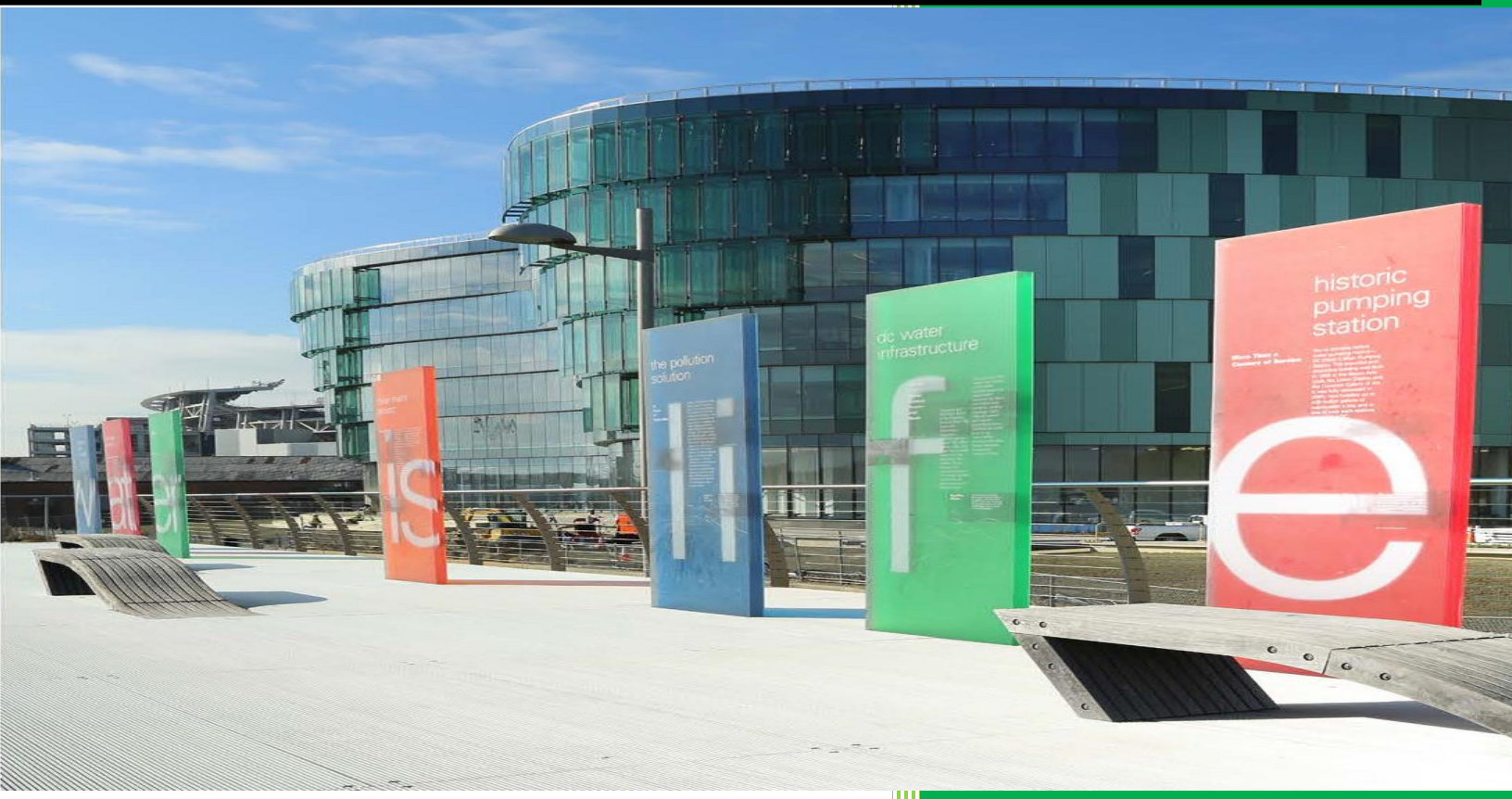
After Action Report – September 10, 2020 Flash Flood



November 2020

David L. Gadis
Chief Executive Officer

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INCIDENT OVERVIEW

Incident Name	After Action Report -September 10, 2020 Flashflood
Incident Date	September 10, 2020
Scope	For 70 minutes on September 10, 2020, the National Capital Region experienced an extreme weather event/flash flood, resulting in surface flooding and basement backups primarily in the combined sewer area and the separate sewer area in Northeast DC around Nicholson Street. This After-Action Report documents activities of DC Water relating to the operations and performance of the stormwater, sewer collection and treatment system during the event, an analysis of core capabilities and areas of improvement based on lessons learned from this event.
Mission Area(s)	Response and Recovery
Core Capabilities	Environmental Response/Health and Safety Situational Assessment Infrastructure Systems
Objectives	1. Respond to escalated number of flooding and basement back up calls 2. Maintain operation of critical infrastructure including stormwater and combined sewage pump stations. 3. Contain open construction sites. 4. Accommodate high peak flows to Blue Plains Advanced Wastewater Treatment Plant.
Threat or Hazard	Extreme Weather/Flash Flood Event
Lead Agency	DC Water – Operations and Engineering
Participating Departments	Department of Sewer and Pumping Operations, Wastewater Treatment, Engineering, DC Clean Rivers, Legal and Government Affairs, Marketing and Communications, Finance and Budget, Procurement, Customer Care, Information Technology
Point of Contact	Kishia L. Powell, COO DC Water 1385 Canal Street, SE Washington, DC 20003 202.787.2251 Kishia.Powell@dcwater.com

EXECUTIVE SUMMARY

On the afternoon of September 10, 2020, a significant rainfall event impacted the DC metro region, with rainfall amounts between 2" and 6" depending on location. This event and the resulting flash flood caused severe surface flooding and basement backups in parts of the District.

This was an unnamed rain event. DC in the recent months in 2020, had experienced two named hurricanes without detrimental impacts. These hurricanes were Isaias and Laura. While these two named hurricanes delivered more rain, they were distributed over a longer period. The rain intensity for these storms were equivalent to 2-5-year storm for Isaias and less than a one-year storm for Laura. In contrast, the major flood event at Bloomingdale and associated destruction in 2012 was equivalent to a 10 - 12-year storm. The storms that accompanied the flash flooding on September 10th, 2020 were equivalent to 10-25-year storm and the most intense in recent times.

The 124 million gallons of built tunnel storage in the Blue Plains and Anacostia River tunnels was available at the beginning of the storm as the tunnels were empty prior to start of the storm. The 124 million gallon (MG) constructed tunnel capacity to date filled and overflowed to the river within 35 minutes. Similarly, the 8 million gallon (MG) First Street Tunnel was also empty at the start of the event. If the First Street and the much larger Blue Plains and Anacostia River Tunnel filled at the same rate, then the First Street Tunnel would have filled within minutes. Until the North East Boundary Tunnel (NEBT) is completed in 2023, once the First Street Tunnel fills, it overflows onto the street.

This After-Action Report (AAR) is focused solely on the activities of DC Water during the storm. It analyzes the operations and performance of the stormwater, sewer collection and treatment systems during the event, and recommends enhancements based on lessons learned from this experience.

Blue Plains WWTP, the Anacostia and First Street Tunnels and the collection system were utilized within the constraints and capacity of the system to minimize flooding. However, the September 10, 2020 rainfall exceeded the capacity of the system, which was the proximate cause of flooding. DC Water is constructing the Northeast Boundary Tunnel which is intended to bring the Northeast Boundary Sewer and the identified chronic flood areas up to the current design standard of a 15-year storm. Investigations of other areas of the City that flooded are underway to determine the cause of flooding and to identify alternatives for improvement.

EVENT OBSERVATIONS

1. Rainfall Analysis

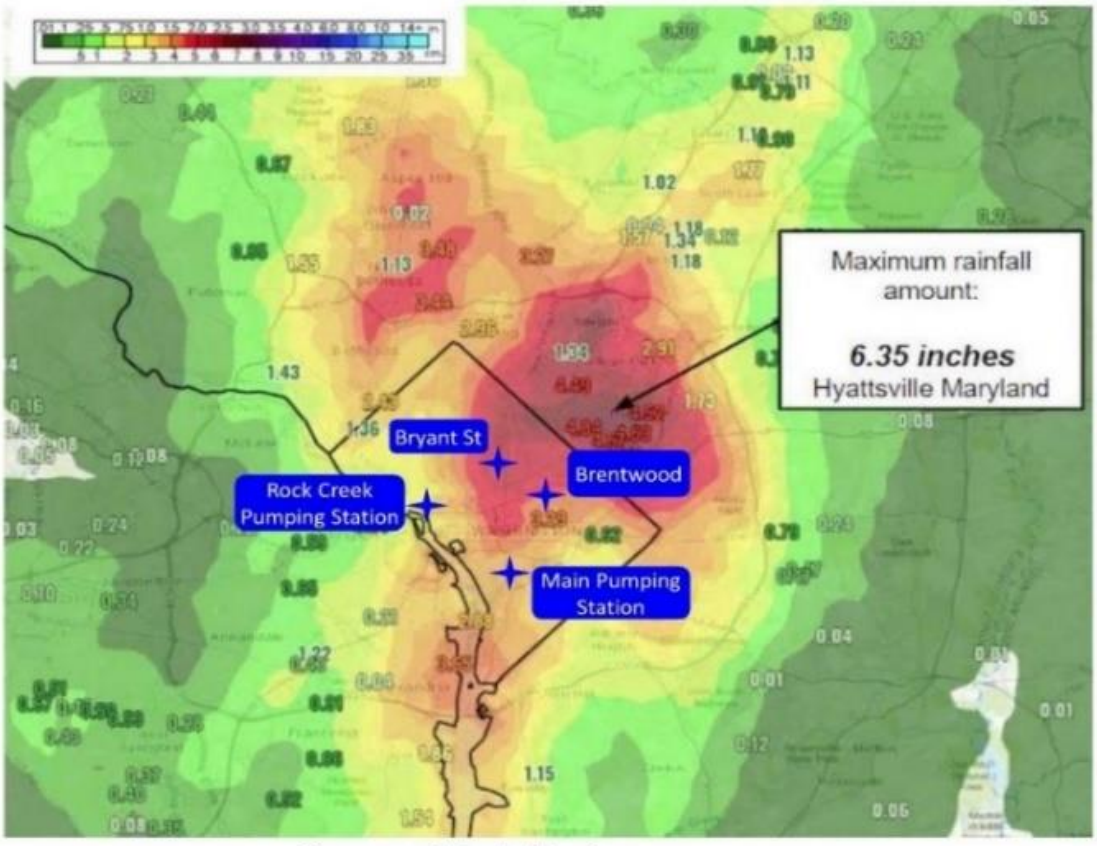
a. DC Water Rain Gages

DC Water operates 4 tipping bucket rain gages located at following locations in the combined sewer system per its NPDES Permit requirements.

- Main Pumping Station
- Bryant Street Pumping Station
- Brentwood Reservoir
- Rock Creek Pumping Station

The rain gages are shown on Figure 1-1, along with a 'heat' map of the rainfall.

Figure 1-1
September 10, 2020 Rainfall Distribution



Source: Wash Post

b. Frequency Analysis

Data from the rain gages was compared against NOAA return frequency data to rank the 9/10/20 storm. Table 1-1 summarizing the results is provided below.

Table 1-1
Rainfall Frequency Analysis – September 10, 2020

Storm Duration	Main PS		Bryant St PS		Brentwood Res.		Rock Creek PS	
	Depth (in)	Approx. Return Freq. (yrs)	Depth (in)	Approx. Return Freq. (yrs)	Depth (in)	Approx. Return Freq. (yrs)	Depth (in)	Approx. Return Freq. (yrs)
5-min	0.27	<1	0.75	100	0.40	1-2	0.22	<1
15-min	0.69	<1	1.17	10	1.01	5	0.50	<1
30-min	1.17	2	1.49	5	1.74	10-25	0.88	<1
1-hr	1.98	5-10	2.14	10	2.44	10-25	1.66	2-5
2-hr	2.42	5-10	2.87	10-25	2.78	10-25	1.90	2-5
3-hr	2.74	10	2.99	10-25	3.02	10-25	2.20	2-5
4-hr	2.81	5-10	2.99	10	3.07	10-25	2.32	2-5
6-hr	2.82	5	3.02	5-10	3.08	5-10	2.36	2-5

Based on the data, the storm had a return frequency between 10 and 25 years in the Northeast Boundary area (Bryant Street and Brentwood), a 5-10 year storm near Main Pumping Station and a 2 to 5 year storm near Rock Creek Pumping Station. Other locations between gages could have received higher amounts of rain.

While the data show a 100-year return frequency for a 5 min duration at Bryant Street, that's not as meaningful given the time it takes runoff to concentrate from roofs, yards, streets, etc. into the sewer system.

c. Comparison to Hurricane Isaias, Hurricane Laura and 2012 Bloomingdale Flooding

Hurricane Isaias – July 29, 2020:

Based on the data, the storm had a return frequency between 2 and 5 years in the Northeast Boundary area (Bryant Street and Brentwood), a 5 year storm near Main Pumping Station and a 1 to 2 year storm near Rock Creek Pumping Station. Table 1-2 Summarizes Hurricane Isaias rainfall.

Table 1-2
Rainfall Frequency Analysis – Hurricane Isaias

Storm Duration	Main PS		Bryant St PS		Brentwood Res.		Rock Creek PS	
	Depth (in)	Approx. Return Freq. (yrs)	Depth (in)	Approx. Return Freq. (yrs)	Depth (in)	Approx. Return Freq. (yrs)	Depth (in)	Approx. Return Freq. (yrs)
5-min	0.34	1	0.14	<1	0.16	<1	0.18	<1
15-min	0.54	<1	0.26	<1	0.32	<1	0.34	<1
30-min	0.64	<1	0.46	<1	0.60	<1	0.48	<1
1-hr	1.18	1	0.82	<1	1.02	<1	0.88	<1
2-hr	1.72	2	1.14	<1	1.56	1-2	1.26	<1
3-hr	1.96	2-5	1.34	<1	1.78	1-2	1.48	1
4-hr	2.18	2-5	1.58	1	2.00	2	1.74	1-2
6-hr	2.74	2-5	2.14	1-2	2.52	2-5	2.06	1-2
8-hr	3.06	5	2.36	2	2.86	2-5	2.26	1-2
10-hr	3.12	2-5	2.41	1-2	2.91	2-5	2.30	1-2
12-hr	3.16	2-5	2.45	1-2	2.94	2-5	2.34	1-2
24-hr	4.00	5	2.85	1-2	3.53	2-5	2.88	1-2
48-hr	4.40	2-5	2.90	<1	3.62	2	2.88	<1

Hurricane Laura – August 28, 2020:

Based on the data in Table 1-3, the storm had a return frequency <1 year in the areas near Northeast Boundary (Bryant Street and Brentwood), Main Pumping Station and Rock Creek Pumping Station. Other locations between gages could have received higher amounts of rain.

Table 1-3
Rainfall Frequency Analysis – Hurricane Laura

Storm Duration	Main PS		Bryant St PS		Brentwood Res.		Rock Creek PS	
	Depth (in)	Approx. Return Freq. (yrs)	Depth (in)	Approx. Return Freq. (yrs)	Depth (in)	Approx. Return Freq. (yrs)	Depth (in)	Approx. Return Freq. (yrs)
5-min	0.28	<1	0.12	<1	0.20	<1	0.22	<1
15-min	0.60	<1	0.31	<1	0.47	<1	0.52	<1
30-min	0.64	<1	0.40	<1	0.52	<1	0.70	<1
1-hr	1.12	<1	0.52	<1	0.64	<1	0.82	<1
2-hr	1.16	<1	0.56	<1	0.68	<1	0.88	<1
3-hr	1.19	<1	0.60	<1	0.73	<1	0.91	<1
4-hr	1.31	<1	0.74	<1	0.84	<1	1.01	<1
6-hr	1.47	<1	0.84	<1	0.95	<1	1.13	<1

2012 Bloomingdale Flooding

In July and September 2012, four storms caused severe flooding in Bloomingdale and LeDroit Park. Rainfall analysis conducted after the events indicated the storms were of the return frequencies shown in Table 1-4.

Table 1-4
2012 Bloomingdale Rainfall Events

Date	Duration	Rainfall (inches)	NOAA Point Precipitation Frequency (Nearly)
7/10/2012	1-hour	1.96	10-year storm
7/18/2012	30-minute	1.35	5-year storm
7/19/2012	15-min	0.94	5-year storm
9/2/2012	2-hour	2.78	10-year storm
* Recorded by DC Water's Bryant Street Rain Gage			

The data show that the September 10, 2020 storm was more severe than the 2012 Bloomingdale flood events and substantially more severe than Hurricane Isaias and Hurricane Laura.

2. Conclusion

During the September 10, 2020 flash flood event, the Blue Plains WWTP, the Anacostia and First Street Tunnels and the collection system were utilized within the constraints and capacity of the system to minimize flooding within combined sewer area. However, the September 10, 2020 rainfall exceeded the capacity of the system, which resulted in flooding. DC Water is constructing the Northeast Boundary Tunnel which is intended to bring the Northeast Boundary Sewer and the identified chronic flood areas up to the current design standard of a 15-year storm. Not all backups are caused by the capacity limitation of infrastructure managed by DC Water. There are many factors attributable to an individual property's on-premises structures that could contribute to backup and flooding. Investigations are underway in areas with separate sewers and flooded properties to determine the factors that resulted in flooding.

APPENDIX A: IMPROVEMENT PLAN

Table 1: Improvement Plan/Actionable Items

#	Improvement Action Needed	Reason for Action	Responsible Department	Involved Departments/ Agencies	FEMA Core Mission	FEMA Core Capability	DCW Core Element Identified (POETE)	Priority Level	Short, intermediate, long term
Leverage existing Programs and Infrastructure Solutions									
1	Implementation of Backwater Valve Program	Relief in advance of the next event	OMAC	Engineering Legal Finance Procurement Risk Management	Mitigation	Long-Term Vulnerability Reduction	Equipment/ Organization	High	Short Term
2	Limited sewer system evaluation in Nicholson St. to assess repeated backups	Nicholson Street is a separate sewer area. Need to understand reason for backups	Engineering	Operations Finance OMAC Risk Management	Mitigation	Long-Term Vulnerability Reduction	Equipment/ Organization	High	Intermediate
3	Develop a platform to view SCADA, DCCR, and PCS (plant data) as an integrated system	Have real time visibility for command and response into the entire system from street flooding to pumping to conveyance to treatment and discharge/overflows to river	Engineering	Blue Plains DCCR Pumping Finance Procurement OMAC	Preparedness	Situational Assessment/ Operational Communications	Equipment	Medium	Long Term

#	Improvement Action Needed	Reason for Action	Responsible Department	Involved Departments/ Agencies	FEMA Core Mission	FEMA Core Capability	DCW Core Element Identified (POETE)	Priority Level	Short, intermediate, long term
Climate Adaptation									
4	Implementation of Early Weather Warning System	Equipment check, catchbasin response crew prep	Engineering	Operations, Procurement, Finance, OMAC	Preparedness	Public Information and Warning	Planning	High	Short
5	Establish a dedicated IMT for extreme weather	Minimize time from Incident to Response	OEM	Operations Engineering Customer Service OMAC	Response/ Recovery	Operational Coordination	Organization	Medium	Intermediate
6	Requirement for Post-Event Granular Rainfall Record	Correlating storm intensity to event; modeling input	Engineering	Operations, Procurement, Finance, OMAC	Response/ Recovery	Infrastructure Systems/ Threats and Hazard Identification	Planning	High	Short
7	Work with DOEE staff to Develop/Access stormwater model for the City	Need to understand inundation after each event to improve DCW response and review changes to surface run off reaching existing storm pump stations operation by DCW to confirm capacity	Engineering	DOEE DDOT	Mitigation	Operational Coordination	Planning	Medium	Long Term

#	Improvement Action Needed	Reason for Action	Responsible Department	Involved Departments/ Agencies	FEMA Core Mission	FEMA Core Capability	DCW Core Element Identified (POETE)	Priority Level	Short, intermediate, long term
8	Participate in a Multi-Agency Task Force focused on Identifying and Prioritizing Mitigation Strategies	Stormwater management and climate change mitigation measures span the responsibilities of multiple agencies in the District. A task force focused on identifying specific strategies and tactics to mitigate climate change would assist in achieving resilience	GM	DOEE DC WATER DPW DDOT HSEMA	Mitigation	Operational Coordination	Planning	High	Intermediate
Enhanced Customer Service and Experience									
9	Conduct storm event staffing analysis	Provide analysis in field operations, and provide additional staffing resources where indicated to properly support operations	Sewer Operations	Finance P&T	Preparedness	Operational Coordination	Planning	High	Intermediate
10	Enhancement of command center staffing including training and skills to manage flood events and dispatching crews and services	Minimize interval between customer complaint and dispatch	Customer Service	Operations Engineering IT Procurement Finance OMAC	Response	Operational Communications	Training	Medium	Intermediate

#	Improvement Action Needed	Reason for Action	Responsible Department	Involved Departments/ Agencies	FEMA Core Mission	FEMA Core Capability	DCW Core Element Identified (POETE)	Priority Level	Short, intermediate, long term
11	Review roles/ responsibilities for stormwater flooding within the District and develop coordinated services for better customer experience	Need for clarification for the scope of responsibilities of each dept. within the District related to stormwater to improve efficiency and expediency of customer service	Govt Relations	Legal Engineering	Preparedness	Operational Coordination	Training/ Exercise	High	Intermediate
12	Policy and Regulatory Recommendations	With changes to weather and rain patterns, existing policies and regulations changes could provide benefits to homeowners	Govt Relations	Legal Engineering Customer Service OMAC Finance	Preparedness	Operational Coordinator	Planning	High	Long Term
Proactive and Timely Leadership Engagement									

#	Improvement Action Needed	Reason for Action	Responsible Department	Involved Departments/ Agencies	FEMA Core Mission	FEMA Core Capability	DCW Core Element Identified (POETE)	Priority Level	Short, intermediate, long term
13	Develop notification procedure for Command center and Leadership	Need to keep leadership team informed on escalated call activity - Manual call to leadership as an interim step -Automated call out to leadership as target action	IT	Finance Engineering Operations Customer Service	Response	Situational Assessment/ Operational Communications	Planning	High	Short Term for Manual Call Intermediate for automated call
14	Establish real-time monitoring access for executive management	Need for dashboard for executive management monitoring and situational awareness	IT	Finance Engineering Operations Customer Service	Response	Situational Assessment/ Operational Communications	Equipment	High	Intermediate