# Beyond the Map

New Resources to Assess, Plan, and Mitigate Flood Risk in Maryland…

# Questions can be submitted via text:

(956) 750 - 8084

# What is Resiliency?

- NOAA defines resiliency as the following:

  The ability of a community to bounce back after a hazardous event, such as hurricanes, coastal storms and flooding – rather than simply reacting to impacts

Source:
http://oceanservice.noaa.gov/facts/resilience.html

# Why is Resiliency important?

- Why resiliency is important according to NOAA

Because all communities are going to face hazards, resilience is important. Resilience is our ability to prevent a short-term hazard event from turning into a long-term community-wide disaster. While most communities effectively prepare themselves to respond to emergency situations, many are not adequately prepared to recover in the aftermath.

Source: http://oceanservice.noaa.gov/facts/resilience.html

# HMP Statistics

- According to the 2011 HMP:

  1,179 flooding events were recorded between 1993 and 2010

  *(Source: NOAA National Weather Service NCDC)*

  - $121.5 million in property damages
  - 16 deaths
  - 64 injuries

*Making flooding one of the most significant hazards in the State!*

# How do we currently define an ‘event’ in Maryland statewide

(100 Year Floodplain/Sea Level Rise/Storm Surge Maps)

# Recognition of Needs

NFIP Floodplain Maps

- Historically, floodplain maps were a paper product and the HAZUS analysis was a paper report.
- Second generation of those products was a Q3 analysis of the floodplain and a separate digital product from HAZUS
- The two products were not compatible
- Limitations in data for comprehensive risk analysis

# Changing Behavior

- 100 Year Floodplain Boundary (Digital)
- Flood Risk Database (Non Regulatory)
  - *FRD bridges to Enhance Hazard Analysis*
- Enhance Hazard Analysis
  - *Includes 100 Year digital Floodplain data and FRD Datasets for the communities*
- New FEMA HMA Policies and Guidance
- Local Hazard Mitigation Plan Guidance
- Interagency Coordination and Partnerships

# Interagency Collaboration












- Hydrology Panel – *Application of Hydrologic Methods in Maryland*
- Hydraulics Panel – *Standardization of Bridge/Culvert Modeling; Sharing information*
- Maryland Emergency Management Agency – *Hazus upgrades to include building specific and critical facilities*
- Maryland Environmental Service/West Virginia GIS Technical Center – *Sharing Source Code*
- U.S. Fish & Wildlife – *Watershed Resources Registry – Stream Stability Index Model*
- Maryland Historical Trust – *Mapping/Protecting Historic Properties*

# Recognition of Needs

Hazard Mitigation

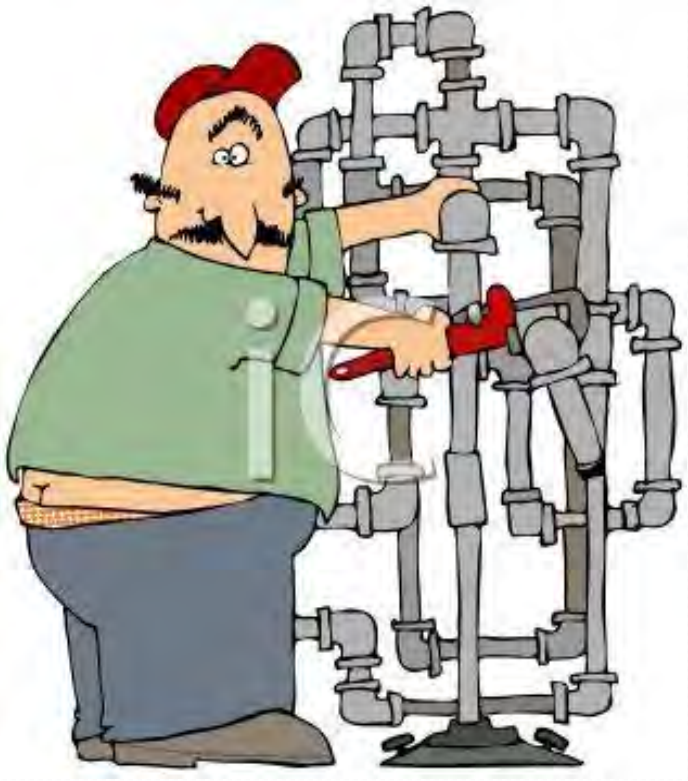
- Hazard Mitigation Strategies and Actions did not consider outside agency efforts
- Limitations in 2011 plan data & risk assessment
    - critical facilities / property data
    - level 1 vs enhanced HAZUS
- 80% of County Plans expire between 2016 & 2018
    - Inconsistency between County Plans
    - Inconsistency between State and County Plans

## Contrasts between agencies from Planning, Floodplain Management, Mitigation perspective:

- Funding sources
- Grant recipients
- Linear Federal-State Partnerships
- Mitigation practices that result in project implementation

# Changing the Culture

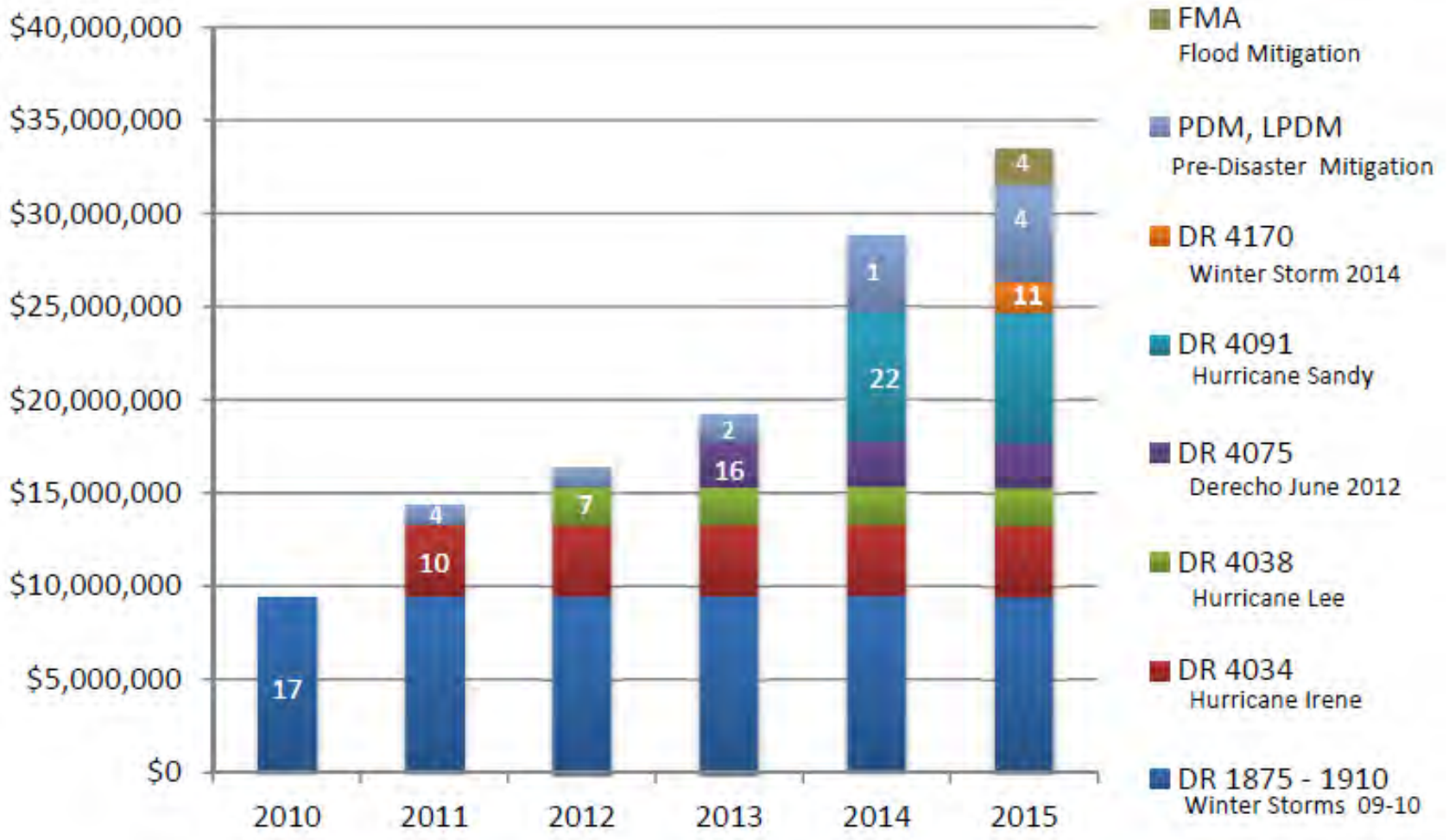
Stove pipe approach needs to be eliminated



# Hazard Mitigation
# Project Coordination & Management

| | |
|---|---|
| • **Open HMA Projects - Total** | **$30,000,000** |
| • **Pre-Sandy Funded Projects** | **$17,800,000** |
| 15 Acquisitions | $ 7,800,000 |
| 3 Elevations | $ 280,000 |
| 8 Other | $ 1,000,000 |
| • **Post-Sandy Funded Projects** | **$13,100,000** |
| 10 Acquisitions | $ 3,700,000 |
| 33 Elevations | $ 3,500,000 |
| Other | $ 89,600 |

# Hazard Mitigation Awards 2010-2015




HMA Award Totals and # projects added by Year

# 2015 HMA Applications Submitted to FEMA (PDM & FMA)

**PDM 2015** *8/27/2015*

| | | | | |
|---|---|---|---|---|
| | $30mm available nationally. $250,000 set aside for Maryland. | | Maximum 11 subapplications. 1 mgt cost sub-app, and max. 3 project subapps. Maximum project cost $3 mm, and maximum planning cost $150k. | |
| | Applicant | Project | PDM | Notes |
| 1 | Saint Marys | Shoreline stabilization | $350,725 | |
| 2 | Somerset Co LTRC Inc. | Elevations | $728,831 | Re-submitted DR4091 app for 90% fed share (impoverished comm) |
| 3 | Annapolis | Dock, harbor flood mitigation | $2,475,000 | |
| 4 | MEMA | HMP: Plan Integration, HAZUS | $200,000 | |
| 5 | Dorchester Co | HMP Update | $28,000 | |
| 6 | Talbot Co | HMP Update | $56,250 | |
| 7 | Saint Marys | HMP Update | $30,000 | |
| 8 | Calvert | HMP Update | $29,996 | |
| 9 | Prince Georges | HMP Update | $40,000 | |
| 10 | Annapolis | HMP Update | $142,150 | |
| 11 | Whitemarsh VFC | Acquisition Demolition | $1,250,000 | |
| 12 | Manchester Union Bridge | Generators (4) | $265,750 | |
| | TOTAL | | $5,596,702 | |

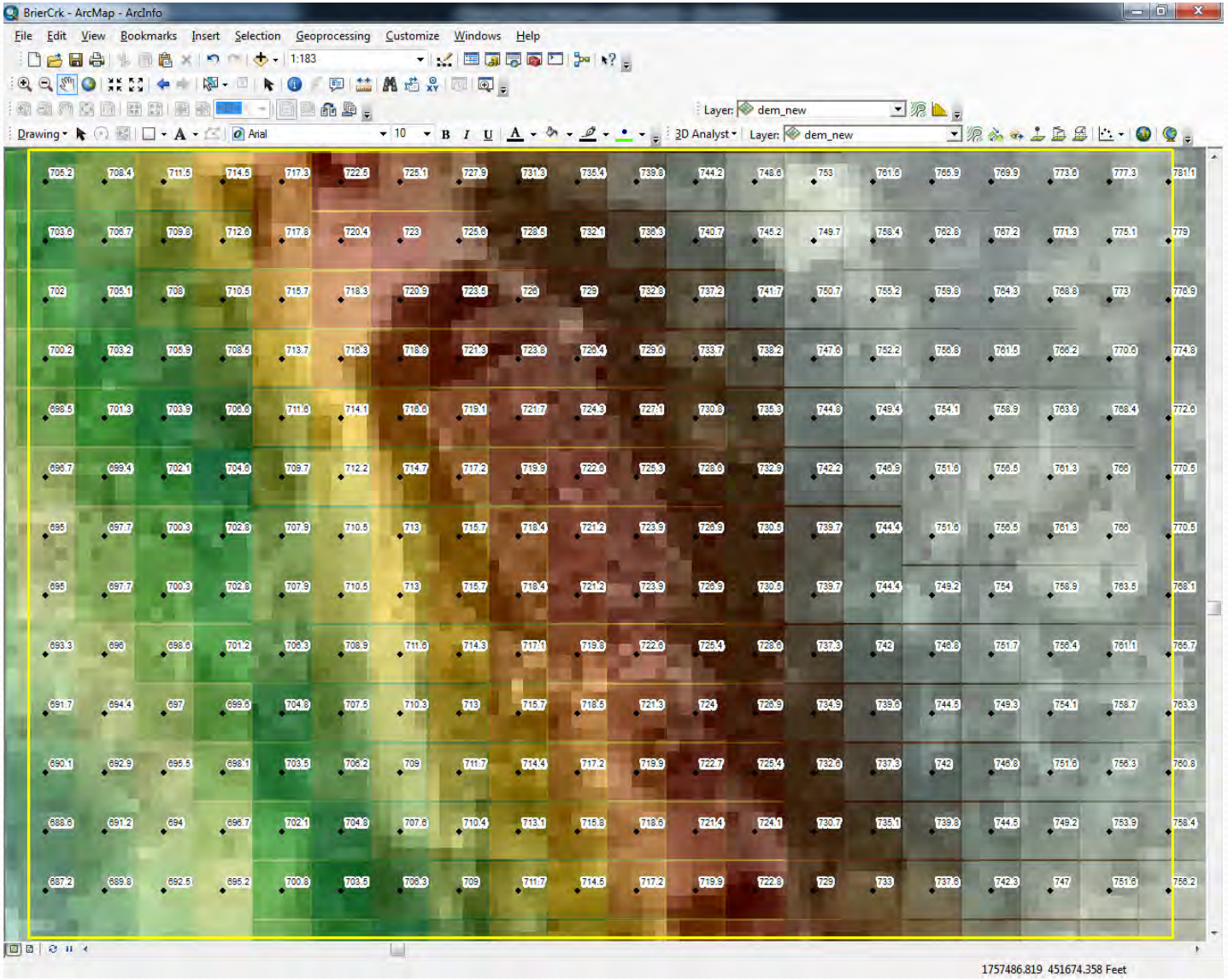
**FMA 2015** *8/27/2015*

| | | | | |
|---|---|---|---|---|
| | $150mm available nationally | Maximum planning grant funding per State - $100k (max for State plan $50k, max for local plan $25k) | | |
| | Management cost max: 10% | Priority: RL (Repetitive Loss) projects up to 90% Fed share; SRL (Severe Repetitive Loss) projects up to 100% Fed share | | |
| 1 | Anne Arundel Elevation | 2254 Lake Dr., Pasadena | $77,615 | **SRL -- Priority** |
| 2 | Anne Arundel Elevation | 2258 Lake Dr. Pasadena | $71,340 | **RL -- Priority** |
| 3 | Dorchester Co | Flood Mitigation Plan | $32,000 | |
| 4 | Queen Annes Co | Elevations (2) | $327,513 | Petinot Place, Perrys Corner Rd |
| 5 | Wicomico | Clara Rd Elevation | $98,700 | |
| 6 | Calvert Co | Elevations (3) | $493,299 | 1690 Cypress Rd, 2903 BeachDrive, 5131 Shore Drive |
| 7 | Anne Arundel Elevations (2) | Elevations (2) | $203,845 | 2272 Lake Drive, 7802 Summit Drive |
| | | | $1,304,312 | |
| | | Total Submitted | $6,901,014 | |

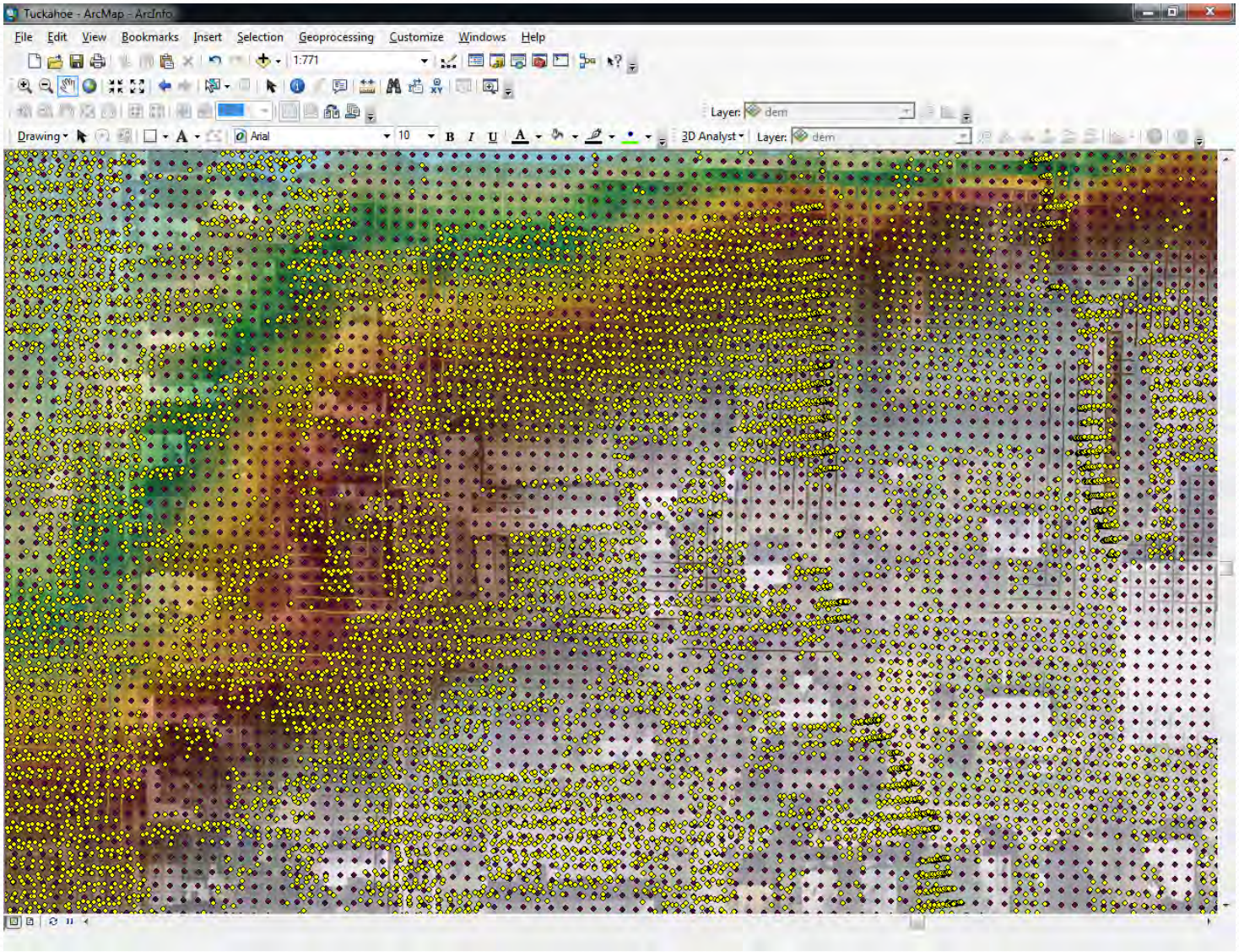
# Data Development

Questions via Text to (956) 750 - 8084

# MDE Terrain Data



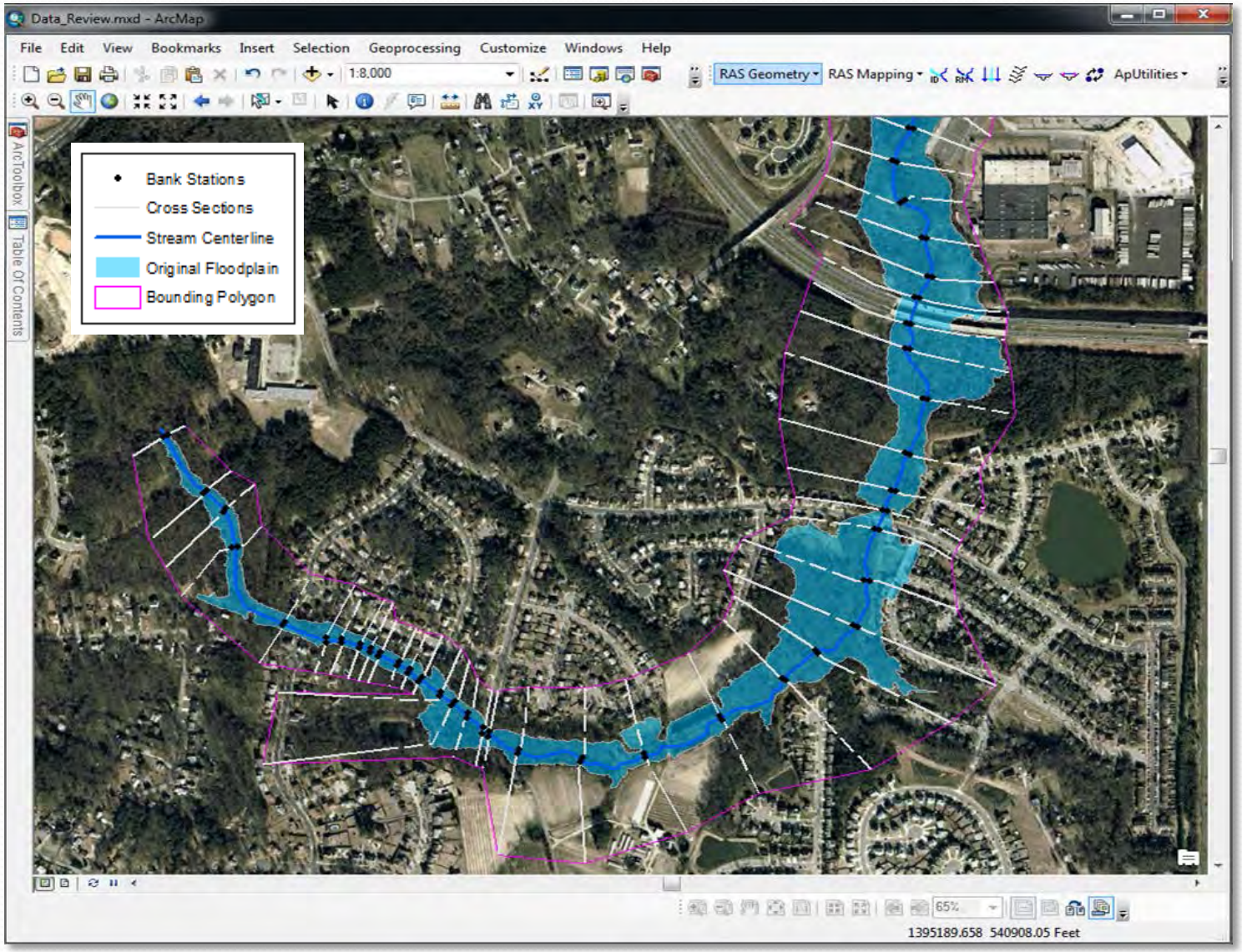
# MDE Terrain Data



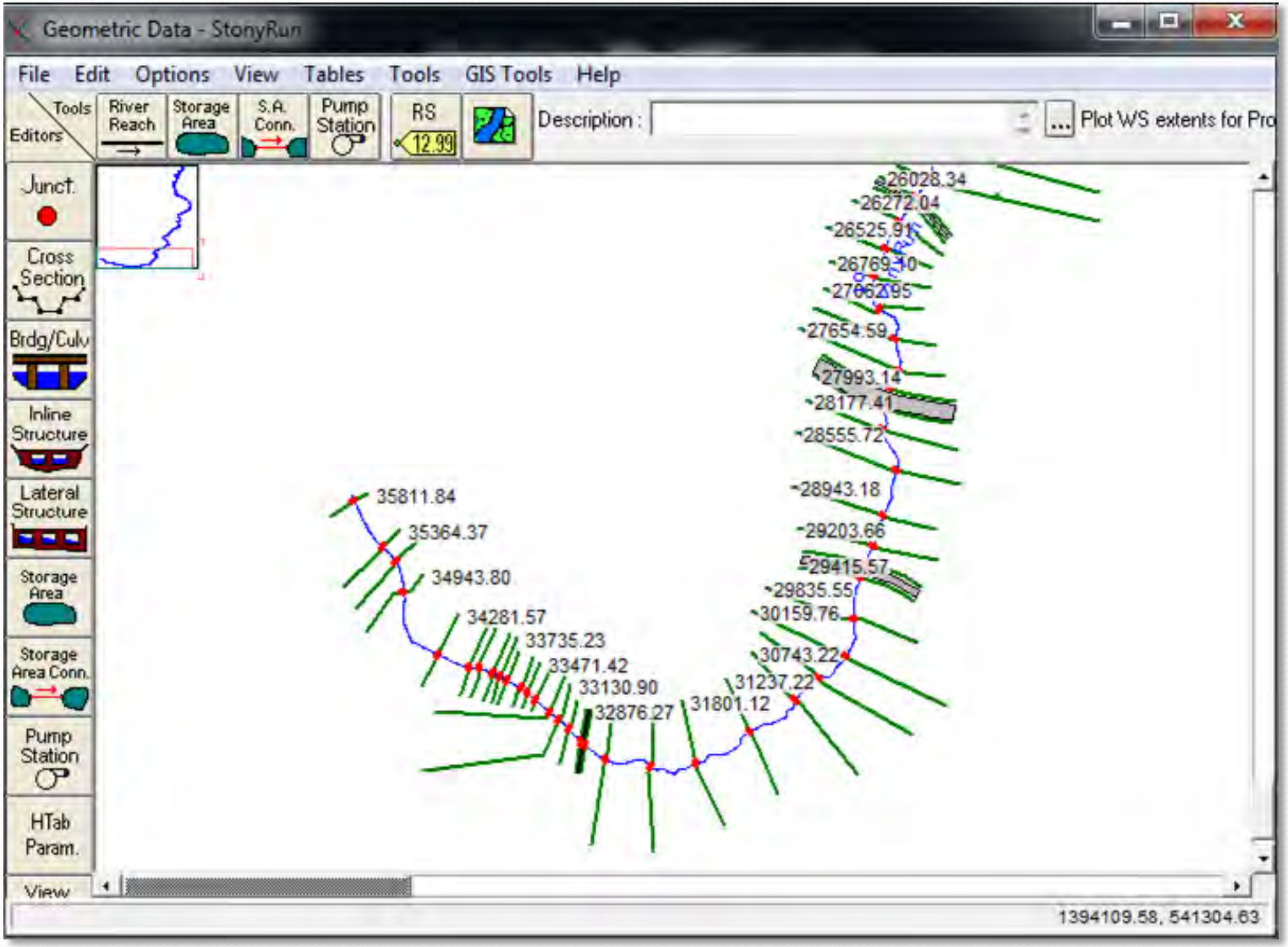
# MD Structure Inventory

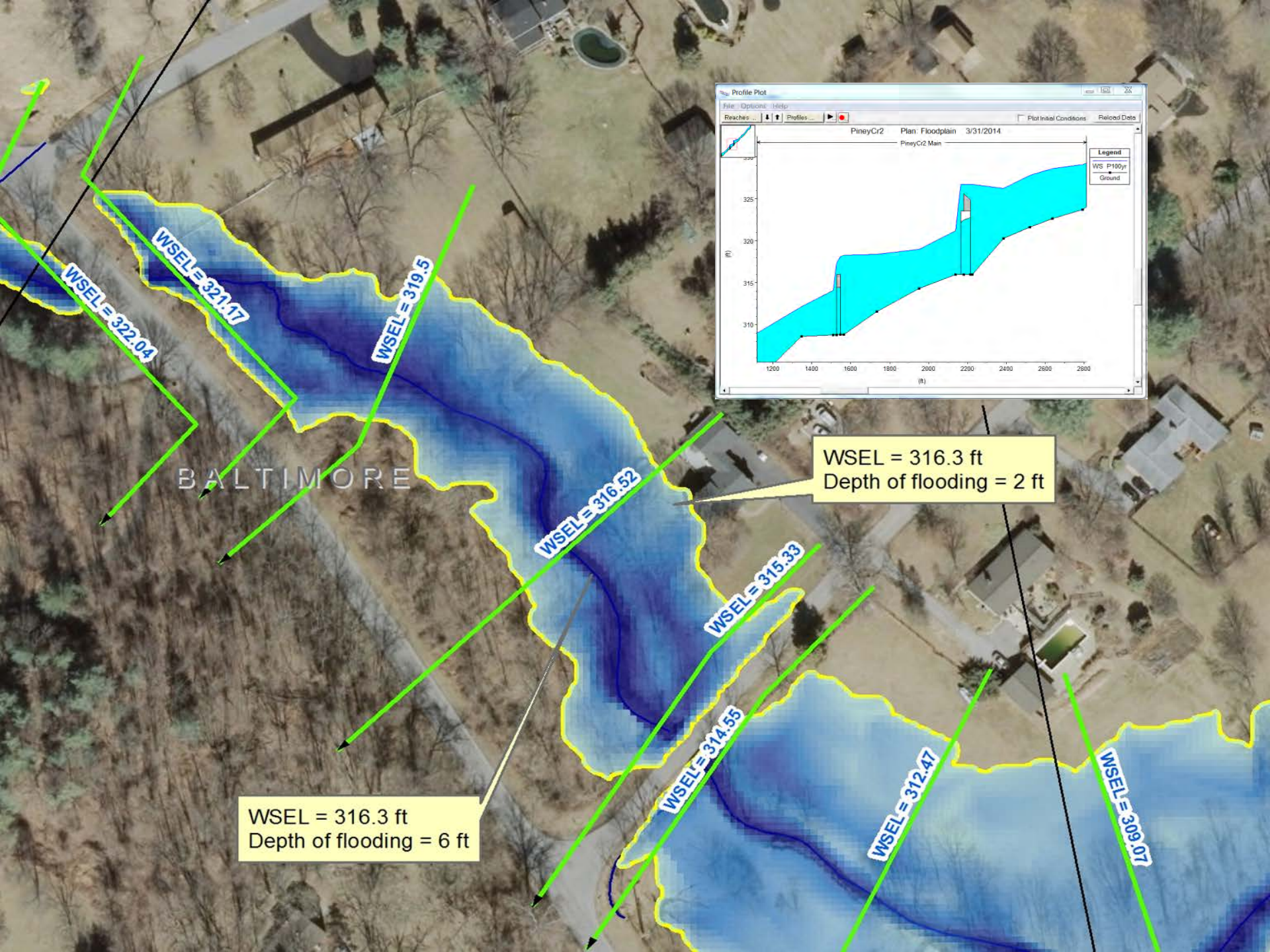
- Stream Crossing Survey
  - Relative dimensions
  - Structure material
  - Piers
  - Entrance parameters
  - Photographs
  - Control channel
- Bridge Viewer

# Georeferenced Floodplain Models



# Georeferenced HEC-RAS

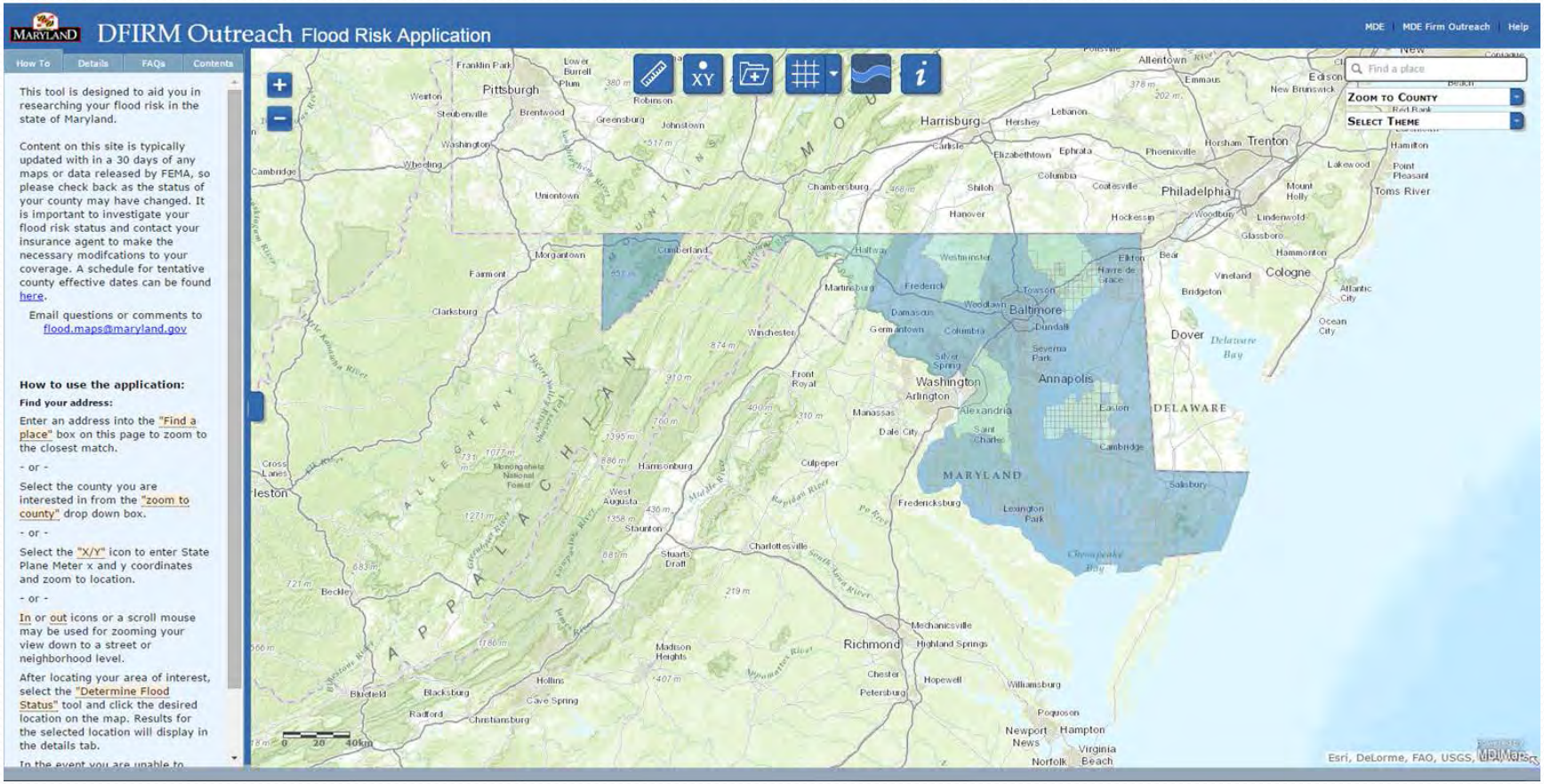



Profile Plot
File Options Help
Reaches ...
Profiles ...
Plot Initial Conditions
Reload Data
PineyCr2 Plan: Floodplain 3/31/2014
PineyCr2 Main
Legend
WS P100yr
Ground
325
320
315
310
(ft)
1200
1400
1600
1800
2000
2200
2400
2600
2800
(ft)
WSEL = 322.04
WSEL = 321.17
WSEL = 319.5
BALTIMORE
WSEL = 316.52
WSEL = 316.3 ft
Depth of flooding = 2 ft
WSEL = 315.33
WSEL = 314.55
WSEL = 312.47
WSEL = 309.07
WSEL = 316.3 ft
Depth of flooding = 6 ft

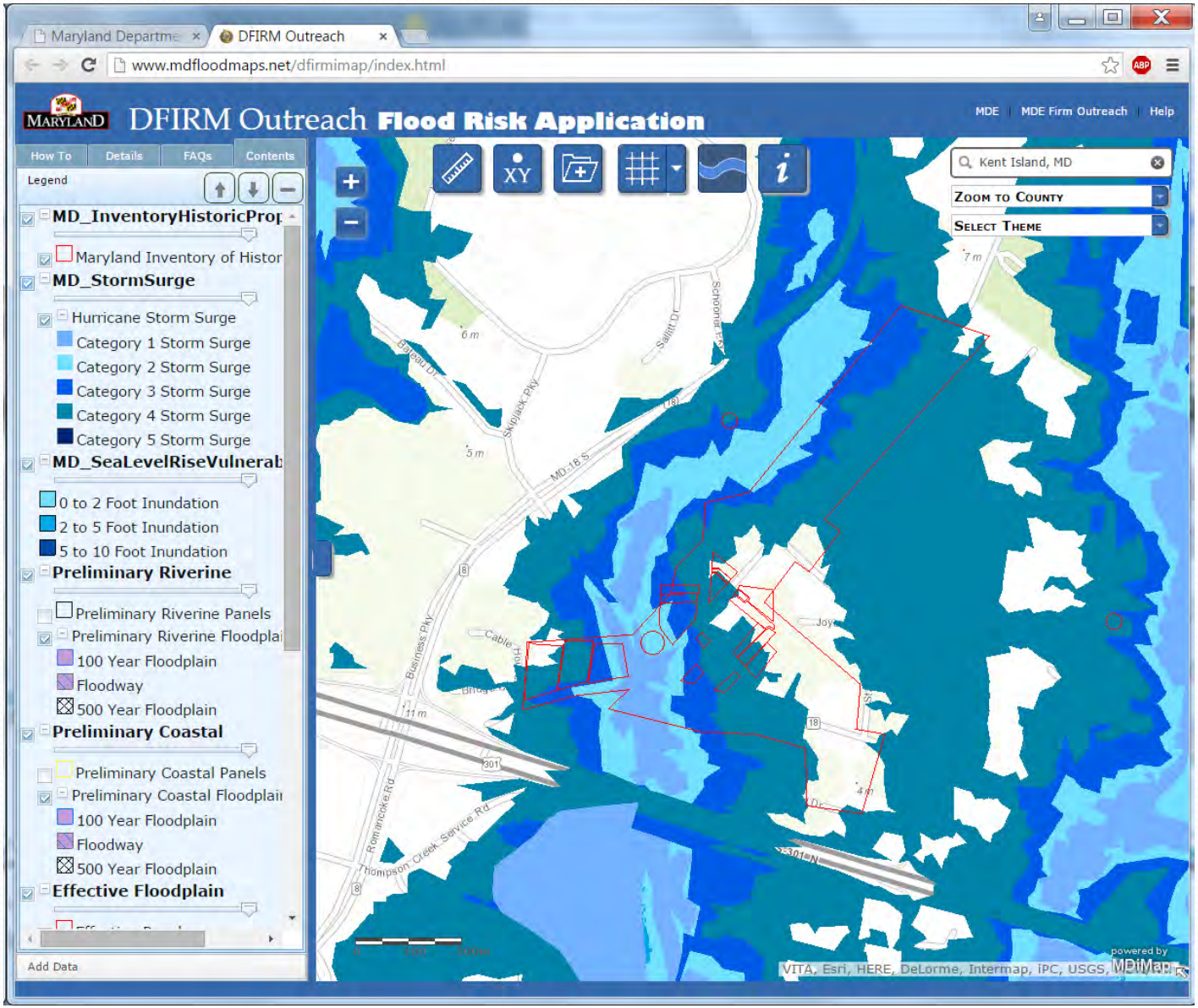
# MDFloodmaps.com

Questions via Text to (956) 750 - 8084

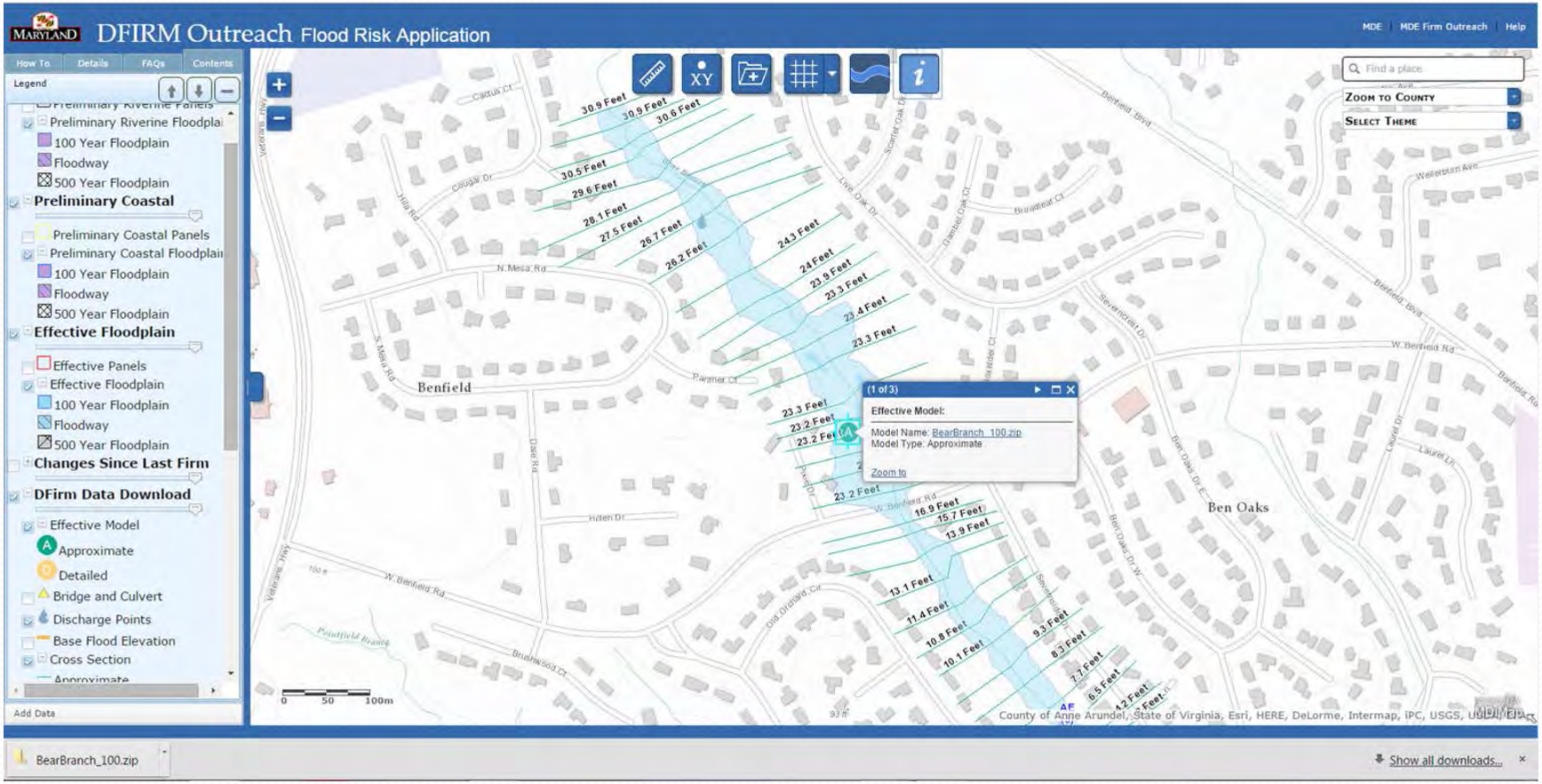
# MDFloodmaps.com



# MDFloodmaps.com

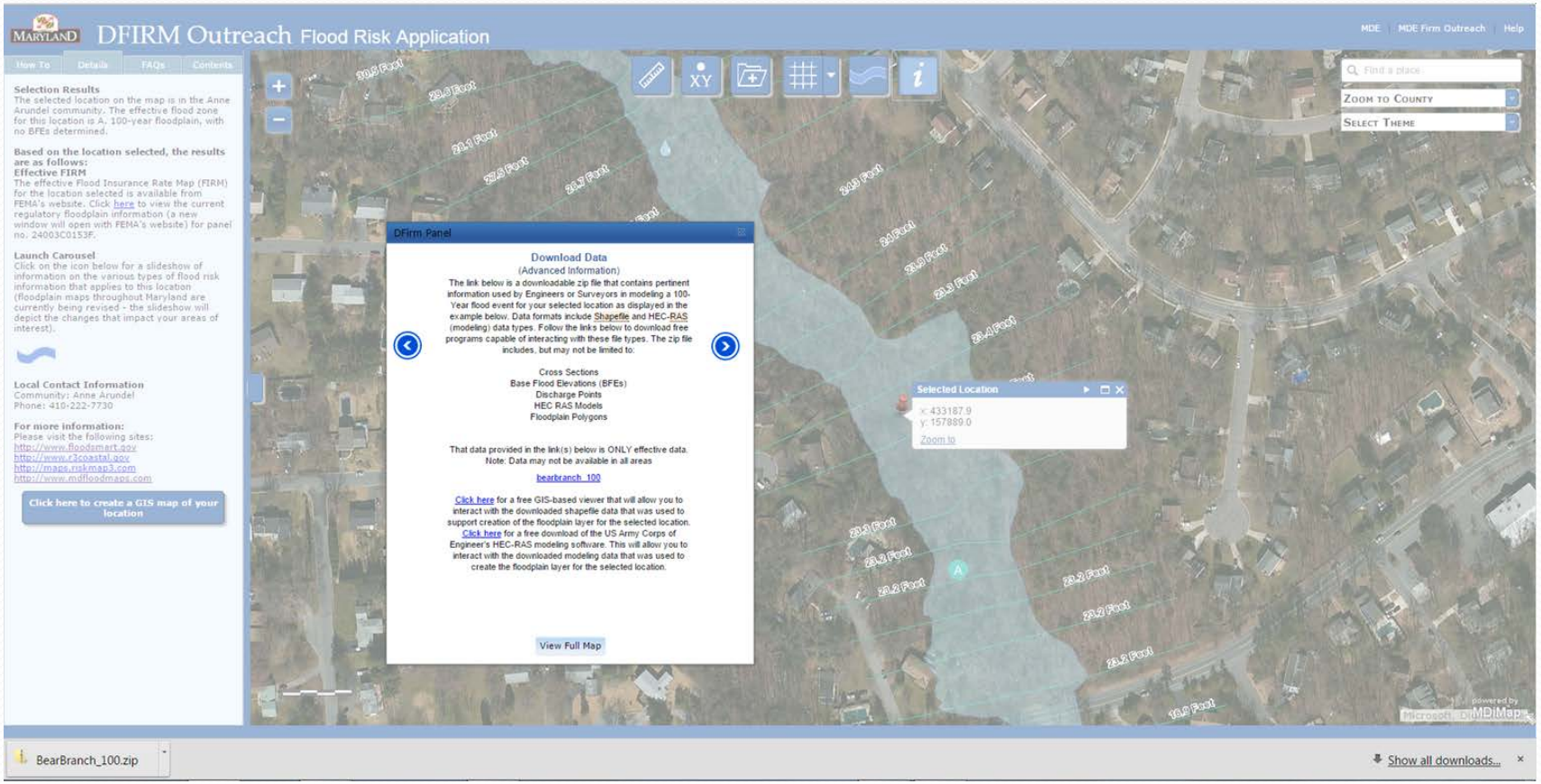


# MDFloodmaps.com



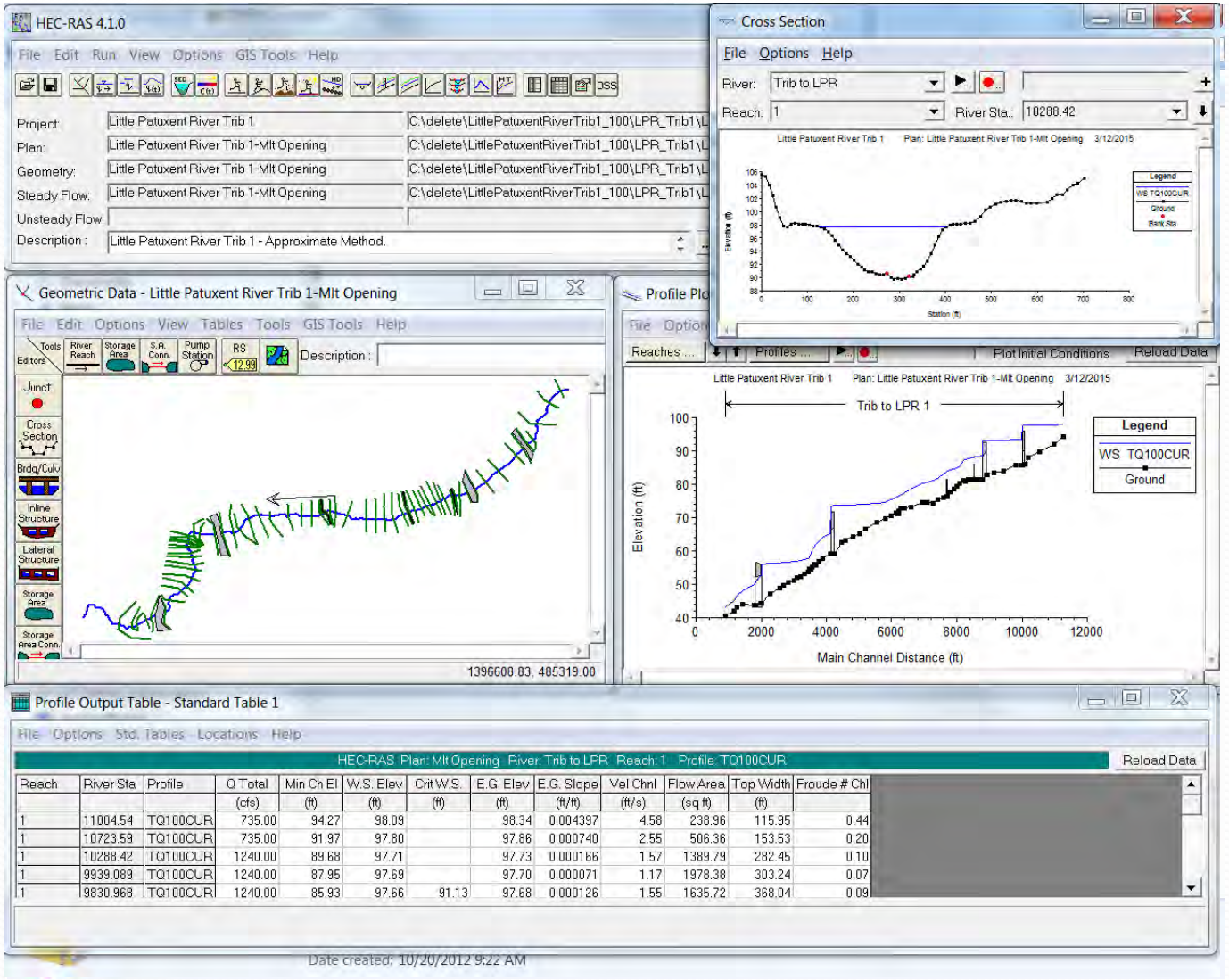

Through the identify tool, you can access Geo – Hec-Ras Models for download and use

# MDFloodmaps.com




Through the carousel, you can access
Geo – Hec-Ras Models for download and use

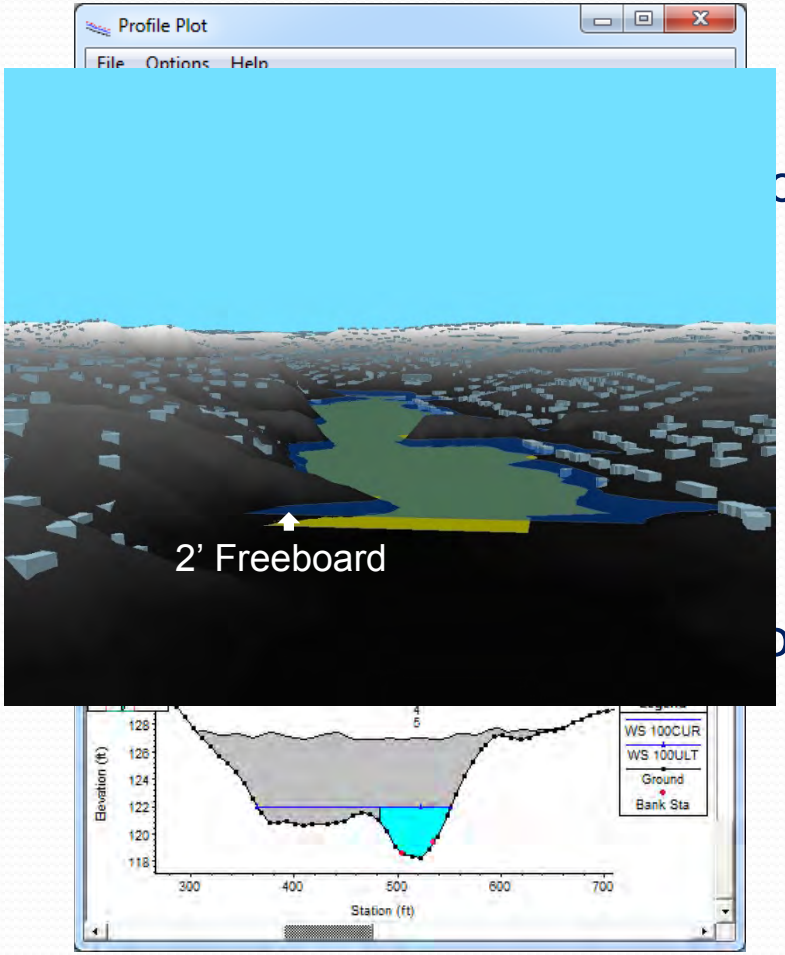
# Flood Risk Application - Example

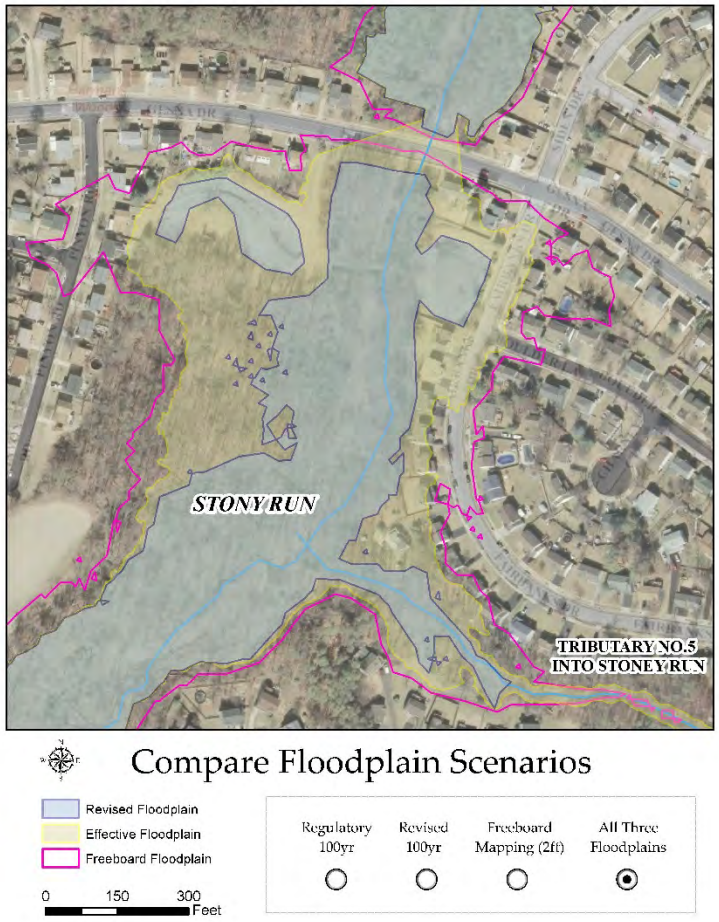



| Reach | River Sta | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11004.54 | TQ100CUR | 735.00 | 94.27 | 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 |

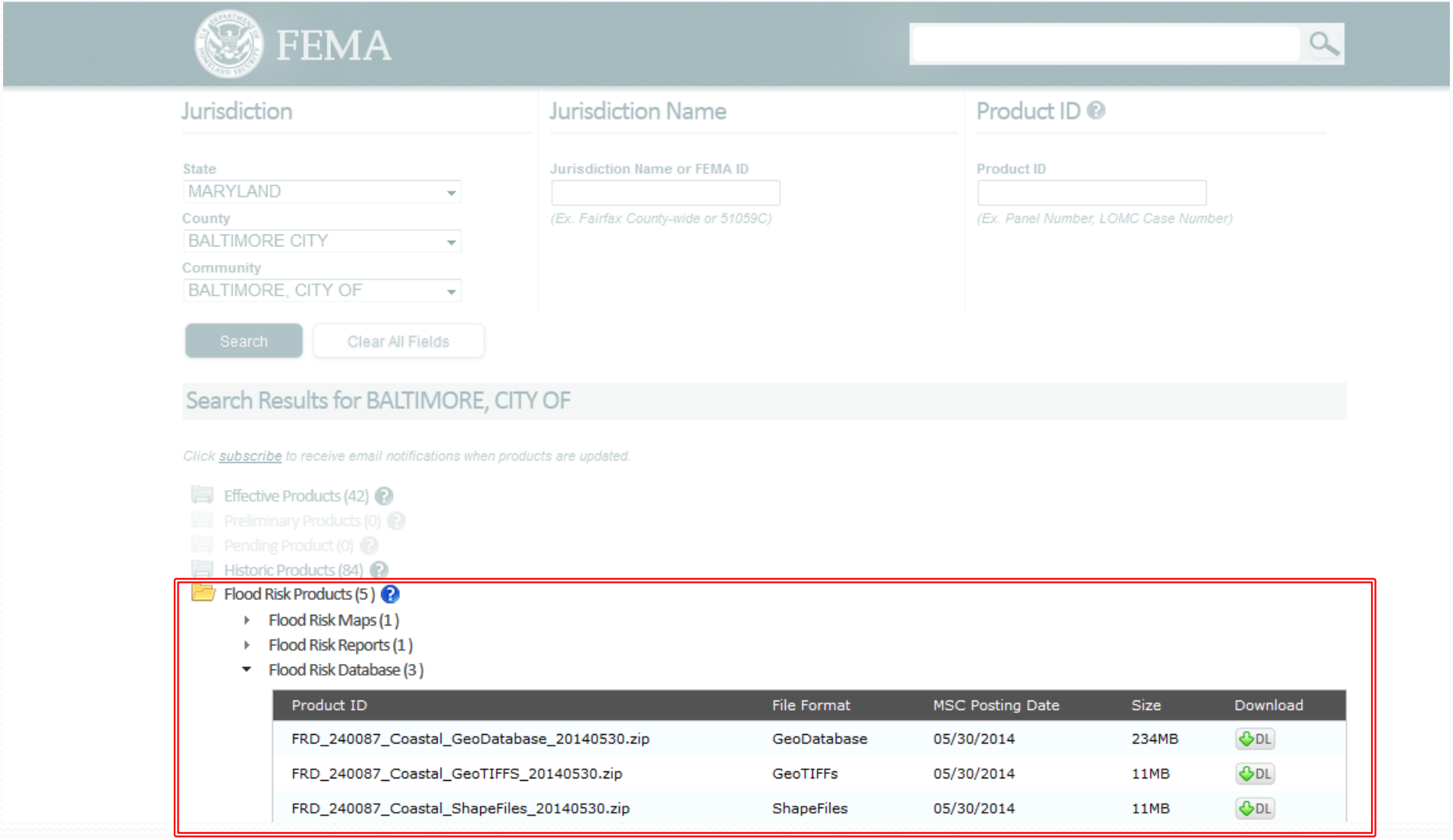
# Model Updates/Living Floodplains

- cs
- ort



# FEMA MSC


FEMA
Jurisdiction
State
MARYLAND
County
BALTIMORE CITY
Community
BALTIMORE, CITY OF
Search
Clear All Fields
Jurisdiction Name
Jurisdiction Name or FEMA ID
(Ex. Fairfax County-wide or 51059C)
Product ID
Product ID
(Ex. Panel Number, LOMC Case Number)
Search Results for BALTIMORE, CITY OF
Click subscribe to receive email notifications when products are updated.
Effective Products (42)
Preliminary Products (0)
Pending Product (0)
Historic Products (84)
Flood Risk Products (5)
Flood Risk Maps (1)
Flood Risk Reports (1)
Flood Risk Database (3)
Product ID
File Format
MSC Posting Date
Size
Download
FRD_240087_Coastal_GeoDatabase_20140530.zip
GeoDatabase
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ShapeFiles
05/30/2014
11MB
DL

# Where can I get data?

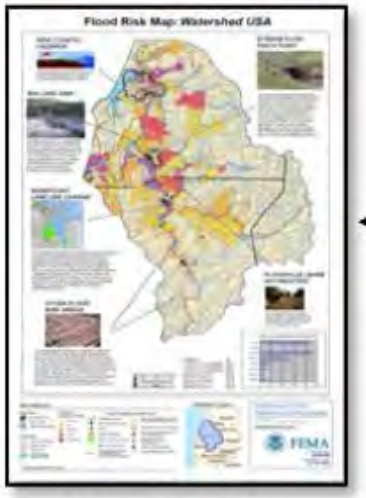
MDFloodmaps.com

- Approximate Cross Sections
- HEC-RAS Models

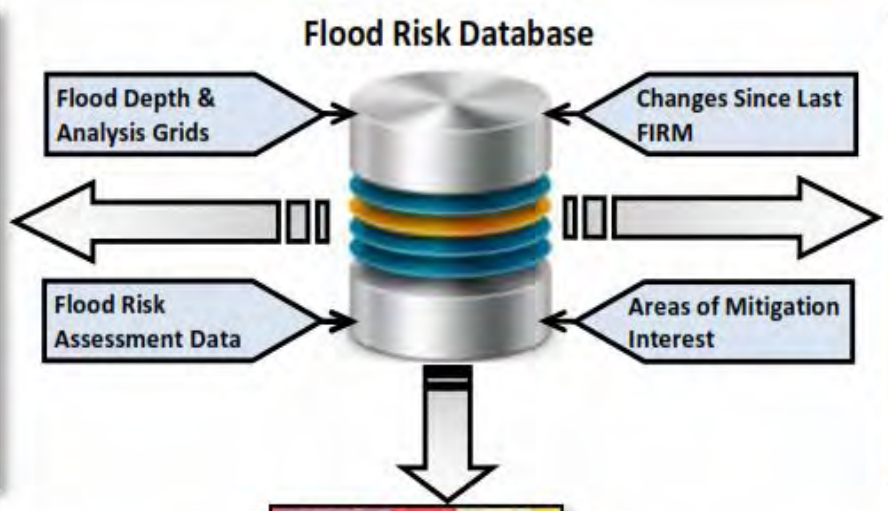
FEMA MSC

- Depth Grids
- Water Surface Elevations

# Non-Regulatory Products

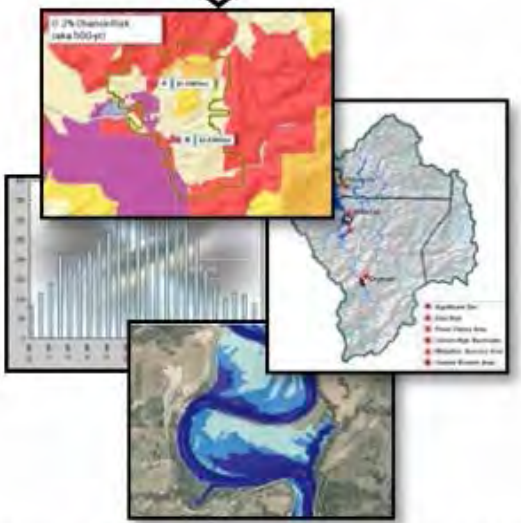



Flood Risk Map





Flood Risk Report



Ad-Hoc & User-Defined Flood Risk Analysis and Mapping

# Enhanced Flood Risk Assessments and Mapping Products

Questions via Text to (956) 750 - 8084

# Using Enhanced Risk MAP Products to Increase Resilience

- Depth Grids and other enhanced, non-regulatory datasets provide an opportunity to develop more accurate loss estimation and Benefit Cost Analysis (BCA) for mitigation projects, a big step towards implementation

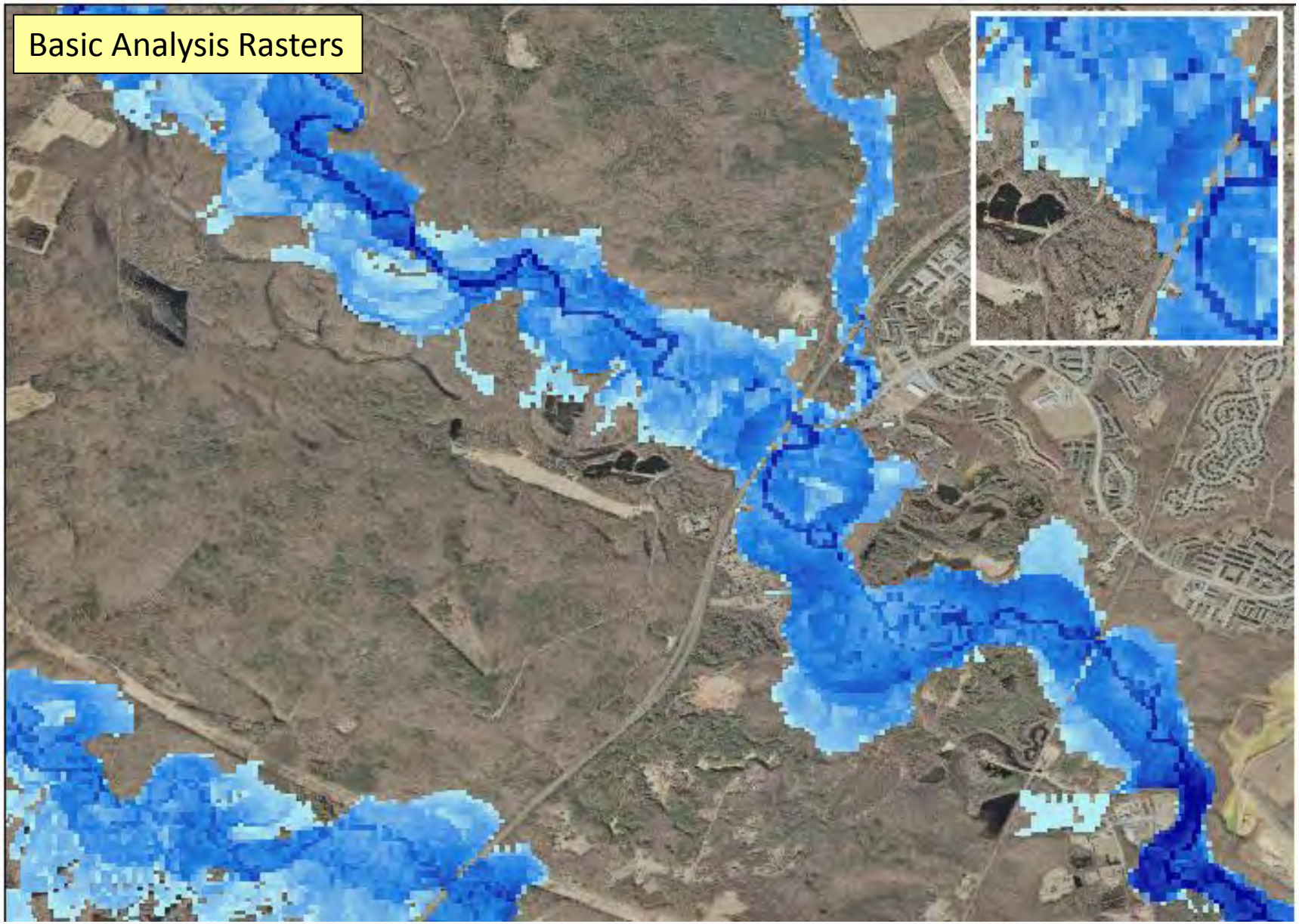
# What is a 'Basic' Analysis

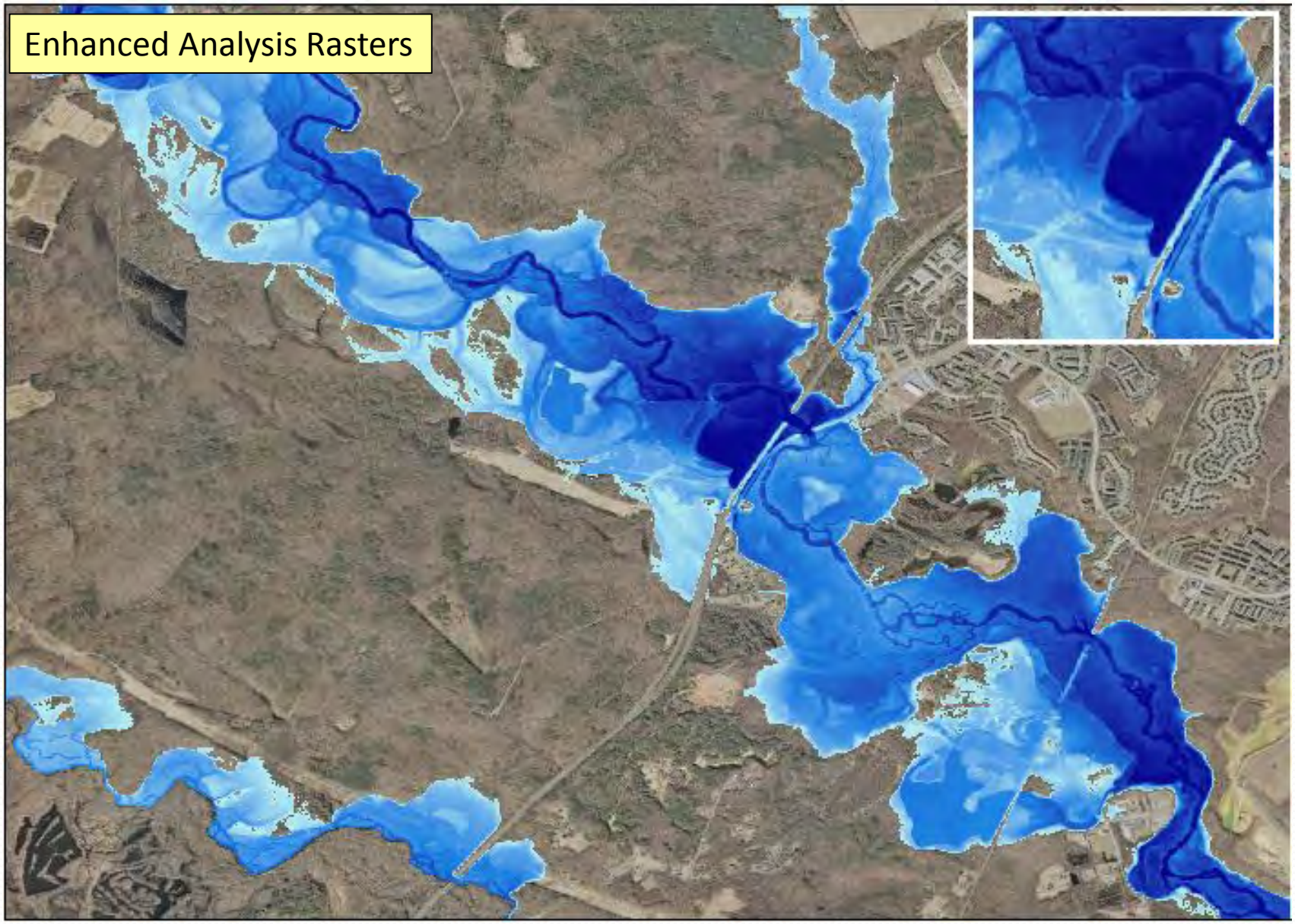
- Using out of the box datasets from Hazus…
  - General Building Stock (GBS)
  - Digital Elevation Models (DEMs) – 30-meter or other – from the National Elevation Dataset (NED)

# What is an ‘Enhanced’ Analysis

- Leverage the best available data, and past investments from state and local sources, including:
  - High resolution terrain data
  - Depth grids based on Risk MAP DB
  - Local building footprints, parcel centroids, and other

    - used to compile a User-Defined Facility (UDF) Inventory

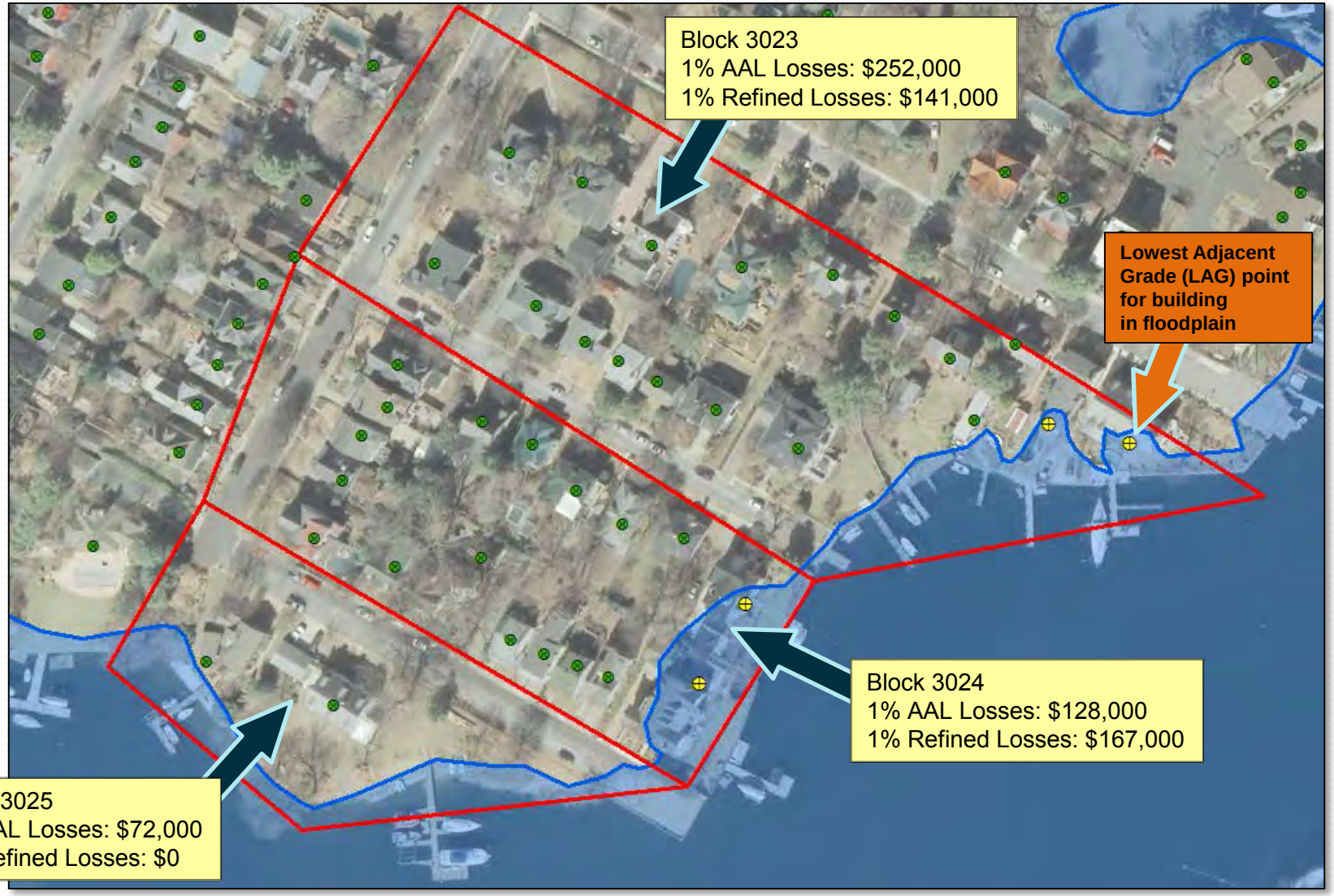

Basic Analysis Rasters


Enhanced Analysis Rasters

# Basic (GBS) - Census Block Level

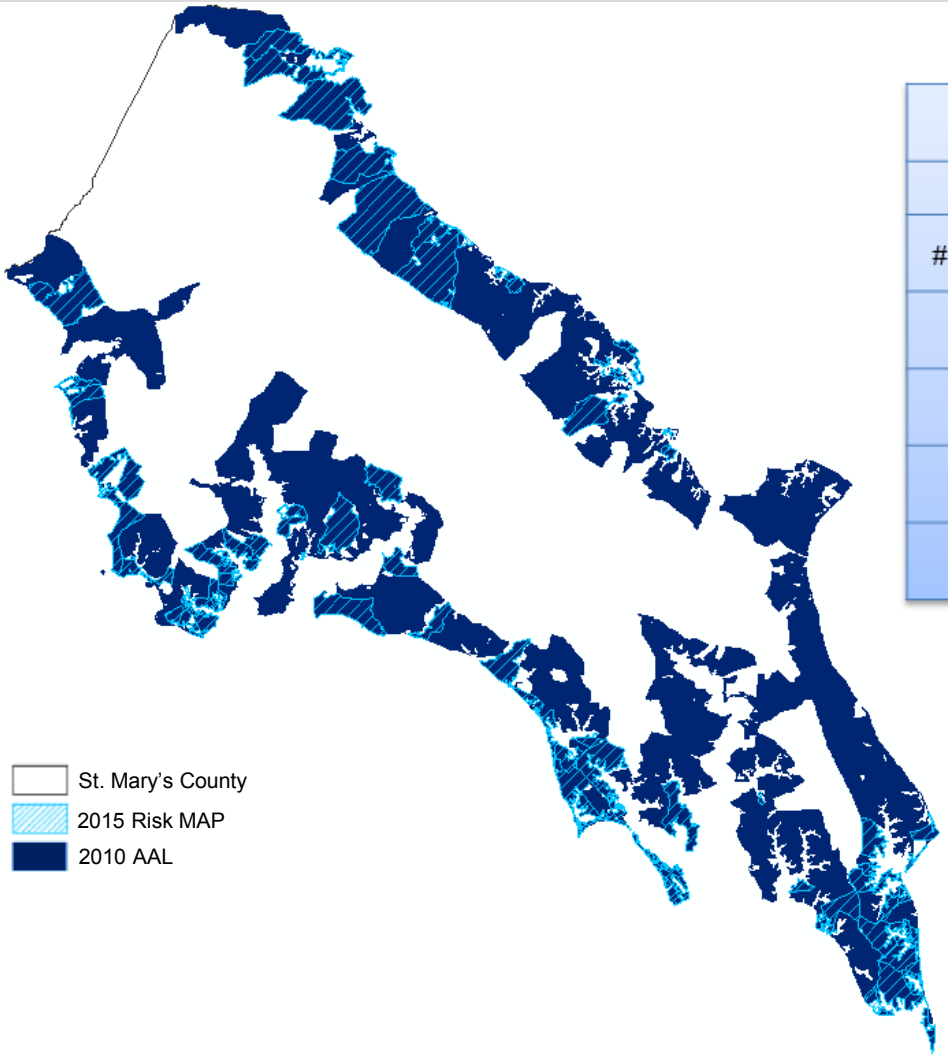
There is a building in the SFHA (lower left corner), but all of the buildings at the top right are skewing the resulting losses for this GBS analysis.

# Enhanced (UDF) – Parcel/Building Level

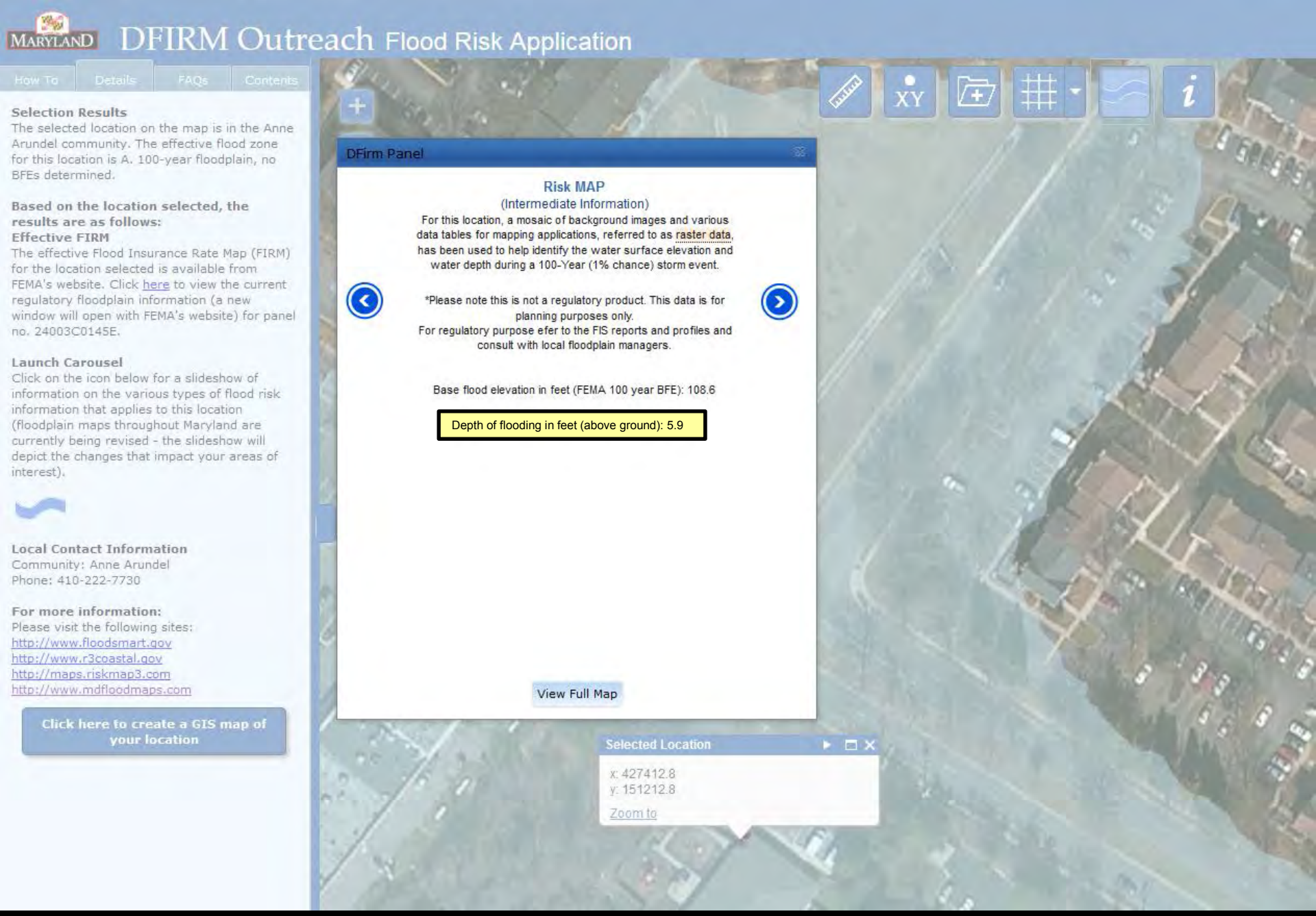


# St. Mary's - Coastal 100-year Loss Estimations

## FEMA 2010 AAL Study (Basic Analysis) vs. 2015 Risk MAP Refined Losses (Enhanced Analysis)




| Coastal 100 Year Total Losses | | |
|---|---|---|
| | 2010 AAL | 2015 Risk MAP |
| # Census Blocks w/ Losses | 542 | 172 |
| Building Losses | $48,305,000 | $11,867,000 |
| Content Losses | $47,232,000 | $9,413,000 |
| Business Disruption | $3,200,000 | $2,800,000 |
| Total Losses | $98,700,000 | $24,100,000 |




www.mdfloodmaps.gov

# Current Schedule

| Location | Riverine Depth Grids | Coastal Depth Grids | Coastal Enhanced Risk Assessment |
|---|---|---|---|
| Allegany County | Jun 2016 | N/A | N/A |
| Anne Arundel County | Sept 2012 | 5/29/2015 | 7/17/2015 |
| Baltimore City | TBD | 5/30/2014 | 5/30/2014 |
| Baltimore County | TBD | 5/13/2014 | 12/16/2014 |
| Calvert County | Sept 2012 | 5/13/2015 | 7/3/2015 |
| Caroline County | -- | 5/18/2015 | 7/10/2015 |
| Carroll County | -- | N/A | N/A |
| Cecil County | Sept 2012 | 5/18/2015 | Oct 2015 |
| Charles County | -- | 5/29/2015 | Nov 2015 |
| Dorchester County | -- | 5/13/2015 | Nov 2015 |
| Frederick County | TBD | N/A | N/A |
| Garrett County | -- | N/A | N/A |
| Harford County | 8/26/2015 | 8/26/2015 | Oct 2015 |
| Howard County | -- | N/A | N/A |
| Kent County | -- | 11/14/2014 | 11/14/2014 |
| Montgomery County | TBD | N/A | N/A |
| Prince George's County | -- | Dec 2015 | Dec 2015 |
| Queen Anne's County | -- | 4/14/2015 | 6/26/2015 |
| Somerset County | -- | 5/29/2015 | Nov 2015 |
| St. Mary's County | -- | 4/21/2015 | 4/21/2015 |
| Talbot County | -- | Dec 2015 | Dec 2015 |
| Washington County | Mar 2016 | N/A | N/A |
| Wicomico County | -- | 5/13/2015 | 9/30/2015 |
| Worcester County | -- | 5/29/2015 | Nov 2015 |

# Value of Enhanced Risk Assessments to Local Communities

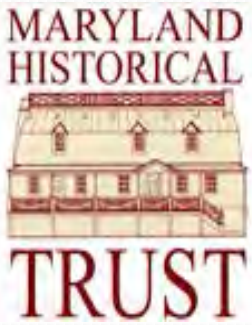
- More refined and realistic loss estimation
  - Dollar amounts
  - Locations
- Improved Mitigation/Planning
  - Inclusion of Essential Facilities, Utilities, High Potential Loss Facilities

# Integrating Mapping Products with Local and State Plans

Questions via Text to (956) 750 - 8084

# Interagency Collaboration



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FEMA

# State & Local HMP Updates

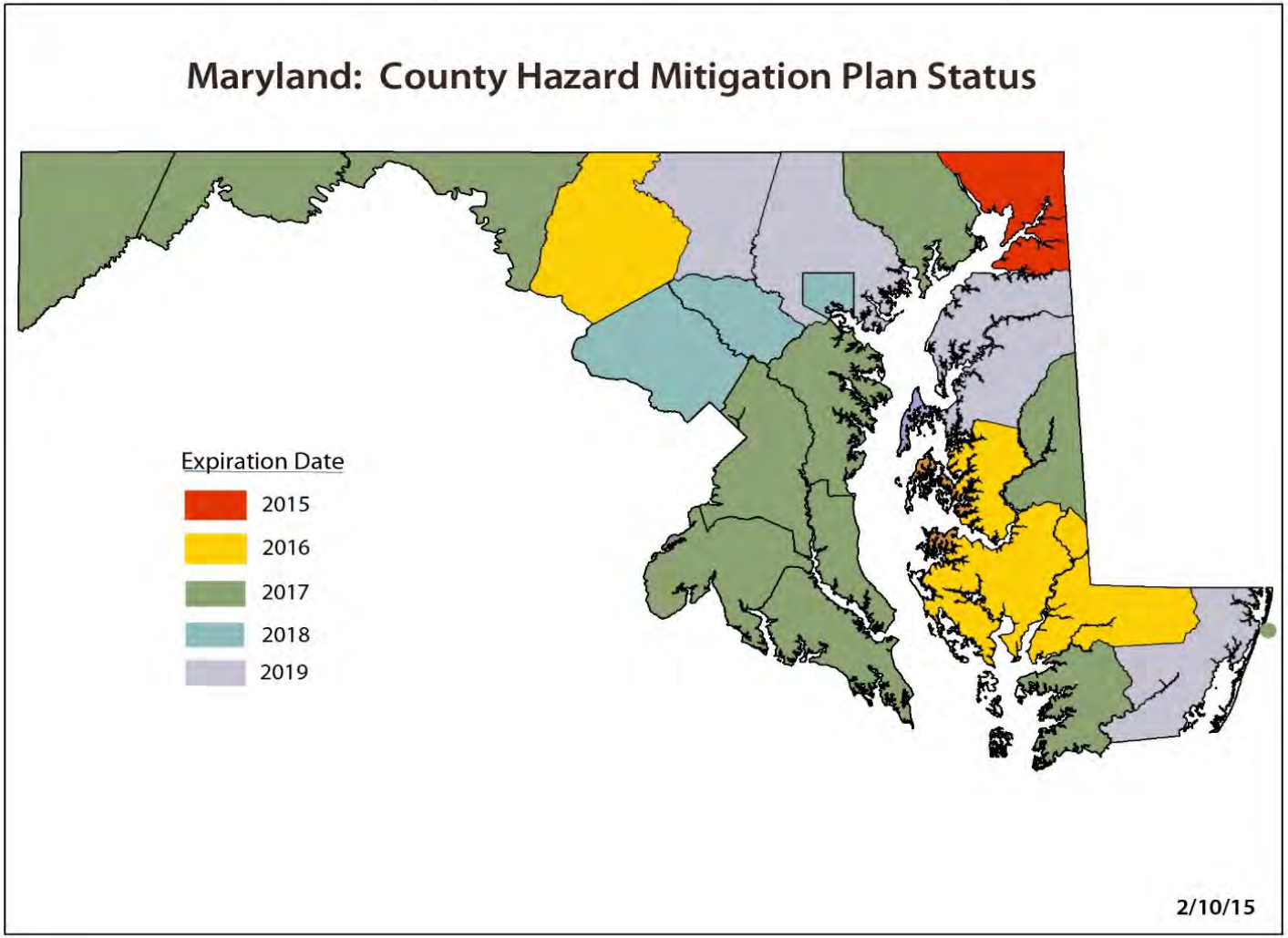
| | Plan expires | NewStarted | MEMA | FEMA | Current Plan | HMGP('12-'15) | Munic.(adptd) | Comments |
|---|---|---|---|---|---|---|---|---|
| Cecil | * 4/26/2015 | ✓ | | | ✓ | ✓ | 8 (1) | HMGP Planning grant - update in progress |
| Baltimore | * 9/17/2015 | | | | ✓ | ✓ | | (Reflects interim update; current update APA) |
| Frederick | * 2/11/2016 | ✓ | | | ✓ | ✓ | 10 (4) | HMGP Planning grant - update in progress |
| Wicomico | * 4/4/2016 | ✓ | | | ✓ | ✓ | 8 (8) | HMGP Planning grant - update in progress |
| Talbot | 12/19/2016 | | | | ✓ | | 5 (4) | County working on scope for update |
| Dorchester | 12/19/2016 | | | | ✓ | ✓ | 6 (3) | County working on scope for update |
| Prince George's | 2/6/2017 | | | | ✓ | ✓ | 1 (1) | |
| St. Mary's | 5/14/2017 | | | | ✓ | ✓ | 1 (0) | Planning grant application under review |
| Caroline | 8/25/2017 | | | | ✓ | ✓ | 10 (10) | |
| Washington | 6/26/2017 | | | | ✓ | ✓ | 9(2) | |
| Anne Arundel | 10/1/2017 | | | | ✓ | ✓ | 1(0) | |
| Ocean City | * 4/30/2017 | ✓ | | | ✓ | ✓ | | HMGP Planning grant - update in progress |
| Charles | 8/6/2017 | | | | ✓ | ✓ | 2 (0) | |
| Somerset | 8/24/2017 | | | | ✓ | ✓ | 2(2) | |
| Calvert | 5/20/2017 | | | | ✓ | ✓ | 2 (1) | Planning grant application under review |
| Allegany | 5/22/2017 | | | | ✓ | ✓ | 7 (3) | |
| Harford | 7/23/2017 | | | | ✓ | ✓ | 3 (3) | |
| Annapolis City | 3/20/2017 | | | | ✓ | ✓ | | |
| Garrett | 12/27/2017 | | | | ✓ | ✓ | 7 (6) | |
| Montgomery | 4/1/2018 | | | | ✓ | ✓ | 7 (0) | |
| Baltimore City | 10/3/2018 | | | | ✓ | ✓ | | |
| Queen Anne's | 4/5/2019 | | | | ✓ | ✓ | 7 (1) | |
| Howard | 12/3/2018 | | | | ✓ | ✓ | | |
| Carroll | 3/1/2019 | | | | ✓ | ✓ | 8 (6) | |
| Worcester | 10/7/2019 | | | | ✓ | ✓ | 3 (3) | |
| Kent | 11/28/2010 | | | | ✓ | ✓ | 5 (4) | |

**APA** = Approved by FEMA pending local adoption

**** 3rd Cycle Update Initiated***

# State & Local HMP Updates

- State Hazard Mitigation Plan Expires– August 2016



# HAZUS – Enhanced Analysis

## Statewide Initiative

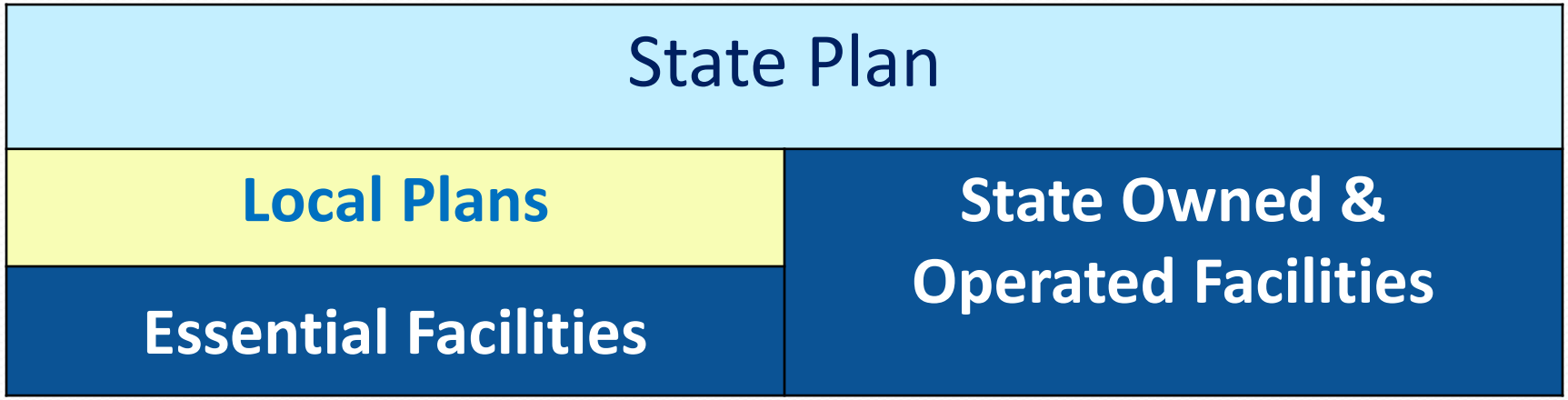
- Coastal (AE & VE Zones) – Funded by MDE & MEMA

  Caroline, Calvert, Somerset, Anne Arundel, Dorchester, Cecil, Charles, Worcester, Prince George's, Wicomico, Kent, Baltimore Co., St. Mary's, Harford, Talbot and Queen Anne's

- Riverine – Pending Funds
- Hurricane Wind – Pending Funds
- Earthquake – Pending Funds

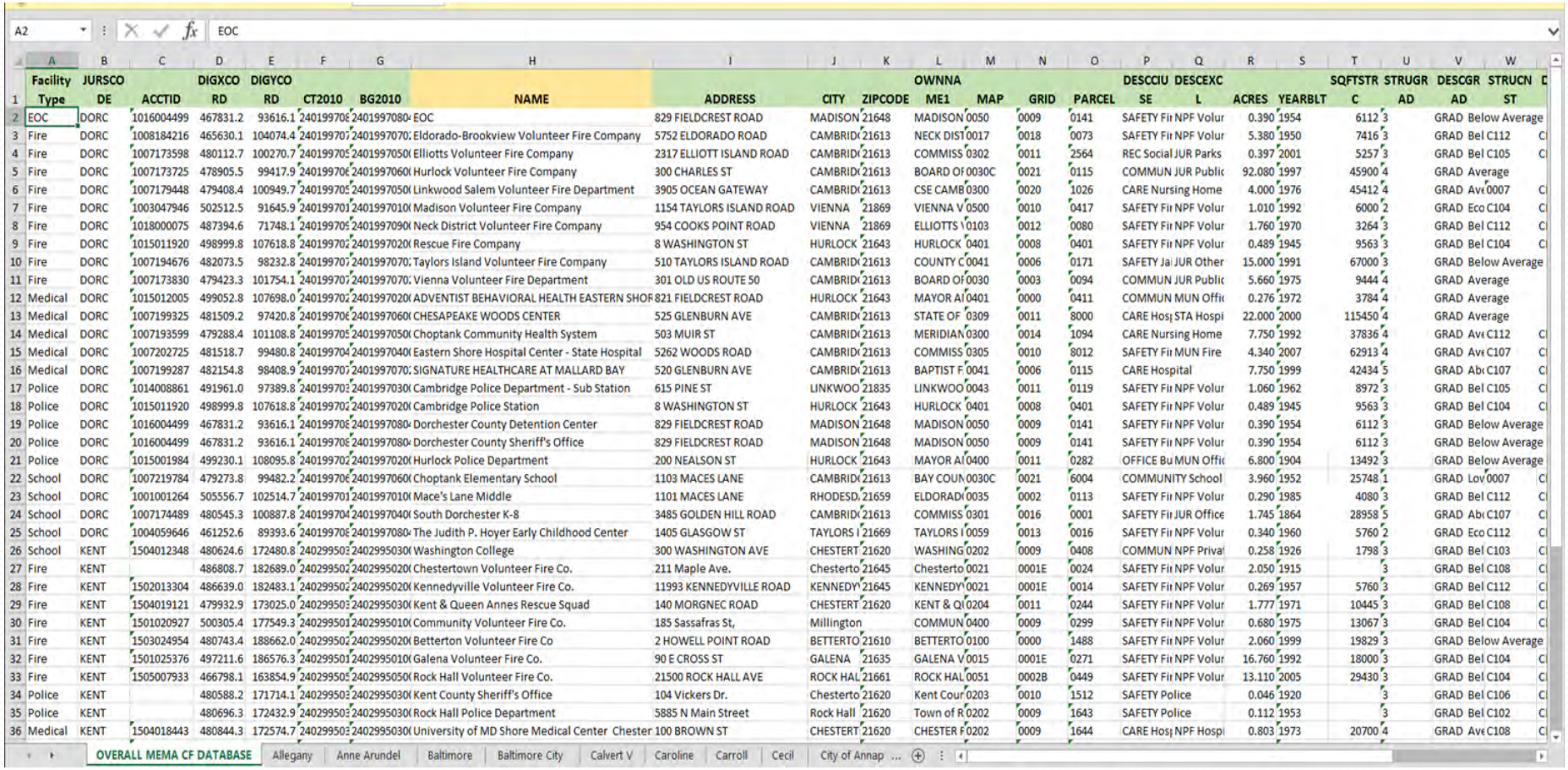
# Data Collection & Analysis

- Enhanced Hazus
- Master Database



# Essential Facilities

- Data Collection and Validation



A2 | EOC

| Facility Type | JURSCO DE | ACCTID | DIGXCO RD | DIGYCO RD | CT2010 | BG2010 | NAME | ADDRESS | CITY | ZIPCODE | OWNNA ME1 | MAP | GRID | PARCEL | DESCCIU SE | DESCEXC L | ACRES | YEARBLT | SQFTSTR C | STRUGR AD | DESCGR AD | STRUCN ST | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EOC | DORC | 1016004499 | 467831.2 | 93616.1 | 240199708 | 2401997080 | EOC | 829 FIELDCREST ROAD | MADISON | 21648 | MADISON | 0050 | 0009 | 0141 | SAFETY Fir | NPF Volur | 0.390 | 1954 | 6112 | 3 | GRAD | Below Average | |
| Fire | DORC | 1008184216 | 465630.1 | 104074.4 | 240199707 | 2401997070 | Eldorado-Brookview Volunteer Fire Company | 5752 ELDORADO ROAD | CAMBRID | 21613 | NECK DIST | 0017 | 0018 | 0073 | SAFETY Fir | NPF Volur | 5.380 | 1950 | 7416 | 3 | GRAD | Bel C112 | C |
| Fire | DORC | 1007173598 | 480112.7 | 100270.7 | 240199705 | 2401997050 | Elliotts Volunteer Fire Company | 2317 ELLIOTT ISLAND ROAD | CAMBRID | 21613 | COMMISS | 0302 | 0011 | 2564 | REC Social | JUR Parks | 0.397 | 2001 | 5257 | 3 | GRAD | Bel C105 | C |
| Fire | DORC | 1007173725 | 478905.5 | 99417.9 | 240199706 | 2401997060 | Hurlock Volunteer Fire Company | 300 CHARLES ST | CAMBRID | 21613 | BOARD OF | 0030C | 0021 | 0115 | COMMUN | JUR Public | 92.080 | 1997 | 45900 | 4 | GRAD | Average | |
| Fire | DORC | 1007179448 | 479408.4 | 100949.7 | 240199705 | 2401997050 | Linkwood Salem Volunteer Fire Department | 3905 OCEAN GATEWAY | CAMBRID | 21613 | CSE CAMB | 0300 | 0020 | 1026 | CARE | Nursing Home | 4.000 | 1976 | 45412 | 4 | GRAD | Ave 0007 | C |
| Fire | DORC | 1003047946 | 502512.5 | 91645.9 | 240199701 | 2401997010 | Madison Volunteer Fire Company | 1154 TAYLORS ISLAND ROAD | VIENNA | 21869 | VIENNA V | 0500 | 0010 | 0417 | SAFETY Fir | NPF Volur | 1.010 | 1992 | 6000 | 2 | GRAD | Eco C104 | C |
| Fire | DORC | 1018000075 | 487394.6 | 71748.1 | 240199705 | 2401997090 | Neck District Volunteer Fire Company | 954 COOKS POINT ROAD | VIENNA | 21869 | ELLIOTTS | 0103 | 0012 | 0080 | SAFETY Fir | NPF Volur | 1.760 | 1970 | 3264 | 3 | GRAD | Bel C112 | C |
| Fire | DORC | 1015011920 | 498999.8 | 107618.8 | 240199702 | 2401997020 | Rescue Fire Company | 8 WASHINGTON ST | HURLOCK | 21643 | HURLOCK | 0401 | 0008 | 0401 | SAFETY Fir | NPF Volur | 0.489 | 1945 | 9563 | 3 | GRAD | Bel C104 | C |
| Fire | DORC | 1007194676 | 482073.5 | 98232.8 | 240199707 | 2401997070 | Taylors Island Volunteer Fire Company | 510 TAYLORS ISLAND ROAD | CAMBRID | 21613 | COUNTY C | 0041 | 0006 | 0171 | SAFETY Jai | JUR Other | 15.000 | 1991 | 67000 | 3 | GRAD | Below Average | |
| Fire | DORC | 1007173830 | 479423.3 | 101754.1 | 240199707 | 2401997070 | Vienna Volunteer Fire Department | 301 OLD US ROUTE 50 | CAMBRID | 21613 | BOARD OF | 0030 | 0003 | 0094 | COMMUN | JUR Public | 5.660 | 1975 | 9444 | 4 | GRAD | Average | |
| Medical | DORC | 1015012005 | 499052.8 | 107698.0 | 240199702 | 2401997020 | ADVENTIST BEHAVIORAL HEALTH EASTERN SHOR | 821 FIELDCREST ROAD | HURLOCK | 21643 | MAYOR AI | 0401 | 0000 | 0411 | COMMUN | MUN Offic | 0.276 | 1972 | 3784 | 4 | GRAD | Average | |
| Medical | DORC | 1007199325 | 481509.2 | 97420.8 | 240199706 | 2401997060 | CHESAPEAKE WOODS CENTER | 525 GLENBURN AVE | CAMBRID | 21613 | STATE OF | 0309 | 0011 | 8000 | CARE Hos | STA Hospi | 22.000 | 2000 | 115450 | 4 | GRAD | Average | |
| Medical | DORC | 1007193599 | 479288.4 | 101108.8 | 240199705 | 2401997050 | Choptank Community Health System | 503 MUIR ST | CAMBRID | 21613 | MERIDIAN | 0300 | 0014 | 1094 | CARE | Nursing Home | 7.750 | 1992 | 37836 | 4 | GRAD | Ave C112 | C |
| Medical | DORC | 1007202725 | 481518.7 | 99480.8 | 240199704 | 2401997040 | Eastern Shore Hospital Center - State Hospital | 5262 WOODS ROAD | CAMBRID | 21613 | COMMISS | 0305 | 0010 | 8012 | SAFETY Fir | MUN Fire | 4.340 | 2007 | 62913 | 4 | GRAD | Ave C107 | C |
| Medical | DORC | 1007199287 | 482154.8 | 98408.9 | 240199707 | 2401997070 | SIGNATURE HEALTHCARE AT MALLARD BAY | 520 GLENBURN AVE | CAMBRID | 21613 | BAPTIST F | 0041 | 0006 | 0115 | CARE | Hospital | 7.750 | 1999 | 42434 | 5 | GRAD | Abi C107 | C |
| Police | DORC | 1014008861 | 491961.0 | 97389.8 | 240199703 | 2401997030 | Cambridge Police Department - Sub Station | 615 PINE ST | LINKWOO | 21835 | LINKWOO | 0043 | 0011 | 0119 | SAFETY Fir | NPF Volur | 1.060 | 1962 | 8972 | 3 | GRAD | Bel C105 | C |
| Police | DORC | 1015011920 | 498999.8 | 107618.8 | 240199702 | 2401997020 | Cambridge Police Station | 8 WASHINGTON ST | HURLOCK | 21643 | HURLOCK | 0401 | 0008 | 0401 | SAFETY Fir | NPF Volur | 0.489 | 1945 | 9563 | 3 | GRAD | Bel C104 | C |
| Police | DORC | 1016004499 | 467831.2 | 93616.1 | 240199708 | 2401997080 | Dorchester County Detention Center | 829 FIELDCREST ROAD | MADISON | 21648 | MADISON | 0050 | 0009 | 0141 | SAFETY Fir | NPF Volur | 0.390 | 1954 | 6112 | 3 | GRAD | Below Average | |
| Police | DORC | 1016004499 | 467831.2 | 93616.1 | 240199708 | 2401997080 | Dorchester County Sheriff's Office | 829 FIELDCREST ROAD | MADISON | 21648 | MADISON | 0050 | 0009 | 0141 | SAFETY Fir | NPF Volur | 0.390 | 1954 | 6112 | 3 | GRAD | Below Average | |
| Police | DORC | 1015001984 | 499230.1 | 108095.8 | 240199702 | 2401997020 | Hurlock Police Department | 200 NEALSON ST | HURLOCK | 21643 | MAYOR AI | 0400 | 0011 | 0282 | OFFICE Bu | MUN Offic | 6.800 | 1904 | 13492 | 3 | GRAD | Below Average | |
| School | DORC | 1007219784 | 479273.8 | 99482.2 | 240199706 | 2401997060 | Choptank Elementary School | 1103 MACES LANE | CAMBRID | 21613 | BAY COUN | 0030C | 0021 | 6004 | COMMUNITY | School | 3.960 | 1952 | 25748 | 1 | GRAD | Lov 0007 | C |
| School | DORC | 1001001264 | 505556.7 | 102514.7 | 240199701 | 2401997010 | Mace's Lane Middle | 1101 MACES LANE | RHODESD | 21659 | ELDORADO | 0035 | 0002 | 0113 | SAFETY Fir | NPF Volur | 0.290 | 1985 | 4080 | 3 | GRAD | Bel C112 | C |
| School | DORC | 1007174489 | 480545.3 | 100887.8 | 240199704 | 2401997040 | South Dorchester K-8 | 3485 GOLDEN HILL ROAD | CAMBRID | 21613 | COMMISS | 0301 | 0016 | 0001 | SAFETY Fir | JUR Office | 1.745 | 1864 | 28958 | 5 | GRAD | Abi C107 | C |
| School | DORC | 1004059646 | 461252.6 | 89393.6 | 240199708 | 2401997080 | The Judith P. Hoyer Early Childhood Center | 1405 GLASGOW ST | TAYLORS I | 21669 | TAYLORS I | 0059 | 0013 | 0016 | SAFETY Fir | NPF Volur | 0.340 | 1960 | 5760 | 2 | GRAD | Eco C112 | C |
| School | KENT | 1504012348 | 480624.6 | 172480.8 | 240299503 | 2402995030 | Washington College | 300 WASHINGTON AVE | CHESTERT | 21620 | WASHING | 0202 | 0009 | 0408 | COMMUN | NPF Privat | 0.258 | 1926 | 1798 | 3 | GRAD | Bel C103 | C |
| Fire | KENT | | 486808.7 | 182689.0 | 240299502 | 2402995020 | Chestertown Volunteer Fire Co. | 211 Maple Ave. | Chesterto | 21645 | Chesterto | 0021 | 0001E | 0024 | SAFETY Fir | NPF Volur | 2.050 | 1915 | | 3 | GRAD | Bel C108 | C |
| Fire | KENT | 1502013304 | 486639.0 | 182483.1 | 240299502 | 2402995020 | Kennedyville Volunteer Fire Co. | 11993 KENNEDYVILLE ROAD | KENNEDY | 21645 | KENNEDY | 0021 | 0001E | 0014 | SAFETY Fir | NPF Volur | 0.269 | 1957 | 5760 | 3 | GRAD | Bel C112 | C |
| Fire | KENT | 1504019121 | 479932.9 | 173025.0 | 240299503 | 2402995030 | Kent & Queen Annes Rescue Squad | 140 MORGNEC ROAD | CHESTERT | 21620 | KENT & QI | 0204 | 0011 | 0244 | SAFETY Fir | NPF Volur | 1.777 | 1971 | 10445 | 3 | GRAD | Bel C108 | C |
| Fire | KENT | 1501020927 | 500305.4 | 177549.3 | 240299501 | 2402995010 | Community Volunteer Fire Co. | 185 Sassafras St, | Millington | | COMMUN | 0400 | 0009 | 0299 | SAFETY Fir | NPF Volur | 0.680 | 1975 | 13067 | 3 | GRAD | Bel C104 | C |
| Fire | KENT | 1503024954 | 480743.4 | 188662.0 | 240299502 | 2402995020 | Betterton Volunteer Fire Co | 2 HOWELL POINT ROAD | BETTERTO | 21610 | BETTERTO | 0100 | 0000 | 1488 | SAFETY Fir | NPF Volur | 2.060 | 1999 | 19829 | 3 | GRAD | Below Average | |
| Fire | KENT | 1501025376 | 497211.6 | 186576.3 | 240299501 | 2402995010 | Galena Volunteer Fire Co. | 90 E CROSS ST | GALENA | 21635 | GALENA V | 0015 | 0001E | 0271 | SAFETY Fir | NPF Volur | 16.760 | 1992 | 18000 | 3 | GRAD | Bel C104 | C |
| Fire | KENT | 1505007933 | 466798.1 | 163854.9 | 240299505 | 2402995050 | Rock Hall Volunteer Fire Co. | 21500 ROCK HALL AVE | ROCK HAL | 21661 | ROCK HAL | 0051 | 0002B | 0449 | SAFETY Fir | NPF Volur | 13.110 | 2005 | 29430 | 3 | GRAD | Bel C104 | C |
| Police | KENT | | 480588.2 | 171714.1 | 240299503 | 2402995030 | Kent County Sheriff's Office | 104 Vickers Dr. | Chesterto | 21620 | Kent Cour | 0203 | 0010 | 1512 | SAFETY | Police | 0.046 | 1920 | | 3 | GRAD | Bel C106 | C |
| Police | KENT | | 480696.3 | 172432.9 | 240299503 | 2402995030 | Rock Hall Police Department | 5885 N Main Street | Rock Hall | 21620 | Town of R | 0202 | 0009 | 1643 | SAFETY | Police | 0.112 | 1953 | | 3 | GRAD | Bel C102 | C |
| Medical | KENT | 1504018443 | 480844.3 | 172574.7 | 240299503 | 2402995030 | University of MD Shore Medical Center | Chester 100 BROWN ST | CHESTERT | 21620 | CHESTER F | 0202 | 0009 | 1644 | CARE Hos | NPF Hospi | 0.803 | 1973 | 20700 | 4 | GRAD | Ave C108 | C |

OVERALL MEMA CF DATABASE | Allegany | Anne Arundel | Baltimore | Baltimore City | Calvert V | Caroline | Carroll | Cecil | City of Annap ...

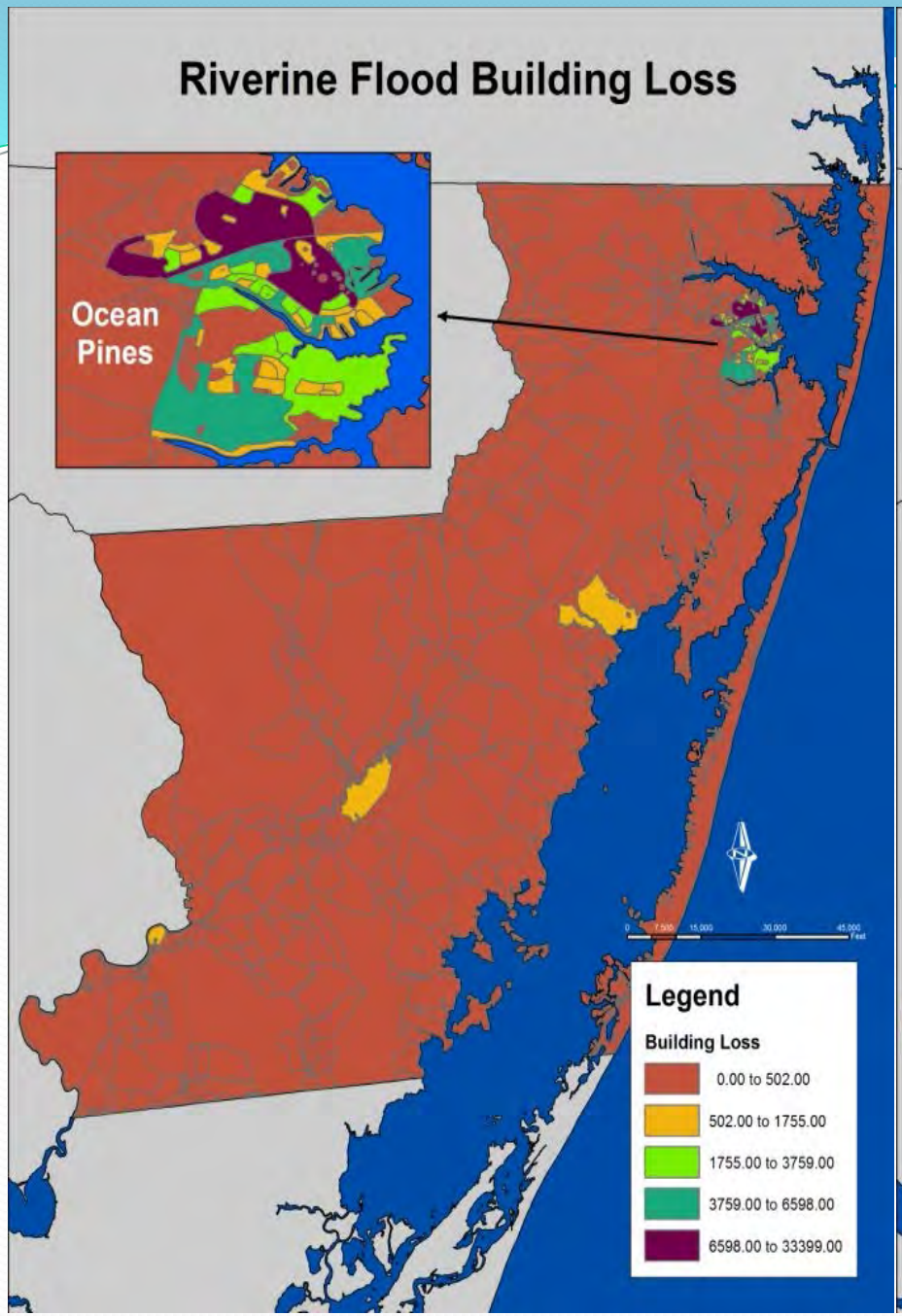
| HAZUS Comparison | | |
|---|---|---|
| Essential Facility Type | HAZUS | Enhanced HAZUS |
| Fire stations/EMS | 5 | 23 |
| Police Stations | 7 | 7 |
| Schools | 18 | 22 |
| EOC | 0 | 1 |
| Medical | 1 | 47 |

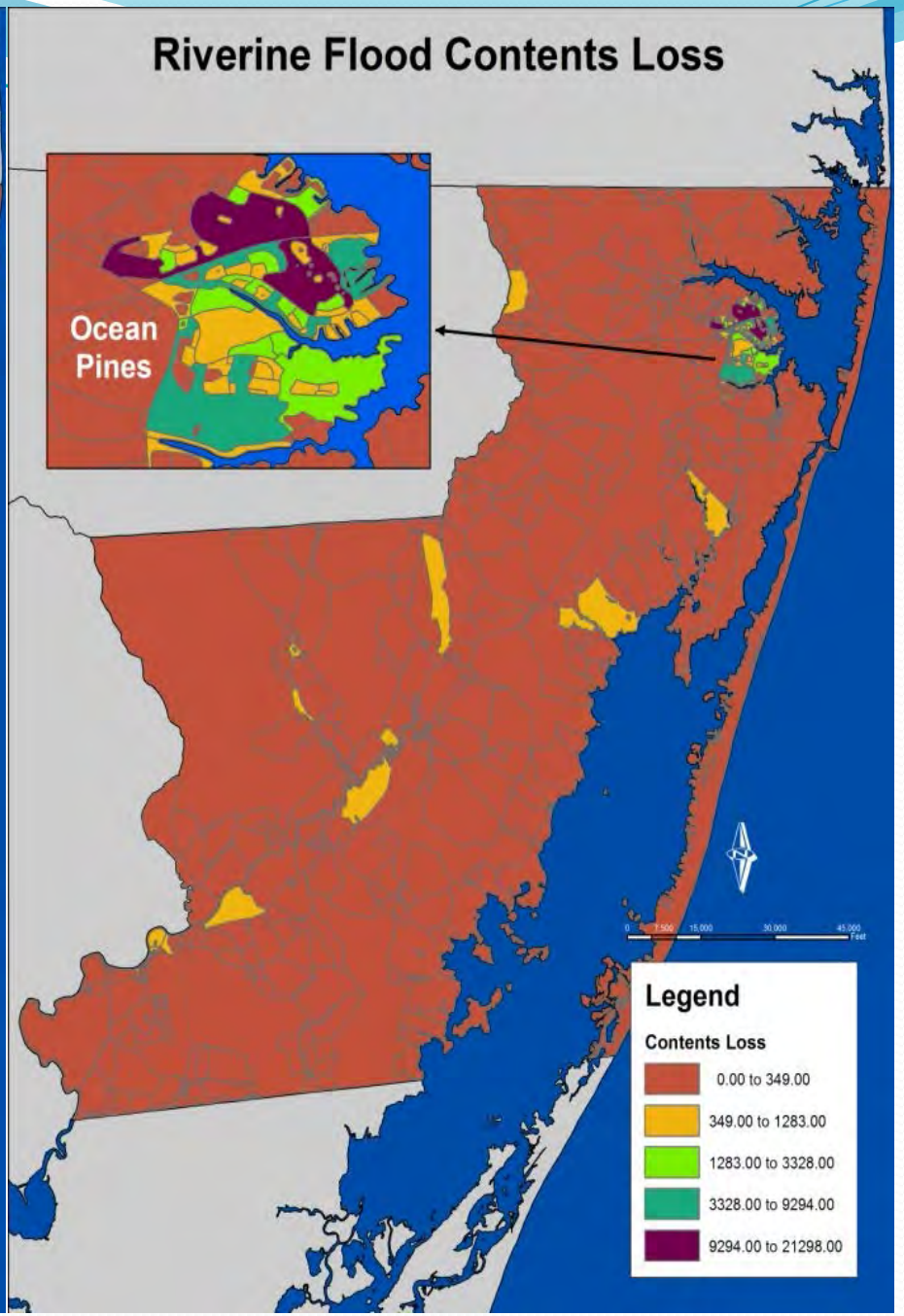
# Essential Facility: Status - To Date

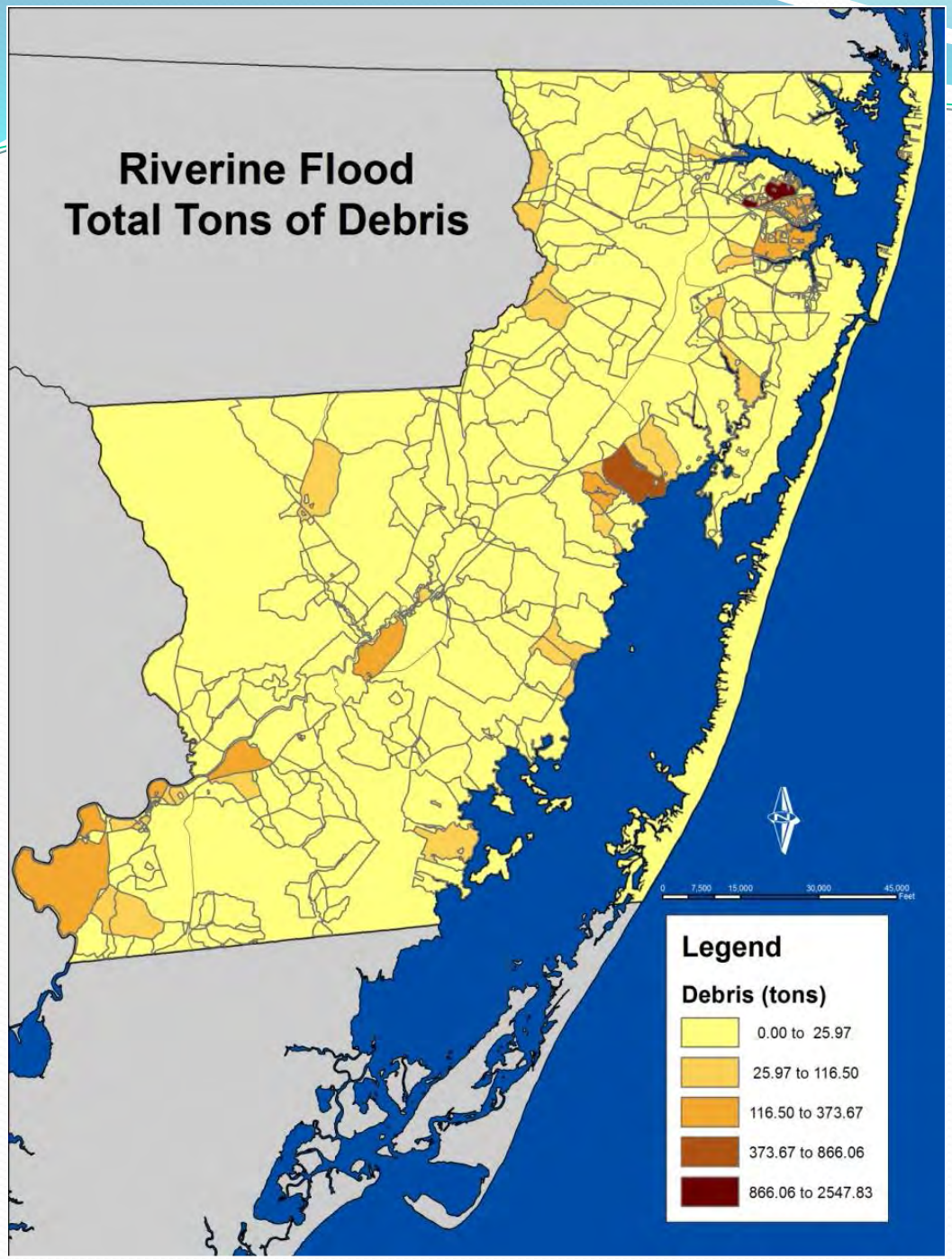
| MEMA Critical Facilities Database Correspondence | | | |
|---|---|---|---|
| **Jurisdiction** | **Date Sent** | **Date Received** | **Received From** |
| Queen Anne's | 5/18/2015 | 6/3/2015 | David Rivett |
| Calvert | 6/1/2015 | 7/2/2015 | Shelly Siegel |
| Cecil | 6/1/2015 | 6/23/2015 | Michelle Llyod |
| Carroll | 6/1/2015 | 6/23/2015 | Jeffery Waltman |
| Dorchester | 6/1/2015 | 7/13/2015 | Steve Garvin |
| Washington | 6/1/2015 | 7/2/2015 | Charlie Summers |
| Garrett | 6/1/2015 | 6/26/2015 | John Frank |
| Talbot | 6/1/2015 | 7/2/2015 | Jim Bass |
| Baltimore County | 6/1/2015 | | |
| Ocean City | 6/1/2015 | Pending | Bob Rhode |
| Worcester | 6/1/2015 | 6/2/2015 | Tom Kane |
| St. Mary's | 6/1/2015 | | |
| Montgomery | 6/1/2015 | | |
| Prince George's | 6/2/2015 | 8/4/2015 | Cara Howard |
| Howard | 6/2/2015 | N/A | N/A |
| Anne Arundel | 6/2/2015 | | |
| Allegany | 6/2/2015 | 7/1/2015 | Susan Lee |
| Caroline | 6/2/2015 | 7/14/2015 | Richard Garner |
| Charles | 6/2/2015 | 6/4/2015 | Michelle Lilly |
| Somerset | 6/2/2015 | 6/5/2015 | Vicki Llyod |
| Wicomico | 6/2/2015 | 6/2/2015 | Steve Schweikert |
| Baltimore City | 6/4/2015 | 6/22/2015 | Connor Scott |
| Frederick | 6/3/2015 | | |
| Harford | 6/3/2015 | 6/26/2015 | Steve Welzant |
| Kent | 6/3/2015 | 6/4/2015 | Wayne Darrell |
| City of Annapolis | 6/4/2015 | 6/19/2015 | Patrick Donlan |

# HAZUS for Mitigation

- Determines what is vulnerable, i.e. what critical facility is vulnerable to flood
- Results – Damage is physical; Losses are economical
- Emphasizes the highest areas of damage as possible areas which could benefit from mitigation project
- HAZUS is ran for Essential Facilities, User Defined Structures, Debris, Direct Social Loss and Indirect Economic Loss

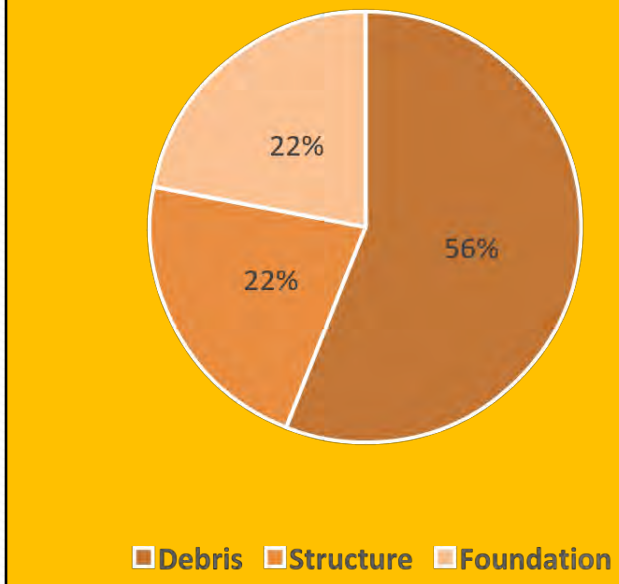

Riverine Flood Building Loss
Ocean Pines
Legend
Building Loss
0.00 to 502.00
502.00 to 1755.00
1755.00 to 3759.00
3759.00 to 6598.00
6598.00 to 33399.00

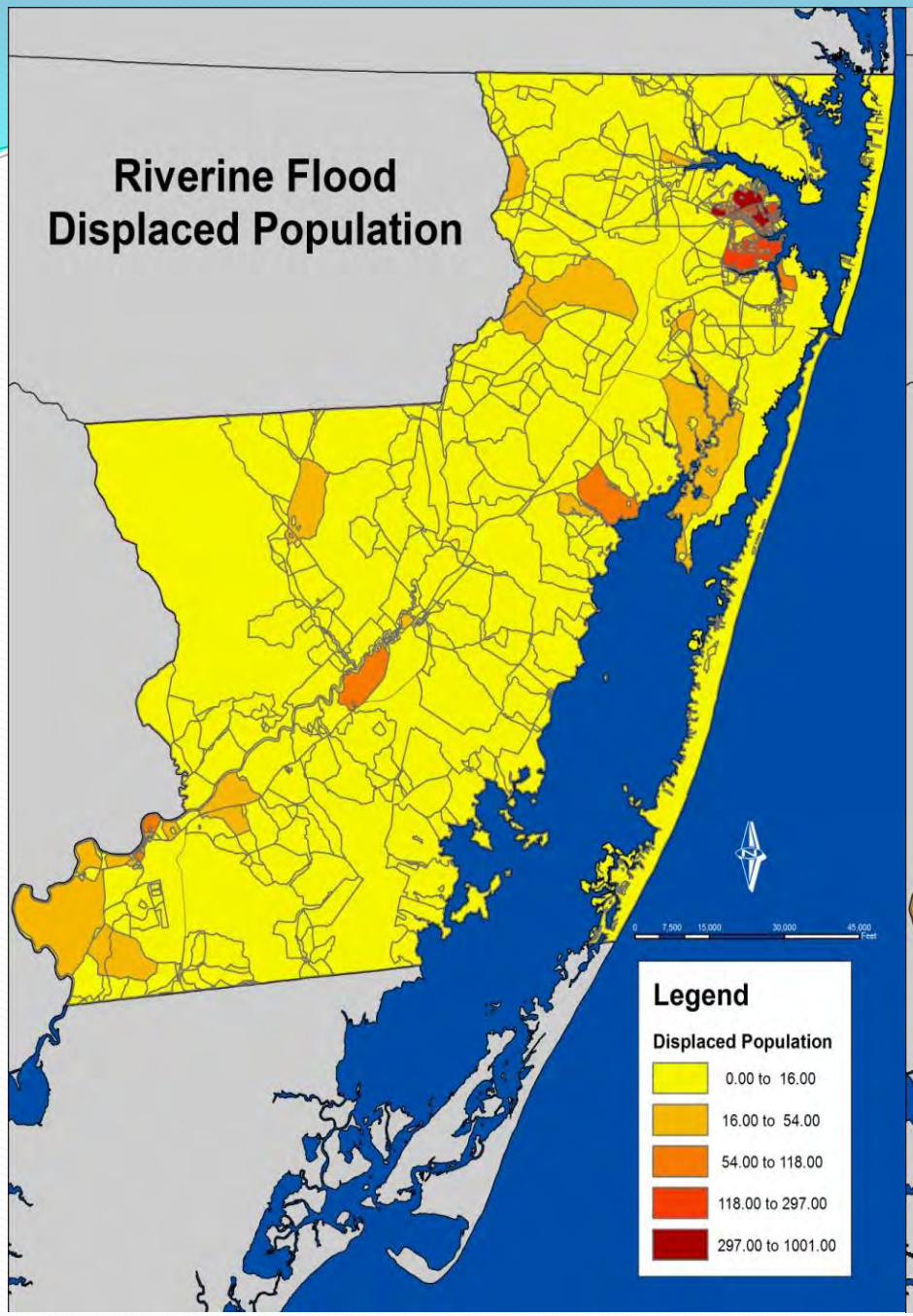

Riverine Flood Contents Loss
Ocean Pines
Legend
Contents Loss
0.00 to 349.00
349.00 to 1283.00
1283.00 to 3328.00
3328.00 to 9294.00
9294.00 to 21298.00

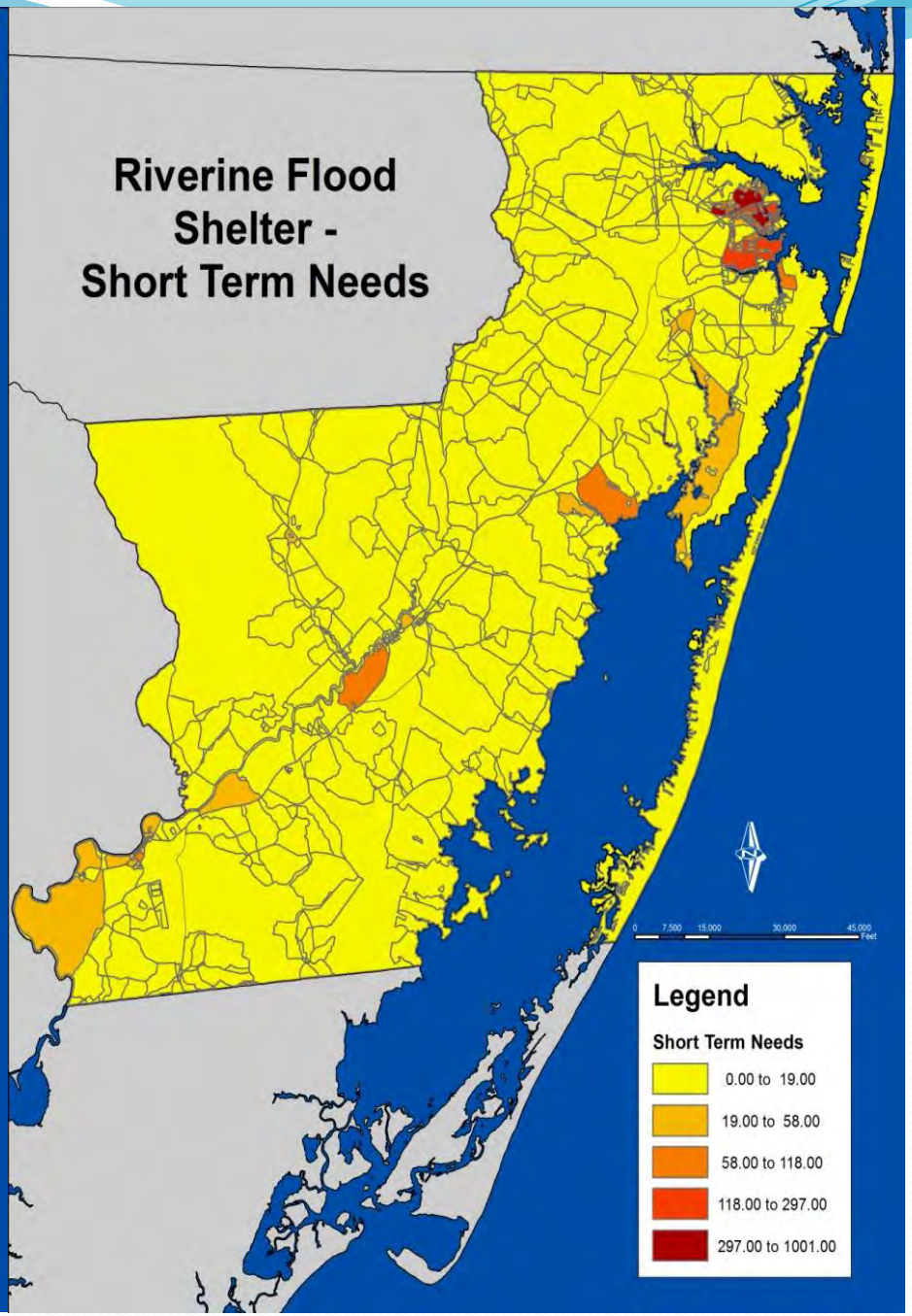


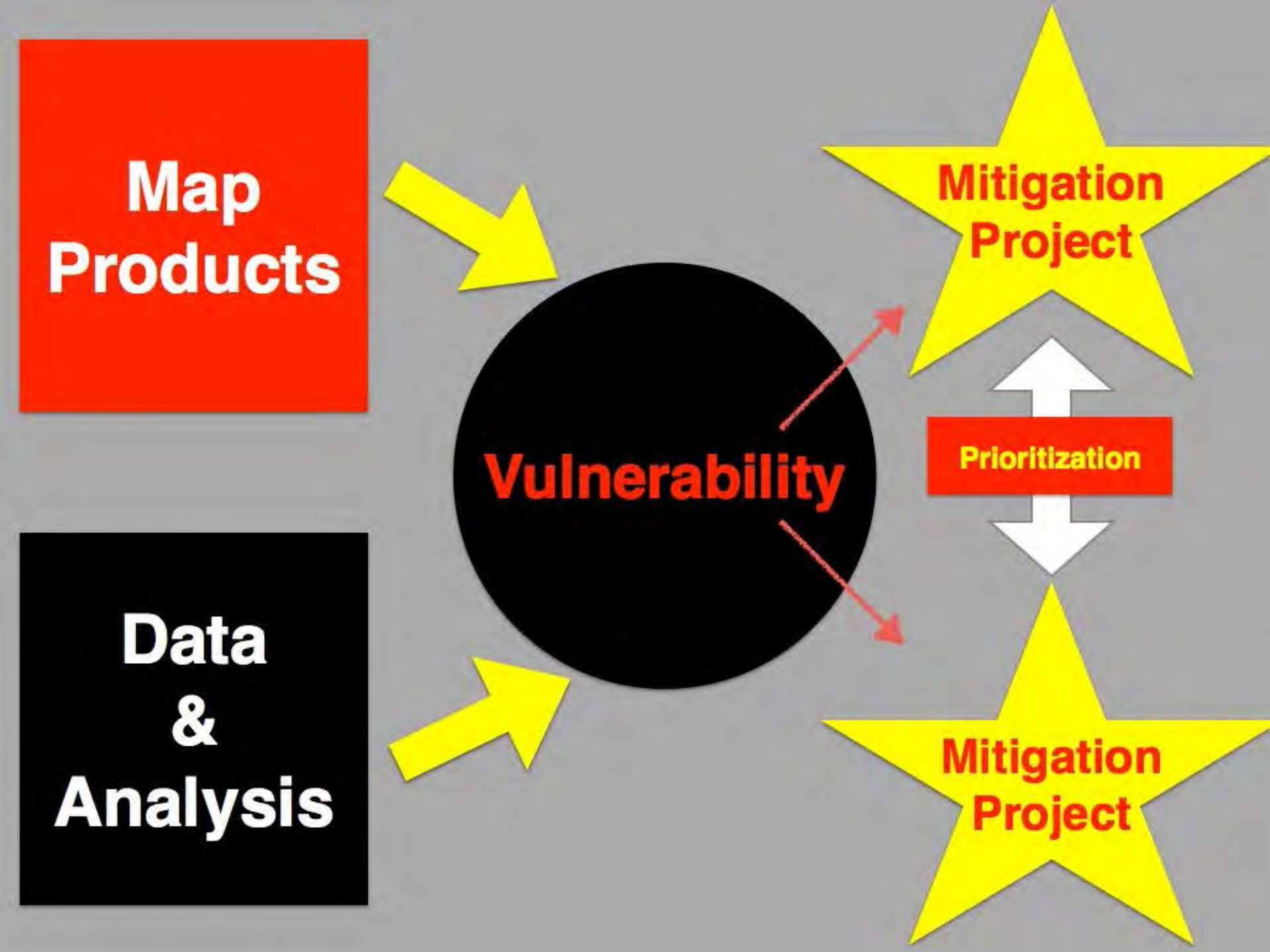

- **DEBRIS: 11,368 tons**

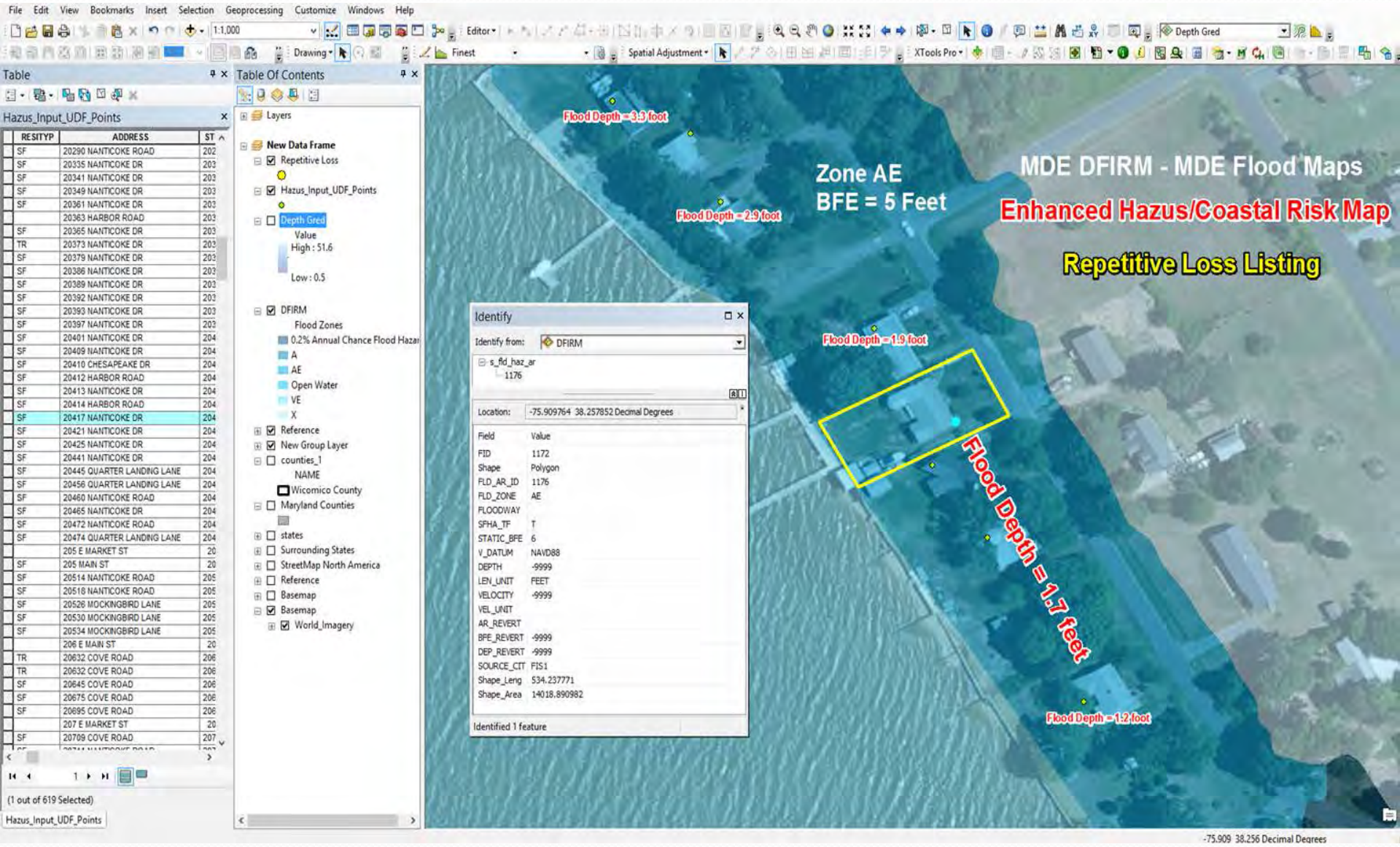
- **TRUCKLOADS: 455 @25 tons**




Riverine Flood
Displaced Population
Legend
Displaced Population
0.00 to 16.00
16.00 to 54.00
54.00 to 118.00
118.00 to 297.00
297.00 to 1001.00


Riverine Flood
Shelter -
Short Term Needs
Legend
Short Term Needs
0.00 to 19.00
19.00 to 58.00
58.00 to 118.00
118.00 to 297.00
297.00 to 1001.00

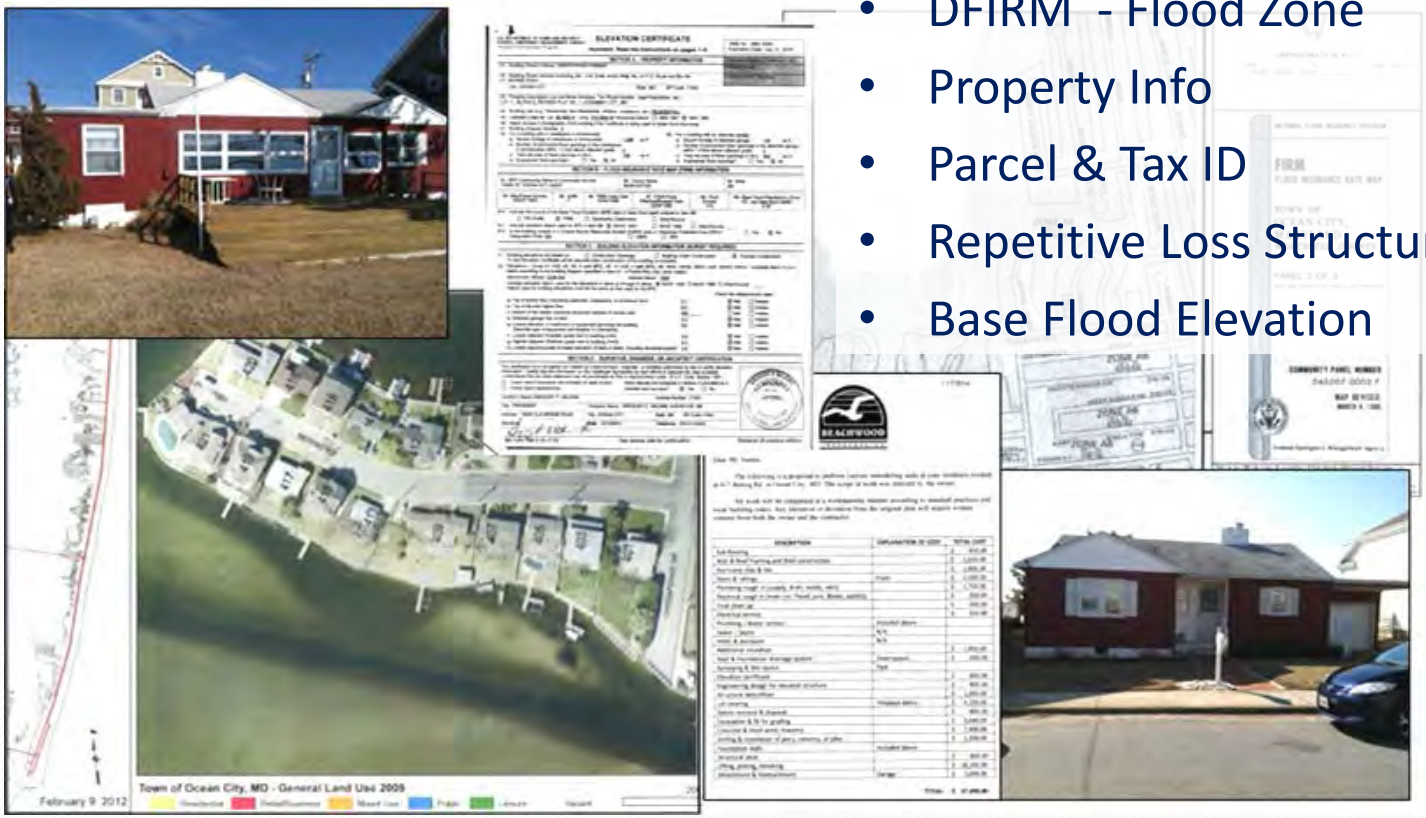

Map Products
Data & Analysis
Vulnerability
Mitigation Project
Prioritization
Mitigation Project


File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table
Hazus_Input_UDF_Points
RESITYP ADDRESS ST
SF 20290 NANTICOKE ROAD
SF 20335 NANTICOKE DR
SF 20341 NANTICOKE DR
SF 20349 NANTICOKE DR
SF 20361 NANTICOKE DR
20363 HARBOR ROAD
SF 20365 NANTICOKE DR
TR 20373 NANTICOKE DR
SF 20379 NANTICOKE DR
SF 20386 NANTICOKE DR
SF 20389 NANTICOKE DR
SF 20392 NANTICOKE DR
SF 20393 NANTICOKE DR
SF 20397 NANTICOKE DR
SF 20401 NANTICOKE DR
SF 20409 NANTICOKE DR
SF 20410 CHESAPEAKE DR
SF 20412 HARBOR ROAD
SF 20413 NANTICOKE DR
SF 20414 HARBOR ROAD
SF 20417 NANTICOKE DR
SF 20421 NANTICOKE DR
SF 20425 NANTICOKE DR
SF 20441 NANTICOKE DR
SF 20445 QUARTER LANDING LANE
SF 20456 QUARTER LANDING LANE
SF 20460 NANTICOKE ROAD
SF 20465 NANTICOKE DR
SF 20472 NANTICOKE ROAD
SF 20474 QUARTER LANDING LANE
205 E MARKET ST
SF 205 MAIN ST
SF 20514 NANTICOKE ROAD
SF 20518 NANTICOKE ROAD
SF 20526 MOCKINGBIRD LANE
SF 20530 MOCKINGBIRD LANE
SF 20534 MOCKINGBIRD LANE
206 E MAIN ST
TR 20632 COVE ROAD
TR 20632 COVE ROAD
SF 20645 COVE ROAD
SF 20675 COVE ROAD
SF 20695 COVE ROAD
207 E MARKET ST
SF 20709 COVE ROAD
(1 out of 619 Selected)
Hazus_Input_UDF_Points
Table Of Contents
Layers
New Data Frame
Repetitive Loss
Hazus_Input_UDF_Points
Depth Gred
Value
High : 51.6
Low : 0.5
DFIRM
Flood Zones
0.2% Annual Chance Flood Hazar
A
AE
Open Water
VE
X
Reference
New Group Layer
counties_1
NAME
Wicomico County
Maryland Counties
states
Surrounding States
StreetMap North America
Reference
Basemap
Basemap
World_Imagery
Identify
Identify from: DFIRM
s_fld_haz_ar
1176
Location: -75.909764 38.257852 Decimal Degrees
Field Value
FID 1172
Shape Polygon
FLD_AR_ID 1176
FLD_ZONE AE
FLOODWAY
SFHA_TF T
STATIC_BFE 6
V_DATUM NAVD88
DEPTH -9999
LEN_UNIT FEET
VELOCITY -9999
VEL_UNIT
AR_REVERT
BFE_REVERT -9999
DEP_REVERT -9999
SOURCE_CIT FIS1
Shape_Leng 534.237771
Shape_Area 14018.890982
Identified 1 feature
Flood Depth = 3.3 foot
Flood Depth = 2.9 foot
Zone AE
BFE = 5 Feet
MDE DFIRM - MDE Flood Maps
Enhanced Hazus/Coastal Risk Map
Repetitive Loss Listing
Flood Depth = 1.9 foot
Flood Depth = 1.7 feet
Flood Depth = 1.2 foot
-75.909 38.256 Decimal Degrees

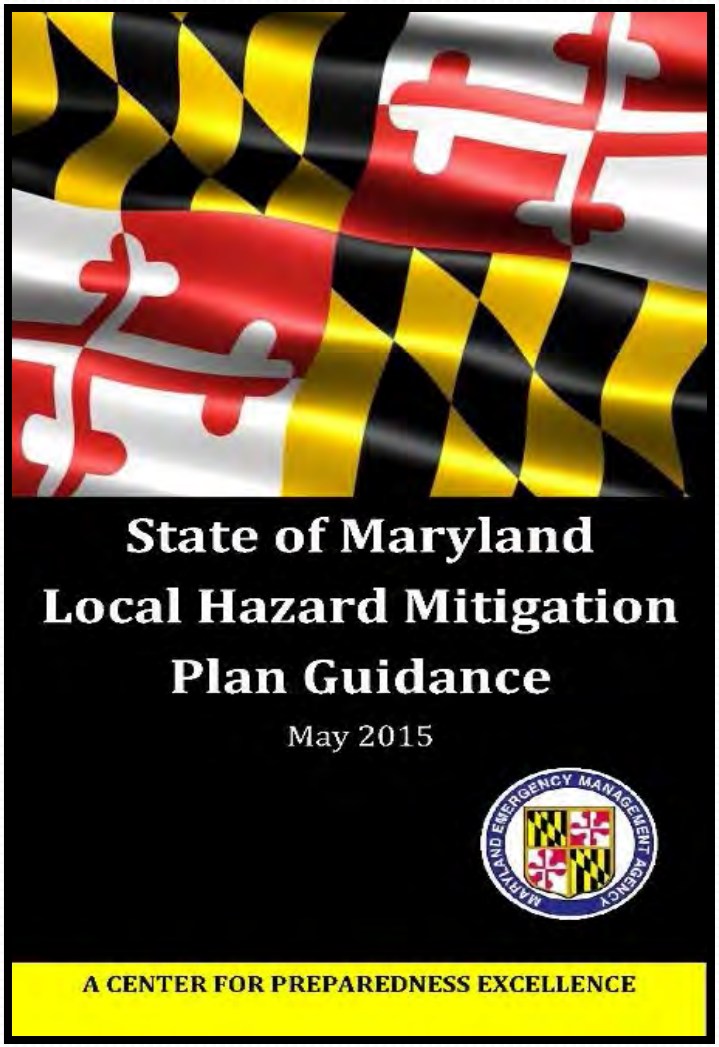
# Mitigation Project
# Acquisition/Demolition or Elevation

**ONE STOP**
**for Data & Mapping**

- HMP Goals/Objectives Rating – “High”
- Hazard Related Info
- Lat/Long
- DFIRM - Flood Zone
- Property Info
- Parcel & Tax ID
- Repetitive Loss Structure – Y/N
- Base Flood Elevation



# Local Hazard Mitigation Plan Guidance



# Minimum Hazard Mitigation Plan Standards

| TOPIC | STANDARD | PAGE |
|---|---|---|
| Hazards | Flooding, Coastal Hazards (where applicable), Winter Weather, Tornado and Wind events | 2-5 |
| Critical Facilities | Fire Stations, Hospitals and Medical Clinics, Police Stations, Emergency Operation Centers and Schools (K-12 & Colleges) | 6-7 |
| Floodplain Management | Floodplain Identification and Mapping, Floodplain Management and Flood Insurance (pages 8 and 9). Also denote qualifying CRS mitigation actions | 8-9 |
| Capability Assessment | Provide responses regarding existing policies, regulations, programs and practices utilized (page 10) | 10 |
| Plan Integration | Complete Safe Growth Audit Questionnaire | 12-13 |

# Hazards

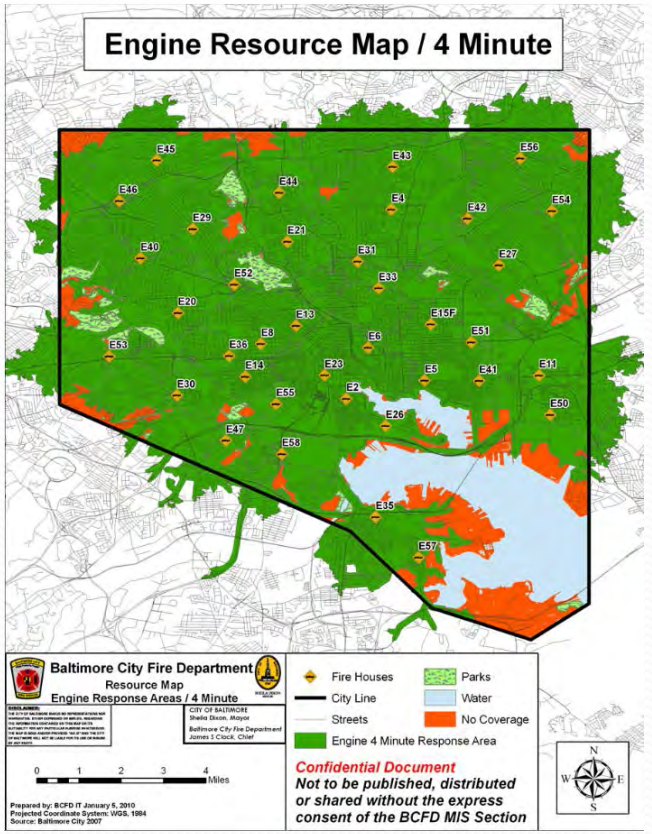
*Pages 2 – 5 in Local Mitigation Plan Guidance*

- **Flood** – Flash, Riverine, and Coastal
- **Coastal Hazards** – Coastal Storms, Storm Surge, Hurricane, Tropical Storm, Nor'easter, Sea Level Rise, and Shoreline Erosion
- **Winter Storm** – Snow, Freezing Rain, Sleet, and Extreme Cold
- **Tornado**
- **Wind** – Synoptic-Scale Winds and Thunderstorm Winds

# Essential Facilities

*Pages 6 – 7 in Local Mitigation Plan Guidance*

- Master Database - Containing all Local Jurisdictions' Essential Facilities (HAZUS Essential Facility Types)
  - Fire Stations
  - Hospitals and Medical Clinics
  - Police Stations
  - Emergency Operation Centers
  - Schools (K-12 & Colleges)



# Capability Assessment

*Pages 10 in Local Mitigation Plan Guidance*

- Assessment that provides a description and analysis of a community's current capacity to address the threats associated with hazards.

- Attempts to identify and evaluate existing policies, regulations, programs and practices that positively or negatively affect the community's vulnerability to hazards or specific threats.

# Resilience

*Pages 11 in Local Mitigation Plan Guidance*

- The concepts of resilience, sustainability, and safe growth are embraced and actively promoted by FEMA through its implementation of Federal regulations for hazard mitigation planning.
  - 2015 FEMA Planning Guidance - Requires consideration of Sea Level Rise
  - DNR Sea Level Rise Cultural Economic Resiliency Study


# Plan Integration

*Pages 12 – 13 in Local Mitigation Plan Guidance*

- A systematic and holistic process of examining a community's plans, programs, and policies to ensure they are in harmony with each other and strive towards the ultimate goal of reducing risk.
- Involves a two-way exchange of information where local planning mechanisms and hazard mitigation plans inform and are informed by one another.

# Historic & Cultural Resources

*Pages 16 in Local Mitigation Plan Guidance*

- Including historic structures & archeological sites in local hazard mitigation plan.
  - Annapolis City Historic Cultural Mitigation Plan
- Natural hazards threaten historic structures & archeological sites, are irreplaceable economic & community assets.

# Next Step:

## Regional Outreach – State Plan

Coordinate Multi Agency Regional Meetings - Introduce new planning concepts and tools:

- Western Maryland
- National Capital
- Central Maryland
- Southern Maryland
- Upper Eastern Shore
- Lower Eastern Shore

July 20 - Participants discuss the Plan Draft in a break-out group.

# Schedule

## *Where do we go from here:*

- Statewide HAZUS Initiative
  - Coastal: Funded – Expected Completion Jan 16
  - Riverine: Pending PDM Funding (Nov - Dec 15)
- Statewide Planning
  - 5 Statewide Regional Outreach Meeting to be scheduled in conjunction with HAZUS runs
  - Summer 2016 Update to the Maryland State Hazard Mitigation Plan and release of digital data
  - September 2016 Hazard Mitigation Workshop

# Real World Examples and Success Stories

Questions via Text to (956) 750 - 8084


# Baltimore, MD

Sea Level Rise Simulation

N
W E
S

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

# Crisfield – Floodplain Mgmt

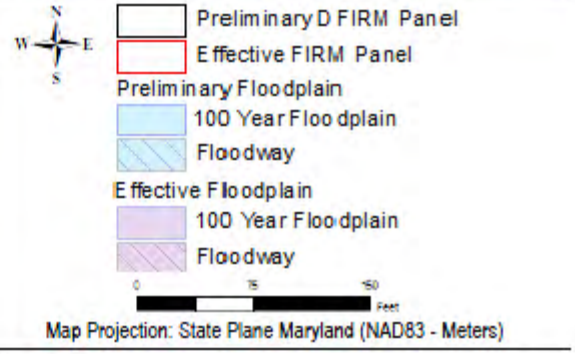
**Flooding in Downtown Crisfield during Superstorm Sandy in October 2012.**
*(Photo: Daily Times file photo)*

# Charles County – Cost/Benefit Analysis for Proposed Buy-Out


## Flood Risk Map

- Northing/Easting: 96417, 398613
- The selected location on the map is WITHIN the preliminary floodplain (Zone A)
- Your local NFIP Office / Coordinator can be reached at 301-645-0617
- DFIRM Panel Number: 24017C0175C
- DFIRM Release Target Date: 9/2011*
- Effective/Current FIRM Panel Number: 2400890050B
- FIRM Effective Target Date: 8/2013*

*DFIRM release and effective dates are subject to change



# Summary and Q&A

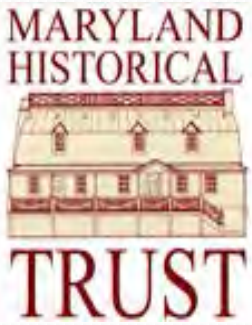
Questions via Text to (956) 750 - 8084

# How Enhanced Analysis and Mapping Products can support Emergency Management?

- **IDENTIFY** vulnerable areas.
- **ASSESS** level of readiness and preparedness to deal with a disaster before disaster occurs.
- **ESTIMATE** potential losses from specific hazard events.
- **DECIDE** on how to allocate resources for most effective and efficient response and recovery.
- **PRIORITIZE** mitigation measures that need to be implemented to reduce future losses (what if)

# Interagency Collaboration



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