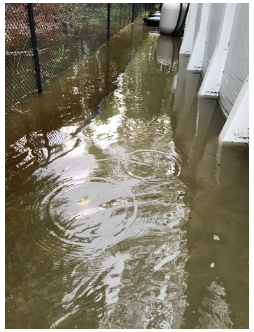
Colonial Beach Storm Water Briefing

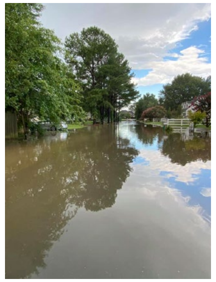
Related to the Weather Event on 24 AUG 2020

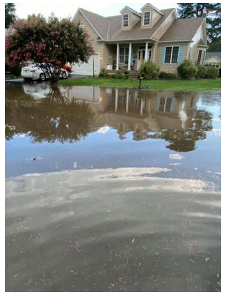
Locust



Stratford Circle

Dogwood





Virginia Ave.

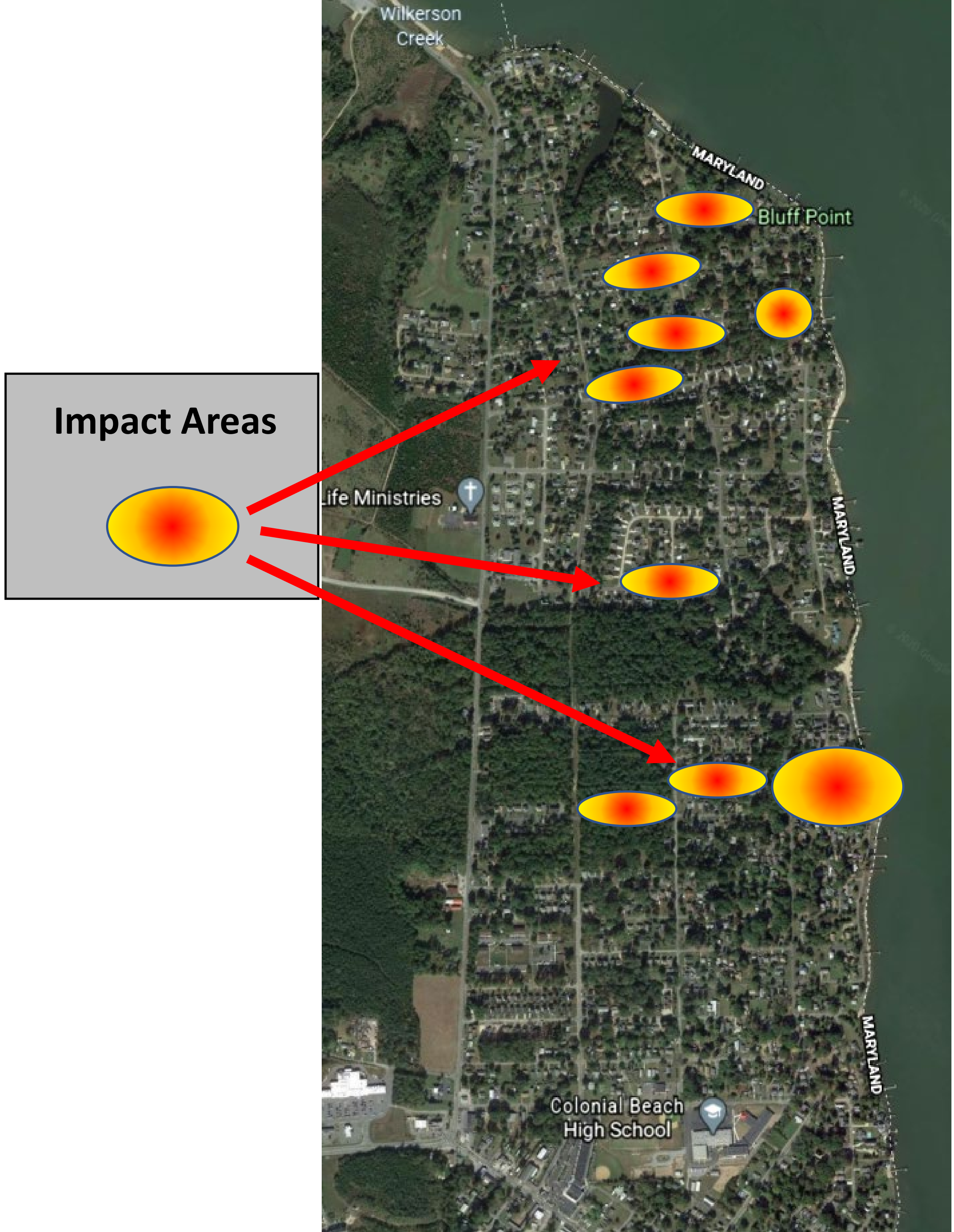
3rd St.

6th St.

Weather Event

24 AUG 2020

- **Description:** *In the early evening of 24 AUG 2020, parts of Colonial Beach received a severe thunderstorm that produced massive amounts of stormwater, ultimately resulting in localized flooding throughout town.*
- Wastewater treatment plant measurement: **3.14 inches within 45 minutes.**
- A personal (citizen) rain gauge in the Meadows measured over **5 inches.**
- A personal (citizen) rain gauge in Classic Shores measured **over 8 inches** before it overflowed.
- Public Works personnel immediately responded to impacted areas to mitigate any debris disrupting the stormwater management system.
- **By early evening most of the flooded areas were void of standing water.**
- Wastewater Treatment plant consumed significant stormwater infiltration to support the impacted areas.



Impact Areas

Magnitude of Stormwater Impact

Bottom Line up front:

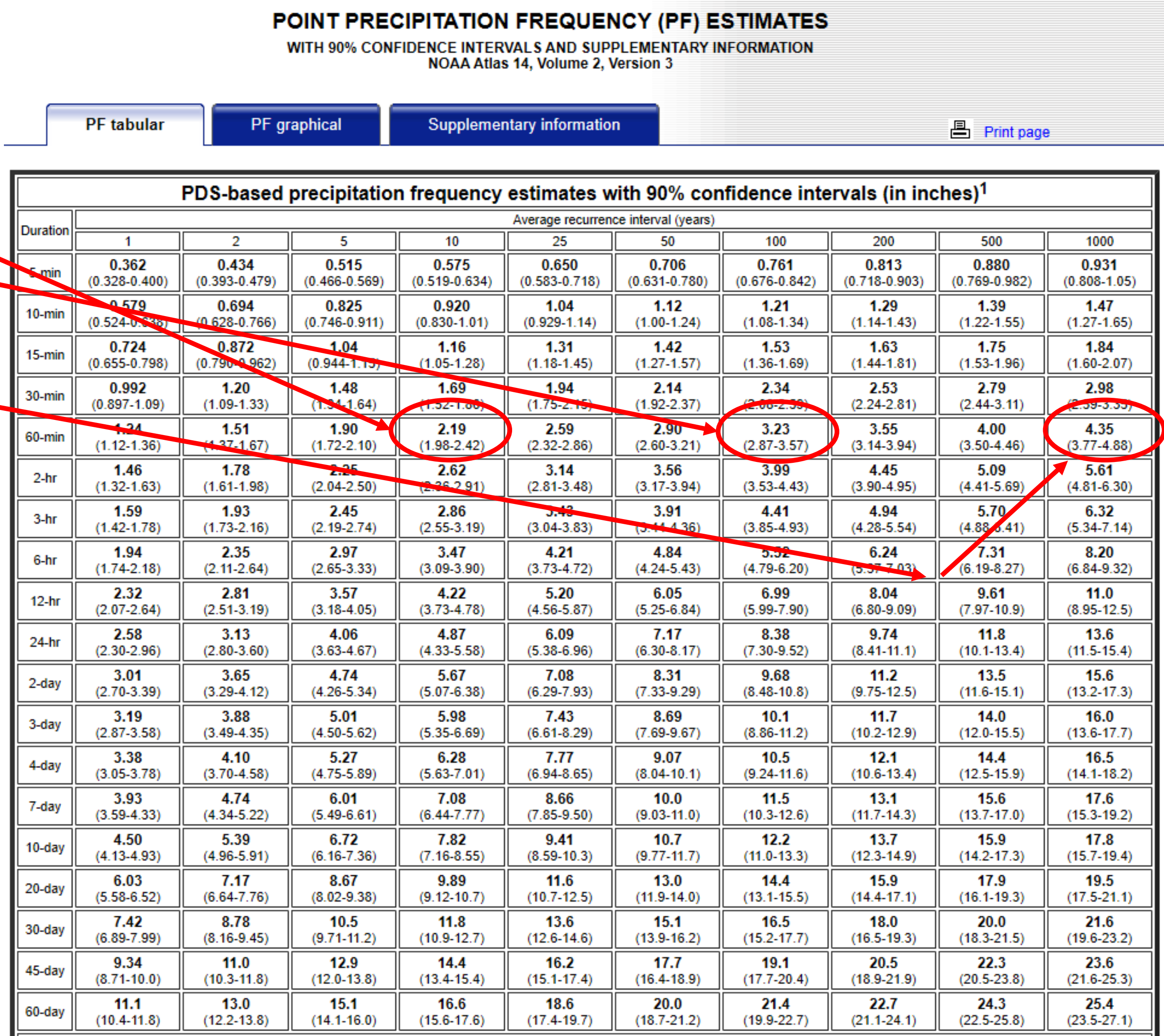
- **By calculation, we receive the equivalent of a 200-500 year storm minimum**
- 2.19 inches of rain in 60 mins = 10-year storm
- 3.2 inches of rain in 60 mins = 100-year storm

24 Aug weather event

- 4.35 inches of rain in 60 mins = 1000-year storm

Notes & Facts

- Perspective:
    - Rt. 205 is designed for a 10-year storm
    - Rt. 1 is designed for a 25-year storm
    - Interstate 95 is designed for a 50-year storm
- The latest regulation indicates that all Colonial Beach roads be designed to the 10-year storm.
- Before the weather event, the ground was already saturated thus causing the run-off to be above standard/predictable measurements.



POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 2, Version 3

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.362** (0.328-0.400)	**0.434** (0.393-0.479)	**0.515** (0.466-0.569)	**0.575** (0.519-0.634)	**0.650** (0.583-0.718)	**0.706** (0.631-0.780)	**0.761** (0.676-0.842)	**0.813** (0.718-0.903)	**0.880** (0.769-0.982)	**0.931** (0.808-1.05)
10-min	**0.579** (0.524-0.638)	**0.694** (0.628-0.766)	**0.825** (0.746-0.911)	**0.920** (0.830-1.01)	**1.04** (0.929-1.14)	**1.12** (1.00-1.24)	**1.21** (1.08-1.34)	**1.29** (1.14-1.43)	**1.39** (1.22-1.55)	**1.47** (1.27-1.65)
15-min	**0.724** (0.655-0.798)	**0.872** (0.790-0.962)	**1.04** (0.944-1.15)	**1.16** (1.05-1.28)	**1.31** (1.18-1.45)	**1.42** (1.27-1.57)	**1.53** (1.36-1.69)	**1.63** (1.44-1.81)	**1.75** (1.53-1.96)	**1.84** (1.60-2.07)
30-min	**0.992** (0.897-1.09)	**1.20** (1.09-1.33)	**1.48** (1.34-1.64)	**1.69** (1.52-1.86)	**1.94** (1.75-2.15)	**2.14** (1.92-2.37)	**2.34** (2.08-2.59)	**2.53** (2.24-2.81)	**2.79** (2.44-3.11)	**2.98** (2.59-3.35)
60-min	**1.24** (1.12-1.36)	**1.51** (1.37-1.67)	**1.90** (1.72-2.10)	**2.19** (1.98-2.42)	**2.59** (2.32-2.86)	**2.90** (2.60-3.21)	**3.23** (2.87-3.57)	**3.55** (3.14-3.94)	**4.00** (3.50-4.46)	**4.35** (3.77-4.88)
2-hr	**1.46** (1.32-1.63)	**1.78** (1.61-1.98)	**2.25** (2.04-2.50)	**2.62** (2.36-2.91)	**3.14** (2.81-3.48)	**3.56** (3.17-3.94)	**3.99** (3.53-4.43)	**4.45** (3.90-4.95)	**5.09** (4.41-5.69)	**5.61** (4.81-6.30)
3-hr	**1.59** (1.42-1.78)	**1.93** (1.73-2.16)	**2.45** (2.19-2.74)	**2.86** (2.55-3.19)	**3.43** (3.04-3.83)	**3.91** (3.44-4.36)	**4.41** (3.85-4.93)	**4.94** (4.28-5.54)	**5.70** (4.88-6.41)	**6.32** (5.34-7.14)
6-hr	**1.94** (1.74-2.18)	**2.35** (2.11-2.64)	**2.97** (2.65-3.33)	**3.47** (3.09-3.90)	**4.21** (3.73-4.72)	**4.84** (4.24-5.43)	**5.32** (4.79-6.20)	**6.24** (5.37-7.03)	**7.31** (6.19-8.27)	**8.20** (6.84-9.32)
12-hr	**2.32** (2.07-2.64)	**2.81** (2.51-3.19)	**3.57** (3.18-4.05)	**4.22** (3.73-4.78)	**5.20** (4.56-5.87)	**6.05** (5.25-6.84)	**6.99** (5.99-7.90)	**8.04** (6.80-9.09)	**9.61** (7.97-10.9)	**11.0** (8.95-12.5)
24-hr	**2.58** (2.30-2.96)	**3.13** (2.80-3.60)	**4.06** (3.63-4.67)	**4.87** (4.33-5.58)	**6.09** (5.38-6.96)	**7.17** (6.30-8.17)	**8.38** (7.30-9.52)	**9.74** (8.41-11.1)	**11.8** (10.1-13.4)	**13.6** (11.5-15.4)
2-day	**3.01** (2.70-3.39)	**3.65** (3.29-4.12)	**4.74** (4.26-5.34)	**5.67** (5.07-6.38)	**7.08** (6.29-7.93)	**8.31** (7.33-9.29)	**9.68** (8.48-10.8)	**11.2** (9.75-12.5)	**13.5** (11.6-15.1)	**15.6** (13.2-17.3)
3-day	**3.19** (2.87-3.58)	**3.88** (3.49-4.35)	**5.01** (4.50-5.62)	**5.98** (5.35-6.69)	**7.43** (6.61-8.29)	**8.69** (7.69-9.67)	**10.1** (8.86-11.2)	**11.7** (10.2-12.9)	**14.0** (12.0-15.5)	**16.0** (13.6-17.7)
4-day	**3.38** (3.05-3.78)	**4.10** (3.70-4.58)	**5.27** (4.75-5.89)	**6.28** (5.63-7.01)	**7.77** (6.94-8.65)	**9.07** (8.04-10.1)	**10.5** (9.24-11.6)	**12.1** (10.6-13.4)	**14.4** (12.5-15.9)	**16.5** (14.1-18.2)
7-day	**3.93** (3.59-4.33)	**4.74** (4.34-5.22)	**6.01** (5.49-6.61)	**7.08** (6.44-7.77)	**8.66** (7.85-9.50)	**10.0** (9.03-11.0)	**11.5** (10.3-12.6)	**13.1** (11.7-14.3)	**15.6** (13.7-17.0)	**17.6** (15.3-19.2)
10-day	**4.50** (4.13-4.93)	**5.39** (4.96-5.91)	**6.72** (6.16-7.36)	**7.82** (7.16-8.55)	**9.41** (8.59-10.3)	**10.7** (9.77-11.7)	**12.2** (11.0-13.3)	**13.7** (12.3-14.9)	**15.9** (14.2-17.3)	**17.8** (15.7-19.4)
20-day	**6.03** (5.58-6.52)	**7.17** (6.64-7.76)	**8.67** (8.02-9.38)	**9.89** (9.12-10.7)	**11.6** (10.7-12.5)	**13.0** (11.9-14.0)	**14.4** (13.1-15.5)	**15.9** (14.4-17.1)	**17.9** (16.1-19.3)	**19.5** (17.5-21.1)
30-day	**7.42** (6.89-7.99)	**8.78** (8.16-9.45)	**10.5** (9.71-11.2)	**11.8** (10.9-12.7)	**13.6** (12.6-14.6)	**15.1** (13.9-16.2)	**16.5** (15.2-17.7)	**18.0** (16.5-19.3)	**20.0** (18.3-21.5)	**21.6** (19.6-23.2)
45-day	**9.34** (8.71-10.0)	**11.0** (10.3-11.8)	**12.9** (12.0-13.8)	**14.4** (13.4-15.4)	**16.2** (15.1-17.4)	**17.7** (16.4-18.9)	**19.1** (17.7-20.4)	**20.5** (18.9-21.9)	**22.3** (20.5-23.8)	**23.6** (21.6-25.3)
60-day	**11.1** (10.4-11.8)	**13.0** (12.2-13.8)	**15.1** (14.1-16.0)	**16.6** (15.6-17.6)	**18.6** (17.4-19.7)	**20.0** (18.7-21.2)	**21.4** (19.9-22.7)	**22.7** (21.1-24.1)	**24.3** (22.5-25.8)	**25.4** (23.5-27.1)

Chronological Activities that have impacted Stormwater affects

Beginning of the Meadows build (circa. 1960's, early 1970's – 50-60 years ago)

- Original geography was marsh and swampland
- Original development occurred 50-70 years ago with standards that are now considered subpar
- The original developers didn't holistically address the need for a comprehensive stormwater approach
- Continuous development without consideration to stormwater impacts have further complicated the issue
- Decaying infrastructure compounds revitalization efforts.
- Until recently, public works funding/budgeting for infrastructure didn't account for adequate maintenance & upgrade costs.
- The absence of a town-wide comprehensive approach for 50 years has created challenges.
- Modern technology & ecological standards have "set-the-bar" higher than 1960 standards.
- We are a coastal town that is at sea-level. Water generally doesn't enjoy natural slopes conducive to gravitational evacuation.

Citizen Activities that have impacted the Stormwater Management

Facts and Challenges

- Our stormwater system is designed to satisfy a 10-year storm scenario
- Ditches by doctrine are designed to capture stormwater from the road. Drainage off personal property is only a byproduct of the original intent of the ditch.
- Citizens have been putting debris (sticks, leaves, etc.) into the ditches which compounds the drainage challenges when faced with any storm of significance.
- We have had several citizens “fill-in” ditches to support additional parking space which in turn, creates upstream dilemmas.
- Some citizens have independently implemented culvert pipes for driveway support but have set them at incorrect elevations causing additional back-ups
- Some citizens when procuring their culvert pipe (not town approved) have either purchased incorrect size or material type.
- Some citizens do not maintain the “right of way” which compounds the town clearing the bi-annual right of way mowing.
- Some citizens have planted significant sized vegetation in the right of way causing additional issues
- Minimal reporting of stormwater issues to public works.

Recent Town Enhancements to Stormwater Mitigation

Within the last 2-3 years

- Bi-annual storm water maintenance in known impact areas (ditch & pipe clearing)
- Re-engineering and reclaiming stormwater retention in vicinity of Santa Maria & Strafford
- Stormwater improvements behind Stratford Circle
- Acquisition of Jet Truck to facilitate debris removal from stormwater pipes
- Reengineered culvert pipes in vicinity of Riverview & Santa Maria
- Beach Stormwater drainage along Irving Ave
- Boardwalk/Pedestrian Plaza stormwater redesign and replace to outfall
- Culvert redesign and implementation at 6th & Meyer
- Culvert and cross pipe design and installation at 7th & Dwight
- 1st St drainage improvement with culvert replacements
- Massive redesign and implementation of stormwater system along Thackery
- Reclaimed right of way for stormwater improvements headed to the third street beach via 5th st.
- Regraded ditches along Forrest Ave., installed overflow drainage ditch. From pipe inlet to outfall
- Ditch work along Marshall Ave.
- Ditch & Culvert improvements in vicinity of Madison and Lossing
- Outfall improvements to Dandridge, Irving, Jefferson and Boundary
- Vernon outfall improvements (Monroe Bay side)
- Stormwater retention initiative for the Torrey Smith Park development
- Continuous outfall evaluation during peak rainfall occurrences

The path forward on Stormwater Management

Next activities anticipated

- The acquisition of imagery that will provide one-foot elevation deltas to support the comprehensive design of our stormwater management system
- Hired a qualified Geographic Information System (GIS) operator who will develop digital overlays (including the one-foot elevation contours) which will be the base data for stormwater analysis
- Begin to identify and develop through analysis of newly acquired GIS capabilities a holistic plan to our stormwater operations.
- Implement the Comprehensive Stormwater management plan
- Begin budgetary and grant driven processes needed for funding opportunities to support implementation operations
- Reinvest in Jet Truck operations (and other stormwater related equipment) to ensure operability of system
- Initiate/recommend policies supporting future development endeavors that factors stormwater principals and best practice procedures.
- Identify emerging stormwater management techniques and procedures that will affect both existing and new development requirements.
- Educate the citizenry and building communities of the dynamics of stormwater management.
- Aggressively pursue non-general fund money sources for fiscal support to stormwater management (i.e. Grants, VDOT funding, State, Federal, Emergency, FEMA, etc.)

Questions and Comments