

Supporting Local Government through Advisory Products and GIS Analysis



FEMA



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Team Players

STARR II

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Federal Emergency Management Agency (FEMA)

Region II Risk Analysis Branch

- Andrew Martin
- Jeanine Neipert
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Puerto Rico Planning Board (PRPB)

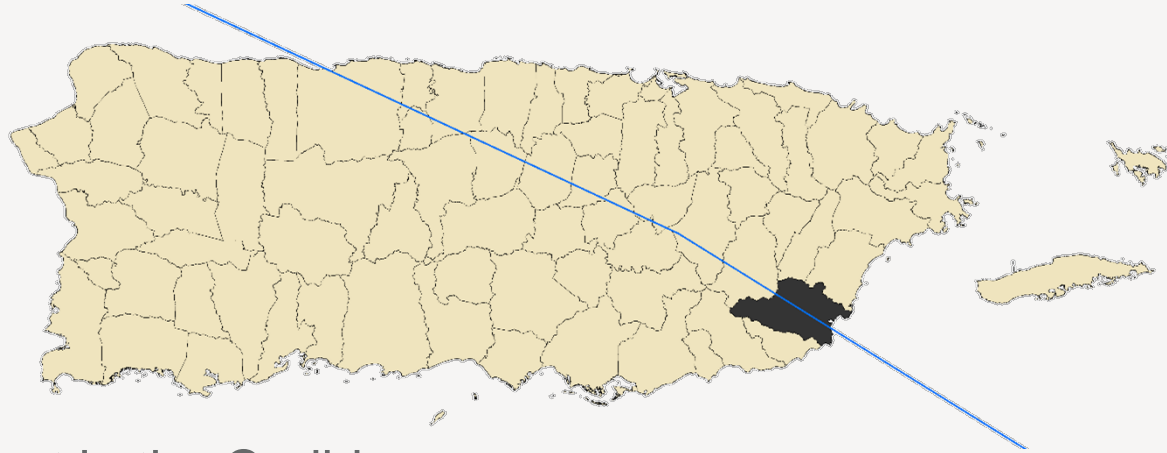
Geology and Hydrogeology Office

- Arleen Reyes-Rodríguez (Former Director)
- Wilfredo Mas-Arroyo



Hurricane María

- Made landfall through Yabucoa on September 20th, 2017 as a Cat 4 hurricane with sustained winds of 155 mph (NWS).



- Unprecedented atmospheric event in the Caribbean.
- Triggered a variety of hazard research and data (academic sector and government agencies).
 - USGS High Water Marks
 - FEMA Mitigation Assessment Team (MAT) Reports
 - **FEMA Advisory Base Flood Elevation (ABFE) Products.**



ABFE Products

What are ABFE Products?

- After large storms, FEMA performs assessments to determine the accuracy of the effective 1% annual chance flood.
 - Age of analysis
 - Coverage of analysis
 - Models used in analysis
- ABFE Products are used to determine stronger construction parameters within the floodplain.
- They are not used to determine flood insurance rates. NFIP still determines those.
- ABFE maps have been created recently for New York and New Jersey after Sandy and US Virgin Islands and Puerto Rico after Maria and Irma.



ABFE Products

Considerations to develop Advisory flood hazard data for Puerto Rico (PRPB, FEMA):

Coastal

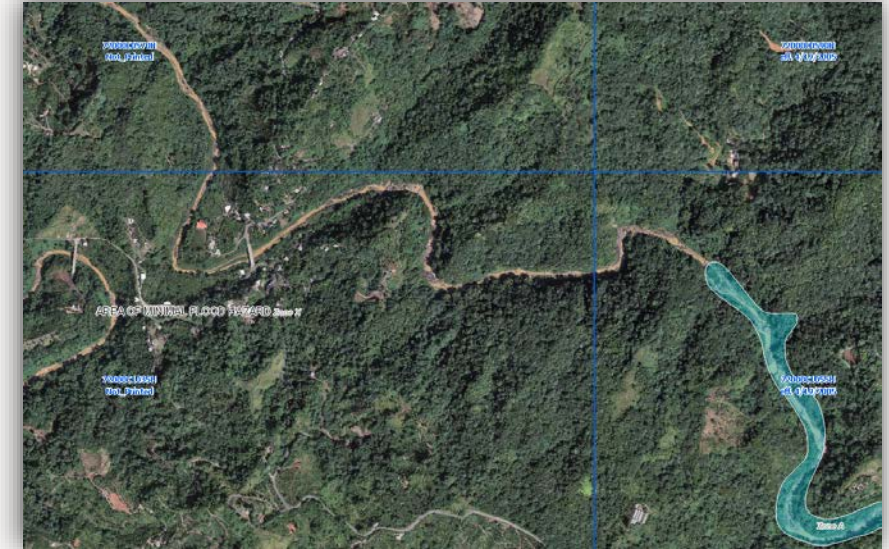
- Work performed 2006-2008, effective 2009.
- Data acceptable but could be improved.

Riverine

- Approximate studies date to early 1980s (~500 miles).
- Detailed studies date from early 1980s to late 2000s (~500 miles).
- Data considered to be outdated.

In many areas the flooding and erosion exceeded what is shown on FIRMs.

FIRM



ABFE



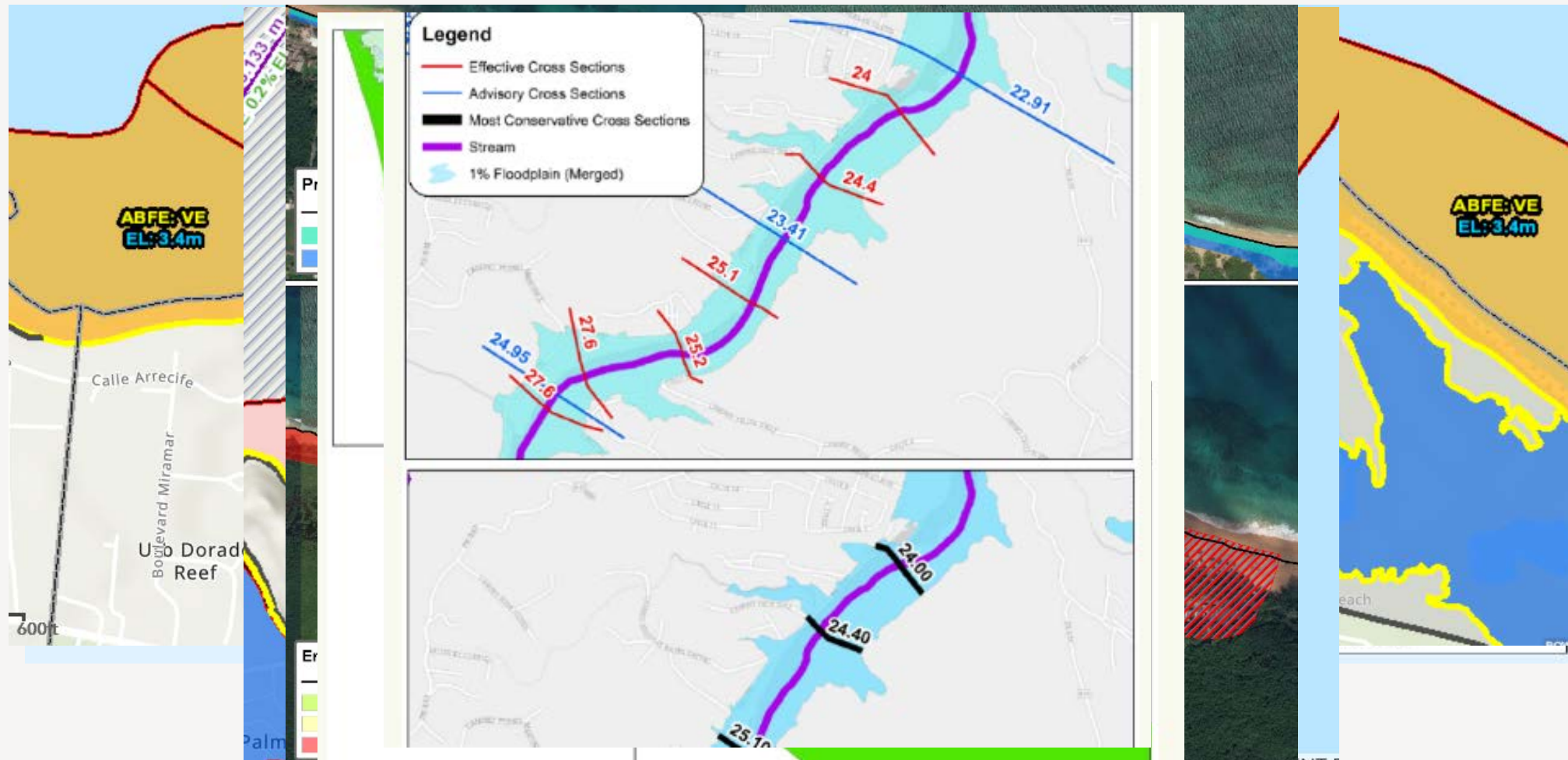
ABFE Products

ABFE GIS Products for Puerto Rico include:

- Updated Riverine Cross-Sections (1% and 0.2% annual chance elevations)
- Updated Special Flood Hazard Areas (SFHA)
- Limit of Moderate Wave Action (LiMWA)
- Storm Erosion: 1% level and Maria & Irma
- Projected Future Coastal Erosion (30 and 60 years)
- Flood Depth Grids
- 0.2% Coastal floodplains and BFEs

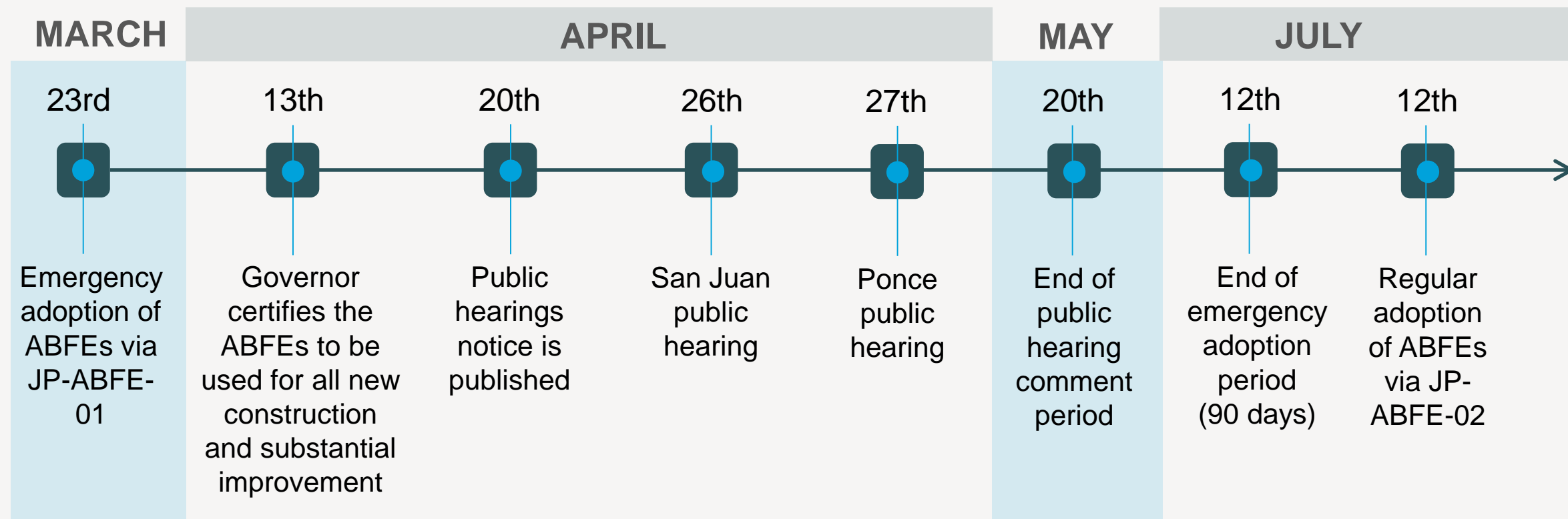


ABFE Products



ABFE Adoption Timeline

2018



Source: Puerto Rico Planning Board

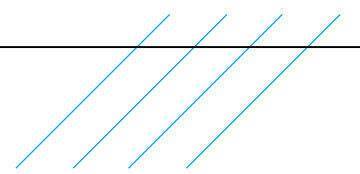
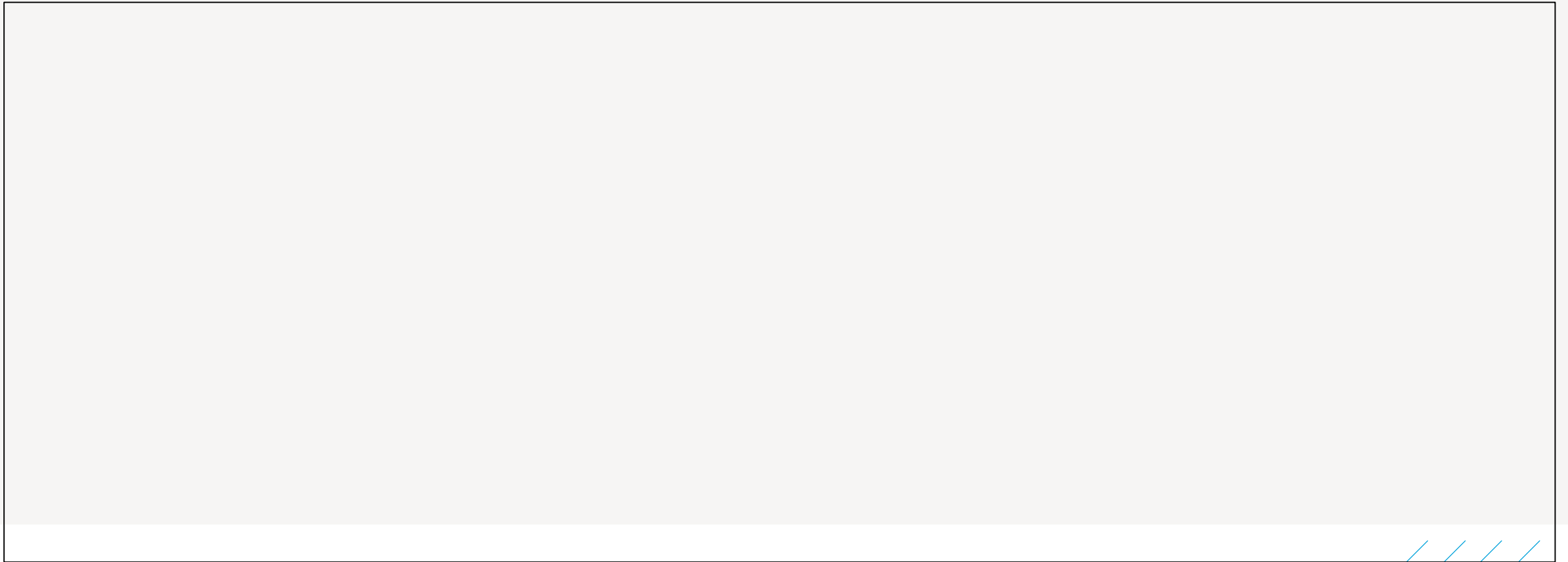
Supporting Government using ABFE Products

- Determining increase in 1% annual flood territorial footprint.
- Identifying structures added to the floodplain.
- Identifying critical facilities within the floodplain.
- Identifying critical facilities threatened by coastal erosion.
- Identifying neighborhoods within the floodplain.
- Technical support at municipal and state government meetings.
- Technical support to different FEMA sectors and Federal agencies at the Puerto Rico JFO/JRO.



Supporting Government using ABFE Products

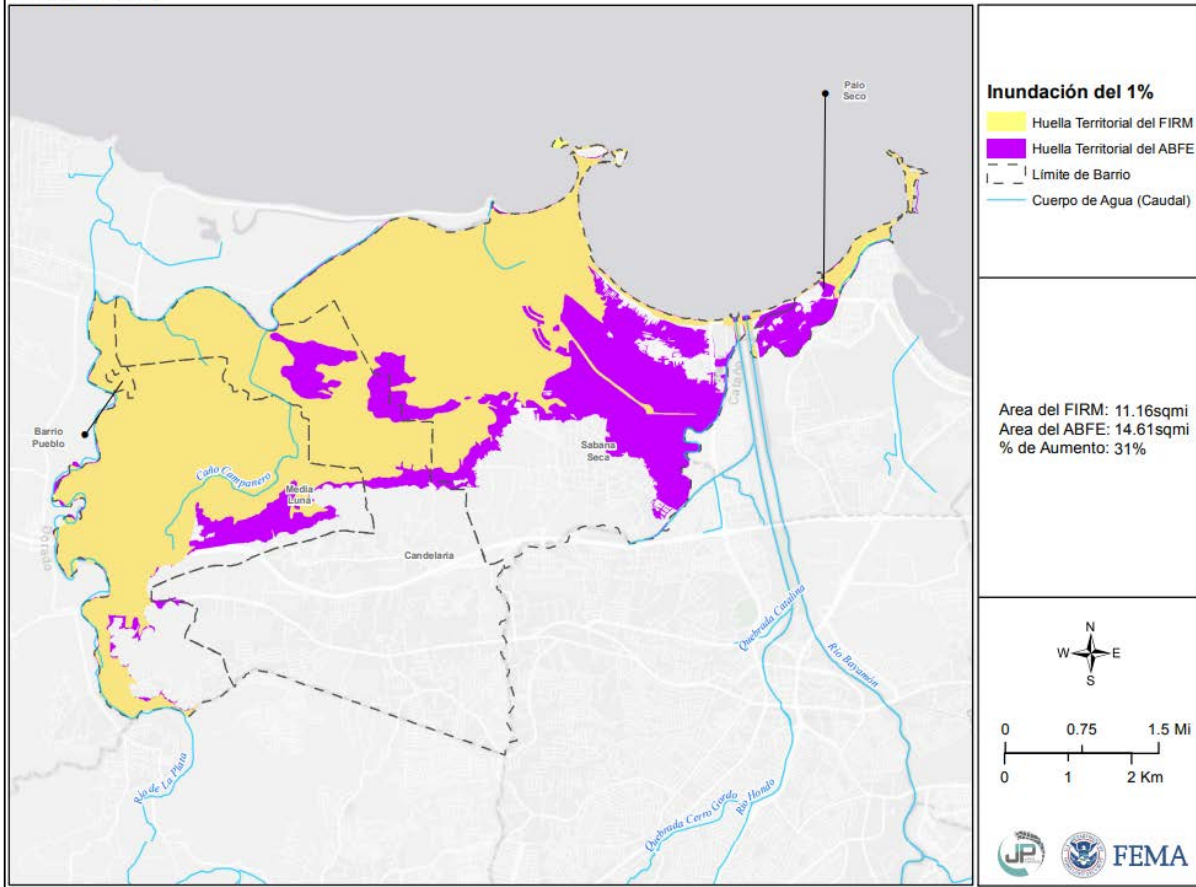
- ✓ Determining increase in 1% annual flood territorial footprint.
 - 20% increase in the floodplain (74.25 mi²)



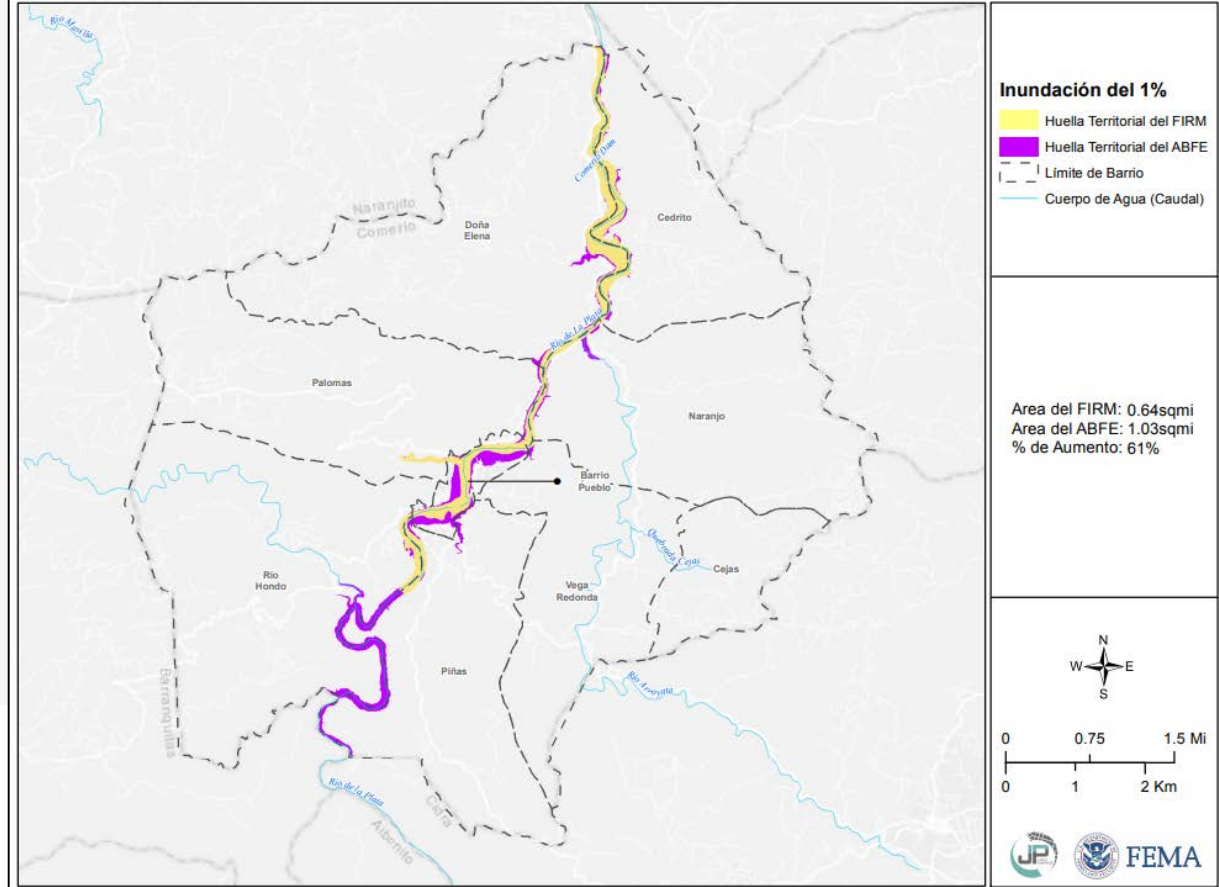
Supporting Government using ABFE Products

- ✓ Determining increase in 1% annual flood territorial footprint.
 - Increase by municipality

Comparación de los Niveles de Inundación: Toa Alta
(FIRM vs ABFE)



Comparación de los Niveles de Inundación: Comerio
(FIRM vs ABFE)



Supporting Government using ABFE Products

✓ Identifying critical facilities within the floodplain.

Figure 1

Critical_Facilities				
FID	Shape	Name	Type	ABFE
1159	Point	ANTONIO VALERO BERNABE	Schools	NO
965	Point	ANTONIO VELEZ ALVARADO	Schools	NO
732	Point	Apeadero	Potable Water Treatment Plant	NO
3779	Point	Apeadero	Water Pump Stations	NO
1839	Point	APEADERO	Schools	NO
3148	Point	Apolo	Waste Water Pump Stations	NO
1014	Point	APOLO SAN ANTONIO	Schools	NO
1272	Point	APOLONIA VALENTIN	Schools	NO
2739	Point	April Gardens	Waste Water Pump Stations	NO
4532	Point	April Gardens (Montones 1)	Water Pump Stations	NO
2952	Point	Aquatika	Waste Water Pump Stations	YES
1263	Point	AQUILINO CABAN	Schools	YES
1929	Point	AQUILINO RIVERA OLAN	Schools	NO
4125	Point	Arca de Noé	Water Pump Stations	NO
5068	Point	Arcadia	Water Pump Stations	NO
402	Point	Arecibo	Fire Stations	NO
3652	Point	Arecibo RWWTP	Waste Water Treatment Plant	NO
2762	Point	Arenales	Waste Water Pump Stations	NO
4765	Point	Arenales (Mantilla)	Water Pump Stations	NO
2654	Point	Arenas	Waste Water Pump Stations	NO
3946	Point	Arenas	Water Pump Stations	NO
1824	Point	ARISTIDES CALES QUIROS	Schools	YES
411	Point	ARMY	Military Facilities	NO
415	Point	ARMY	Military Facilities	NO
416	Point	ARMY	Military Facilities	NO
419	Point	ARMY	Military Facilities	YES
4319	Point	Arrayanes 1	Water Pump Stations	NO
4882	Point	Arrayanes 2	Water Pump Stations	NO
5000	Point	Arrendado	Water Pump Stations	NO
396	Point	Arroyo	Fire Stations	YES
525	Point	Arroyo	Police Stations	YES
679	Point	Arroyo	Police Stations	YES
3107	Point	Arroyo (Troncal Arroyo)	Waste Water Pump Stations	NO
2073	Point	ARSENIO MARTINEZ	Schools	YES
1776	Point	ARTURO GRANT PARDO	Schools	NO
1617	Point	ARTURO LLUBERAS	Schools	NO
4171	Point	Arturo López (La Agrícola) Cortina	Water Pump Stations	NO

Figure 2

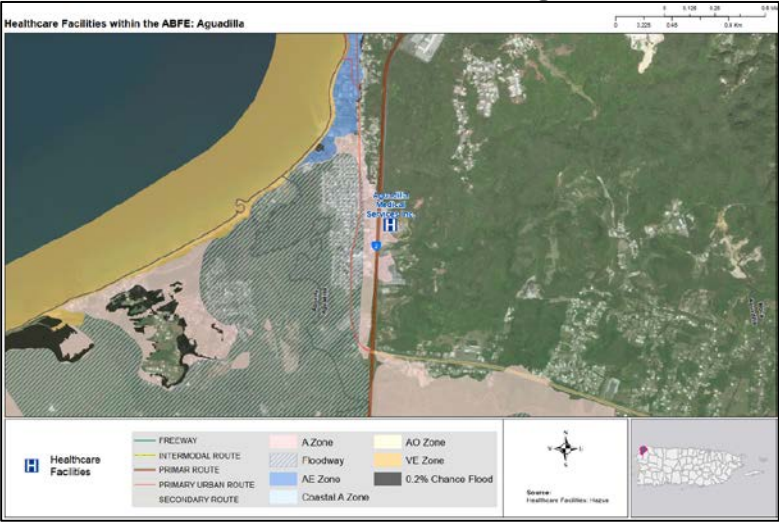


Figure 3

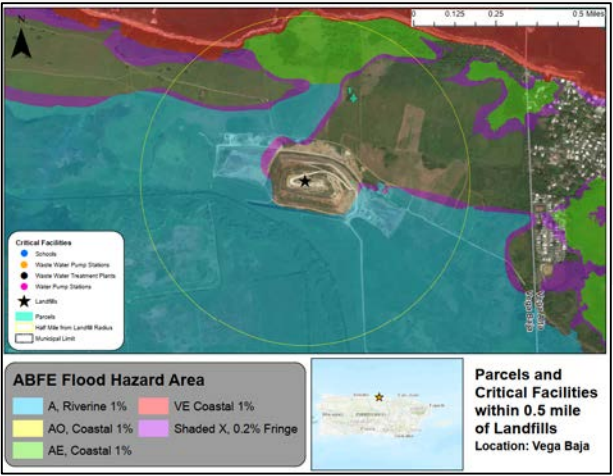
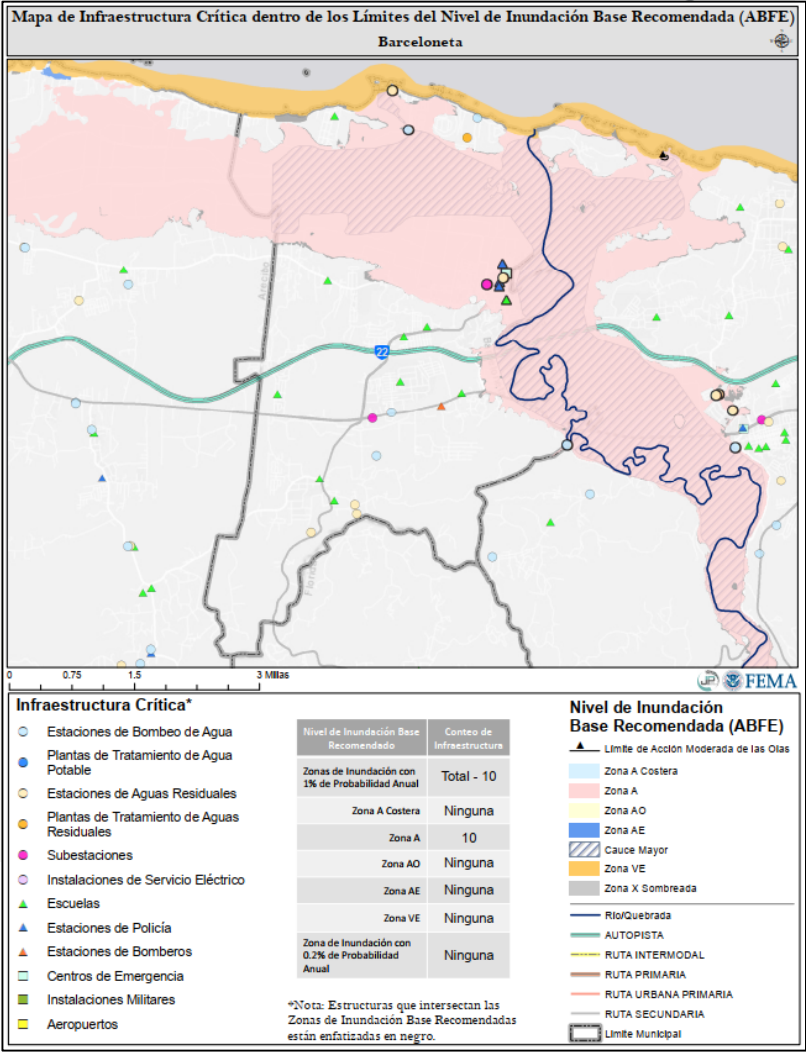


Figure 4



Supporting Government using ABFE Products

Figure 1: Power Plants

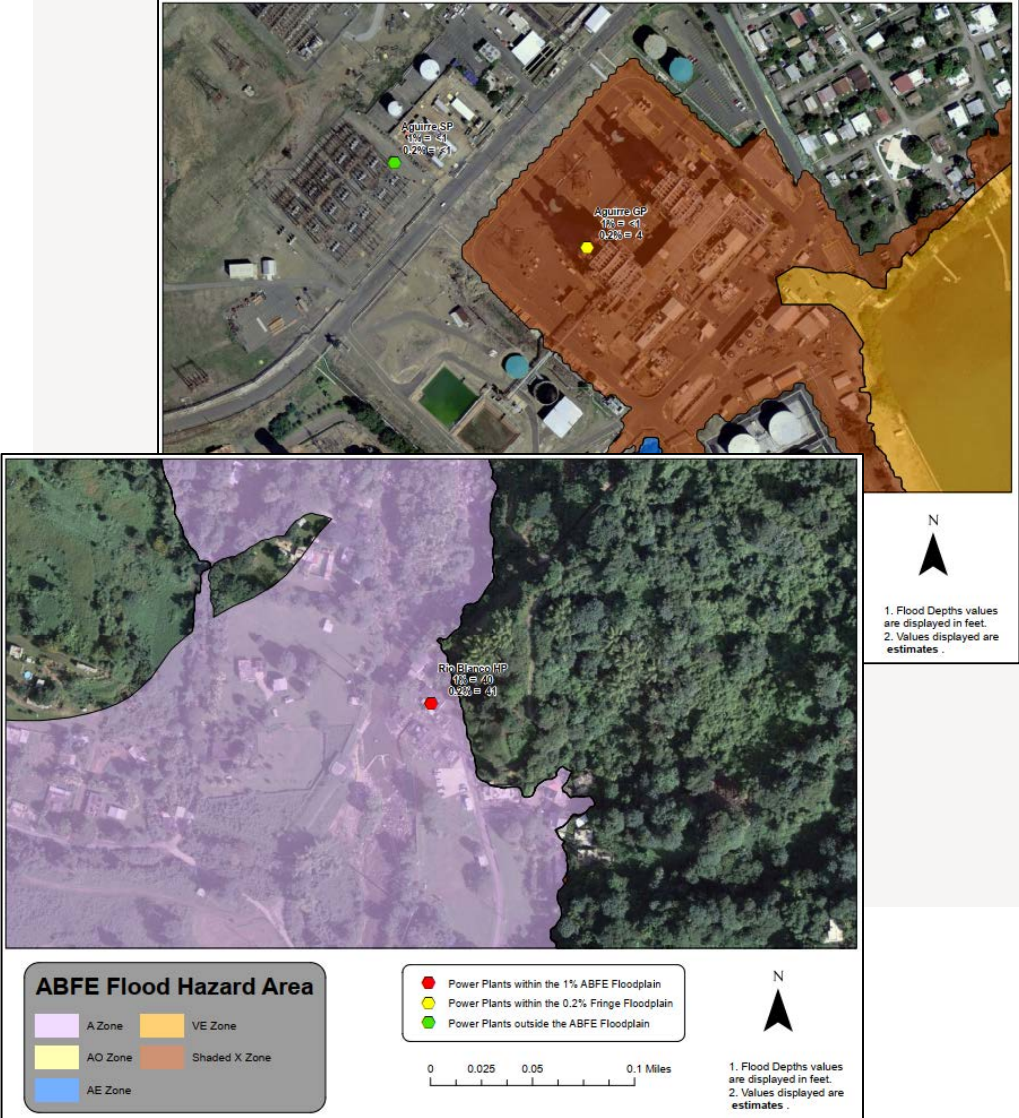
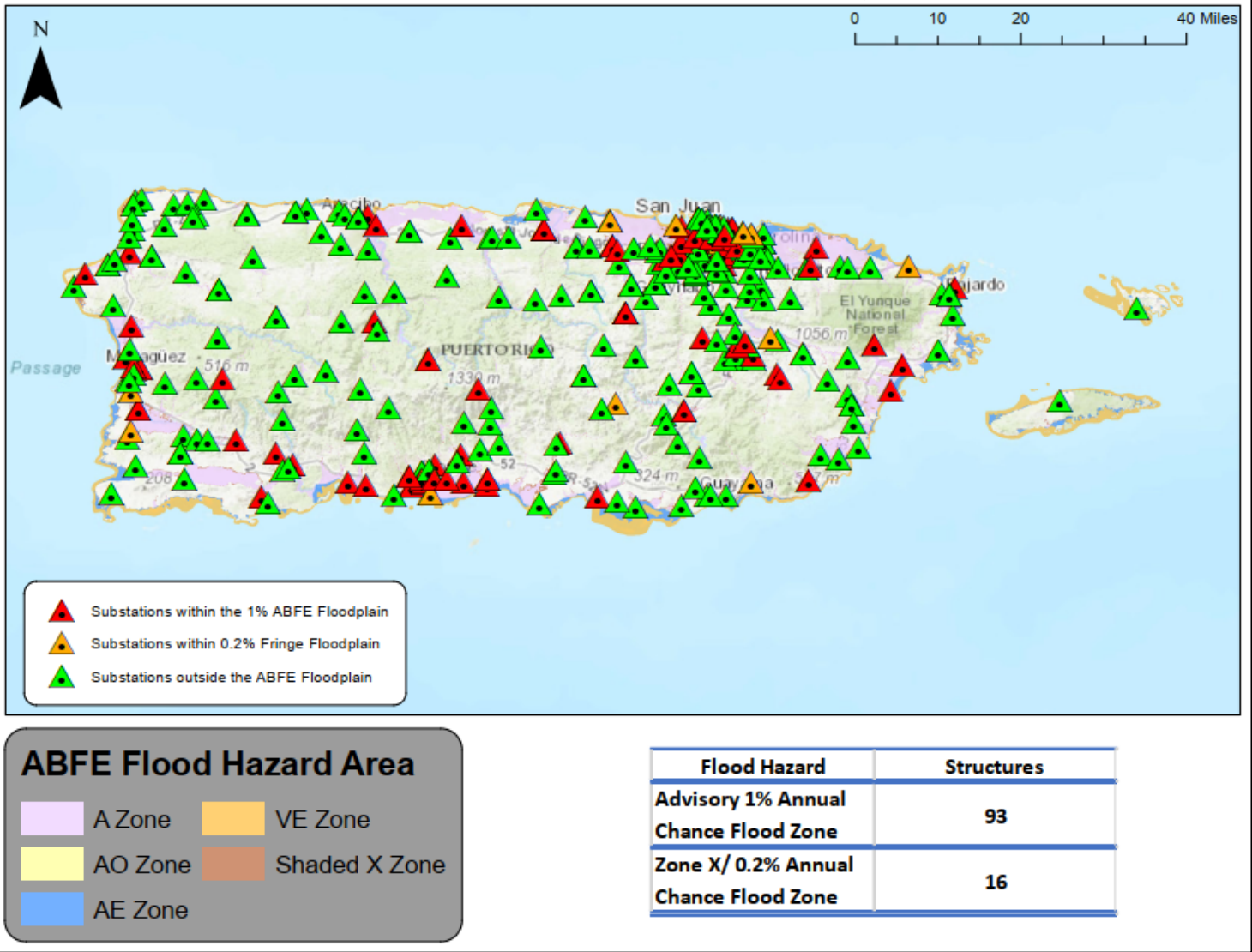


Figure 2: Electrical Substations



Supporting Government using ABFE Products

- ✓ Identifying critical infrastructure threatened by coastal erosion.

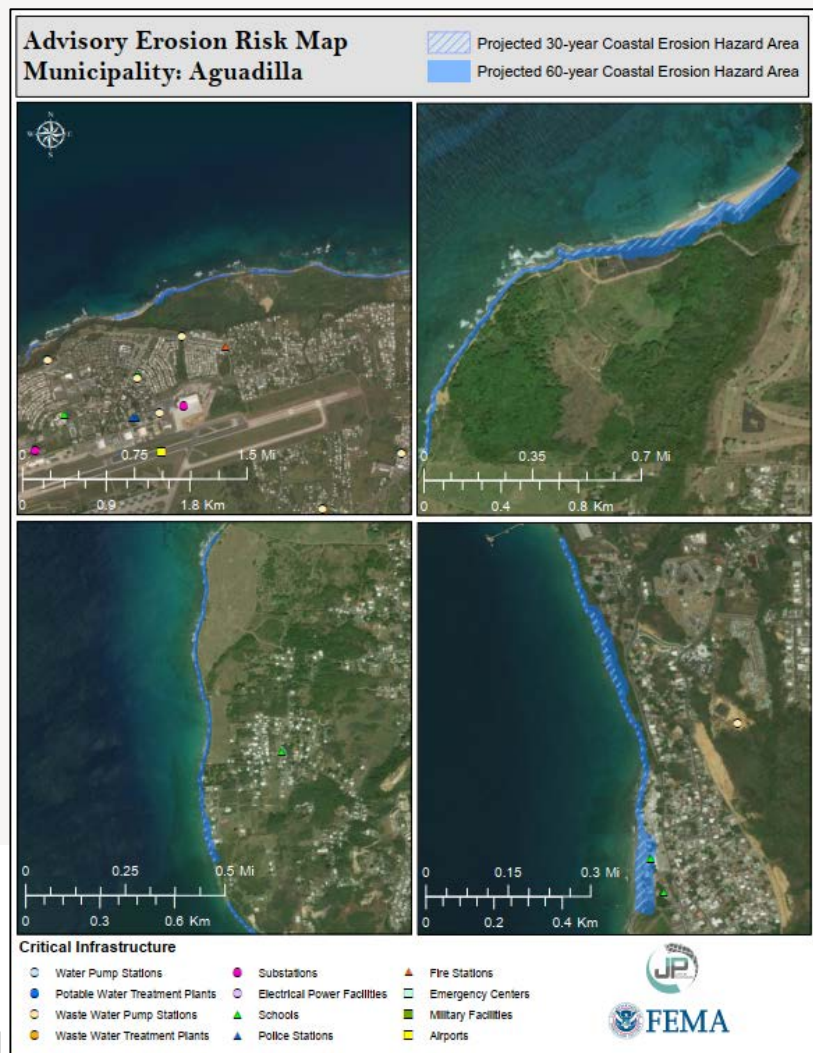


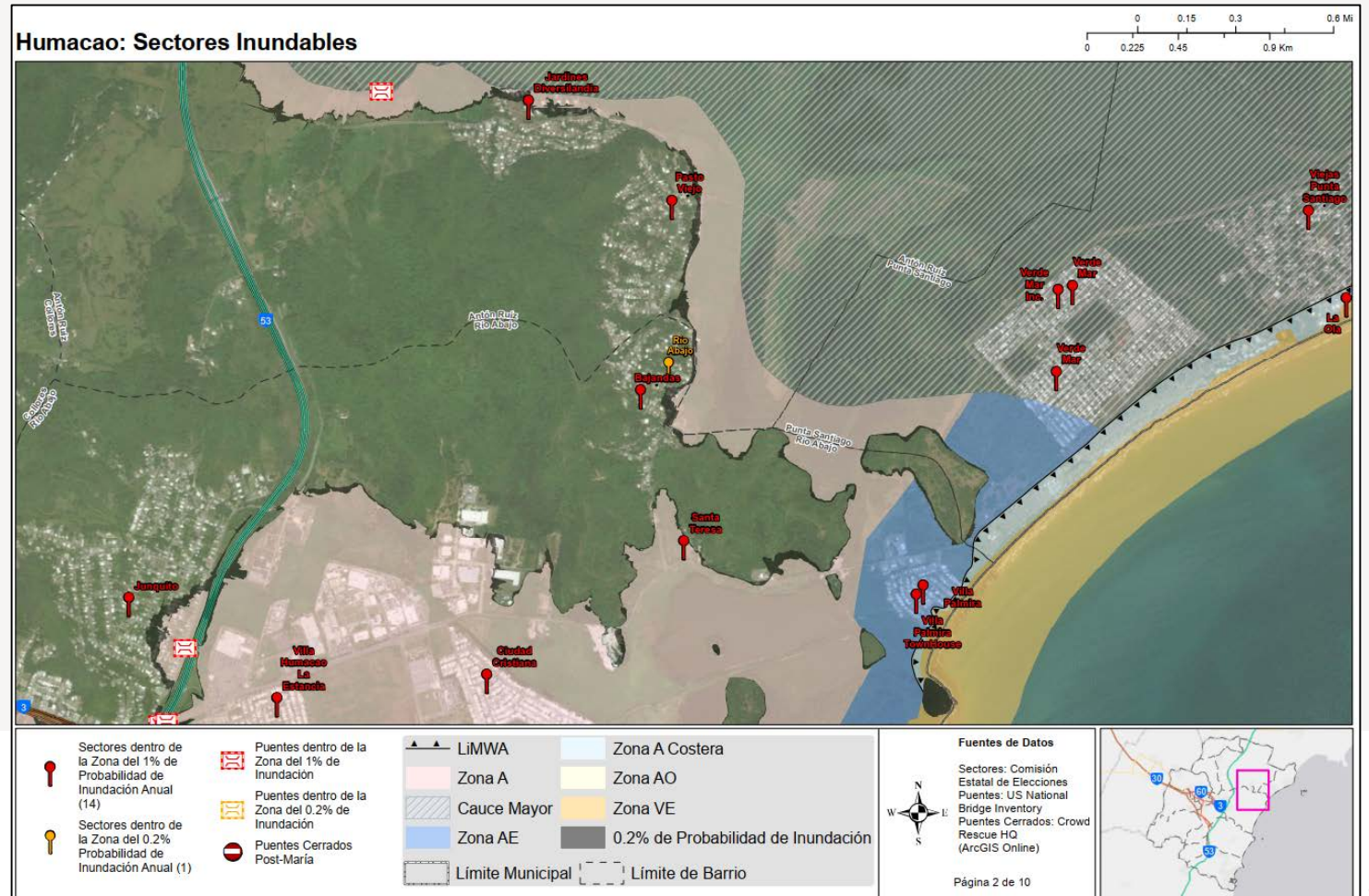
Figure 1



Figure 2

Supporting Government using ABFE Products

- ✓ Identifying neighborhoods within the floodplain.
- ✓ Identifying bridges within the floodplain.



Supporting Government using ABFE Products

✓ Outreach support:

- Technically supported PRPB at regional outreach municipal government meetings.
- Technically supported different FEMA sectors and Federal agencies at the Puerto Rico JFO/JRO.

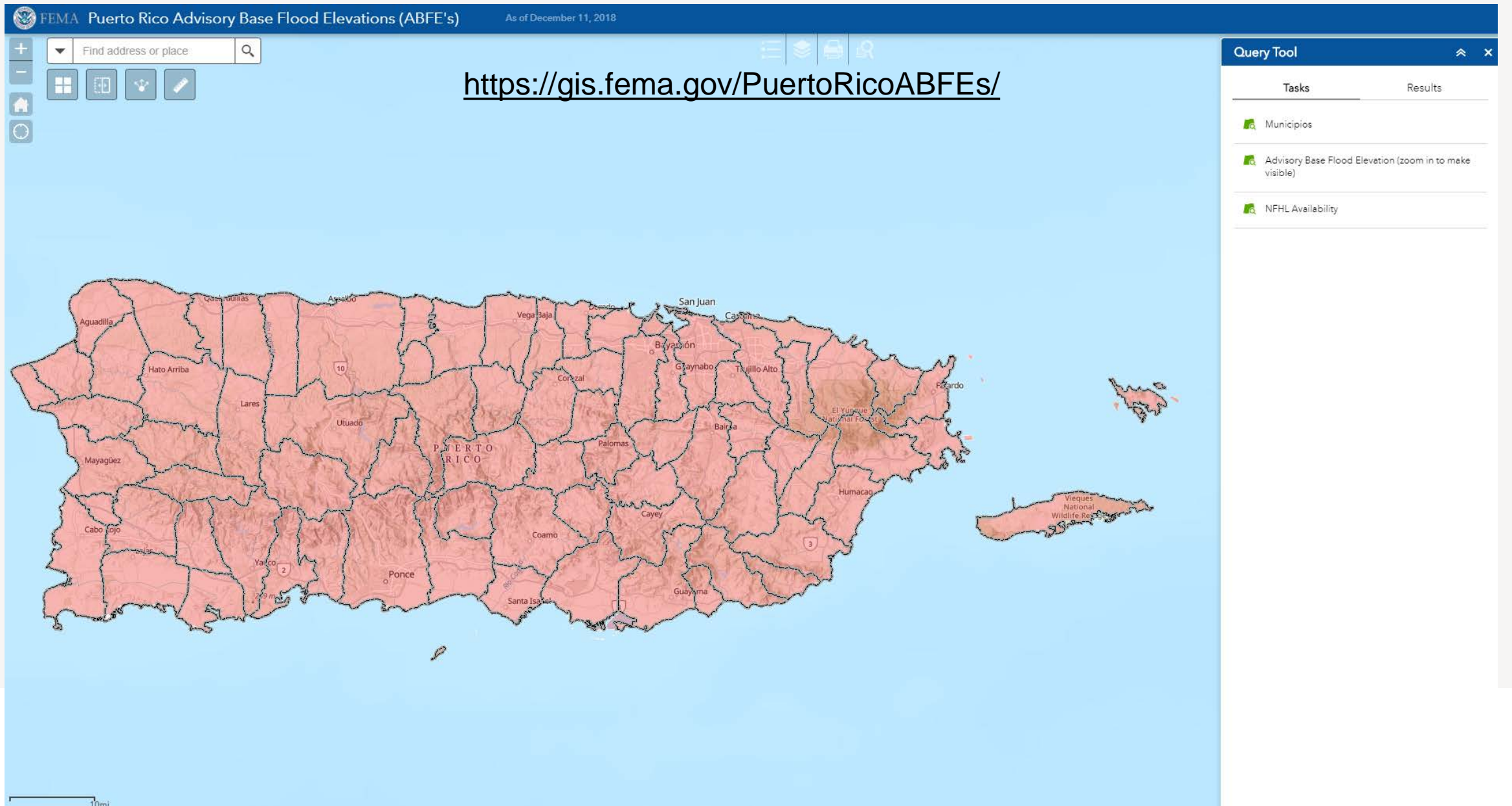


Limitations

- ✓ Data availability
- ✓ Address system in Puerto Rico
- ✓ Riverine data based on older effective data or approximate stream modeling
- ✓ Coastal data based on effective coastal hazard analysis



Virtual Tool: FEMA



ABFE Landing Page



<http://cedd.pr.gov/fema/>

HECRAS Models for the PR Advisory Maps

– [HECRAS](#)

Mapas(.zip file)

- [SHP](#)
- [Metadata](#)
- [Puerto Rico Advisory Data \(.zip file\)](#)

Below is link to download the revised deliverable for PR. It includes GIS data (File Geodatabase and shapefile formats including metadata) and MXDs for web publishing. This corrects the XSs that were not showing the most conservative value. It also corrected the VE zone in Aibonito.

– [Históricos](#)

Información Adicional por Municipio

- [Aumento de Zonas Inundables](#)
- [Infraestructura Crítica en Zona Inundable](#)
- [Sectoros en Zona Inundables](#)

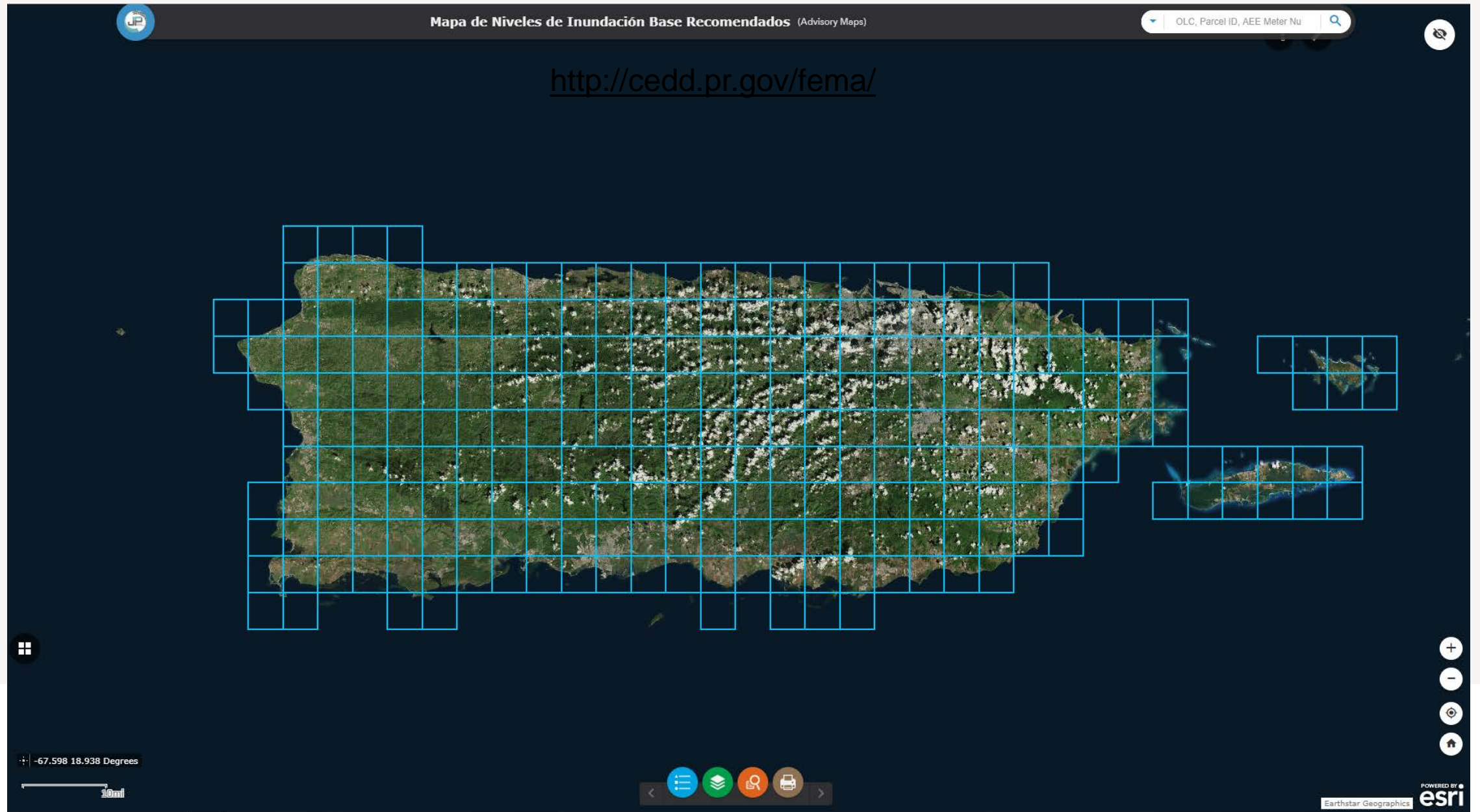
Water Surface Elevations

Estos geodatos representan los niveles de inundación base recomendados en metros referenciados al PRVD02 para todas las zonas inundables de los Mapas ABFE a excepción de las zonas AO, las cuales se muestran directamente en el mapa.

– [Geodatos](#)



Virtual Tool: Puerto Rico Planning Board

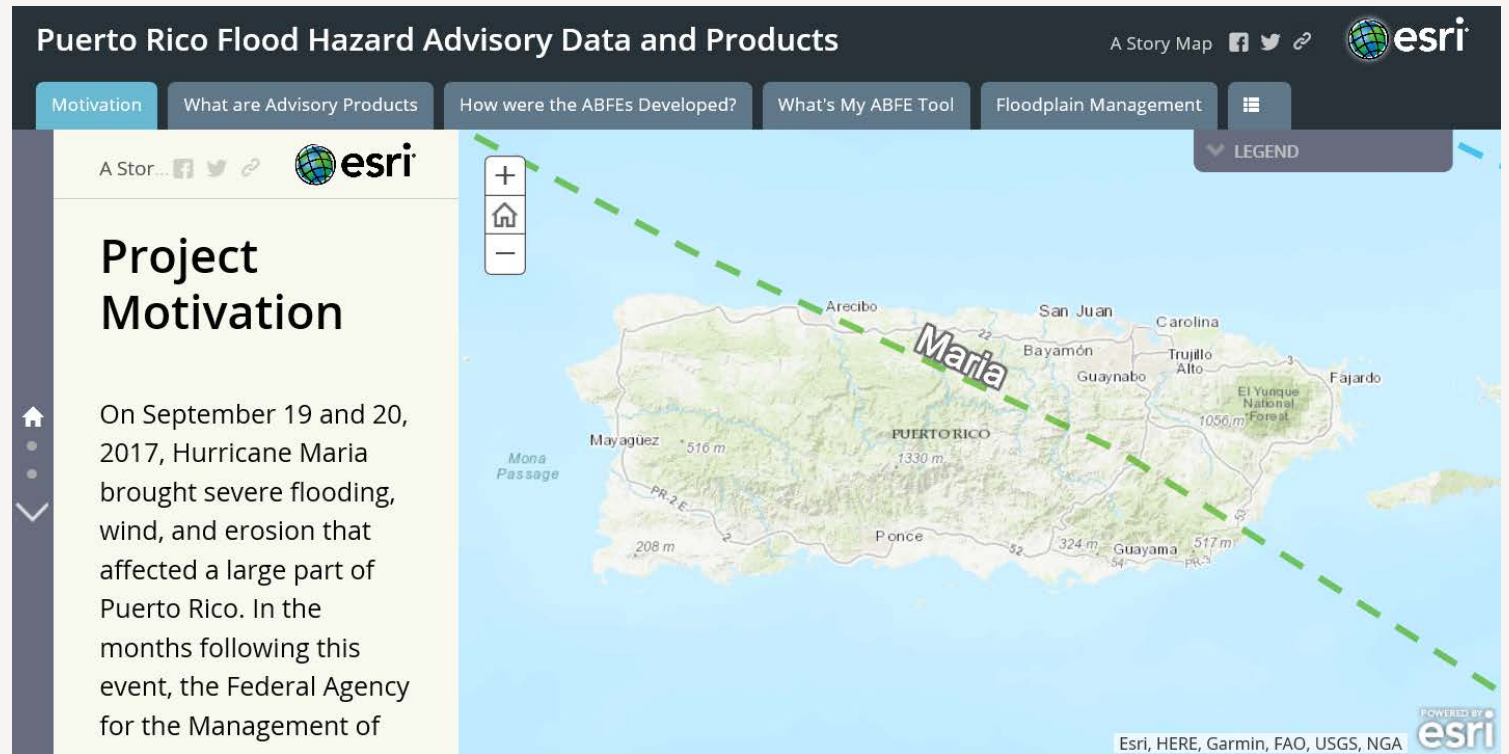


Advisory Data and Products Quick Guide & Story Map



Puerto Rico Advisory Base Flood Elevations
Quick Guide

February 2019



What's My BFE tool

☒ Search by Latitude,Longitude
 ☐ Address Search (

Enter an address, latitude/longitude coordinates (in decimal degree format)

****Note that address searches are not always accurate in Puerto Rico. It may**

Approximate Address Identified: **30.14 Carr 165, Sabana Seca, Puerto Rico**

Advisory FEMA Flood Hazard Data

FEMA advisory flood hazard data currently available for Puerto Rico is provided below to help you understand the current flood risk to your property.

FEMA advisory flood hazard data currently available for Puerto Rico and to guide post Maria recovery and rebuilding efforts. This tool provides Flood Hazard Data for riverine floodplains and Advisory Base Flood Elevations (ABFEs) for riverine

Attribute Na

What is the most recent FEMA flood hazard data source available?


What is my property's Flood Zone?  (For N/A results, please see more information.)

[What is my property's Advisory Flood Elevation?](#) (For AO 2
elevation; For N/A results, please contact your local floodplai

What is my property's Depth?

Was there erosion for my property based on Hurricane Maria?

Is there potential for erosion on my property based on the 1%

Is my property within a 30-year erosion risk area? 

Is my property within a 60-year erosion risk area?

View your property on our Interactive Web Tool



Advisory Flood Data for non-standard frequencies


The values in the table below provide estimated water surface elevations and depth of flooding (feet above the ground surface) for other flood frequencies. The 10% event has a 1 in 10 probability of occurring in any given year. The 4% event has a 1 in 25 probability of occurring in any given year. The 2% event has a 1 in 50 probability of occurring in any given year. And finally, the 0.2% event has a 1 in 500 probability of occurring in any given year.

Annual Chance Flood	10%	4%	2%	0.2%
Depth	N/A	N/A	N/A	0.2 m
Water Surface Elevation	N/A	N/A	N/A	3.7 m (PRVD02) (PRVD02)

Effective Flood Insurance Data

This information is from the effective Flood Insurance Rate Map for your community. It is used to determine who must buy flood insurance and how much it costs. It may also be used by your community to regulate development in flood prone areas.

Attribute Name	Attribute Value
What is my property's current effective Base Flood Elevation? 	2.70 m (MSL)
What is my property's current effective Flood Zone? 	VE
View your property on our Interactive Web Tool	Link to Web Tool for Effective Data

 Jobos Beach – Isabela, PR



¡Gracias!

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