Climate Change Adaptation and the MTA

FTA Climate Change Adaptation Webinar

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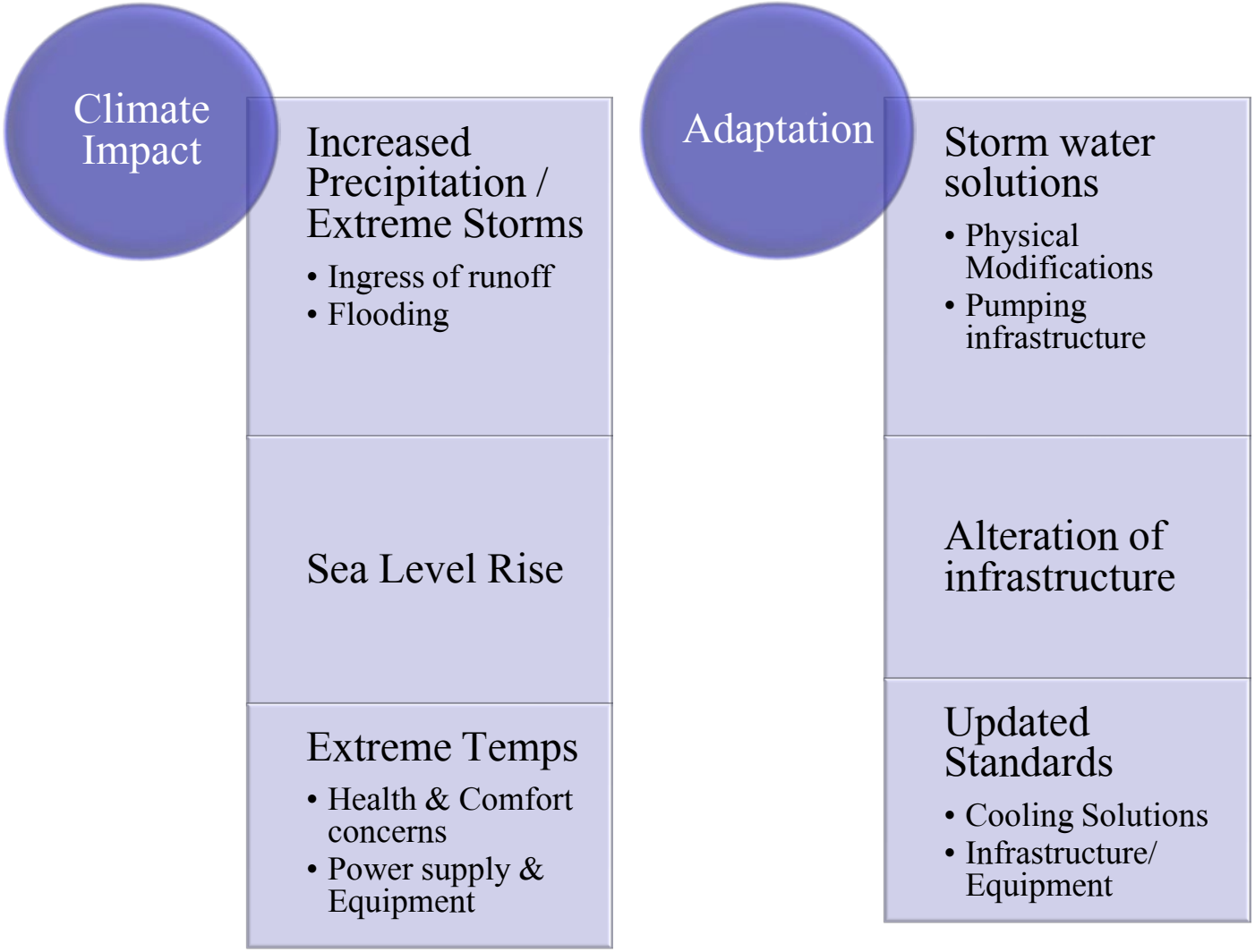
Climate Impacts & Adaptive Needs



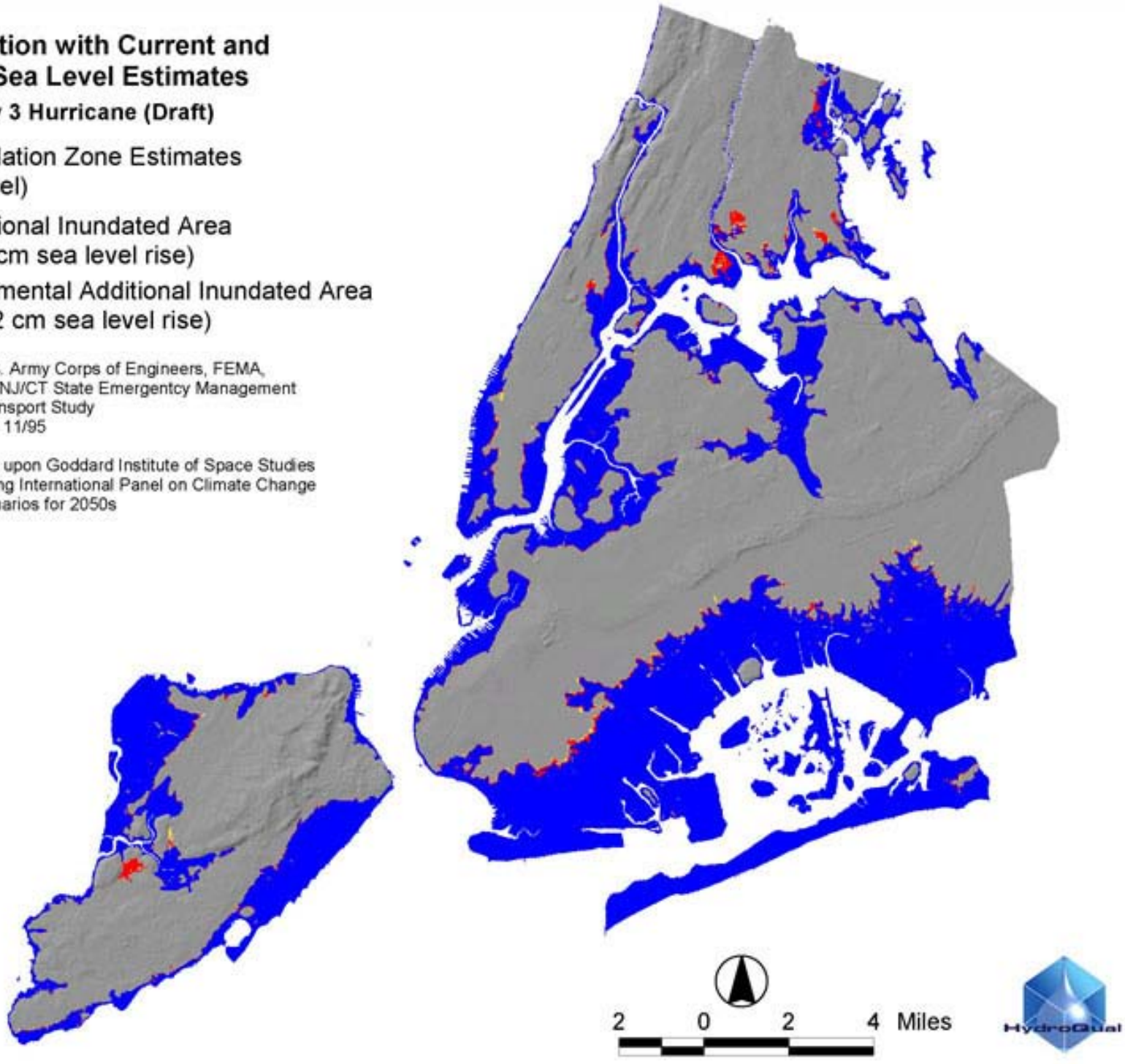
Comparing Inundation with Current and Projected (2050s) Sea Level Estimates

Case Study: Category 3 Hurricane (Draft)

- Projected Inundation Zone Estimates (current sea level)
- Projected Additional Inundated Area IPCC B1 (37.5 cm sea level rise)
- Projected Incremental Additional Inundated Area IPCC A1B (47.2 cm sea level rise)

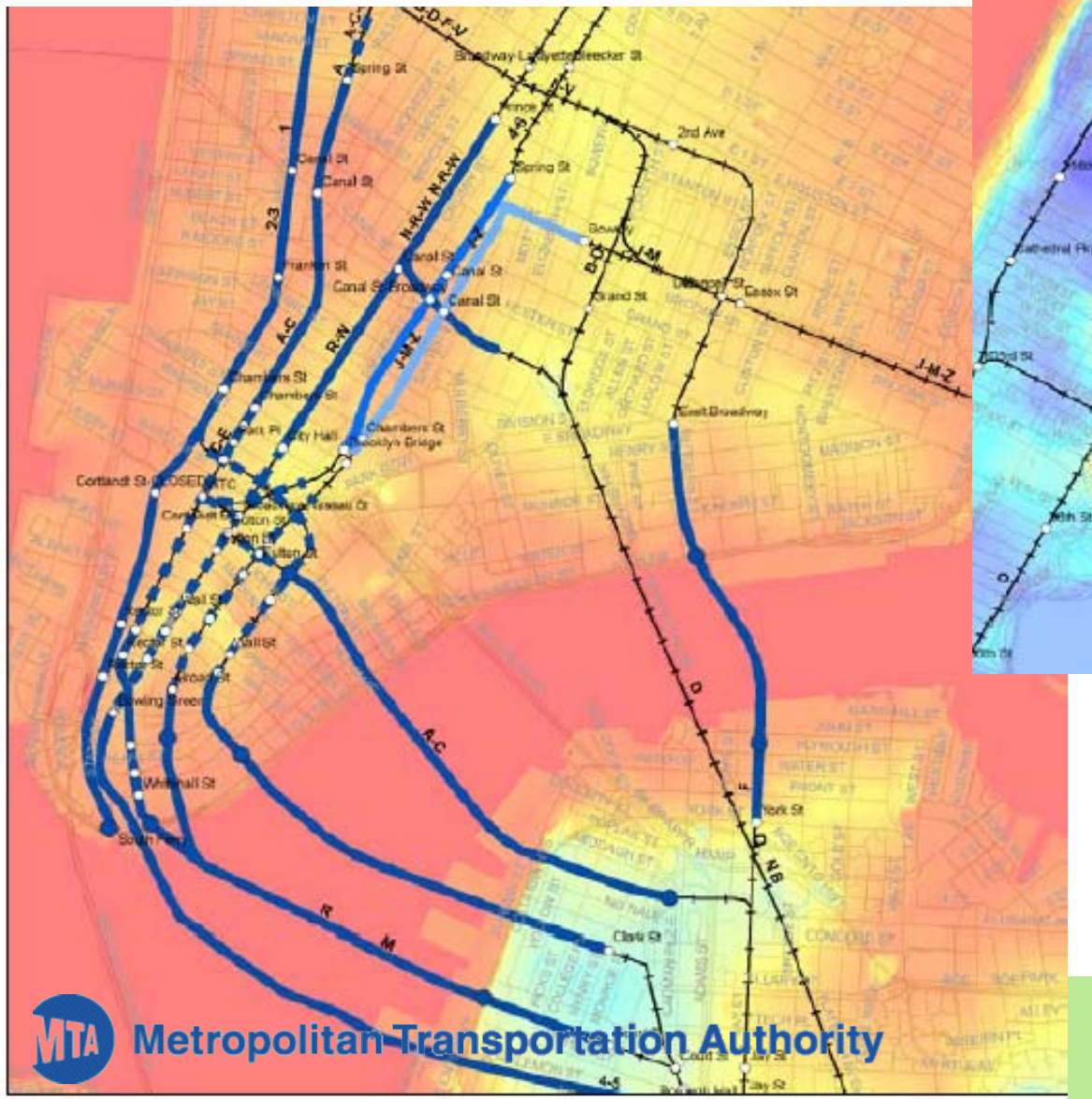
Storm Surge Data Source: U.S. Army Corps of Engineers, FEMA, National Weather Service, NY/NJ/CT State Emergentcy Management Metro New York Hurricane Transport Study
Interim Technical Data Report, 11/95

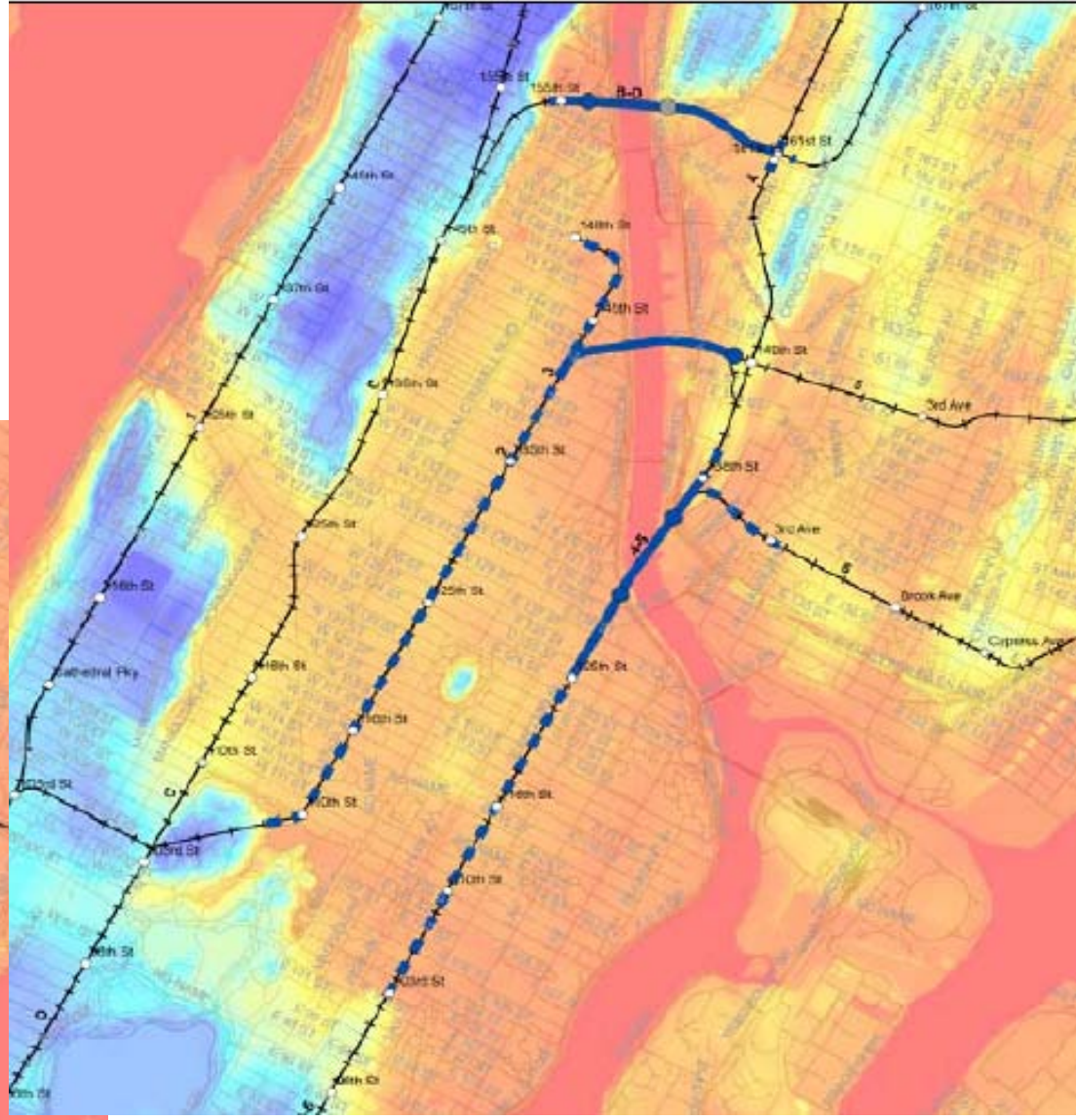
Sea level rise estimates based upon Goddard Institute of Space Studies Atmospheric-Ocean Model using International Panel on Climate Change greenhouse gas emission scenarios for 2050s



100-year flood with

4ft sea level rise





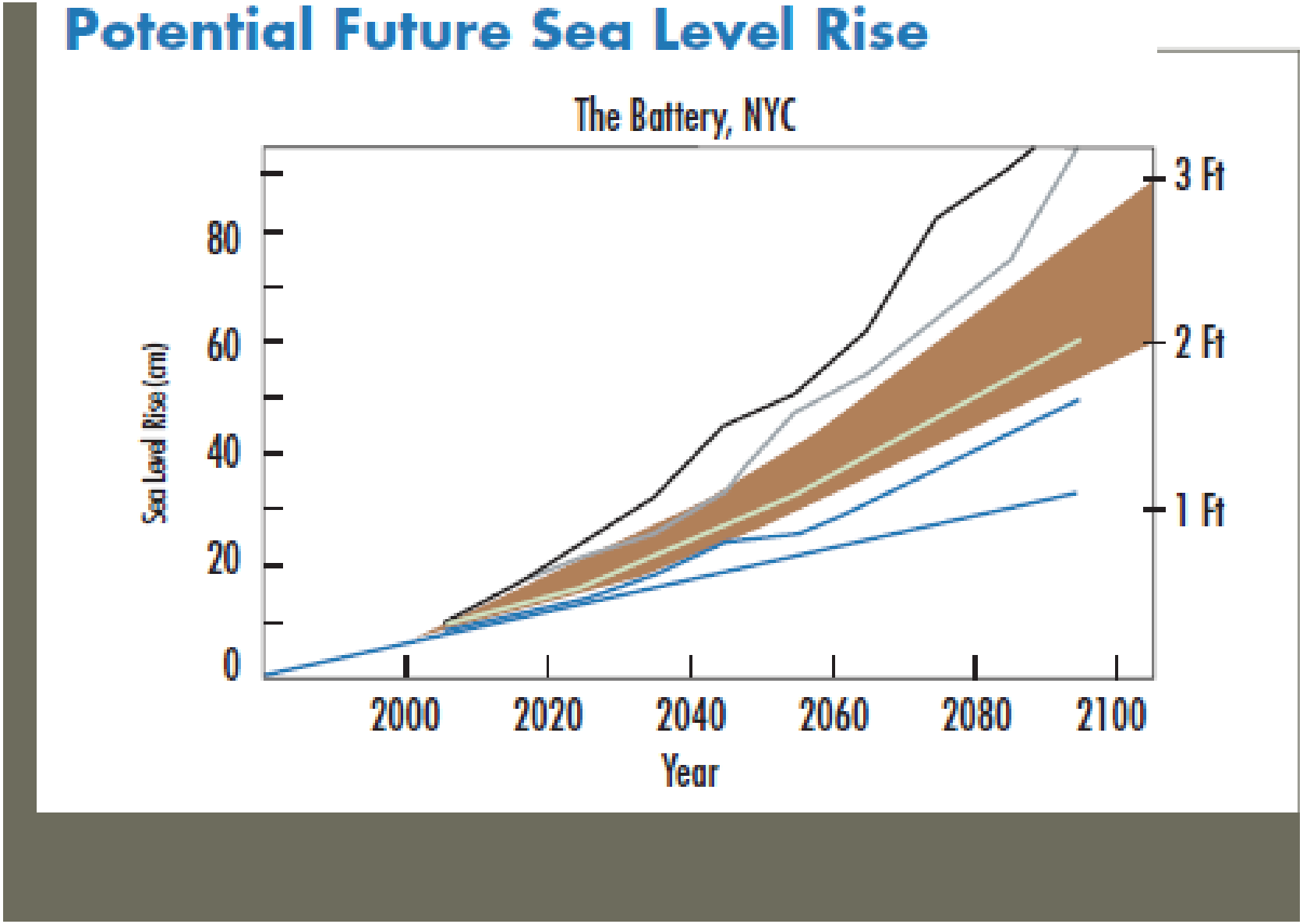
Lowest critical elevations

- The lowest points of entry to tunnels, subways or ventilation shafts.

MTA Subway Lines Lowest Critical Elevations(LCEs)	
A C Lines	7.0 feet
M N R Lines	7.5 feet
1 Line	9.1 feet
2 3 Lines	9.1 feet
4 5 6 Lines	9.9 feet
E F Lines	10.0 feet
B Q Lines	12.7 feet

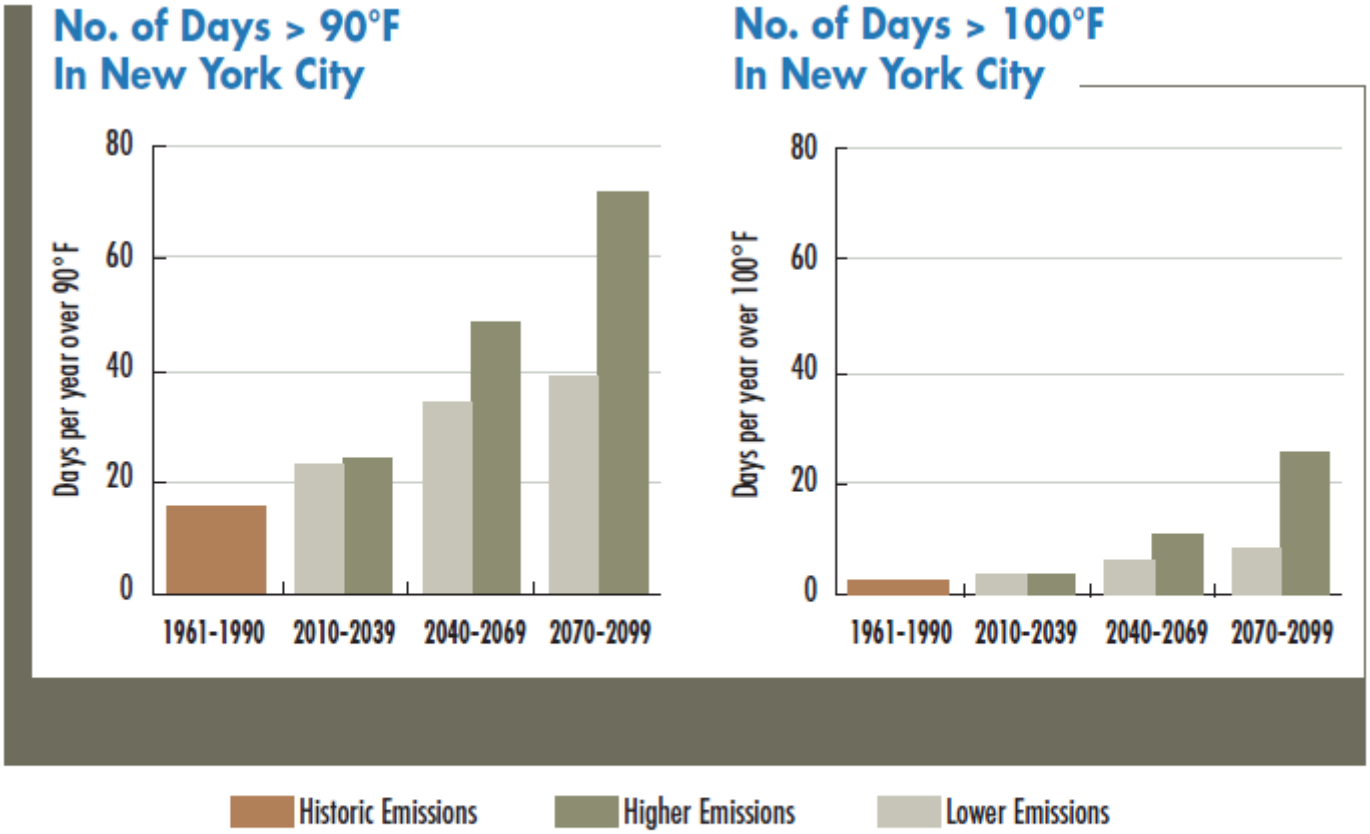
Elevations measured in feet above the National Geodetic Vertical Datum of 1929 – NGVD'29.
Source: Jacob et al. (2000)[2]

Potential Future Sea Level Rise



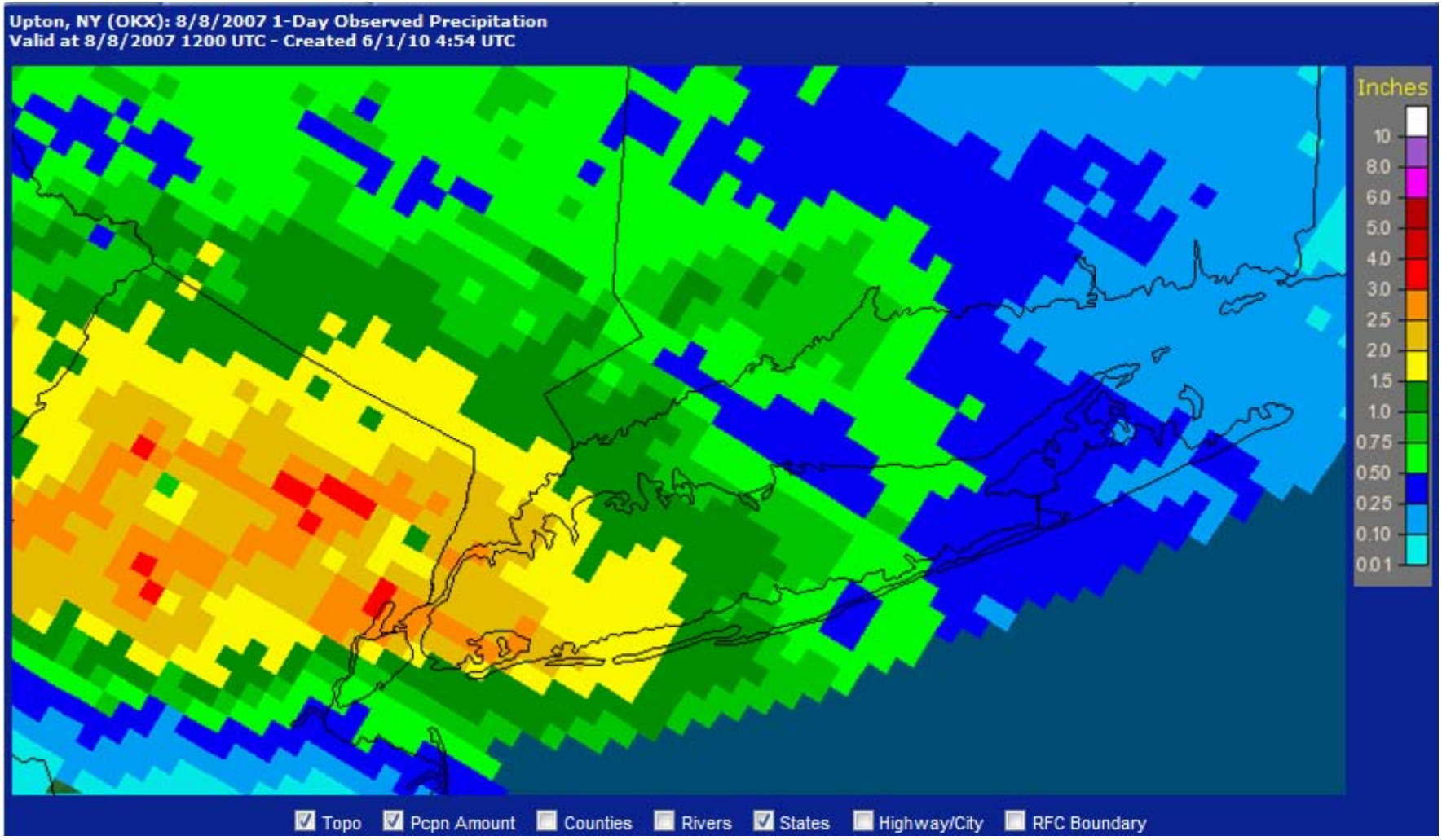
Range of projected local sea level rise (SLR) for New York City as optional input for precautionary planning purposes. The different lines represent projections for various atmospheric greenhouse gas scenarios and climate models. The orange band depicts a range of optional SLR planning scenarios during this century, implying 2ft SLR as a minimum scenario, and 3 ft by the end of this century as precautionary target planning scenario. (Source: Modified from Jacob et al, 2007).

Extreme Temperatures



Forecast of number of days/year in New York City with temperatures exceeding 90°F (left) and 100°F (right) for different decadal periods and for two GHG emissions scenarios. The orange bar represents observed occurrences prior to 1990. (Source: NECIA, 2006)

Anatomy of a Storm



Case Study:
Lessons from August 8, 2007

- 1.4 to 3.5 inches of rainfall in two-hour period
- Pockets of intense, sustained rain overwhelms regional drainage systems
- First tornados to hit Brooklyn in over 100 years
- Storm coincides with morning rush hour
- Reports of flooding throughout system begin just before 6am

Progression of the Worst Flooding

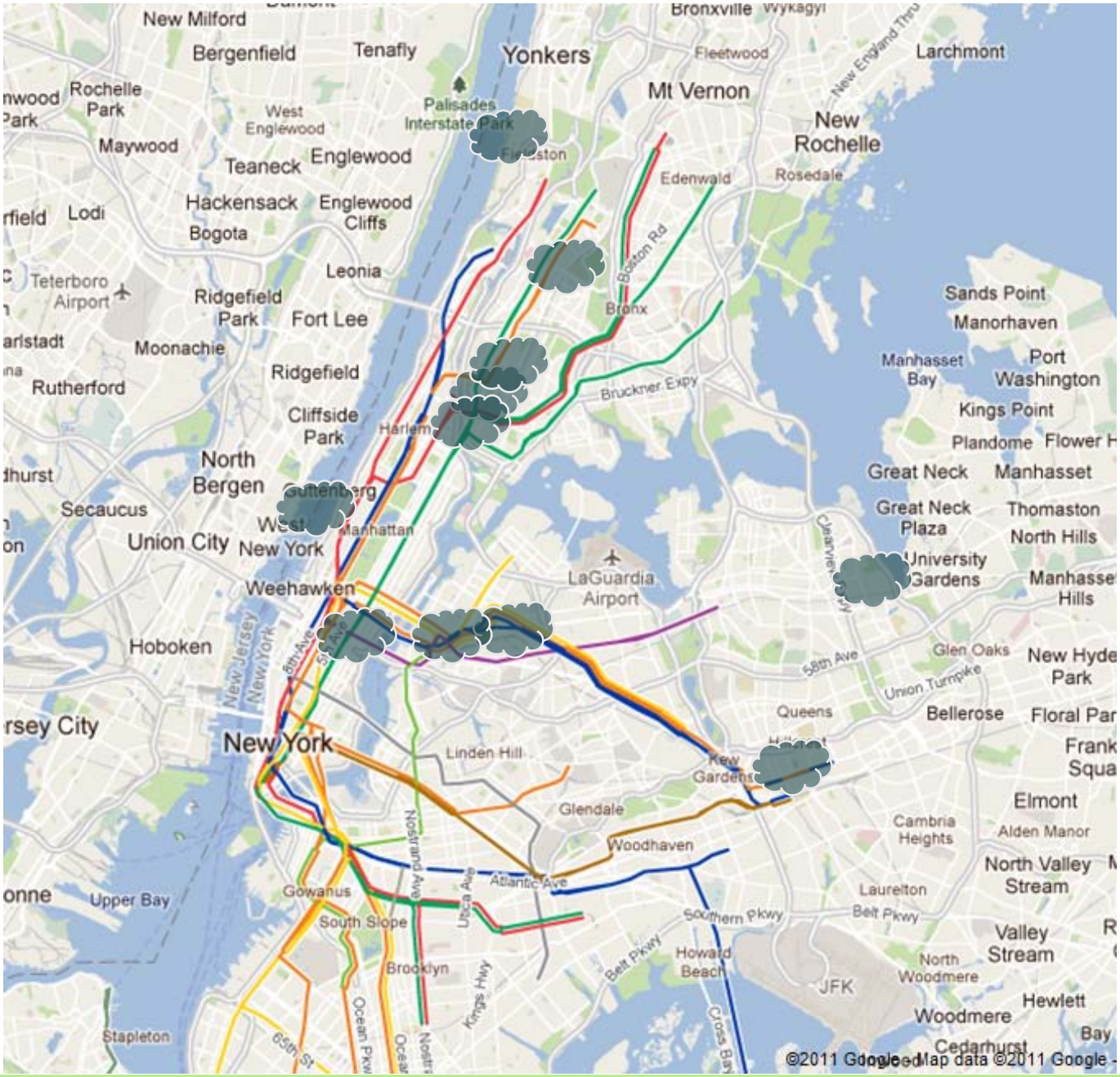
6:10 am

6:31 am

6:46 am

7:11 am

7:20 am



Most Flood-prone Subway locations

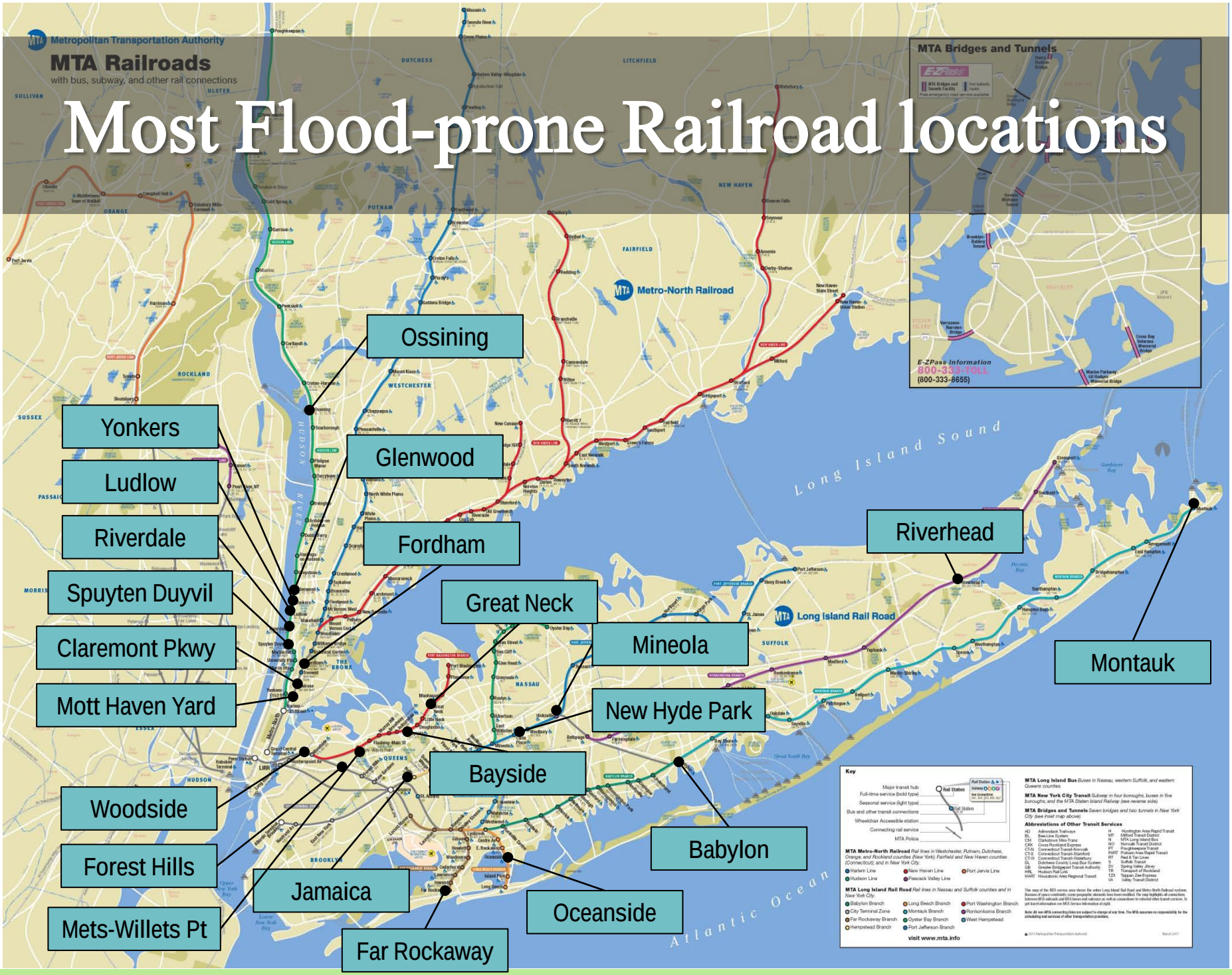
- 116th Street
- 145th Street
- 86th Street
- 125th Street
- 79th Street
- Queens Plaza
- Parsons Blvd
- Times Sq. Shuttle
- 86th Street
- 36th Street
- 34th St. & 8th Ave.
- 47-50th Sts.
- 65th Street
- Sutphin Blvd
- 34th St. & 6th Ave.
- Court Square
- Myrtle Ave.
- 28th Street **
- Jefferson St.
- 23rd Street
- Canal St.
- Broadway
- Flushing Ave
- North of Chambers
- Borough Hall
- Utica Ave
- North of Cortlandt
- Hoyt-Schermerhorn
- Chambers St. at Nassau
- Nevins St.
- Pacific St. **
- Union Street


Exit
34 Street & 8 Avenue


3602
23
Ely
Exit

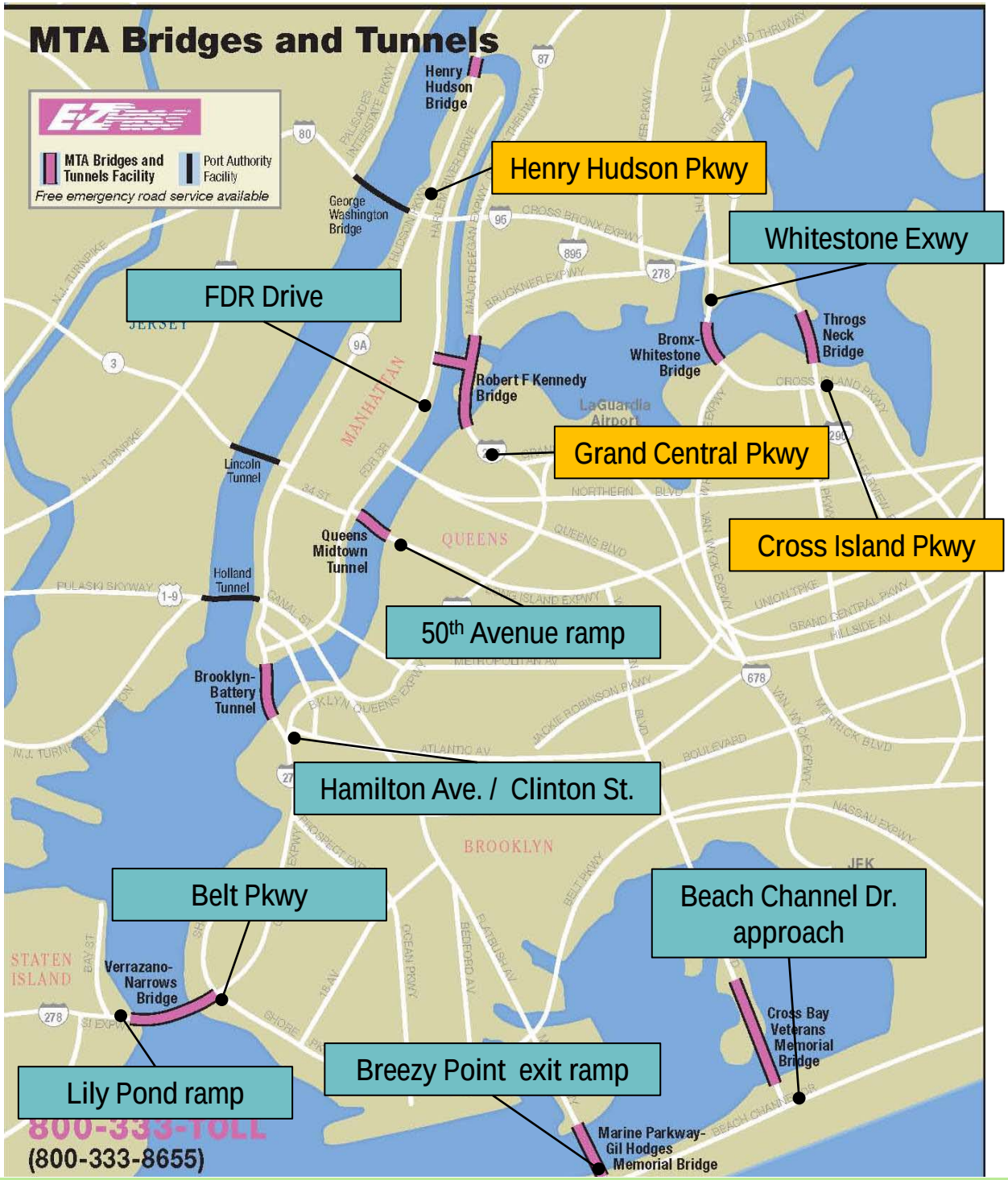
Storms on the Railroad

Most Flood-prone Railroad locations



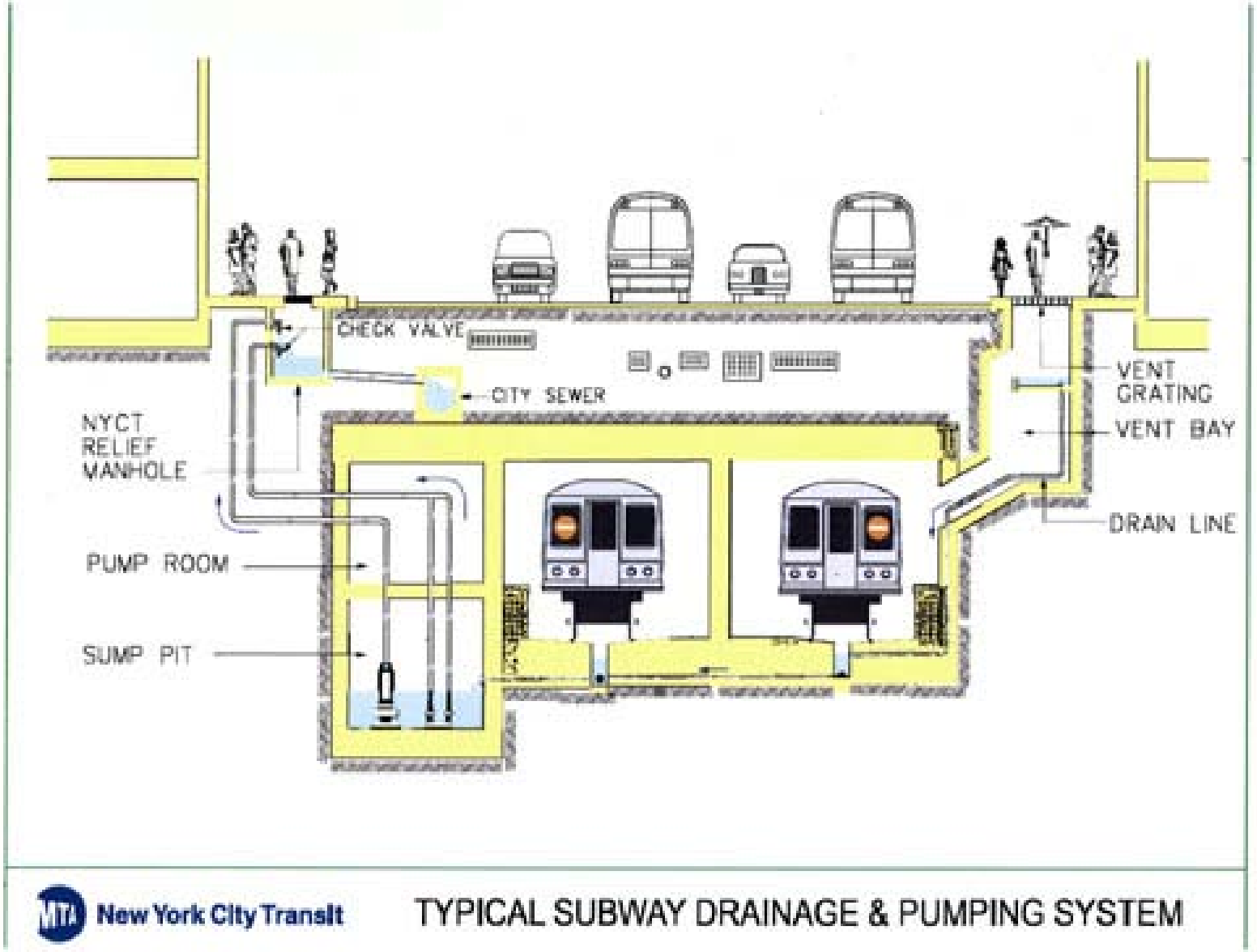
Bridge and Tunnel Flooding

- Impacts resulting from flooding adjacent to B&T property
- i.e. Flooding on local roads and approaches



Adaptation Responses

Subway Drainage System

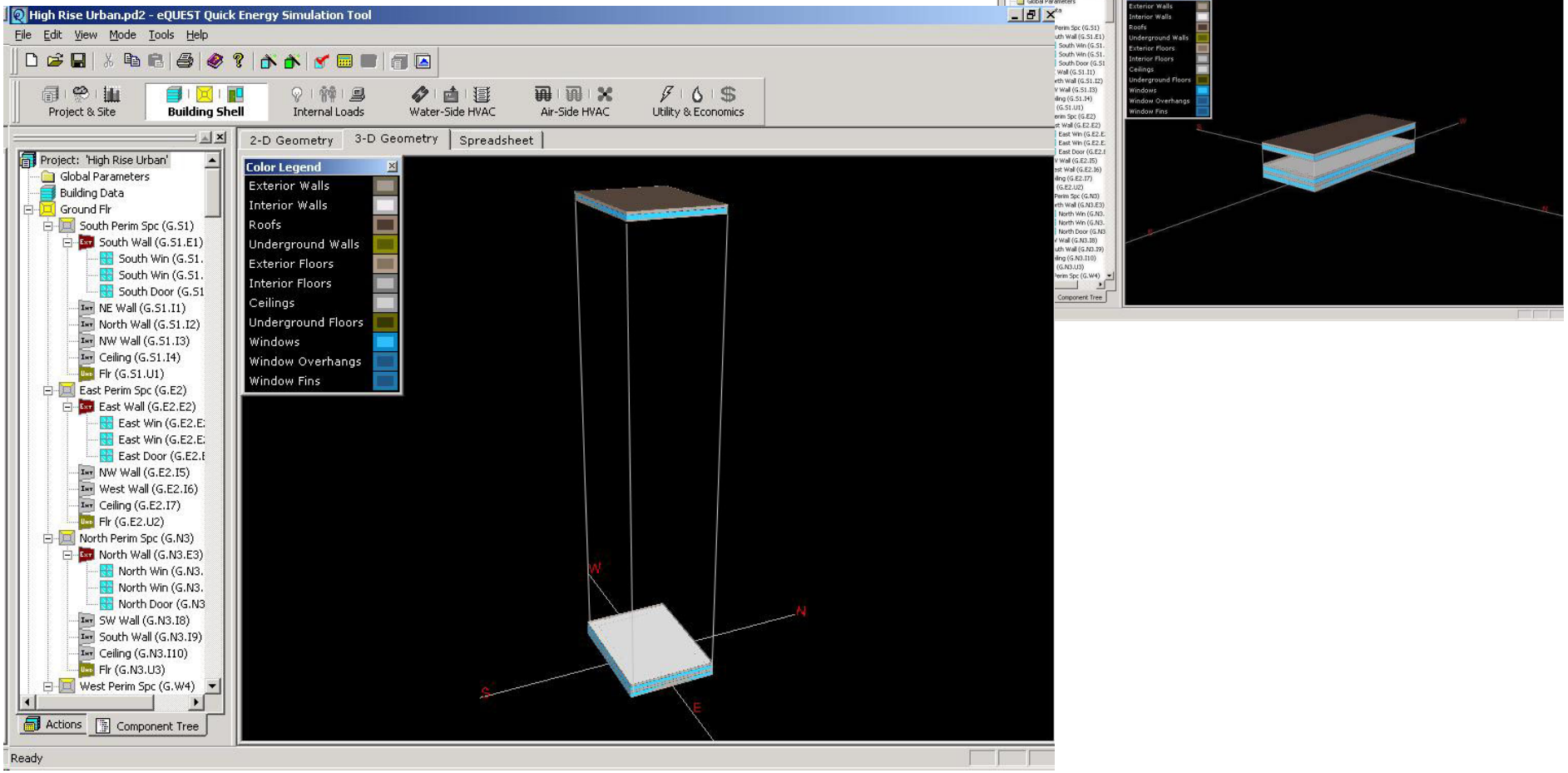


Mitigation

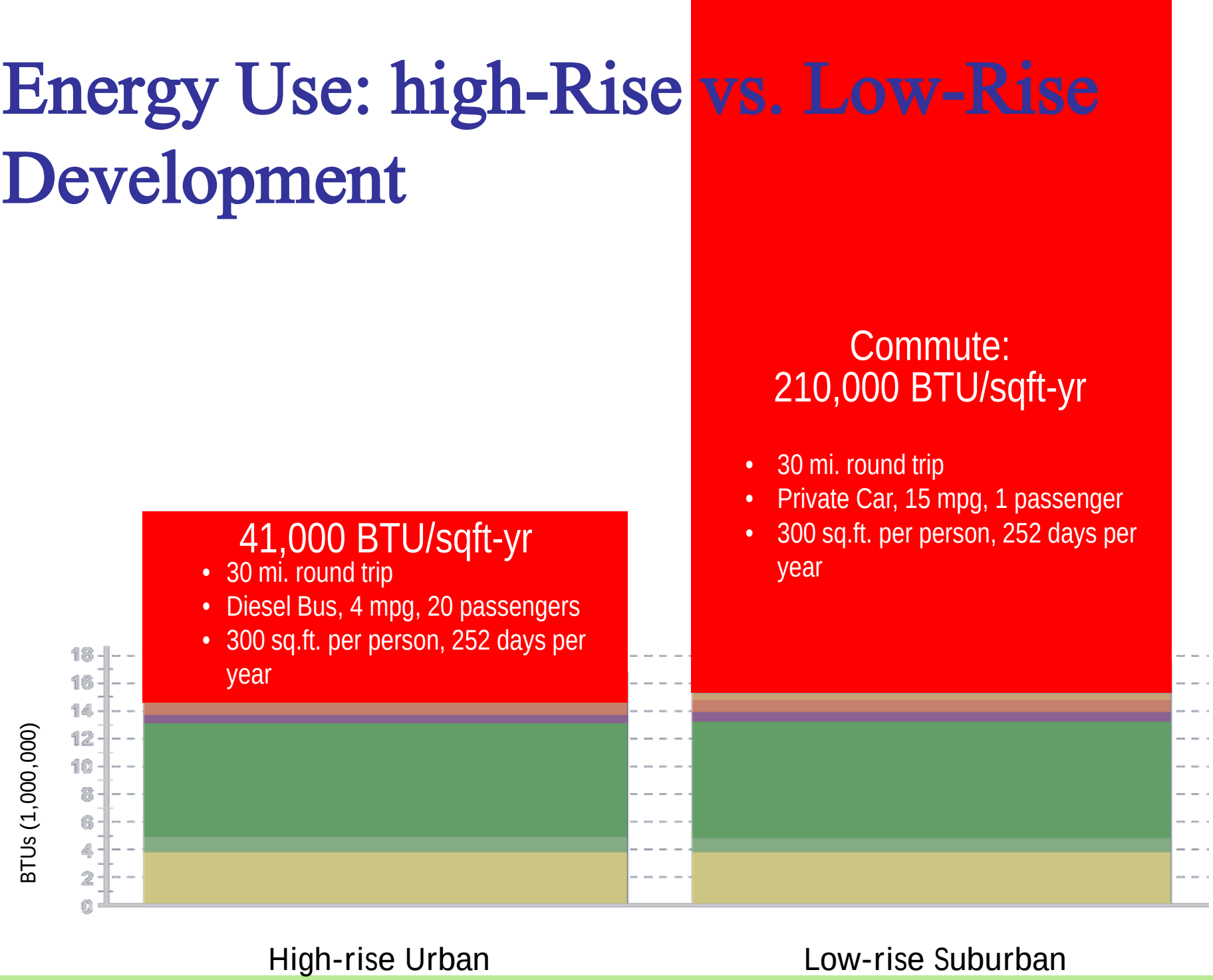
Energy Use: High-Rise vs. Low-Rise Development

	High-Rise	Low-Rise
Number of buildings	1	10
Average floor size	30,612 sf	36,000 sf
Area of roof	88,000 sf	375,000 sf
Area of ext wall	343,000 sf	385,000 sf
Area of parking	0 sf	1,837,500 sf

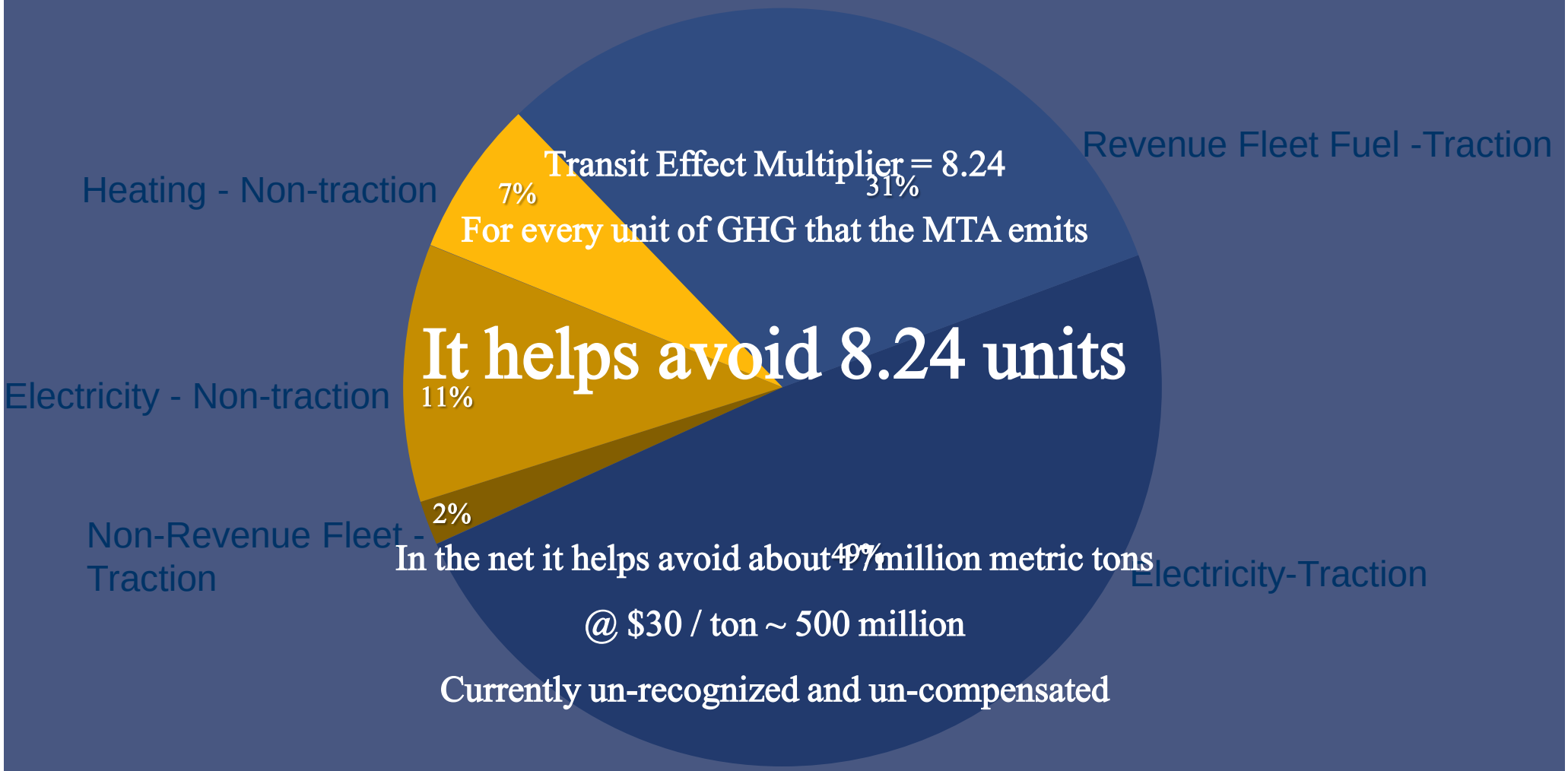
Energy Consumption: Low-Rise Office Park vs. Tall Urban Building



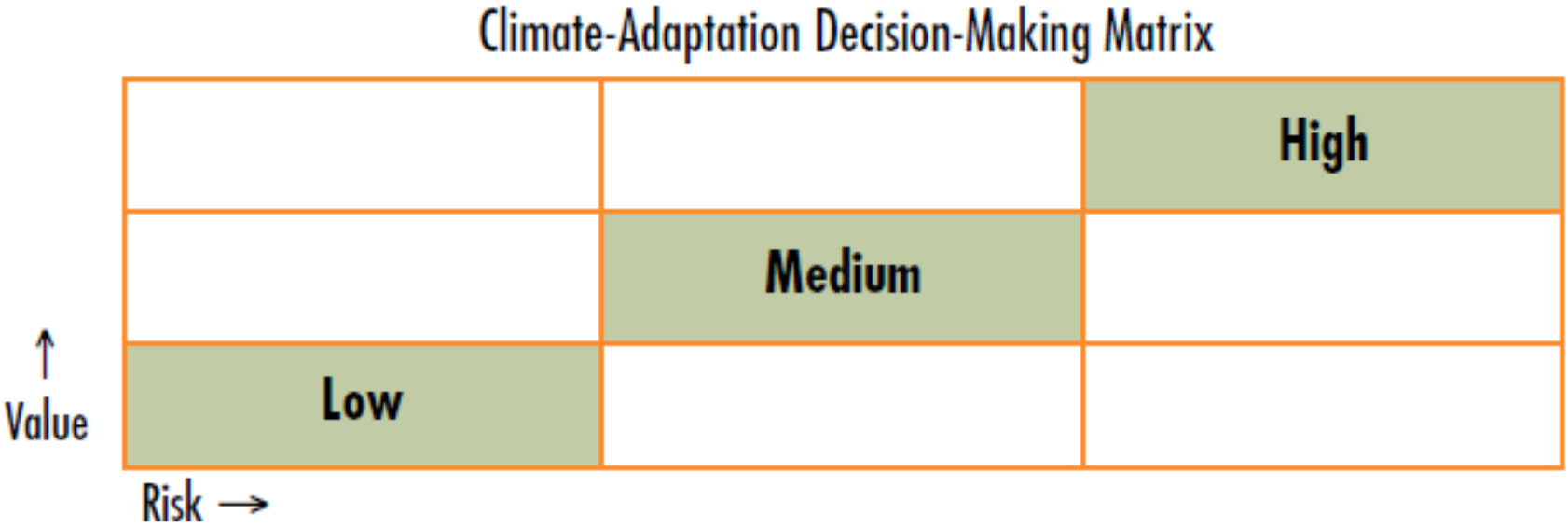
Energy Use: high-Rise vs. Low-Rise Development



2.3 million metric tons



Climate Adaptation Matrix



Identify options for protection vulnerable rapid transit infrastructure, considering both the level of risk and the value of facilities/components. i.e. Elevated subway station vs. Train yard/Maintenance Shop in low-lying area near the coast.

Recommendations

- Implement Operational Climate Change Database
- Complete Quantitative Vulnerability and Risk Assessment
- Develop Climate Change Adaptation Master Plan
- Climate Adaptation Resilience Evaluation Procedure


WATCH THE GAP
WATCH THE