NCST Technical Investigation of Hurricane Maria's Impacts on Puerto Rico:

Preliminary Project Plan to Study Emergency Communications during Hurricane Maria

May 16, 2018
NCST Advisory
Committee Meeting

Erica Kuligowski
Leader, NCST Investigation of Hurricane Maria
National Institute of Standards and Technology

Goal 3: The Performance of Emergency Communications Systems and the Public's Response to Such Communications

Project: Public Response to Emergency Communications during Hurricane Maria

- Project Objective: To investigate the role of emergency communications in public response for those under imminent threat from Hurricane Maria. This project also aims to investigate the use of communications in disaster response (during and immediately after the hurricane event).

Background

- NIST's preliminary reconnaissance of Hurricane Maria (Puerto Rico) highlighted severe evacuation and emergency response challenges:
  - The threat of a Category 5 hurricane hitting an island that had just been affected by Hurricane Irma two weeks prior
  - An island's heterogenous terrain that posed different risks (flooding, heavy winds, storm surge, landslides), requiring different protective actions
  - Societal preference for sheltering in place
  - Lack of communication between emergency and building officials, and with the public for extended periods of time
  - Many people/families requiring rescues, e.g., from flooding in multiple towns on the island

Project's Preliminary Investigation Plan (1/3)

- Conducting interviews and surveys in 3-4 selected areas/locations throughout the Commonwealth
- Areas/locations should be chosen based on factors associated with public response during hurricanes, e.g.,
  - Geographic location on the island (e.g., coastal, inland)
  - Pre-hurricane household characteristics
  - Number of shelters available (pre-hurricane)
  - Hurricane Maria impacts to communities (e.g., loss of telecommunications, deaths/injuries)
  - Hurricane Maria exposures/intensity of exposures (predicted and actual)

Project's Preliminary Investigation Plan (2/3)

- Open-ended interviews conducted with State/Commonwealth, regional and/or local emergency managers and others responsible for communication with the public located in the 3-4 areas

- Information will be collected on the following:
  - Pre-hurricane communication procedures/plans
  - Situational awareness prior/during Hurricane Maria
  - Decisions made about communicating with the public
  - Types of information provided to the public before/during the hurricane via multiple channels (e.g., social media, television/radio, Internet, etc.)
  - Challenges encountered in communicating with each other and the public during and days after the event

Project's Preliminary Investigation Plan (3/3)

- Structured surveys with sampled households within each of the 3-4 selected areas
- Information will be collected on the following:
  - Pre-hurricane preparedness activities
  - Types of emergency information sought/received before/during the hurricane
  - Perceptions of this emergency information
  - Subsequent responses to this information (over time)
  - Information needs during/after the event
  - Challenges encountered in obtaining information during and for days after the event
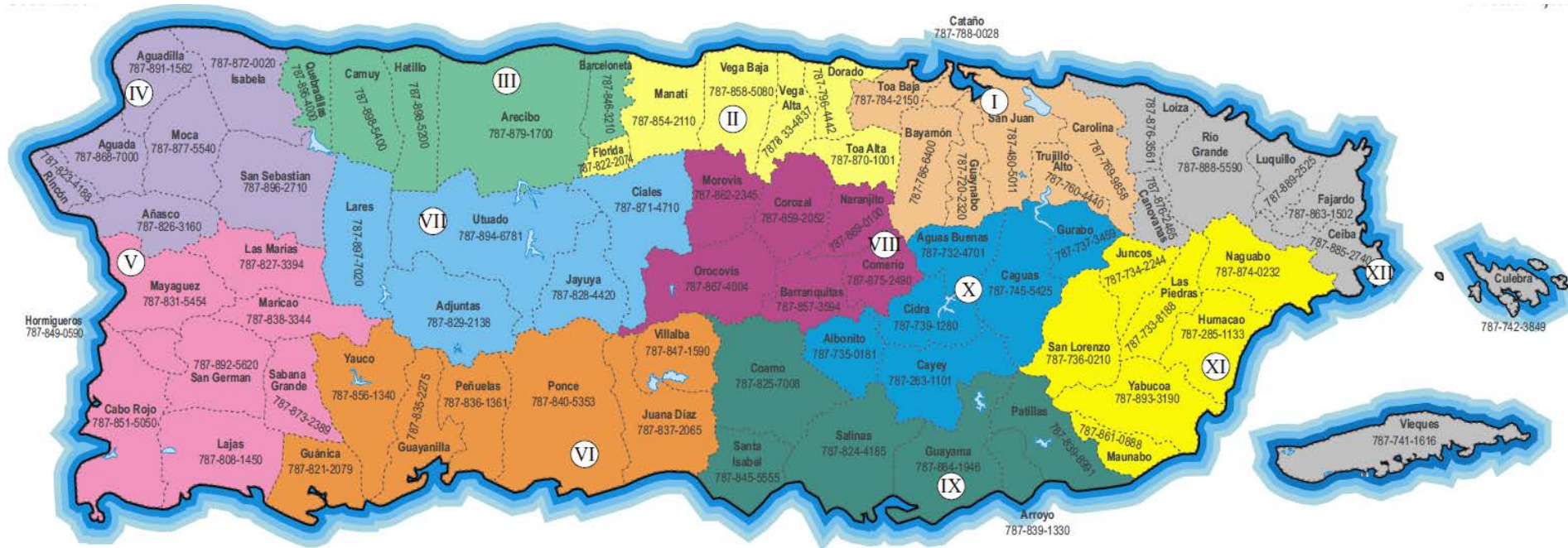
FY18 Planning Tasks

- Other agencies (e.g., NOAA/NWS) with information on emergency communication/messages provided to the public will be identified, and plans will be made on best ways to reach out

- 3-4 areas/locations will be selected

- Specifications will be developed for a Contractor to conduct surveys and interviews
  - (Sources Sought notice currently posted: https://www.fbo.gov/index?s=opportunity&mode=form&id=7b726288d3a629d06a9f7a6792b04809&tab=core&_cview=0)

- Survey and interview protocols will be created

- Sampling strategies among selected areas will be developed

- PRA/IRB approvals will be obtained for the protocols, as necessary

- Additional resources, e.g., term appointments, may be obtained to assist with this project, as necessary

Scoping of the NCST Technical Investigation of Hurricane Maria (Puerto Rico)

Scoping of the NCST Investigation

- Puerto Rico contains ~3.3 M people across 78 municipalities (Source: U.S. Census 2017 population estimates) [https://www.census.gov/quickfacts/PR]

Source: PR.gov
http://prfaa.pr.gov/wp-content/uploads/2017/09/Oficinas-Regionales.pdf

Scoping of the NCST Investigation, cont.

- Goal – to identify areas/regions in Puerto Rico where team can focus and have the highest impact in characterizing:
  - (1) the wind environment and technical conditions associated with deaths and injuries;
  - (2) the performance of representative critical buildings, and designated safe areas in those buildings, including their dependence on lifelines; and
  - (3) the performance of emergency communications systems and the public's response to such communications.

Scoping of the NCST Investigation, cont.

- Therefore, it will be important for the Goals (1-3) to focus on the areas where we can have most impact
- For example, areas that provide heterogeneity in the following:
  - Terrain (coastal, inland, mountainous)
  - Population density

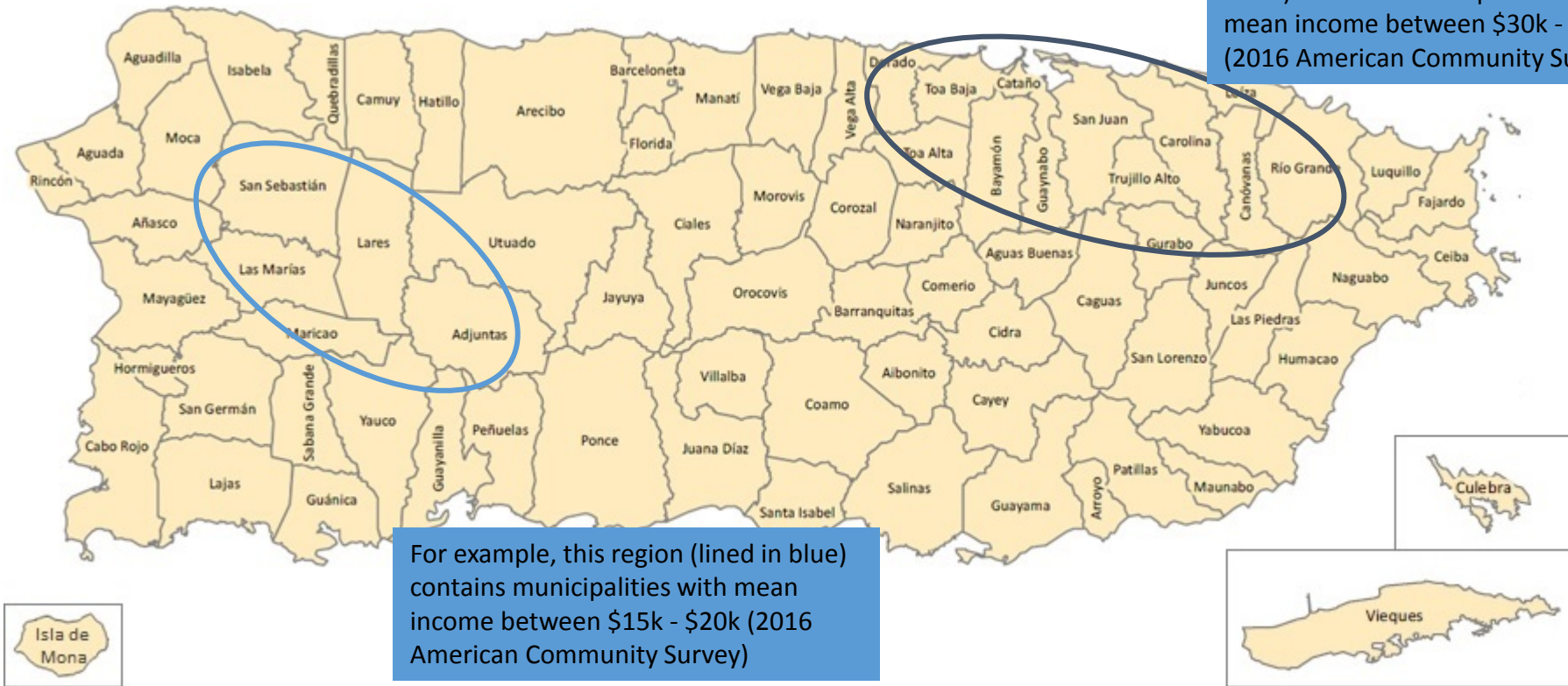# High/Low Density Development in Puerto Rico by Elevation

Source: USDA

Scoping of the NCST Investigation, cont.

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- For example, areas that provide heterogeneity in the following:
  - Terrain (coastal, inland, mountainous)
  - Population density
  - Socio-economic characteristics (e.g., employment, education, and income)

An Example of Differences in Mean Income among Regions in Puerto Rico

For example, this region (lined in black) contains municipalities with mean income between $30k - $60k (2016 American Community Survey)

For example, this region (lined in blue) contains municipalities with mean income between $15k - $20k (2016 American Community Survey)

Source: http://www2.pr.gov/oech/oech/RegistroNacional/Pages/Propiedades-de-PR-Incluidas.aspx
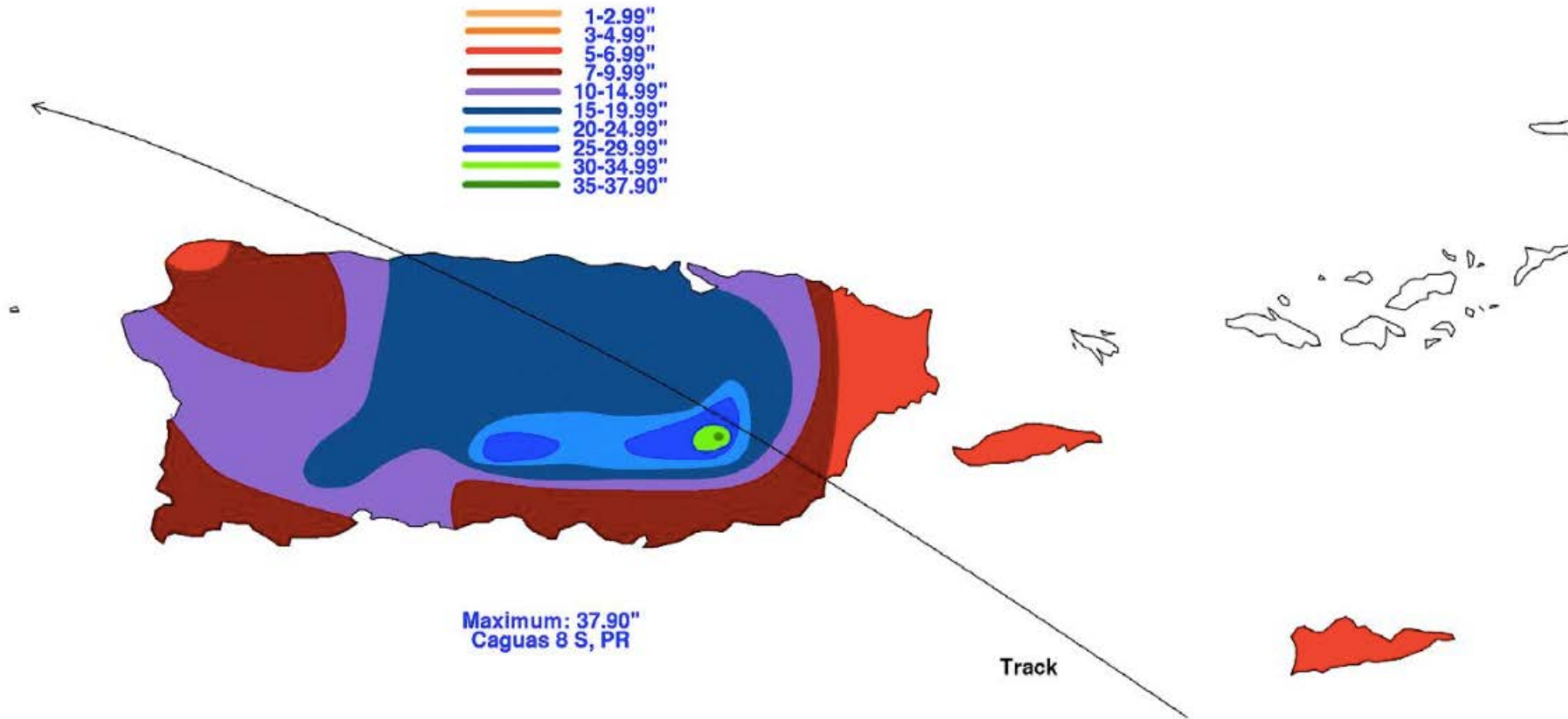
Scoping of the NCST Investigation, cont.

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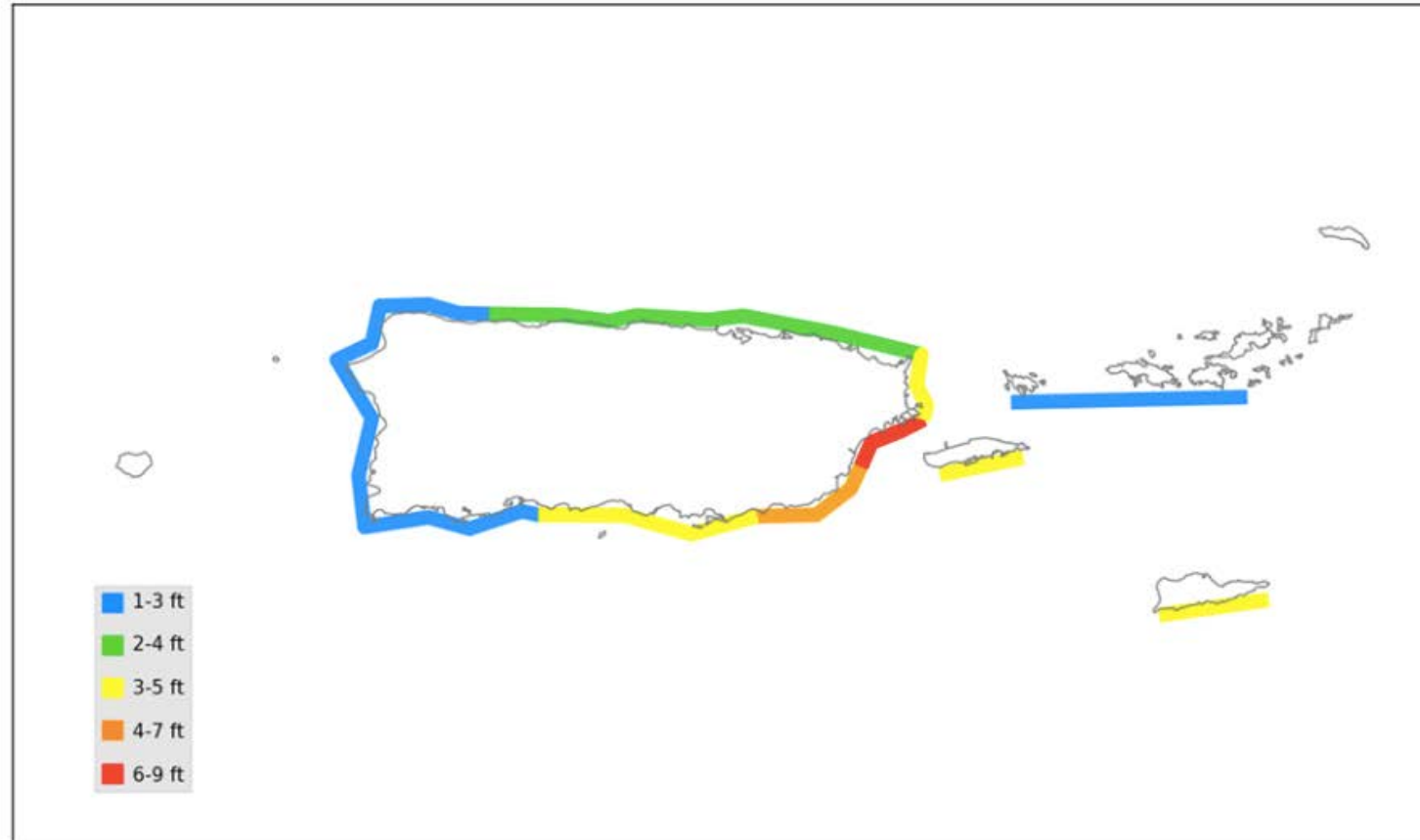
Hurricane Maria Estimated Peak Wind Speeds
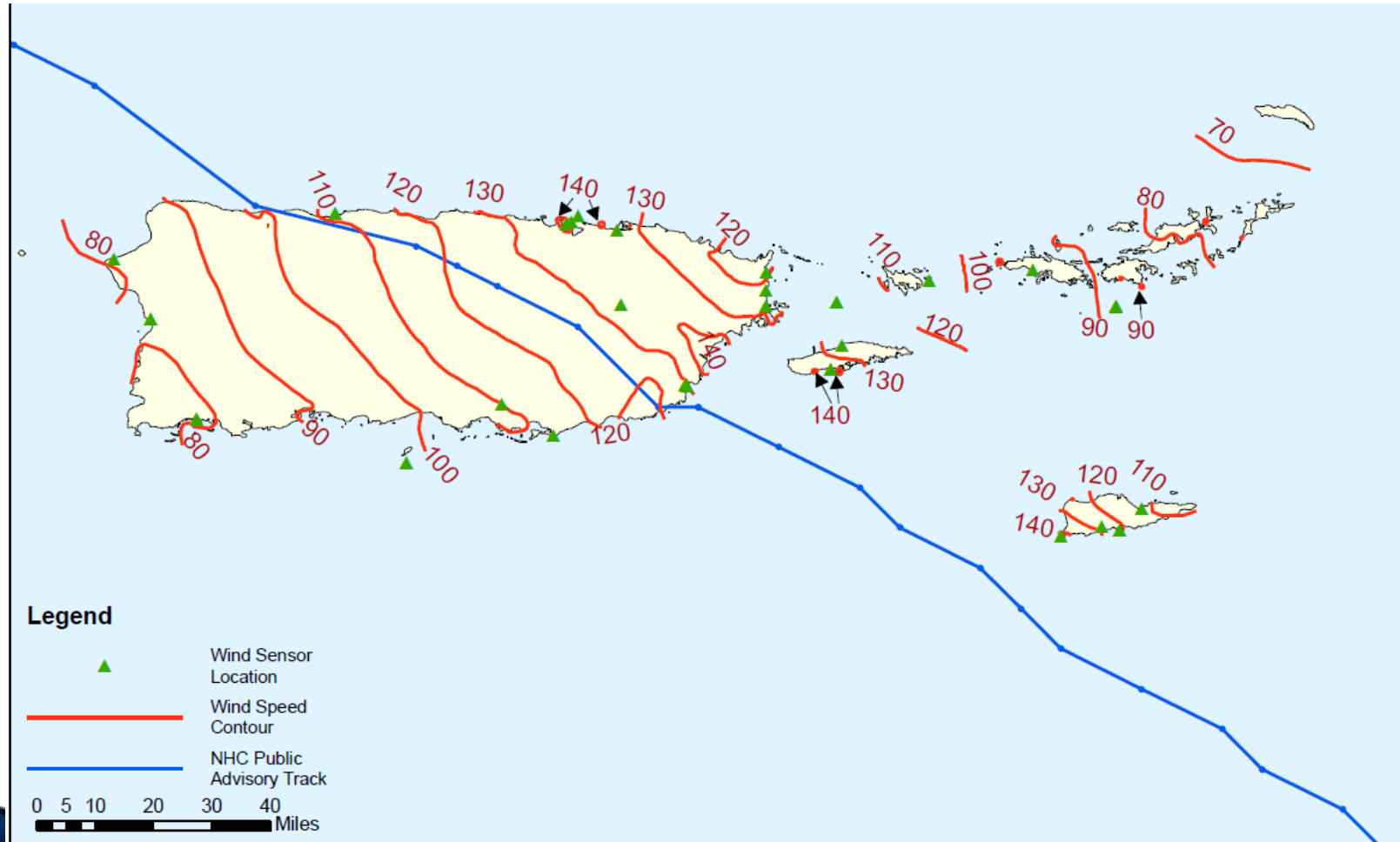
Hurricane Maria Estimated Storm Total Rainfall
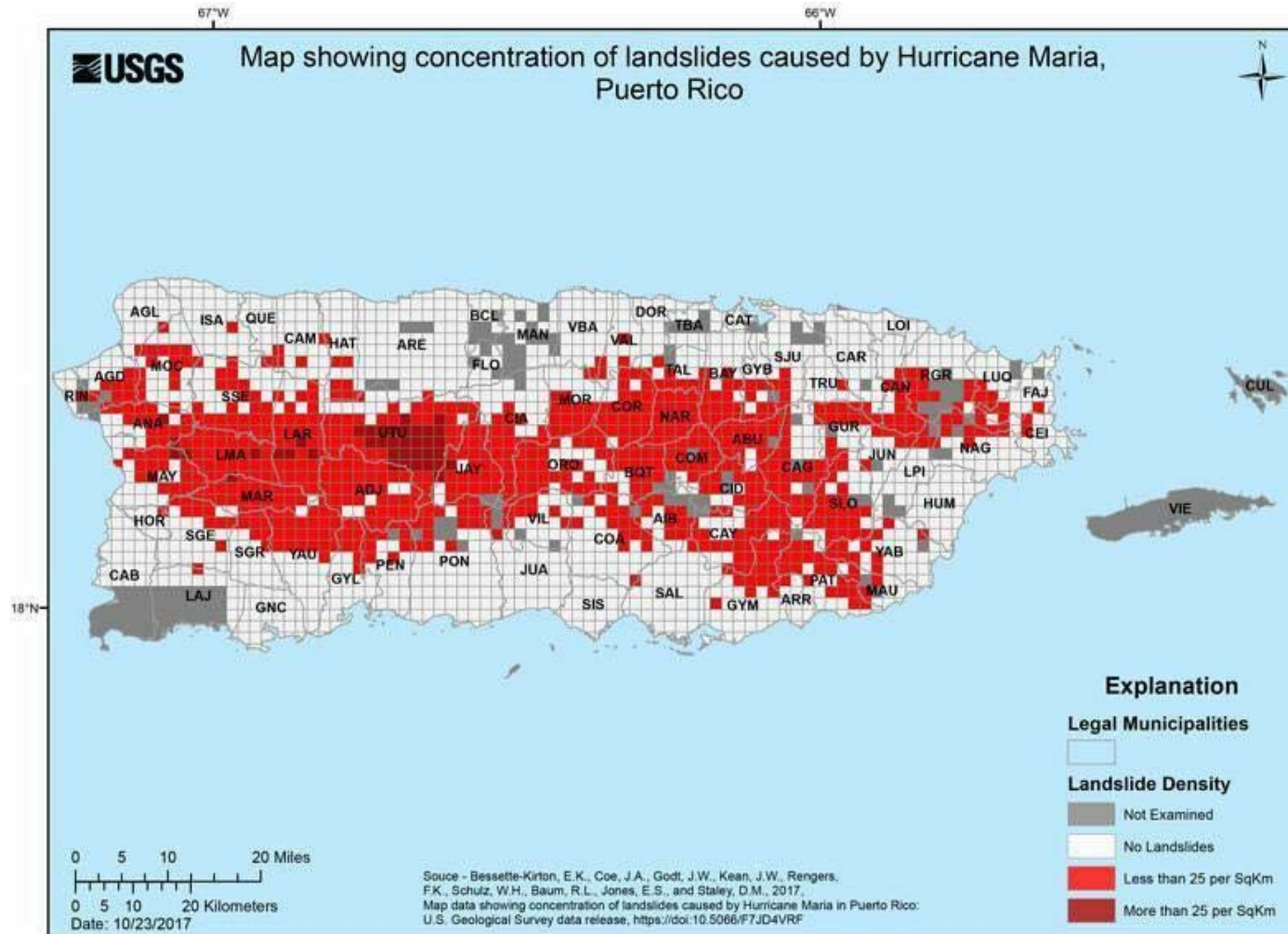

Source: NOAA

Hurricane Maria Estimated Storm Surge Inundation

NHC Total Water Level Estimate

1-3 ft
2-4 ft
3-5 ft
4-7 ft
6-9 ft

Source: NOAA

Hurricane Maria Estimated Concentration of Landslides

Source: USGS

Scoping of the NCST Investigation, cont.

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  - Terrain (coastal, inland, mountainous)
  - Population density
  - Socio-economic characteristics (e.g., employment, education, and income)
  - Hurricane Maria exposures/risks to and impacts on the island of Puerto Rico (e.g., high winds, rainfall, storm surge, and landslides)
  - Impact of Hurricane Maria on communities, including
    - Areas where significant damage occurred to critical buildings (hospitals and schools) and supporting lifelines, as well as areas where little damage occurred (especially in areas hit hardest by the hurricane)
    - Areas where a significant number of deaths/injuries occurred

Preliminary Study Regions of Interest

Source: PR.gov
http://prfaa.pr.gov/wp-content/uploads/2017/09/Oficinas-Regionales.pdf

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Questions?

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U.S. Department of Commerce