Chengdu Form on UN-GGIM
Global Map for Sustainable Development:
Development and Applications in Urban Hazard Mapping
October 15, 2013

Delivering Reliable Geospatial Data During Emergencies

James McConnell, Assistant Commissioner
New York City Office of Emergency Management

NYC COMPLEXITIES

Preparing for emergencies in the nation's largest city

OEM

$1.13 TRILLION GDP

ONE-THIRD OF THE NATION'S LARGEST MEDIA COMPANIES

2.5 MILLION DAILY BUS PASSENGERS

21 ACTIVE US MILITARY INSTALLATIONS

ELLIS ISLAND

WALL STREET

THE BROOKLYN BRIDGE

THE STATUE OF LIBERTY

92.4 MILLION ANNUAL AIR TRAVELERS

THE UNITED NATIONS

TWO MAJOR LEAGUE BASEBALL STADIUMS

22 UNDERWATER RAIL TUNNELS

61 HOSPITALS

5 MILLION DAILY SUBWAY PASSENGERS

THE NEW YORK STOCK EXCHANGE

176 Languages Spoken

950 COMMERCIAL VESSELS IN THE NEW YORK HARBOR

51 MILLION ANNUAL TOURISTS

600 CULTURAL INSTITUTIONS

182 NURSING HOMES

THE EMPIRE STATE BUILDING

800,000 SUBURBAN COMMUTERS

BROOKHAVEN NATIONAL LABORATORY

200,000 BUSINESSES

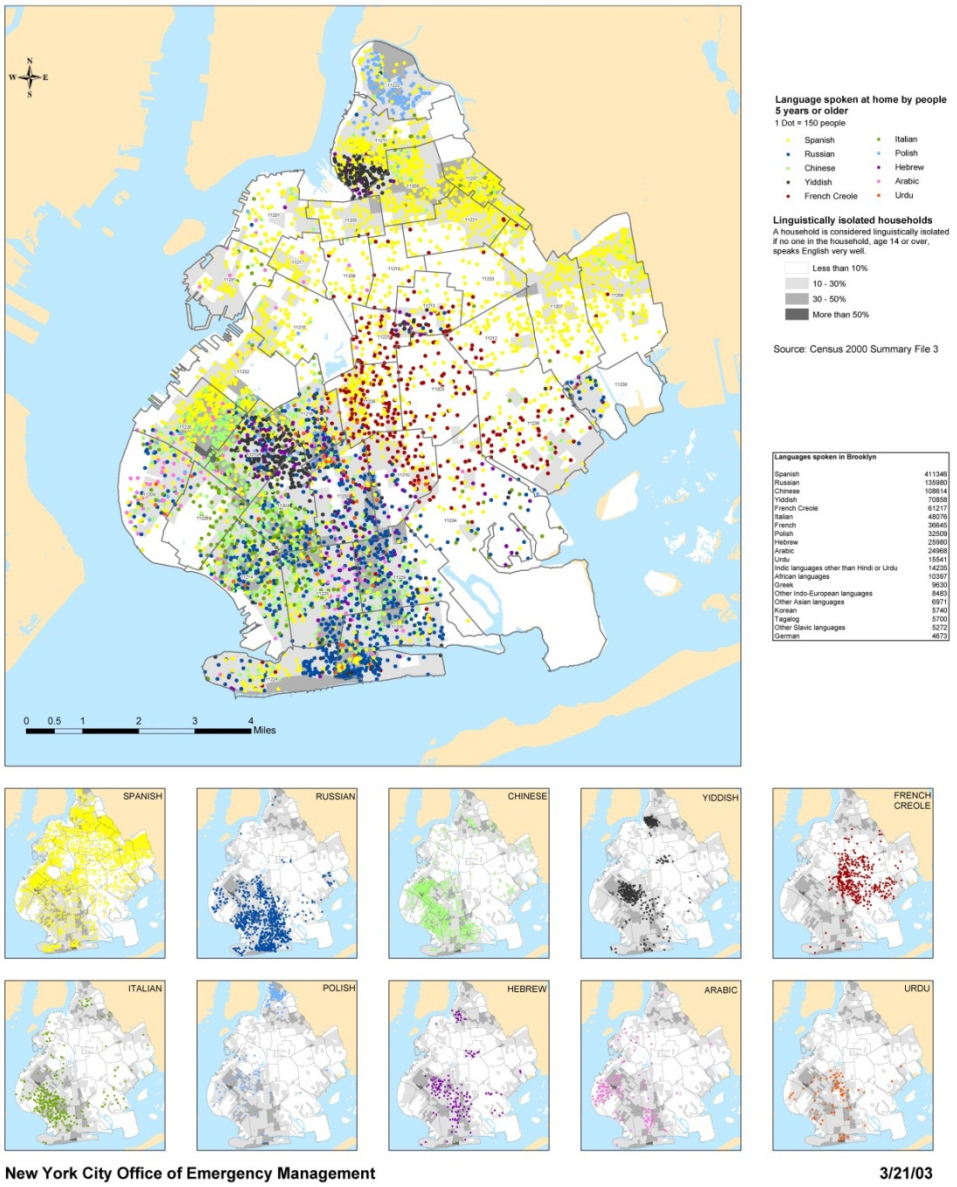
INDIAN POINT NUCLEAR POWER PLANT

8.2 MILLION RESIDENTS

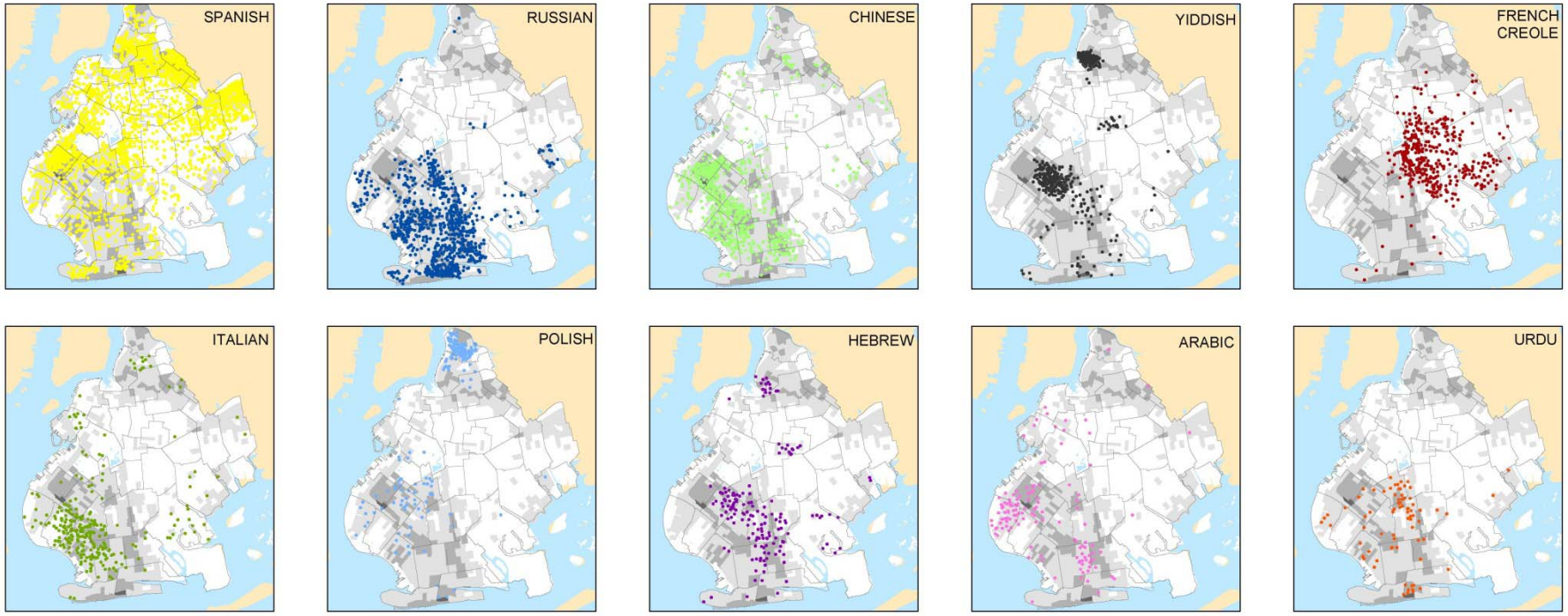
NYC COMPLEXITIES

Preparing for emergencies in the nation's largest city

Students in New York City public schools speak 176 languages



Top 10 languages other than English spoken in Brooklyn



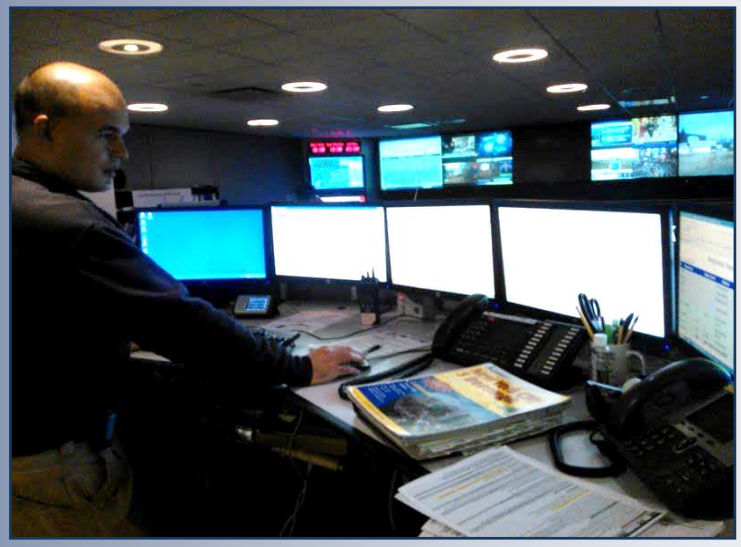
NYC COMPLEXITIES

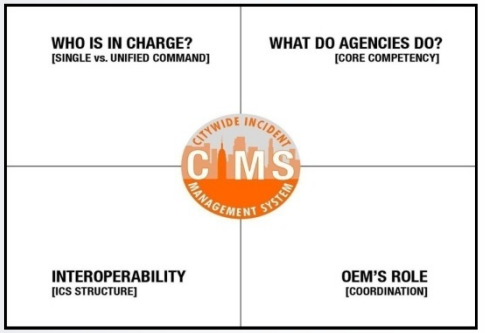
OUR MISSION
New York City Office of Emergency Management

1. Plan & prepare for emergencies
2. Coordinate emergency response & recovery efforts
3. Educate the public about preparedness
4. Collect & disseminate critical information
5. Seek funding to support preparedness

OPERATIONS

- Watch Command
- Field Response





GIS for Urban Hazards: Man-Made

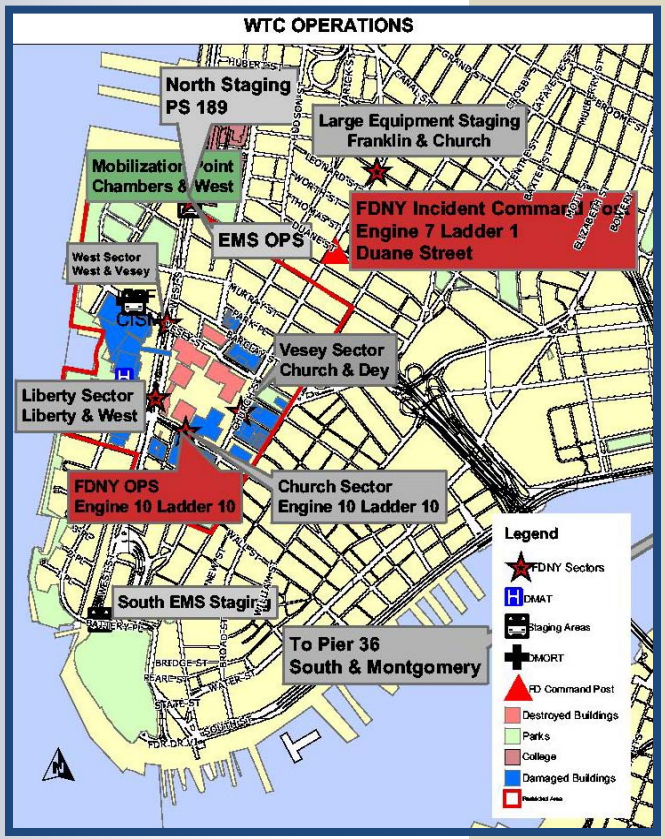
World Trade Center Attacks

9/11

OEM's Role in 9/11 Response

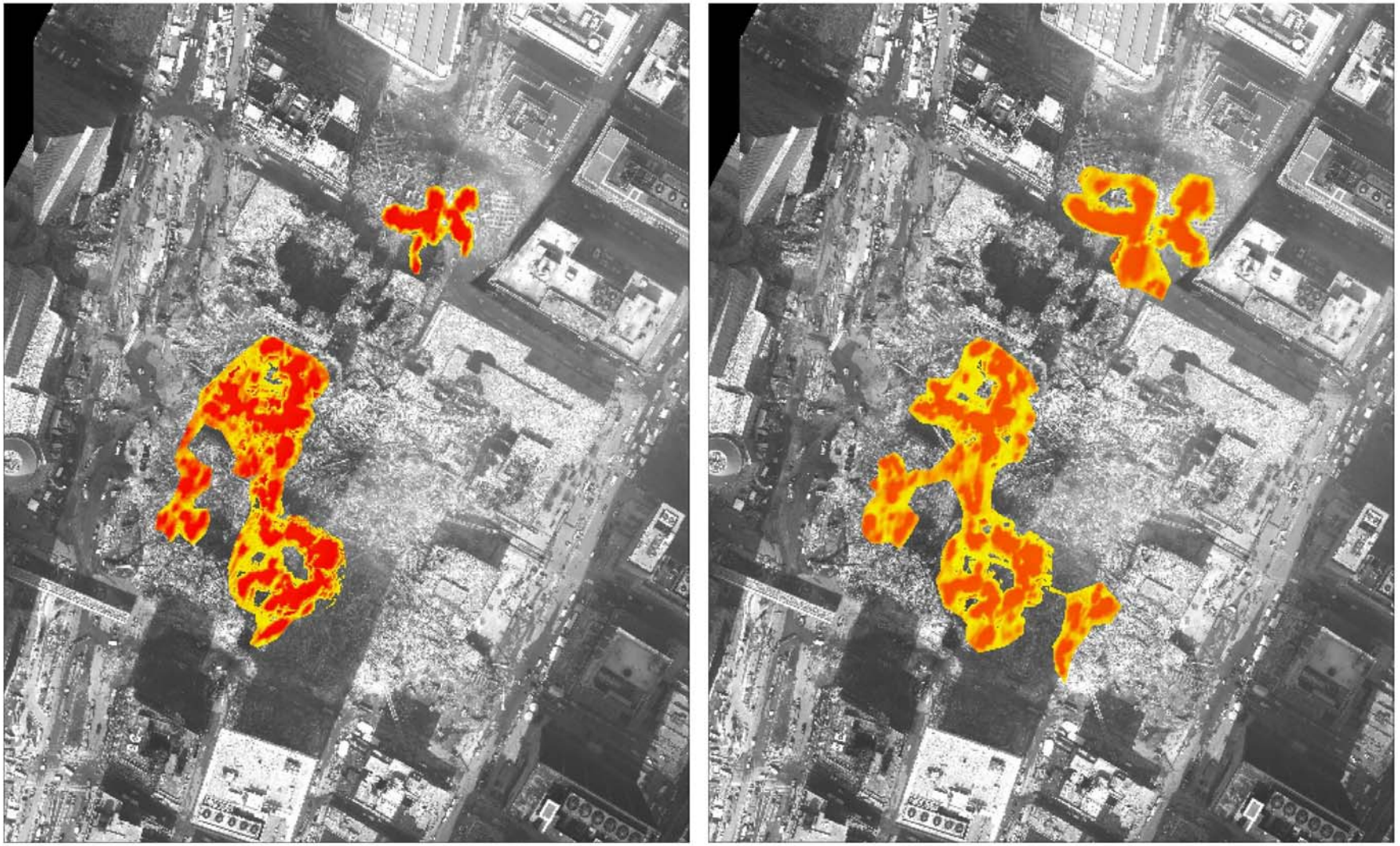
Incident Coordinator:

Health and Medical
Human Services
Logistics
Debris Removal
Recovery
Frozen Zone
Transportation
Business recovery



Thermal Imagery

Thermal Image from 22 and 23 Sep 2001

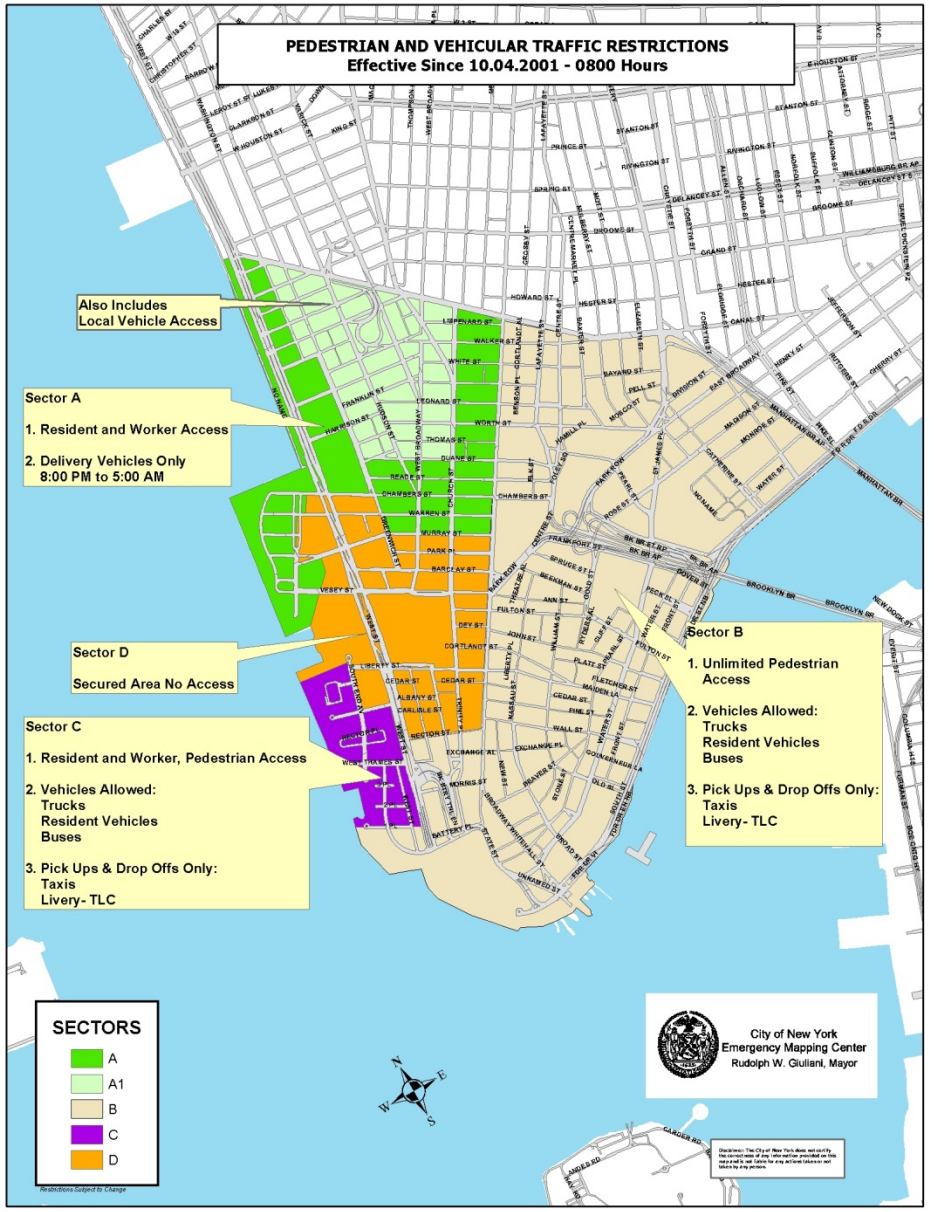


Rapid Mapping and Information Analysis Cell (MITRE)

Disclaimer: The MITRE Corp. does not certify the correctness of any information provided on this map and is not liable for any actions taken or not taken by any persons.

9/11 Restrictions

Pedestrian & Vehicular Restrictions

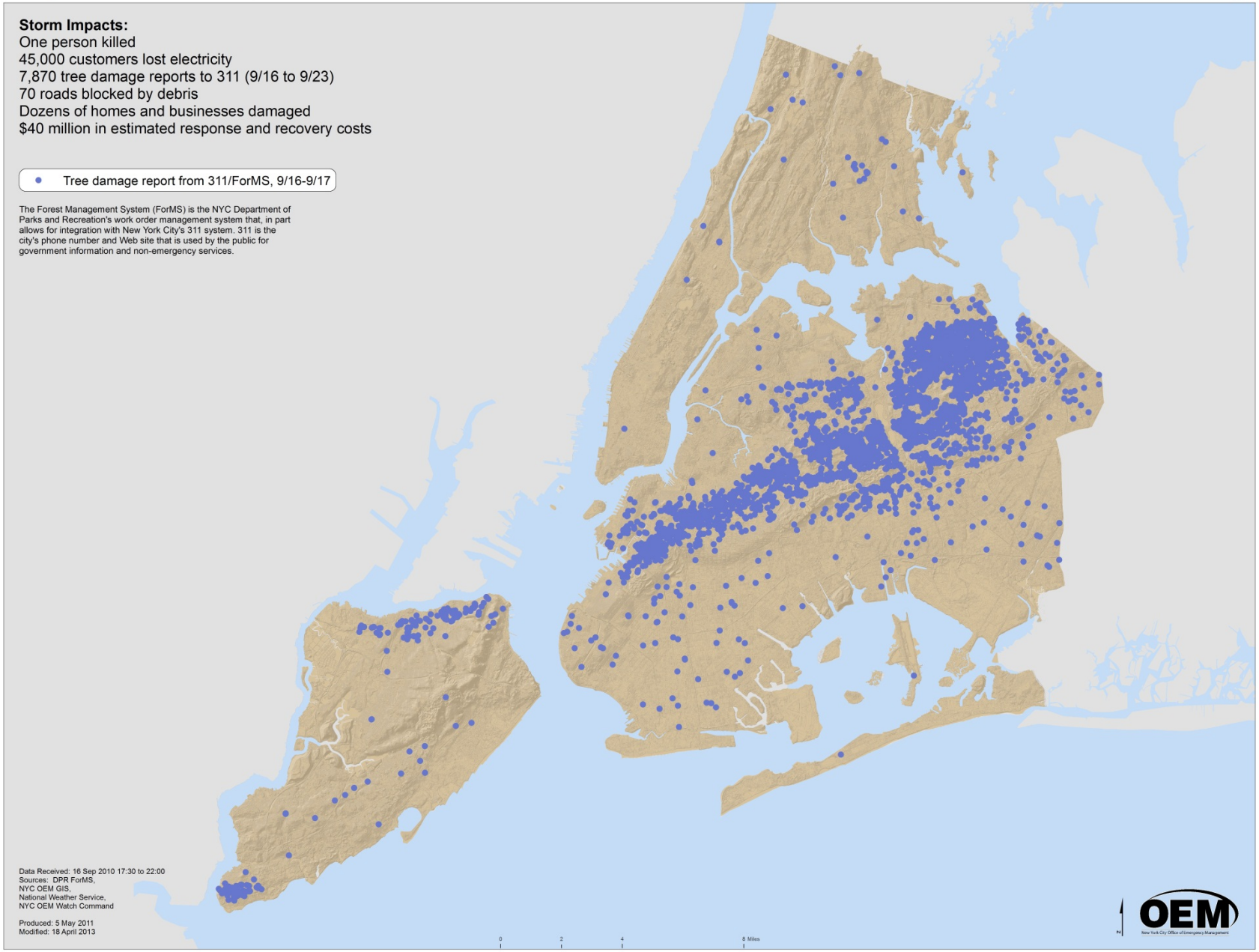


GIS for Urban Hazards: Natural

- Extreme Weather
- Snow
- Tornados
- Coastal Storms

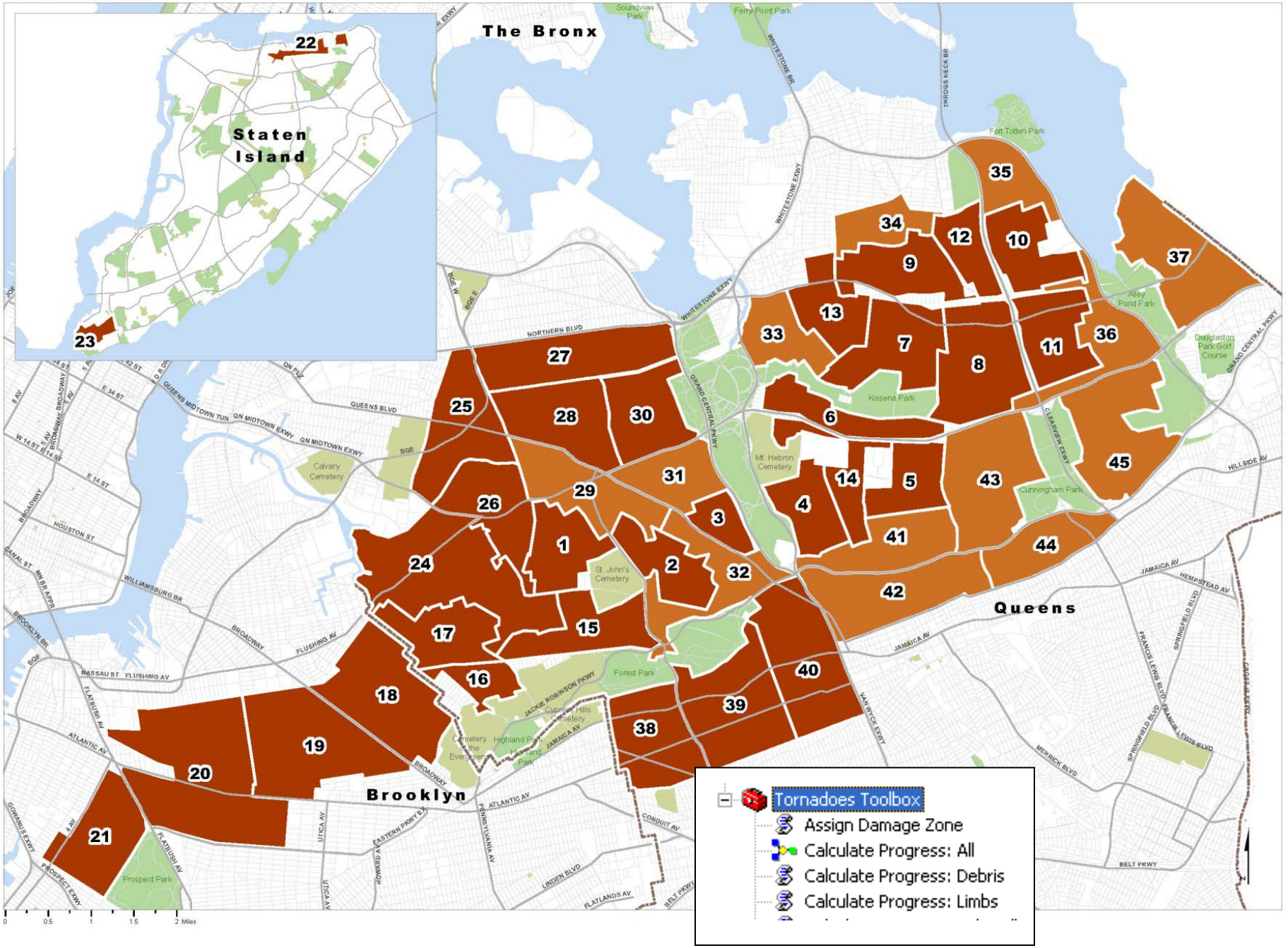
September 16, 2010 Tornadoes

New York City



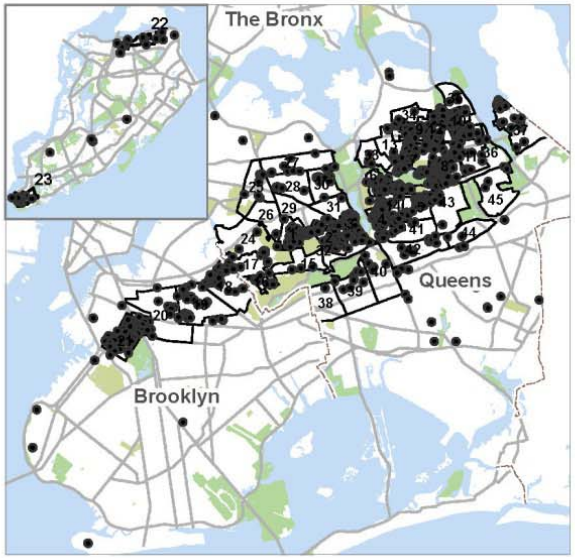
Debris Removal Progress: Effective 9/30/10 11:30

Source: NYC OEM Operations

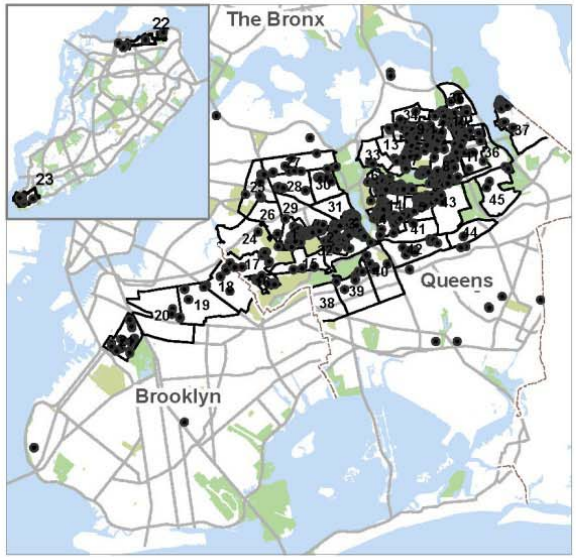


Sidewalk Recovery Efforts: Effective 10/17/2010 - 10/22/2010

Source: NYC Dept. of Design and Construction Sharepoint: OEM Response > Lists > Tornado Response - Sidewalk Repair Tracking (*Accessed 10/22/2010 at 10:00*)



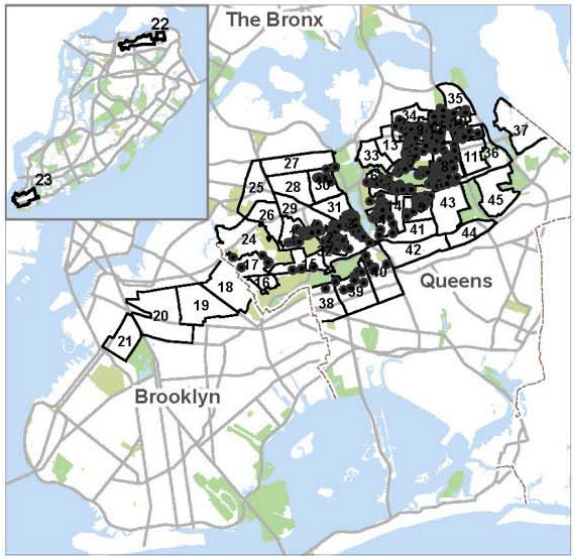
Completed PIR
(1,286 inclusive of all damage types)



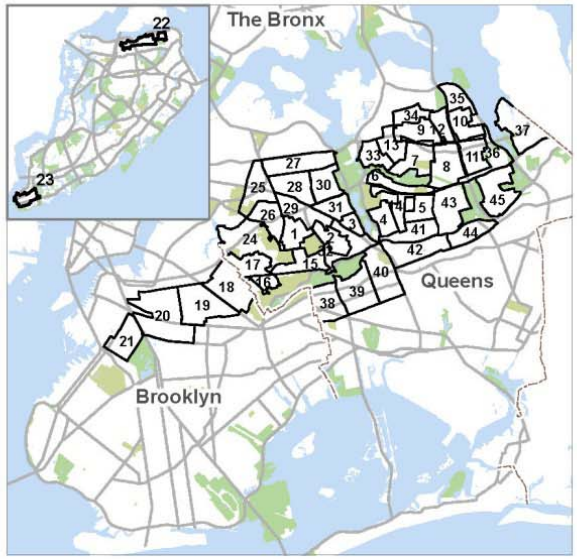
Requiring Sidewalk Repair
(65%, 837 out of 1,286)

Contractor Assigned
(60%, 506 out of 837)

Sidewalk Complete
(32%, 269 out of 837)



Tree Pit Inspected
(70%, 584 out of 837)
414 trees scheduled for planting



Trees Planted
(0%, 0 out of 837)

GIS for Urban Hazards: Natural

Storm Damage Zones with Asian Long-horned Beetle Quarantine Boundary

Source: NYC DPR; NYC OEM; USDA APHIS

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Produced: 30 Sep 2010 08:00

Queens

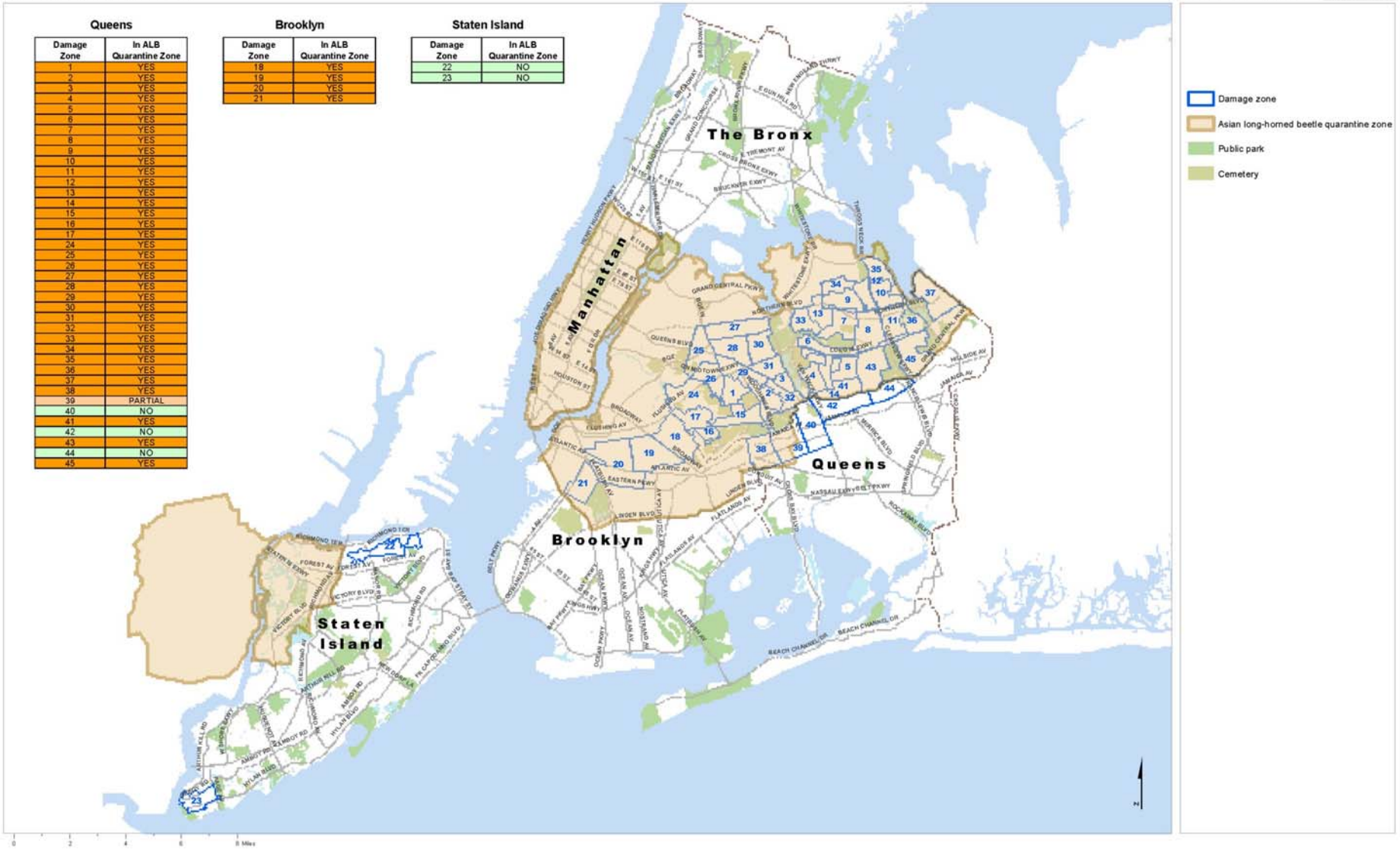
Damage Zone	In ALB Quarantine Zone
1	YES
2	YES
3	YES
4	YES
5	YES
6	YES
7	YES
8	YES
9	YES
10	YES
11	YES
12	YES
13	YES
14	YES
15	YES
16	YES
17	YES
24	YES
25	YES
26	YES
27	YES
28	YES
29	YES
30	YES
31	YES
32	YES
33	YES
34	YES
35	YES
36	YES
37	YES
38	YES
39	PARTIAL
40	NO
41	YES
42	NO
43	YES
44	NO
45	YES

Brooklyn

Damage Zone	In ALB Quarantine Zone
18	YES
19	YES
20	YES
21	YES

Staten Island

Damage Zone	In ALB Quarantine Zone
22	NO
23	NO



GIS - Successful Response

Successful Response Starts With A Map

Improving Geospatial Support for Disaster Management

How is GIS Useful for Emergency Response?

GIS combines layers of information…

Aerial photos

Elevation

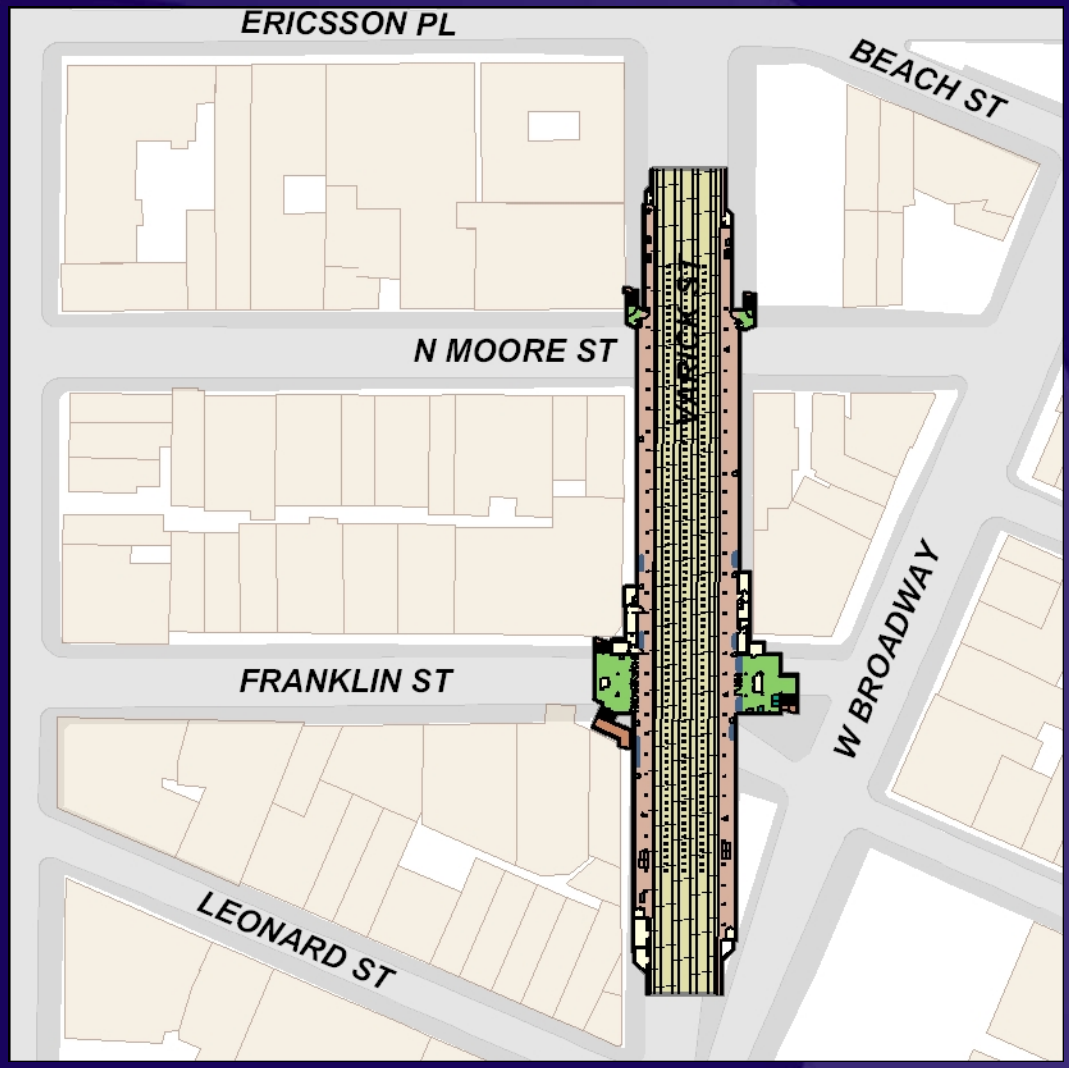
Streets

Buildings

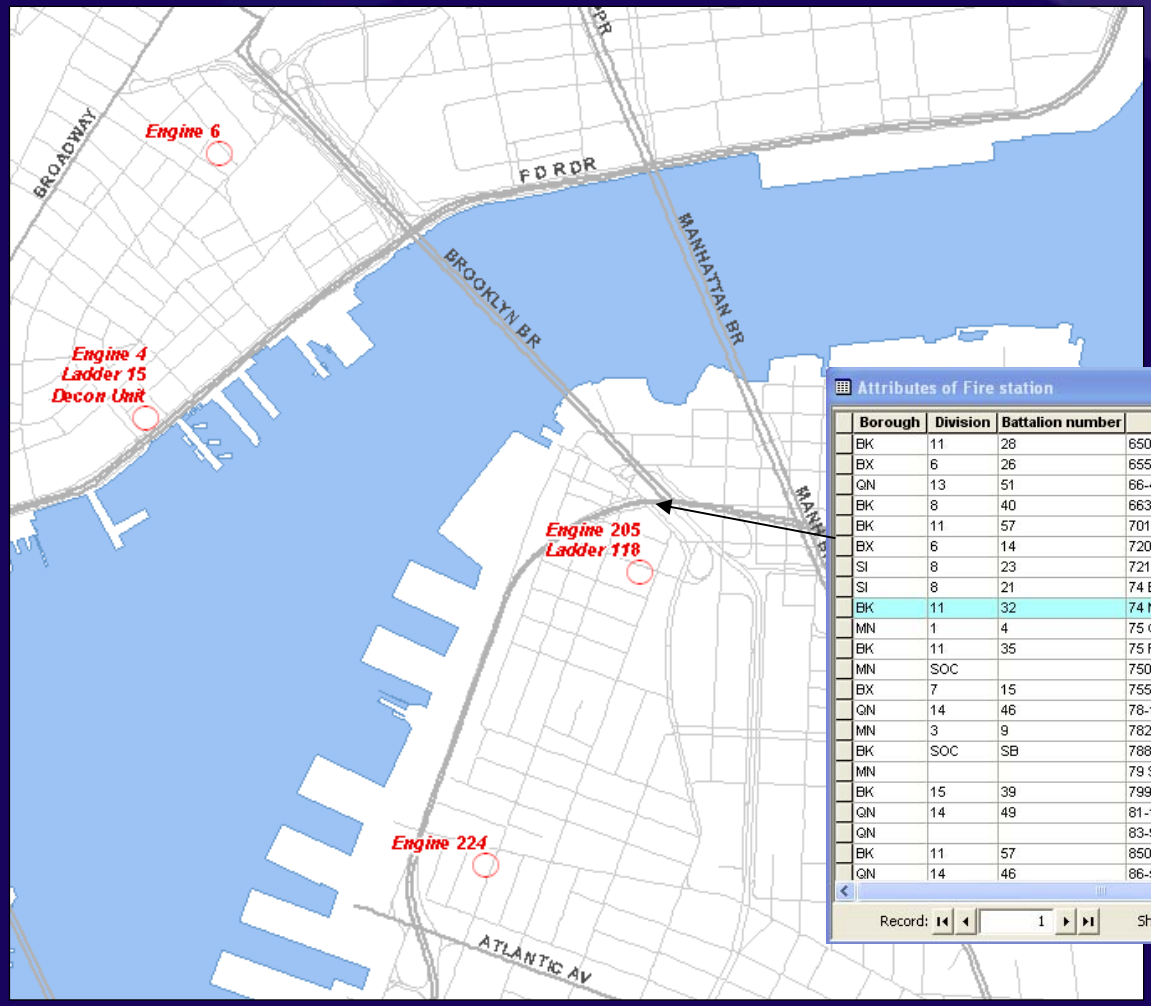
Facilities

Subway Stations

…and many more



How is GIS Useful for Emergency Response?



Data + Location

A Geographic Information System (GIS) links location information and tabular (database) information, enabling a person to visualize patterns, relationships, and trends.

Attributes of Fire station

Borough	Division	Battalion number	Address	Unit name	
BK	11	28	650 HART STREET	Engine 218	E218
BX	6	26	655 PROSPECT AVE.	Engine 73, Ladder 42	E073,
QN	13	51	66-44 MYRTLE AVENUE	Engine 286, Ladder 135	E286,
BK	8	40	6630 3RD AVENUE	Engine 241, Ladder 109	E241,
BK	11	57	701 PARK AVENUE	Engine 230	E230
BX	6	14	720 MELROSE AVE.	Engine 71, Ladder 55, Division 6	E071,
SI	8	23	7219 AMBOY ROAD	Engine 151, Ladder 76, Thawing Apparatus 63	E151,
SI	8	21	74 BROAD STREET	Engine 153, Ladder 77	E153,
BK	11	32	74 MIDDAGH STREET	Engine 205, Ladder 118	E205,
MN	1	4	75 CANAL STREET	Engine 9, Ladder 6, Satellite 1	E009,
BK	11	35	75 RICHARDSON STREET	Engine 229, Ladder 146	E229,
MN	SOC		750 MAIN ST, ROOSEVELT ISL.	RAC Unit 4, Dewatering Unit, Tactical Support Unit 1	RA04
BX	7	15	755 EAST 233 STREET	Engine 63, Ladder 39, Battalion 15	E063,
QN	14	46	78-11 67TH ROAD	Engine 319	E319
MN	3	9	782 EIGHTH AVENUE	Engine 54, Ladder 4, Battalion 9	E054,
BK	SOC	SB	788 UNION STREET	Squad 1	SQ00
MN			79 STREET && TRANSVERSE RD	Communications Office	MNCC
BK	15	39	799 LINCOLN AVE.	Engine 225, Ladder 107, Battalion 39	E225,
QN	14	49	81-17 NORTHERN BLVD.	Engine 307, Ladder 154	E307,
QN			83-98 WOODHAVEN BLVD	Communications Office	QNCC
BK	11	57	850 BEDFORD AVE.	Ladder 102	L102
QN	14	46	86-53 GRAND AVENUE	Engine 287, Ladder 136, Battalion 46	E287,

Record: 1 Show: All Selected Records (1 out of 228 Selected) Options

Primary Responsibilities of GIS Specialists

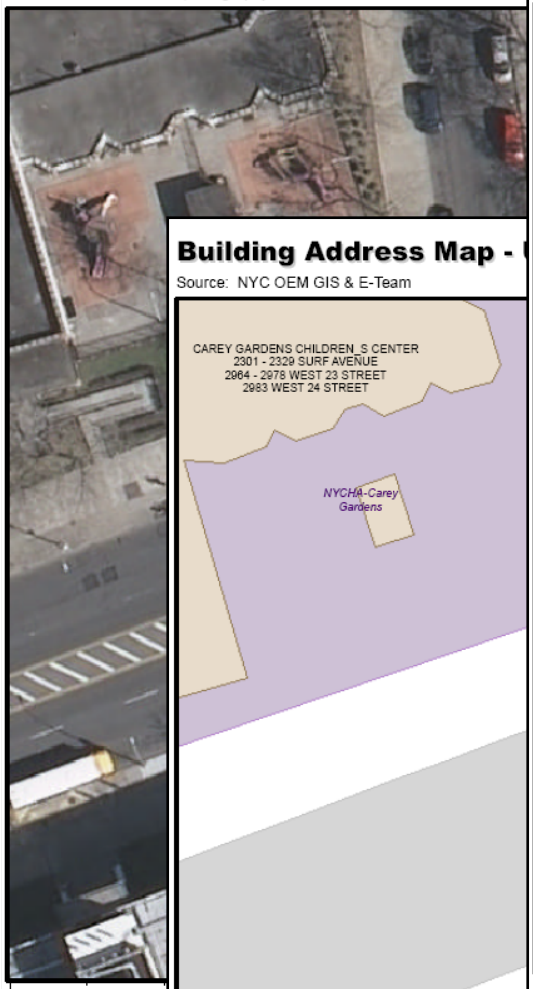
- Provide reliable information to decision makers
- Create, collect, refine and organize data
- Develop map and data applications to present data

Situational Awareness for Field Response Support System

Emergency Response Data Packet Maps

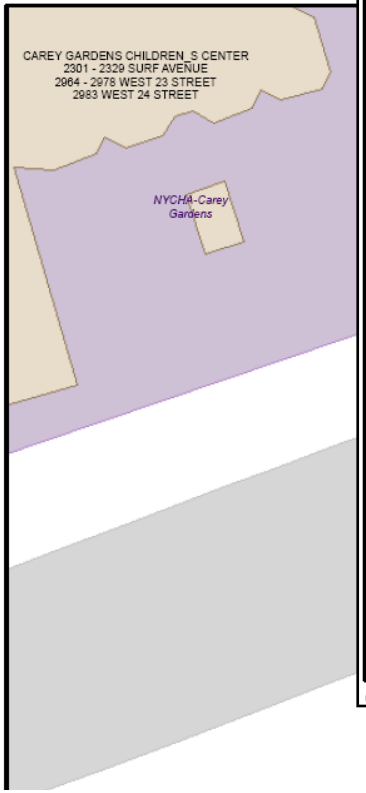
Aerial Map - Utility-Water Main

Source: 2008 Aerial Orthophotography & E-Team



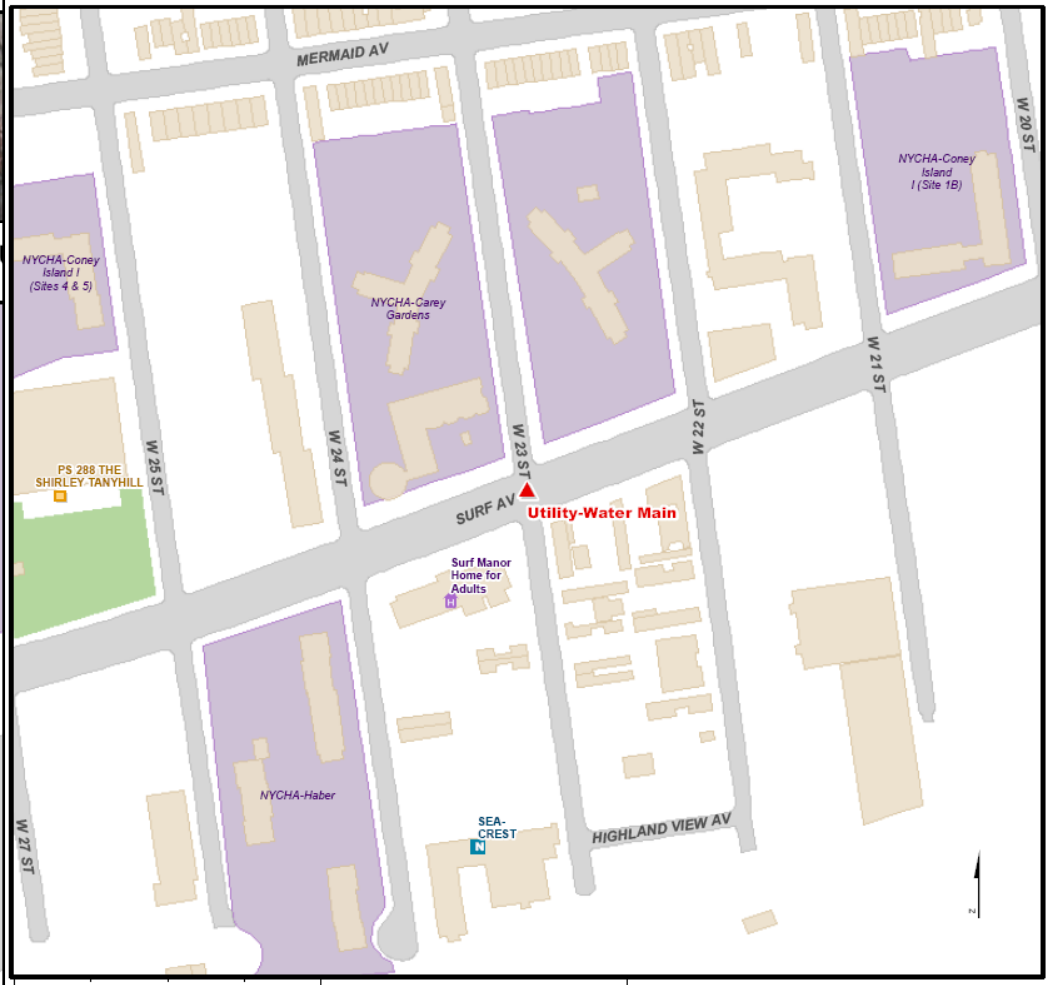
Building Address Map -

Source: NYC OEM GIS & E-Team



Area Map - Utility-Water Main

Source: NYC OEM GIS & E-Team



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Modified: 08/01/2010 09:47

Map Information

- Incident Location (point)
- Hospitals
- Psychiatric Hospitals
- Police Stations
- Fire Stations
- Nursing Homes
- Adult Homes
- Public Schools
- Private Schools
- Colleges
- Correctional Facility
- UN Missions
- Foreign Consulates (See UN Mission/Consulate PDFs)
- Subway Stations
- Subway Station Envelopes
- Rail Stations
- Passenger Rail Lines
- AirTrain JFK
- Freight Rail Lines
- Roosevelt Island Tram
- Hospital Buildings
- NYCHA Lots
- Large Housing Developments
- NYC Borough Borders

Situational Awareness for Field Response Support System

Emergency Response Data Packet Reports

Demographic information in a quarter mile radius of Surf Ave & W 23rd St Utility-Water Main incident

8/1/2010 9:46:44PM

TOTAL POPULATION	9,111
AGE UNDER 5	692
AGE 5 TO 17	2,337
AGE 65 AND UP	1,457
HOUSEHOLDS	3,008
OWNER OCCUPIED	154
RENTER OCCUPIED	2,748

Administrative and Political Districts Information for S

8/1/2010 9:46:46PM

Police Precinct	60
Fire Battalion Number	43
Fire Division Number	8
Community District	Brooklyn CD 13
City Council District	47
NY State Assembly District	46
NY State Senate District	23
US Congressional District	8
Borough	Brooklyn

Top 5 Critical Facilities Nearest to Surf Ave & W 23rd St Utility-Water Main Incident

(All distances are in miles)

8/1/2010 9:46:41PM

Public Schools

Distance	School name	Location	Borough
0.14	PS 288 THE SHIRLEY TANYHILL	2950 West 25 Street	Brooklyn
0.32	PS 329 SURFSIDE	2929 West 30 Street	Brooklyn
0.35	IS 239 MARK TWAIN	2401 Neptune Avenue	Brooklyn
0.57	PS 90 EDNA COHEN SCHOOL	2840 West 12 Street	Brooklyn
0.60	PS 188 MICHAEL E BERDY	3314 Neptune Avenue	Brooklyn

Hospitals

Distance	Name	Location	Borough
1.50	CONEY ISLAND HOSPITAL	2601 Ocean Parkway	Brooklyn
2.96	VETERANS ADMINISTRATION NY HARBOR HEALTH CARE SYSTEM/BROOKLYN CAMPUS	800 Poly Place	Brooklyn
3.50	NEW YORK COMMUNITY HOSPITAL OF BROOKLYN	2525 Kings Highway	Brooklyn
3.94	BETH ISRAEL MEDICAL CENTER - KINGS HIGHWAY DIVISION	3201 Kings Highway	Brooklyn
4.56	MAIMONIDES MEDICAL CENTER	4802 Tenth Avenue	Brooklyn

Nursing Homes

Distance	Facility name	Location	Borough
0.11	SEA-CREST HEALTH CARE CENTER	3035 West 24th St	Brooklyn
0.22	SAINTS JOACHIM AND ANNE RESIDENCE	2720 Surf Avenue	Brooklyn
0.26	SHOREFRONT JEWISH GERIATRIC CENTER	3015 W 29 St	Brooklyn

Provide Reliable Data

Public Safety GIS Data Development Center

Police (NYPD)

Fire (FDNY)

Health (DOHMH)

Environmental Protection (DEP)

Emergency Management (OEM)

Data Sources

- OEM staff
- City agencies
- State agencies
- Federal agencies
- Public authorities
- Utilities
- Non-profits
- Academia
- Field collection

Documentation (Metadata)

What?

Where?

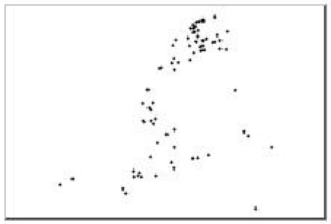
When?

Who?

Primary Care

SDE Feature Class

Description | Spatial | Attributes



Keywords

Theme: Primary Care, Community health centers, Federally Qualified Health Care (FQHC) facilities

Theme: Healthcare and Public Health, Direct Patient Healthcare, Ambulatory Healthcase Facilities

Place: New York City, NYC

Description

Abstract

Primary care centers in New York City. These are federally qualified health care (FQHC) facilities, which is a type of provider defined by the Medicare and Medicaid statutes. FQHCs include all organizations receiving grants under Section 330 of the Public Health Service Act, certail tribal organizations, and FQHC Look-Alikes. A Look-Alike is a FQHC facility that meets all eligibility requirements of an organization that receives a PHS Section Grant, but which does not receive grant funding.

Purpose

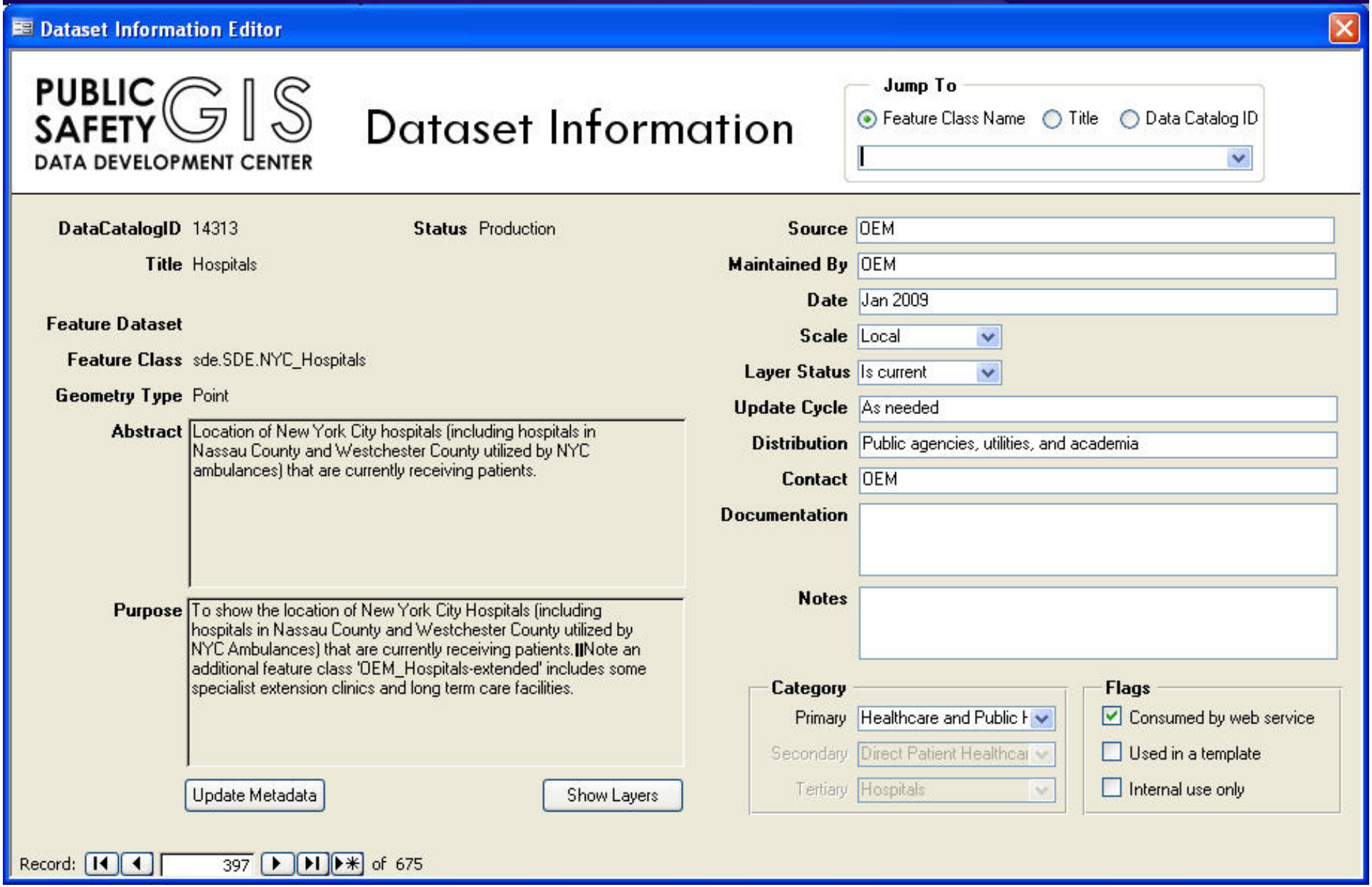
To show the location of primary care centers in New York City

Supplementary Information

This information was provided in excel format March 2009 by NYC OEM Planning Division (Rashada Outlaw) who received the data from:

Matthew J. Ziemer
Emergency Preparedness Program Manager
Community Health Care Association of New York State (CHCANYS)
535 8th Avenue, 8th Floor
New York, NY 10018
Direct Line: 212.710.3800
Mobile: 347.558.8400
Main Line: 212.279.9686, ext. 215
mziemer@chcanys.org

Catalog the Data



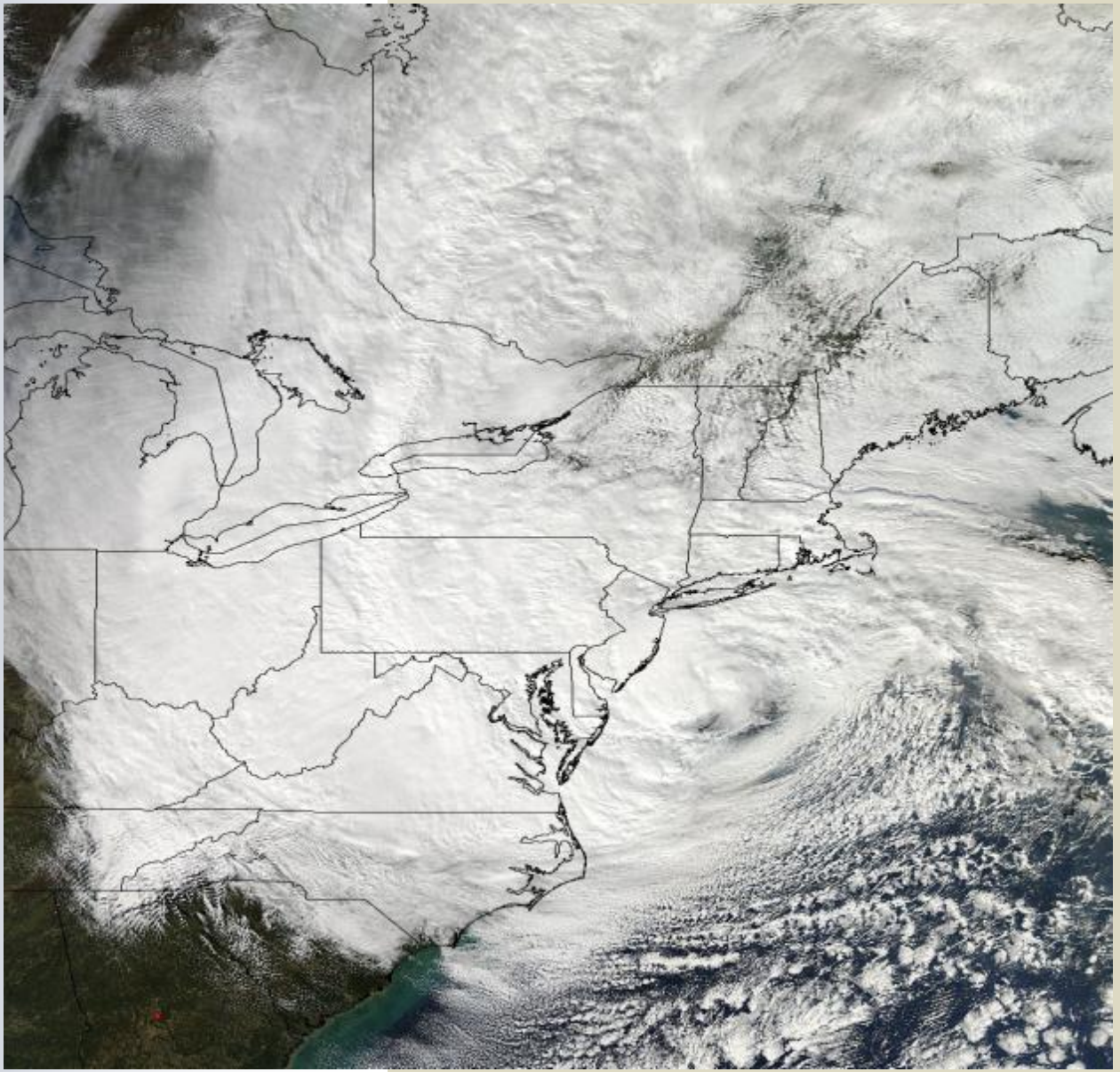
Catalog the Data

Title	Abstract
Healthcare and Public Health	
Direct Patient Healthcare	
Ambulatory Healthcare Facilities	
New York City - ESRD dialysis centers	Dialysis centers in New York City.
Primary Care	Primary care centers in New York City. These are also called community health centers. They provide primary care, often to underserved populations.
Extended Care Facilities	
Adult care facilities	Adult care facilities
Nursing homes	Nursing homes
Hospitals	
Hospital building footprints	Hospital building footprints. Includes building names.
Hospital Features	Hospital features, including entrances; primary and secondary command centers; external decontamination showers, corridors, and stations; safe doors; emergency departments; patient care areas; capital projects; generators; fueling sites; CT scanners; MRI imagers; hazardous material storage areas; gas tanks; liquid oxygen pumps; and electrical vaults. Detailed information available for 56 hospitals.
Hospitals	Location of New York City hospitals (including hospitals in Nassau County and Westchester County utilized by NYC ambulances) that are currently receiving patients.
Hospitals (U.S. Geographic Names Information System)	U.S. Geographic Names Information System Hospitals represents an automated inventory of the proper names and locations of physical and cultural geographic features located throughout the United States and its Territories.
Metroarea hospitals outside of NYC	Hospitals in the metropolitan area outside of NYC. Created by merging data from NYS and NJ. Connecticut is not included.
New Jersey - Acute Care Hospitals	Point locations of the 84 Acute Care Hospitals listed by the New Jersey Department of Health and Senior Services.

NYC COASTAL STORM PLAN

Worst Case Scenario

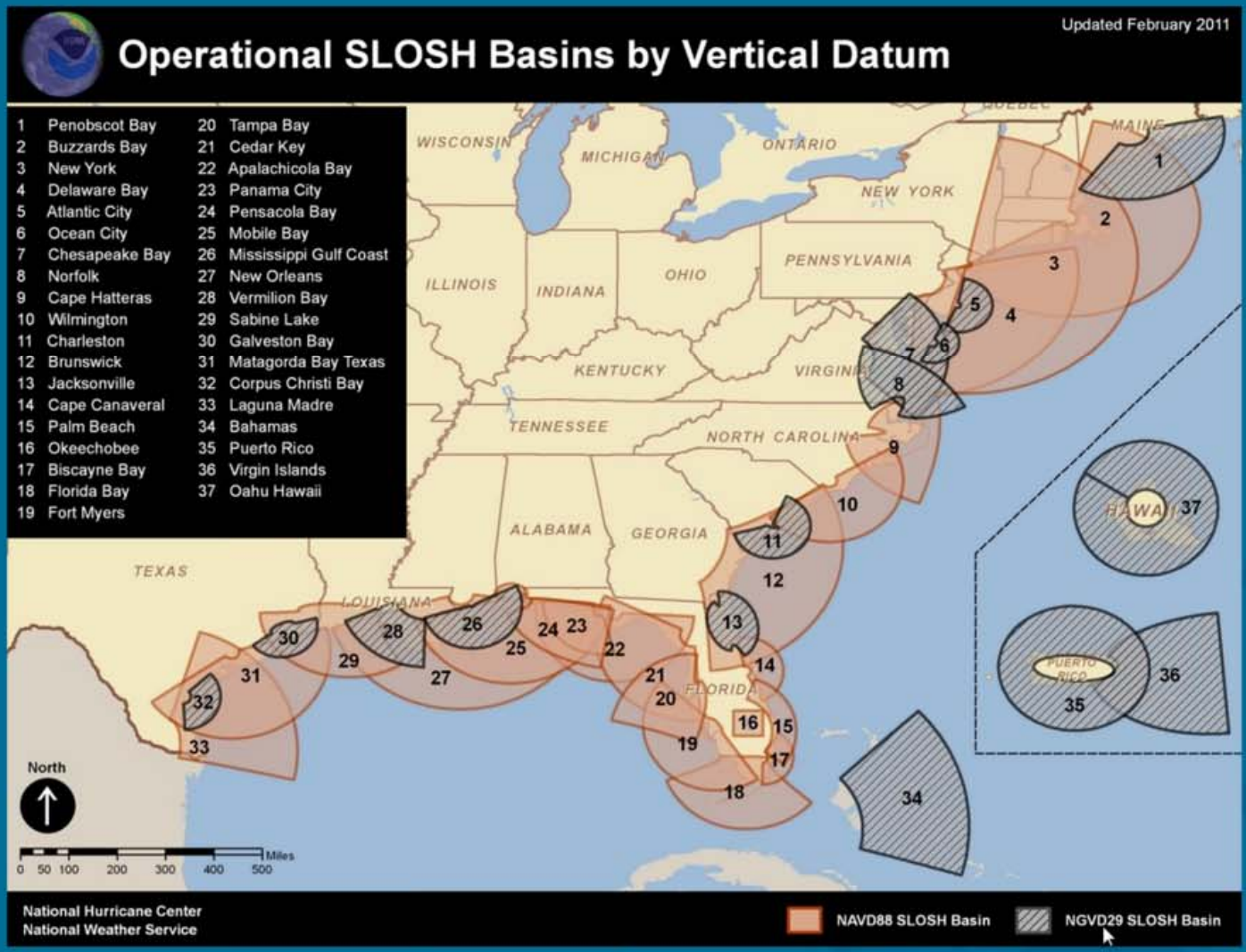
- Category 4 Hurricane
- Landfall at Atlantic City, NJ
- NE quadrant of storm
- Strongest wind impact
- 3 million New Yorkers evacuate
- 605,000 seek public shelter



NYC COASTAL STORM PLAN

The NY Bight

SLOSH: Sea, Lake, Overland Surges from Hurricanes

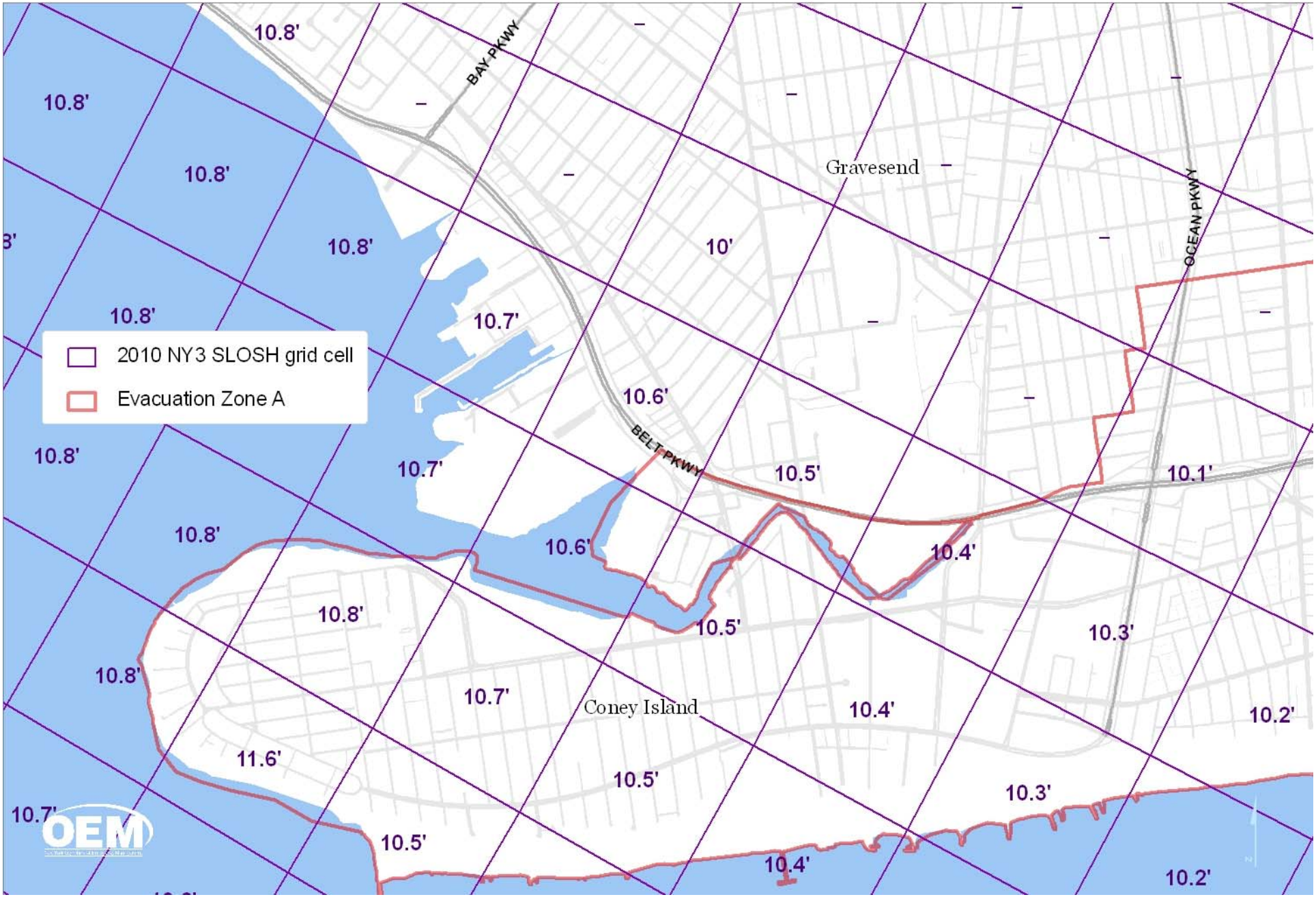


SLOSH

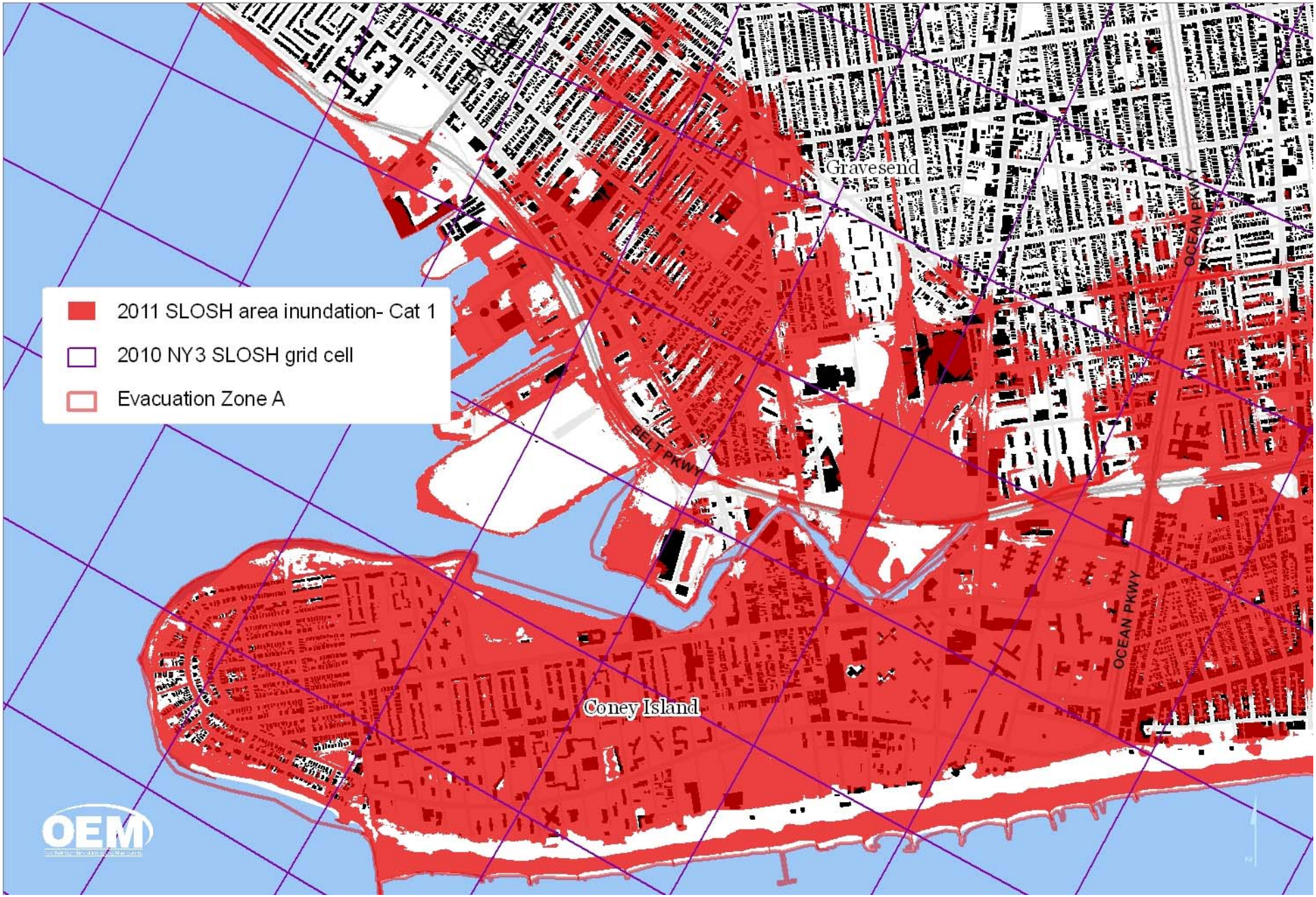
- SLOSH does include:
  - Flow through barriers/gaps/passes
  - Deep passes between bodies of water
  - Inland inundation (wet/dry cell)
  - Overtopping of barrier systems, levees, and roads
  - Coastal reflection (coastally trapped Kelvin waves)
- SLOSH does not include:
  - Breaking waves/wave run-up
  - Astronomical tide
    - Operational runs can be run at different tide levels via an initial water level (anomaly)
  - Normal river flow and rain

Gravesend Neighborhood - 2010 NY3 SLOSH grid

DRAFT



Gravesend Neighborhood - 2011 SLOSH area inundation (Cat 1) DRAFT



SLOSH products

SLOSH = Sea, Lake, and Overland Surges from Hurricanes

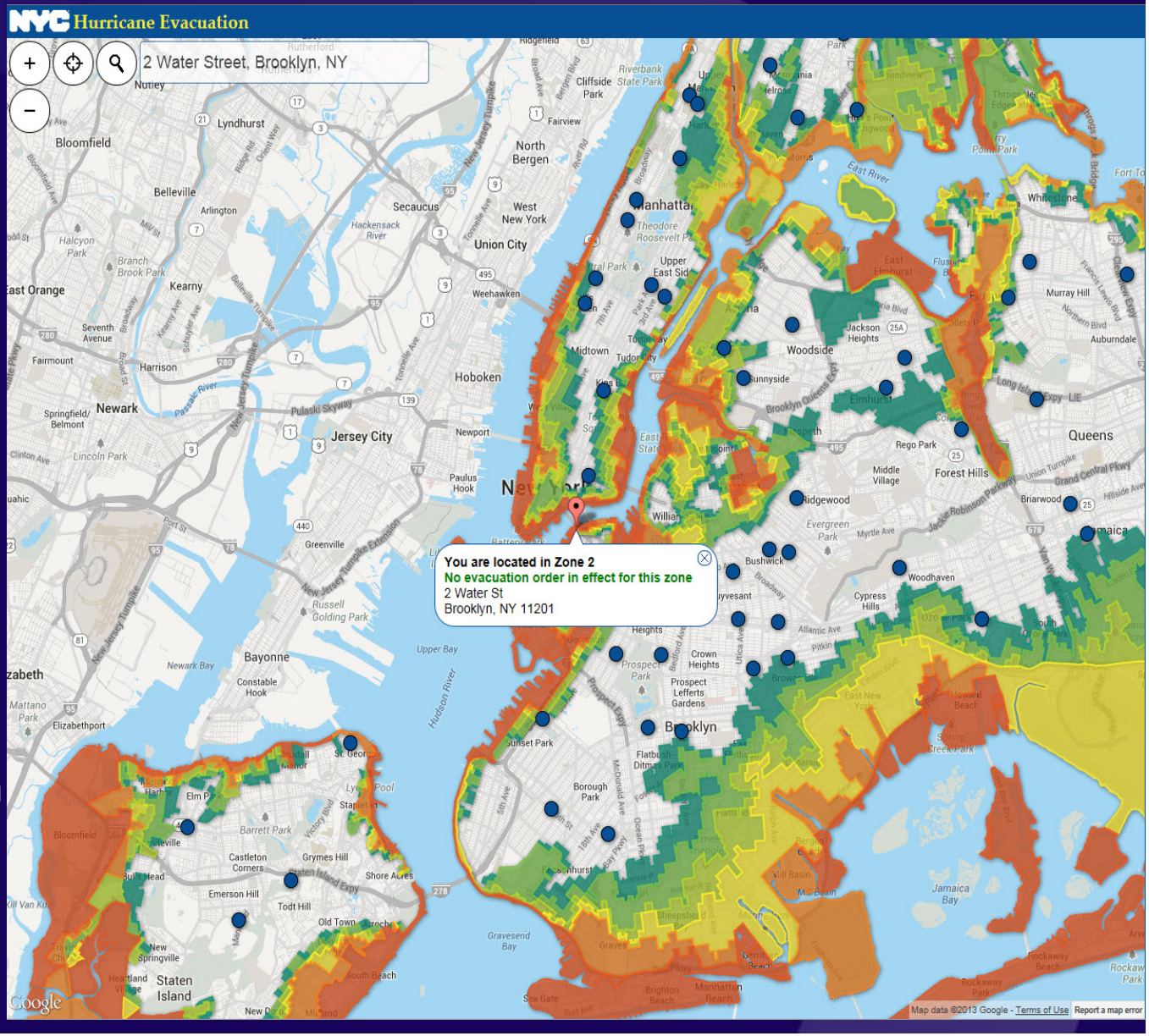
- MEOWs – Maximum Envelope of Water
  - Direction of the storm is held constant, but landfall location is varied
  - Category of storm is held constant
  - Can be run for a single RMW and forward speed or may include multiple RMWs and forward speeds

- MOMs – Maximum of the MEOWs
  - For a given category of storm, combines worst case for each grid cell for all the MEOWs
  - MOM ensemble includes ~15,000 model runs

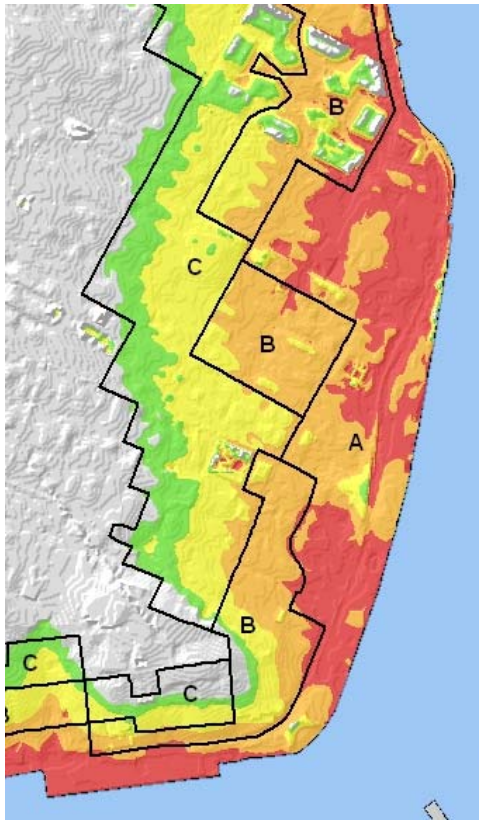
- P-surge – Probabilistic Storm Surge
  - Run for a given storm, using the current forecast and the average historical error in track, intensity, size, and forward speed
  - Results reported as the probability that a given surge depth will be exceeded
  - Might include 4000 model runs
  - Does not include tide

Coastal Storm Plan

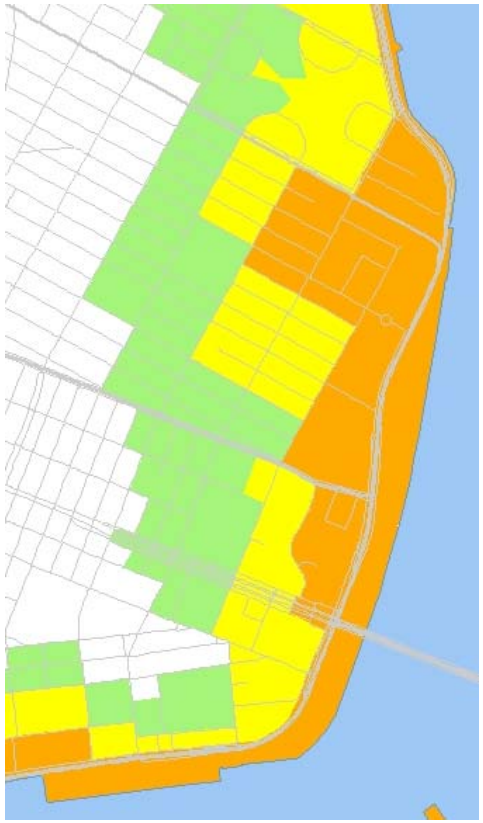
- Topography
- SLOSH
- Evacuation Zones
- Critical Facilities
- Demographics
- Evacuation Plan
- Hurricane Zone Finder Application



SLOSH versus Evacuation Zones



SLOSH



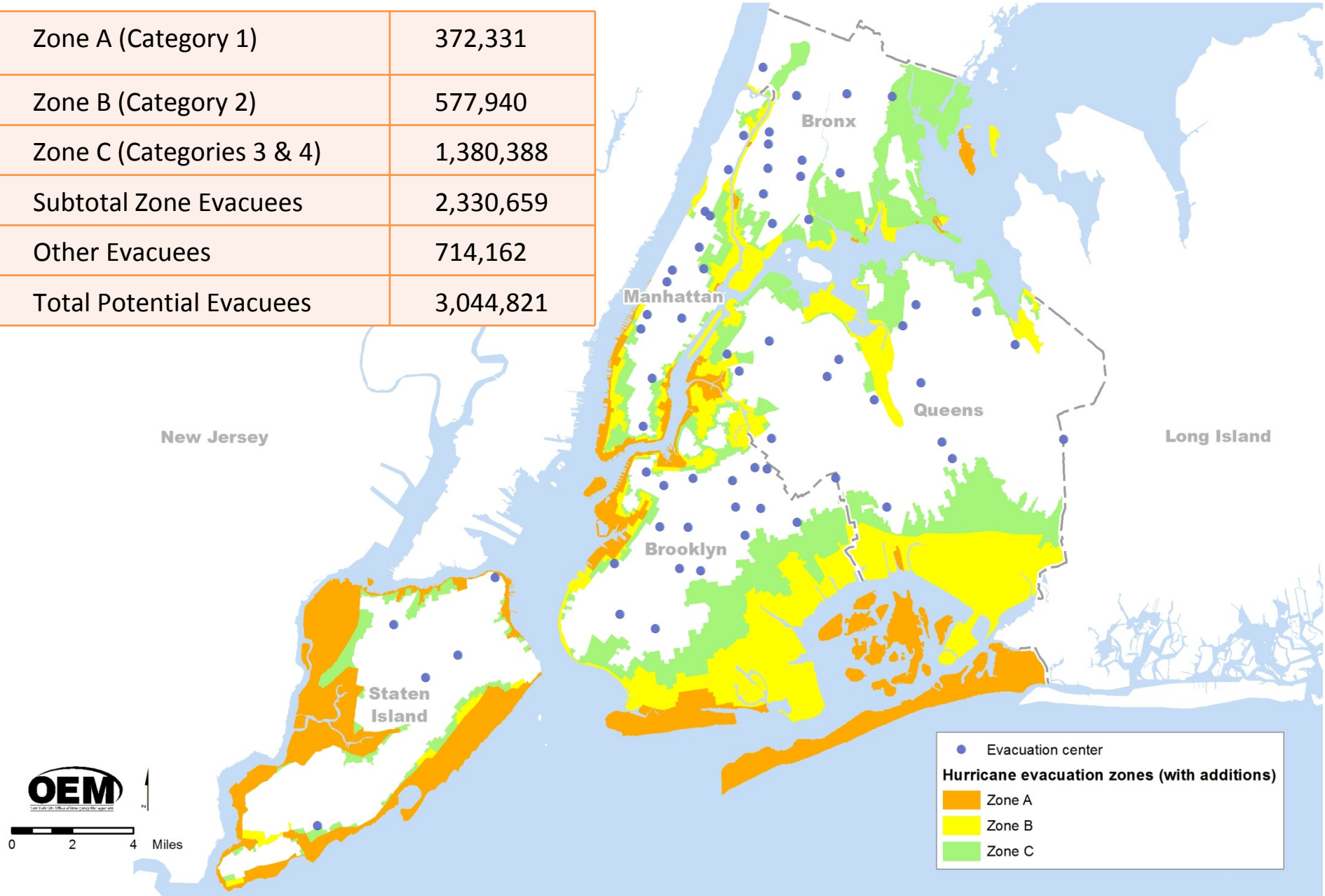
Evacuation Zones

Evacuation zones are aligned to streets to simplify public messaging

NYC COASTAL STORM PLAN

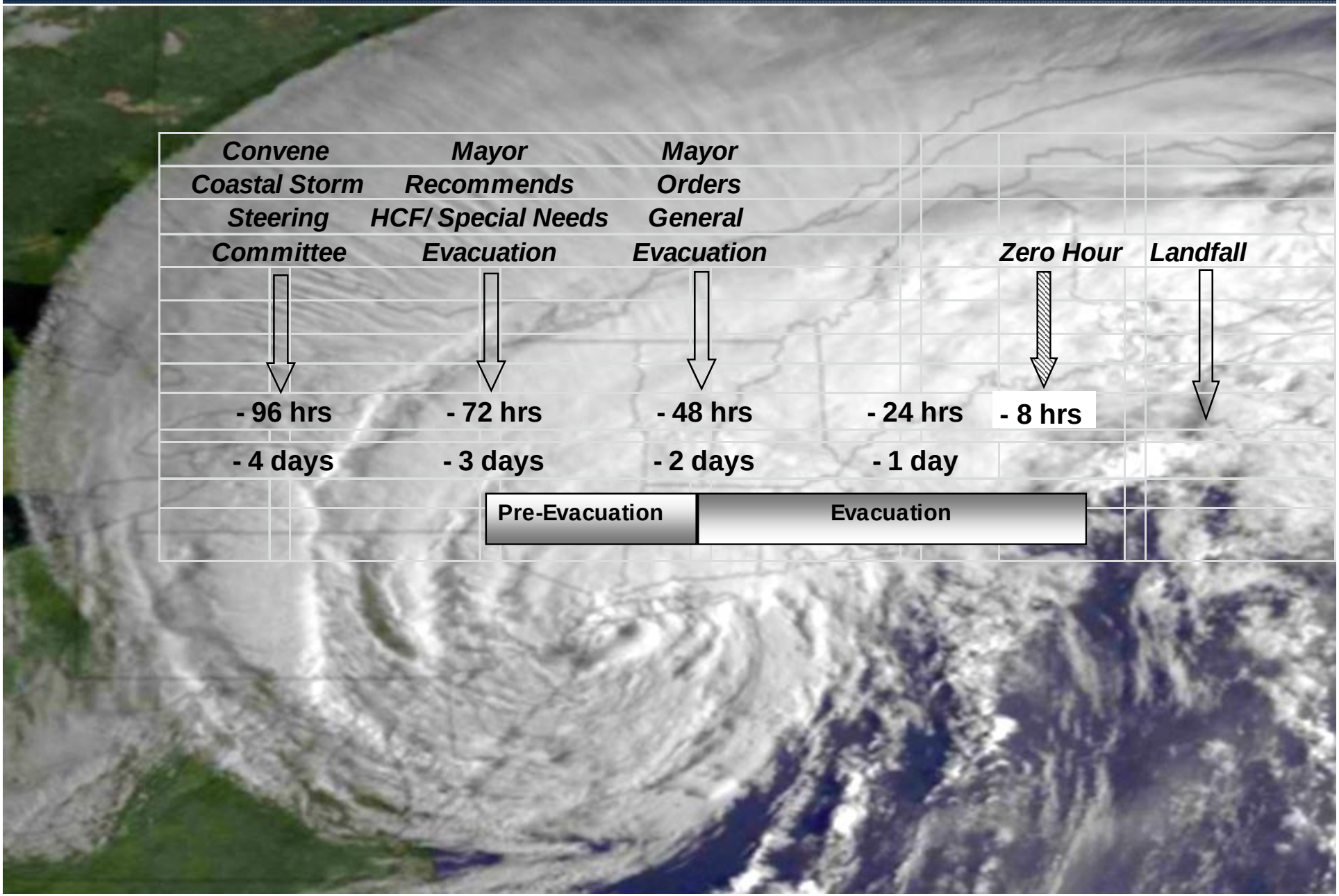
Key Components: Evacuation Zones

Zone A (Category 1)	372,331
Zone B (Category 2)	577,940
Zone C (Categories 3 & 4)	1,380,388
Subtotal Zone Evacuees	2,330,659
Other Evacuees	714,162
Total Potential Evacuees	3,044,821



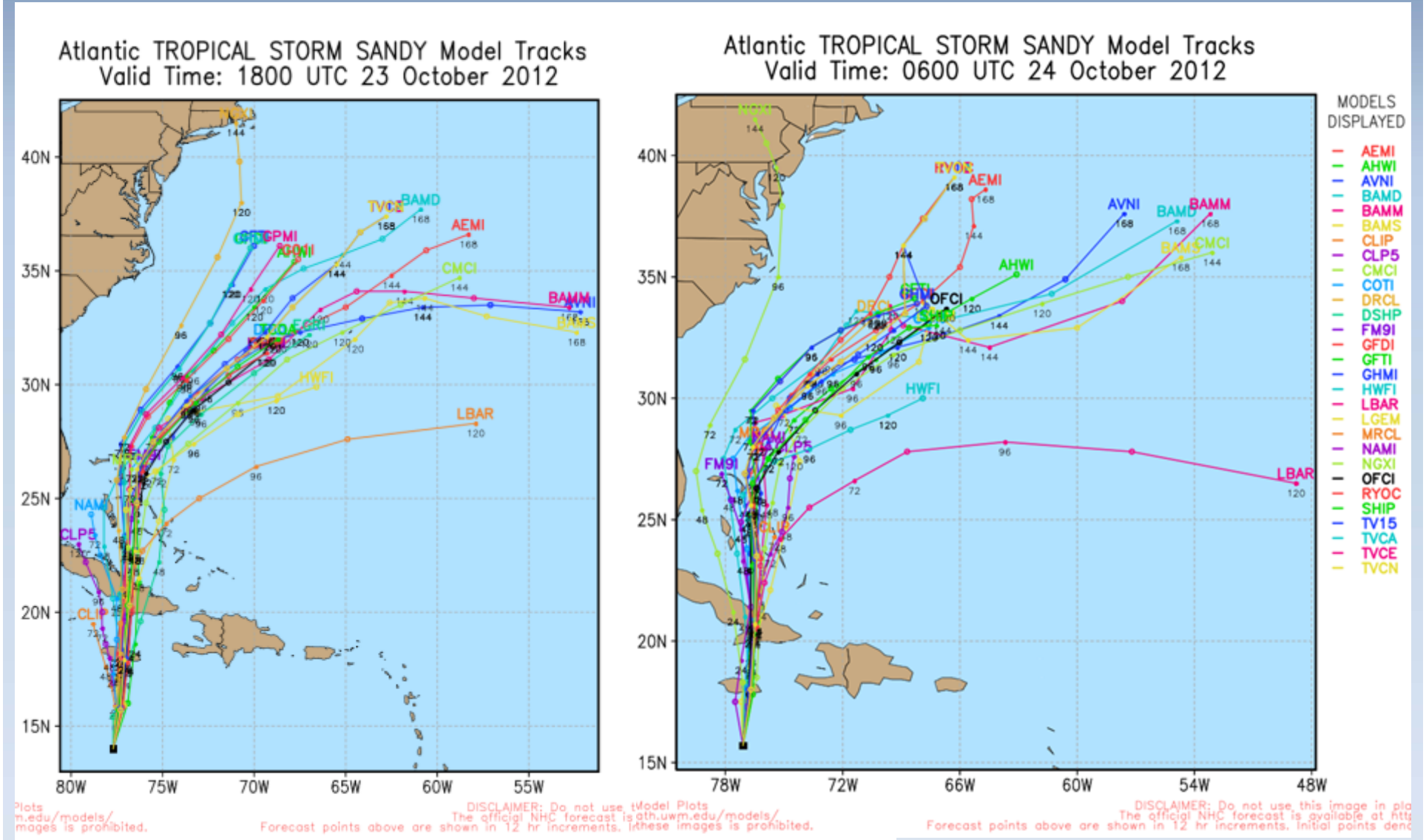
NYC COASTAL STORM PLAN

Key Components: Timeline



SANDY: THE FORECAST

10/23—10/24—10/25—10/26—10/27—10/28



SANDY: THE FORECAST

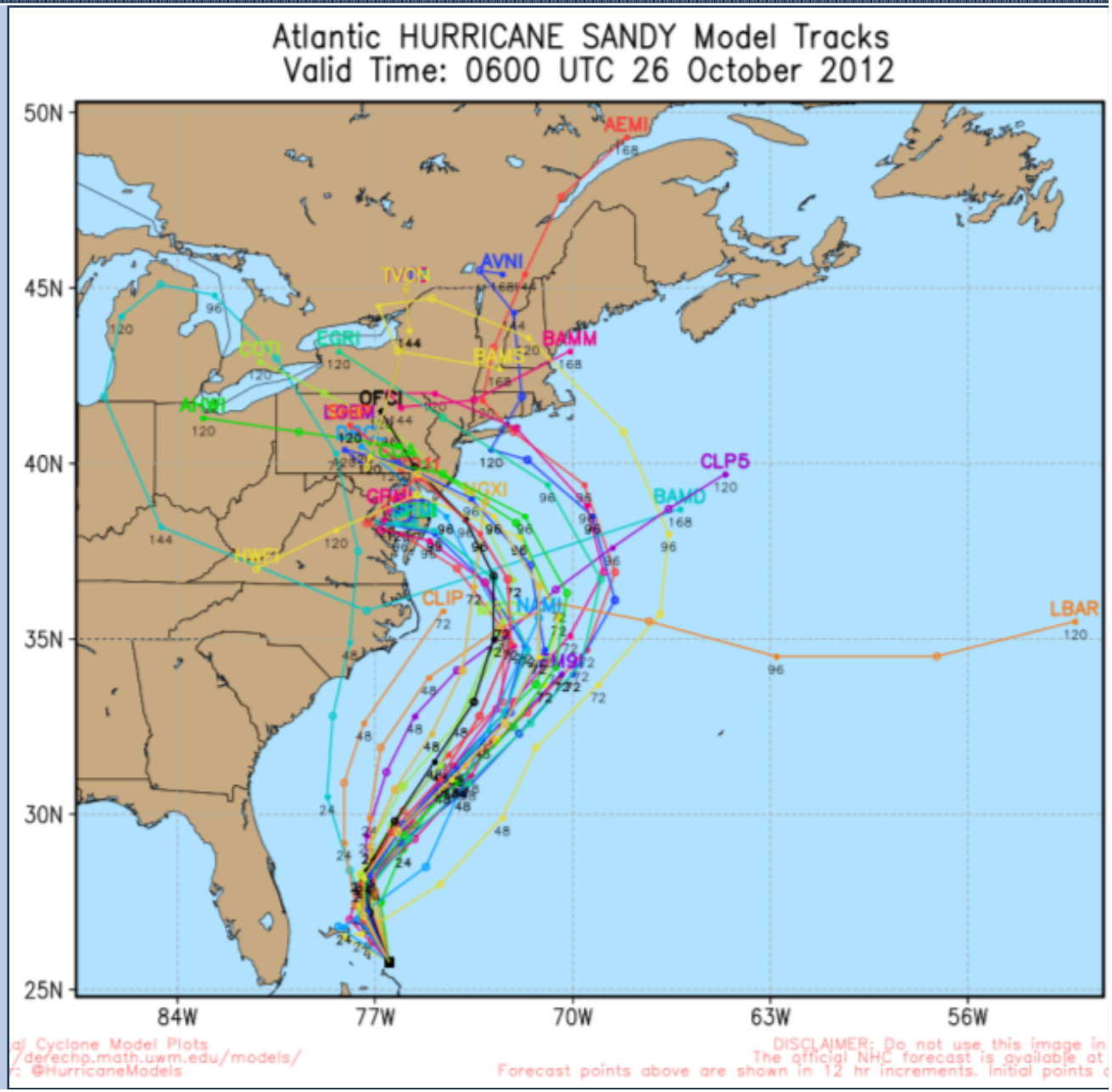
10/23—10/24—**10/25**—10/26—10/27—10/28

- **Category 2 Hurricane**
- **105 mph max sustained winds**
- **Ocean bound path becoming unlikely**

SANDY: THE FORECAST

10/26—10/27—10/28—10/29—10/30—10/31

- **Category 1 Hurricane**
- **80mph max sustained winds**
- **Landfall predicted 2am Tues 10/30 as Category 1**
- **NWS predicts landfall near Southern New Jersey**



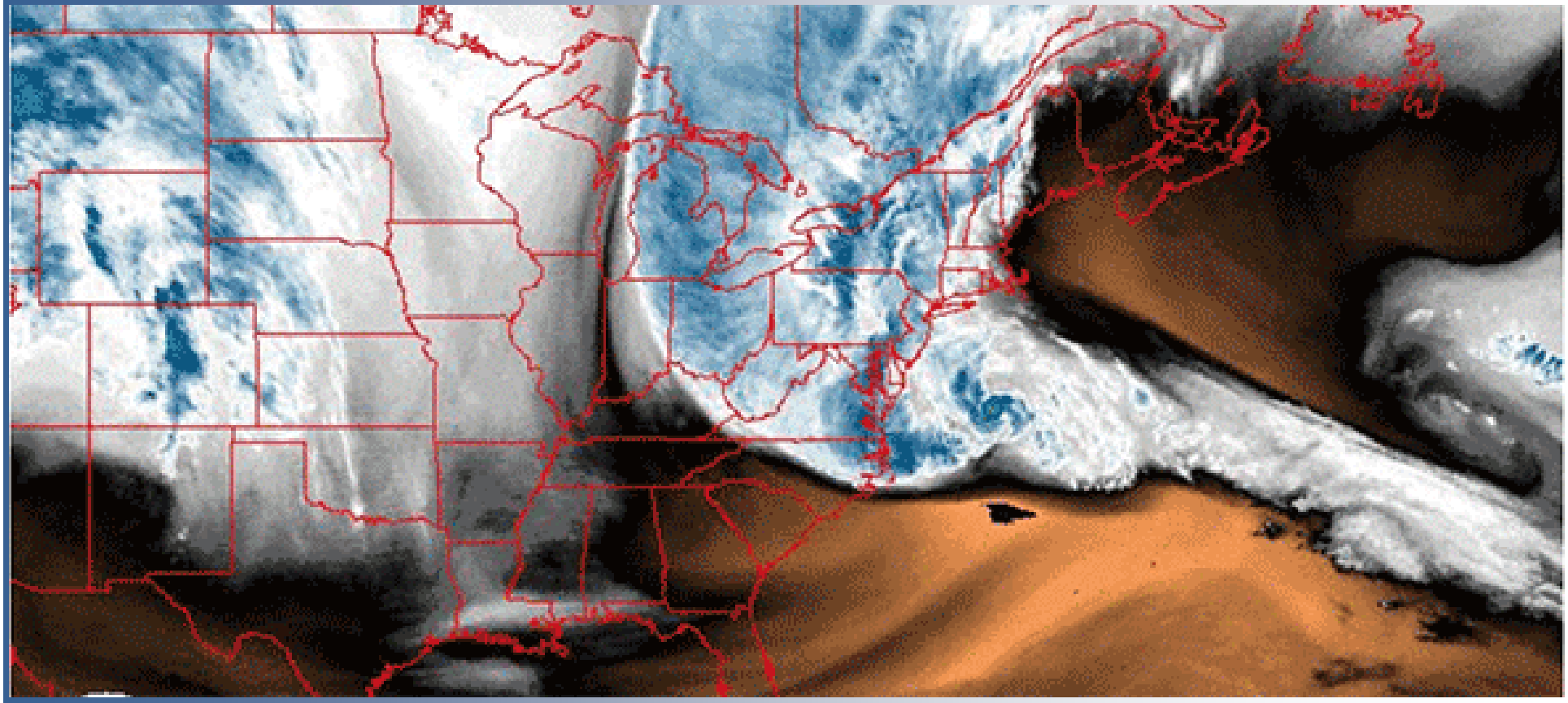
EOC ACTIVATED

10/26—10/27—10/28—10/29—10/30—10/31

140 representatives worked from the EOC

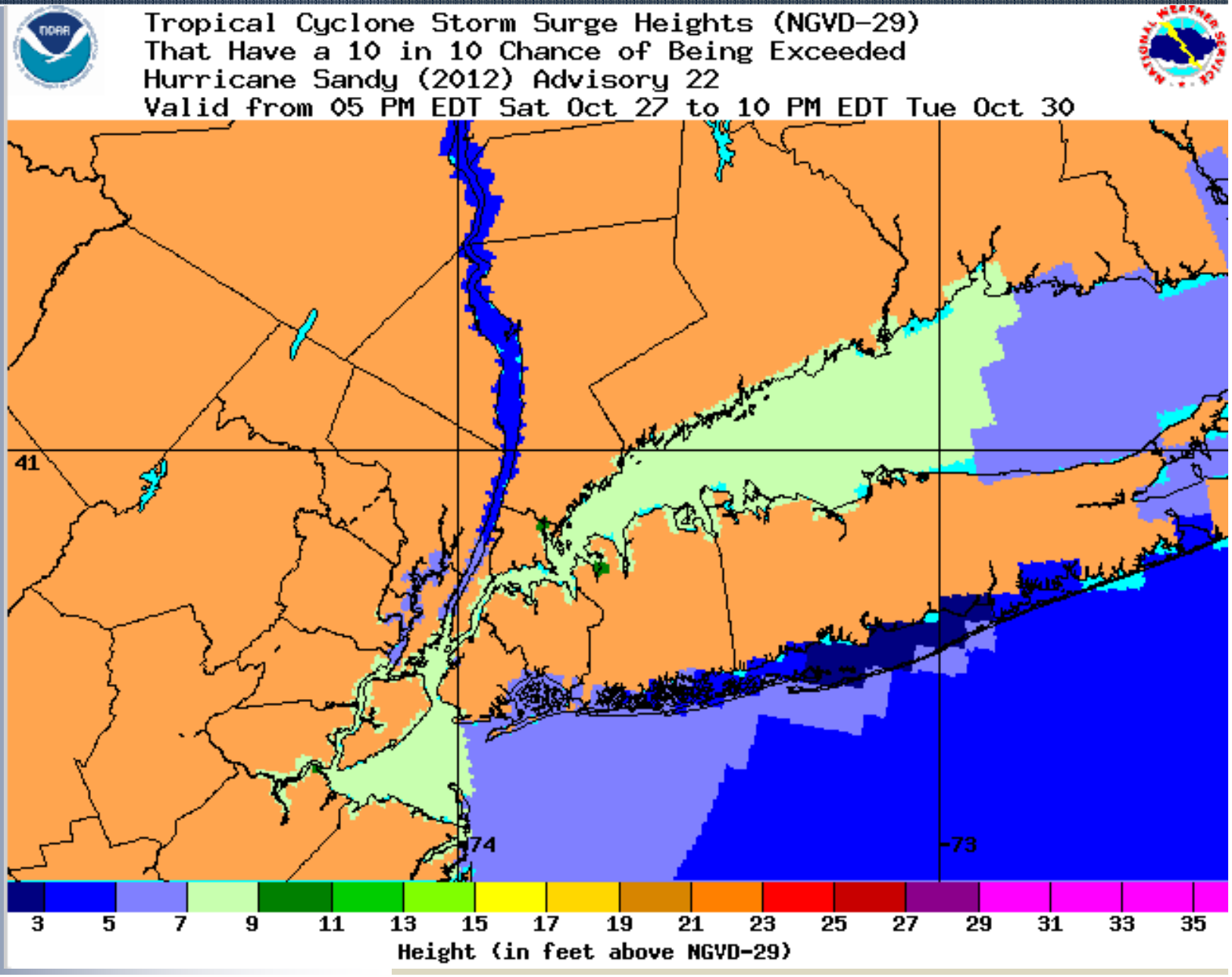
SANDY: FORECAST WORSENS

10/26—10/27—**10/28**—10/29—10/30—10/31



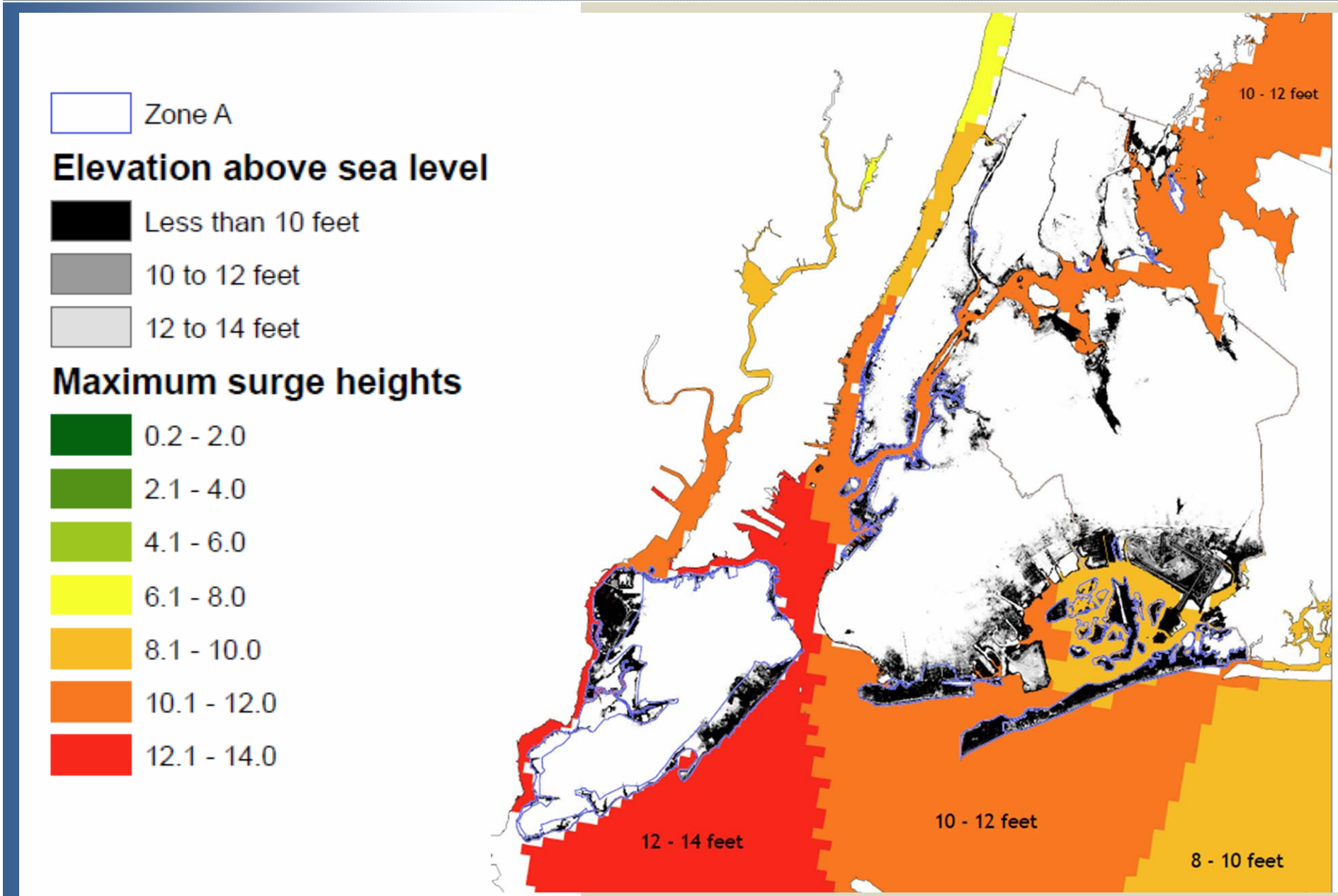
SANDY: THE FORECAST

NWS predicts surge heights of 4-8ft



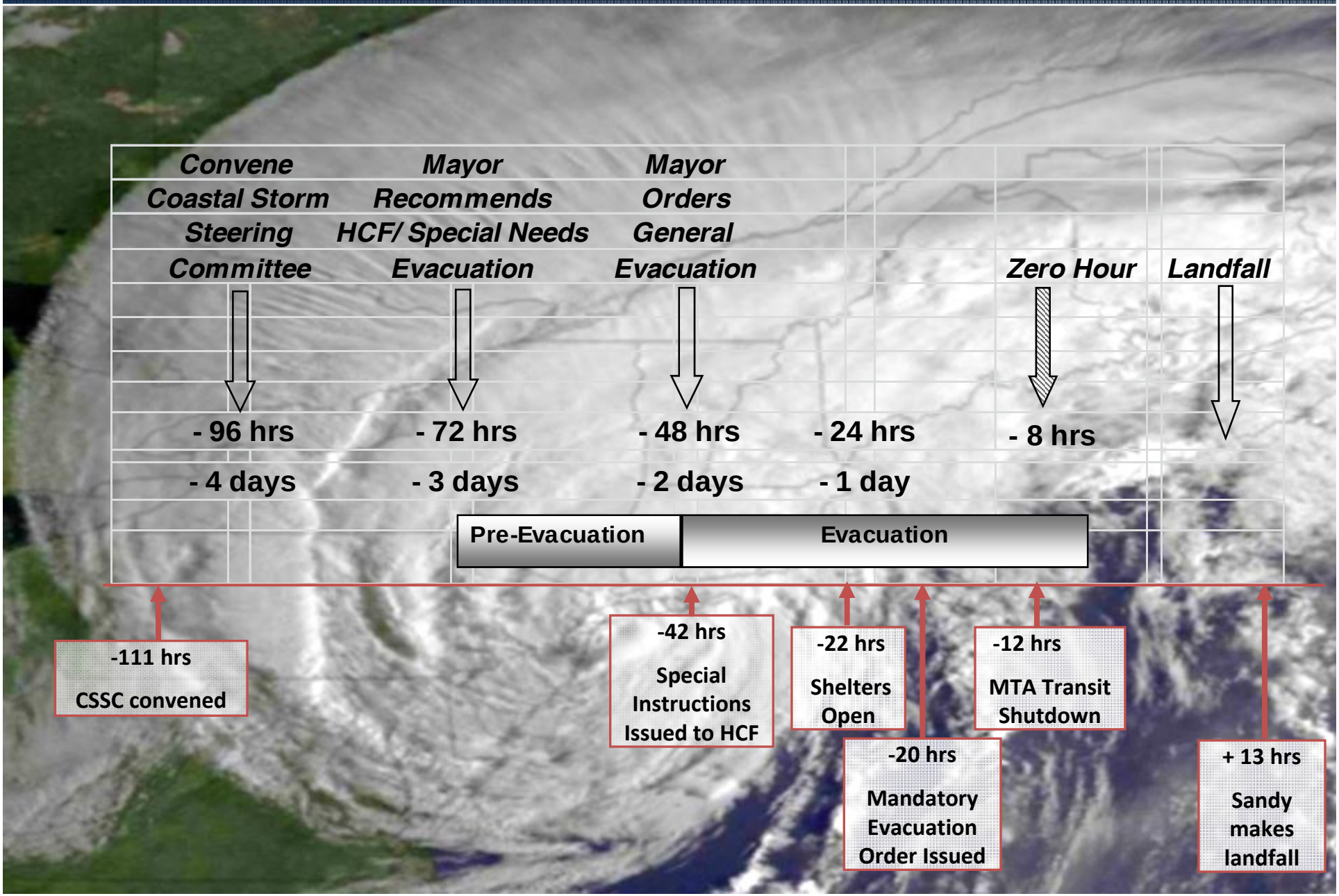
SANDY: FORECAST WORSENS

10/26—10/27—**10/28**—10/29—10/30—10/31



NYC COASTAL STORM PLAN

The Sandy Timeline

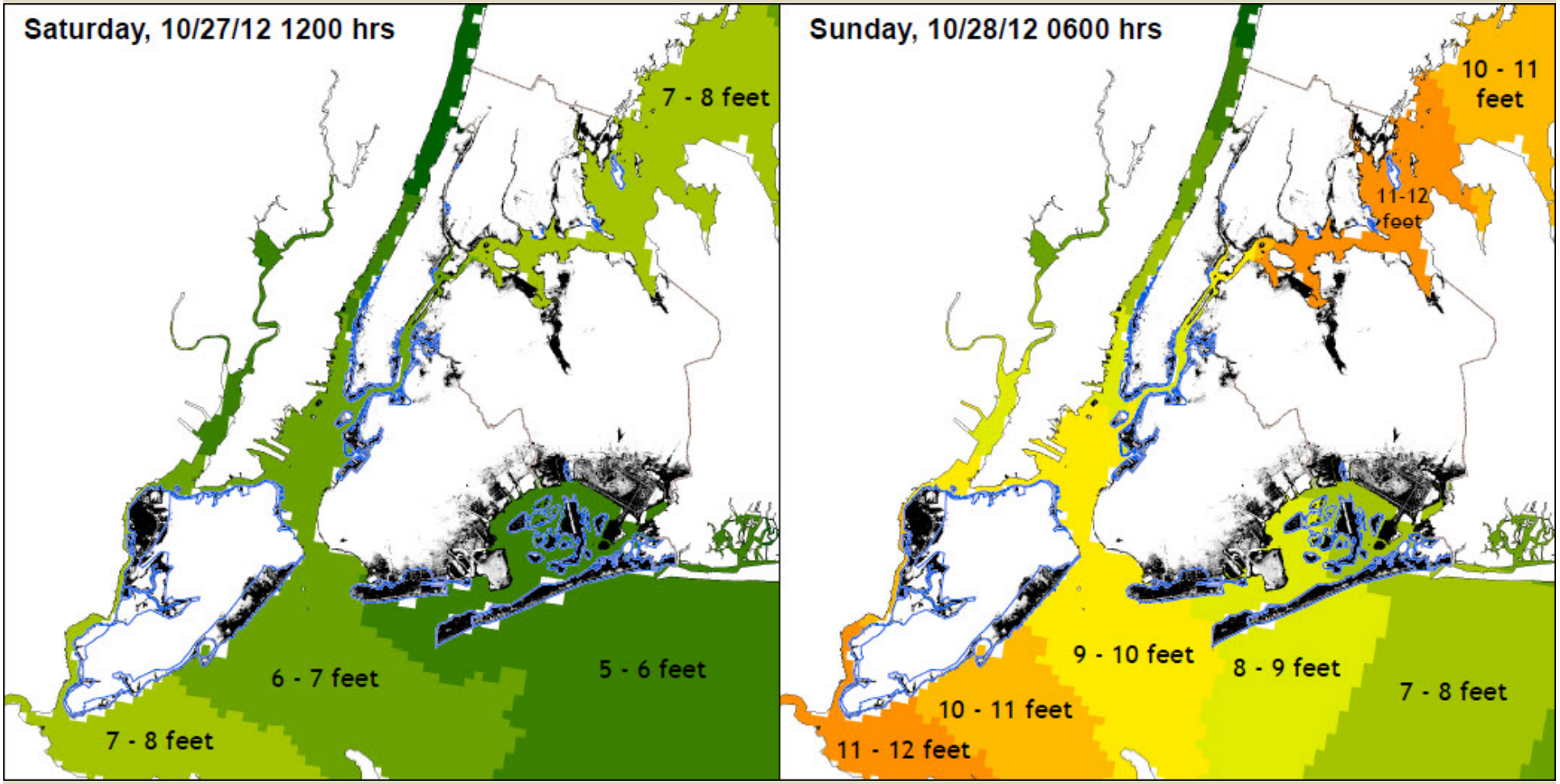


SANDY: FORECAST WORSENS

10/26—10/27—**10/28**—10/29—10/30—10/31

OEM

Changes in Maximum Surge Height Predictions for Sandy



Zone A with additions

Land elevation above MSL (NAVD88)

- Less than 10 feet
- 10 to 12 feet
- 12 to 14 feet

Predicted water surge heights above MSL (NGVD29)

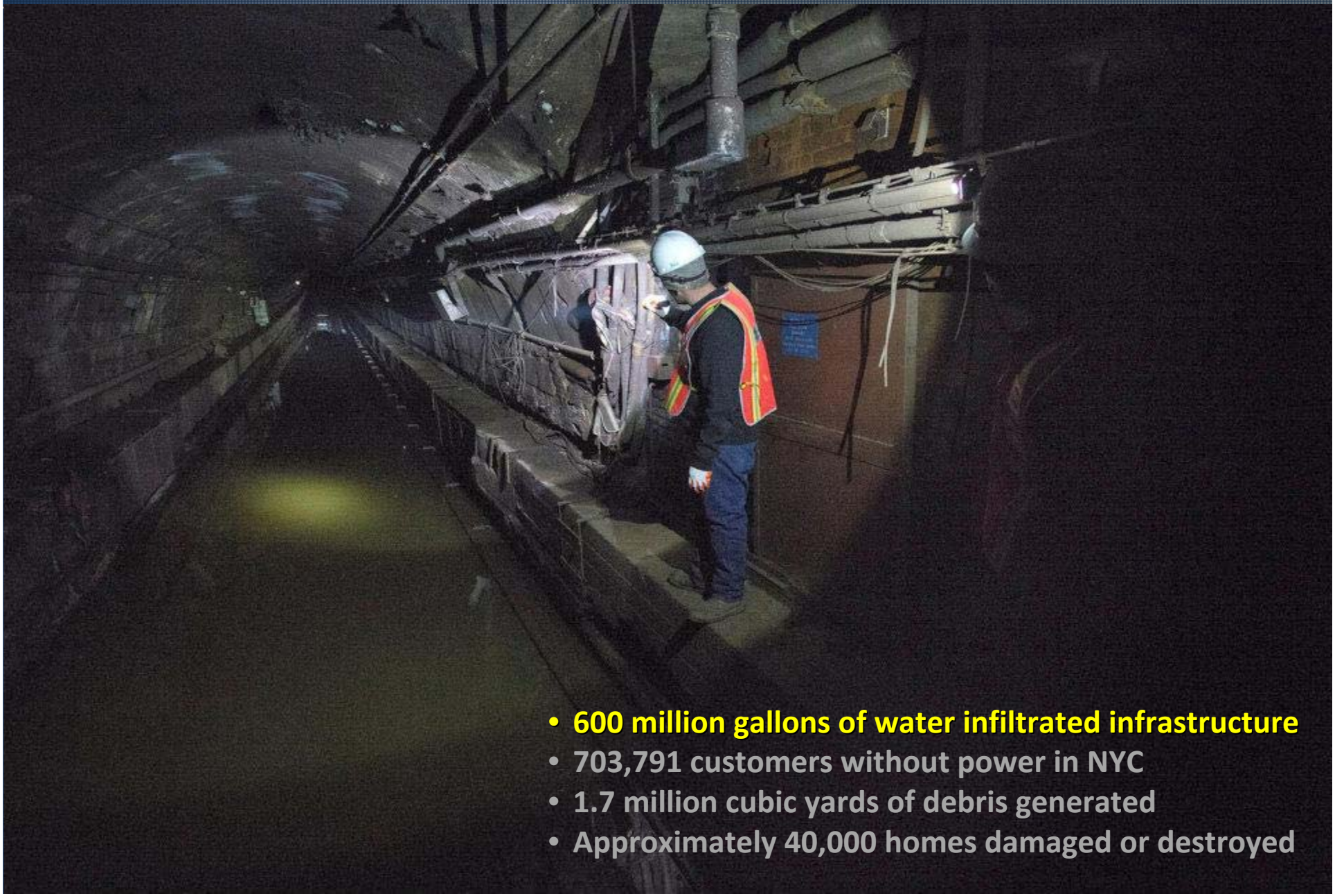
- 4.1 - 5.0
- 5.1 - 6.0
- 6.1 - 7.0
- 7.1 - 8.0
- 8.1 - 9.0
- 9.1 - 10.0
- 10.1 - 11.0
- 11.1 - 12.0
- 12.1 - 13.0
- 13.1 - 14.0

Source: National Hurricane Center

SANDY'S ARRIVAL

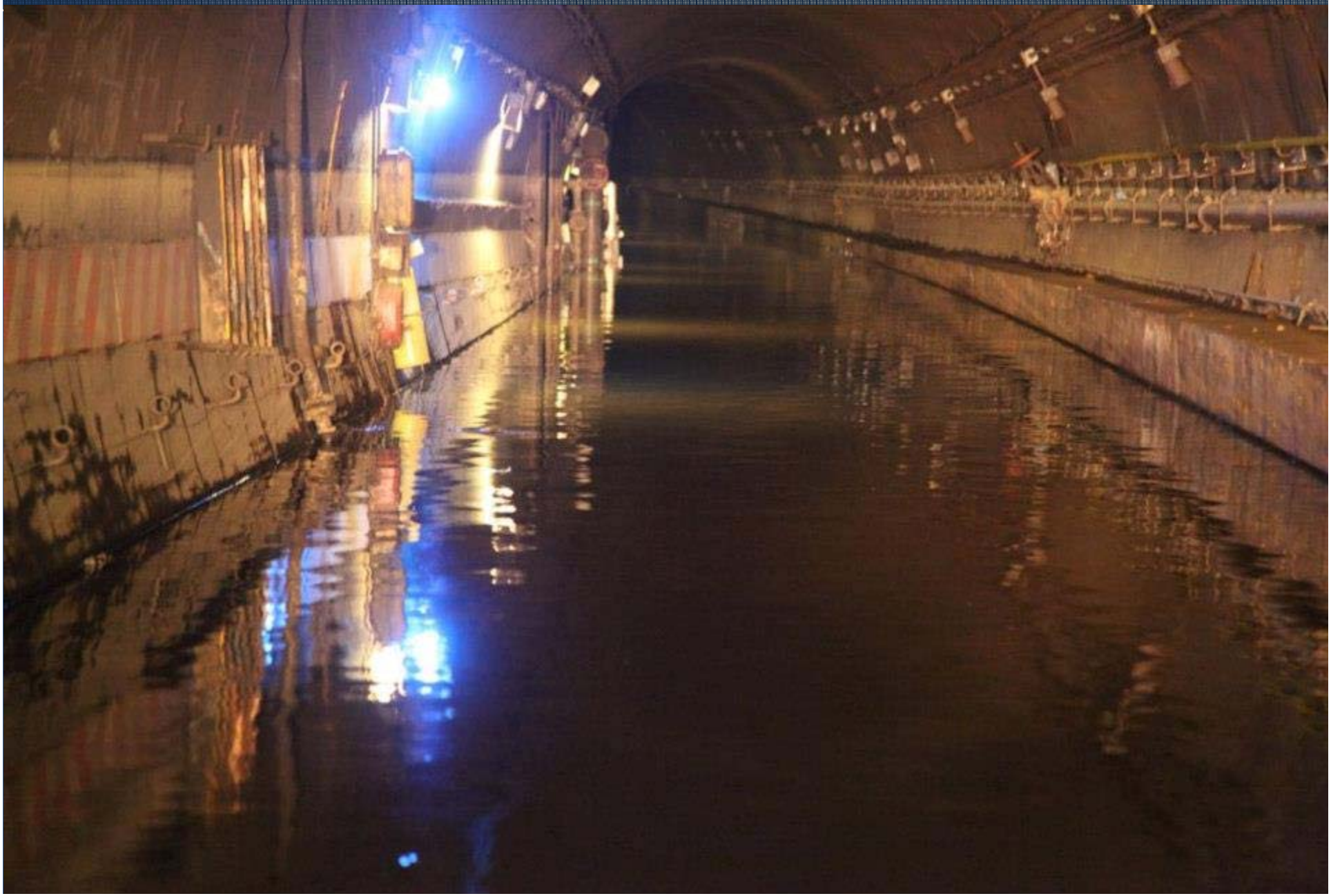
10/26—10/27—10/28—**10/29**—10/30—10/31

DEWATERING



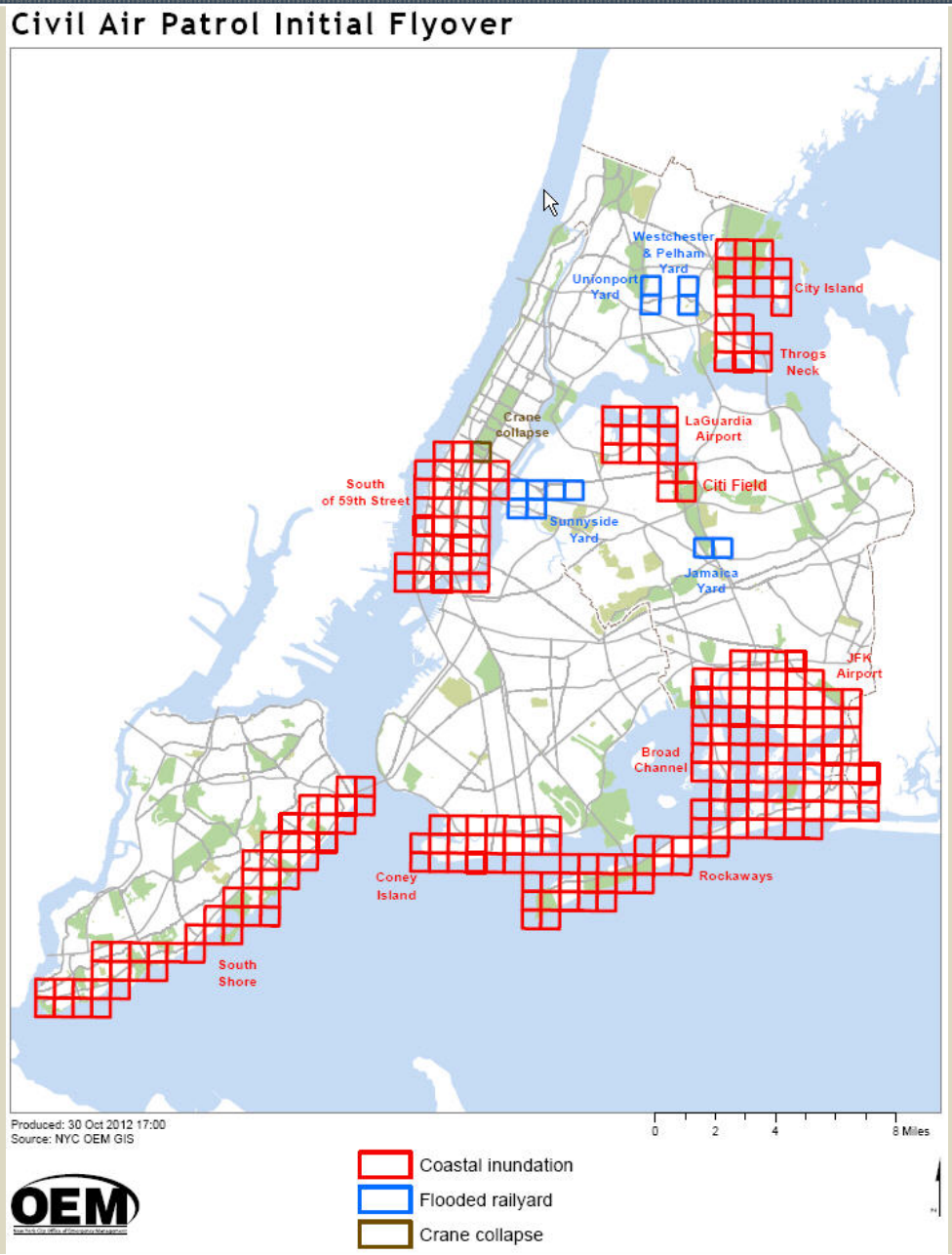
- **600 million gallons of water infiltrated infrastructure**
- **703,791 customers without power in NYC**
- **1.7 million cubic yards of debris generated**
- **Approximately 40,000 homes damaged or destroyed**

DEWATERING



Civilian Air Patrol

Used National Grid

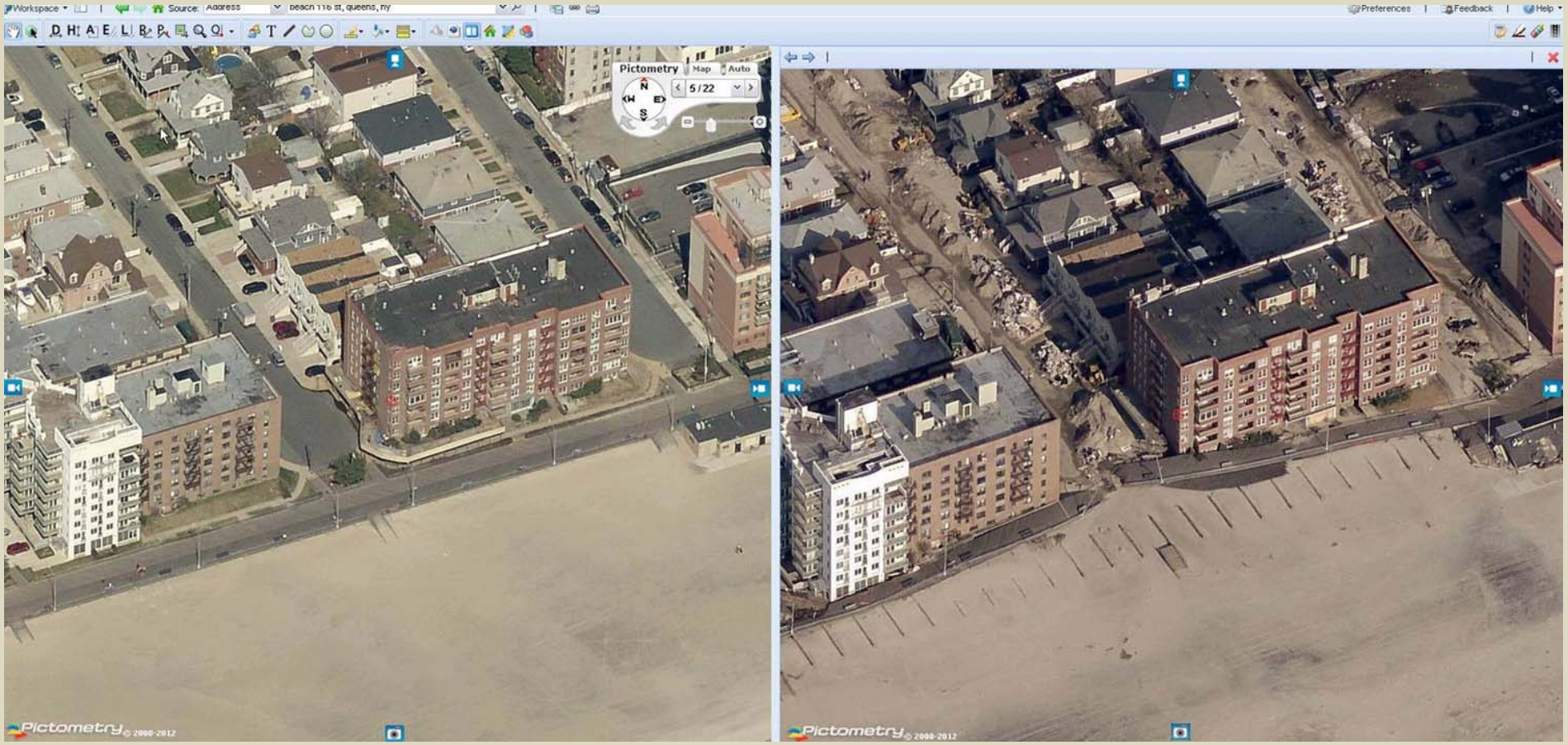


Civilian Air Patrol

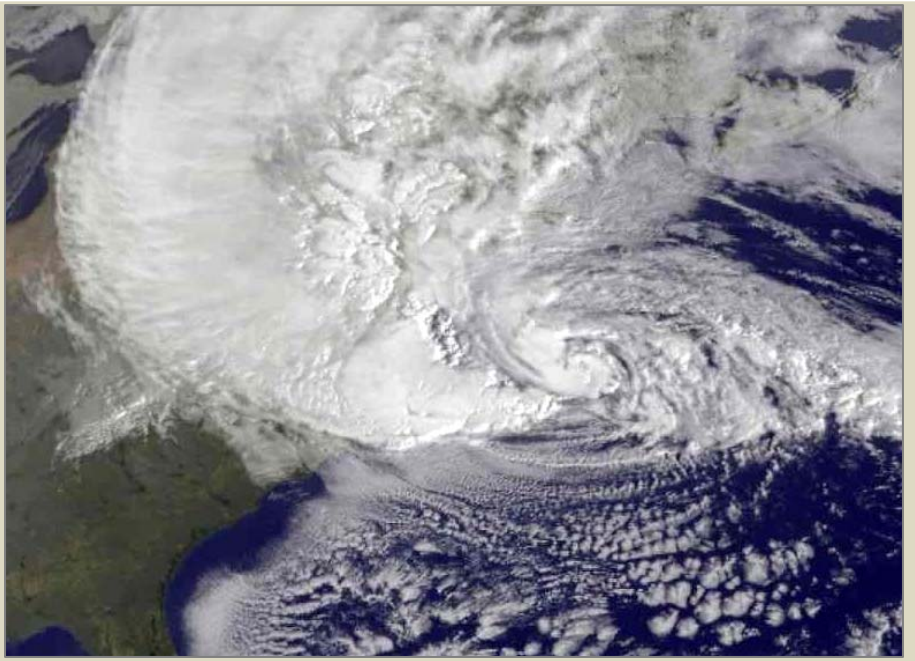
Civilian Air Patrol

Civilian Air Patrol

Georeferenced Oblique Aerial Photography



THE SANDY STORY



Hurricane Sandy Impacts

600 million gallons of water infiltrated infrastructure

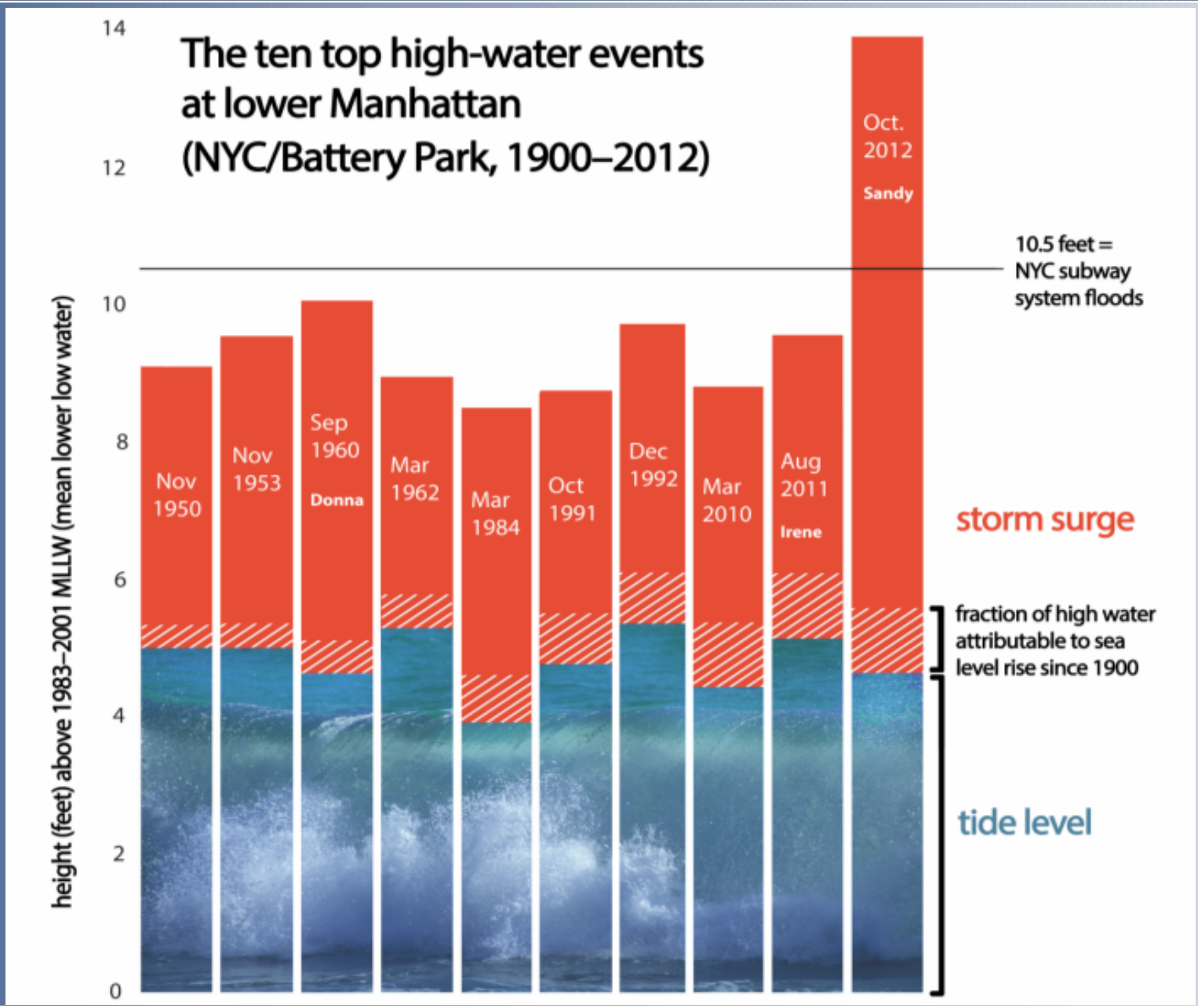
703,791 customers without power in NYC

1.7 million cubic yards of debris generated

Approximately 40,000 homes damaged or destroyed

JOB 1: DEWATERING

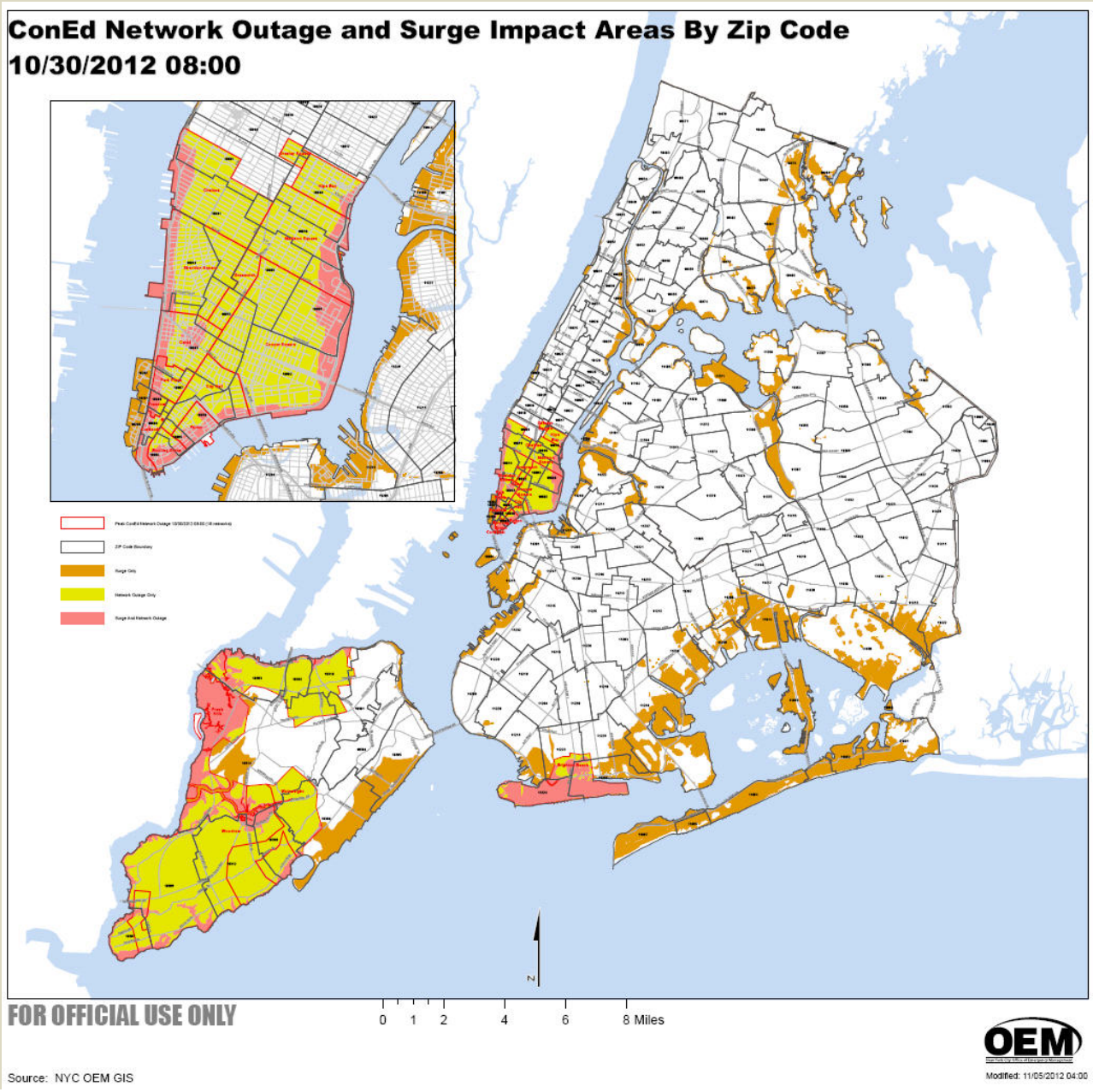
Storm Surge at Battery Park



POWER RESTORATION

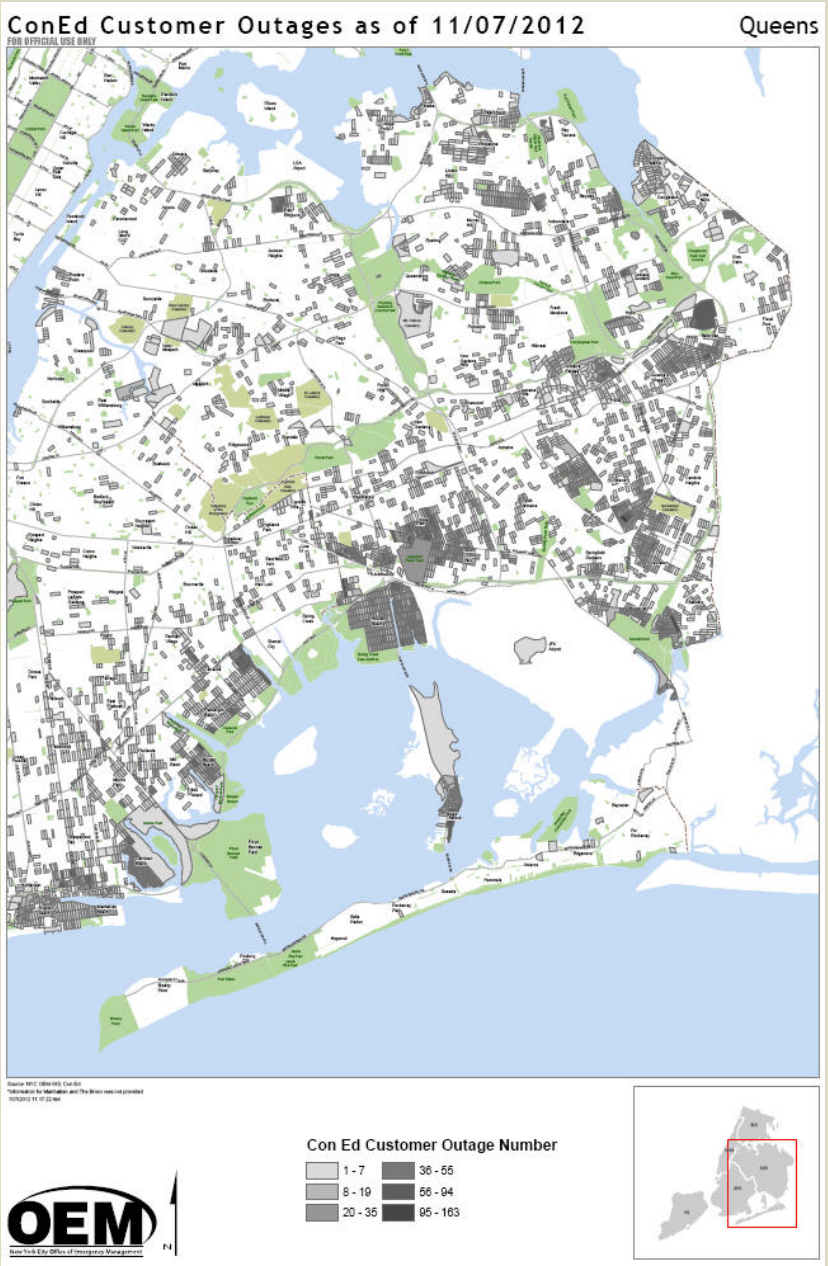
Electrical Power Outages

Information from Consolidated Edison Private Electric Utility



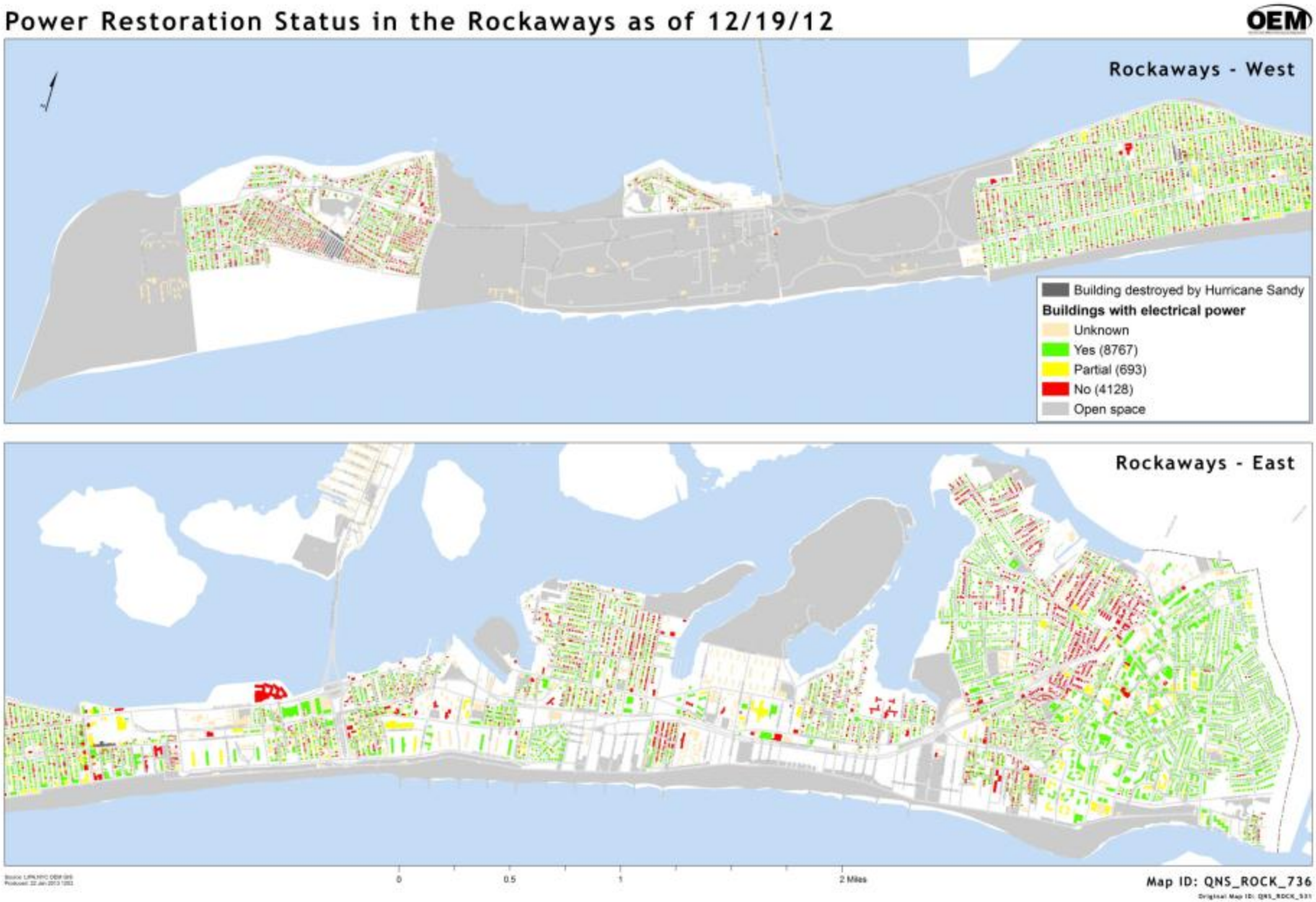
Electrical Power Outages

Information from Consolidated Edison Private Electric Utility

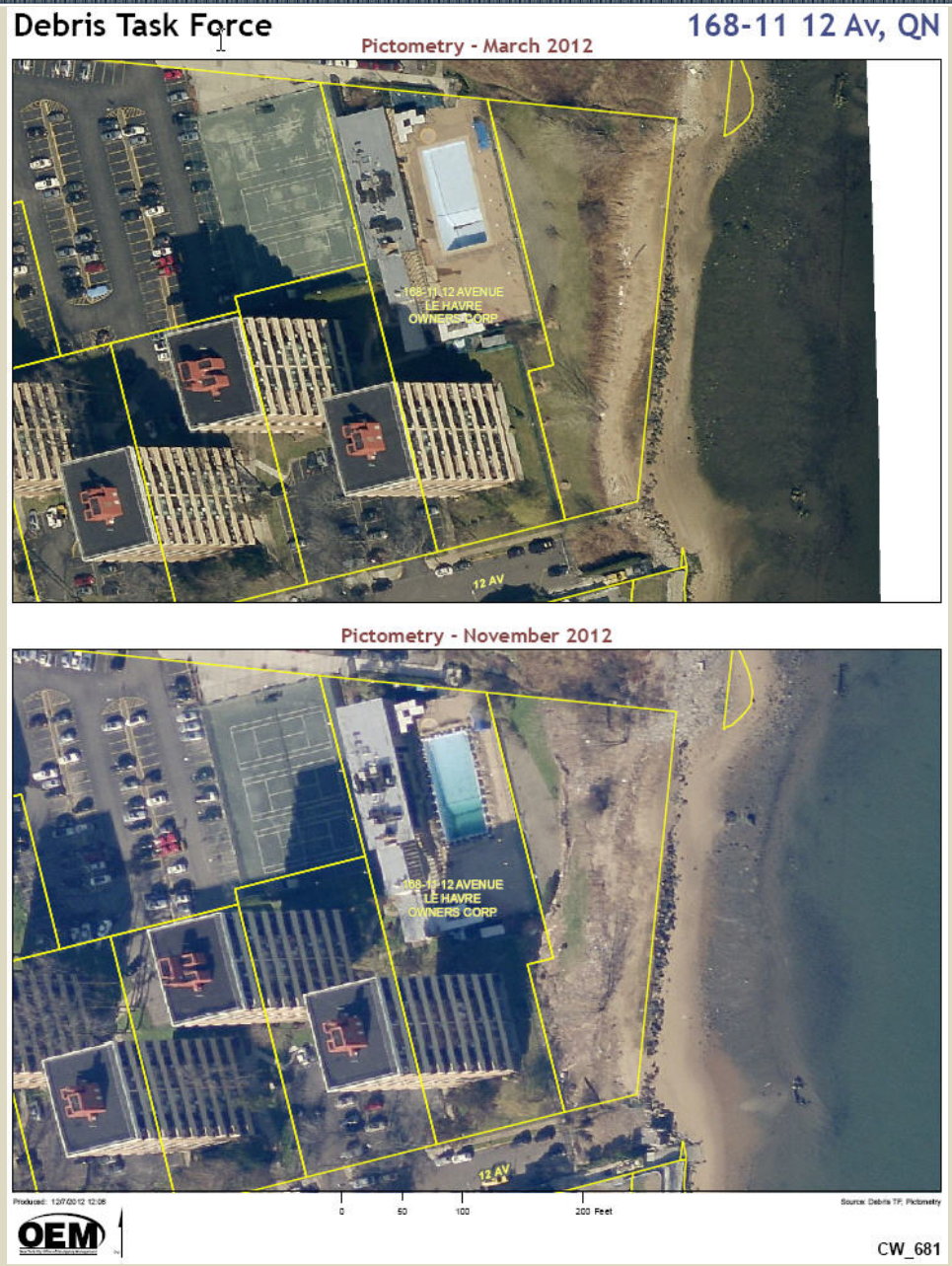


POWER RESTORATION: NYCHA & HPD

POWER RESTORATION



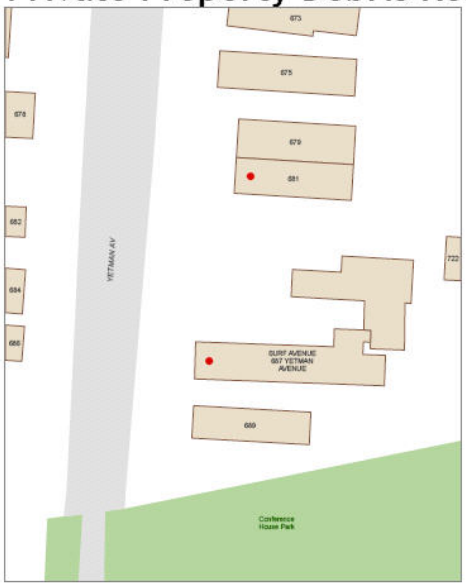
Debris

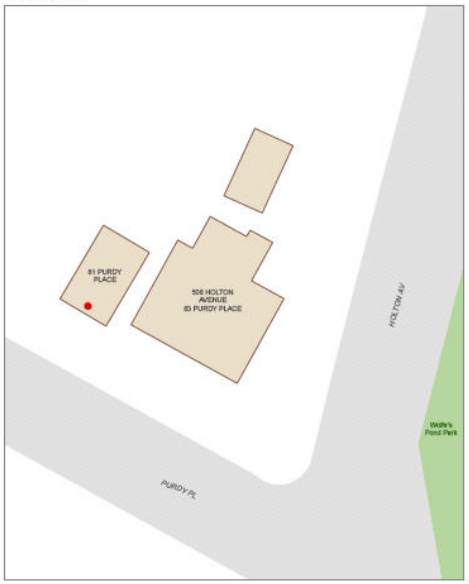

Debris Task Force
168-11 12 Av, QN
Pictometry - March 2012
168-11 12 AVENUE
LE HAVRE
OWNERS CORP
12 AV
Pictometry - November 2012
168-11 12 AVENUE
LE HAVRE
OWNERS CORP
12 AV
0
50
100
200 Feet
CW_681

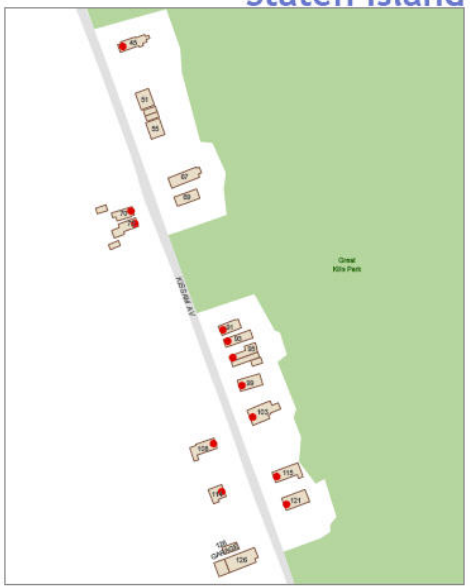
Debris

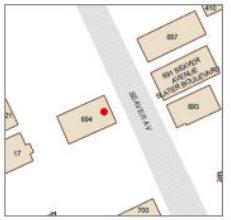
Private Property Debris Removal

Staten Island









Address
67 CEDAR GROVE AVENUE
76 CEDAR GROVE BEACH
1 CEDAR GROVE BEACH
71 CEDAR GROVE BEACH PLACE
4 CEDAR GROVE BEACH PLACE
2 CEDAR GROVE BEACH PLACE
1A CEDAR GROVE BEACH PLACE
14 CRESCENT BEACH
133 GOODALL STREET
45 KISSAM AVENUE
121 KISSAM AVENUE
115 KISSAM AVENUE
114 KISSAM AVENUE
108 KISSAM AVENUE
103 KISSAM AVENUE
99 KISSAM AVENUE
91 KISSAM AVENUE
89 KISSAM AVENUE
95 KISSAM AVENUE
70 KISSAM AVENUE
72 KISSAM AVENUE
59 MAPLE TERRACE
619 MIDLAND AVENUE
621 MIDLAND AVENUE
81 PURDY PLACE
620 QUINCY AVENUE
694 SEAVER AVENUE
667 YETMAN AVENUE
681 YETMAN AVENUE

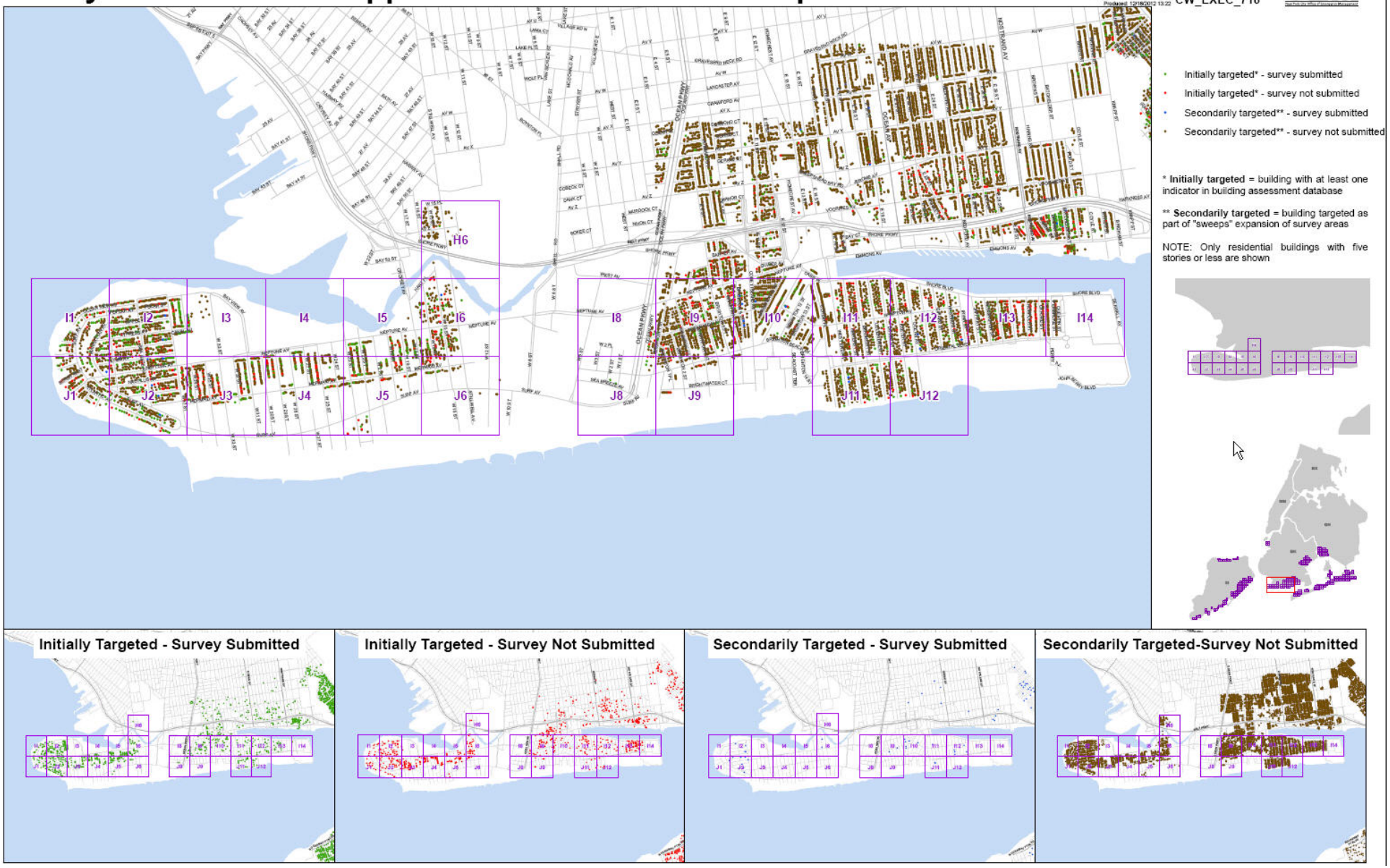
SI PPDR
Building footprint

Produced: 12/29/2012 13:30
Data source: OEM Ops

SUPPORT TO RESIDENTS IN THEIR HOMES (SRITH)

Door-to-Door Wellness Checks

Coney Island Sector Support to Residences Field Operations



Door-to-Door Wellness Checks

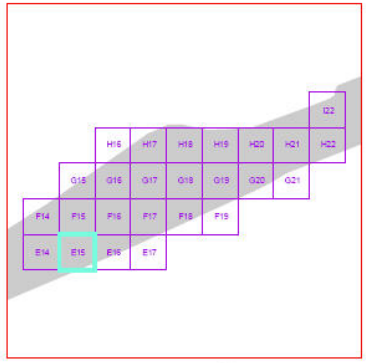
Rockaway Sector Support to Residences Field Operations

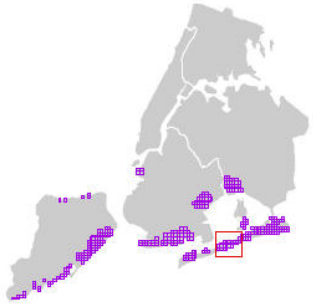
Cell: E15

Source: NYC OEM
Original MAP ID: CI_EXEC_697
Produced: 12/20/2012 15:56

CI_EXEC_737

- Building with no heat
- Building with no response to heat question
- Building that did not answer door



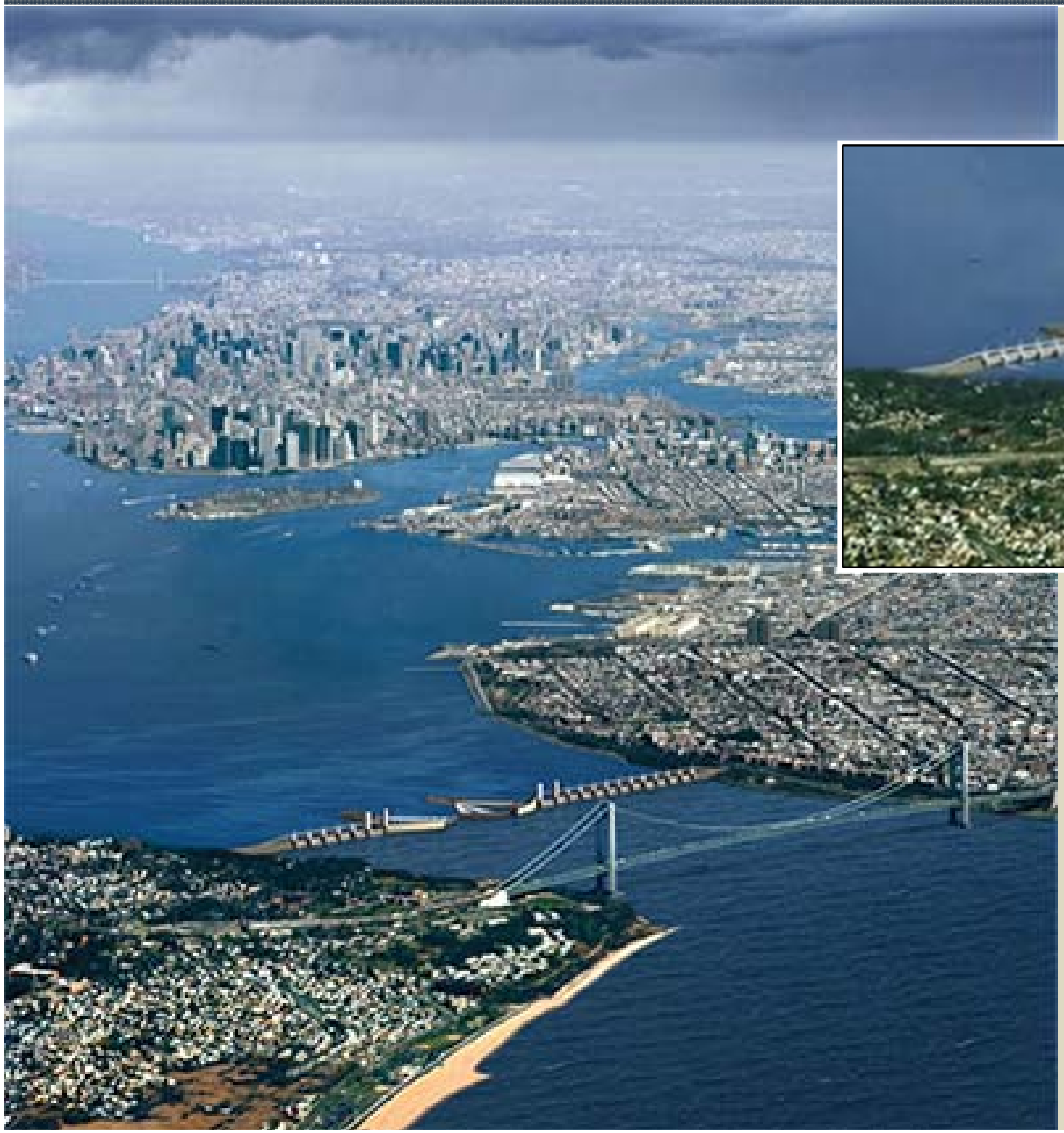


Future Planning

- Mitigation Measures
- Better modeling

Proposed Inflatable Tubes for Subway Tunnels

Proposed Sea Gates at Entrance to Upper New York Bay



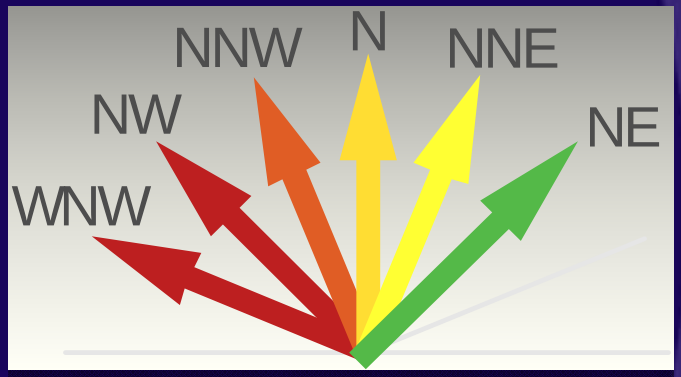
Proposed Changes in SLOSH Modeling: Bearing Based Approach

- Bearing has significant effect on storm surge
- Allows for more flexibility in evacuation (less likely to over- or under- evacuate)
- Storm track predictions are more accurate than predictions of intensity

Maximum Surge Heights by Storm Bearing

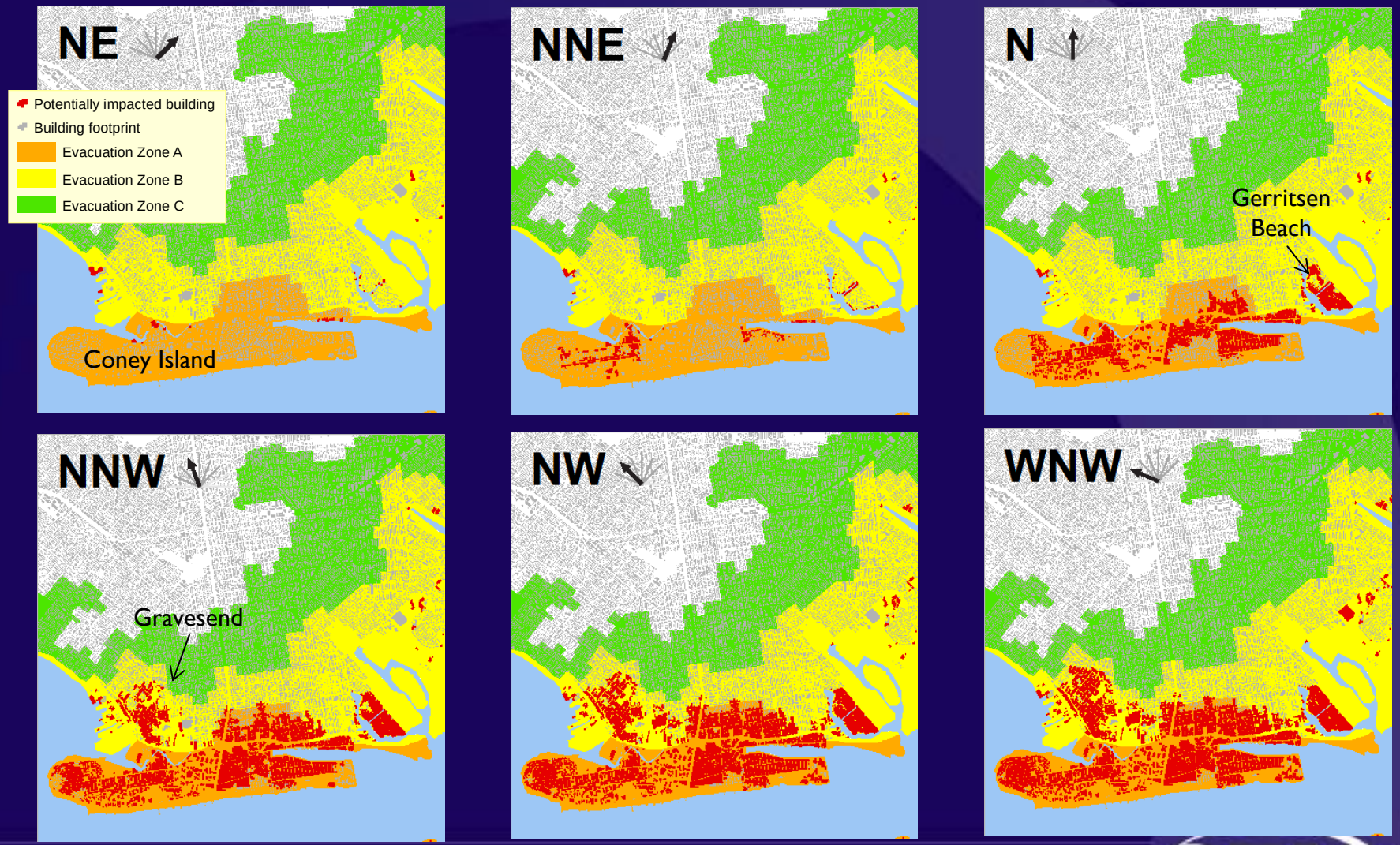
	WNW	NW	NNW	N	NNE	NE
Category 1	12.6	12.1	10.7	8.8	6.6	5
Category 2	20.9	20	20.1	16.5	11.4	8.1
Category 3	26.6	27.6	27.4	23.4	17	11.3
Category 4	32.4	33.9	33.9	30.6	21.7	14.6

Storm bearings



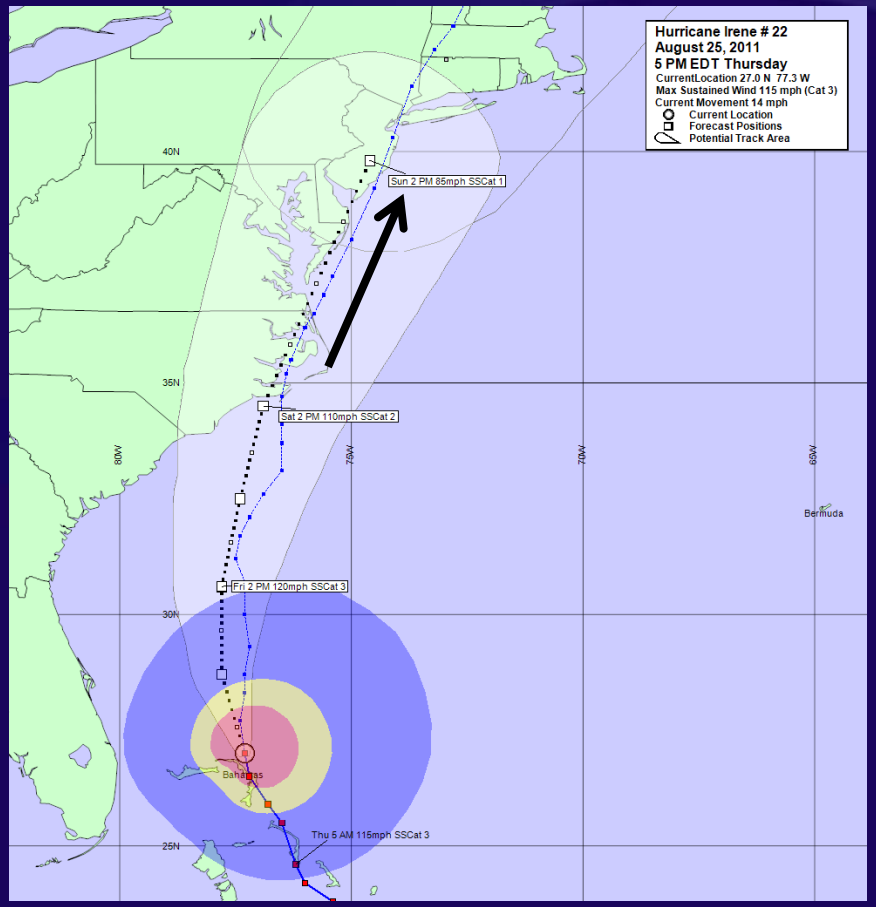
Potential Building Impacts: Cat 1 Hurricanes

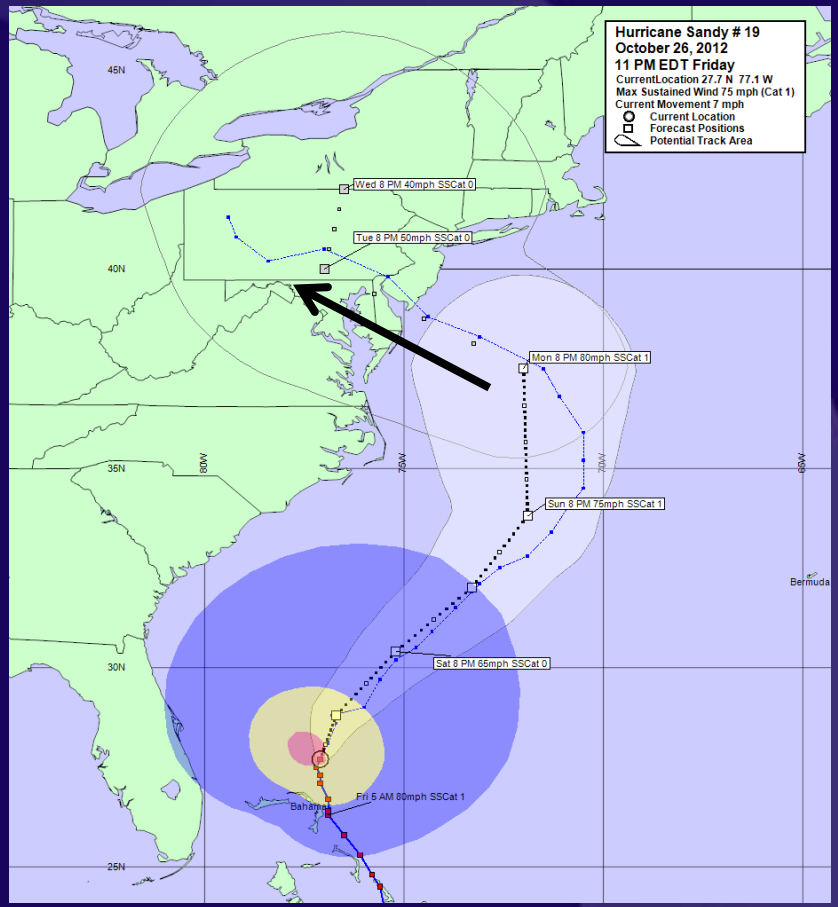
Buildings potentially impacted by worst-case surge based on hurricane bearing



Irene – NNE bearing

Sandy – WNW bearing
(NW at landfall)





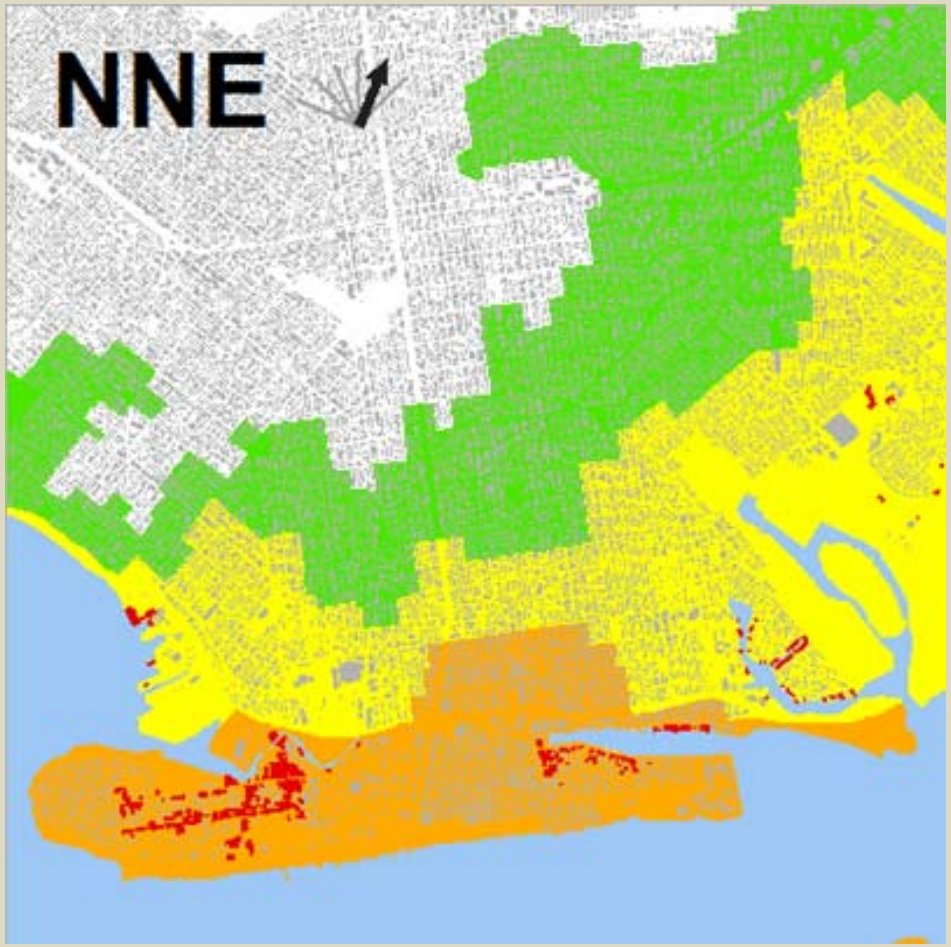
Predicted storm tracks for both storms 70 hours before landfall

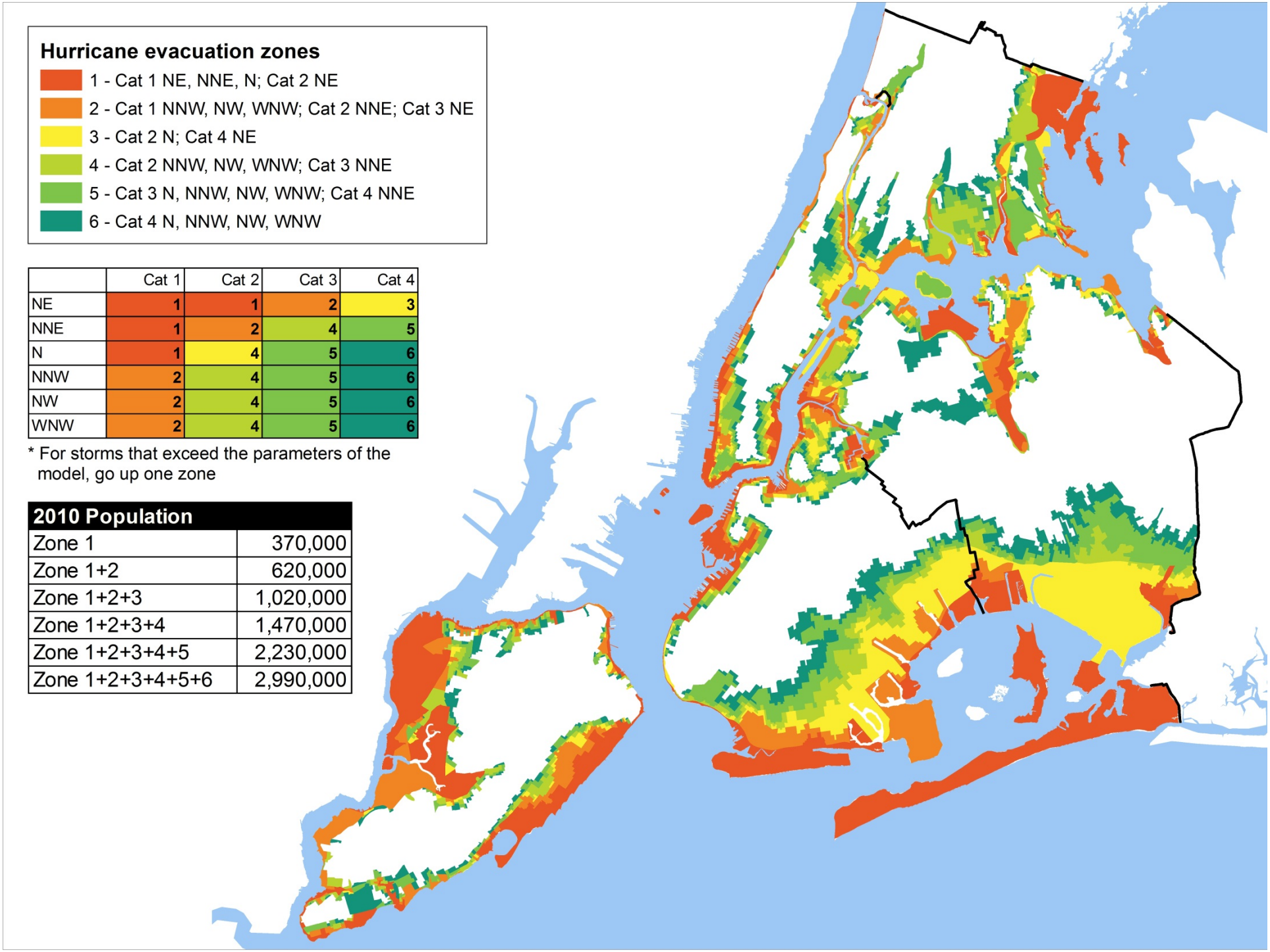
Redraw Hurricane Evacuation Zones

Using new methodology and better data, investigate increasing the number of evacuation zones to better target areas needing to be evacuated for approaching storm

2012 – 3 zones (A,B,C)

2013 – 3, 4, 5, or 6 zones?





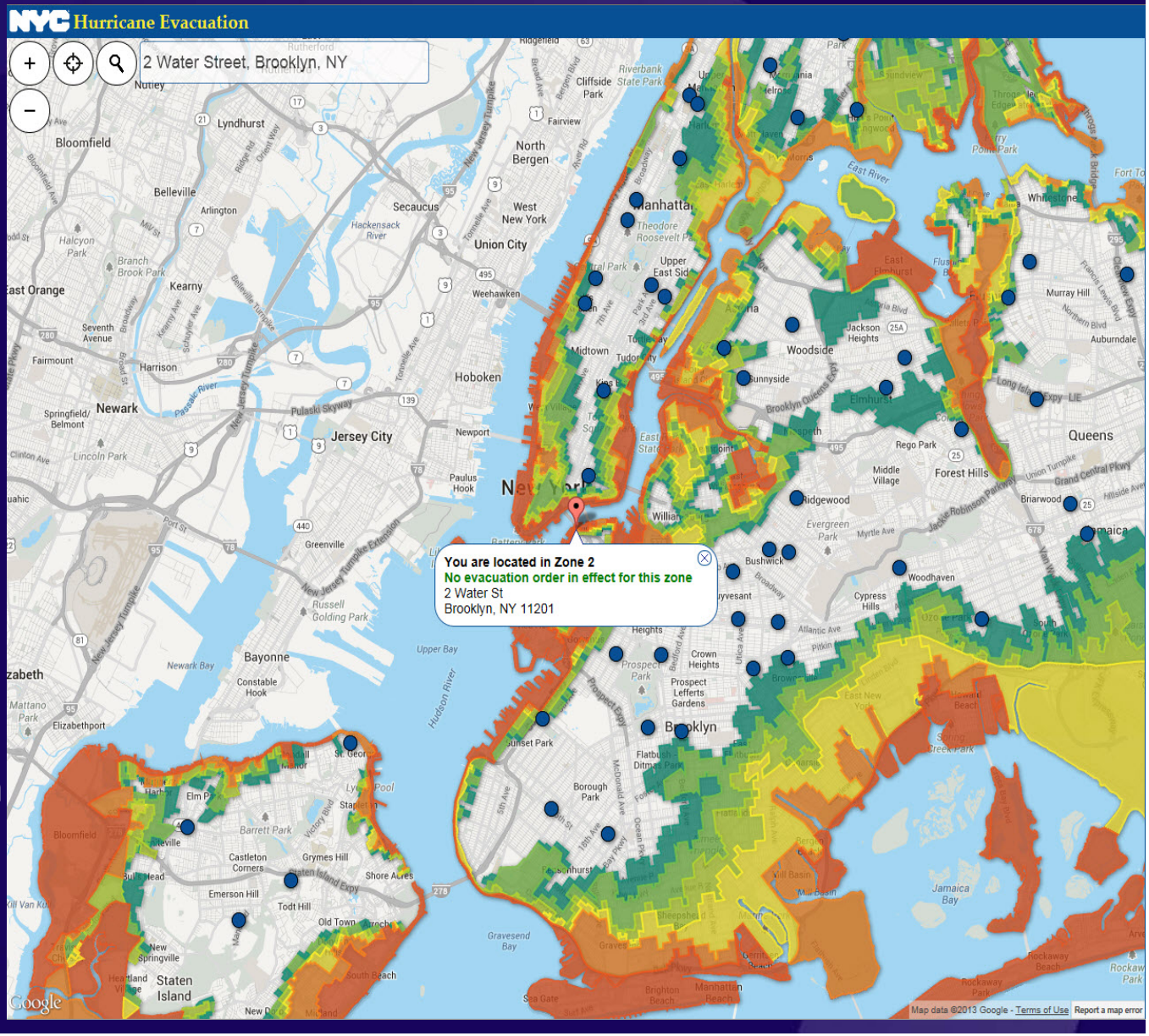
	Cat 1	Cat 2	Cat 3	Cat 4
NE	1	1	2	3
NNE	1	2	4	5
N	1	4	5	6
NNW	2	4	5	6
NW	2	4	5	6
WNW	2	4	5	6

* For storms that exceed the parameters of the model, go up one zone

2010 Population	
Zone 1	370,000
Zone 1+2	620,000
Zone 1+2+3	1,020,000
Zone 1+2+3+4	1,470,000
Zone 1+2+3+4+5	2,230,000
Zone 1+2+3+4+5+6	2,990,000

Coastal Storm Plan

- Topography
- SLOSH
- Evacuation Zones
- Critical Facilities
- Demographics
- Evacuation Plan
- Hurricane Zone Finder Application



Chengdu Form on UN-GGIM
Global Map for Sustainable Development: Development and Applications in Urban Hazard Mapping
October 15, 2013

OEM

Thank you

James McConnell, Assistant Commissioner
New York City Office of Emergency Management