a discount may be rescinded.

Most SWUs provide discounts for non-residential parcels. Typical non-residential discounts in Virginia range from 10 to 50 percent and across the nation range from 33 to 75 percent according to the 2006 NAFSMA study. Rarely will a SWU provide a 100 percent discount because the Stormwater Fee funds the stormwater management of communal resources such as public rights of ways (e.g., roads and sidewalks), streams, and public buildings over which all owners have a mutual interest.

REDUCTION OF REQUIRED INFRASTRUCTURE INVESTMENT

The District of Columbia's LTCP is focused on the storage of excess storm water and sanitary sewage in a network of large pipes and chambers distributed throughout the combined sewer system. When a CSO period ends, the excess is released into sewers for treatment at Blue Plains. Any rainfall retained on the land surface through stormwater controls and thus not released to the combined sewers, such as through the use of Low Impact Development (LID), does not receive advanced wastewater treatment and therefore "avoids" associated Blue Plains treatment costs. Similar wastewater treatment reduction strategies have successfully been employed in Portland, Seattle, and other parts of the United States. Over time, as the implementation of on-site stormwater management practices becomes ubiquitous as planned, there would be a decrease in the volume of stormwater draining to the combined sewer system resulting in an anticipated reduction in Blue Plains variable treatment costs that could be diverted toward further funding/rebates for BMP projects in DC.

Other reductions in required infrastructure should also be considered. Basic BMPs such as decreasing paving and increasing landscaped areas are less expensive to construct when compared to traditional development. For example, installing sod and some types of

Case Study: An environmental educational opportunity in NoMa could be developed that is similar to the Houston, Texas Land/Water Sustainability Forum's Low Impact Development Competition. This was a conscience-raising process that helped educate developers, civil engineers, landscape architects, and others in the use of LID as part of an integrated runoff control program. Twenty-two teams from forty-nine firms submitted designs which integrated LID into runoff management programs. A nominal prize of $15,000 was established and the winning team(s) also had opportunities to implement their designs, offering public relations and corporate communications benefits.

(See http://www.houstonlwsforum.org/)

Figure 38: Houston, Texas

landscaping is inherently less costly than installing the same amount of square footage in concrete or brick sidewalks.

SECTION 319 U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) GRANTS

Grants from the EPA Clean Water Act (CWA) Section 319 Program can be used to fund demonstration pollution prevention projects applicable to non-point sources. A grant application for NoMa could be managed by the District of Columbia Department of the Environment, who could facilitate the creation of a demonstration project in NoMa. The value of the grant fluctuates annually.

Runoff controls in an urban area such as NoMa, which integrate LID, are suitable for funding as a non-point source demonstration project for two reasons. First, they are transferable to other urban areas, some of which are non-point source areas. In addition, education and outreach projects are considered to apply to non-point sources even if they are located in a point source area. The demonstration project could include control practices conceptualized for NoMa, which demonstrate education and outreach principles for wider community involvement.

VARIATIONS ON THE PACE PROGRAM/ ENERGY EFFICIENT MORTGAGES

The District of Columbia Department of the Environment (DDOE) together with the Office of the Deputy Mayor for Planning and Economic Development (DMPED) recently announced the creation of a Property Assessed Clean Energy (PACE) program to allow property owners to borrow from municipally financed bonds providing low-interest loans to DC property owners to make energy efficiency and renewable energy improvements to their properties. Under the proposed program borrowers would be able to offset their new loan repayments with the savings realized from lower energy costs. One should note that a PACE program has yet to be implemented in DC and that structural issues regarding existing mortgages need to be resolved in order to activate this type of financing.

Repayments are then made through the increased property taxes. The system is similar to that of Energy Efficient Mortgages, used in other cities, and allows for long-term repayment and effective collateral since the obligation runs with the real estate and is collectible from future owner(s). It does not disturb the collateral of the property for an existing mortgage and allows for lower interest rates than a conventional small business loan.

The installation of BMPs such as green roofs would result in lower energy costs for cooling and heating, adding to the savings a property owner could secure from the reduction of stormwater fees.

OPPORTUNITY/NEED GRANTS

The District of Columbia has a need for open spaces and an objective to achieve better storm-water management practices. For example, DC might define a need for public open space that also provides stormwater management for public rights-of-way or for under managed public space in NoMa. DC would also determine the regulatory requirements and costs that they would incur to meet this objective.

The District of Columbia could request proposals from the private community on what open space or voluntary stormwater management practices could be provided to benefit these public objectives. Private property owners would propose to improve their under utilized land to service this “public need”, such as open space/stormwater management, for a specified period of time. The private property owners would request a fee and DC would evaluate the monetary benefits, such as cost savings to DC to meet the need, and negotiate with the private entity to pay them to deliver their proposed project.

The District of Columbia is not obligated to accept any proposed project and the period of offer of new projects can be open indefinitely.

NoMa

NORTH of MASSACHUSETTS AVENUE

Recommendations: Specific to NoMa

3

3.1 RECOMMENDATIONS OVERVIEW

The NoMa Vision and Development Strategy developed in 2006 identified the creation of a significant open space in NoMa as one of the area's greatest challenges. One of the main recommendations of the report also outlines the importance of a vibrant, highly walkable environment with landscaped streets and attractive open spaces with active ground floors and pedestrian links. First Street, NE, is NoMa's Main Street. As the north-south street crossing through the center of NoMA, 1st Street is an important corridor that is positioned to become a "main street" lined with neighborhood-serving retail and places to meet neighbors and co-workers. Its central location and continuous length through the neighborhood makes it a character defining feature of NoMa and the heart of the neighborhood - and thus why the strategy identifies a centrally located green space on 1st Street between Pierce and M Streets. This chapter follows the recommendations from the NoMa Vision and Development Strategy and incorporates stormwater management as part of an overall multi-purpose infrastructure solution.

3.1.1 OPEN SPACE RECOMMENDATIONS

The lack of public land available in NoMa for the creation of a sizable and well distributed open space system is a problem that needs to be overcome through creative public/private partnerships and economic/financial mechanisms. There are obvious long term benefits for creating several small to medium sized open spaces throughout NoMa, which can function as main gathering centers and attractive quiet areas for the NoMa neighborhood. Wide sidewalks also need to be utilized efficiently to carry multiple functions such as entertainment, retail, and environmental benefits. The ROW will become a linear network that can weave through the urban environment and connect multiple open spaces throughout NoMa.

With the expected increase in NoMa's residential and daytime population, adequate public and accessible open spaces will be important to neighborhood life. DC should engage with developers and property owners in developing a coordinated effort for open spaces in NoMa. This effort would inform DC of land acquisition options and/or public/private partnerships with a focus in providing an adequate park system with ROW networks functioning as connectors throughout NoMa.

3.1.2 STORMWATER RECOMMENDATIONS

The District of Columbia will revise and update the municipal stormwater regulations in response to requirements contained within the most recent draft MS4 permit, and to better advance the goals of the Clean Water Act. The new stormwater regulations will place more environmentally protective design requirements on development and redevelopment projects, and will require these projects to incorporate on-site controls that retain and use stormwater runoff on the site. Most development within DC is now redevelopment, and wholesale upgrades to existing stormwater infrastructure is costly; therefore multi-functional infrastructure solutions such as LID and green infrastructure are now the preferred approaches on private and federal properties. The return to DC and property owners will be enhanced if the green infrastructure on private property blends into contiguous green/blue infrastructure along the City owned rights-of-way. It is therefore in DC's and private property owners' interests to cooperatively plan and implement green/blue infrastructure enhancements that incorporate private properties, rights-of-way, and open space with stormwater management and landscaped architecture. This would increase property values, support compliance with the MS4 permit, and improve the hydrology of areas throughout the city.

FINANCIAL RECOMMENDATIONS

To explore creative financing options for open space, this study evaluated three basic aspects of Financial Analysis:

1. Initial Capital Costs with Potential Sources of Funds;
2. Annual Operating Expenses with Potential Sources of Revenue; and,
3. Costs and Benefits for:

a. The Site Owner
b. Neighboring Property Owners
c. Public Bodies including DC Government and DC Water.

The goal of this financial analysis is to quantify the level of funding, revenue and increased property value needed to provide sufficient incentives for all parties to consider implementation of each of the scenarios proposed.

INITIAL CAPITAL COSTS WITH POTENTIAL SOURCES OF FUNDS

Costs:

- Land Acquisition, assumed to be $488 per s.f. for land within the central NoMa Transfer of Development Rights (TDR) zone based on 2010 assessed land values. This equates to a cost of $70 per s.f. of building area for an FAR of 7.0, or $50 per s.f. of building area for an FAR of 10.0. Outside of the TDR zone, land is assessed at approximately $260 per s.f. of land based on lower densities permitted for as-of-right development.
- Site Improvements include site development costs and amenities such as playgrounds, fencing, hardscape and landscaping, as well as any kiosks or utility buildings. Total estimated cost is $80 per s.f. of land. This cost could vary considerably depending on the level of improvements and the mix and extent of amenities desired. Given the high cost of land in NoMa, there is an argument for a smaller park with more amenities rather than a larger park with fewer amenities.
- BMP Stormwater Improvements would include specific improvements and systems for retaining and managing stormwater runoff, including above ground areas such as bioswales and below-ground cisterns for water capture.

Sources of Funds:

- Bonds offer the most promising source of funding for land acquisition and site improvements for a park scenario. The bonds could be issued by DC and backed by the anticipated increase in tax revenues for surrounding parcels within a 500 foot radius for a Mini Park (1/4 acre) or 1,000 radius for a larger Neighborhood Park (1/2 acre).
- Public Grants targeted to BMP stormwater improvements can help offset additional cost of increasing the capacity and efficiency of these systems. For example, the EPA 319 Grant could provide up to $150,000 or 50% of the cost of these improvements. Additional grants may be available from DDOE, OP or other DC agencies.
- Owner's Equity already is being applied to make interim and permanent improvements to development sites and public space.
- Donations of land and/or property to a 501 (c) 3 Community Land Trust (CLT) set up for the specific purpose of owning public open space within the NoMa BID boundaries. Such an organization could be governed by a board made up of DC and NoMa BID members to ensure long-term direction for any public space created.
- Reduction of Required Infrastructure Investment can also provide an offset to the cost of BMP Stormwater Improvements to the extent that the reduction in the amount of stormwater to be processed by DC Water may result in lowering the peak quantities used for sizing new infrastructure.

ANNUAL OPERATING EXPENSES WITH POTENTIAL SOURCES OF REVENUE

Operating Expenses

- Debt Service to repay the bonds used for site acquisition and improvement based on estimated 30-year term at 5% interest.
- Programming for special events and regular features to encourage greater use of a park.
- Security above and beyond the normal services provided by NoMa BID. To the extent that parking is provided within a scenario, any parking staff could also provide additional element of security.

- Administrative Costs including liability insurance, accounting and organizational costs associated with the proposed CLT.
- General Maintenance for the Park amenities above and beyond cleaning provided by NoMa BID as part of its regular services.
- Green Maintenance specific to the operation of the BMP Stormwater Improvements, including annual costs as well as a sinking fund for longer-term replacement costs of certain elements on a regular basis.

Potential Revenues

- Special Assessment levied on property owners within 500 feet or 1,000 feet for the park scenarios. Such assessments have been used successfully in NoMa to raise $1.85 million for annual debt service on a $25 million bond for construction of the New York Avenue Metro Station. NoMa BID also raises approximately $1.5 million annually from its assessments to cover annual operating costs. To support such an assessment, Owners will need to be convinced of the increased property values they will receive from the Park amenity to be created.
- Parking Fees can be collected for any hardscape areas that could be used for office parking during normal business hours and then become available as public space in the evenings or on weekends. Parking fees collected, which in NoMa are currently $8 per day, would be net of any additional expenses for parking lot management.
- Kiosk Rental from coffee, ice cream or other small retail spaces built as amenities within a Park. The study has assumed a rate of $1,000 per month, or approximately $25 per s.f. for a 500 s.f. kiosk.
- Special Event Income from sponsorships and other revenues to offset the cost of Programming noted above.
- Real Estate Tax Discounts for a period of time for a property owner who converts a portion of his commercial site into public open space.

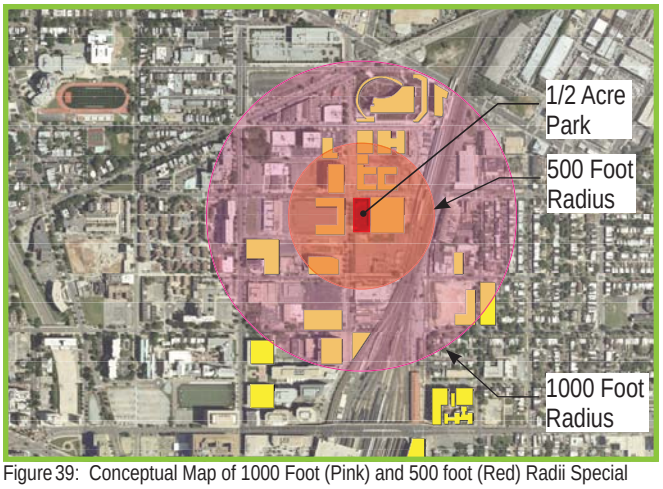


Figure 39: Conceptual Map of 1000 Foot (Pink) and 500 foot (Red) Radii Special Assessment Area.

- Discounts for IAC and Stormwater Fees for owners who carry out BMP improvements to increase their stormwater management above and beyond the requirements. DDOE or DC Water could also reallocate a portion of their fees collected to a proposed scenario.
- Reduction of Stormwater processing costs due to the reduction in the quantity of stormwater required to be processed by the public utilities, especially during peak load events.
- Supply of Stormwater for re-use as an offset for the cost of procuring water from DC Water at $6.71 per CCF.

COST BENEFIT ANALYSIS

This analysis is based on the anticipated increased value created for neighboring properties surrounding a public open space amenity. The amount of increased value has been estimated at between 1.5% and 5% in a series of studies referenced earlier in Chapter 2. Since it is not possible to precisely estimate the increase in value, the analysis is structured on a break-even basis to calculate how much increase in value would be required to completely offset the cost of making the improvements. Readers may then judge for themselves whether such an increase is a reasonable assumption and whether the actual increase would be more.

For Seller / Property Owner:

- The seller of a currently vacant or under utilized site redeveloped as a park would trade its land asset for cash proceeds. Since nearly all of the potential park sites within NoMa are owned by private property owners, the study assumes that the seller is a private party.
- The seller would forego any future profits from the developed site, but also eliminate the accompanying development risks and time delay associated with a future sale.
- The seller, or an affiliated entity, would also forego any development fees related to a potential new development, unless the same developer were hired to manage the development of the park on the site.
- Sellers of a park site adjacent to their other sites would also potentially benefit from the creation of an amenity adjacent to their other development projects. A number of potential sites within NoMa are planned for phased developments where reprogramming a future phase could have a positive impact on the adjacent developments.

For NoMa BID Owners:

Based on the research noted earlier, the study evaluates the potential increase in value of the land within a certain radius of a park.

- For a Mini Park (1/4 acre) assume a radius of 500 feet; and for a larger Neighborhood Park (1/2 acre) assume a radius of 1,000 feet. Studies have shown that the greatest impact on value occurs within 600-800 feet. A 1,000 foot distance represents less than a 5-minute walk.
- The study assumes that the special assessment would be applied against the value of the land. In this manner, it would apply equally to all property owners regardless of whether or not their property was developed.
- For a property owner with a land valued at $488 per s.f. paying annual real estate taxes of 1.85%, the current property tax per square foot of land would be approximately $9.03.
- The study looked at the Present Value of the total assessments to repay the 30-year bond and then calculated the break-even increase in value of a neighbor's land that would be required in order to match the total cost of these assessments.

For Public Bodies:

Property Taxes

- For a privately-owned vacant land site converted to public use, the DC government would lose annual real estate tax revenue based on the current rates. Therefore the study calculated how much the adjacent properties within either a 500-foot or 1,000-foot radius would need to increase in order to generate an amount of property taxes equal to those lost on the tax-exempt parcel created. Historically, this type of analysis was carried out in New York City in the 1800s to support the creation of Central Park.
- The study also compared the potential real estate taxes on a developed property with the potential increase in real estate taxes on completed projects. This would help calculate how much the adjacent buildings would need to increase in value in order to match the anticipated future loss of real estate tax revenue if the park site were to be developed in accordance with its FAR at estimated current market rates for office buildings in NoMa.

Stormwater Fees

- Both the IAC and Stormwater Fees are currently calculated based on the amount of impervious area for a site, measured in ERU (Equivalent Residential Unit or 1,000 s.f. of impervious area). The IAC fee is planned to increase from its current rate of $2.20 per ERU up to $23.99 per ERU in 2017. For purposes of the models, the study used the 2017 figure of $23.99 per ERU.

- DC Water and DDOE are required by law to offer discounts to their customers for implementing BMP strategies. The details of this discount program have yet to be determined as of the date of this report. The study assumes a discount of 30% on the impervious area for developments meeting new requirements.
- While DC Water and DDOE will lose fees, an offsetting benefit is created by the amount of stormwater that does not need to be processed. Based on an estimated cost of $0.76 per CCF, we have calculated the amount of stormwater that would have to be retained from on-site and off-site sources by the BMP in order to offset the loss in IAC and Stormwater Fees paid.

3.2 SCENARIOS SPECIFIC TO NOMA

3.2.1 SCENARIO 1 - MULTIPLE 1/4 ACRE PARCELS OR LESS

APPLICATION:

Publicly Owned or Privately Owned.

GOAL AND DESCRIPTION:

The goal of this scenario is to create two separate parks that are located approximately 1000 feet from each other. These parks, considered Mini Parks by DPR guidelines, would provide quality green spaces and quiet gathering places. These open spaces would add economic value to the surrounding properties and thereby offer an incentive for property owners to absorb a portion of the costs of acquisition and development of the site.

If a ¼ acre site is acquired, the park could be owned by a Community Land Trust that would be governed by a board representing DC, NoMa BID and residents. The park would be managed by the NoMa BID under a contract with the Community Land Trust. See earlier section of Best Practices for description and examples of a Community Land Trust.

Each park would serve a surrounding neighborhood within a 500 foot radius.

OPEN SPACE CREATED:

In this scenario, the ¼ acre park is approximately 100 feet by 109 feet (10,800 SF) in size. The percentage of hardscape (impervious areas) versus softscape or planting areas (permeable areas) is based on the assumption that the design for the park would need to strike a balance between cost, programmability, and aesthetics. Potential uses of the space could be as a flexible open space for individual experiences and small gatherings - during the work day, after hours, and weekends.

For the purposes of this study, one of the parks would be comprised primarily of hardscape surface such as a plaza. The other park would be comprised primarily of green space. These parks could be located so as to serve a particular zone within NoMa and would not need to be located within the central TDR area.

STORMWATER IMPACT:

The stormwater impact would be determined by the extent of stormwater best practice facilities that could be incorporated within the green space and underground storage areas of the park.

The capacity and treatment within the park can be determined based on the area to be captured or a reasonable storage capacity within the park. However, stormwater management should not be limited to underground storage. Combined green/blue infrastructure treatments using landscape-based stormwater management facilities should be incorporated to infiltrate and retain stormwater. Water passing through this system can then be captured in storage facilities and reused.

A ¼ acre park with an approximate dimension of 100 feet by 108 feet would be able to support an underground storage facility 80 feet by 65 feet by 3 feet in depth. Larger facilities would be possible, but a 15,500 CF facility is used for the purposes of this study.

A 15,500 CF storage facility would be able to capture the runoff from the 1.2 inch storm for a 4 acre impervious area. Several development parcels in NoMa are approximately 4 acres in

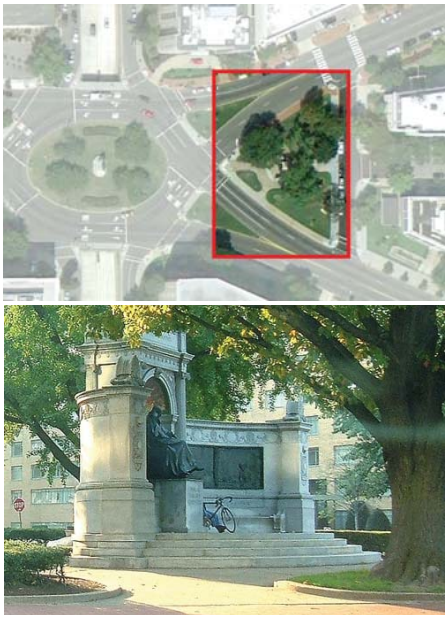


Figure 40: Example of 1/4 Acre Park in DC, Reservation 74, Rhode Island and Massachusetts Avenue, NW

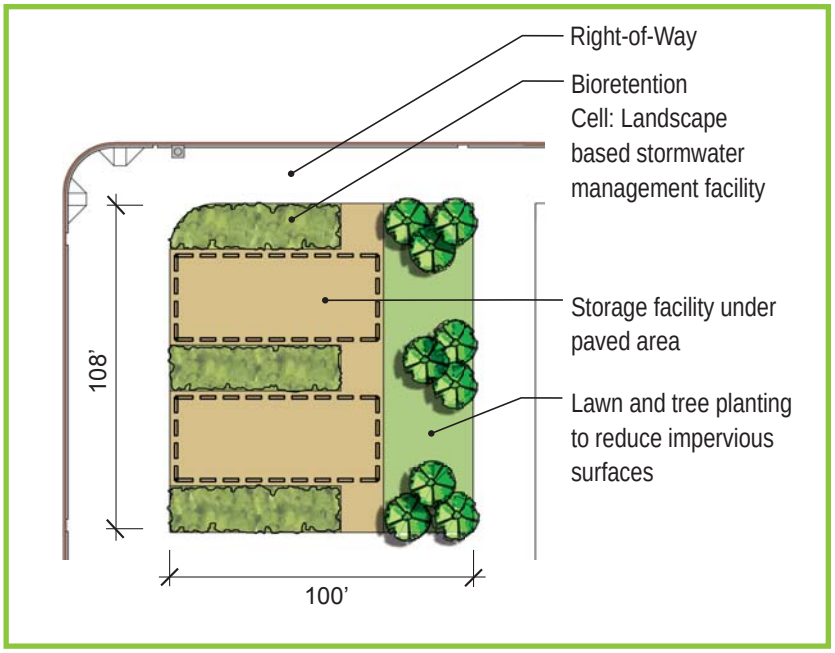
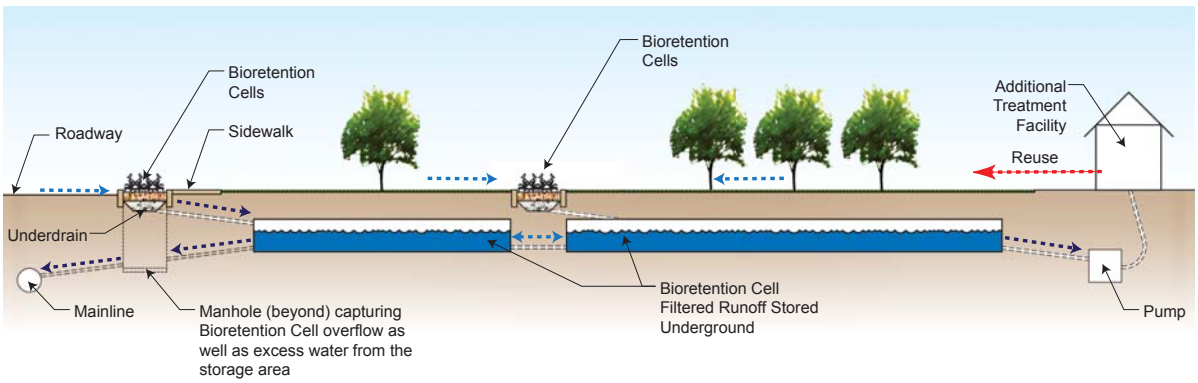


Figure 41: Conceptual Plan of a Mini Park

Figure 42: Mini Park Examples

Elmhurst College: West Hall. Example of an open space used for recreational purposes, as well as water harvesting of surrounding building runoff. Underground storage facility captures 35,000 gallons or approximately 47 CCF of water.

Figure 43: Conceptual Section of Integrated Stormwater Management Solutions



size, so it is not inconceivable to assume that all the required retention can be done on a ¼ acre open space. It would also be possible to sell or trade stormwater discounts if the storage facility exceeds the stormwater management requirements. A 1.2 inch precipitation event was selected because it meets the expected maximum retention requirement for the MS4 permit that will be assigned to DC in 2011. Being able to capture runoff from storm events up to the 1.2 inch precipitation means that at least 90 percent of all precipitation will be captured.

If the open space remains a part of a private development, the stormwater runoff would be mostly roof runoff. Captured runoff from the roof is generally considered cleaner than roadway runoff and therefore easier to treat for gray water use.

The same sized storage facility on a publicly owned site would be able to capture runoff from impervious areas of the adjacent roadway and sidewalks, as well as hardscapes within the park. Because road ROWs can contain some vegetation such as grassed medians, trees, or grass strips, the total runoff might be roughly 80 to 90% of the total ROW surface area. Therefore, the underground storage area described above could manage the runoff from a 1.2 inch storm event that came from nearly one mile of roadway [e.g., one side (40-foot) of a wide major urban road such as M Street]

FINANCIAL FEASIBILITY:

Bonds could be used to pay for the acquisition and development of the Park. Repayment of the bonds would come from a Special Assessment on property owners within a 500 foot radius. Additional funding for construction of best practice stormwater facilities could come from EPA 319 and other public grants.

On-going operation of the parks could be funded from a combination of revenue sources as shown below. From a cost-benefit perspective, the increase in value generated by the development of the parks would justify the additional assessments paid by the surrounding property owners.

CAPITAL COSTS FOR SCENARIO 1

PROJECT COSTS	Area (s.f.)	Percent	Unit Cost ($/s.f.)	Subtotal	Total Cost
Residential Land Acquisition #1	10,890	100%	$260.00		$2,831,400
Residential Land Acquisition #2	10,890	100%	$260.00		$2,831,400
	21,780				
Site Improvements for 2 1/4 Acre Parks	21,780		$80.00	$1,742,400	$1,742,400
Hardscape (Impervious)	10,890	50%	$14.00	$152,460	
Planting (Permeable area)	9,148	42%	$11.00	$100,628	
Site Furnishings, Amenities			Allowance	$250,000	
Stormwater Infrastructure					
Water Quality (LID)	1,742	8%	$35.00	$60,984	
Water Quantity (Underground Storage)	10,890	0%	$15.00	$163,350	
Infrastructure & Other Costs (Sitework, electric, environmenal, etc.)	21,780	100%	$46.60	$1,014,978	
Total Project Costs					**$7,405,200**

SOURCE OF FUNDS	Area (s.f.)	Description	Unit Cost / s.f.	Total Source
Bond	1,099,000	Parcel Area for (2) 500 ft radii	$6.60	$7,255,200
EPA 319 Grant		Up to 50% of BMP Costs		$150,000
Owner's Donation to Park	21,780	Contribution from Land Sale	$0.00	$0
Total Source of Funds				**$7,405,200**

ANNUAL OPERATIONS FOR SCENARIO 1

OPERATING COSTS	Bond Amount	Interest Rate	Term (years)	Unit Cost ($/ s.f.)	Total Cost
Annual Bond Repayment	$7,255,200	5%	30	$0.43	$471,961
Park Operations	**Area (s.f.)**	**Description**		**Unit Cost**	**Total Cost**
Programming	21,780	Balance Available		$2.64	$57,585
Security, Maintenance	21,780	(Above and beyond normal BID services)		$1.38	$30,000
Administration, Liability Insurance	21,780	Allowance		$0.23	$5,000
LID Maintenance	1,742	Annual Costs including Sinking Fund		$5.00	$8,712
Total Project Costs					**$573,258**

REVENUES	Area (s.f.)	Description	Unit Cost	Total Source
Annual Special Assessment	1,099,000	Parcel Area within (2) 500 ft radii of Park Sites	$0.43	$471,961
Parking Fees (Impervious Area)	10,890	300 s.f./space, 50% occupancy, 5-day week	$8.00	$37,752
Special Event & Promotions	na	Advertising, Sponsorship	na	$50,000
Kiosk Rental	500	Coffee / Sandwiches etc.	$25.00	$12,500
IAC Discount (30%)	10,890	Based on 2017 Rates, Discount for Permeable Area created	$23.99	$941
Stormwater Fee Discount (30%)	10,890		$2.67	$105
Total Source of Funds				**$573,258**

CONCLUSION

Two separate ¼ acre Mini Parks located outside the central NoMa TDR zone could provide a total of ½ acre of green public open space for recreation and passive enjoyment to serve residential and office users within an immediate vicinity of 500 feet from each of these parks. The parks could be owned by a CLT and managed by the NoMa BID. Such parks could be built upon land with lower matter-of-right zoning, thereby lowering the acquisition cost of the land. Ideally, these Mini Parks would be located adjacent to other public amenities such as the Metropolitan Branch Trail or an improved public ROW to leverage the investment in these improvements as part of a broader green network within NoMa.

RECOMMENDATIONS: SPECIFIC TO NoMa

Capital costs of Scenario 1 are estimated at $7.4 million. The financial feasibility of this Scenario would depend on convincing property owners within the 500 radius of each Mini Park to agree to pay for capital costs, discounts, and a special assessment to finance the acquisition and development costs. However, an increase of 2.5% in the value of the land within 500 feet would be sufficient to reach a break-even point for this Scenario. Potential EPA 319 grants are available to pay for capital costs, and discounts for IAC and Stormwater fees would offset a portion of the operating costs for BMP improvements. However, the level of stormwater-related grants and discounts on their own would not provide a sufficient argument for undertaking this Scenario.

COST BENEFITS FOR SCENARIO 1

A. Sellers of the Park Sites

Land Area	21,780
Potential FAR	87,120

Cost				Benefit			
Gives Up:	Amount	Per s.f.	Per FAR	**Receives:**	Amount	Per s.f.	Per FAR
Residential Land	$5,662,800	$260	$65	Sales Proceeds	$5,662,800	$260	$65
Donation to Park	$0	$0	$0	Less Donation	$0	$0	$0
				Net Proceeds	$5,662,800	$260	$65
Future Profits (and Risks) of Developing the 2 Park Sites				Potential Gain in Value for any other Properties adjacent to the amenity of the Park.			

B. Land Owners within a 500-foot radius

Parcel Area	1,099,000
Potential FAR	4,396,000

Cost				Benefit			
Gives Up:	Amount	Per s.f. Land	Per FAR	**Receives:**	Amount	Per s.f. Land	Per FAR
Increased Annual Assessments	$471,961	$0.43	$0.11	Potential for faster lease-up, sales due to nearby amenity			
Present Value of 30 years of assessments	$7,255,200	$6.60	$1.65	Total Land Value within 500 ft. Radii of 2 Parks	$285,740,000	$260	$65
				Break Even Land Value Increase	$7,255,200	$6.60	$1.65
				% Increase	**2.54%**	**2.54%**	**2.54%**
				An increase in just the LAND value of approximately 2.5% would completely offset the assessments.			

C. DC Government

Parcel Area	1,099,000
Potential FAR	4,396,000

Land Area	21,780
Potential FAR	87,120

Cost				Benefit			
Gives Up:	Assessed Value	Tax Rate	Annual Tax	**Receives:**	Value	Tax Rate	Annual Tax
Current Property Tax on Park Parcel	$5,662,800	0.85%	$48,134	Total Land Value within 500 ft. Radii of 2 Parks	$285,740,000	0.85%	$2,428,790
				Break Even Land Value Increase	$5,662,800	0.85%	$48,134
				% Increase	**1.98%**		**1.98%**
Potential Property Tax if Park Parcels are fully developed*	$34,848,000	0.85%	$296,208	Potential Total Building Value within 500 ft.*	$1,758,400,000	*0.85%*	$14,946,400
** Assume Building Valued at $400 per s.f.				Break Even Land Value Increase	$34,848,000	0.85%	$296,208
				% Increase	**1.98%**		**1.98%**

D. DC Water

Cost				Benefit			
Gives Up:	Impervious Area	30% Discount / s.f.	Total Discount	**Receives:**	Annual Stormwater Gallons*	Cost / Gallon**	Total Benefit
IAC Charges	14,157	$7.20	$1,223	Reduction in Stormwater Gallons to Treat	260,489	$0.001	$264
				Water Retained for Re-Use	946,036	$0.001	$959
Total Fees			**$1,223**	**Break-Even Benefit**			**$1,223**

* With annual rainfall equal to 37 inches, each square foot receives approximately 23 gallons of stormwater, of which an estimated 80% will flow into the DC Water combined sewer system.

Plus Any Potential Reduction in Infrastructure Costs, plus any additional Off-Site Stormwater Collected
** Based on 20% variable costs for DC Water sewer costs of $3.79 per CCF (748 gallons).

3.2.2 SCENARIO 2 - LARGE 1/2 ACRE PARK

APPLICATION:

Public or Privately Owned, centrally located.

GOAL AND DESCRIPTION:

The goal of this scenario is to create a park that will be large enough to be considered a Neighborhood Park. This park would provide much needed open space for programmed events, quality open space, and stormwater treatment and storage benefits. Such a park would add economic value to the surrounding properties and thereby offer an incentive for property owners to absorb a portion of the costs of acquisition and development of the site.

If a ½ acre site is acquired, the park could be owned by a Community Land Trust that would be governed by a board representing DC, NoMa BID and residents. The park would be managed by the NoMa BID under a contract with the Community Land Trust. See earlier section of Best Practices for description and examples of a Community Land Trust.

Due to its more substantial size, the park would be assumed to serve a surrounding neighborhood within a 1,000 foot radius.

If desired, this scenario could be adjusted to form a larger park based on DPR guidelines. A park of more than one acre is considered a Community Park or City Park.

OPEN SPACE CREATED:

In this scenario, the ½ acre park is approximately 100 feet by 217 feet. (21,780 s.f.) in size. The percentage of hardscape (impervious areas) versus softscape or planting areas (permeable areas) is based on the assumption that the design for the park would need to strike a balance between cost, programmability, and aesthetics. Potential uses of the space could be as a flexible open space for large and small gatherings - during the work day, after hours, and weekends.

By providing a gathering place, the open space would support ground floor retail in the adjacent properties. For this reason it should be located in a central NoMa area to generate the maximum benefit within the densely developed TDR zone. Since the price of land in central NoMa is expensive, it may be more practical to make more extensive improvements to a smaller piece of green or open space, rather than trying to maximize the size of the open space.

STORMWATER IMPACT

The stormwater impact would be determined by the extent of stormwater best practice facilities that could be incorporated within the green space and underground storage areas of the park.

The capacity and treatment within the park can be determined based on the area to be captured or a reasonable storage capacity within the park. However, stormwater management should not be limited to underground storage. Combined green/blue infrastructure treatments using landscape-based stormwater management facilities should be incorporated to infiltrate and retain stormwater. Water passing through this system can then be captured in storage facilities and reused.

A ½ acre park with an approximate dimension of 100 feet by 220 feet, would be able to support an underground storage facility 80 feet by 130 feet by 3 feet in depth. Larger facilities would be possible, but a 31,000 CF facility is used for the purposes of this study.

A 31,000 CF storage facility would be able to capture the 1.2 inch storm for 8 acres of impervious area. Because an 8 acre parcel is twice the size of the largest development within NoMa, stormwater discounts could be traded or sold to other developments in the District of Columbia where it may not be technically feasible to meet the new stormwater requirements.

If the open space remains a part of a private development, the stormwater runoff would be mostly roof runoff. Captured runoff from the roof is generally considered cleaner than roadway runoff and therefore easier to treat as gray water.

The same sized storage facility on a publicly owned site would be able to capture runoff from

Figure 44: Example of a 1/2 Acre Park in DC, Reservation 309C, Rabaut Park, Columbia and 16th Street, NW

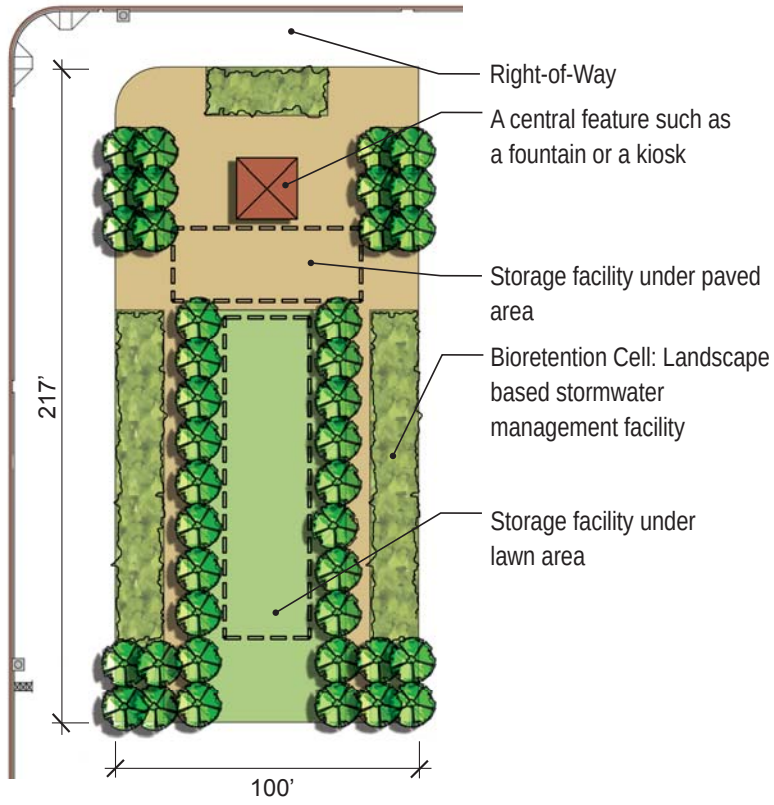


Figure 45: Conceptual Plan of Neighborhood Park

Figure 46: Scenario 2 Example Images

The bold contemporary design of the new Seattle Central Library encouraged owners of nearby properties to invest in redevelopment. The result includes new residential and commercial developments and a publicly accessible green roof slightly less than ½ acre in size. The green roof is a park that features cascading waterfalls, pathways, plantings, and furnished gathering areas that attract people during the day and night. Water used for irrigation comes from harvested water stored in cisterns under the green roof.

impervious areas of the adjacent roadway and sidewalks, as well as hardscapes within the park. The stormwater system proposed could fully capture the storm water for the proposed park as well as an additional area more than 2 times as large per the calculations in the model.

FINANCIAL FEASIBILITY:

Bonds could be used to pay for the acquisition and development of the Park. Repayment of the bonds would come from a Special Assessment on property owners within a 1,000 foot radius. Additional funding for construction of best practice stormwater facilities could come from EPA 319 and other public grants.

On-going operation of the Park could be funded from a combination of revenue sources as shown below. From a cost-benefit perspective, the increase in value generated by the development of the Park would justify the additional assessments paid by the surrounding property owners.

CONCLUSION

A one-half acre Neighborhood Park located within the central NoMa BID TDR Zone could add significant value as a gathering space and a supporting amenity for adjacent ground floor retailers. The Park could be owned by a CLT and managed by the NoMa BID.

Capital costs for Scenario 2 are estimated at $12.3 million. The higher acquisition cost for land within the TDR Zone could be spread across a larger impact area based on the larger size of the park. An increase of less than 2% in value of land within a 1,000 foot radius would be necessary to reach a break-even point for this Scenario. As with Scenario 1, the stormwater-related grants and discounts would not on their own provide sufficient funding for site acquisition and development, but they would help to offset the costs of BMP improvements.

CAPITAL COSTS FOR SCENARIO 2

PROJECT COSTS	Area (s.f.)	Percent	Unit Cost ($/s.f.)	Subtotal	Total Cost
Commercial Land Acquisition	21,780	100%	$487.50		$10,617,750
Site Improvements	21,780		$80.00	$1,742,400	$1,742,400
Hardscape (Impervious)	7,623	35%	$14.00	$106,722	
Planting (Permeable area)	12,937	59%	$11.00	$142,311	
Site Furnishings, Amenities			Allowance	$250,000	
Stormwater Infrastructure					
Water Quality (LID)	1,220	6%	$35.00	$42,689	
Water Quantity (Underground Storage)	7,623	0%	$15.00	$114,345	
Infrastructure & Other Costs (Sitework, electric, environmental, etc.)	21,780	100%	$49.88	$1,086,334	
Total Project Costs					**$12,360,150**

SOURCE OF FUNDS	Area (s.f.)	Description	Unit Cost / s.f.	Total Source
Bond	2,198,000	Parcel Area for 1,000 ft radius	$5.56	$12,210,150
EPA 319 Grant		Up to 50% of BMP Costs		$150,000
Owner's Donation to Park	21,780	Contribution from Land Sale	$0.00	$0
Total Source of Funds				**$12,360,150**

ANNUAL OPERATIONS FOR SCENARIO 2

OPERATING COSTS	Bond Amount	Interest Rate	Term (years)	Unit Cost ($/ s.f.)	Total Cost
Annual Bond Repayment	$12,210,150	5%	30	$0.36	$794,288
Park Operations	**Area (s.f.)**	**Description**		**Unit Cost**	**Total Cost**
Programming	21,780	Balance Available		$2.24	$49,187
Security, Maintenance	21,780	(Above and beyond normal BID services)		$1.38	$30,000
Administration, Liability Insurance	21,780	Allowance		$0.23	$5,000
LID Maintenance	1,220	Annual Costs including Sinking Fund		$5.00	$6,098
Total Project Costs					**$884,573**

REVENUES	Area (s.f.)	Description	Unit Cost	Total Source
Annual Special Assessment	2,198,000	Parcel Area within 1,000 ft radius of Park Site	$0.36	$794,288
Parking Fees (Impervious Area)	7,623	300 s.f./space, 50% occupancy, 5-day week	$8.00	$26,426
Special Event & Promotions	na	Advertising, Sponsorship	na	$50,000
Kiosk Rental	500	Coffee / Sandwiches etc.	$25.00	$12,500
IAC Discount (50%)	14,157	Based on 2017 Rates, Discount for Permeable Area created	$23.99	$1,223
Stormwater Fee Discount (50%)	14,157		$2.67	$136
Total Source of Funds				**$884,573**

RECOMMENDATIONS: SPECIFIC TO NoMa

COST BENEFITS FOR SCENARIO 2

A. Seller of the Park Site

Land Area	21,780
Potential FAR	152,460

Cost				Benefit			
Gives Up:	Amount	Per s.f.	Per FAR	**Receives:**	Amount	Per s.f.	Per FAR
Commercial Land	$10,617,750	$488	$70	Sales Proceeds	$10,617,750	$488	$70
Donation to Park	$0	$0	$0	Less Donation	$0	$0	$0
				Net Proceeds	$10,617,750	$488	$70
Future Profits (and Risks) of Developing the Park Site				Potential Gain in Value for any other Properties adjacent to the amenity of the Park.			

B. Land Owners within 1,000 foot radius

Parcel Area	2,198,000
Potential FAR	15,386,000

Cost				Benefit			
Gives Up:	Amount	Per s.f. Land	Per FAR	**Receives:**	Amount	Per s.f. Land	Per FAR
Increased Annual Assessments	$794,288	$0.36	$0.05	Potential for faster lease-up, etc. due to nearby amenity			
Present Value of 30 years of assessments	$12,210,150	$5.56	$0.79	Total Land Value within 1,000 ft. Radius of Park	$1,071,525,000	$488	$70
				Break Even Land Value Increase	$12,210,150	$5.56	$0.79
				% Increase	1.14%	1.14%	1.14%
				An increase in just the LAND value of approximately 1% would completely offset the assessments.			

C. DC Government

Parcel Area	2,198,000
Potential FAR	15,386,000

Land Area	21,780
Potential FAR	152,460

Cost				Benefit			
Gives Up:	Assessed Value	Tax Rate	Annual Tax	**Receives:**	Value	Tax Rate	Annual Tax
Current Property Tax on Park Parcel	$10,617,750	1.85%	$196,428	Total Land Value within 1,000 ft. Radius of Park	$1,072,624,000	1.85%	$19,843,544
				Break Even Land Value Increase	$10,617,750	1.85%	$196,428
				% Increase	**0.99%**		**0.99%**
Potential Property Tax if Park Parcel is fully developed*	$60,984,000	1.85%	$1,128,204	Potential Total Building Value within 1,000 ft.*	$6,154,400,000	*1.85%*	$113,856,400
** Assume Building Valued at $400 per s.f.				Break Even Land Value Increase	$60,984,000	1.85%	$1,128,204
				% Increase	**0.99%**		**0.99%**

D. DC Water

Cost				Benefit			
Gives Up:	Impervious Area	30% Discount / s.f.	Total Discount	**Receives:**	Annual Stormwater Gallons*	Cost / Gallon**	Total Benefit
IAC Charges	14,157	$7.20	$1,223	Reduction in On-Site Stormwater to Treat	260,489	$0.001	$264
				Reduction Off-Site Stormwater	946,036	$0.001	$959
Total Fees			**$1,223**	**Operating Cost Reduction**			**$1,223**
* With annual rainfall equal to 37 inches, each square foot receives approximately 23 gallons of stormwater, of which an estimated 80% will flow into the DC Water combined sewer system.				Plus any potential reduction in Infrastructure costs, plus any additional off-site stormwater collected. ** Based on 20% variable costs for DC Water sewer costs of $3.79 per CCF (748 gallons)			

3.2.3 SCENARIO 3 - RIGHT-OF-WAY

APPLICATION:

Major Urban Streets, Local Streets, and Trails

GOAL AND DESCRIPTION:

The goal of this scenario is to create a quality public realm that provides environmental benefits by treating stormwater from the Right-of-Way (ROW), as well as help improve social and cultural conditions. The ROW would serve as the connecting network with a primary responsibility of weaving open spaces together. It also needs to become the transition space between public and private space, often times acting as a delicate perforated barrier that balances security, aesthetics, and comfort.

Since the ROW in most of NoMa varies from 50 feet (Patterson Street) to 150 feet (K Street), and sidewalk area varies in width from 10 feet (Patterson Street) to 55 feet (K Street), the ROW represents an important opportunity for creating an attractive experience that supports stormwater management solutions and potentially increases property value.

OPEN SPACE CREATED:

Whether the streetscape has a single or a double row of street trees, the linear open space provided by the ROW is an important part of urban life. Within a wide streetscape, the open space can become a dynamic linear public space with small intimate pockets. These “leisure zones” can be shaped by various forms of planting area, enhanced with creative artwork, and provide critical functions. Planting areas need to be coordinated with numerous utilities, street furniture and pedestrian circulation.

STORMWATER IMPACT:

As stated in earlier chapters, transportation systems require enormous impervious areas and generate large volumes of water. Since NoMa falls in a combined sewer area, the ROW is not required to reduce stormwater flows or pollutants. It is legally acceptable to convey stormwater through a series of pipes to the Blue Plains. However, it is environmentally and socially responsible to control and treat stormwater on-site as much as possible. Numerous small scale on-site treatment facilities in the ROW will reduce the flow of a typical rainstorm into the conveyance system and the treatment facilities in Blue Plains. Monitoring for water quantity and quality efficiency of these on-site systems will help make the argument that there is a cost saving for installing landscape-based stormwater management devices as a reliable solution. This would justify reducing the cost of infrastructure projects and treatment facility operations.

FINANCIAL BENEFITS

A cost comparison between an integrated blue and green infrastructure approach is included in this Scenario study. It shows that the cost for plantings in the ROW is slightly more expensive if landscape-based stormwater management facilities are integrated into the sidewalk design - approximately $200,000 only. The benefit of integrating various infrastructures with the purpose of efficiently managing stormwater on-site surpasses the one-time cost of constructing these facilities.

CONCLUSION

The benefits, outlined in previous chapters of this study, go beyond environmental improvements and extend into social and cultural responsibilities. Integrated infrastructure improvement to the ROW could add significant value to nearby properties and the overall NoMa community. The maintenance of these devices could be part of a retrained NoMa BID management team that currently provides ROW maintenance.

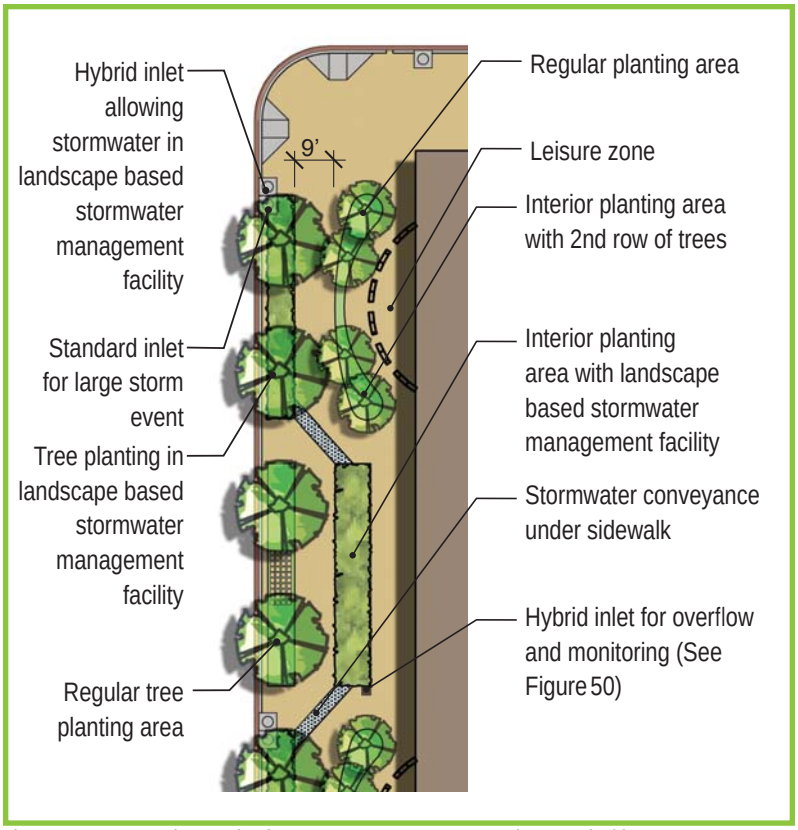


Figure 47: Conceptual Example of Streetscape Treatment Integrating Sustainable Stormwater Management Solutions

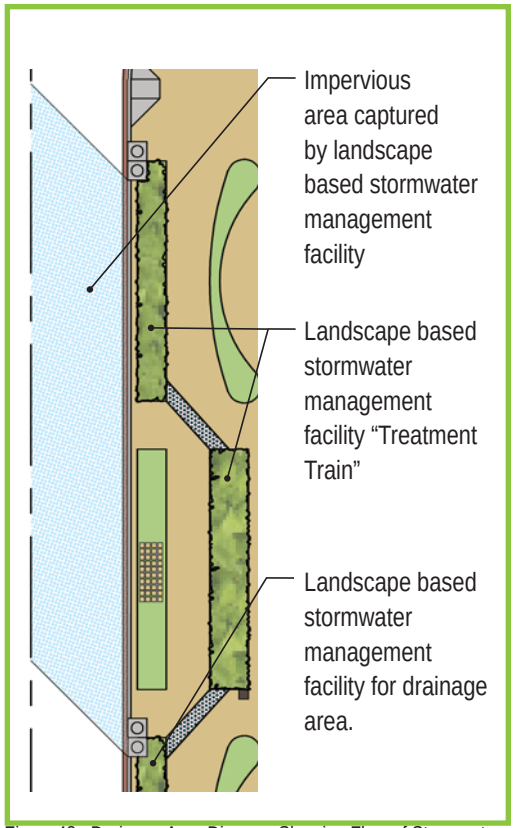


Figure 48: Drainage Area Diagram Showing Flow of Stormwater Towards Appropriate Treatment Facility

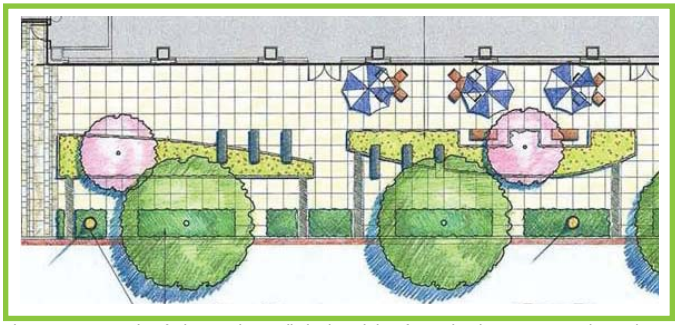


Figure 49: Example of Bioretention Cells in the Right-of-Way in First Street, NE (NoMa); (Picture of Bioretention Cell: Figure 51-4)

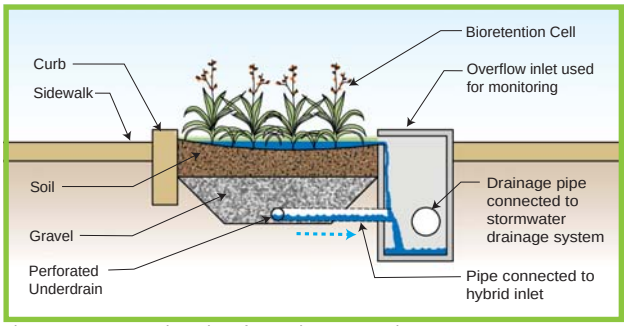


Figure 50: Conceptual Section of a Landscape Based Stormwater Management Facility in Sidewalk

Figure 51: Examples of Bioretention Cells in the Right-of-Way throughout the United States

1. High Point, Seattle

2. 12th Street, Portland

3. Siskiyou Street, Portland

4. First Street, NE, NoMa (Figure 49)

RECOMMENDATIONS: SPECIFIC TO NoMa

A -Curbside Standard Tree Planting Area (6 ft. x 50 ft.)	
General Infrastructure Allowance	$2,000
Stone Edging & Surfacing	$6,906
Planting soil, mulch, groundcover, plants and 2 trees	$10,540
Total per Curbside Standard Planting	$17,446
Curbside standard planting areas in one block or 600 ft.	5
Total Curbside Standard Planting Areas	$87,230

B - Curbside Landscape Based Storm Management Facility - at curb (6 ft. x 50 ft.)	
General Infrastructure Allowance	$2,000
Concrete edging & railing	$6,716
Planting soil, mulch and plants	$14,129
Filtration media and underdrain	$4,049
Manhole, one hybrid inlet and one overflow	$11,150
Total per type 1 area	$38,044
Type 1 areas needed in one side of one block or 600 ft.	5
Total	$190,220

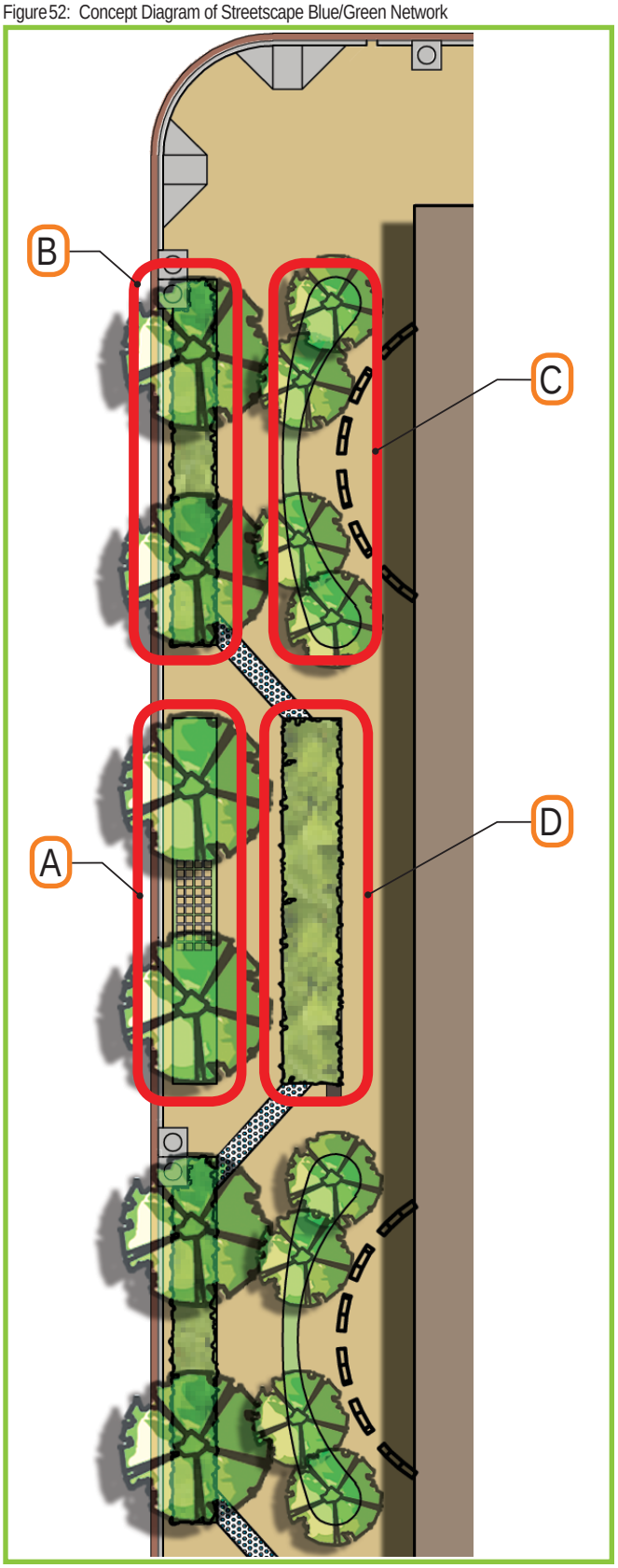
C - Interior Standard Planting Area (6 ft. x 50 ft.)	
General Infrastructure Allowance	$2,000
Extra Amenities (Landscape lighting, Art Stage Areas, Railings)	$8,000
Planting soil, mulch, groundcover, plants and 2 trees	$15,160
Seatwalls	$12,000
Total per Curbside Standard Planting	$37,160
Curbside standard planting areas in one block or 600 ft.	5
Total Interior Standard Planting Areas	$185,800

D - Mid-Walk Landscape Based Storm Management Facility - in paving (8 ft. x 50 ft.)	
General Infrastructure Allowance	$2,000
Edging & Railing	$6,952
Planting soil, mulch and plants	$15,820
Filtration media and underdrain	$4,280
Manholes and Inlets	$7,150
Total per type 2 area	$36,202
Type 2 areas needed in one side of one block or 600 ft.	5
Total	$181,010

COST COMPARISON

The plan and the charts represent an anticipated cost of construction for the streetscape landscaping if stormwater management is integrated into the public realm design. For the purposes of this study, a typical block with a 35' wide ROW is used. The double row of tree design follows the standards developed for First Street, NE. The expected cost for an integrated blue and green network, which would include landscape-based stormwater management facilities combined with planting areas, is $724,460. A traditional non-integrated system with separated planting areas and stormwater management facilities would be $546,060 - an approximately $200,000 difference.

Figure 52: Concept Diagram of Streetscape Blue/Green Network



3.2.4 SCENARIO 4 - PRIVATE OPEN SPACE

APPLICATION:

Privately Owned Developments

GOAL AND DESCRIPTION:

The goal of Scenario 4 would be to demonstrate the potential for positive returns on investment for a typical NoMa building owner who carried out innovative stormwater improvements on private property. This could include green roofs, cisterns, landscape-based stormwater management facilities, and storage facilities integrated with open space at the ground level.

For green roofs, partial funding could be provided by DDOE's Green Roof Rebate program administered by the Anacostia Watershed Society (AWS). The balance of funds needed could be provided by a PACE (Property Assessed Clean Energy) loan provided by the DC Government and repaid over time by a special assessment on the property. Energy savings over an assumed 20-year useful life for the green roof would by itself provide the benefits to justify the cost of these improvements.

OPEN SPACE CREATED:

In this scenario, open space is defined as any part of the development that provides visual as well as functional benefits to the urban fabric. An open space can be an extensive green roof that provides stormwater and heat island reduction benefits, as well as energy savings and wildlife creation, but would not add recreational value. While cisterns and other storage tanks are not open spaces, they can be integrated into the built form and add interest as an architectural or sculptural element. The goal for these elements is to exhibit these technologies to tell the story of the integration of water in the daily experience.

Accessible open spaces would provide significant benefits to the urban environment, whether publicly accessible or only accessible for private use. These open spaces would include intensive green roofs, court yards, entrances into buildings, and common greenspaces.

STORMWATER IMPACT:

There are two basic requirements for stormwater - water quality and water quantity. The intent for water quantity controls is to limit disruption of natural hydrology by reducing impervious cover, increasing on-site storage and infiltration capacity, and reducing the risk of on-site and downstream flooding. Water quality improvements seek to remove runoff pollutants and contaminants through mechanical or biologic means. While green roofs are an acceptable technology for meeting water quality requirements, they alone would not be enough to meet the water quantity requirements. A combination of cisterns and landscape-based stormwater management techniques, including green roofs, would provide a holistic multi-purpose infrastructure solution.

FINANCIAL FEASIBILITY:

Primary sources of funding to pay for capital costs not assumed by a developer for the proposed BMP improvements could come from rebates and loans. DDOE offers a rebate for $7 per square foot of green roof above 4,000 s.f. For the purposes of this scenario, we have assumed installation of an extensive green roof covering 50% of the rooftop. The balance of funds could come from a PACE loan program based on the savings in annual energy costs realized at the property.

Green roofs can assist property owners to achieve significant energy savings. A green roof can lower the air temperature on the rooftop where most HVAC systems draw their intake air. A green roof can also provide additional insulation for the floor just below the roof. Estimates of the potential annual savings on energy used for air-conditioning at a Florida office building ranged from 19% to 40%. According to BOMA (Building Owners and Managers Association), the average annual energy costs for an office building in Washington, DC, are $2.40 per s.f. Assuming that energy used for cooling represents 33% of this cost, or $0.80 per s.f., then a 15% reduction in cooling costs could result in an annual savings of $0.12 per s.f., an amount sufficient to offset the annual debt service on a PACE loan used to finance the BMP improvements.

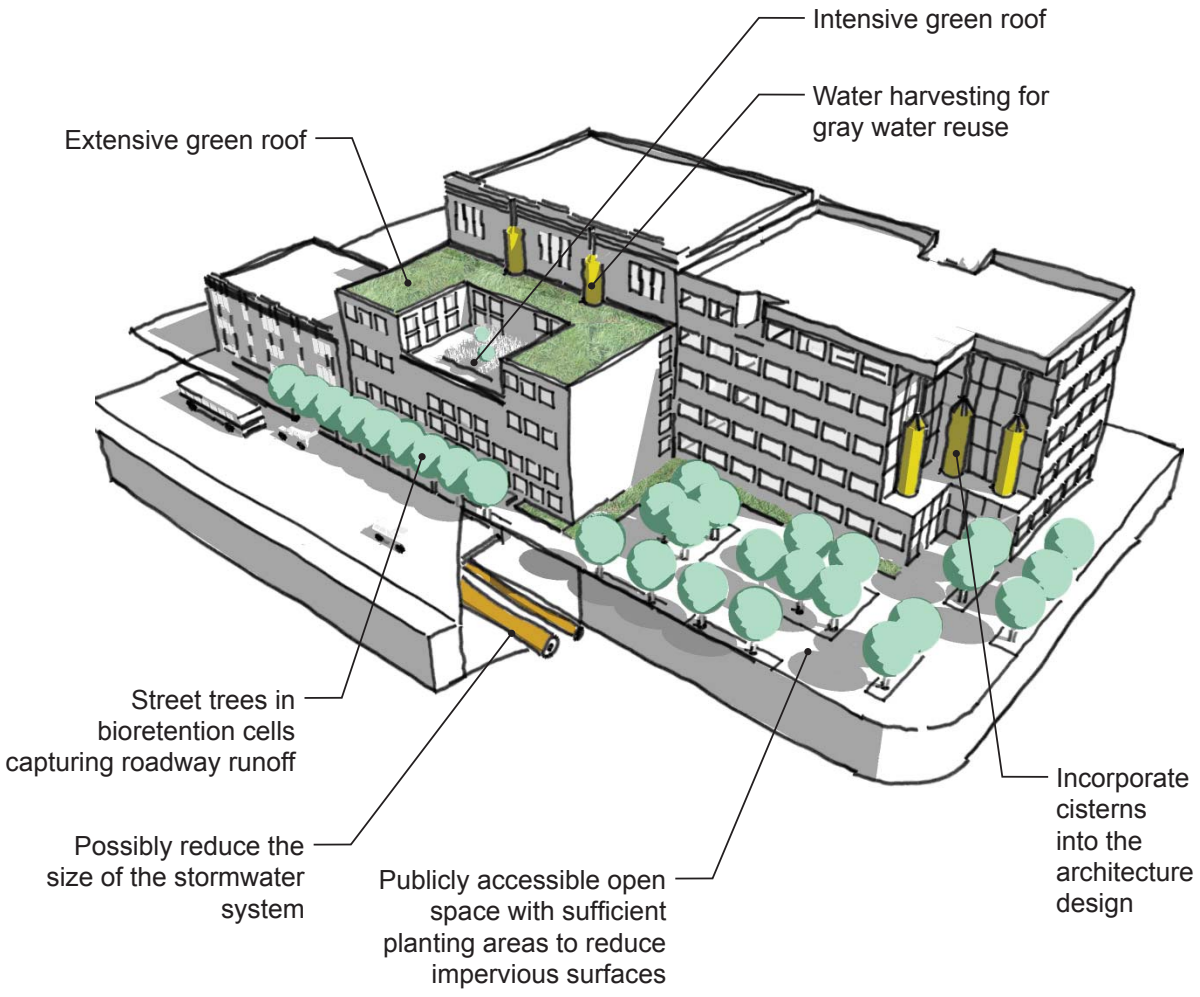


Figure 53: Conceptual Sketch of How Green and Blue Infrastructure Can be Incorporated into the Building Design

Figure 54: Example Images of Stormwater Management Solutions in Private Development

1. Example of cisterns strategically placed as part of the development

2. Example of existing green roof

3. Example of landscape based stormwater management facility at M.I.T. in front of main entrance

RECOMMENDATIONS: SPECIFIC TO NoMa

CONCLUSION

The owner of a typical office building comprised of 150,000 s.f. gross building area on a half-acre NoMa site might well consider carrying out stormwater-related retrofits due to the combination of incentives for green roofs as well as the potential for energy savings. If the District of Columbia were to move ahead with a PACE-type loan program, the potential energy savings could provide sufficient funding, together with the DDOE green roof grants, to cover the cost of these improvements.

Capital costs for Scenario 4 are estimated at $230,000 for an extensive green roof covering 10,000 s.f., along with cisterns to collect runoff from both the green and non-green portions of the roof. DDOE rebates are estimated to cover approximately 30% of these capital costs.

CAPITAL COSTS FOR SCENARIO 4

PROJECT COSTS	Area (s.f.)	Percent	Unit Cost ($/s.f.)	Subtotal	Total Cost
Commercial Land Acquisition	21,780	100%	$0.00	N/A	$0
Building Improvements					
Impervious Area (Footprint)	20,038	92%			
Permeable Area (At Ground)	1,742	8%			
	21,780	100%			
Stormwater Infrastructure					
Water Quantity					
Cisterns	20,038 (area collected)		$1.50	$30,057	
Water Quality					
(Extensive Green Roof 50% of Roof)	10,019		$20.00	$200,376	
Subtotal Improvements				$230,433	$230,433
Total Project Costs					**$230,433**

SOURCE OF FUNDS	Area (s.f.)	Description	Unit Cost / s.f.	Total Source
PACE Loan	21,780	Cost Net of Grant(s)	$7.36	$160,301
DC Green Roof	10,019	$7 per s.f. up to 20,000 s.f.	$7.00	$70,132
Owner's Equity	21,780	Balance (if needed)	$0.00	$0
Total Source of Funds				**$230,433**

ANNUAL OPERATIONS FOR SCENARIO 4

OPERATING COSTS	Loan Amount	Interest Rate	Term (years)	Unit Cost ($/ FAR)	Total Cost
PACE Loan Repayment	$160,301	7%	20	$0.10	$15,131
BMP Operations	**Area (s.f.)**	**Description**		**Unit Cost**	**Total Cost**
Green Roof Maintenance	10,019	Annual Costs including Sinking Fund		$0.73	$7,314
Annual Costs					**$22,445**

REVENUES	Area (s.f.)	Description	Unit Cost	Total Source
Potential Energy Savings	152,460	Break Even Savings Net of Stormwater Discounts	$0.12	$18,399
IAC Discount (30%)	20,038	Based on 2017 Rates, Discount for Permeable Area created	$23.99	$1,731
Stormwater Fee Discount (30%)	20,038		$2.67	$193
Water Supply	20,038	Stormwater collected in Cisterns for Re-Use*	$6.89	$2,123
Total Revenues				**$22,445**

* Assume 50% of annual rainfall is collected for re-use as gray water or for irrigation of Green Roof.

RECOMMENDATIONS: SPECIFIC TO NoMa

COST BENEFITS FOR SCENARIO 4

A. Building Owner

Site Area	21,780
Permeable	10,019
Building Area	152,460

Cost				Benefit			
Invests:	Amount	Per s.f.	Per FAR	**Receives:**	Amount	Per s.f.	Per FAR
Annual PACE Loan Repayment	$15,131		$0.10	Annual Energy Savings	$18,399		$0.12
Annual LID Maintenance	$7,314	$0.73	$0.05	IAC Fee Reduction	$1,923	$0.09	$0.01
				Water Supplied	$2,123		
PV 20 years of Payments	$188,570	$8.66	$1.24	PV 20 years of Energy Savings	$229,297	$10.53	$1.50
PV 20 years of Maintenance	$91,145	$4.18	$0.60	PV 20 years IAC Reduction	$23,966	$1.10	$0.16
				PV 20 years Water Supply	$26,452		
Total Cost	$279,715	$12.84	$1.83	Total Benefits	$279,715	$11.63	$1.66
Assume 20 year Repayment for Pace Loan				Assume 20 Year Useful Life of Green Roof For a Typical Office Building with $0.80 per s.f. annual HVAC cost, the Green Roof would need to generate savings of:			15.1%

B. DC Water

Cost				Benefit			
Gives Up:	Impervious Area	30% Discount / s.f.	Total Discount	**Receives:**	Annual Stormwater Gallons*	Cost / Gallon**	Total Benefit
IAC Charges	20,038	$7.20	$1,731	Reduction in Stormwater Gallons to Treat	368,699	$0.001	$374
Total Discount			**$1,731**	**Operating Cost Reduction**			**$374**
* With DC annual rainfall equal to 37 inches, each square foot receives approximately 23 gallons of stormwater, of which an estimated 80% will flow into the DC Water combined sewer system.				Plus any potential reduction in infrastructure costs. ** Based on 20% variable costs for DC Water sewer costs of $3.79 per CCF (748 gallons).			

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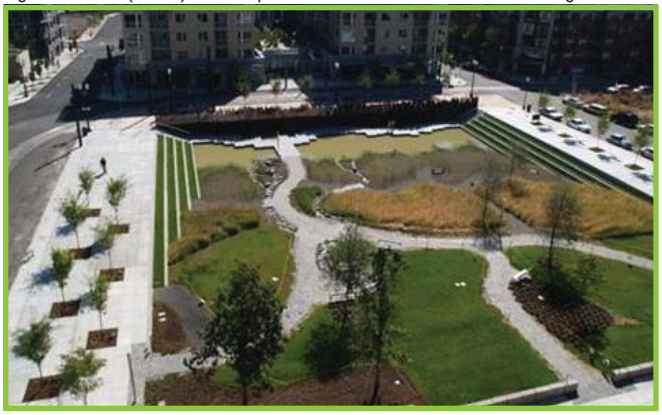
3.2.5 SCENARIO 5 - RECOMMENDED OPTION - COMBINATION OF SCENARIOS 1 - 4

OVERVIEW:

While each of the individual scenarios presented in Scenarios 1 through 4 have merits on their own, the combination of multiple scenarios to become part of a “Blue and Green System” within NoMa would offer the most benefit. An improved ROW in Scenario 3 would physically and visually connect the open spaces proposed in Scenarios 1 and 2. Retrofitting existing buildings, Scenario 4, with green roofs would not only augment the amount of stormwater retained, but also reduce the temperatures of individual buildings and contribute towards a general reduction of the urban heat island effect. Some green roofs could also be designed for public access as shown in the example of Scenario 2.

Examples of retrofitted parcels and networks are shown throughout the report and can be seen in other case studies throughout the United States. Traditional development in the urban environment is typically designed for single purpose objectives such as a parking lots and developments with an impervious roof (gray parcels), a typical green space used as a playground or a dog park (green parcels), or a water reservoir collecting drinking water (blue parcels). Parcels can be either public parcels or private parcels, but need to be linked by networks which are typically publicly owned. The two figures shown represent integrated blue, green and gray efforts in both a parcel scenario and a network scenario.

Figure 55: Park (Parcel) used for passive recreation and stormwater management



Linkage between Mini Parks and a Neighborhood Park, with an improved ROW and private development willing to provide publicly accessible or quality green space, would further reinforce the image of NoMa as a livable, walkable community and thereby further contribute towards the positive development of this area.

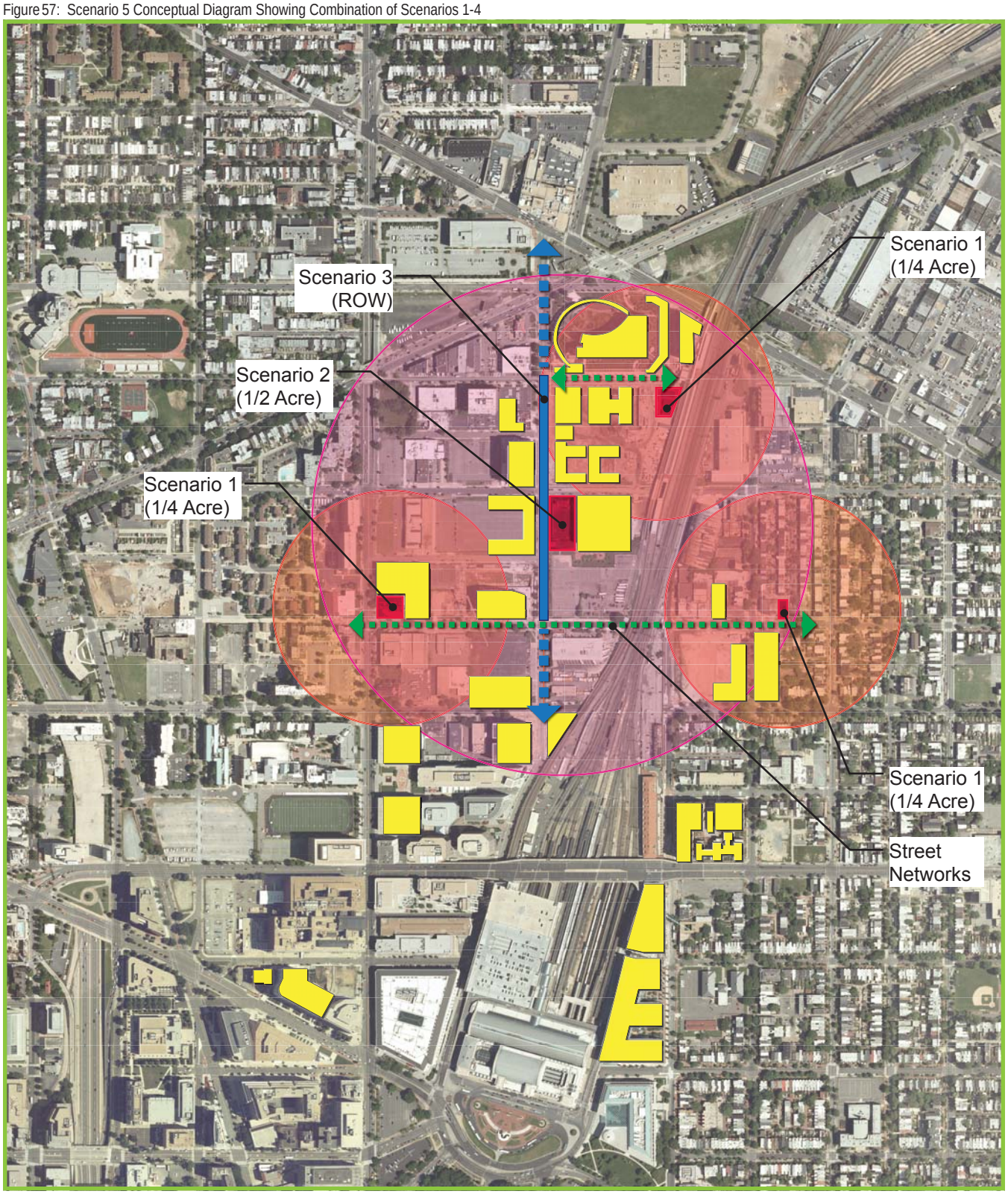
Parcel at L and 3rd, Scenario 1 Around a Residential Low Density Area

Parcel at Metro, Scenario 1 Around a Mixed Use High Density Area

Parcel at M and 1st, Scenario 2 Around a Mixed Use High Density Area

Figure 56: Greenspace (Network) used to link parcels while creating a pedestrian friendly environment.

Figure 57: Scenario 5 Conceptual Diagram Showing Combination of Scenarios 1-4



Privately owned sites in NoMa - potential Scenario 4 locations

This diagram is for conceptual planning purposes only and does not reflect any negotiated agreements with property owners.

SCENARIO 5 - FUNDING SOURCES AND USES

This chart summarizes the potential Sources and Uses of funds for a combined approach (Scenario 5) based on publicly-funded initiatives that would be repaid in part from increased fees, property taxes and stormwater and energy credits. Scenario 5 includes the acquisition and improvement of public open spaces (Scenarios 1 and 2), joined by an improved public right-of-way on both sides of a model block (Scenario 3). Scenario 4 represents the example of one single half-acre private property owner along any given block that has undertaken BMP improvements. The successful completion of one privately- owned project would hopefully encourage a number of other property owners within the same block to follow suit. The concentration and coordination of open spaces and BMP improvements would reinforce the momentum for potential gains in surrounding property values and thereby justify the initial investments.

Project Costs	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
LAND					
Square Ft. Land	21,780	21,780	7,000	21,780	72,340
SF Building Area	500	500	na	152,460	153,460
Cost / SF Land	$260	$488	$0	$0	$384
Subtotal Land	$5,662,800	$10,617,750	$0	$0	$16,280,550
IMPROVEMENTS					
Hardscape	$152,460	$106,722	$136,680	$0	$395,862
Plantings	$100,624	$142,311	$299,490	$0	$542,424
Amenities	$250,000	$250,000		$0	$500,000
BMP Improvements					
Water Quality	$60,984	$42,689	$83,290	$200,376	$387,339
Water Quantity	$163,350	$114,345		$30,056	$307,751
Other Infrastructure	$1,014,982	$1,086,334	$223,000	$0	$2,324,316
Subtotal Improvements	$1,742,400	$1,742,400	$742,460	$230,432	$4,457,692
TOTAL COSTS:	**$7,405,200**	**$12,360,150**	**$742,460**	**$230,432**	**$20,738,242**

Sources of Funds	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Bonds	$7,255,200	$12,210,150	$546,060		$20,011,410
PACE Loans				$160,300	$160,300
Grants			$196,400		$196,400
EPA 319	$150,000	$150,000			$300,000
DC Green Roof				$70,132	$70,132
Donations					
TOTAL SOURCES:	**$7,405,200**	**$12,360,150**	**$742,460**	**$230,432**	**$20,738,242**

APPENDIX

SOURCES

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- "Real Estate Impacts of Urban Parks," Patrick L. Phillips, Economics Research Associates (ERA).
- www.bv.com/Downloads/Resources/Brochures/rsrc_EMS_2007StormwaterUtilitySurvey.pdf
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- www.houstonlwsforum.org/

ACRONYMS

- AWS - Anacostia Watershed Society
- AWTADG - Anacostia Waterfront Transportation Architecture Design Guidelines
- BID - Business Improvement District
- BMP - Best Management Practice
- BOMA – Building Owners and Managers Association
- CCF - 100 Cubic Feet
- CLT - Community Land Trust
- CSO - Combined Sewer Overflow
- CSS - Combined Sewer System
- CWA - Clean Water Act
- DDOE - District Department of Environment
- DDOT - District Department of Transportation
- DMPED - Deputy Mayor for Planning and Economic Development
- EPA - Environmental Protection Agency
- ERU - Equivalent Residential Unit
- HVAC - Heating, Ventilating, and Air Conditioning
- IAC - Impervious Area Charge
- LID - Low Impact Development
- LTCP - Long Term Control Plan
- MS4 - Municipal Separate Storm Sewer System
- NAFSMA - National Association of Flood and Stormwater Agencies
- NPDES - National Pollutant Discharge Elimination System
- NoMa - North of Massachusetts Avenue
- OP - Office of Planning
- PACE - Property Assessed Clean Energy
- ROW - Right-of-Way
- SF - Square Feet
- SSL - Square/ Suffix/ Lot
- SWU - Stormwater Utilities
- TDR - Transfer of Development Rights

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NoMa

NORTH of MASSACHUSETTS AVENUE

District of Columbia
Office of Planning

Baker

Amber Real Estate L.L.C.
Development Investment Corporate Advisory