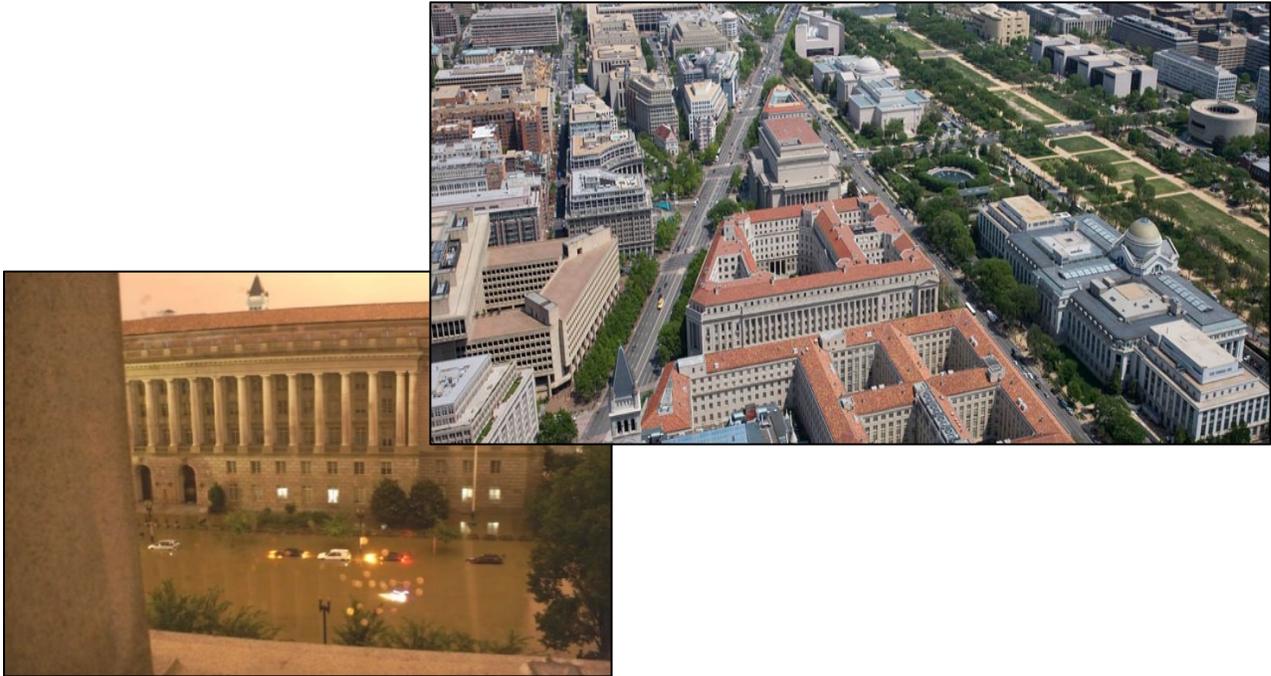




# FEDERAL TRIANGLE AREA FLOOD WORKSHOPS AND STRATEGY REPORT WASHINGTON D.C.

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***Report prepared by:* District of Columbia Silver Jackets Team**

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FINAL REPORT  
OCTOBER 2019

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### APPENDICES

Appendix A – Summary of Flood Workshop #1

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## 1 INTRODUCTION

### 1.1 Project Purpose

The Federal Triangle area (FTA) in Washington, DC experienced significant flooding in June 2006 and flooded again during the writing of this report in July 2019. The area, shown in Figure 1, continues to be at risk of flooding. The purpose of this project was to engage stakeholders and flood experts in discussing the flood risk and potential solutions and to determine if there is agreement from key agencies in collectively working together to further explore a system-wide solution.



Figure 1. Federal Triangle Study Focus Area

The District of Columbia Silver Jackets received funding to conduct this effort, which included hosting two workshops, coordinating with many agencies, and hosting a stakeholder leadership meeting. The DC Silver Jackets is an interagency team that coordinates and collaborates to reduce the flood risk in the District of Columbia (DC). It is comprised of many federal, regional and DC agencies and is co-led by the DC Department of Energy and Environment (DOEE), the U.S. Army Corps of Engineers, Baltimore District (USACE) and the National Park Service (NPS). The National Capital Planning Commission (NCPC) is also an active member and was part of this core



project team. The USACE runs the Silver Jackets Program and reviews proposals and funds various interagency flood risk management related projects each year.

Following the June 2006 flood, there was significant interest in mitigating the area's flood risk. Several studies were conducted and various actions were taken. Some entities with facilities and infrastructure within the Federal Triangle implemented flood-proofing measures specific to their own facilities. In 2011, DC Water completed the *Federal Triangle Stormwater Drainage Study* in partnership with several District, federal and regional stakeholders. The study evaluated several flood risk management solutions related to the storm water system. The study identified the viability and broad cost ranges for several system-wide solutions such as constructing storage tanks under the National Mall, pumping stations and new tunnels that would reduce the flood risk. Some options, such as installing low-impact development in this urban watershed, were beneficial but not able to control the volume of a 2006 flood. The costs ranged from \$360-\$400 million. Interested stakeholders continued to meet regularly to share information, and several affected facilities undertook site-specific flood risk management projects and strategies. However, no comprehensive project has been implemented. This was in part due to multi-jurisdictional nature of the FTA, with stakeholders that are affected by the flooding and/or have some role or property related to the flooding and potential solutions. No single agency has responsibility for the flooding problem. The DC Silver Jackets determined that it would be helpful to re-engage interested agencies and stakeholders and review emerging information on new flood risk management strategies to help evaluate and reduce this significant flood risk, so the team developed the FTA Workshop and Strategy proposal, which was approved and funded by the USACE in FY18.

The goal of the two workshops and subsequent report-out to the leadership representatives was to achieve agreement on a path forward for further mitigating flood risk in the FTA. The goal was not to identify which particular project should be implemented, but to discuss the types of projects that could be further evaluated and obtain support for pursuing a system-wide solution rather than, or in addition to, individual actions.

## 1.2 Key Agencies

Managing the flood risk in the FTA has and will continue to involve coordination among a number of federal and DC agencies. Some agencies have buildings and assets that are vulnerable to flooding, some own property that could be affected by the flooding and/or a solution to the flooding, and others have some type of role and/or responsibility related to the stormwater system, agency coordination or planning within DC. Prior to the workshop, the DC Silver Jackets sent letters to leaders in key stakeholder agencies, requesting agency participation and committing to a briefing following the workshops. The key stakeholder agencies involved in this effort are listed below:

- General Services Administration (GSA)
- National Archives and Records Administration (NARA)
- National Capital Planning Commission (NCPC)
- National Gallery of Art (NGA)
- National Park Service (NPS)
- Smithsonian Institute (SI)
- DC Department of Energy and Environment (DDOE)



- DC Office of Planning (DC OP)
- DC Department of Transportation (DDOT)
- DC Water
- Washington Metro Area Transit Authority (WMATA)



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## 2 FLOOD RISK BACKGROUND

Historically, the Washington, DC region has been prone to flooding. Several rivers and streams flow through the area and connect to the Chesapeake Bay, and the area is subject to major storms, storm surges, and micro-storms. DC has experienced riverine, tidal, and interior flooding. The FTA is vulnerable to all three types of flooding, but recent floods in 2006 and 2019 have been caused by interior (or stormwater) flooding. DC and the FTA are not alone in this flood risk. Many cities throughout the nation and world are experiencing urban flooding and are working to find ways to reduce flood risk. The FTA is adjacent to the National Mall and contains federal headquarters and offices, cultural institutions housing national treasures, other District and private buildings, and major regional transportation and utility infrastructure. The FTA is located where Goose Creek/Tiber Creek once flowed. The area has been filled in and developed over time, along with its watershed, but continues to be a low point where water collects. Like many other city stormwater systems, the storm drainpipes in this area were only designed to carry smaller rainfall amounts – in this case, the 15-year flood. An additional challenge in the FTA is the uncertainty of predicting the timing and extent of interior flooding, with a very limited response time in most instances.



Figure 2. June 2006 Flood Inundation Map

The FTA experienced severe flooding in June 2006, resulting in millions of dollars in damages to numerous buildings, utilities, and the Metro system. The flooding and related power outages

caused major disruption in operations to agencies and businesses. The extensive flooding shut down operations at four key federal office buildings - the IRS Headquarters, the Commerce Department, the Justice Department, and the National Archives. Damage estimates show that GSA and the IRS expected to spend \$54 million in repairs, in addition to \$4 million associated with employee time lost. Additionally, other buildings were affected, including the DC Government Wilson Building and EPA facilities, as well as numerous Smithsonian Institution and National Gallery facilities.

After the June 2006 flood, there was significant interest in mitigating the area's flood risk. Several studies were conducted and various actions were taken. Some entities with facilities and infrastructure within the Federal Triangle implemented flood-proofing measures specific to their own facilities. In 2011, DC Water completed the *Federal Triangle Stormwater Drainage Study* in partnership with several District and federal stakeholders. The study evaluated several flood risk management solutions related to the stormwater system; however, none of the comprehensive flood risk management solutions were implemented, as discussed above. Although some agencies have implemented flood-proofing measures that help reduce flood risk at individual locations, significant flood risks still exist.



### 3 WORKSHOPS

In 2018, the DC Silver Jackets held two interagency workshops to engage stakeholders in discussing the flooding problem and potential solutions.

#### 3.1 Overview of First Workshop

The first workshop was held on June 6, 2018 at the University of the District of Columbia and was attended by 72 stakeholders. The purpose of the workshop was to provide attendees with an overview of the flood history and risk in the Federal Triangle area; discuss steps individual agencies are taking to flood-proof their properties; present types of interior flood risk management measures; and engage around key opportunities and challenges related to interior flooding in the area. The workshop was attended by facility managers, planners, engineers, environmental specialists, emergency managers and more representing federal and district agencies, international embassies, non-profit organizations, and academia. A detailed summary of this workshop is included in Appendix A.

The workshop included presentations and a discussion from several stakeholder agencies in the FTA, explaining the damages they experienced during the 2006 flood, the flood proofing or flood risk management measures they have or are implementing since the flood, and the flood risk vulnerabilities that still exist at their facilities. The panel included representatives from the General Services Administration (GSA), Smithsonian Institute (SI), National Archives and Records Administration (NARA), National Gallery of Art (NGA) and the Washington Metropolitan Area Transit Authority (WMATA). While some agencies had taken steps to reduce flood risk for individual buildings, many expressed that their facilities are still at risk of flooding and more projects are needed to further reduce risk.

After the panel discussion, there was an interactive breakout session with groups comprised of people from different agencies and backgrounds. Participants identified projects/activities planned in the Federal Triangle watershed and discussed opportunities and challenges that should be considered during the development of any flood risk management project(s) for the FTA. Each group documented its ideas and reported out on the opportunities and challenges that were identified. DC Silver Jackets team members compiled a list of the opportunities and challenges heard during the report out, and refined the list based on real-time participant feedback. Later, each participant was given the opportunity to individually select the three most important opportunities and challenges that should be considered.

The most selected opportunities included:

- Improvements upstream in the watershed using retention and leveraging development sites
- New projects being reviewed should consider flooding/stormwater management
- Capital improvement projects
- Underground storage
- Helping move projects along that have flood risk management potential



The most selected challenges included:

- Multi-jurisdictional planning including overlapping or competing priorities, coordination of efforts, and a lack of ownership and authority
- Funding and financing

### 3.2 Overview of Second Workshop

The second workshop was held on September 5, 2018 at the University of the District of Columbia and attended by 83 stakeholders. The purpose of the second workshop was to discuss the types of potential projects that could be further evaluated to reduce the FTA flood risk. General types of solutions being implemented in the United States and in other countries were presented, along with two specific concepts for this area. These concepts are very preliminary, require significant additional analysis, and have not obtained required approvals or support from the key stakeholders and landowners. A detailed summary of the second workshop is included in Appendix B.

The workshop consisted of several presentations. DC Water (Greeley and Hansen) presented the findings from the 2011 *Federal Triangle Stormwater Drainage Study*. They provided information on the following preliminary solutions evaluated in the study: low impact development/green practices (not a viable standalone solution); storage upstream of the Federal Triangle (not a viable standalone solution); using the GSA condensate line (not a viable solution); storage under the National Mall (viable solution); pumping station serving the Mall (viable solution); and a tunnel to the Main and O Pumping Stations (no longer viable due to recent construction projects).

The Silver Jackets invited non-governmental organizations who have taken an interest in the FTA flooding issue to present their concepts for addressing the problem. The National Mall Coalition, a non-profit organization, gave a presentation on a concept they developed called the National Mall Underground. The preliminary concept included constructing a multi-use facility under the National Mall, between the 9<sup>th</sup> and 12<sup>th</sup> Street tunnels that would include flood storage, car and bus parking, and a visitor center. Karolina Kawiaka, a lecturer from Dartmouth College, gave a presentation on a preliminary concept that she developed to restore the role of Tiber Creek, which once flowed through the area that is now Constitution Avenue and the Federal Triangle. Her concept plan included constructing a bioswale adjacent to Constitution Avenue in front of the museums to mimic the original role of Tiber Creek and a normally dry flood retention area next near Constitution Avenue north of the Washington Monument.

Finally, there were two presentations by consultants describing how communities are tackling flood risk internationally. Ramboll explained how the City of Copenhagen developed innovative upstream detention techniques using roads, open spaces, and even recreation areas for flood storage and conveyance. Arcadis shared examples of flood risk management used in the Kingdom of the Netherlands that emphasized urban resilience. This presentation emphasized that in order to reduce flood risk, one must do the following: understand your climate risk, vulnerability and interdependencies, design a collaborative process and plan for the long term, and seek and invent new rules.

After the presentations there was a breakout session where participants answered three important questions. First, each group was asked to identify potential advantages/co-benefits and challenges



for the various project types that were presented (underground storage and/or conveyance out of Federal Triangle, underground storage with parking, upstream detention techniques, restoration of natural drainage, flood proofing buildings). There were many advantages and challenges identified for each. Second, the groups were asked to identify potential funding opportunities and partnerships for implementing any type of flood risk management solution for the FTA. Finally, they were asked to identify any short-term actions that could be taken to combat flood risk. The results of these breakout sessions can be found in Appendix B.

The afternoon consisted of two presentations. The first presentation was on DC Levee Risk Communication, explaining the benefits and risks associated with the Potomac Park Levee System. The second presentation was on the DC Hazard Mitigation Plan, including information on funding opportunities and types of projects that qualify for hazard mitigation grants.



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## 4 STAKEHOLDER LEADERSHIP MEETINGS

### 4.1 Individual Agency Leadership Meetings

Between October 2018 and February 2019, the DC Silver Jackets leadership team held individual meetings with four key stakeholder agencies (NPS, Smithsonian Institution, DC Water, and GSA) to hear their thoughts regarding reducing the FTA flood risk and to help prepare for a collective agency leadership meeting.

### 4.2 Group Stakeholder Leadership Meeting

On May 23, 2019, the DC Silver Jackets held a meeting bringing together leaders from all of the key stakeholder agencies (listed in Section 1.2, except for DDOT) to provide a briefing on the workshops and discuss interest in further multi-agency coordination to study a comprehensive flood risk management solution for the FTA. Future activities for a shared solution could include a feasibility study, National Environmental Policy Act (NEPA) compliance, which includes Section 106 compliance, funding source identification, and then project development. The goals of the meeting were to:

- Present information from the workshops.
- Seek direction on either moving forward with additional multi-agency exploration of system-wide solutions or determining that agencies will pursue individual flood risk management actions as appropriate.
- If there was interest in continued multi-agency work, seek direction on next steps, including possible data, staff and funding commitments from agencies to support a longer-term feasibility study.

**KEY OUTCOME:** All of the agency representatives indicated support for moving forward collectively with studying comprehensive solutions to the FTA flooding problem. They committed to support several short-term tasks by providing data and personnel, and to work towards scoping and funding strategies for a longer-term feasibility study. Stakeholders emphasized the complex, multi-jurisdictional nature of the flooding problem in the FTA and the need to recognize the area's significant historic, cultural, and environmental features, as well as agency operational and mission needs. With this in mind, they encouraged a focus on potential solutions that primarily address flood risk and are appropriate given the many constraints in and around the Federal Triangle area, including solutions that have minimal visual impact. While other benefits of any given potential solution may be commendable, addressing flood risk is the primary goal. They encouraged consideration of new opportunities for solutions arising from ongoing or developing projects, planning or technologies, such as the Pennsylvania Avenue Initiative or future work contemplated north of the Tidal Basin, as well as interest in previously considered alternatives, particularly a pumping station solution.

This report reflects the general guidance from the leadership group, and addresses big picture goals, not an assessment of individual projects. Before any project is selected and implemented, various processes and laws such as NEPA must be followed, to include consideration of alternatives, impact evaluation, and public input.



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## 5 PATH FORWARD

During the May 23, 2019, leadership meeting, a path forward was established with the following action items:

***Identify Current Building Flood Risk Management Levels*** – This task involves compiling existing data or surveying the low opening/first floor elevations and height of existing flood risk management measures for each building in the FTA. This will assist the team in understanding the current overall flood risk to all of the buildings in the area and help determine the need and potential benefits for a system wide solution.

*Status:* USACE Baltimore District obtained funds through their Floodplain Management Services (FPMS) Program to conduct this limited analysis and it is expected to be completed in December 2019.

***Conduct Flood Damage and Impact Analysis*** – This task includes estimating the physical damage to buildings, contents and infrastructure, potential loss of operational abilities (Metro, buildings, other), impacts to regional and national stakeholders, and the unique federal government operations and cultural assets in the Federal Triangle. To help make a case to potential funders and decision-makers, it is important to have information regarding the potential damages/impacts that could be avoided if a comprehensive project is implemented.

*Status:* USACE Baltimore District obtained funds through their FPMS Program to conduct this analysis in FY20 and it will be completed by September 2020. The various property owners will support the effort by providing information and access to their buildings.

***Conduct Stakeholder Agency Alternatives Charrette*** – This task includes holding a charrette with the agencies represented at the stakeholder leadership meeting for a high-level discussion on existing and new alternatives, considering engineering and context/operational issues. There are several new projects/initiatives since 2011 that could be considered in a future flood risk management project. This could help inform the team when scoping a larger feasibility study.

*Status:* USACE Baltimore District obtained funds through their FPMS Program to assist in the planning and hosting of a one-day charrette in FY20. Various stakeholder agencies have committed to supporting and participating in this effort. It is expected to be held in February/March 2020.

***Conduct Larger Feasibility Study*** – This effort would involve conducting a detailed feasibility study, including NEPA analysis. This study would lead to selection of a flood risk management solution, followed by design and construction.

*Status:* No agency has been authorized or funded to conduct a feasibility study.

***Determine Funding Strategy*** – This effort would involve coordination among stakeholder agency representatives to discuss ways that the feasibility study, and subsequently the design and construction of a solution, could be funded considering the multi-jurisdictional nature of the issue.



*Status:* The DC Silver Jackets leaders are planning to hold a funding strategy meeting in December 2019.



## 6 CONCLUSION

All of the key stakeholder agencies agreed to move forward collectively with pursuing a system-wide solution to the FTA flooding problem. They committed to supporting the short-term tasks: identifying current flood risk management levels of each building, conducting a damage and impact analysis, and participating in a charrette to further explore and refine possible solutions. They also committed to help identify funding and other resources for a comprehensive feasibility study.



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Appendix A  
Summary of Flood Workshop #1





# Federal Triangle Area Flood Workshop #1 Summary

Hosted by the DC Silver Jackets Team

June 6, 2018 at the University of the District of Columbia



## General Overview

### *Purpose*

The DC Silver Jackets interagency flood risk management team hosted a Federal Triangle Area (FTA) Flood Workshop with 72 stakeholders in attendance at the University of the District of Columbia, on June 6, 2018. The purpose of the workshop was to provide attendees with an overview of the flood history and risk in the Federal Triangle area; discuss steps individual agencies are taking to flood proof their properties; present on types of interior flood risk management measures; and engage on key opportunities and challenges related to interior flooding in the area. The workshop was attended by facility managers, planners, engineers, environmental specialists, emergency managers and more representing federal and district agencies, international embassies, non-profit organizations, and academia. A list of participants is attached. A second workshop will be held on September 5, 2018.

The goal of these two workshops and subsequent meetings with the stakeholder leadership is to achieve consensus on a path forward for mitigating flood risk in the FTA. The workshops are not to identify which particular project should be implemented, but to discuss the types of projects that could be further evaluated and obtain support in further pursuing a comprehensive solution.

### *The Progression of the Workshop*

After welcoming comments, Nicholas Bonard, National Capital Planning Commission, gave an overview of the FTA, highlighting the area's stakeholders, historic resources, cultural assets, and the architecture. Then Jason Elliott, National Weather Service, presented on the flood history of the FTA. Dating back to 1748, DC has experienced riverine, tidal, and interior flooding. The Federal Triangle experienced severe interior flooding in June 2006. He emphasized the uncertainty in predicting these types of storms and the limited warning time associated with them. In response to the 2006 flood, some studies were conducted, including the July 2011 Federal Triangle Stormwater Drainage Study. Brandon Flora, DC Water, presented an overview of the flood risk and modeling portions of that study.

The workshop moved to panel presentations and discussion from several stakeholder agencies in the FTA. Representatives from the Smithsonian Institution, Washington Metropolitan Area Transit Authority (WMATA), National Archives and Records Administration (NARA), National Gallery of Art (NGA) and the General Services Administration (GSA) presented information on the damages they experienced during the 2006 flood, the flood proofing or flood risk management measures they have implemented or are implementing since the flood, and the flood risk vulnerabilities that still exist at their facilities. Although these agencies have taken some actions to reduce their flood risk, they expressed that their facilities are still at risk of flooding and more projects are needed to further reduce their risk.

Amy Guise, Planning Division Chief, US Army Corps of Engineers (USACE) Baltimore District, briefly mentioned the DC Coastal Flood Risk Management Study that USACE is authorized to conduct.

USACE is currently scoping that study with the Metropolitan Washington Council of Governments and is looking for non-federal agencies to partner with.

Following lunch, an interactive breakout session was held. After hearing a presentation from the facilitator regarding the various types of interior flood risk management measures that exist and could be considered in this area, groups were formed at each table. Each table had participants from various agencies that could provide different perspectives on the tasks presented to them. Participants identified projects/activities planned in the Federal Triangle watershed, and discussed opportunities and challenges that should be considered during the development of any flood risk management project(s) for the FTA. Each group documented its ideas and reported out on the opportunities and challenges that were identified. DC Silver Jackets team members compiled a list of the opportunities and challenges heard during the report out, and refined the list based on real-time participant feedback. Later, each participant was given the opportunity to individually select the three most important opportunities and challenges that should be considered. This information was collected and is documented below in Tables 2 and 3 below.

Guest speaker Rokwha Rim, concluded the workshop with a presentation on the Cheonggyecheon Stream Restoration Project in Seoul, South Korea. This project involved removing busy highways in a highly urbanized setting to restore the natural stream, reduce flood damages, and revitalize the downtown area. The project was completed in 2005 at a cost of \$386 million dollars. The presentation was an inspirational end to the first workshop.

The workshop concluded with an overview of the next steps. The next and final workshop will be held on September 5, 2018 at the same location. At this workshop, participants will hear presentations on innovative projects to reduce flood risk; some will be specific to the Federal Triangle and some will be solutions that worked in similar situations around the world. The participants will discuss the various solutions and start to discuss potential funding options for pursuing a more comprehensive solution.

### [Breakout Session and Individual Survey Results](#)

During the breakout session, each table/group was asked to answer the following three questions.

- 1. What projects/activities are planned in the Federal Triangle area?**
- 2. What opportunities exist in the Federal Triangle area that should be considered during the development of any flood risk management project?**
- 3. What challenges/limitations exist that should be considered during the development of any flood risk management project for the Federal Triangle area?**

The responses to the first question were compiled and are an attachment to this summary document. During the workshop, after compiling the list of opportunities and challenges reported out by the groups, each individual was asked the following questions:

- 1. Should additional flood risk management measures/projects above what has already been implemented in the Federal Triangle area be pursued?**

2. From the list compiled from the group responses, what are the 1-3 most important opportunities that exist in the Federal Triangle area that should be considered during the development of any flood risk management project?
  
3. From the list compiled from the group responses, what are the 1-3 most important challenges/limitations that exist that should be considered during the development of any flood risk management project for the Federal Triangle area?

The tally of the responses to the three questions are shown below in the three tables.

Table 1 – Tally of Individual Responses to Question #1

Question 1	Yes	Maybe	No
Should additional flood risk management measures/projects above what has already been implemented in the Federal Triangle area be pursued?	47	4	0

Table 2 – Opportunities Identified by the Audience and Tally of Individual Responses to Question #2 (Most Important Opportunities to Consider)

Opportunities	Number of Responses
A. Using Climate Change data to select design flood risk management levels	1
B. Subgrade parking	4
C. Multi-use areas, recreation, human engagement, open space, memorial parks, place-making	0
D. Capital improvements (bldgs., roads, public spaces, mechanical and plumbing)	14
E. Reuse- recycle rainwater (irrigation and sanitation)	7
F. Design of perimeter security systems	4
G. Re-purposing NPS areas	5
H. Projects being reviewed should consider flooding, stormwater management, retention (potential policy change)	16
I. Upstream in the watershed, retention, leveraging development sites	24
J. Below ground level opportunities (sealing abandoned vaults, vulnerabilities underground)	6
K. Outreach, communication, and education (flood mapping)	4
L. Working with non-governmental and quasi-governmental (insurance companies)	7
M. Catchment around the edge of federal triangle	4
N. Repurpose abandoned infrastructure	6
O. Help move existing projects and initiatives forward through identification of flood risk management potential	10
P. Mutual aide agreements	5
Q. Political lobbies	5
R. Improvements to stormwater credit system	3
S. Paving around the mall for storage	0
T. Division of stormwater catchment areas to increase focus on individual areas	7
U. Underground Storage	10
< Low to High >	

Table 2: Responses were tallied by the number of times an opportunity was listed on the participants' Individual Survey. The color gradient ranges from the blue (Opportunities that received the lowest number responses) to yellow (Opportunities that received a moderate number of responses) to red (Opportunities that received the highest number of responses).

Table 3 – Challenges Identified by the Audience and Tally of Individual Responses to Question #3 (Most Important Challenges to Consider)

Challenges	Number of Responses
A. Determining flood risk management levels and which data (climate change/vulnerability) to use?	4
B. Funding and financing (availability, cycles)	32
C. Existing standards and uses (historic districts, uses of NPS land, zoning)	3
D. Multi-jurisdiction planning (many stakeholders), overlapping/competing priorities, coordination of efforts, lack of ownership, lack of authority	36
E. Existing sewer is undersized, difficulty of replacing the system	10
F. Political will, upstream residents and stakeholders	12
G. Keeping commitment levels and engagement with stakeholders consistent	6
H. Disruptive nature of construction in urban (high density) environment	3
I. Various federal and local review required	5
J. Time to implement projects	4
K. Lack of resources for maintenance	1
L. Lack of knowledge of underground utilities	1
M. High Groundwater table/ groundwater management	6
N. Human behaviors (proactive vs reactive), perception issues, lack of awareness, education, expectation management	11
O. Limited warning times	3
P. Benefit cost analysis (life safety, avoidance)	7
Q. Lack of Measureable Metrics (modeling)	6
< Low to High >	

Table 3: Responses were tallied by the number of times a challenge was listed on the participants' Individual Survey. The color gradient ranges from the blue (Challenges that received the lowest number responses) to yellow (Challenges that received a moderate number of responses) to red (Challenges that received the highest number of responses).

Participants also had the opportunity to provide comments related to flood risk management in the Federal Triangle Area and the workshops that the project team will consider when planning the next workshop and the meeting with stakeholder leaders.

### Looking Forward

As a reminder, the subsequent workshop will be on September 5, 2018 at UDC. Please be on the lookout for an invitation for the September workshop in the following weeks. If you believe someone or some agency should be invited to this workshop please email Stacey Underwood at [STACEY.M.UNDERWOOD@usace.army.mil](mailto:STACEY.M.UNDERWOOD@usace.army.mil).

If you wish to access the presentations and viewing materials (maps) from the June workshop please follow this link: <https://silverjackets.nfrmp.us/State-Teams/Washington-DC>

### Attachments

- June 6<sup>th</sup> Workshop Agenda
- June 6<sup>th</sup> Workshop List of Attendees
- June 6<sup>th</sup> Workshop Responses to Question: **What projects/activities are planned in the Federal Triangle area?**



## Federal Triangle Area Flood Workshop #1 Agenda



University of the District of Columbia  
Student Center Ballroom  
June 6, 2018

9:30 - 9:45

### **Welcome**

*Stacey Underwood, Silver Jackets Coordinator  
U.S. Army Corps of Engineers, Baltimore District*

*Kevin Bluhm, Facilitator  
U.S. Army Corps of Engineers, New Orleans District*

9:45 - 10:05

### **Federal Triangle Area Overview**

*Nicholas Bonard, Urban Planner  
National Capital Planning Commission*

10:05 – 10:25

### **Flood History**

*Jason Elliott, Senior Service Hydrologist  
National Weather Service*

10:25 – 10:45

### **Federal Triangle Flood Risk**

*Brandon Flora, Project Manager  
DC Water (Greeley and Hansen)*

10:45 -11:00

### **Break**

11:00 – 12:00

### **Facilities Panel - Flood Risk Management Actions and Vulnerabilities**

*Jane Passman, Senior Facilities Master Planner  
Smithsonian Institution*

*Jim Ashe, Environmental Planning Manager  
Washington Metropolitan Area Transit Authority*

*Mark Sprouse, Director of Facilities and Property Management Division  
National Archives and Records Administration*

*David Samec, Chief of Facilities Management  
National Gallery of Art*

*Anthony Mondy, Project Manager  
General Services Administration*

12:00 – 12:45	<b>Lunch Break</b> ( <i>lunch will be provided</i> )
12:45 – 1:00	<b>Types of Interior Flood Risk Management Measures</b> <i>Kevin Bluhm, Facilitator</i>
1:00 – 1:45	<b>Breakout Session</b> <ul style="list-style-type: none"> <li>• What projects/activities are planned in the Federal Triangle area?</li> <li>• What opportunities exist in the Federal Triangle area that should be considered during the development of any flood risk management project?</li> <li>• What challenges/limitations exist that should be considered during the development of any flood risk management project for the Federal Triangle area?</li> </ul>
1:45 – 2:20	<b>Report Out from Breakout Session</b>
2:20 – 2:35	<b>Break</b>
2:35 – 2:55	<b>Audience Documentation of Key Opportunities and Challenges</b>
2:55 – 3:15	<b>Cheonggyecheon, South Korea, Stream Restoration Project</b> <i>Rokwha Rim, Team Leader of Parks and Landscape Office</i> <i>Seoul Metropolitan Government</i>
3:15 – 3:30	<b>Wrap-Up and Next Steps</b> <i>Stacey Underwood, Silver Jackets Coordinator</i>

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*A Very Special Thanks to the Speakers and to the Members of the DC Silver Jackets Team for their Support in Planning this Workshop:*





# Federal Triangle Area Flood Workshop #1

June 6, 2018

## List of Participants



**DC Flood  
Awareness**

Agency/Organization	First Name	Last Name
Architect of the Capitol	Jamie	Herr
Danish Embassy	Christian Nyerup	Nielsen
Danish Embassy	Trine Stausgaard	Munk
Dartmouth Univ.	Karolina	Kawiaka
DC Dept. of Transportation	Blake	Holub
DC Dept. of Energy and Environment	Phetmano	Phannavong
DC Dept. of Energy and Environment	Trevor	Cone
DC HSEMA	Tara	Seibold
DC Office of Planning	Andrea	Limauro
DC Office of Planning	Tanya	Stern
DC Water	Aaron	Henderson
DC Water	Alireza	Parhami
DC Water	Brandon	Flora
DC Water	Ned (Edward)	Fernandez
DC Water	Moussa	Wone
DC Water	Srinivasa	Gadiparthi
DC Water	Jonathan	Reeves
Dutch Embassy	Jan	Peelen
FEMA	Darlene	Messina
FEMA	Shilpa	Mulik
General Services Administration	Anthony	Mondy
General Services Administration	Darrick	Woods
General Services Administration	Darryl	Speller
General Services Administration	Greg	Westphal
General Services Administration	Mike	Glock
General Services Administration	Kevin	Rattliff
General Services Administration	Kristi	Tunstall
General Services Administration	Sharon	Etienne
General Services Administration	Shawn	Proctor
General Services Administration	Stephen	Zettlemoyer
General Services Administration	Tyler	Kasak
National Archives and Records Admin.	Mark	Sprouse
National Archives and Records Admin.	Donna	Forbes
National Archives and Records Admin.	James	Garvin
National Capital Planning Commission	Julia	Koster
National Capital Planning Commission	Meghan	Spigle
National Capital Planning Commission	Nicholas	Bonard
National Capital Planning Commission	Sarah	Ridgely
National Gallery of Art	Alton	Limbaugh
National Gallery of Art	David	Samec
National Gallery of Art	Mike	Ottmers
National Mall Coalition	Author Cotton	Moore
National Mall Coalition	Judy Scott	Feldman
National Park Service	Mark	Baker

<b>National Park Service</b>	<b>Nate</b>	<b>Epling</b>
<b>National Park Service</b>	<b>Robert</b>	<b>Spence</b>
<b>National Park Service</b>	<b>Susan</b>	<b>Spain</b>
<b>National Weather Service</b>	<b>Jason</b>	<b>Elliott</b>
<b>Seoul Metropolitan Government</b>	<b>Rokwha</b>	<b>Rim</b>
<b>Sierra Club</b>	<b>Ankita</b>	<b>Mandelia</b>
<b>Sierra Club</b>	<b>Larry</b>	<b>Martin</b>
<b>Smithsonian Institution</b>	<b>John</b>	<b>Bixler</b>
<b>Smithsonian Institution</b>	<b>Michael</b>	<b>Carrancho</b>
<b>Smithsonian Institution</b>	<b>Ramon</b>	<b>Davis</b>
<b>Smithsonian Institution</b>	<b>Mike</b>	<b>Henry</b>
<b>Smithsonian Institution</b>	<b>Daren</b>	<b>Kennedy</b>
<b>Smithsonian Institution</b>	<b>Jane</b>	<b>Passman</b>
<b>Smithsonian Institution</b>	<b>Brenda</b>	<b>Sanchez</b>
<b>University of MD</b>	<b>Sandra</b>	<b>Knight</b>
<b>US Army Corps of Engineers</b>	<b>Amy</b>	<b>Guise</b>
<b>US Army Corps of Engineers</b>	<b>Craig</b>	<b>Thomas</b>
<b>US Army Corps of Engineers</b>	<b>Jim</b>	<b>Ludlam</b>
<b>US Army Corps of Engineers</b>	<b>Kevin</b>	<b>Bluhm</b>
<b>US Army Corps of Engineers</b>	<b>Levi</b>	<b>Koehl</b>
<b>US Army Corps of Engineers</b>	<b>Marco</b>	<b>Ciarla</b>
<b>US Army Corps of Engineers</b>	<b>Richard</b>	<b>Carroll</b>
<b>US Army Corps of Engineers</b>	<b>Sarah</b>	<b>Lazo</b>
<b>US Army Corps of Engineers</b>	<b>Sharon</b>	<b>Sartor</b>
<b>US Army Corps of Engineers</b>	<b>Stacey</b>	<b>Underwood</b>
<b>US Army Corps of Engineers</b>	<b>Ty</b>	<b>White</b>
<b>US Commissions of Fine Arts</b>	<b>Sarah</b>	<b>Batcheler</b>
<b>WMATA</b>	<b>Jim</b>	<b>Ashe</b>

# Federal Triangle Area Flood Workshop #1

## Breakout Session

### Question 1 Responses

Question to each table: **What project/activities are planned in the Federal Triangle Area?**

Responses are listed below:

- Both subsurface and above ground:
  - Flood proofing DC Water facility pump station to 500 year flood
  - 2MW(?) generator is being used to power pump station
  - Constitution Gardens redevelopment
  - Development in Ward 6
  - Pershing Park development (World War I Memorial)
  - Special events flanking Federal Triangle (both North and South), parades, demonstrations, runs and other events in downtown
  - Bioretention facilities; continued investment
- National mall panels/cisterns (Completed) (200 year storm? - more than irrigation)
- NGA East Building waterproofing (Completed)
- Pennsylvania Ave. initiative - 20' of road could be reallocated for other use
- Smithsonian South Mall Campus... could there be an opportunity to capture/reuse?
- Federal Triangle perimeter security
- Bioswales (?) - Multi objective planning
- Commerce Department - perimeter improvements to address security and storm water management
- IRS/DOJ - Building improvements to address and safeguard building vulnerabilities such as mechanical systems, etc.
- Soldiers Home redevelopment, McMillan redevelopment, Union Station redevelopment 395/Capital crossing, Sursum Corda development
- NMNH groundwater study, potential additional detention pond
- NARA - quantified water amount from Tiber Creek infiltrating facility
- Updating DC floodplain ordinance
- Natural History H.C. ramps /ADA improvements
- Art Gallery West Building roof
- Clean Rivers projects under DC Water
- Pennsylvania Avenue initiative
- Monumental Core streetscape project (Guidelines for streetscapes NCP)
- Pennsylvania Avenue initiative
- Pershing Park World War II
- Franklin Park - design development
- Tidal Basin Master Plan - controlling water access

- Burnham Plan
- DOJ roof replacement – 4 to 5 months
- Metro vent shaft 12<sup>th</sup> street and perimeter security
- GSA Hemicycle (?) – soil capacity and why sink holes
- South Mall Campus MP
- EPA and IRS inside the moats
- Streetscape manual
- Department of Commerce modernization - phase 4; Pump stations → Retro-fits → Cap update - Install backup generators
- Pump connectivity to other area
- DC Water 3rd Street pump station available 9/2018
- Franklin Park plans
- Lower area trunk sewer/B street sewer prelining → sufficient long term?
- South Mall Master Plan - Smithsonian
- DC Coastal Study - USACE
- FBI Headquarters redevelopment
- Capital South Metro vent shafts
- Eisenhower Memorial
- Desert Storm Memorial
- Many development projects (Large areas scale) are in the pipeline: SW, Union Station, NOMA, and Armed Forces Retirement Home projects = Opportunity to incorporate multi projects to curb storm water runoff

Appendix B  
Summary of Flood Workshop #2





# Federal Triangle Area Flood Workshop #2 Summary

Hosted by the DC Silver Jackets Team

September 5, 2018 at the University of the District of Columbia



**DC Flood  
Awareness**

## General Overview

### *Purpose*

The DC Silver Jackets interagency flood risk management team recently hosted two workshops to learn about and discuss the flood risk in the Federal Triangle Area (FTA). The FTA experienced severe flooding in June 2006 resulting in millions of dollars in damages to buildings, utilities and the Metro system. It also caused major disruption in operations to agencies and businesses.

The first workshop, which focused on understanding the flooding problem, was held on June 6, 2018 at the University of the District of Columbia. This document summarizes the second workshop that was held at the same location on September 5, 2018 and was attended by 83 stakeholders. The purpose of the second workshop was to discuss the types of potential projects that could be further evaluated to reduce the FTA flood risk. General types of solutions being implemented in our nation and in other countries were presented, along with two specific concepts for this area. However, these concepts are very preliminary, still require a lot of analysis and do not yet have approval from the key stakeholders and landowners.

The workshop was attended by facility managers, planners, engineers, environmental specialists, emergency managers and more representing federal and District agencies, international embassies, non-profit organizations, and academia. A list of participants is attached.

The goal of these two workshops and subsequent meetings with the stakeholder leadership is to achieve consensus on a path forward for further mitigating flood risk in the FTA. The workshops are not to identify which particular project should be implemented, but to discuss the types of projects that could be further evaluated and obtain support in further pursuing a system-wide solution.

### *The Progression of the Workshop*

After welcoming comments from Stacey Underwood, U.S. Army Corps of Engineers (USACE), Baltimore District, the morning session involved presentations regarding types of potential flood risk management solutions that could be considered for the FTA.

#### *Morning Presentations*

**Federal Triangle Stormwater Drainage Study Alternatives** - Brandon Flora, DC Water (Greeley and Hansen), presented the findings from the 2011 Federal Triangle Stormwater Drainage Study. He provided information on the following preliminary solutions: low impact development/green practices (not a viable standalone solution), storage upstream of the Federal Triangle (not a viable standalone solution), using the GSA condensate line (not a viable solution), storage under the National Mall (viable solution), pumping station serving the Mall (viable solution), and a tunnel to Main and O Pumping Stations (no longer viable due to recent construction projects).

**National Mall Underground** - Judy Feldman and Arthur Cotton Moore, from the non-profit organization National Mall Coalition, gave a presentation on a concept they are developing called the National Mall Underground. The concept includes constructing a multi-use facility under the National Mall, between 9<sup>th</sup> and 12<sup>th</sup> Street tunnels that would include flood storage, car and bus parking, and a visitor center. The tour bus parking level would also be used for flood storage during a flood and the buses would have to be evacuated. Other features of the concept plan include cisterns for irrigation and a geo-thermal energy field. The National Mall Coalition funded USACE Baltimore District to conduct a technical review of the concept. USACE identified various technical issues, such as life safety and operation/evacuation procedures and connecting to the DC stormwater system. Further analysis and design and coordination with the various stakeholders is necessary for this concept.

**Integrated Resiliency Planning: A Catchment-Wide Approach to Flood Protection and Multi-Functional Measures** - John Stewart Frey, Ramboll, who consults for the City of Copenhagen, Denmark, gave a presentation on catchment-wide approaches and multi-function measures that are working in the City of Copenhagen and in other areas around the world to reduce flood risk. He showed innovative examples of upstream detention techniques, including using roads, open space, and recreation areas for flood storage and conveyance. He also presented examples of restoring concrete canals and reconnecting green space and green buildings and using rainfall as a resource.

**Restoring the Role of Tiber Creek: Flood Adaptation for the Federal Triangle** - Karolina Kawiaka, from Dartmouth College, gave a presentation on a concept that she is developing to restore the role of Tiber Creek. Tiber Creek (previously Goose Creek) once flowed through the area that is now Constitution Avenue and the Federal Triangle. Tiber Creek was converted into a canal in the 1800's and was eventually filled in and replaced with the current storm drain system. Her concept plan includes constructing a bioswale adjacent to Constitution Avenue in front of the museums to mimic the original role of Tiber Creek and a normally dry flood retention area next near Constitution Avenue north of the Washington Monument. Further analysis and design and coordination with the various stakeholders is necessary for this concept.

**Dutch Inspiration on Urban Resilience** - Edgar Westerhof, ARCADIS, who consults for the Embassy of the Kingdom of the Netherlands, shared some of their experiences in the Netherlands regarding flood risk management and urban resilience. An integrated approach is used in the Netherlands and a variety of solutions are implemented to reduce flood risk such as "artificial urban floodplains," underground water storage and other recreational water storage opportunities. They strive to combine functions in their projects. His conclusion stated that you must 1) understand your climate risk, vulnerability and interdependencies, 2) design a collaborative process and plan for the long term and 3) seek and invent new rules.

Following the five morning presentations, the workshop took a break for lunch. Following lunch, an interactive breakout session was held.

## Breakout Session

During the breakout session, each table/group was asked to answer the three questions below:

1. Identify potential advantages/co-benefits and challenges for each type of project below, based on the various morning presentations. Each table was assigned one type of project to start with, but was encouraged to try to discuss 2-3 of the types of projects.
  - a. Underground storage and/or conveyance out of Federal Triangle
  - b. Underground storage with parking
  - c. Upstream detention techniques
  - d. Restoration of natural drainage
  - e. Flood proofing buildings
2. Identify potential funding opportunities and partnerships for implementing any type of flood risk management solution for the FTA (for study, design, construction, and/or operation).
3. Identify any short-term actions that could be taken in the interim to reduce the flood risk in the FTA

Following the breakout session, the facilitator provided an opportunity for the participants to report out on some of their responses. All of the written responses to the questions were compiled and are included as an attachment.

## Afternoon Presentations

Following the breakout session and report out, the workshop concluded with two flood related presentations.

**District of Columbia Levee Risk Communication** - Mark Baker (National Park Service), Jehu Johnson (U.S. Army Corps of Engineers Baltimore District), and Nickea Bradley (DC Homeland Security and Emergency Management Agency (HSEMA)) presented information regarding the DC levee system risk assessment. The DC levee system was constructed by USACE in 1939 and is operated and maintained by the National Park Service. The Federal Triangle is located on the landward side of the levee and receives flood risk reduction benefits from the levee. The levee system was designed to reduce the risk of Potomac River flooding (riverine and tidal surge); however, it does not reduce the risk from interior/stormwater drainage flooding. During the risk assessment, it was determined that the levee is in good condition and is designed to hold back major Potomac River floods. However, extreme floods or levee failure could cause loss of life, billions of dollars in damages and major disruption to the national government. HSEMA also provided information regarding emergency and evacuation planning and the existing online flood inundation mapping tool.

**DC Hazard Mitigation Plan** – Nickea Bradley (DC HSEMA), provided information regarding DC's Hazard Mitigation Plan, funding opportunities and types of projects.

## Looking Forward

The next step of this project is for the team leaders, with support from the project working group, to meet with the stakeholder leaders to present information learned during these two workshops and to try to achieve consensus on a path forward for mitigating flood risk in the Federal Triangle area.

If you wish to access the presentations from the September workshop please follow this link: <https://silverjackets.nfrmp.us/State-Teams/Washington-DC>. All of the presentations are available except for the Dutch Inspiration slides which cannot be made available to the public for privacy/rights reasons.

## Attachments

- September 5<sup>th</sup> - Workshop Agenda
- September 5th - Workshop List of Attendees
- September 5th - Workshop Responses



## Federal Triangle Area Flood Workshop #2 Agenda



University of the District of Columbia  
4200 Connecticut Ave, NW, Washington DC  
Student Center Ballroom  
September 5, 2018

- 9:30 - 9:50      **Welcome and Overview of First Workshop**  
*Stacey Underwood, Silver Jackets Coordinator*  
*U.S. Army Corps of Engineers, Baltimore District*
- Kevin Bluhm, Facilitator*  
*U.S. Army Corps of Engineers, New Orleans District*
- 9:50 - 10:10      **Federal Triangle Stormwater Drainage Study Alternatives**  
*Brandon Flora, Project Manager*  
*DC Water (Greeley and Hansen)*
- 10:10 – 10:30      **National Mall Underground**  
*Judy Feldman, Chair, National Mall Coalition*
- Arthur Cotton Moore, Vice Chair and Project Architect*  
*National Mall Coalition*
- 10:30 – 11:00      **Integrated Resiliency Planning: A Catchment-Wide Approach to Flood Protection and Multi-Functional Measures**  
*John Stewart Frey, Landscape and Urban Designer,*  
*Ramboll – Liveable Cities Lab, City of Copenhagen*
- 11:00 -11:10      **Break**
- 11:10 – 11:30      **Restoring the Role of Tiber Creek: Flood Adaptation for the Federal Triangle**  
*Karolina Kawiaka, Senior Lecturer*  
*Dartmouth College*
- 11:30 – 12:00      **Dutch Inspiration on Urban Resilience**  
*Jan Peelen, Attaché for Infrastructure & Water Management*  
*Embassy of the Kingdom of the Netherlands*
- Edgar Westerhof, Flood Risk & Resilience Lead – North America*  
*Arcadis U.S.*
- 12:00 – 12:40      **Lunch Break** (*lunch will be provided*)

12:40 – 1:40

**Breakout Session**

- Identify potential advantages/co-benefits and challenges for each type of project:
  - *Underground storage and/or conveyance out of Federal Triangle*
  - *Underground storage with parking*
  - *Upstream detention techniques*
  - *Restoration of natural drainage*
  - *Flood proofing buildings*
- Identify potential funding opportunities and partnerships
- Identify any short-term actions that could be taken in the interim to reduce the flood risk in the Federal Triangle area

1:40 – 2:25

**Report Out from Breakout Session**

2:25 – 2:40

**Break**

2:40 – 3:10

**District of Columbia Levee Risk Communication**

*Mark Baker, Dam and Levee Safety Officer  
National Park Service*

*Jehu Johnson, Levee Safety Program Manager  
U.S. Army Corps of Engineers Baltimore District*

*Nickea Bradley, State Hazard Mitigation Officer  
DC Homeland Security and Emergency Management Agency*

3:10 – 3:20

**DC Hazard Mitigation Plan**

*Nickea Bradley, State Hazard Mitigation Officer  
DC Homeland Security and Emergency Management Agency*

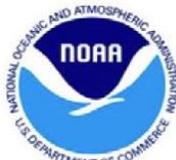
3:20 – 3:30

**Wrap-Up and Next Steps**

*Stacey Underwood, Silver Jackets Coordinator*

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*A Very Special Thanks to the Speakers and to the Members of the DC Silver Jackets Team for their Support in Planning this Workshop:*



**US Army Corps  
of Engineers**





## Federal Triangle Area Flood Workshop #2

September 5, 2018

### List of Attendees



Agency/Organization	Representative/Name
Anacostia Riverkeeper	Robbie O'Donnell
ARCADIS	Fernando Pasquel
Arcadis U.S.	Edgar Westerhof
Arthur Cotton Moore Assoc, Architects and Planners	Patricia Moore
C40	Brendan Shane
Constellation (Exelon)	Tammy Sanford
Dartmouth College	Karolina Kawiaka
DC Department of Energy and Environment	Trevor Cone
DC Department of Energy and Environment	Melissa Deas
DC Department of Energy and Environment	Phetmano Phannavong
DC Department of Energy and Environment	Stephen Reiling
DC Homeland Security and Emergency Management	Nickea Bradley
DC HSEMA	Bill Lescure
DC Office of Planning	Andrea Limauro
DC Water	Gordon Evans
DC Water	Edward Fernandez
DC Water	Brandon Flora
DC Water	Srinivasa Gadiaprthi
DC Water	Amy Hsu
DC Water	Dusti Lowndes
DC Water	Alireza Parhami
DC Water	Matt Ries
District of Columbia - Department of Transportation	Kelsey Bridges
District of Columbia - Department of Transportation	Tom Neider
Embassy of the Kingdom of the Netherlands	Jan Peelen
Exelon	Chris Babcock
FEMA Region III	Darlene Messina
FEMA Region III	Shilpa Mulik
General Services Administration	Kevan Fareed
General Services Administration	Joseph Glock
General Services Administration	Tyler Kasak
General Services Administration	Ann Kosmal
General Services Administration	Ramesh Mehta
General Services Administration	Anthony Mondy
General Services Administration	Shawn Proctor
General Services Administration	Kristi Tunstall
General Services Administration	Lisa Walsh
General Services Administration	Greg Westphal
National Archives and Records Administration	James Garvin
National Archives and Records Administration	Tim Edwards
National Capital Planning Commission	Nicholas Bonard
National Capital Planning Commission	Julia Koster

<b>Agency/Organization</b>	<b>Representative/Name</b>
National Capital Planning Commission	Sarah Ridgely
National Capital Planning Commission	Meghan Spigle
National Gallery of Art	Alton Limbaugh
National Gallery of Art	Brock Manville
National Gallery of Art	Michael Ottmers
National Gallery of Art	David Samec
National Mall Coalition	Judy Feldman
National Mall Coalition	Arthur Cotton Moore
National Park Service	Mark Baker
National Park Service	Nathan Epling
National Park Service	Doug Jacobs
National Park Service	Peter May
National Park Service	Susan Spain
National Park Service	Eliza Voigt
National Weather Service	Jason Elliott
Pepco Holdings Inc	Justin Vick
Ramboll, City of Copenhagen	John Frey
Regan Associates	Sean Regan
Sierra Club	Larry Martin
Smithsonian Institution	Michael Carrancho
Smithsonian Institution	Ramon Davis
Smithsonian Institution	Mike Henry
Smithsonian Institution	Daren Kennedy
Smithsonian Institution	Jane Passman
Smithsonian Institution	Sarah VanLandingham
Smithsonian Institution	Ann Trowbridge
University of the District of Columbia	Pradeep Behera
US Army Corps of Engineers	Kevin Bluhm
US Army Corps of Engineers	Biniam Bogale
US Army Corps of Engineers	Marco Ciarla
US Army Corps of Engineers	Jehu Johnson
US Army Corps of Engineers	Levi Koehl
US Army Corps of Engineers	Sarah Lazo
US Army Corps of Engineers	Sharon Sartor
US Army Corps of Engineers	Jacqueline Seiple
US Army Corps of Engineers	Craig Thomas
US Army Corps of Engineers	Stacey Underwood
US Commission of Fine Arts	Sarah Batcheler
US Commission of Fine Arts	Daniel Fox
US Geological Survey	Roger Barlow
WMATA	Jim Ashe



## Federal Triangle Area Flood Workshop #2 Breakout Session Questions



**DC Flood  
Awareness**

### Summary of Group/Table Responses

Below is a summary of the key comments/ideas that the groups documented during the breakout session. Note that the participants were brainstorming during this session, so some of the responses are ideas that have not been confirmed as accurate or viable.

#### **1. Discuss as a group and list the top 3-5 responses for each type of project.**

#### **Underground Storage and/or Conveyance out of Federal Triangle (e.g., storage tank, tunnels)**

##### *Potential Advantages/Co-benefits:*

- Could redistribute floodwater throughout the city
- Preserves historic character of the city (since infrastructure is underground)
- Large capacity; there are viable solutions that can solve the problem
- Integrates well with existing system
- Out of sight – initial construction disruption – but no later disruption
- Consolidated (possibility)
- Single entity (DC Water) responsible for maintenance
- Potential design of Potomac River tunnel to accommodate pumped water from Federal Triangle - might not be too late. This would give advantage of potential water treatment at Blue Plains (vs. pumping to Tidal Basin) and at worst case, overflow would discharge down river at JBAB rather than at Tidal Basin

##### *Potential Challenges:*

- Still multi-jurisdictional
- Large pumping operation
- Lots of maintenance
- Very capital cost intensive
- Construction could be very disruptive
- Underground utilities – identify, relocate, may be constraints
- Distribution of cost – could lead to increased water bills (like DC Water long-term control plan)
- No co-benefits/multi-use potential

#### **Underground Storage with Parking**

##### *Potential Advantages/Co-benefits:*

- Multi-purpose (parking, flood control, irrigation, geothermal, visitor center)
- Revenue generating – self-financing; public – private financing

- Large storage capacity; meet or exceed 200 year flood volumes
- Area of refuge/first response capability
- Gets buses off street to free space for other activities
- Deficit of parking in the area
- Structure is all underground
- Wouldn't be used very frequently so wouldn't have to deal with cleanup. Clean waters funding.
- Reduce pollution from traffic
- Provides tourist parking – may increase total tourist revenue
- Water credits

#### *Potential Challenges:*

- Operational challenges; dual use facility but conflicting uses
- Multi stakeholder participation needed if pursuing project
- Underground utility coordination/relocation, unknown federal security infrastructure in the area
- High groundwater to deal with
- Unknown impact on traffic and congestion
- Increased security risk to surrounding properties/visitors (terrorism, etc.)
- Concern about if we even need parking (or if parking should be centralized); encourages cars and detracts from public transit
- Life safety – in flash flood do you have time to get people out quickly enough? Are gates 100% reliable? Substantial risk of people and assets in flood control facility; evacuation plan (people and equipment)and cost to evacuate?
- Need to also deal with upstream pipe systems, upgrades will increase cost
- Not consistent with other existing plans; conflicts with Smithsonian South Campus Master Plan
- Who will run, maintain and operate – who will clean the water?
- Highly disruptive construction on the Mall for several years
- Ventilation engineering requires above ground structures (aesthetics)
- Initial upfront cost
- Low potential for full cost recovery

### **Upstream Detention Techniques**

#### *Potential Advantages/Co-benefits:*

- More comprehensive approach
- Paradigm shift on allowing areas to flood
- Design is amenity; co-benefits – environmental, heat island, recreation, open space, gardens, quality of life
- Incorporated into future development – already happening to some degree with regulation (SW) – could encourage incentives for exceeding regulations
- More public engagement, community cohesion
- Extending life of existing SW infrastructure
- We need to look for a solution beyond Federal Triangle

- Gives the city a way to do park infrastructure
- Incorporate green infrastructure into existing projects
- Policy restrictions to promote retention on private property
- Opportunity to pretreat runoff
- Initially less expensive to construct
- Helps with small storms, adaptive
- DC Water has trained folks for DC Clean River LID work maintenance
- Increase property value (of private properties)
- Could reduce insurance rates

*Potential Challenges:*

- Not enough capacity to handle large floods; doesn't solve the problem on its own
- First cost as well as maintenance cost
- Multi-jurisdictional
- Maintenance after flooding / cleanup
- Distributed ownership/management
- Difficult to monitor progress – is there a consistent baseline?
- Finding space in an urban environment
- Utility conflicts
- Would need to acquire larger parcels to do more substantial intervention
- Enforcement challenges for private property
- Construction and maintenance disruptions
- Might slow down traffic/roads
- Hard to get upstream areas to contribute to Federal Triangle, where is the incentive?
- Groundwater table is higher
- Stakeholder buy-in is complex
- Permitting and funding challenges

**Restoration of Natural Drainage**

*Potential Advantages/Co-benefits:*

- Not fighting against nature
- Design is amenity
- Additional green space in urban areas
- Could be backup for 17th street levee
- More resilient (adaptable)
- Co-benefits/recreation: aesthetics, heat island reduction; increased natural habitat; education (more visible)
- Might be a stand-alone solution to solve flooding for Fed Triangle
- Could be aesthetically pleasing but replaces things like pollinator garden, old elms
- Potentially less expensive
- Potential water quality benefit
- Works with ancient history of site

- Potential for quicker, incremental implementation

#### *Potential Challenges:*

- Multi jurisdiction stakeholders
- Maintenance, irrigation, cutting, planting; potentially limited plant palette
- Standing water problems after rain (mosquitos?); puts water against museums
- Channel would often be dry (not a running stream)
- Trash collecting
- Utilities and maintenance
- Smithsonian Gardens (and NGA Sculpture) negatively impacted; difficult to access for visitors, volunteers and staff
- Moat between visitors and museums – not welcoming, potential lack of wheel chair access
- Changes cultural setting of buildings; potential for negative impacts to cultural/historic resources and park land
- Impacts on sidewalks, bus stops, drop offs at C Ave, etc.; less width for pedestrians
- Bridges needed to museum, who repairs?
- Eliminates cultural features like A.H. fountain, site sculptures
- May interfere with extended lower level of NMAAHC
- Dense urban environment – limited available space
- Potential traffic impacts
- Complexity of design

### **Flood Proofing Buildings**

#### *Potential Advantages/Co-benefits:*

- All federal buildings should include roof water retention gardens
- Follow executive orders or exceed them
- Cost distributed and lower cost expected
- Customizable
- Multiple options – passive and active
- Passive and active options
- Benefit to investing facility
- Can be implemented in phases; quicker implementation
- Smaller project = fewer people to coordinate with positive, direct impact to flood insurance
- Could provide security protection for man-made hazards too
- Small-scale project will not shift enough water to impact your neighbor
- Could be secondary measure to create redundancy

#### *Potential Challenges:*

- Still have issue of backup of sewer systems within buildings
- Storage requirements for bulky measures/barriers
- Training and maintenance burden

- Deployment time and manpower – may not have enough time and manpower to deploy temporary barriers
- Lack of motivation
- Reliability question, difficult to test
- Aesthetic/historic requirements/Section 106
- May induce flooding on other properties
- Existing structural issues
- It's expensive – need to navigate funding issues
- Requires stakeholder buy-in and permitting
- Operations/maintenance coordination is extensive and expensive
- Evacuation plan

**2. As a group, identify potential funding opportunities and partnerships for implementing any type of flood risk management solution for the Federal Triangle area (for study, design, construction, and/or operation).**

- Use tax for storm water
- Federal appropriation/ Congress
- Donations
- Commuter, Tourist, Park and Recreation taxes
- Tax incentives
- SW fees, impervious areas fees, local DC funds (limited amount)
- Volunteer work (for small green infrastructure stuff)
- Public Private Partnership (P3)
- Business improvement districts
- EPA/FEMA grants
- HUD - Upstream distributed projects
- EPA – co-benefactor – Chesapeake Bay Implementation Grant, 319
- Need to create a partnership between FED/DC/NPS; any additional funding from utility would be hard
- Disburse cost burden to building owners
- DC Government
- Streetscape integration with roadway grant? ICET?
- Maintenance using adoption-highway type mechanism
- Agency partnerships
- Parking – visitor events
- Reduced risk – insurance taxes
- Trust Account for feds in the area
- Water quality for Bay, Potomac; charge for irrigation
- Turn to Security and continuity of operations
- Take advantage of major redevelopment – FBI, Penn Ave, Constitution Gardens
- Retrofit – do more green roof
- Fund a study lead by NCPC or other agency that completely tests and compares options across broad criterion
- DC Water? Credits?

- District storm water retention credit program (use facility to generate SRC's), for fed agencies selling and accepting SRC money is problematic but could use private contractor (like ESPCs (?)) where contractor builds and receives SRC money for 20 years
- Insurance company investment
- Environmental incentive
- Regulation (decree)
- Bond funding
- GSA downtown bid dedicated stream to flood risk management
- Capital improvements request should be coordinated with planning phase (2-5 years)
- Identify lead agency, partners and pool funds
- This group can come up with projects and identify agency lead to ask for funding: NPS-floodable parks, GSA – floodproofing, HMA grant, PDM, FMA, HMGP
- Partnership – working with DC agencies to apply for grants
- Talk to David Rubenstein
- GSA has a capital funding account from their rent from other federal buildings

**3. As a group, identify any short term actions that could be taken in the interim to reduce the flood risk in the Federal Triangle area.**

- Flood proofing buildings; elevate utilities and valuable resources
- Green infrastructure, bioswales, green roofs, etc.; DOEE/DDOT GI implementation
- Consider cloudburst roads for road renewal
- See upstream
- Flood warning system
- Better modeling (real time)
- Maintaining existing infrastructure
- Automated/remote control systems
- Keep funding current initiatives/programs
- Emergency action plans
- DOEE can consult Federal Triangle buildings on flood proofing systems
- Develop vulnerability rating system
- Find ways to brag about interventions – like flood conversations at Lock Keepers House – Public Education
- Earth day or preparedness – educational programs about flood risk
- Put flood gauges around town
- Get used to living with water
- Make use of what you have – make use of parks and recreation area for low lying areas
- New projects should retain more water – more than 1, 2” per hour
- Develop flood management plan
- Hold flood training exercises
- Could we use a side street as a designated “flood street”
- Keep taking advantage of major remodels and retrofits of buildings, streets, parks to include detention, LID
- Other efforts to move key equipment to protected location
- Improve resiliency of roadway tunnels; harden tunnel utilities to handle water or provide gates and keep water out

- Regional and agency emergency response planning
- Public outreach – keeping trash out of catch basins. Put up “story pole” with flood marks for 100 year flood
- Recalibrate thinking to 500 year plus
- Gel bags – no more sand!
- Planning – identify and prioritize risks (DOEE will do this!), vulnerabilities for the entire campus; what has been accomplished to help with mitigation?
- Update policies and guidance to require more rigorous flood assessment - for risk during planning/design
- Engineering audit in terms of locations of flood barrier, risk assessment, entry points
- Update/implement current policies and guidance on compliance with SW regulations to assess flooding risk and the need of mitigating
- FEMA to talk to FHA on policies to allow other federal agencies to take their grant funding