

# The Ellicott City, MD Flash Flood of 30 July 2016:

Where Meteorology, Hydrology, and Geography Collide

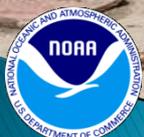
**Jason C. Elliott, Heather S. Kenyon, Steven M. Zubrick**

**NWS Baltimore/Washington**

**Jonathan J.A. Dillow, Edward J. Doheny**

**USGS MD-DE-DC Water Science Center**

*97<sup>th</sup> American Meteorological Society Annual Meeting  
January 24, 2017*

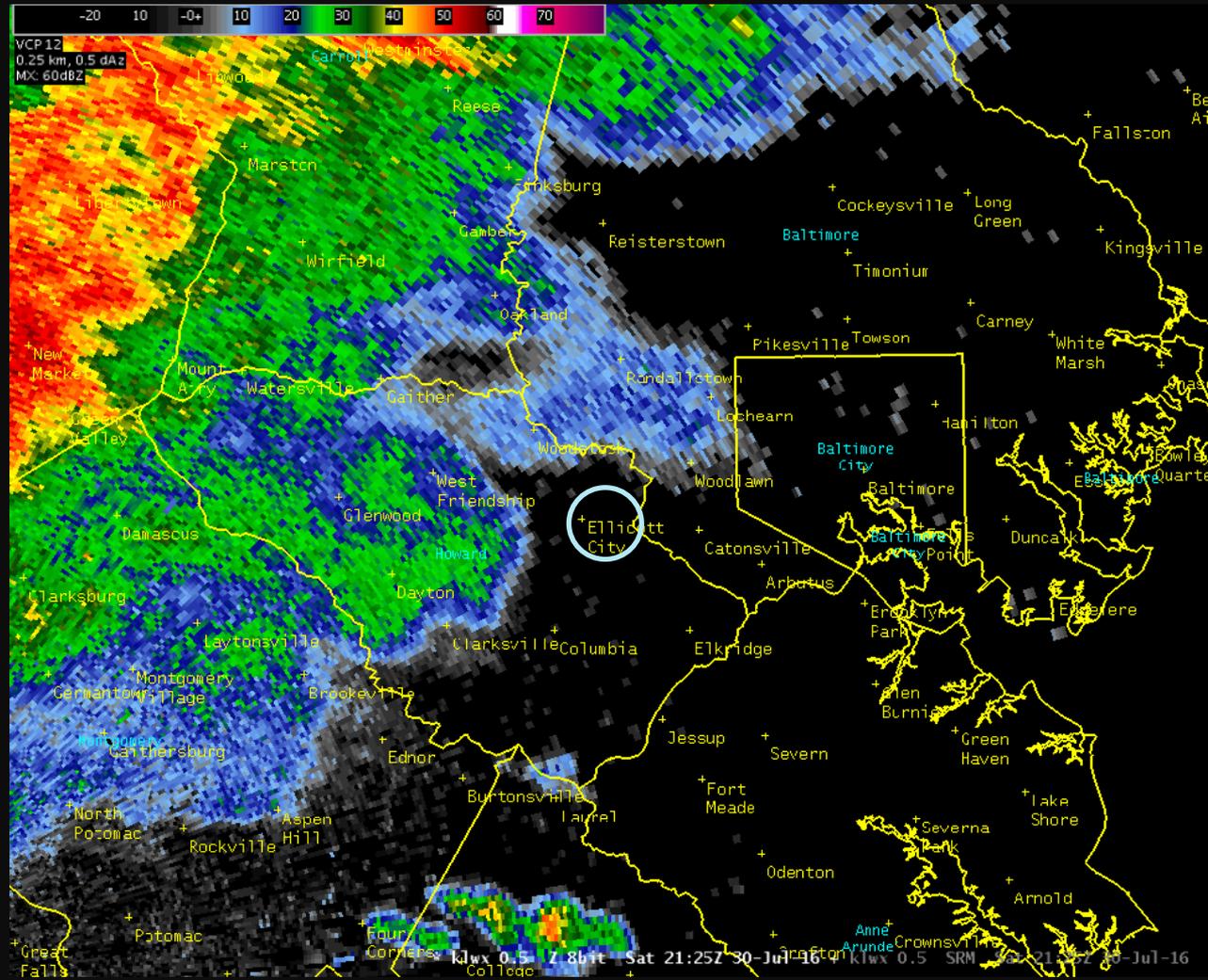


@jsaysitall

# Overview

On the evening of July 30, 2016, heavy rain formed into a persistent band affecting a small multi-county area in central Maryland.

*KLWX Radar loop from 2125 UTC 30 July to 0102 UTC 31 July*

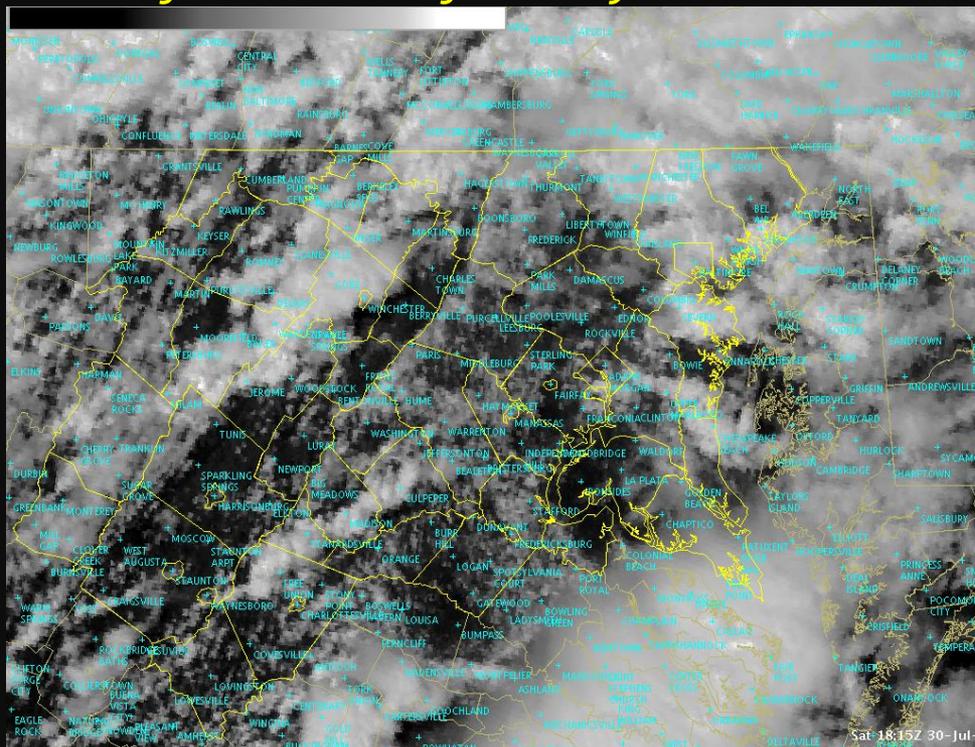
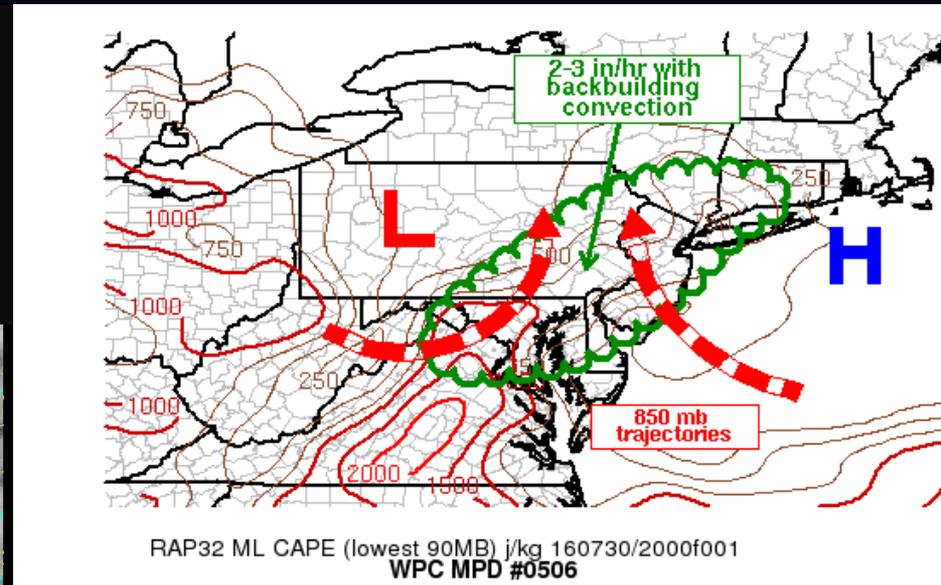




# Mesoscale Setup

WPC issued MPD #0506 at 5:00pm EDT indicating area was in region of convergent low-level flow

*...but focus much of the day was on PA*



Boundary appears on satellite prior to convective initiation in the vicinity of the ultimate heavy rain axis

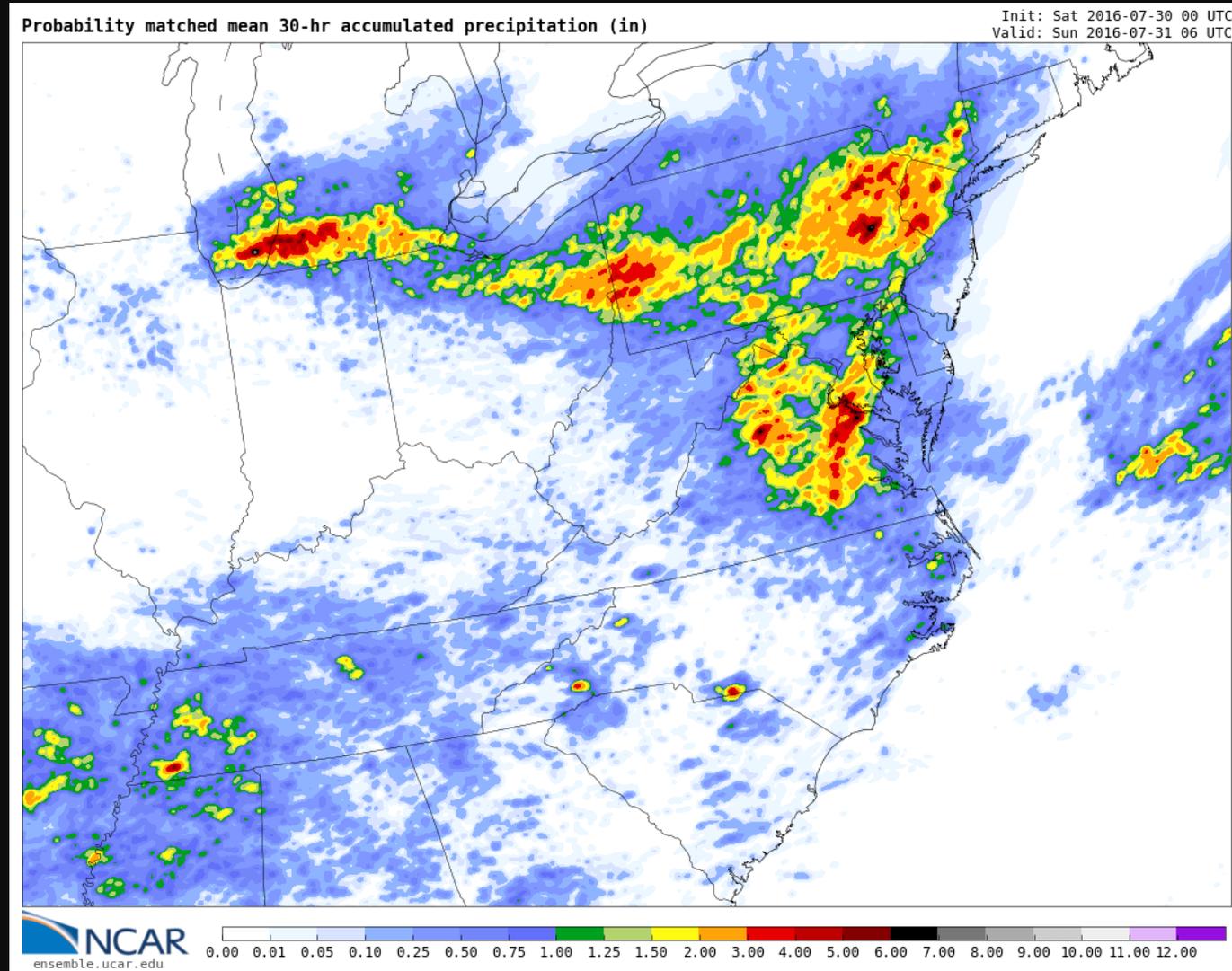


National Weather Service Baltimore/Washington



# CAM Output

What is becoming a “classic case” – a strong signal exists but it occurs in a *slightly* different location than CAMs



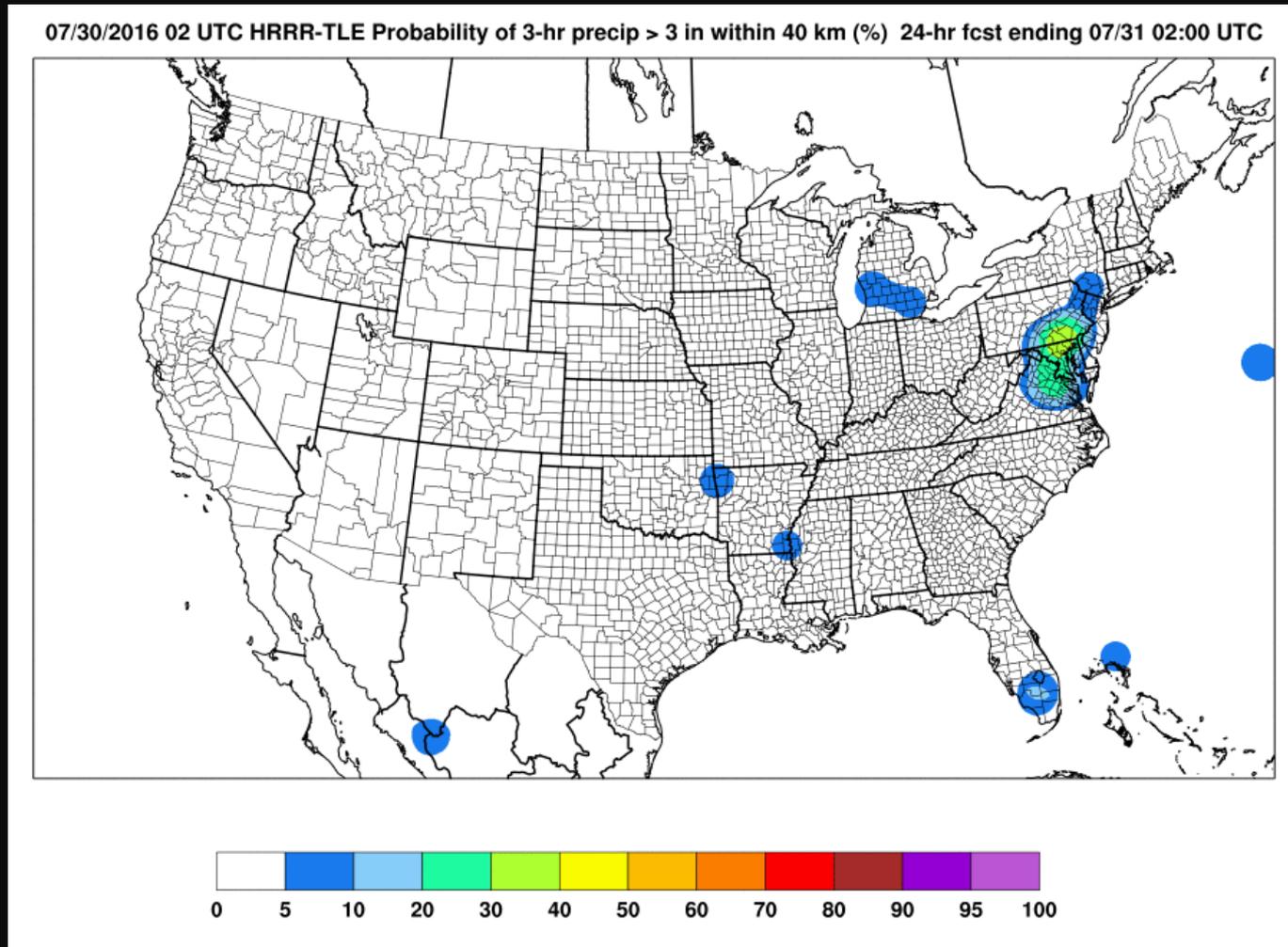
National Weather Service Baltimore/Washington



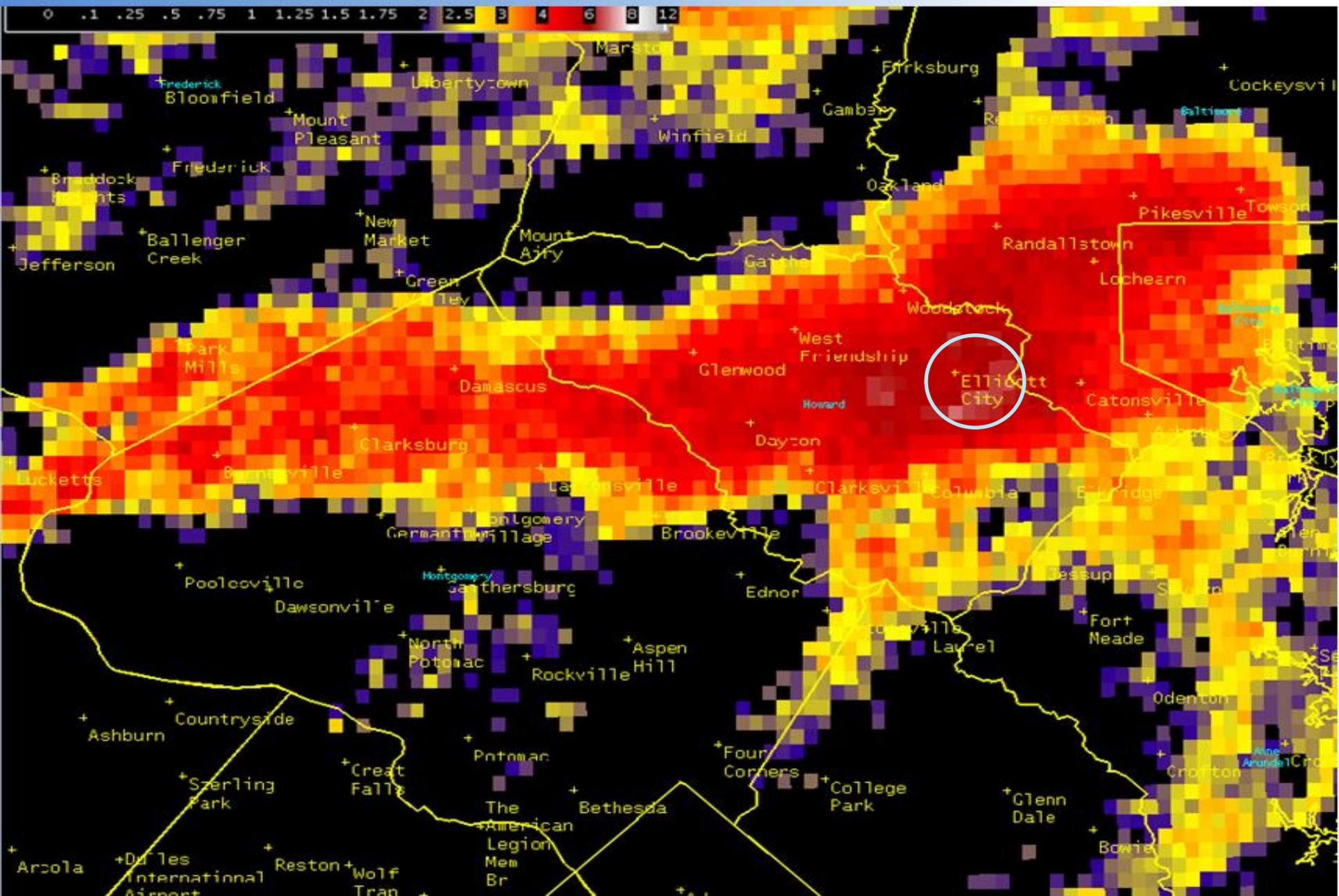
# HRRR-TLE

What is becoming a “classic case” – a strong signal exists but it occurs in a *slightly* different location than CAMs

*Also, “classic case” – notice the HRRR had it, lost it, and then got it back...*



# Precipitation Estimates – July 30, 2016

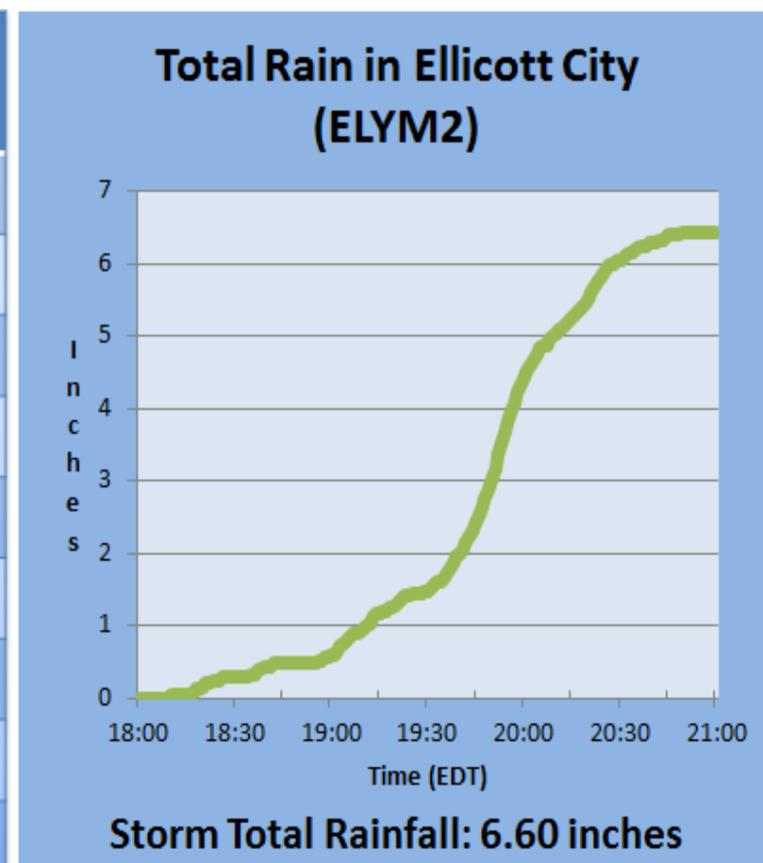


# Extreme Precipitation

## Historic Rainfall in Ellicott City, Maryland – July 30, 2016

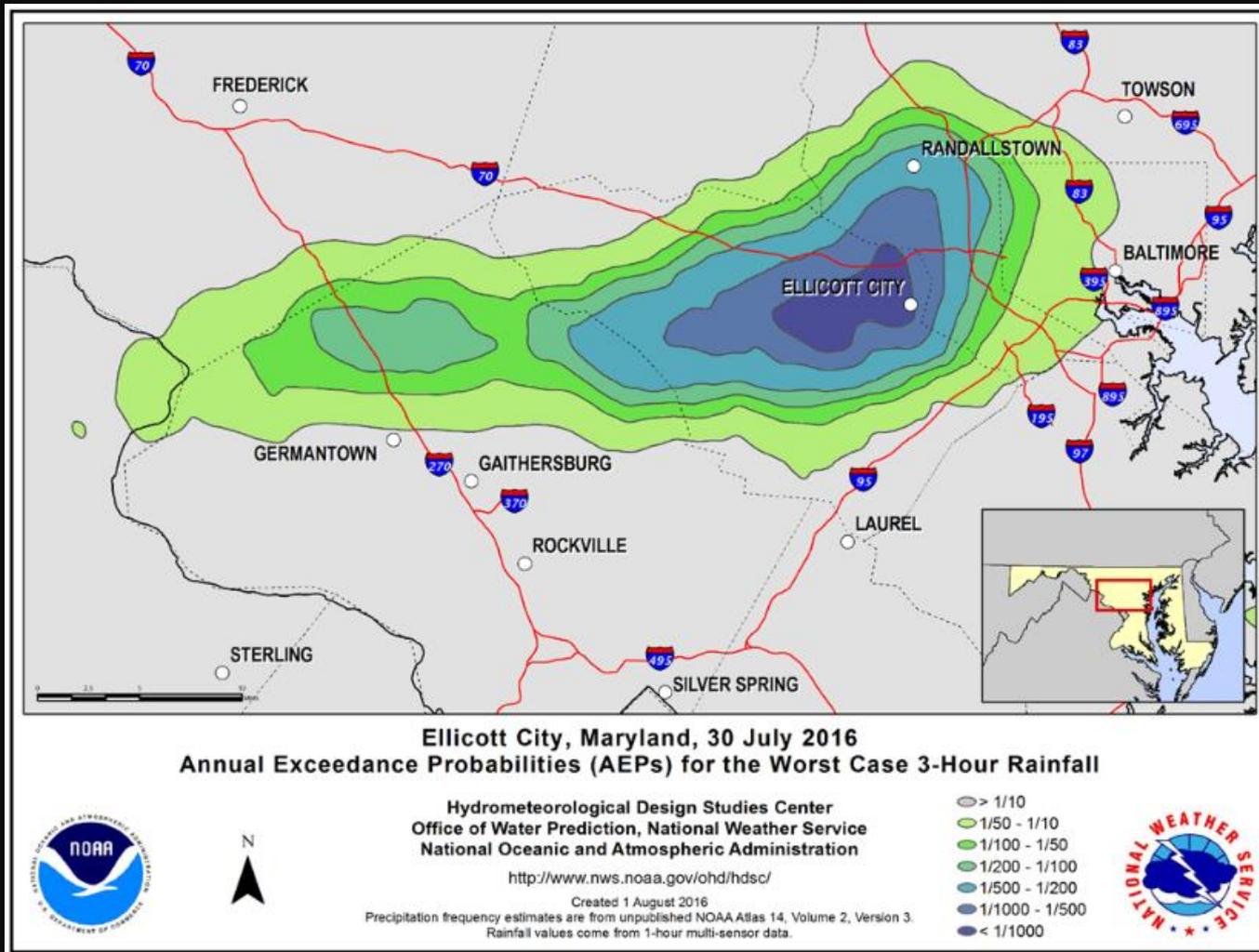


Duration	Max Rainfall in Duration	Time of Occurrence
1 minute	0.20"	7:52pm-7:53pm
5 minutes	0.80"	7:50pm-7:55pm
10 minutes	1.44"	7:50pm-8:00pm
15 minutes	2.04"	7:46pm-8:01pm
20 minutes	2.44"	7:44pm-8:04pm
30 minutes	3.20"	7:36pm-8:06pm
60 minutes	4.56"	7:30pm-8:30pm
90 minutes	5.48"	7:00pm-8:30pm
2 hours	5.96"	6:50pm-8:50pm



*Information obtained from the Ellicott City (ELYM2) rain gauge.  
This gauge reports in 0.04" increments.*

# Precipitation Annual Exceedance

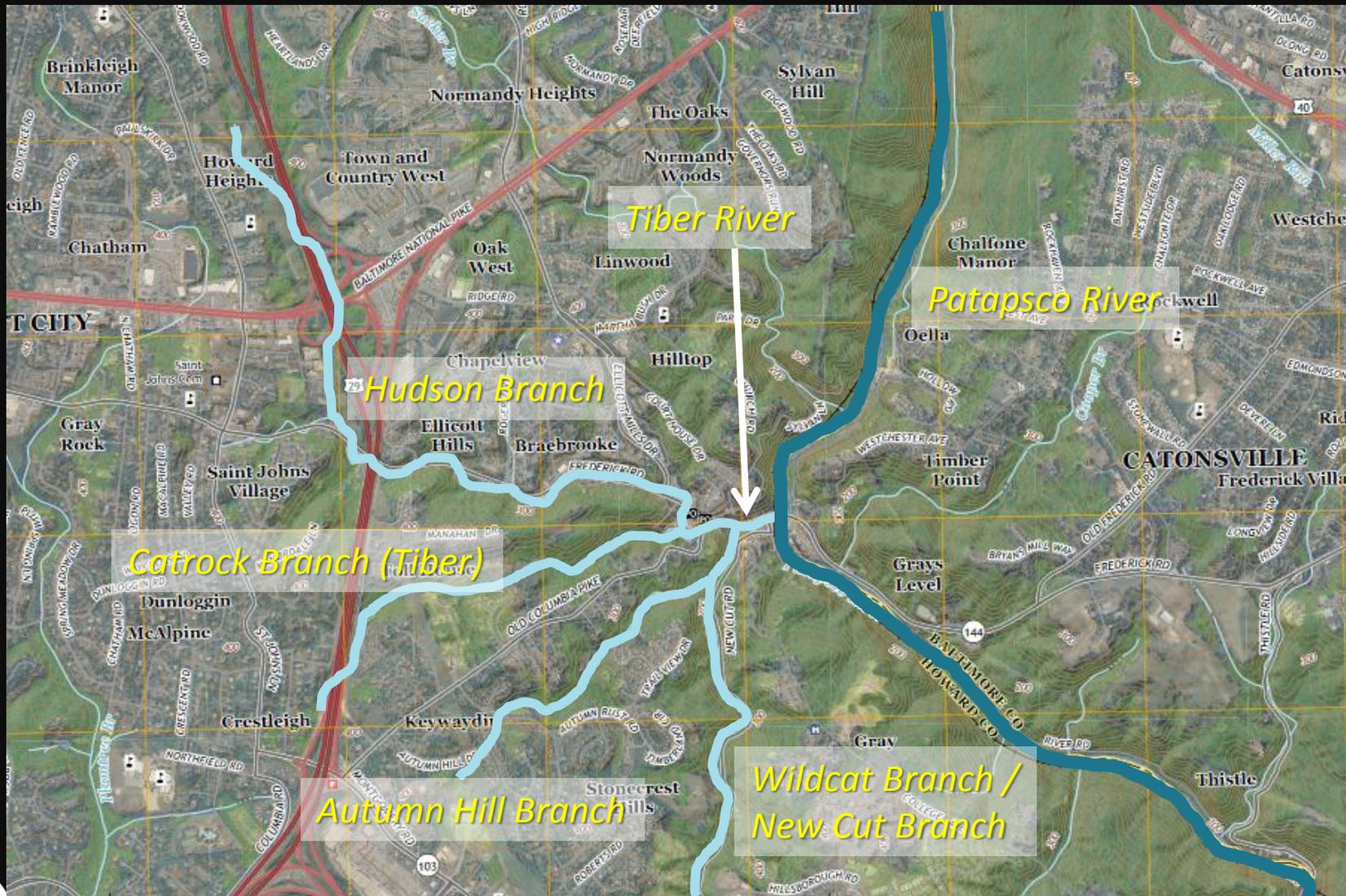


[http://www.nws.noaa.gov/ohd/hdsc/aep\\_storm\\_analysis/](http://www.nws.noaa.gov/ohd/hdsc/aep_storm_analysis/)

National Weather Service Baltimore/Washington

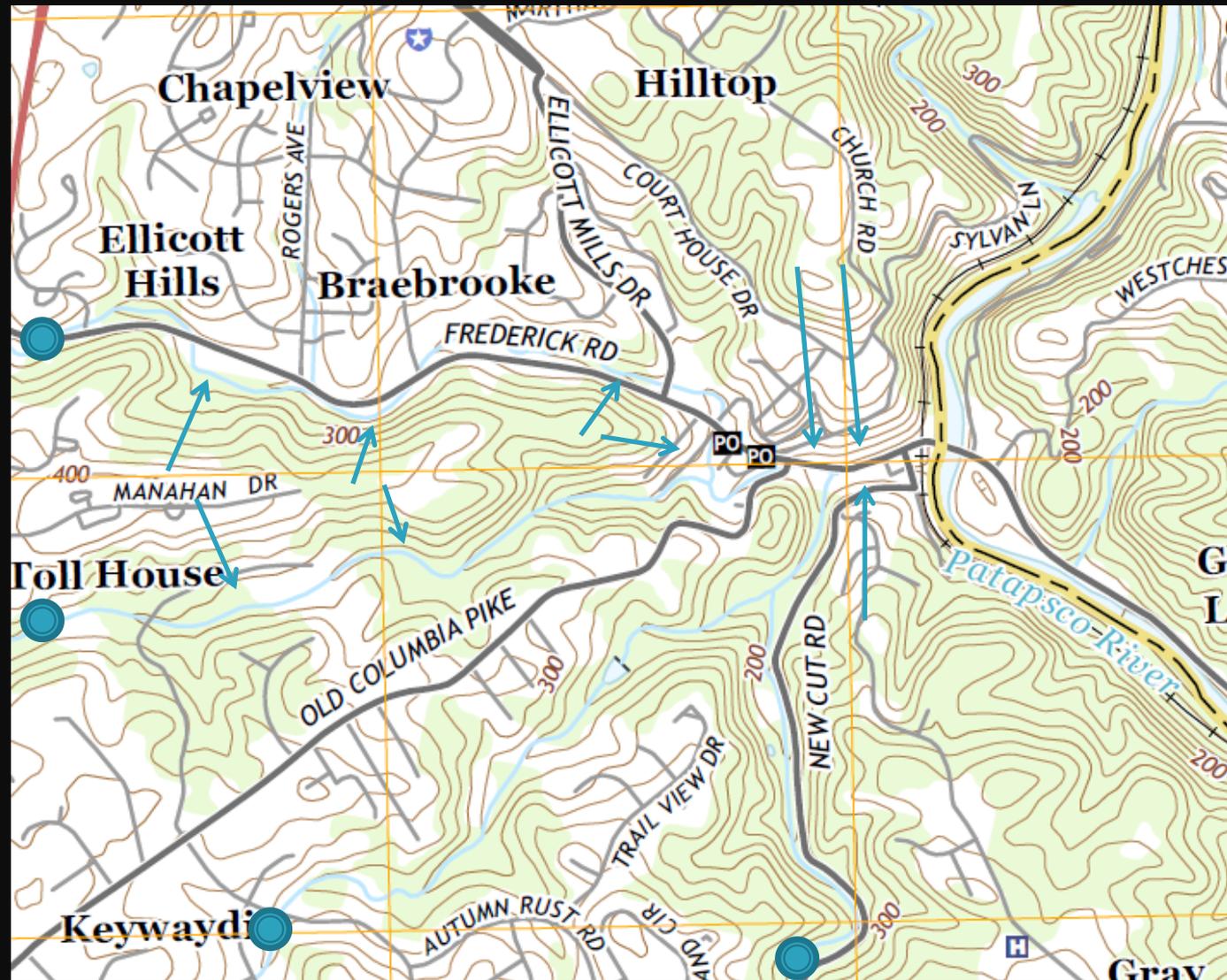


# Geography – Tiber River Basin

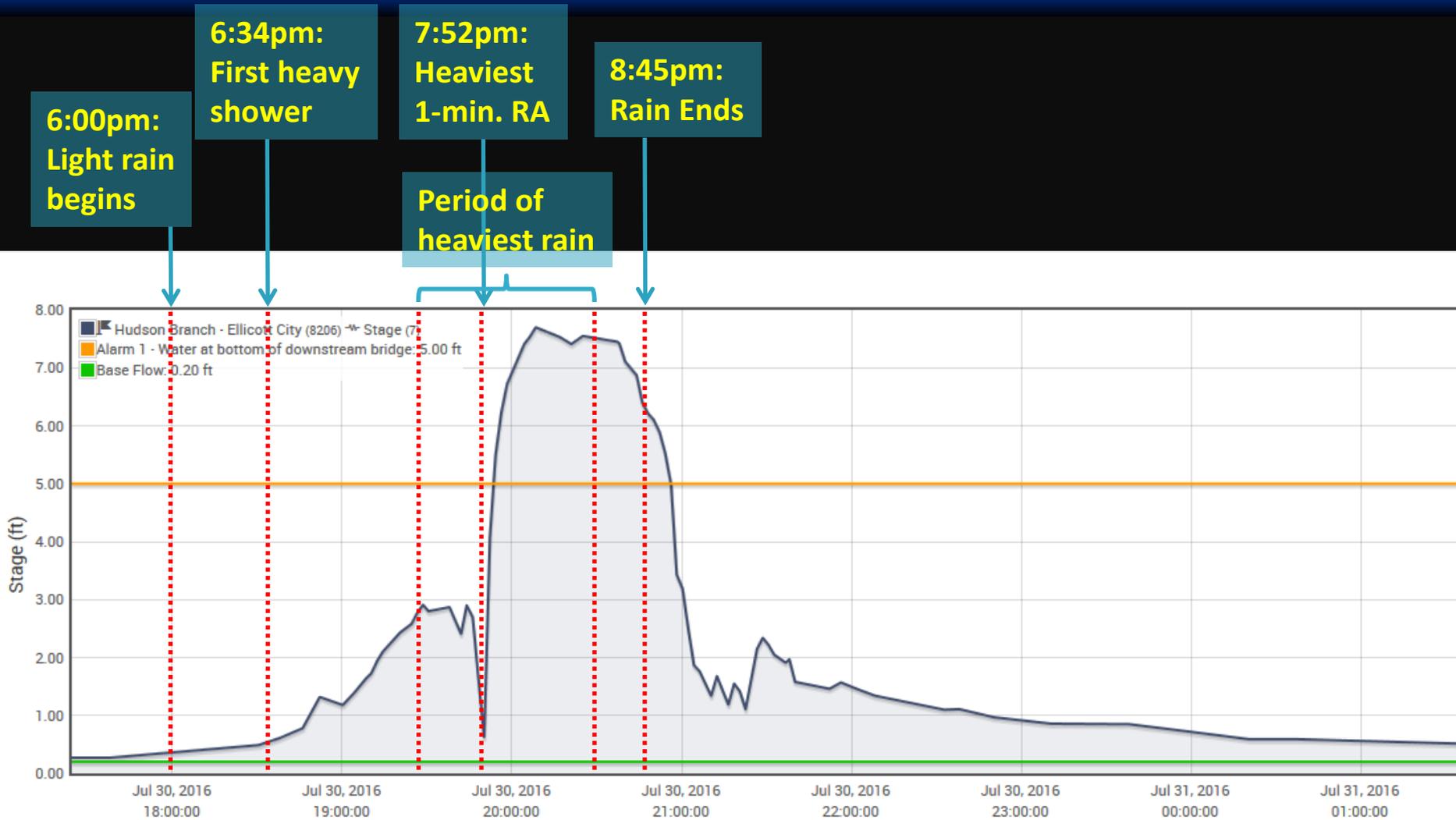


# Geography – Terrain & Streams

In addition to the four streams, local runoff can also occur off relatively steep terrain throughout the watershed.



# Hudson Branch Hydrograph

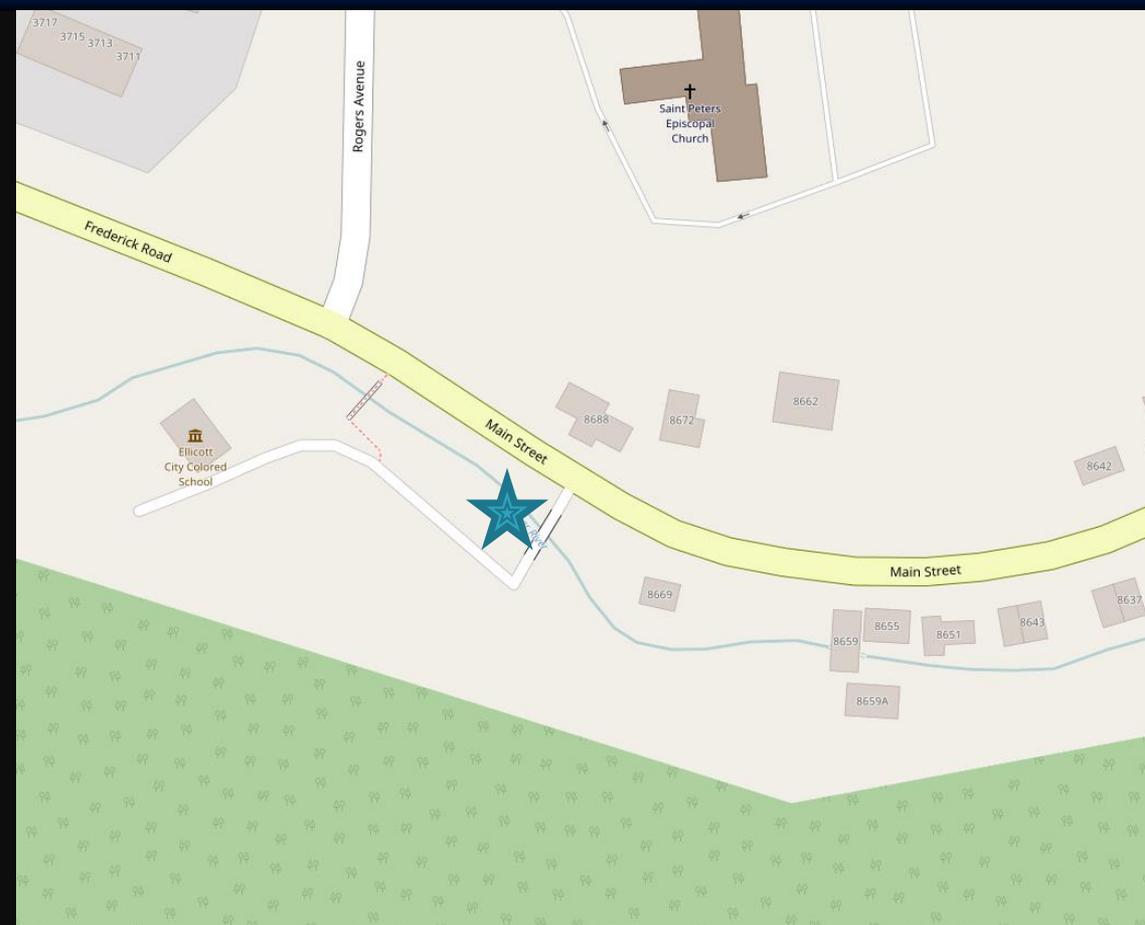


# Hudson Branch Hydrograph

USGS computations:

Bridge opening at gauge location can pass 525 cfs

Estimated flow on 30 July 2016 = 2750 cfs  $\pm$  20%



National Weather Service Baltimore/Washington



**Patapsco River  
at Hollofield:  
22800 cfs  
(peak at 9:37pm)**

**Hudson Branch  
2750 cfs (est.)  
(peak 8:04-8:37pm)**

**Patapsco River  
at Ellicott City:  
elevation 128.05  
(peak at 8:57pm)**

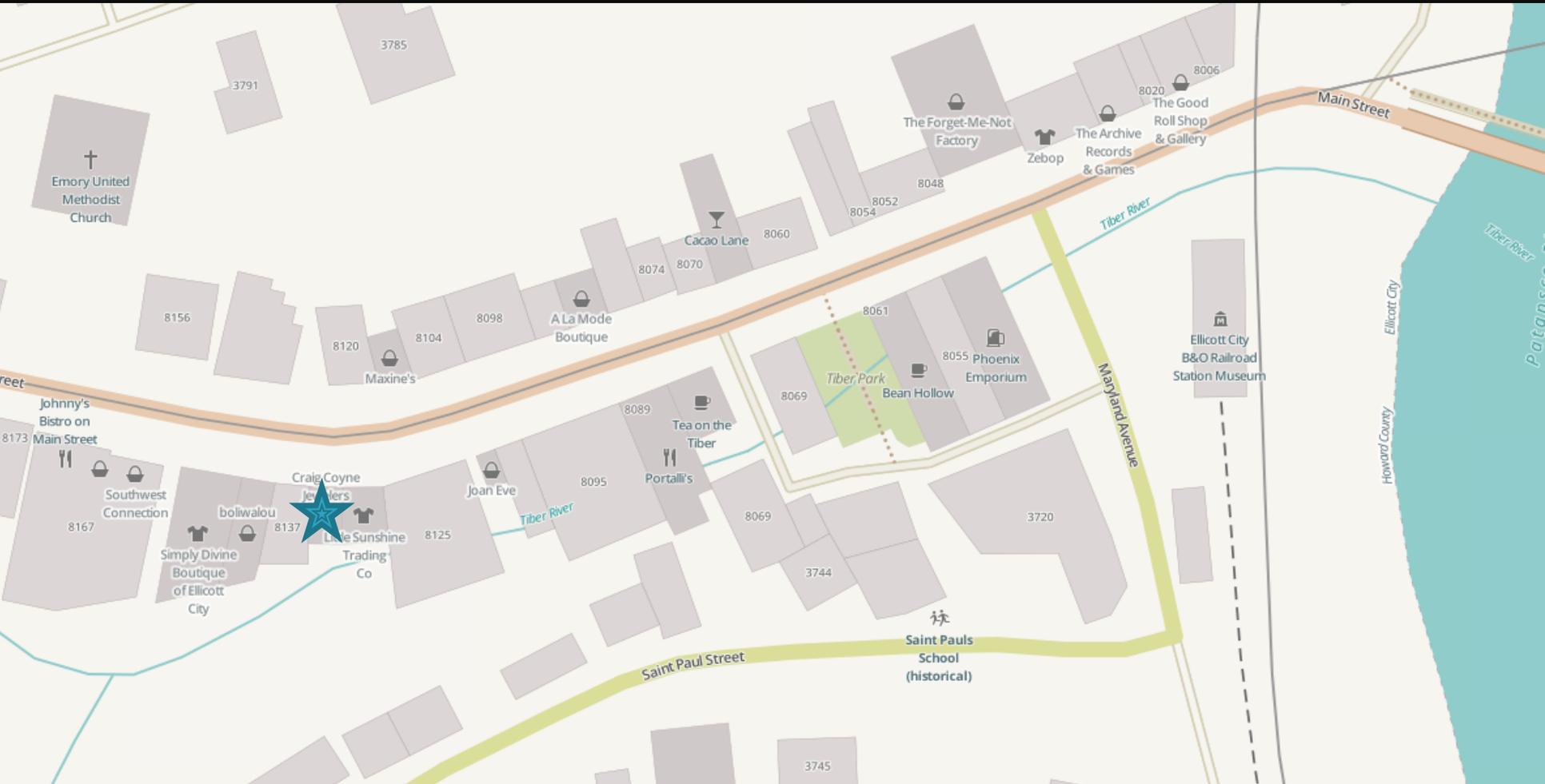
**Catrock Branch (Tiber)  
2100 cfs (est.)**

**New Cut Branch  
3320 cfs (est.)**

**Patapsco River at  
Catonsville:  
25500 cfs  
(peak at 9:15pm)**



# The Tiber is Trouble



National Weather Service Baltimore/Washington



# Ellicott City Flood – July 30, 2016

- ▶ **Security camera footage** (used with permission)  
**Craig Coyne Jewelers, Ellicott City**



# Timeline

- ▶ NWS issued flash flood warning: 7:18pm
- ▶ First flooding in Ellicott City's West End: 7:54pm
- ▶ Water enters buildings from Tiber River: 8:04pm
- ▶ Main Street Ellicott City starts to flood: 8:05pm
- ▶ Flash Flooding reaches its worst: 8:15pm
- ▶ Patapsco River reaches flood stage: 8:25pm
- ▶ Deepest flooding on lower Main Street: 8:45pm
- ▶ Patapsco River crests: 8:57pm
- ▶ Patapsco River falls below flood stage: 11:00pm

<http://www.weather.gov/baltimore/EllicottCityFlood2016>



# Questions?

Jason C. Elliott

Senior Service Hydrologist,  
NWS Baltimore/Washington

[jason.elliott@noaa.gov](mailto:jason.elliott@noaa.gov)



<http://www.weather.gov/baltimore/EllicottCityFlood2016>



National Weather Service Baltimore/Washington

