



Maryland
Department of
the Environment

wood.

Maryland Hydraulics Panel – Integrated FEMA/MDE Compliance Process

Dave Guignet, Maryland Department of the Environment
Tucker Clevenger, PE, CFM, Wood E&IS



Maryland Hydraulics Panel



Maryland
Department of
the Environment



**US Army Corps
of Engineers®**



wood.

AECOM

RK&K

**Michael Baker
INTERNATIONAL**

**Land
studies**

Maryland Hydraulics Panel Mission

Explore the development of improved procedures to ensure that Maryland policies and processes leading to construction in floodplains are efficient, while also providing accurate assessments of hydraulic performance of highway waterway crossings. The Panel has worked closely with the staff of MDOT, SHA and MDE; reviewed MDE regulations, policies and design approaches; and provided input on a variety of issues.

Non-tidal Hydraulics Initiatives:

- Floodplain Construction
- Repair of Deteriorating Culverts
- Channel Stability
- Aquatic Organism Passage
- MDE Waterways and FEMA Permitting Processes

MDE/FEMA Integrated Permitting Process

Challenge: FEMA Conditional Approval Applications (CLOMRs) and MDE Waterways Permits have historically been on separate and disconnected paths.

MDE Waterways Permit  FEMA Approval

Solution/Opportunity: Develop an integrated process that leverages FEMA/MDE floodplain modeling and mapping information as a common platform.

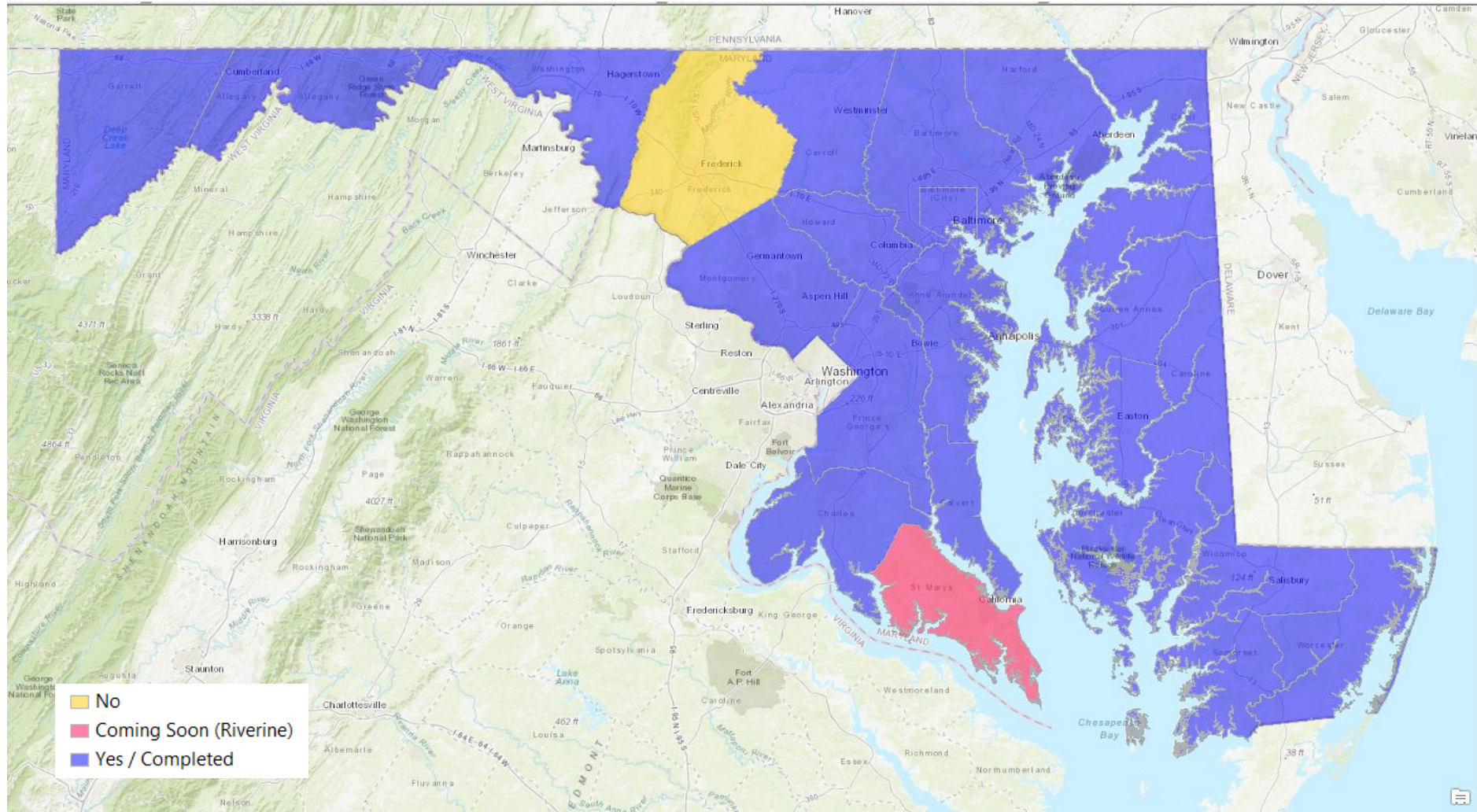


MDE/FEMA Integrated Permitting Process Benefits

- Enables applicants/stakeholders to work from a common hydraulic modeling platform to promote consistency and efficiency in updated flood study development
- Promotes continuity and improved coordination across both the MDE Waterways Construction and FEMA review processes
- Maximizes efficiencies in review and permit approval processes
- Enables maintenance of improved digital flood risk data to support sound floodplain management and future flood hazard mapping updates
- Mutually beneficial partnership!



Bridges / Culverts

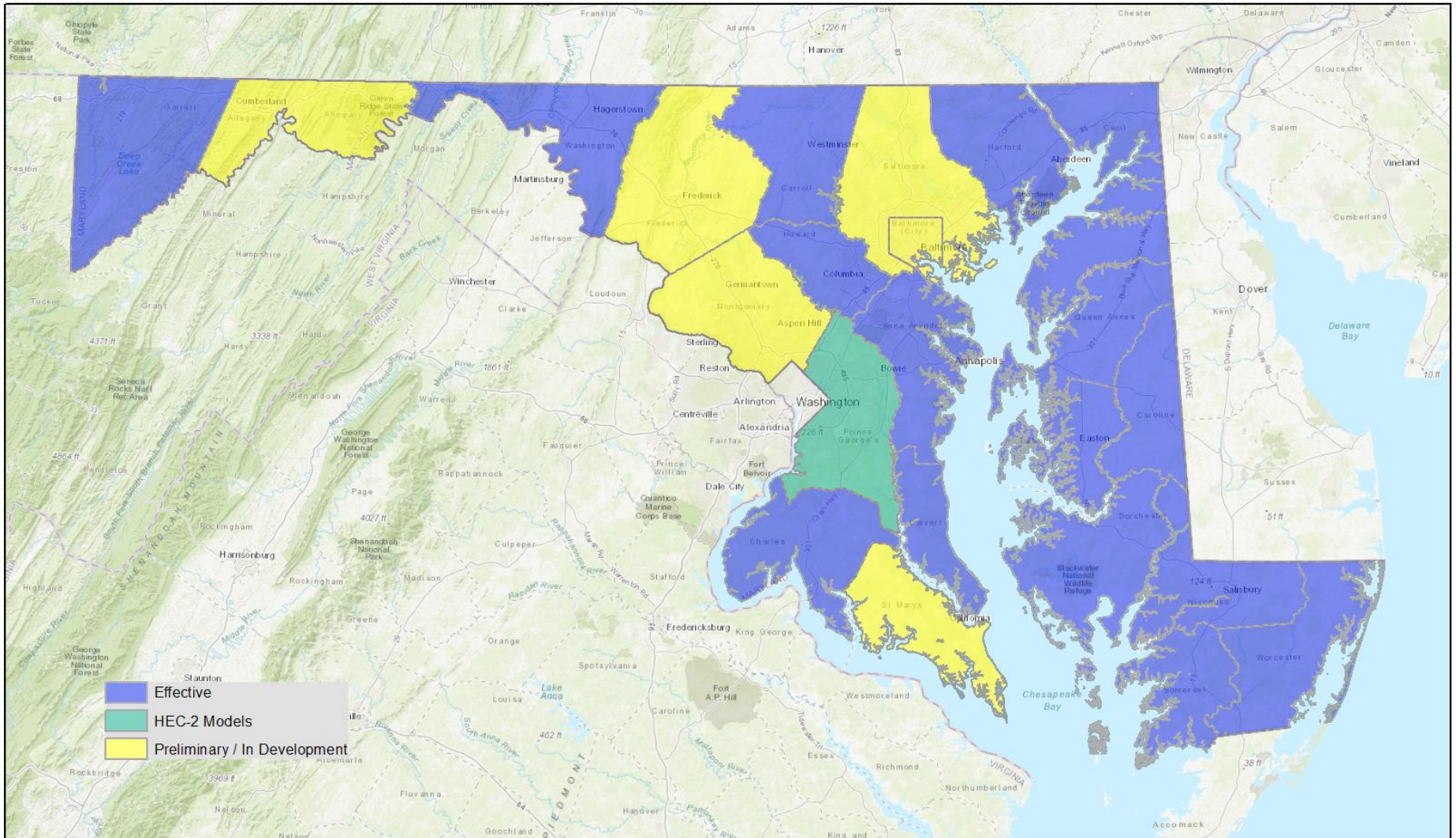


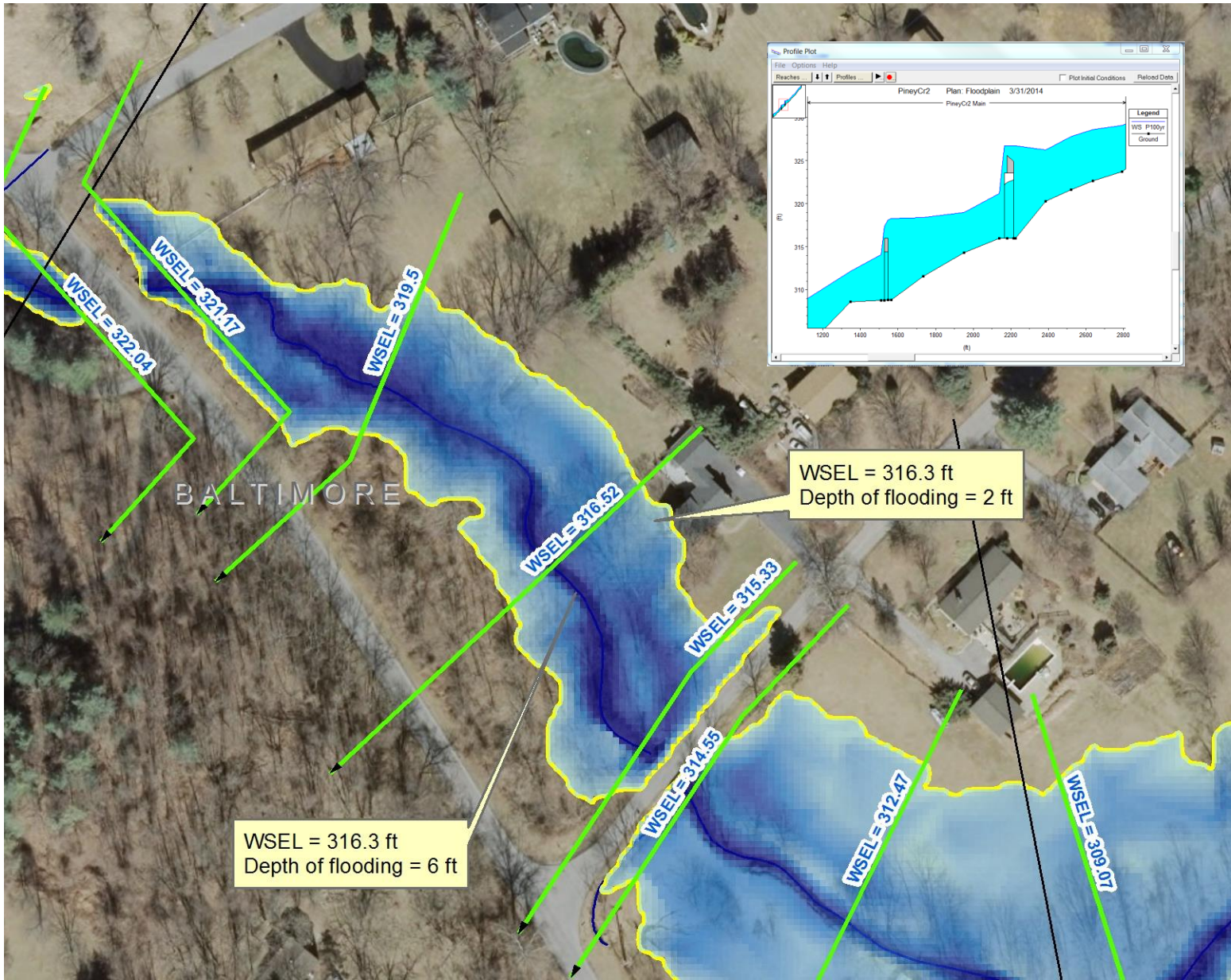
Bridge and Culvert Surveys

- ▶ Stream Crossing Survey
 - ▶ Dimensions
 - ▶ Inverts/abutments
 - ▶ Structure material
 - ▶ Piers
 - ▶ Entrance parameters
 - ▶ Photographs
 - ▶ Upstream and Downstream Channel Surveys
- ▶ Majority inventoried by MES
- ▶ Information hosted on MDFloodmaps website

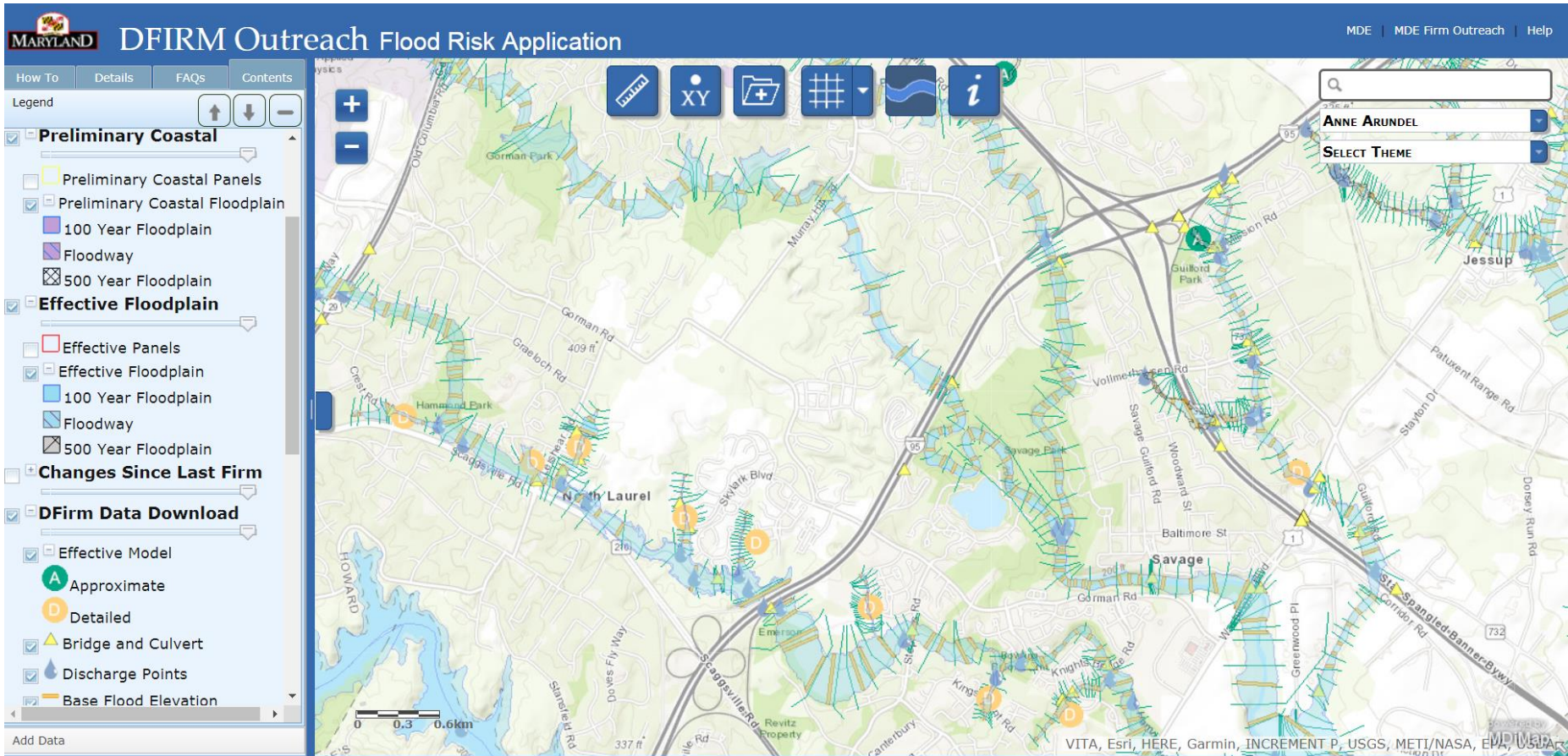


Models





Flood Risk Application – Data Download



Flood Risk Application – Data Download

HEC-RAS 4.1.0

File Edit Run View Options GIS Tools Help

Project: Little Patuxent River Trib 1
 Plan: Little Patuxent River Trib 1-Mit Opening
 Geometry: Little Patuxent River Trib 1-Mit Opening
 Steady Flow: Little Patuxent River Trib 1-Mit Opening
 Unsteady Flow:
 Description: Little Patuxent River Trib 1 - Approximate Method.

Geometric Data - Little Patuxent River Trib 1-Mit Opening

File Edit Options View Tables Tools GIS Tools Help

Tools: River Reach, Storage Area, S.A. Conn., Pump Station, RS, Description: 12.93

Profile Plot

File Options

Reaches ... Profiles ... Plot Initial Conditions Reload Data

Little Patuxent River Trib 1 Plan: Little Patuxent River Trib 1-Mit Opening 3/12/2015

Elevation (ft)

Station (ft)

Legend: WS TQ100CUR, Ground, Bank Sta

Little Patuxent River Trib 1 Plan: Little Patuxent River Trib 1-Mit Opening 3/12/2015

Elevation (ft)

Main Channel Distance (ft)

Legend: WS TQ100CUR, Ground

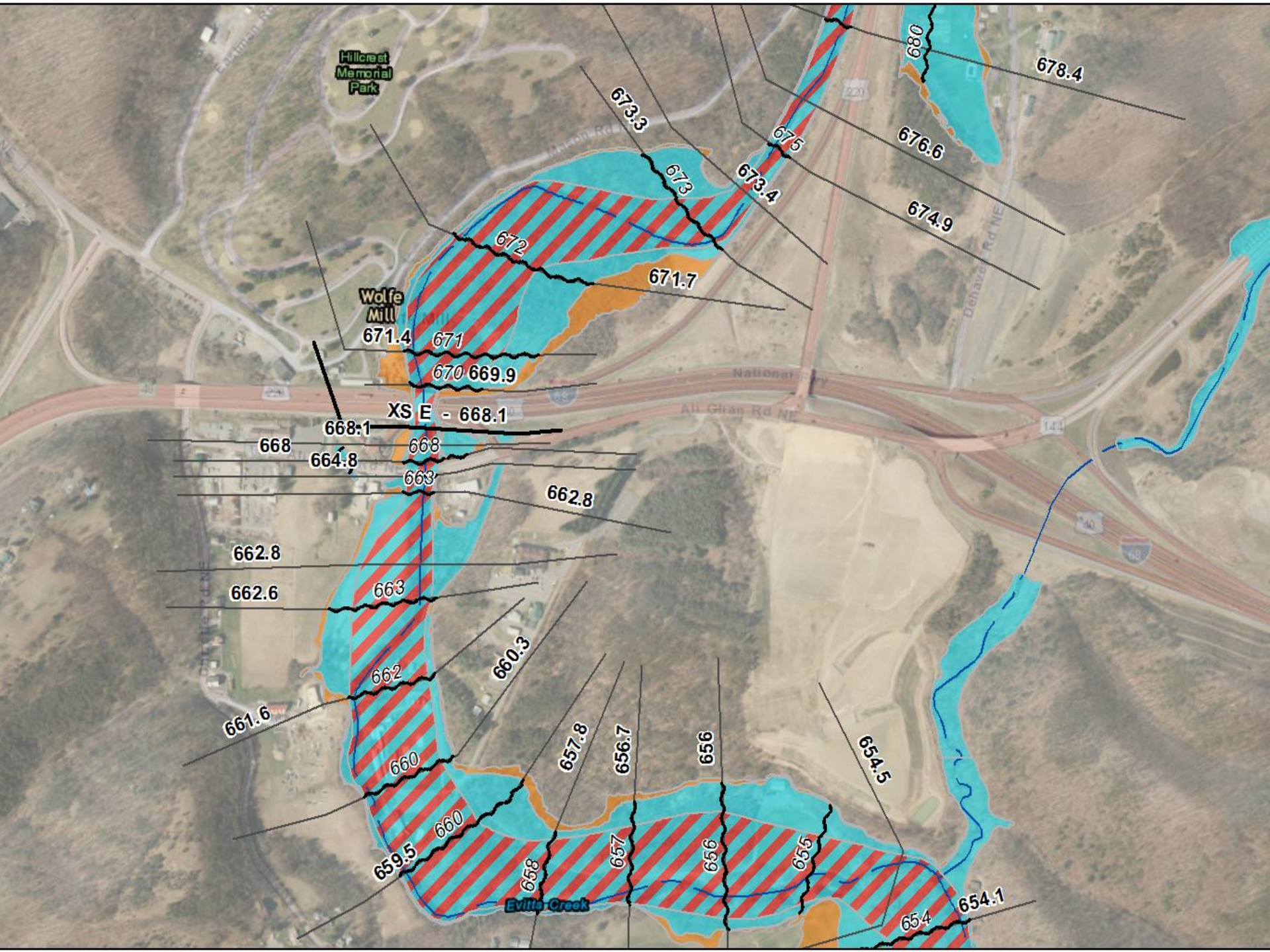
Profile Output Table - Standard Table 1

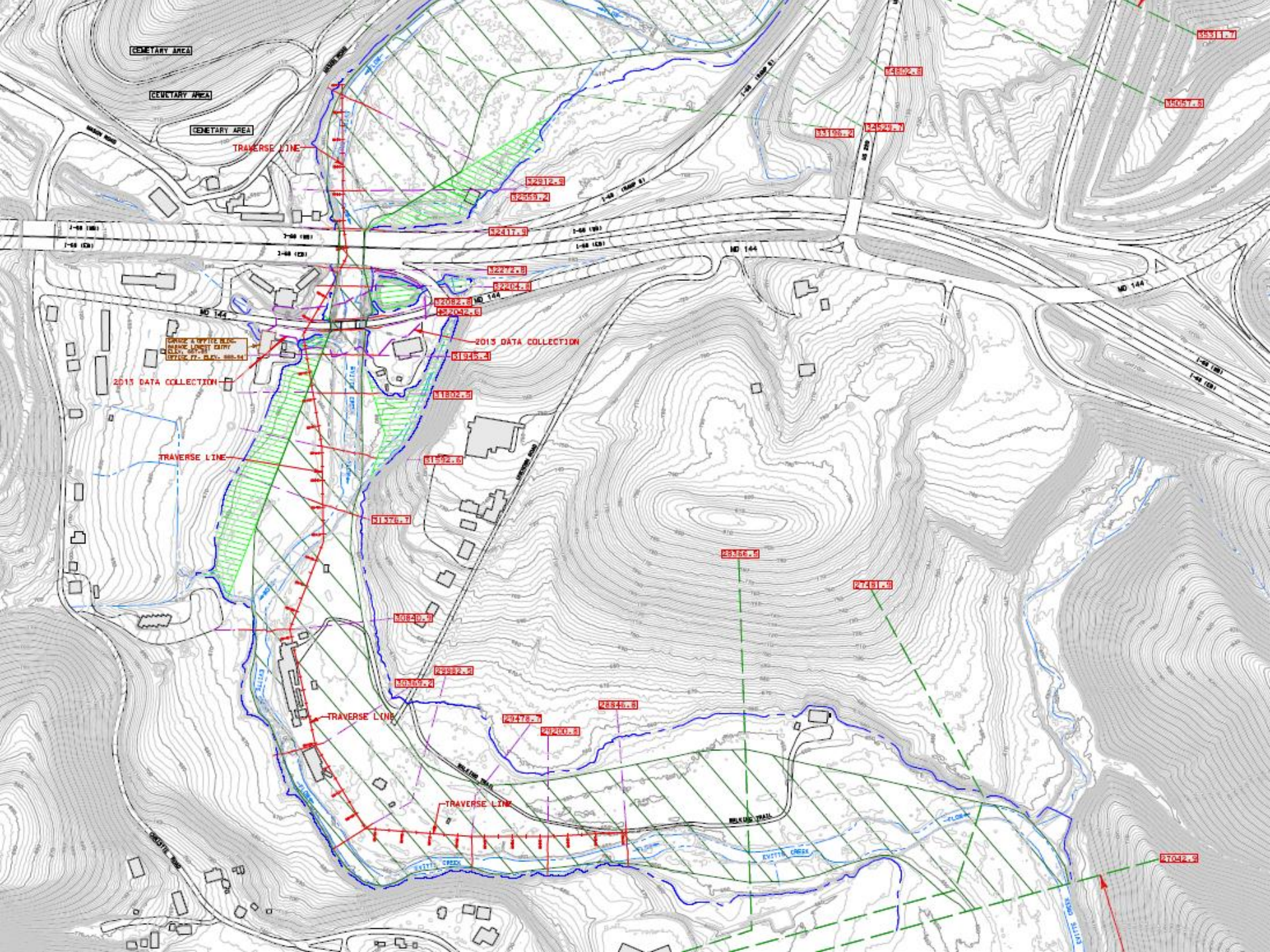
File Options Std. Tables Locations Help

HEC-RAS Plan: Mit Opening River: Trib to LPR Reach: 1 Profile: TQ100CUR Reload Data

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #	Chl
1	11004.54	TQ100CUR	735.00	94.27	98.09		98.34	0.004397	4.58	238.96	115.95	0.44	
1	10723.59	TQ100CUR	735.00	91.97	97.80		97.86	0.000740	2.55	506.36	153.53	0.20	
1	10288.42	TQ100CUR	1240.00	89.68	97.71		97.73	0.000166	1.57	1389.79	282.45	0.10	
1	9939.089	TQ100CUR	1240.00	87.95	97.69		97.70	0.000071	1.17	1978.38	303.24	0.07	
1	9830.968	TQ100CUR	1240.00	85.93	97.66	91.13	97.68	0.000126	1.55	1635.72	368.04	0.09	

Date created: 10/20/2012 9:22 AM



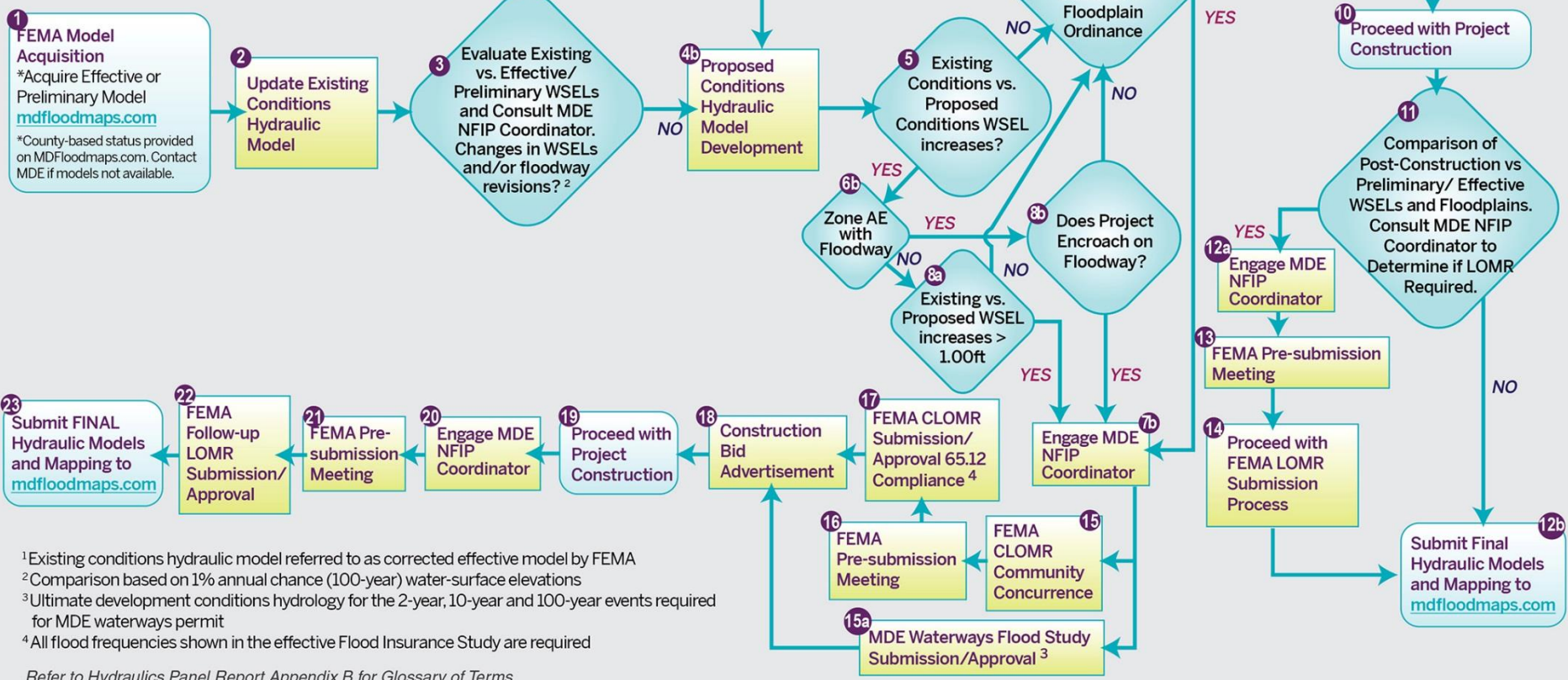


MDE/FEMA Process in Detailed Study Areas

MDE/FEMA Integrated Review Process

For projects encroaching on a FEMA detailed (Zone AE) floodplain

* This document provided as a guidance document to supplement FEMA 44 CFR, and is not to be considered regulatory



1 Existing conditions hydraulic model referred to as corrected effective model by FEMA
 2 Comparison based on 1% annual chance (100-year) water-surface elevations
 3 Ultimate development conditions hydrology for the 2-year, 10-year and 100-year events required for MDE waterways permit
 4 All flood frequencies shown in the effective Flood Insurance Study are required

Refer to Hydraulics Panel Report Appendix B for Glossary of Terms



Is FEMA Approval Required?

The screenshot displays the DFIRM Outreach Flood Risk Application interface. The main map shows a residential area with various flood risk contours labeled with elevations such as 47.7 Feet, 48.1 Feet, 49 Feet, 50.1 Feet, 50.4 Feet, 51 Feet, 51.7 Feet, 52 Feet, 53 Feet, 54 Feet, 55 Feet, 56 Feet, 57 Feet, 57.1 Feet, 57.4 Feet, 57.5 Feet, 57.6 Feet, 57.8 Feet, 57.9 Feet, 58 Feet, 59 Feet, 61.1 Feet, 61.7 Feet, 61.8 Feet, and 62.1 Feet. The map includes a search bar, a legend, and a scale bar (0 to 0.4 km). The legend on the left lists various data layers, including DFirm Data Download, Effective Model, Bridge and Culvert, Discharge Points, Base Flood Elevation, Cross Section, Stream, Structure Footprint, Tax Ditches, Stream Buffers, Coastal Barrier Resource, Hydrography, Effective FIRM Panel, and Effective Floodplain. The interface also features a navigation menu with 'Details', 'FAQs', and 'Contents' tabs, and a search bar at the top right. The map is powered by MDIMap and is for the County of Anne Arundel, M-NCPPC, VITA.

MARYLAND DFIRM Outreach Flood Risk Application

MDE | MDE Firm Outreach | Help

Legend

- DFirm Data Download
 - Effective Model
 - Approximate
 - Detailed
 - Bridge and Culvert
 - Discharge Points
 - Base Flood Elevation
 - Approximate
 - Detailed
 - Stream
 - Structure Footprint
 - Tax Ditches
 - Stream Buffers
 - Coastal Barrier Resource
 - Hydrography
 - Effective FIRM Panel
 - Effective Floodplain

County of Anne Arundel, M-NCPPC, VITA, powered by MDIMap

Is FEMA Approval Required?

MARYLAND DFIRM Outreach Flood Risk Application

MDE | MDE Firm Outreach | Help

Details | FAQs | Contents

Legend

- DFirm Data Download**
 - Effective Model
 - A** Approximate
 - D** Detailed
 - Bridge and Culvert
 - Discharge Points
 - Base Flood Elevation
 - Approximate
 - Detailed
 - Cross Section
 - Stream
 - Structure Footprint
 - Tax Ditches
 - Stream Buffers
 - Coastal Barrier Resource
 - Hydrography
 - Effective FIRM Panel
 - Effective Floodplain

61.1 Feet

Conway Rd

61 Feet

57.6 Feet

57 Feet

57.9 Feet

57.8 Feet

57.6 Feet

57.1 Feet

57.5 Feet

57.4 Feet

56.3 Feet

57 Feet

56 Feet

61 Feet

Little Patuxent River

Conway Rd

Transportation Blvd

Unnamed Little Patuxent River Tributary

61 Feet

57.9 Feet

57.8 Feet

57.6 Feet

57.1 Feet

57.5 Feet

57.4 Feet

56.3 Feet

57 Feet

56 Feet

61 Feet

0 100 200m

County of Anne Arundel, M-NCPPC, VITA, MDMap

powered by MDMap

Search

ANNE ARUNDEL

SELECT THEME

Current Effective Floodplain:

Flood Hazard Zone	AE
Zone Definition	100-year floodplain, with BFES determined.
Floodway	FLOODWAY

[Zoom to](#)

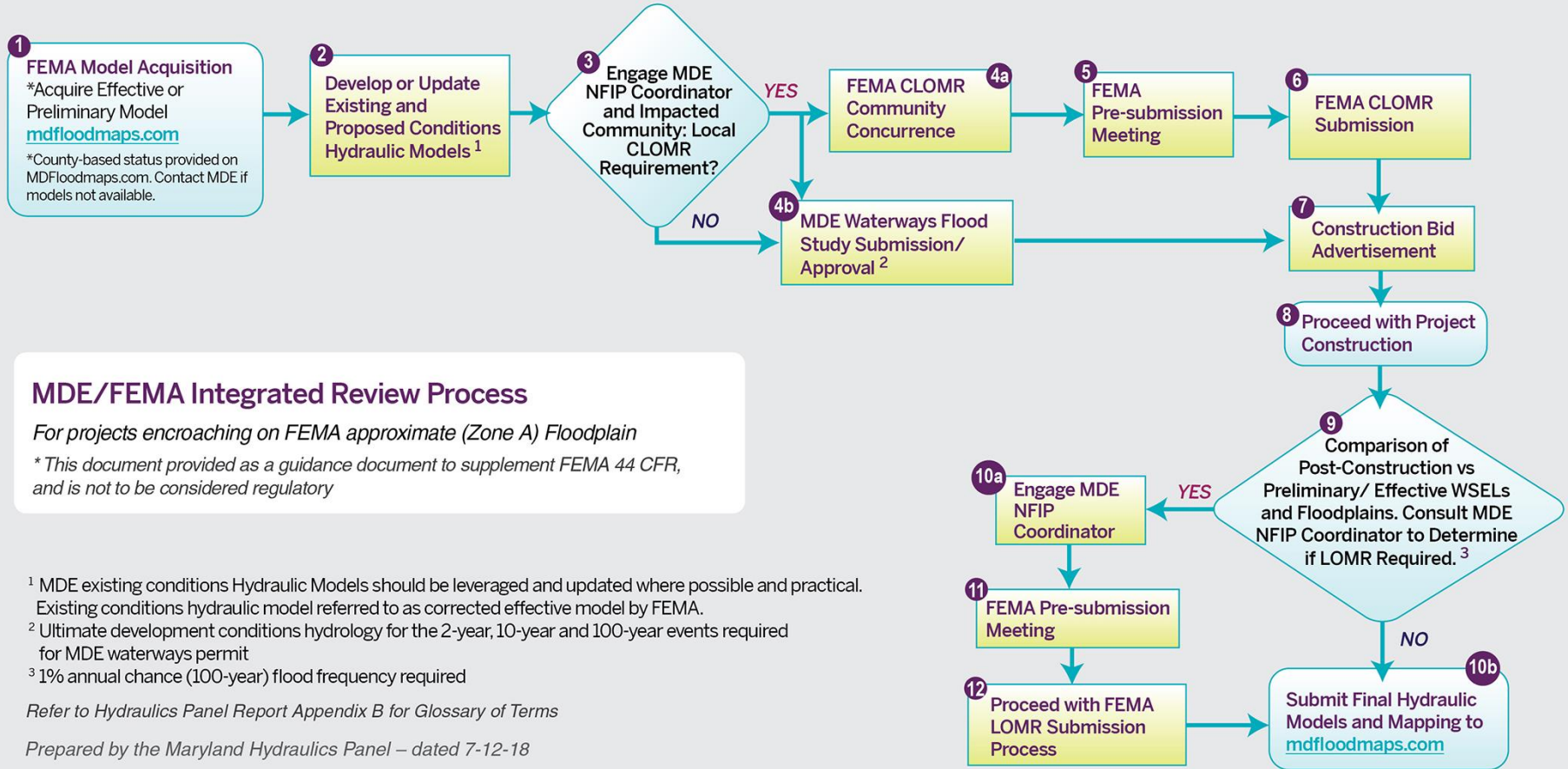
Add Data

MDE Waterways Permitting Considerations

- ***Existing vs. Proposed Conditions floodplain studies = common requirement between MDE and FEMA***
- Ability of all on-site construction to withstand the impacts of the 100-year flood event;
- Flooding on adjacent properties;
- Erosion of the construction site or stream bank (WQC); and
- Environmental effects, such as the project's impacts on existing in-stream fisheries; wildlife habitat; or rare, threatened or endangered species.



MDE/FEMA Process in Approximate Study Areas



MDE/FEMA Integrated Review Process

For projects encroaching on FEMA approximate (Zone A) Floodplain

* This document provided as a guidance document to supplement FEMA 44 CFR, and is not to be considered regulatory

¹ MDE existing conditions Hydraulic Models should be leveraged and updated where possible and practical.

Existing conditions hydraulic model referred to as corrected effective model by FEMA.

² Ultimate development conditions hydrology for the 2-year, 10-year and 100-year events required for MDE waterways permit

³ 1% annual chance (100-year) flood frequency required

Refer to Hydraulics Panel Report Appendix B for Glossary of Terms

Prepared by the Maryland Hydraulics Panel – dated 7-12-18



MD Flood Risk Application – Data Uploads

Latitude:

39.090756

Longitude:

-76.629185

Map Scale:

1:1128

[Click to add the location](#)



MD Flood Risk Application – Data Uploads

STEP 4: UPLOAD ADDITIONAL DOCUMENTATION (Optional)

Applicants will have an opportunity to upload additional documents to accompany their application.

Notes: Documents, unless the type is specified as "Miscellaneous", must be in a .pdf format. Miscellaneous documents can include other digital formats (Excel document, Word document, .jpeg file, etc.)

A submission should not be one single document but each specific piece of the application should be uploaded separately.

The applicant may be requested to provide paper copy/copies of the full size plan sheets associated with this application.

Upload Attachments

- Choose the document type
- Enter a short description for the attachment
- Select the file No file chosen
- Should this be considered confidential?
- Click the Upload button to upload the file now.



Key Takeaways

- Download the FEMA models and supporting information from the website - Using this information as a baseline can help to expedite the permitting and approval process [mdfloodmaps.com](https://www.mdfloodmaps.com)
- Receiving a MDE Waterways permit does not imply FEMA compliance
- FEMA conditional approval is required for any proposed construction within the floodway that results in more than a 0.00 foot rise in BFEs
- FEMA requires that any information resulting in changes to flood elevations be submitted within 6-months of project completion (FEMA CFR 65.3)
- MDE wants your data!



Resiliency in Maryland (Who's In Charge ?)

MAFSM Conference

Dave Guignet

State NFIP Coordinator

November 8, 2018



Maryland
Department of
the Environment

**In Maryland –
No State (or Federal)
Agency Has Been
Directed to Lead
Resiliency**

But Several State Agencies Have a Role ...

- **MEMA**
- **MDE**
- **SHA, MDOT, and MTA**
- **MD Insurance
Administration**
- **Housing and Community
Development**

How Does the NFIP Community Currently Imply Resiliency ?

- **Freeboard (1-3 feet)**
- **Higher Standards (setbacks or higher requirements)**
- **Climate Change (future or ultimate conditions) / Not there Yet !**
- **Setbacks**
 - **(All Triggered by Actions ONLY in the FEMA floodplain)**

How Does the NFIP Community Define Resiliency ?

- All Actions that Require Local or State Permit
- **Only Activities within the Floodplain**
- **Only Activities Required by the NFIP**
- *So – If we only take action in the FEMA floodplain*
 - **Only buildings in the floodplain built higher**
 - Only buildings in the floodplain built to a higher standard (V-Zone construction in the LiMWA)
 - **Only new or improved construction** will be built higher (And higher means BFE – freeboard) which means ***3 additional feet is our best effort***.

As a Result – Resiliency Stops at FP Limit ?

- **Buildings Outside the Floodplain Are NOT Built Higher** (Elevated to Include Freeboard)
- **Buildings Outside the Floodplain Are NOT Built Stronger** (V-Zone Standards Outside LiMWA)
- **Buildings Outside Floodplain Are Not Required to Move Back Further from Floodplain**

So – Lets Consider Where We ALL Stand in the NFIP Process?

- ***We Are ALL Following the (Default) FEMA Metric (And Sending the Message) in our Communities that...***
 - Flooding Stops at the FEMA floodplain Limits
 - Flooding will not Exceed 3 feet (or the freeboard limit) in my Community
 - The Only people that need Flood Insurance are in the Floodplain and Have a Mortgage
- { Yes, I know this is An Exaggeration, but by default – This is the Collective Message that We Are Sending }**

**What does this number
represent ?**

12 %

**What does this number
represent ?**

12 %

**% of Homes in NC flooded by
Florence with Flood Insurance**

Which means that ...

88 %

Do NOT Have Flood Insurance !

How Does this Relate to Resiliency ?

If We Only Follow the Current NFIP Metric..

- **In North Carolina only 12% of the homes flooded had Flood Insurance (after 3 Hurricanes in 15 years) In South Carolina less than 10% had Flood Insurance**
- **Florida's Upper Panhandle Area Successfully Requested to Be Exempted Out of the State's Higher Construction Standards**
- **In Houston 45% of the Homes Flooded by Harvey had Flood Insurance (after 3 Hurricanes in 10 years)**

Maryland's Message about Resiliency Needs to Change...(Why)

- **Maryland Is NOT Immune from a Hurricane !**
- **Maryland has had severe flooding recently from Tropical Storms (Agnes and Irene) and Super Storm Sandy (But No Hurricane)**
- **Flooding from a Hurricane will probably be greater or exceed our 3 foot Sea-Level Rise Projections (see NC)**
- **Maryland's Coast and Inland Coastal Plain is Very Similar to North Carolina and South Carolina**
- **Greater Probability of a Hurricane in Next 30 years than No Hurricane and Only 3 feet of Sea-level rise**

**What does this number
represent?**

\$ 6000

**What does this number
represent?**

\$6000

**Average NFIP Pay Out to
Home Owner Without Flood
insurance?**

**What does this number
represent?**

\$ 25,000

**What does this number
represent?**

\$ 25,000

**Average Damages from Flood
(First 3 feet inside home)**

What Could We Do to Increase Resiliency Now ?

- Purchase Flood Insurance Outside the Floodplain
 - **Maryland's Percentage of Flood Insurance Policies Outside the Floodplain is Estimated at 5% (less)**
- Purchase Flood Insurance Outside the Floodplain
 - **Insurance Outside the Floodplain is about \$600/year**
- Purchase Flood Insurance Outside the Floodplain
 - **Insurance is Almost Immediate (30 days) and Cheaper than Elevating or Relocating**
- Purchase Flood Insurance Outside the Floodplain
 - **Disaster Assistance typically pays about \$ 6000 for damages to a home owner without insurance versus up to \$ 260,000 plus contents for homes with insurance**

Which Community is More Resilient ?

- **Disaster Assistance typically pays about \$ 6000 for damages to a home owner without insurance versus up to \$ 260,000 plus contents for homes with insurance**
 - **\$ 6000 to Home Owners *With Out* Flood Insurance**
 - OR**
 - ***Up to \$ 260,000* to Home Owners *With* Flood Insurance**

What Does FEMA Pay for After a Disaster ?

Roads / Bridges / Culverts Infrastructure:

The **basic** facilities and installations that help a government or community run, including roads, schools, phone lines, sewage treatment plants and power generation.



What's Covered Outside a Floodplain for Homeowners Without Flood Insurance ?

**Hint: Almost None of the
following.....**







What's the Limit or Extent of Flood Damages from a Direct Hit in MD?





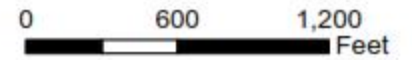


Summary: What Can We Do as Floodplain Managers ?

- Educate Public and Permittees
 - *Flooding Does Not Stop at Floodplain*
- Outreach
 - *Need for Insurance Outside Floodplain*
 - *Floodplain is Less Expensive Outside Floodplain*
 - *Maryland is Not Immune*
- Expand Data Tools to Convey a Message Beyond FEMA Flood Boundaries (Our metric)
 - *Additional Tools Coming in Maryland...*

Baltimore, MD

Sea Level Rise Simulation



Legend

 Example Points

Flood Depth

 High

 Low

Change View

Hurricane Isabel 

Isabel + 3ft Rise 

Isabel + 5ft Rise 

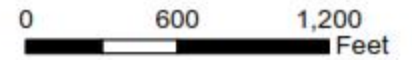
Isabel + 7ft Rise 

BACK



Baltimore, MD

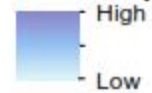
Sea Level Rise Simulation



Legend

 Example Points

Flood Depth



Change View

Hurricane Isabel

Isabel + 3ft Rise

Isabel + 5ft Rise

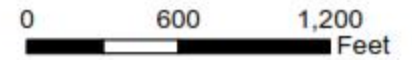
Isabel + 7ft Rise

BACK



Baltimore, MD

Sea Level Rise Simulation



Legend

 Example Points

Flood Depth



Change View

Hurricane Isabel

Isabel + 3ft Rise

Isabel + 5ft Rise

Isabel + 7ft Rise

BACK



Baltimore, MD

Sea Level Rise Simulation




0 600 1,200 Feet

Legend

 Example Points

Flood Depth

 High
Low

Change View

Hurricane Isabel

Isabel + 3ft Rise

Isabel + 5ft Rise

Isabel + 7ft Rise

BACK




Additional Tools...

- **Additional Data Sets Using Statewide LiDAR**
 - **Floodplain Plus 2 feet, 5 feet, 10 feet, and...**
- **ESRI Story Board Using Depth Grids Floodplain Layers and Community HAZUS Data Sets**
 - **Tool is Plug and Play with Available Data**
 - **GIS Ready**
 - **Promote Greater Outreach, Education, and Community Awareness**

Examples of Story Board

Anne Arundel Flood Dashboard Screenshots View using Water Surface Elevation (WSE) 01%

 Anne Arundel Flooding

Choose Flood Level **0** 1 2 3 4 5 6

Anne Arundel Flood Test Explore in Scene Viewer

When preparing for emergencies, for example when developing flood response plans, identifying flood risk, locating at risk critical infrastructure and especially communicating with the public, 3D visualization can add tremendous value to your organization.

3D maps (scenes) make it much easier to communicate the risk out to local floodplain and hazard mitigation planners, decision makers and the public.

This dashboard is a first prototype of a web app allowing the user to step through different flood events and see the impact in the panel on the right hand side.

How to use:


- select a flood level in the 3D scene by clicking on the bookmarks at the bottom.
- select the same flood level in the upper right of the dashboard.


The features in red are the affected buildings at that flood level. On the right you see for each flood level:

- number of buildings that are affected
- total area that is flooded
- estimated loss potential

Comments and feedback are appreciated.

3D Solutions Team



Buildings
 **77**


Exposure
310,761 ft²

Damage
\$6.276M

USDA/FSA | Source: USGS, NGA, NASA, CGIAR, GEP/CO, N Robinson, NCEAS, NLS, OS, NMA, GeoDataByte and the GIS User Community. Powered by Esri.

Examples of Story Board

View with the buildings most exposed to flooding highlighted in red

 Anne Arundel Flooding

Choose Flood Level **0** 1 2 3 4 5 6

When preparing for emergencies, for example when developing flood response plans, identifying flood risk, locating at risk critical infrastructure and especially communicating with the public, 3D visualization can add tremendous value to your organization.

3D maps (scenes) make it much easier to communicate the risk out to local floodplain and hazard mitigation planners, decision makers and the public.

This dashboard is a first prototype of a web app allowing the user to step through different flood events and see the impact in the panel on the right hand side.

How to use:

- select a flood level in the 3D scene by clicking on that bookmark at the bottom.
- select the same flood level in the upper right of the dashboard.

The features in red are the affected buildings at that flood level. On the right you see for each flood level:


- number of buildings that are affected
- total area that is flooded
- estimated loss potential


Comments and feedback are appreciated.

3D Solutions Team

Anne Arundel Flood Test

Explore in Scene Viewer



Buildings
 **77**

Exposure
310,761 ft²

Damage
\$6.276M

Powered by Esri

More Info on Story Board

**Stop by Resiliency
Booth in the Lobby**