USGS Involvement in the Passaic River Basin

New Jersey Water Science Center
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In cooperation with the New Jersey Department of Environmental Protection

U.S. Department of the Interior
U.S. Geological Survey

Presented at:
NJ Water Monitoring Council Meeting
May 30, 2012

Overview

- Passaic Flood Warning System
- USGS Gages in the Passaic River Basin
- Inundation Mapping
  - General Overview of FIMP
  - Mapping in the Passaic Basin
  - FIM Deliverables
- Alternative to NWS Forecast Point
  - How To Have the Data Alert You
- Further Information

USGS

Passaic Flood Warning System

- The USACE operates and maintains the PFWS through an Economy Act Agreement with NOAA–NWS, USGS, NJDEP, and NJSP–OEM
- The PFWS protects a 935 mi^2 flood basin with 132 communities, including parts of Bergen, Essex, Hudson, Morris, Passaic, Sussex, Somerset, and Union Counties in NJ; and Orange and Rockland Counties in NY.
- This one-of-a-kind system uses unique technology with atypical implementation (non-structural with USACE responsible for operation) to monitor flooding threats in one of the most densely populated river basins in the U.S. (population exceeds 2.5 million, with 20,000+ homes and businesses in the floodplain).
- As part of the Memorandum of Understanding (MOU) between USACE, NOAA – NWS, USGS, NJDEP, and NJSP–OEM, a PFWS Advisory Committee was set up to coordinate PFWS activities.
- The USGS provides technical assistance by operating and maintaining the stream gages and telemetry system that is integrated into the PFWS.

USGS

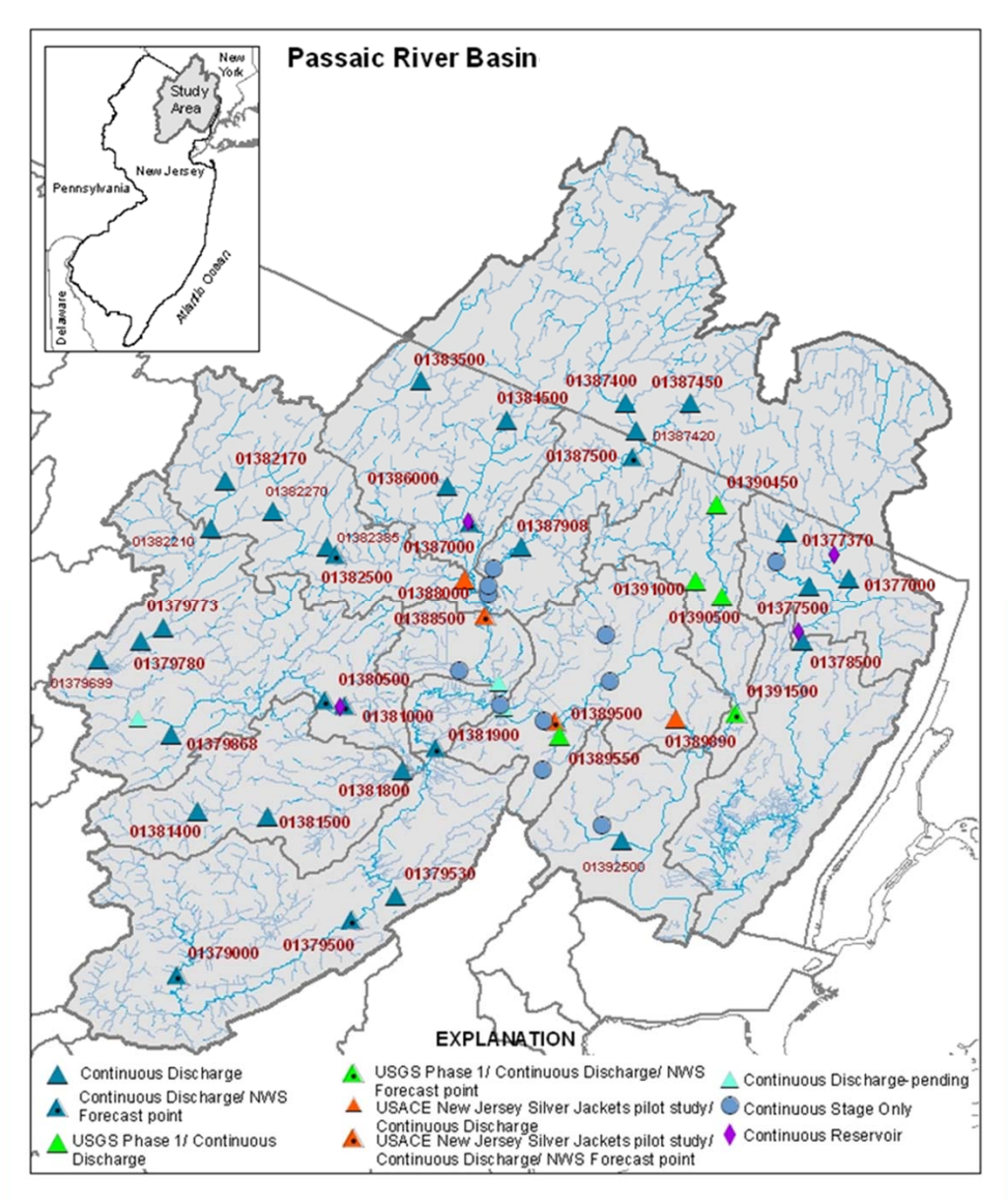
US Army Corps of Engineers® New York District

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

OFFICE OF EMERGENCY MANAGEMENT OEM

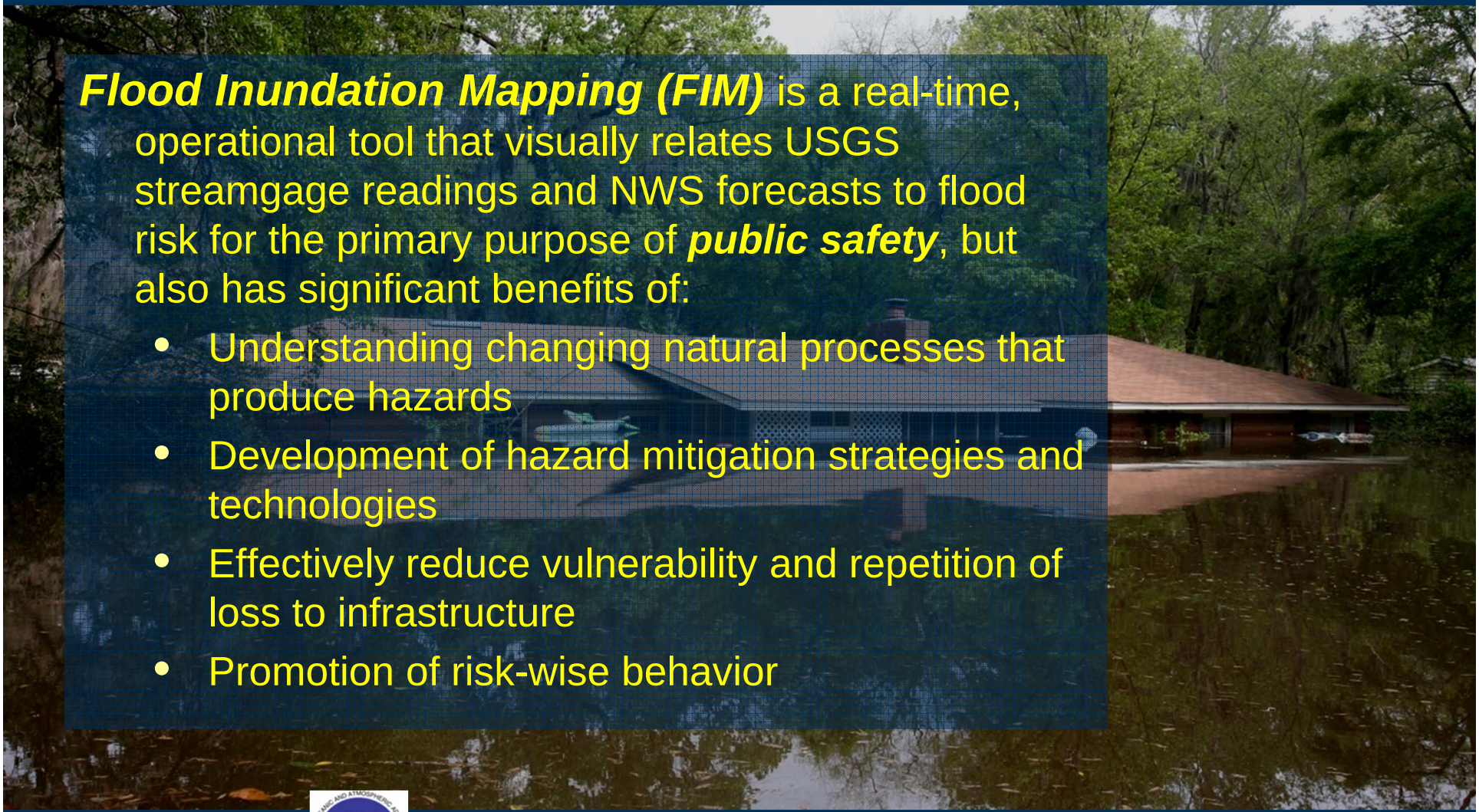
USGS Gages in the Passaic River Basin

- Drainage area: 1,134 mi^2
- Total River miles: 1,964 mi
- Population density: 8,656 people/mi^2
- Mean Annual Precip: 50.08 in
- # of USGS Stream Gages: 61
  - 45 Continuous Discharge Gages (3 pending installation)
  - 11 Continuous Stage Only
  - 5 Continuous Reservoir
- # of NWS Forecast Points: 13 (1 pending installation)



USGS

What is Flood Inundation Mapping?



Flood Inundation Mapping (FIM) is a real-time, operational tool that visually relates USGS streamgage readings and NWS forecasts to flood risk for the primary purpose of ***public safety***, but also has significant benefits of:

- Understanding changing natural processes that produce hazards
- Development of hazard mitigation strategies and technologies
- Effectively reduce vulnerability and repetition of loss to infrastructure
- Promotion of risk-wise behavior

USGS

NOAA

I.M. becomes a tool for flood…

- Preparedness
  - "What-if" scenarios
- Response
  - Tied to gage & forecast data
- Recovery
  - Damage assessment
- Mitigation & planning
  - Flood risk analyses
- Environmental & ecological assessments

Flooded underpass, Beaumont, TX (photo courtesy of L. Roll/FEMA)

USGS

Flood Inundation Mapping Program

1. Consistent visual and electronic format for USGS inundation geospatial products.
2. Static flood inundation map libraries linked to gages/flood forecasts
3. State-of-the art dynamic, real-time flood inundation applications (pilot)
4. A core of USGS and partner agencies
5. National FIM Web portal and mapper

USGS

NOAA

Integrated Water Resources Science and Services

SUMMIT TO SEA

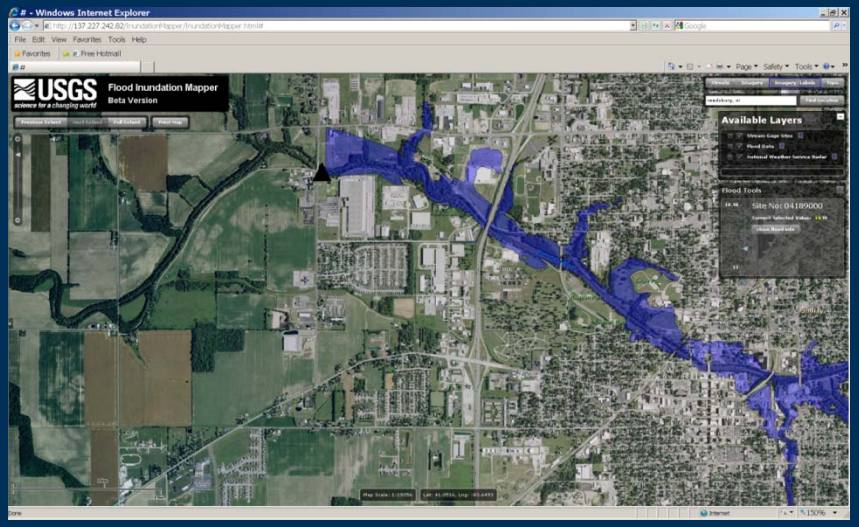
FIMP – partner oriented

- State/local level, to leverage resources for inundation
- On a Federal level, getting the agencies to work together
  - USGS
  - NWS
  - USACE
  - FEMA
  - Integrated Water Resources Science and Services (IWRSS)

USGS

Creation of Inundation-Maps

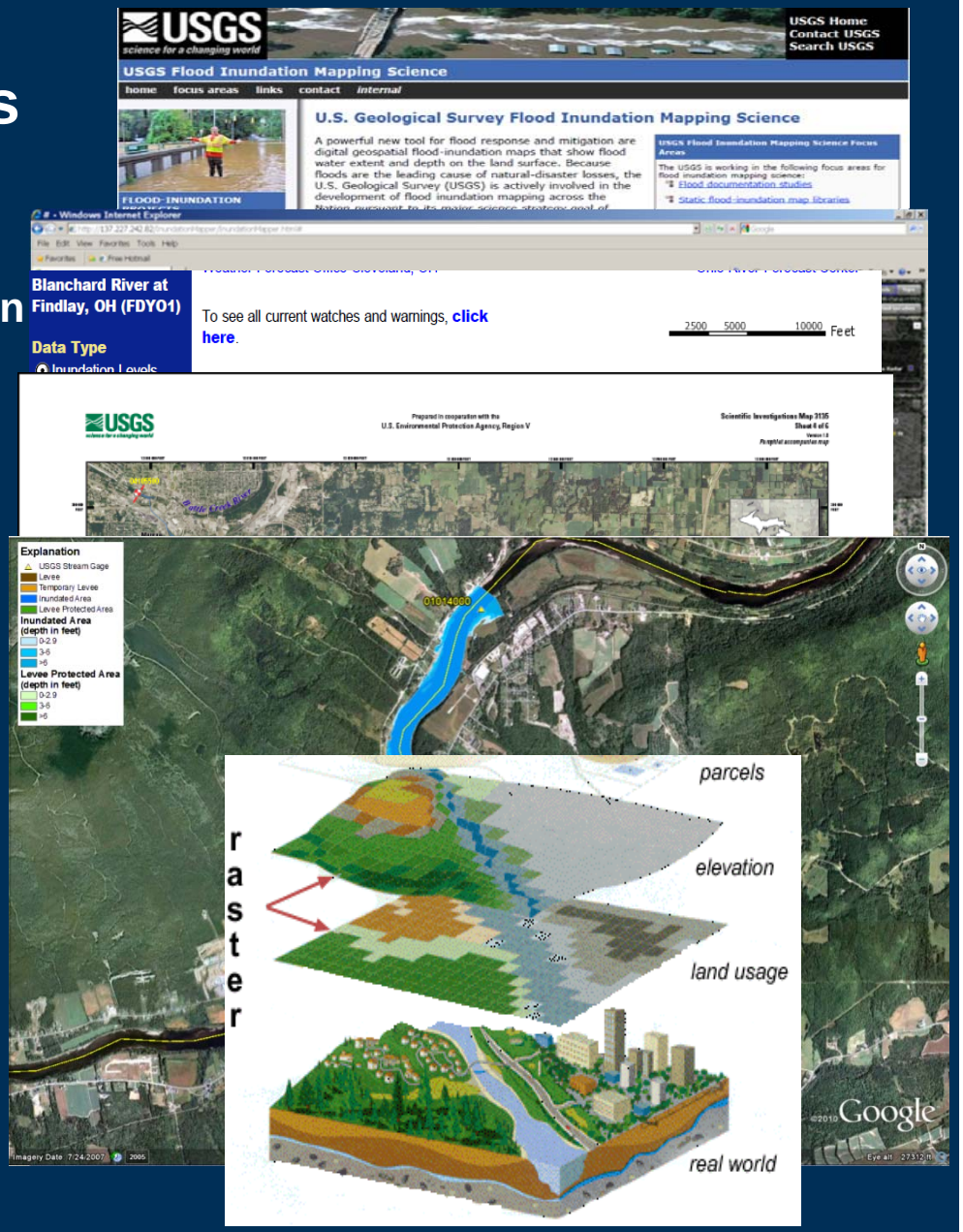
- LiDAR + hydraulic model
- Gage/HWM calibration data
- GIS generated maps
  - bankfull-record stage
  - Predefined map interval
- Linked to USGS real-time gage and NWS flood forecast



USGS

Deliverables

- Inundation-Map Libraries
  - WWW
    - FIMP Web Portal
    - FIMP Web Mapping Application
    - NWS AHPS
  - Print Products
    - PDF
    - JPG
    - SIM
  - KML/KMZ (Google)
  - GIS
    - All spatial files
    - FGDC compliant metadata



USGS

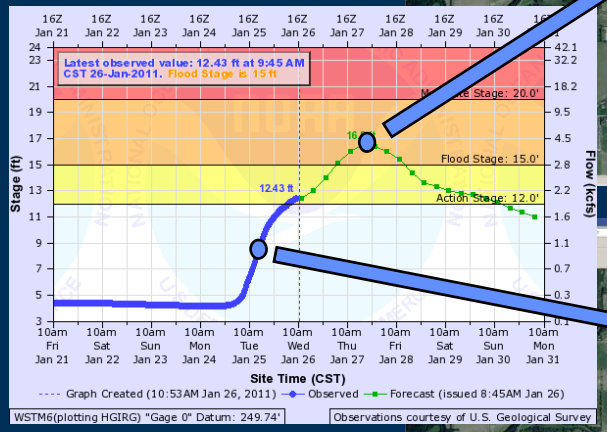
Purpose and Scope

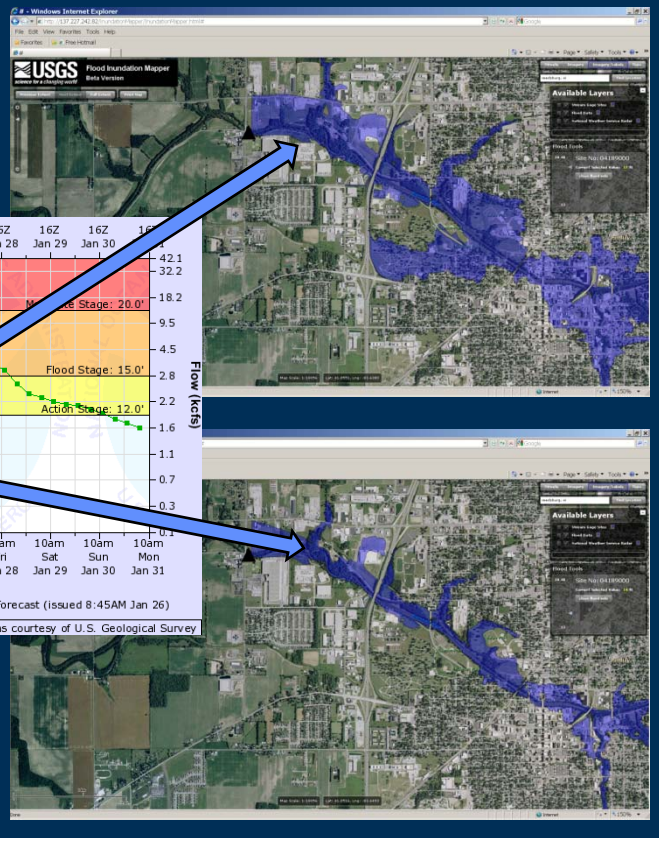
- As recommended by the Passaic River Basin Flood Advisory Commission in its Report to the Governor, January 2011
  - Develop a library of detailed digital flood-inundation maps (FIMs) that correspond to a range of flood elevations on selected portions of streams in the Passaic River Basin
  - Maps will depict estimates of the areal extent and depth of flooding at one-foot increments ranging from approx NWS Action Stage to the extent of the rating curve at the associated USGS streamgage

USGS

Purpose and Scope (cont)

- FIMs, used in conjunction with USGS real-time streamgage data & NWS flood forecasts, allow users to **visualize** current and forecasted flood-inundated areas
  - EM officials and residents can **see** where the potential threat of flood waters is highest





USGS

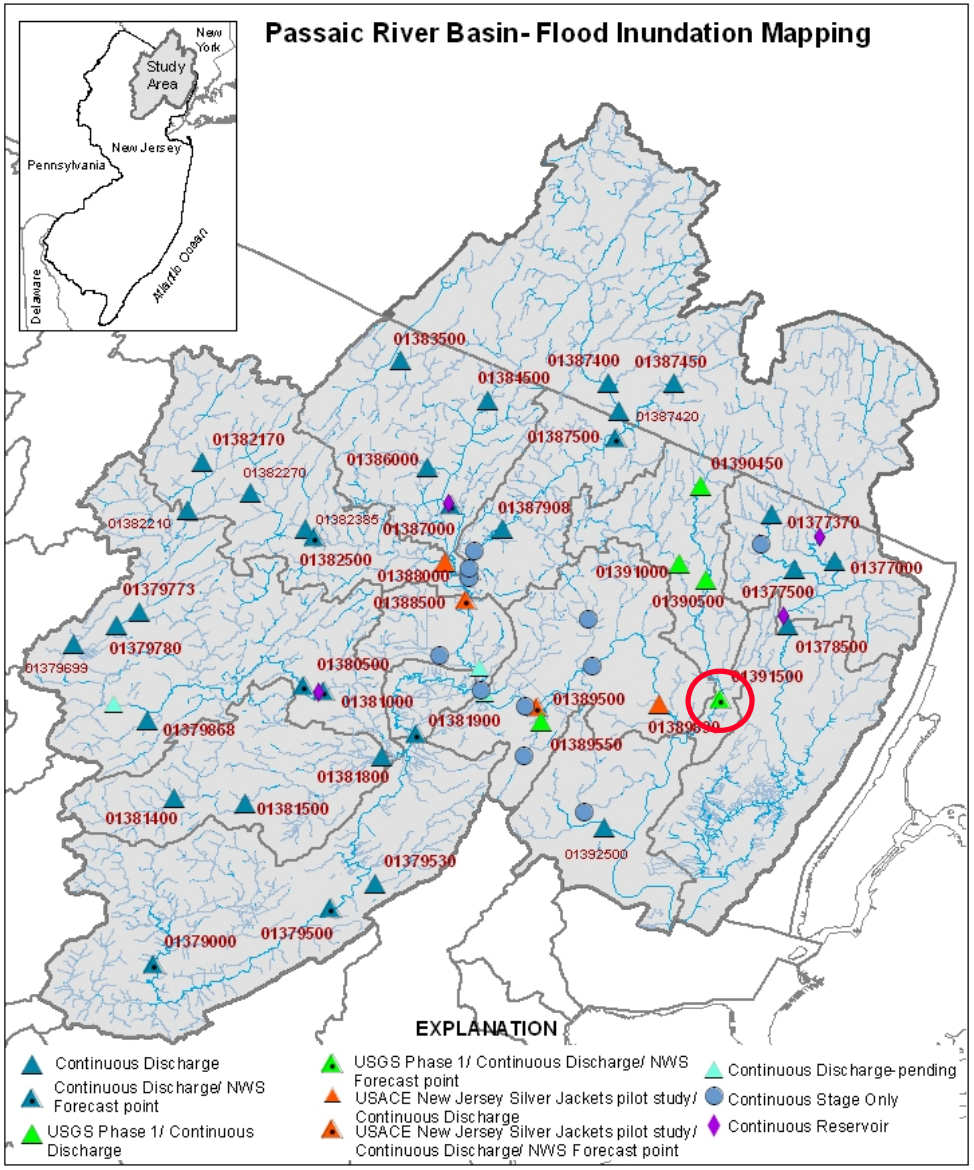
Passaic FIM

- USGS FIMI began (June 2010)
  - Pilot Study--Saddle River at Lodi
- Passaic River Basin Flood Advisory Commission Report to the Governor (January 2011)
  - NJDEP assessed the PRB for locations of NWS forecast points & real time USGS gages near high-risk municipalities (April 2011)
- USGS signed JFA w/ NJDEP and work began on Phase 1—which includes 5 gage locations (May 2011)
- NJ Silver Jackets Pilot Study (lead by ACOE) will map 4 gage locations

NJDEP Inundation Mapping Priority List
Passaic-Hackensack Watershed
December 14, 2011

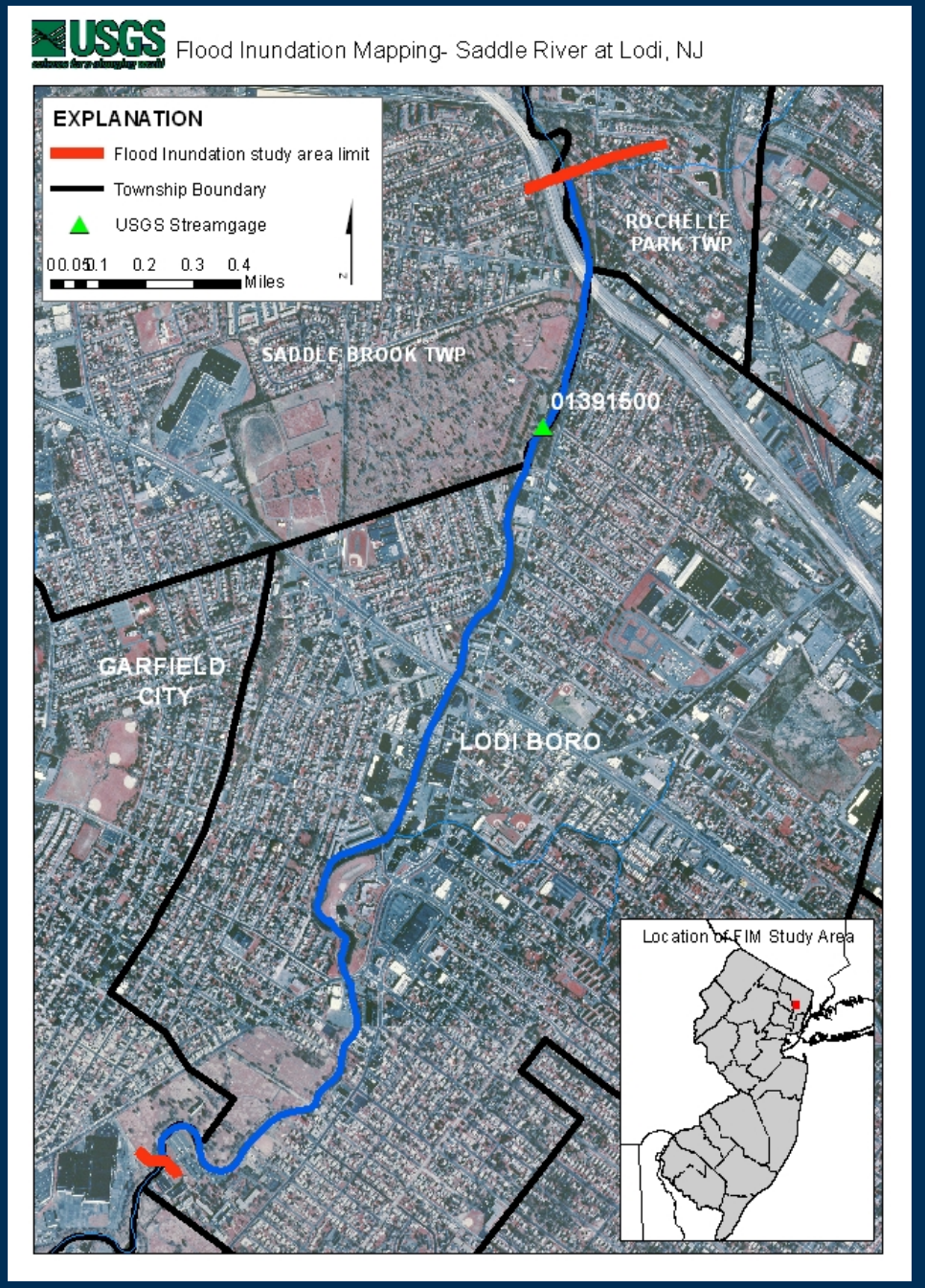
Priority	USGS Gage	AHPS Forecast Point	Site Name	Basin	Hydraulic Model Available or to be Available in Digital Format	Hydraulic Model Details
1	01391500	yes	SADDLE RIVER AT LODI NJ	Passaic	yes	2005 FEMA model
2	01389500	yes	PASSAIC RIVER AT LITTLE FALLS NJ	Passaic	yes	expected March 2011 FEMA/RAMPP
3	01381900	yes	PASSAIC RIVER AT PINE BROOK NJ	Passaic	yes	expected March 2011 FEMA/RAMPP
4	01388000	yes	RAMAPO RIVER AT POMPTON LAKES NJ	Passaic	yes	Gate Reevaluation Feb 2012 NJDEP/AECOM
5	01388500	yes	POMPTON RIVER AT POMPTON PLAINS NJ	Passaic	yes	expected 2012 NJDEP/AECOM
6	01387500	yes	RAMAPO RIVER NEAR MAHWAH NJ	Passaic	yes	expected 2012 NJDEP/AECOM
7	01387000	yes	WANAQUE R AT WANAQUE NJ	Passaic	yes	expected 2012 NJDEP/URS
8	01379500	yes	PASSAIC RIVER NEAR CHATHAM NJ	Passaic	yes	1990 FEMA
9	01379000	yes	PASSAIC RIVER NEAR MILLINGTON NJ	Passaic	yes	1990 FEMA
10	01380500	yes	ROCKAWAY RIVER ABOVE RESERVOIR AT BOONTON NJ	Passaic	no	1984 FEMA
11	01380500	yes	ROCKAWAY RIVER BELOW RESERVOIR AT BOONTON NJ	Passaic	no	1984 FEMA
12	01389550	no	PECKMAN RIVER AT LITTLE FALLS NJ	Passaic	yes	2001 FEMA model, 2005 ACOE model
13	01389890	no	PASSAIC RIVER U/S DUNDEE DAM AT CLIFTON NJ	Passaic	yes	expected March 2011 FEMA/RAMPP
14	01382500	no	PEQUANNOCK RIVER AT RIVERDALE NJ	Passaic	yes	expected June 2011 FEMA/RAMPP
15	01387908	no	RAMAPO RIVER AT RAILROAD BRIDGE AT OAKLAND NJ	Passaic	yes	expected 2012 NJDEP/AECOM
16	01390500	no	SADDLE R AT RIDGEWOOD NJ	Passaic	yes	2005 FEMA model
17	01391000	no	HOHOKUS BROOK AT HO-HO-KUS NJ	Passaic	yes	2005 FEMA model
18	01390450	no	SADDLE RIVER AT UPPER SADDLE RIVER NJ	Passaic	yes	2005 FEMA model
19	01381800	no	WHIPPANY R NR PINE BROOK NJ	Passaic	no	1984 FEMA
20	01381500	no	WHIPPANY RIVER AT MORRISTOWN NJ	Passaic	no	1984 FEMA
21	01381400	no	WHIPPANY R NR MORRISTOWN NJ	Passaic	no	1984 FEMA
22	01377500	no	PASCACK BROOK AT WESTWOOD NJ	Hackensack	yes	2001 FEMA model
23	01377370	no	PASCACK BROOK AT PARKRIDGE NJ	Hackensack	yes	2001 FEMA model; expected 2012 NJDEP/URS
24	01378500	no	HACKENSACK RIVER AT NEW MILFORD NJ	Hackensack	yes	1982 NJDEP/FEMA; expected 2012 NJDEP/URS
25	01377000	no	HACKENSACK RIVER AT RIVERVALE NJ	Hackensack	yes	1979 NJDEP/FEMA; expected 2012 NJDEP/URS
26	01382500	yes	PEQUANNOCK R AT MACOPIN INTAKE DAM NJ	Passaic	yes	expected June 2011 FEMA/RAMPP
27	01379630	no	CANOE BROOK NEAR SUMMIT NJ	Passaic	no	none available
28	01379060	no	Mill Brook at Route 10 at Victory Gardens NJ	Passaic	no	none available
29	01386000	no	WEST BROOK NEAR WANAQUE NJ	Passaic	yes	1979 NJDEP/FEMA; expected 2012 NJDEP/AECOM
30	01382170	no	Pequannock River at NJ Route 23 near Oak Ridge NJ	Passaic	no	1986 NJDEP/FEMA (Project R)

USGS NJ Water Resource Center Tasked
USACE NY District Tasked - through Silver Jackets Grant Award to NJ



Lodi Study Area

- **Saddle River from Rochelle Park to Lodi, NJ**
  - Approximately 0.8 mi upstream and 2.1 mi downstream of USGS streamgage 01391500 Saddle River at Lodi, NJ



USGS

USGS Flood Inundation Mapping- Saddle River at Lodi, NJ
Stage- 5 ft

Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 5.0 Feet and an Altitude of 29.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)

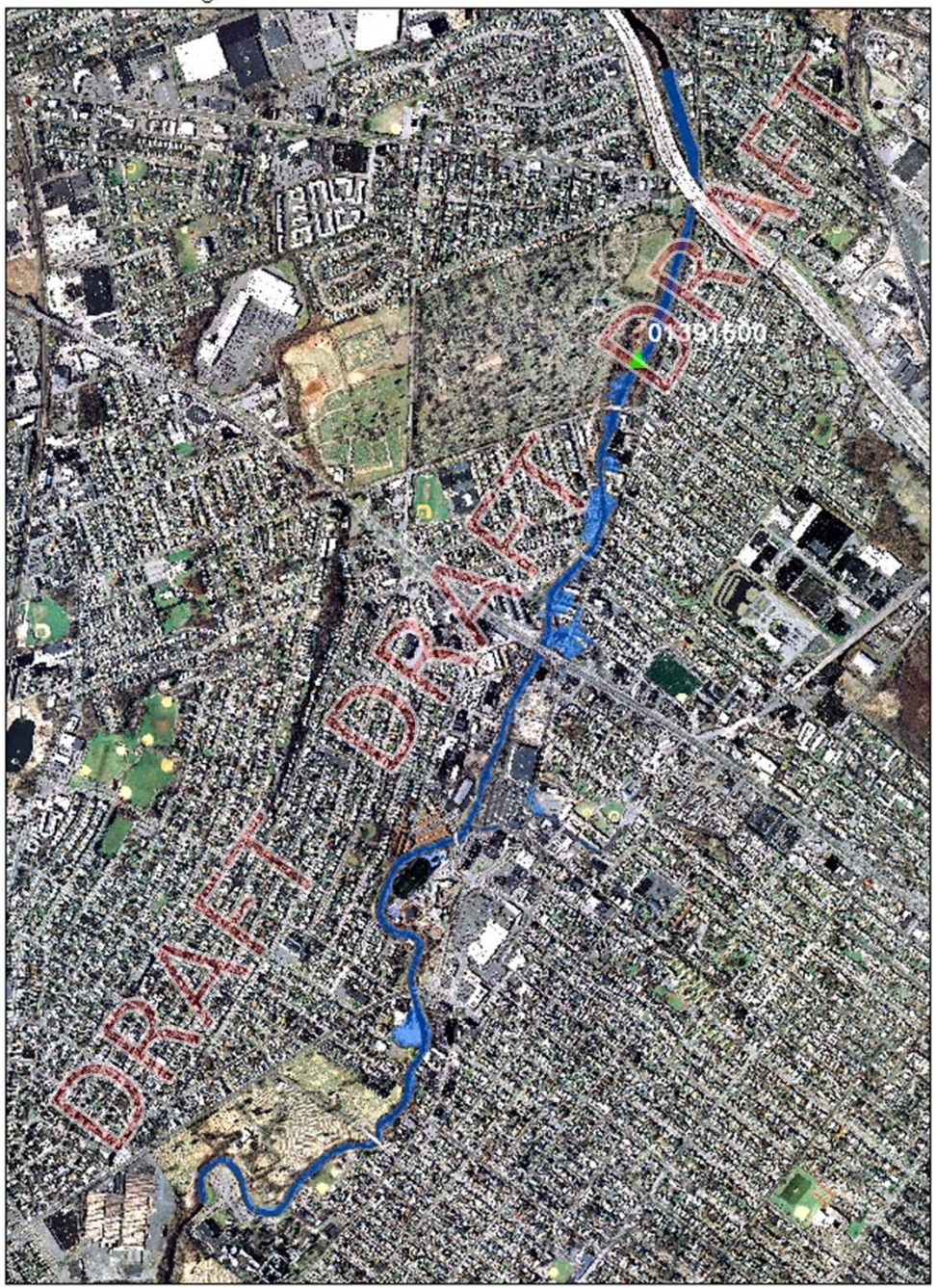
USGS Flood Inundation Mapping- Saddle River at Lodi, NJ
Stage- 6 ft

Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 6.0 Feet and an Altitude of 30.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)

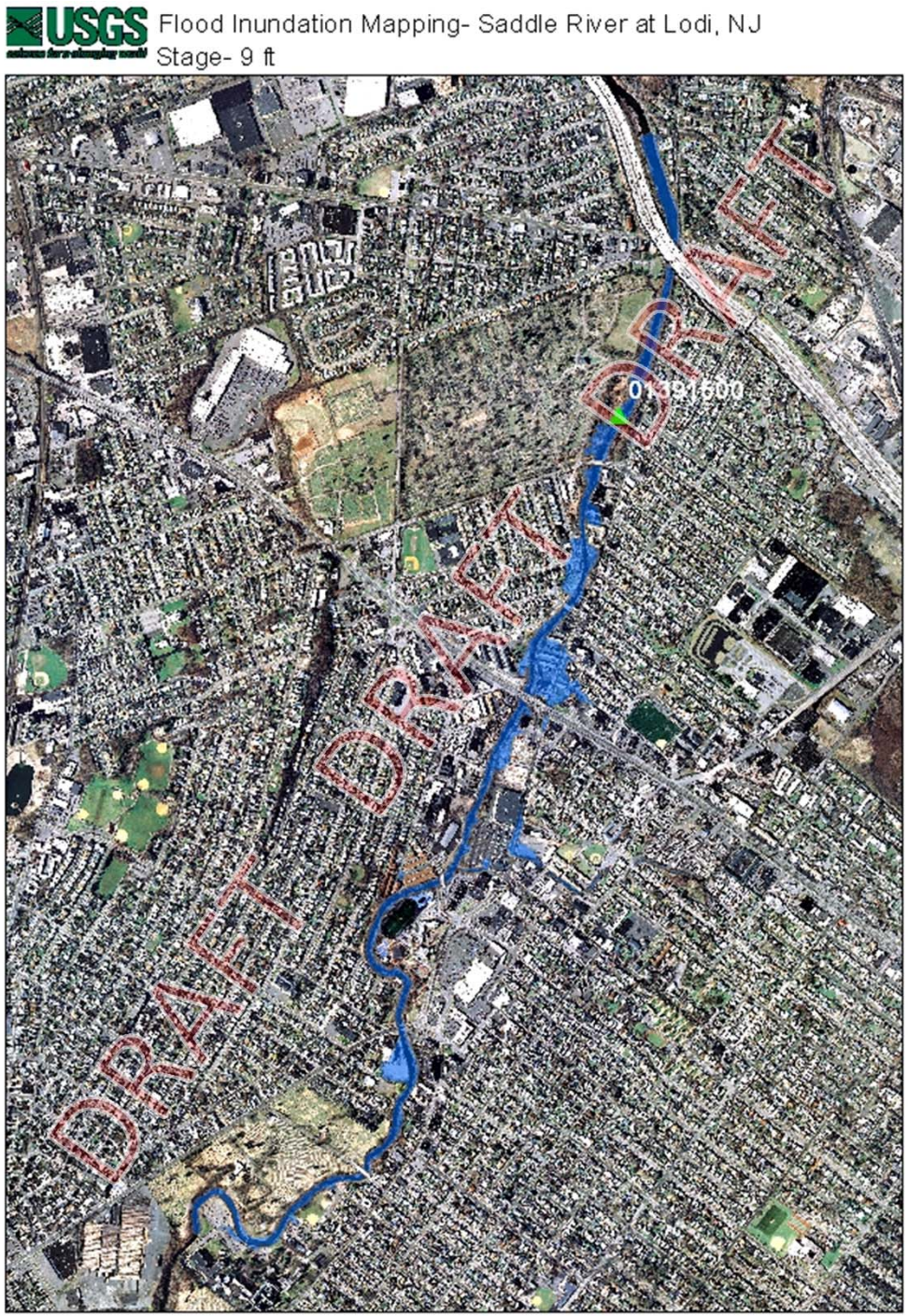
USGS Flood Inundation Mapping- Saddle River at Lodi, NJ
Stage- 7 ft

Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 7.0 Feet and an Altitude of 31.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)

USGS Flood Inundation Mapping- Saddle River at Lodi, NJ
Stage- 8 ft

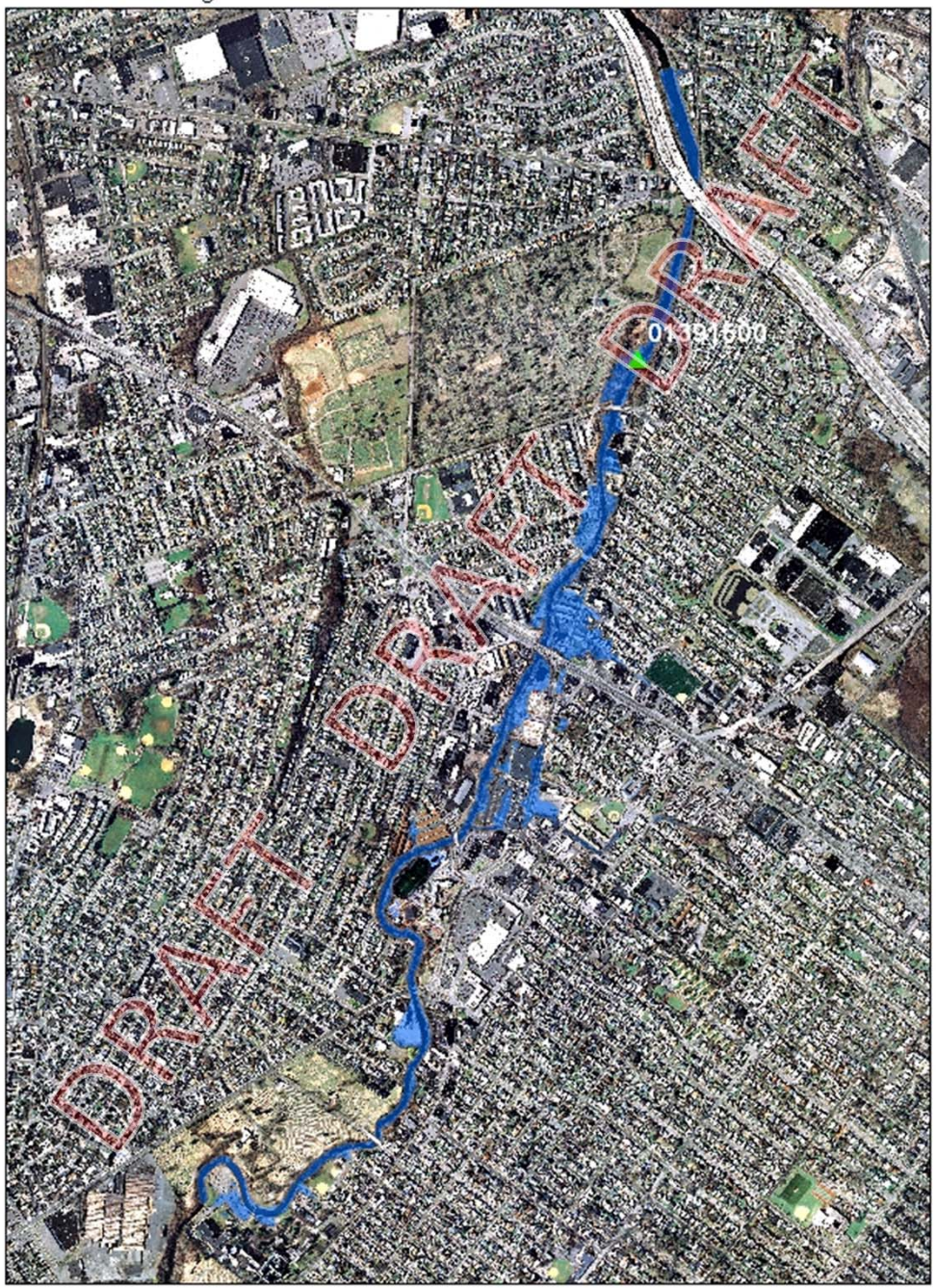


Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 8.0 Feet and an Altitude of 32.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)



Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 9.0 Feet and an Altitude of 33.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)

USGS Flood Inundation Mapping- Saddle River at Lodi, NJ
Stage- 10ft



Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 10.0 Feet and an Altitude of 34.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)

USGS Flood Inundation Mapping- Saddle River at Lodi, NJ
Stage- 11 ft

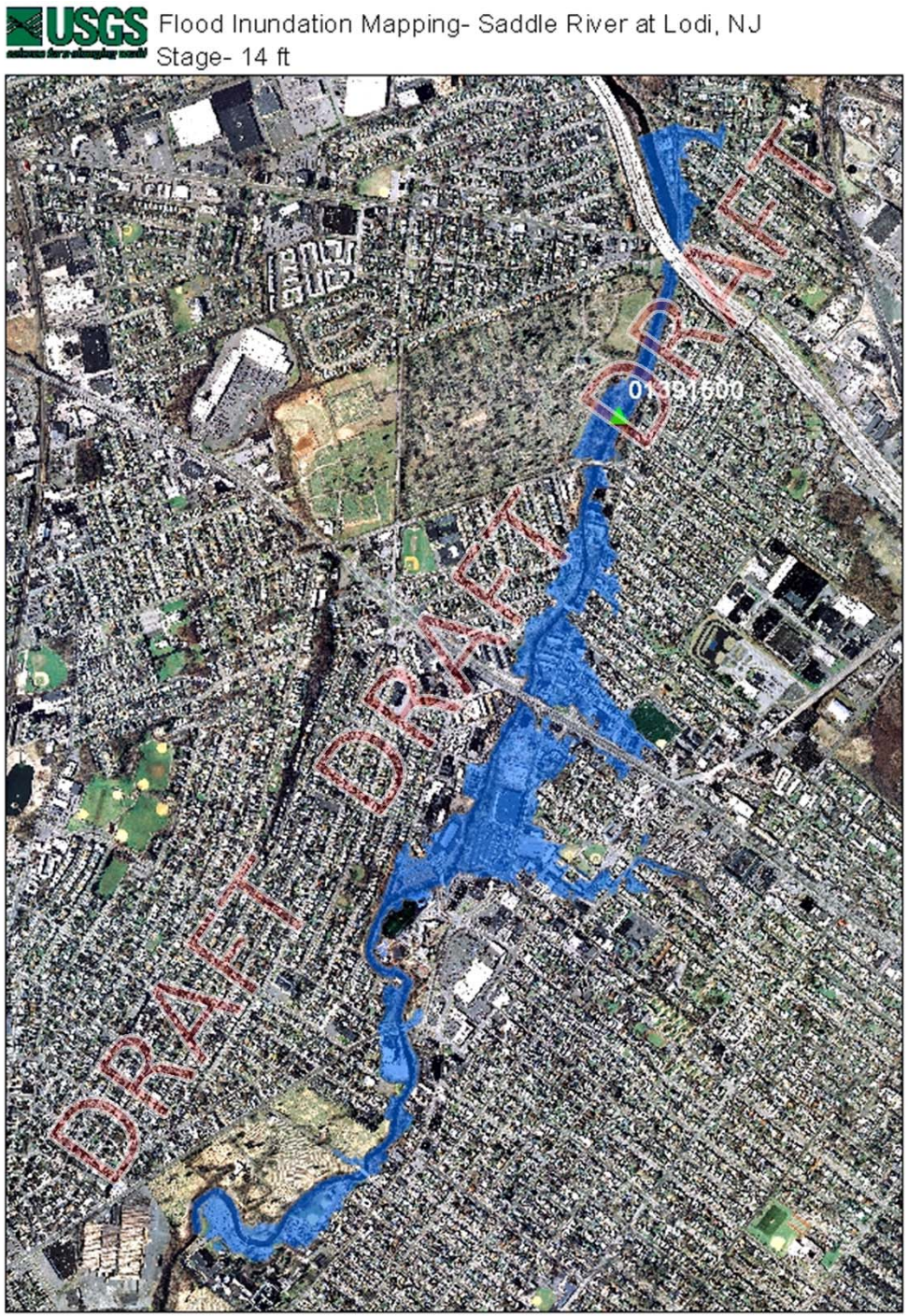
Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 11.0 Feet and an Altitude of 35.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)

USGS Flood Inundation Mapping- Saddle River at Lodi, NJ
Stage- 12 ft

Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 12.0 Feet and an Altitude of 36.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)

USGS Flood Inundation Mapping- Saddle River at Lodi, NJ
Stage- 13 ft

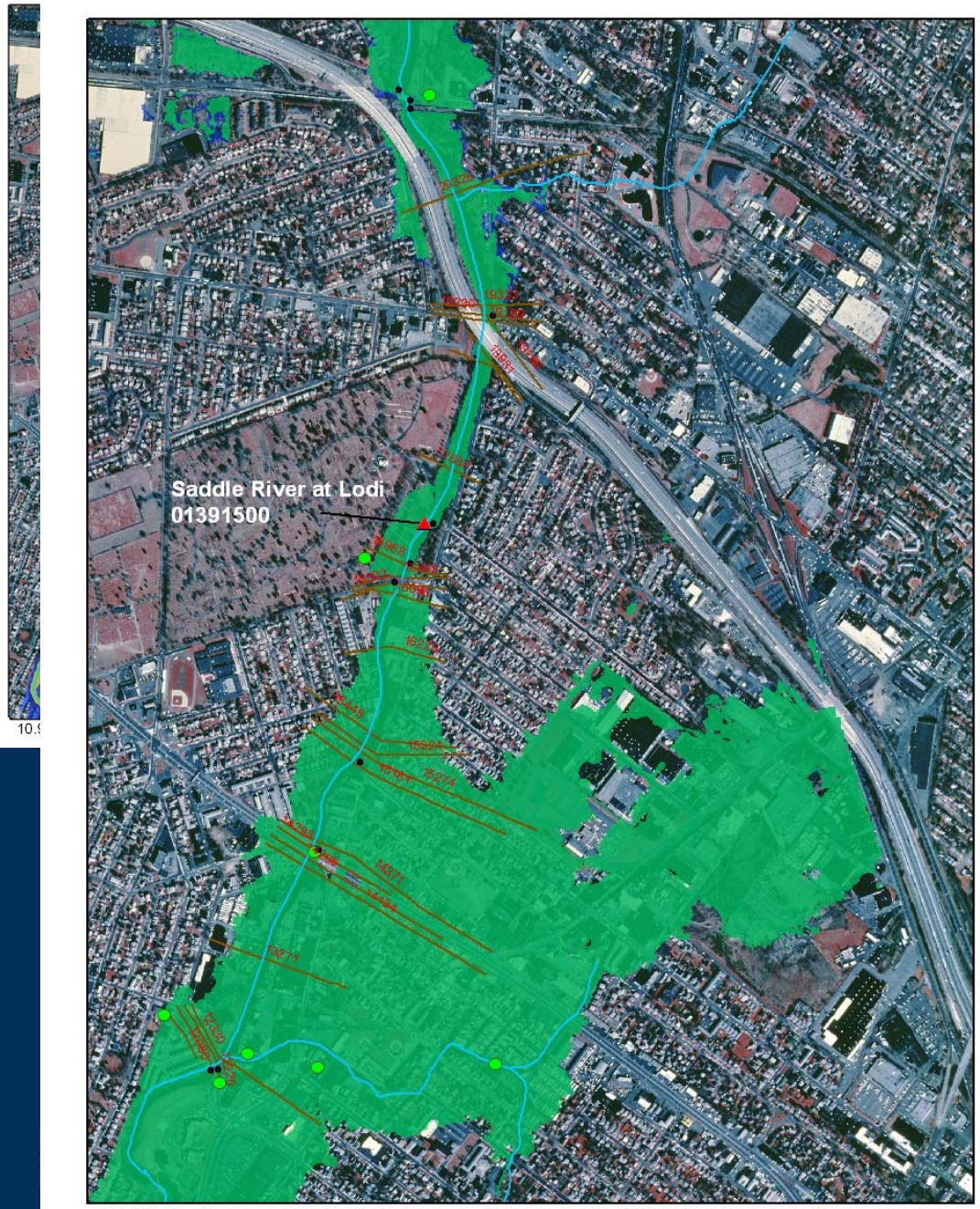
Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 13.0 Feet and an Altitude of 37.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)



Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 14.0 Feet and an Altitude of 38.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)

USGS Flood Inundation Mapping- Saddle River at Lodi, NJ
Stage- 15 ft

Estimated Flood-Inundation Map for the Saddle River from Market Street in Saddle Brook to Arnot Street in Lodi, New Jersey for a Flood Corresponding to a Gage Height of 15.0 Feet and an Altitude of 39.0 Feet (NAVD88) at the U.S. Geological Survey Streamgage at Lodi, New Jersey (Station ID 01391500)



13.94 ft stage- Floyd 1999 Flood- green; Blue 14 ft flood statge from model

Quality Assurance with HWMs

Flood of 1971

Flood of 1977

Floyd 1999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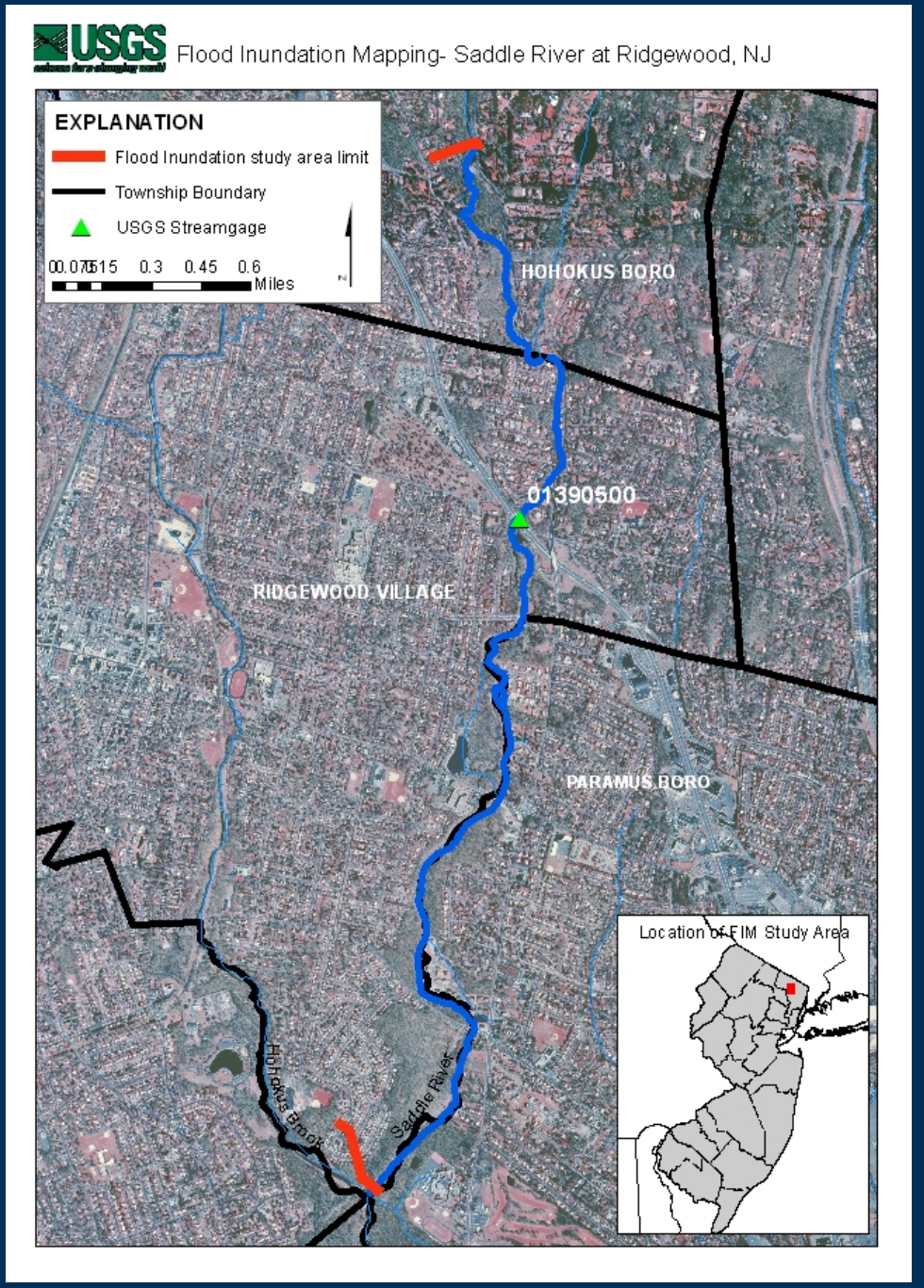
Ridgewood Study Area

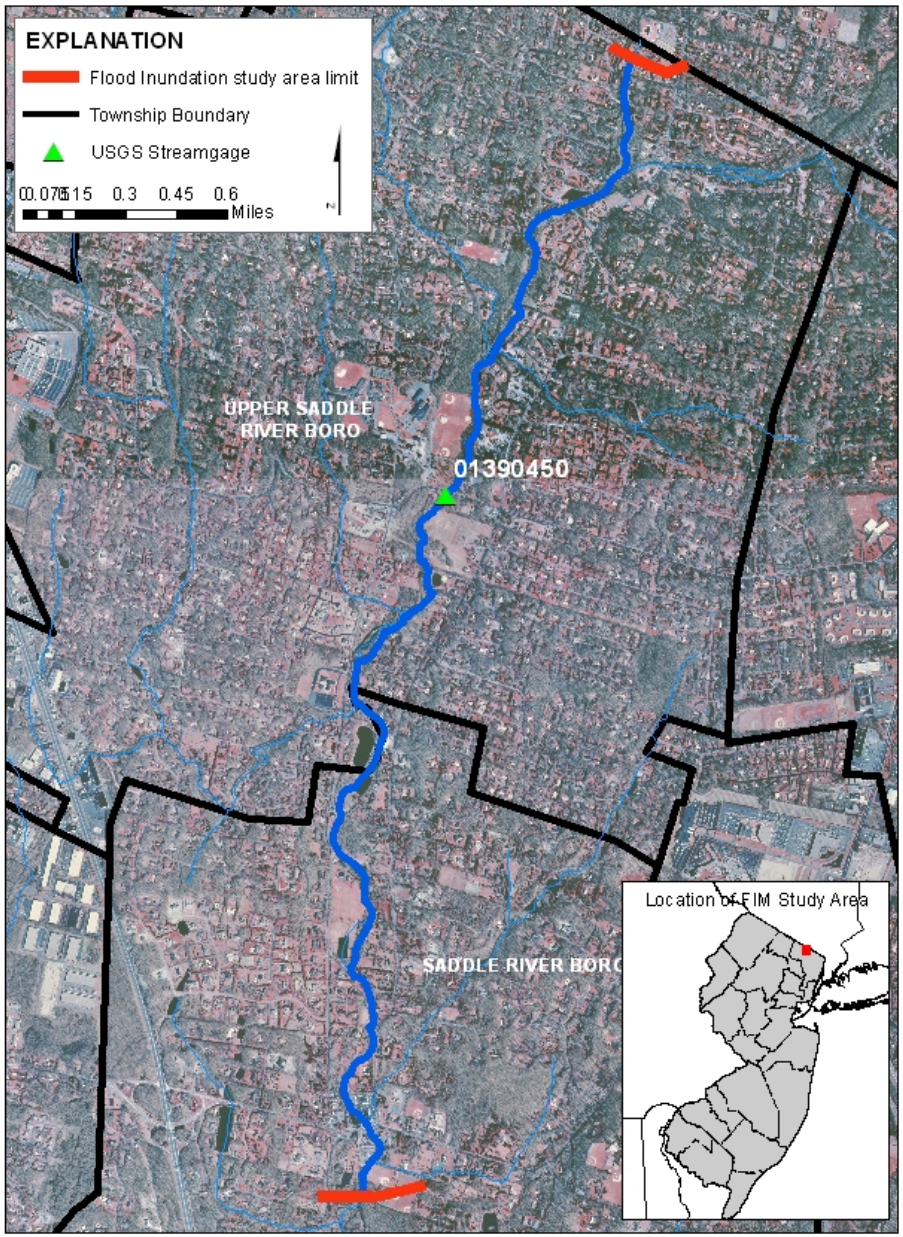
- **Saddle River from Ho-Ho-Kus to Paramus, NJ**
  - Approximately 1.5 mi upstream and 2.5 mi downstream of USGS streamgage 01390500 Saddle River at Ridgewood, NJ



USGS

Upper Saddle River Study Area

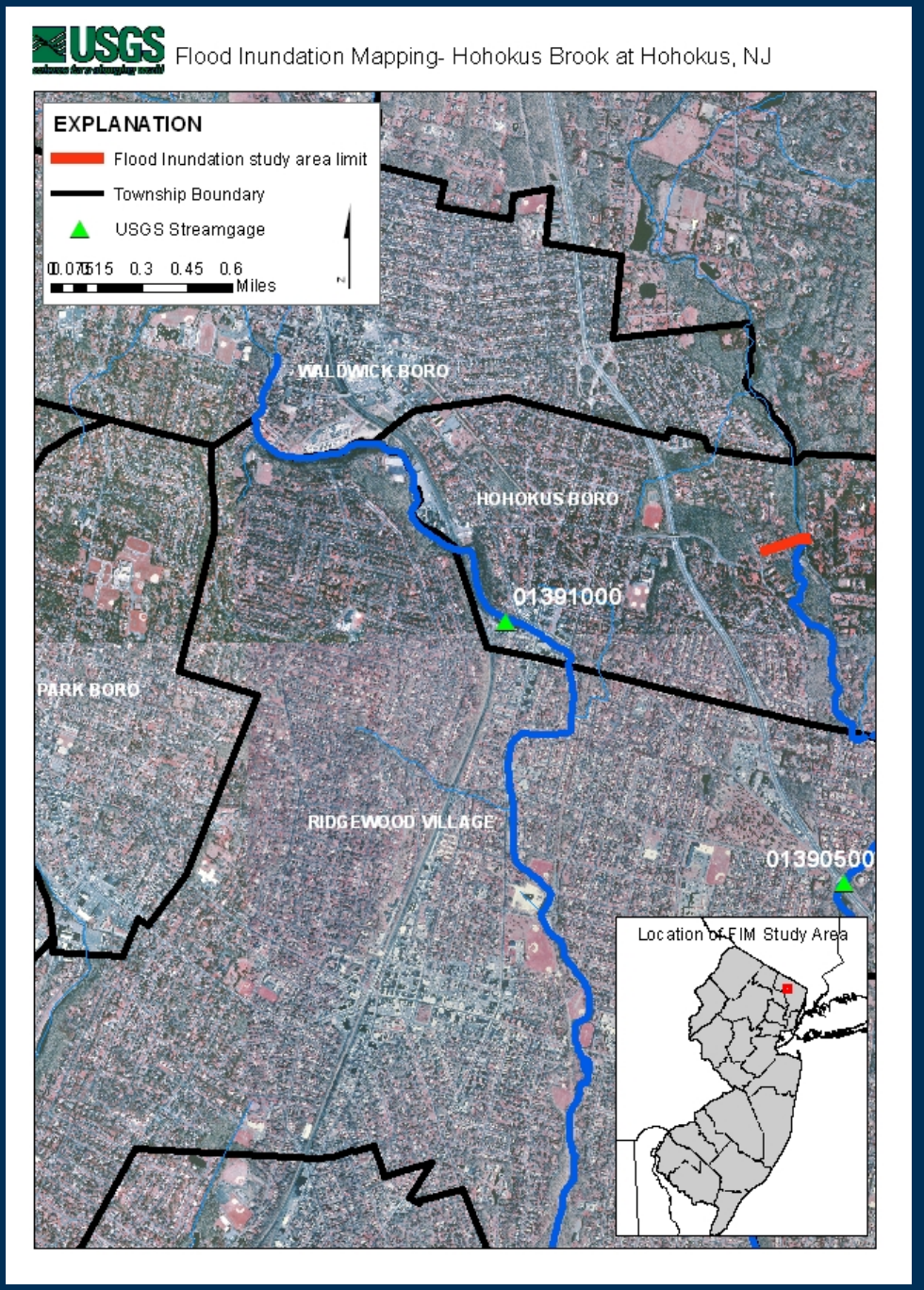
- **Saddle River from Upper Saddle River to Saddle River, NJ**
  - Approximately 1.6 mi upstream and 2.4 mi downstream of USGS streamgage 01390450 Saddle River at Upper Saddle River, NJ



USGS

Ho-Ho-Kus Study Area

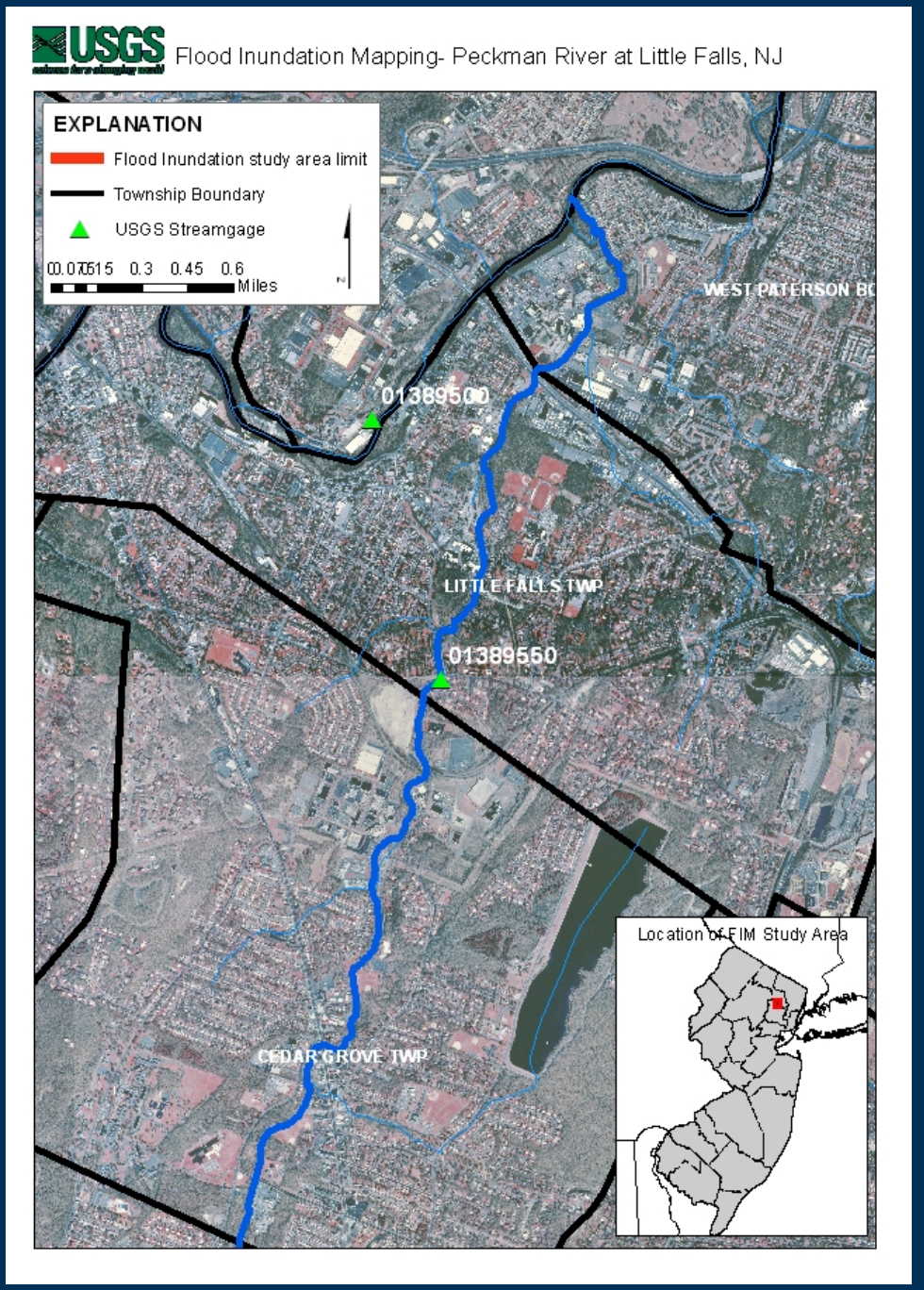
- **Hohokus River from Waldwick to Ridgewood, NJ**
  - Exact distance upstream and downstream of USGS streamgage 01391000 Hohokus River at Ho-Ho-Kus, NJ yet to be determined



USGS

Little Falls Study Area

- **Peckman River from West Paterson to Cedar Grove, NJ**
  - Exact distance upstream and downstream of USGS streamgage 01389550 Peckman River at Little Falls, NJ yet to be determined

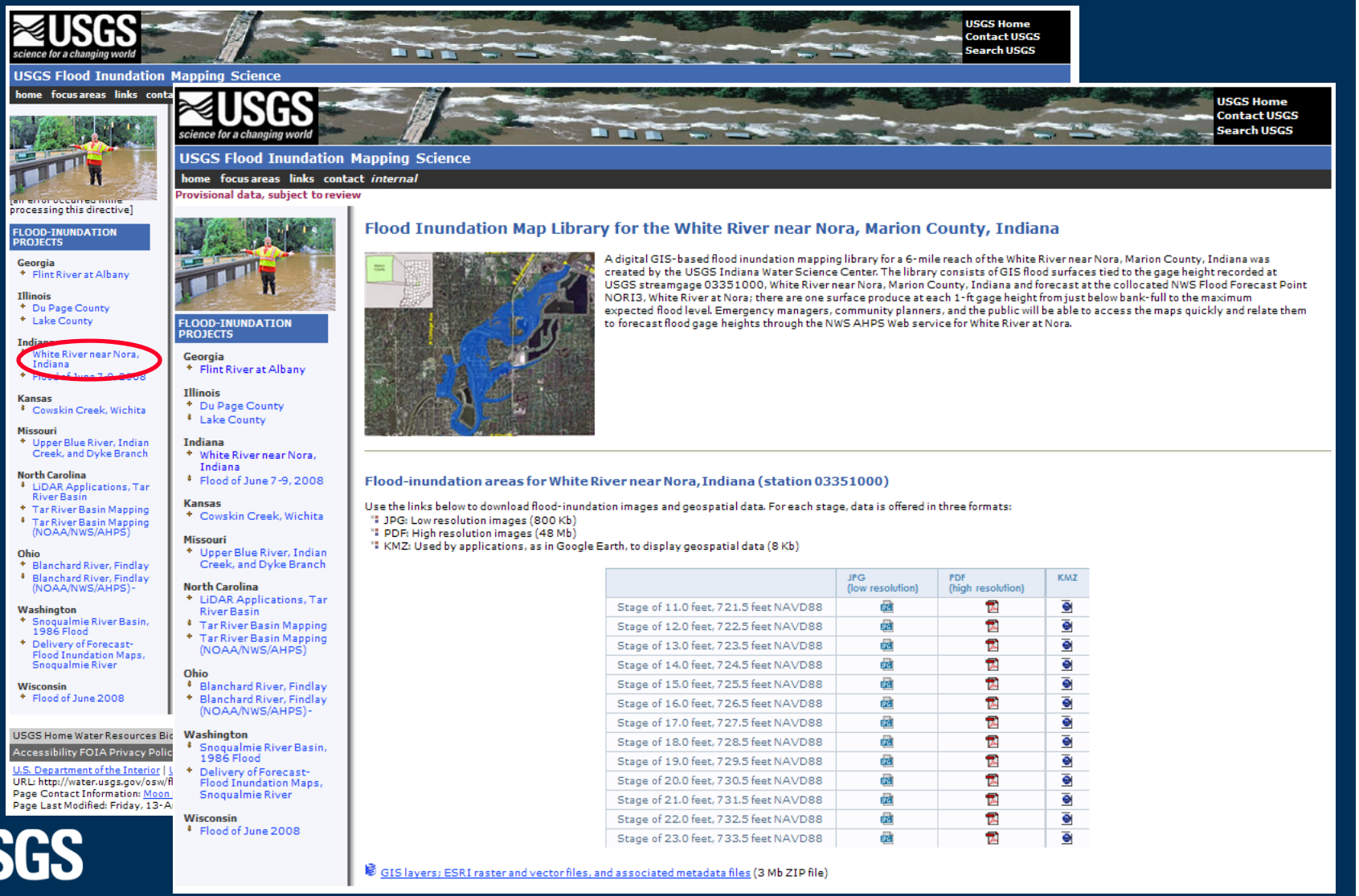


USGS

Deliverables…

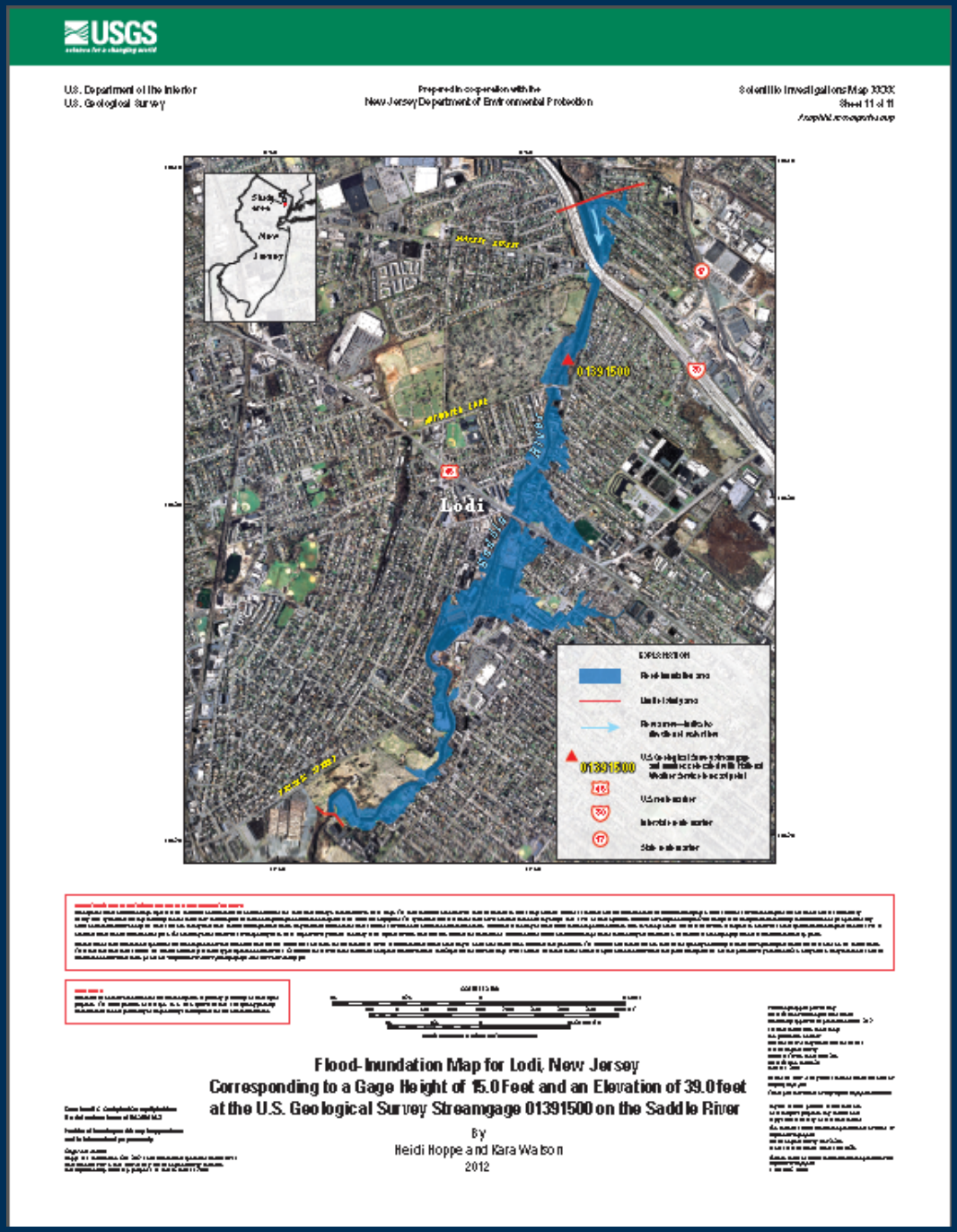
USGS

USGS Flood Inundation Mapping Science (http://water.usgs.gov/osw/flood_inundation)

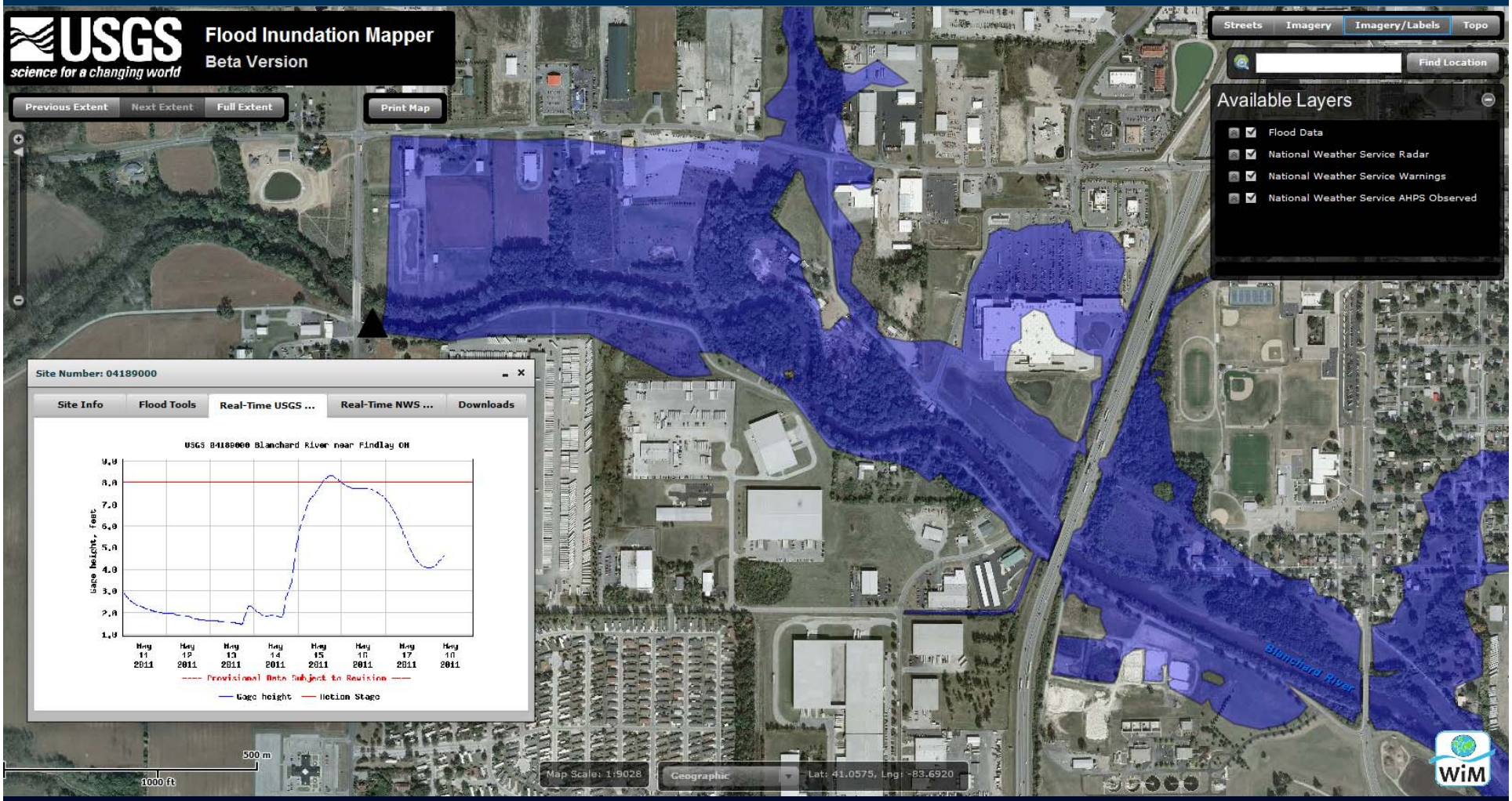


USGS
science for a changing world

Example of Flood Inundation Scientific Investigations Map (SIM) in PDF format



U.S. Department of the Interior
U.S. Geological Survey



Example of Flood Inundation Mapper

Note the real-time hydrograph of the USGS gage, the sliding scale to adjust the extent of flood inundation, and the user-defined map options such as the map types (Streets, Imagery, Imagery/Labels, & Topo) and layers (Stream Gage Sites, Flood Data, & NWS Radar), as well as the adjustable opacity of those layers.

Alternative to NWS Forecast Point

- WaterAlert
  - http://water.usgs.gov/wateralert/
- USGS StreamMail
  - http://water.usgs.gov/wateralert/streamail.html

USGS

How to Have the Data ALERT YOU…

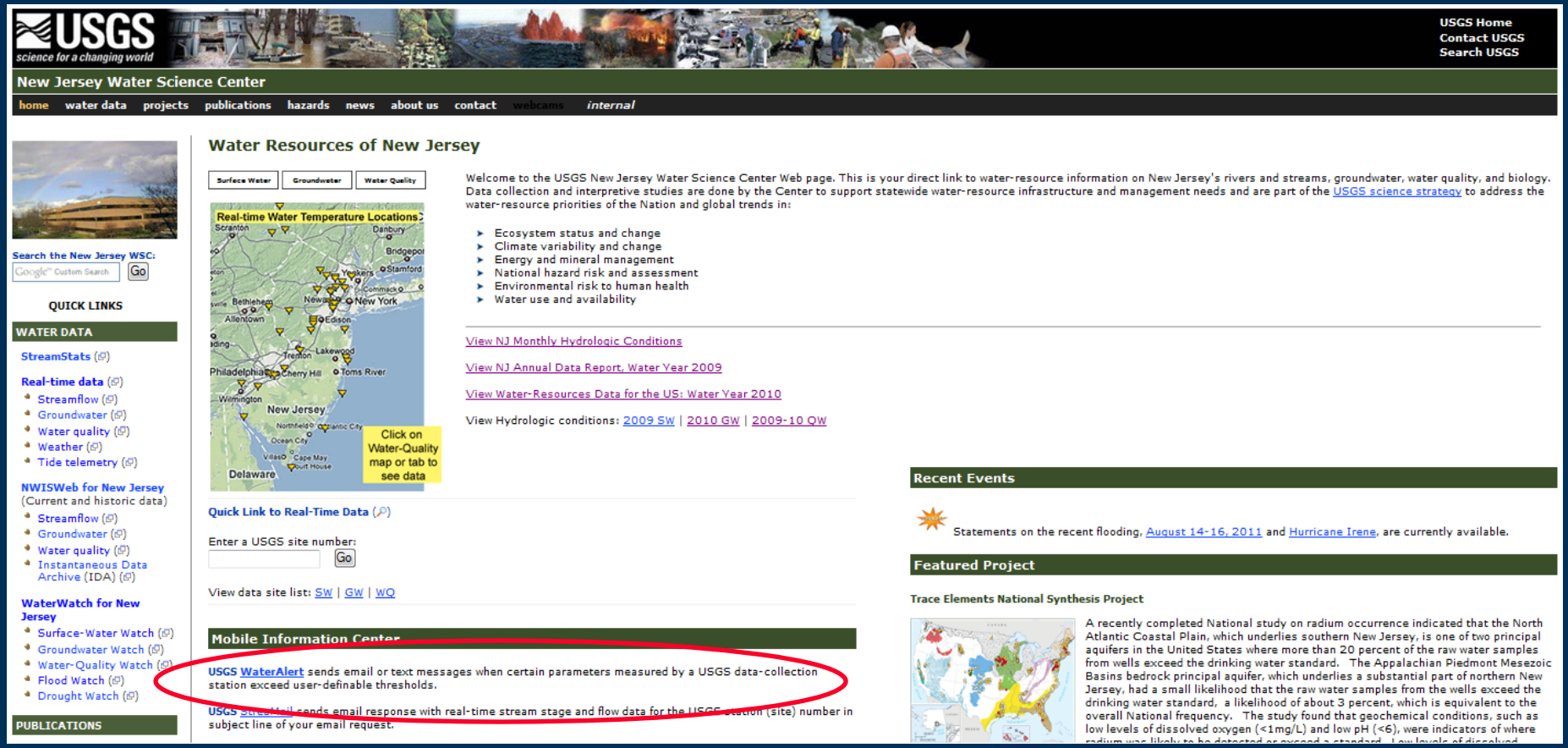
USGS WaterAlert

- Threshold notification system
- WaterAlert sends e-mail or text (SMS) messages when certain parameters, as measured by a USGS real-time data-collection station, exceed user-definable thresholds
- Real-time data from USGS gages are transmitted via satellite to USGS offices once every hour.
  - Emergency transmissions, such as during floods, are more frequent (typically every 15 min)
- Notifications will be based on the data received at these site-dependent intervals.

USGS

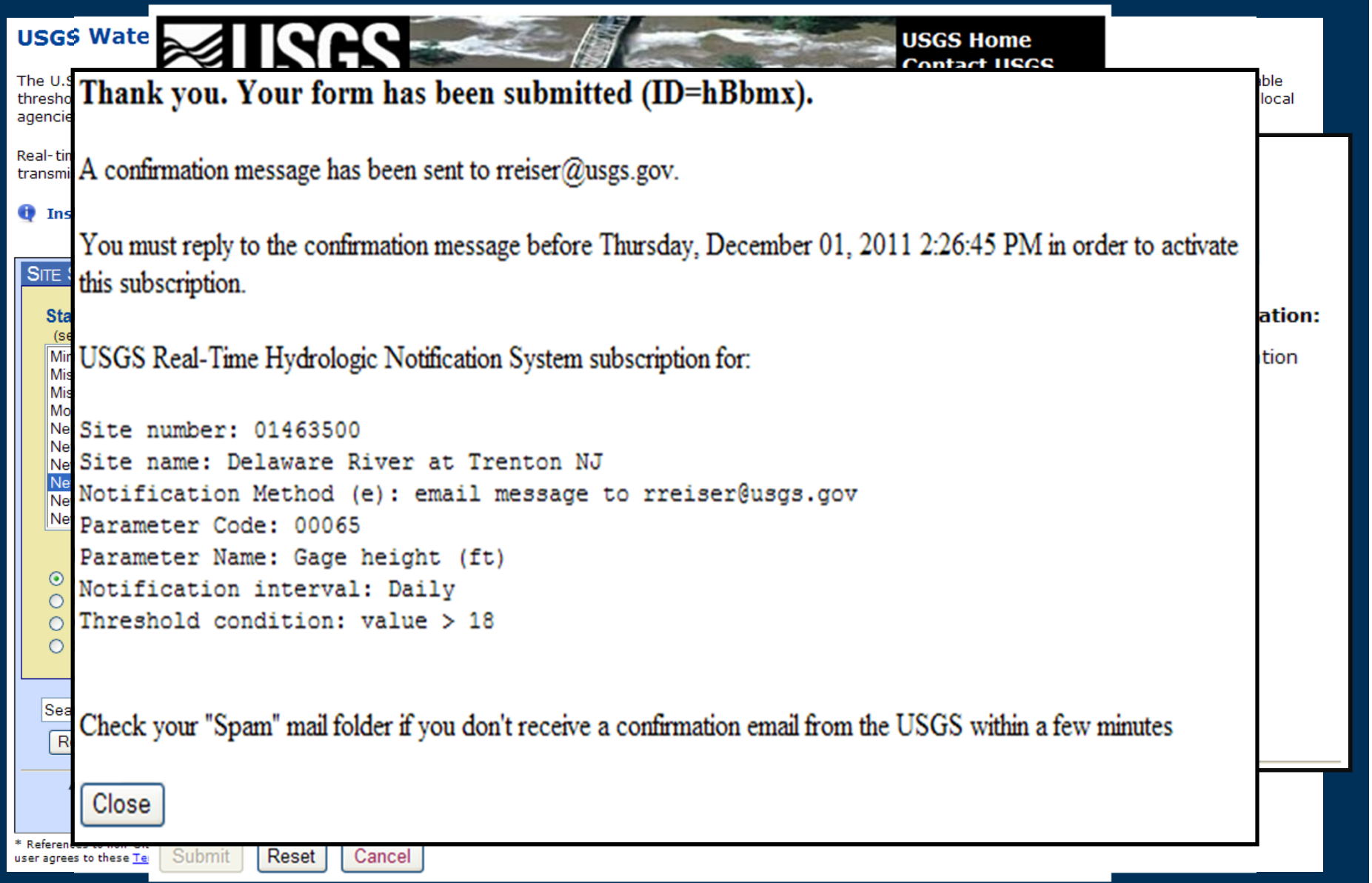
How to Have the Data ALERT YOU…

USGS WaterAlert



USGS

WaterAlert (http://water.usgs.gov/wateralert/)



Water Alert Confirmation Emails

- Confirmation email sent within minutes of subscribing
- Reply to the email within 48 hours to confirm subscription
  - Click reply and send without changing anything in the body of the message

USGS

Water Alert's Email Message When Threshold Reached

Gage height of 18.5 ft exceeds subscriber threshold of 18.0 at 2011-08-28 06:15:00 EDT
01463500 00065 Delaware River at Trenton NJ
Notification interval, no more often than: Daily

For Realtime Data at this station:
http://waterdata.usgs.gov/nwis/uv/?site_no=01463500

For Subscription Help:
http://water.usgs.gov/hns?m3cPv:01463500

To Sign up for New Notifications:
http://water.usgs.gov/wateralert

Send Questions to: wateralert@usgs.gov

USGS

Water Alert's Help Page

- Send email replies to wateralert@usgs.gov
- How to:
  - Pause this Specific Alert for 5 days
  - Pause all Alerts for 5 days
  - Continue (unpause) this or ALL alerts
  - Delete (signoff) this alert
  - List Settings
  - List Settings for all Notifications at same site

- To Modify a threshold, set a "new" notification with the same email address, site number and parameter

USGS

USGS StreamMail

(http://water.usgs.gov/wateralert/streamail.html)

Sample Email

U.S. Geological Survey (USGS) StreaMail:
The latest river stage and streamflow values you requested from StreaMail.

Site: 02336300
Station name: PEACHTREE CREEK AT ATLANTA, GA
Date: 09/30/2010
Time: 09:00:00
Stage: 2.95 feet
Streamflow: 90 cubic feet per second (cfs)

Link to charts for 02336300:
Stage: http://waterwatch.usgs.gov/wwapps/zchart.php?i=nwis2&&vt=uv&&cd=00065&site_no=02336300
Streamflow: http://waterwatch.usgs.gov/wwapps/zchart.php?i=nwis2&&vt=uv&&cd=00060&&site_no=02336000

Sample SMS Text Message

From: streamail@usgs.gov
Site 02336300 09:30
Stage: 3.29
Flow: 34

USGS

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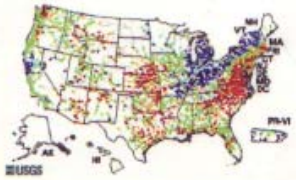
USGS StreamMail

Provides immediate water information from the USGS Real-Time Network. Send an e-mail to streammail@usgs.gov; in the subject line enter a USGS station number. After a few minutes, get back an e-mail with the most recent real-time stage and streamflow.

Hydrologic information can be e-mailed to devices such as cell phones and personal digital assistants



Current USGS real-time stations available to StreamMail

For more information contact:
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Further Information

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- Kara Watson (kmwatson@usgs.gov)
- USGS New Jersey Water Science Center Home Page
  - http://nj.usgs.gov
- Data Requests
  - USGS NJ Water Science Center
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