



SIMULATION MODELING FOR URBAN AREA COMMERCE AND TRANSPORTATION STUDIES

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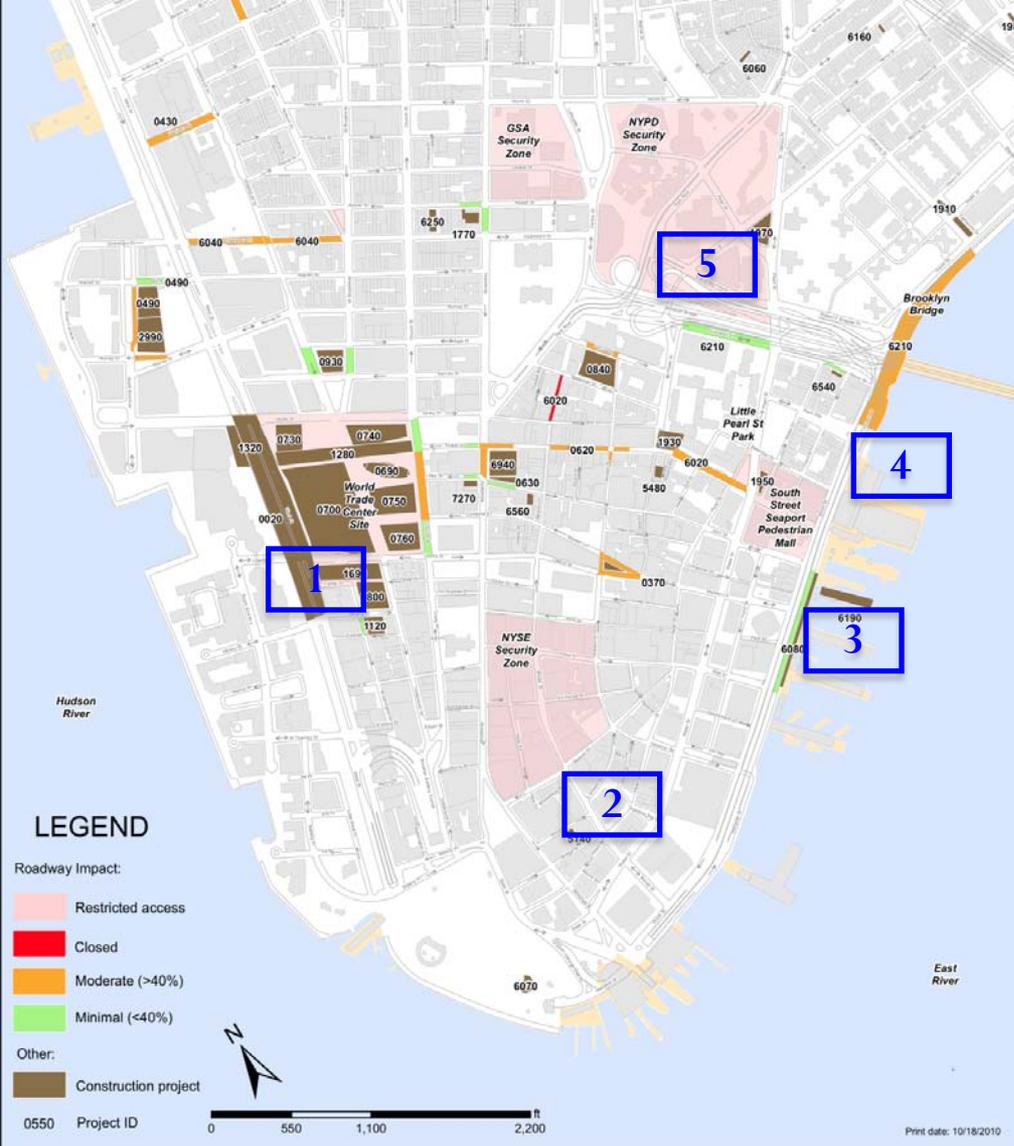
GOAL:

U-CASS project focuses on urban settings to understand the interplay between security measures and commercial activity.

COMPLEXITY:

Interactions among people, businesses and infrastructure.

Vulnerability, resilience and commercial activity



HIGH LEVEL VIEW OF LOWER MANHATTAN

1. WTC Site
2. NYSE Security Zone
3. South Street Seaport Pedestrian Mall
4. Brooklyn Bridge
5. NYPD Security Zone

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WTC SITE

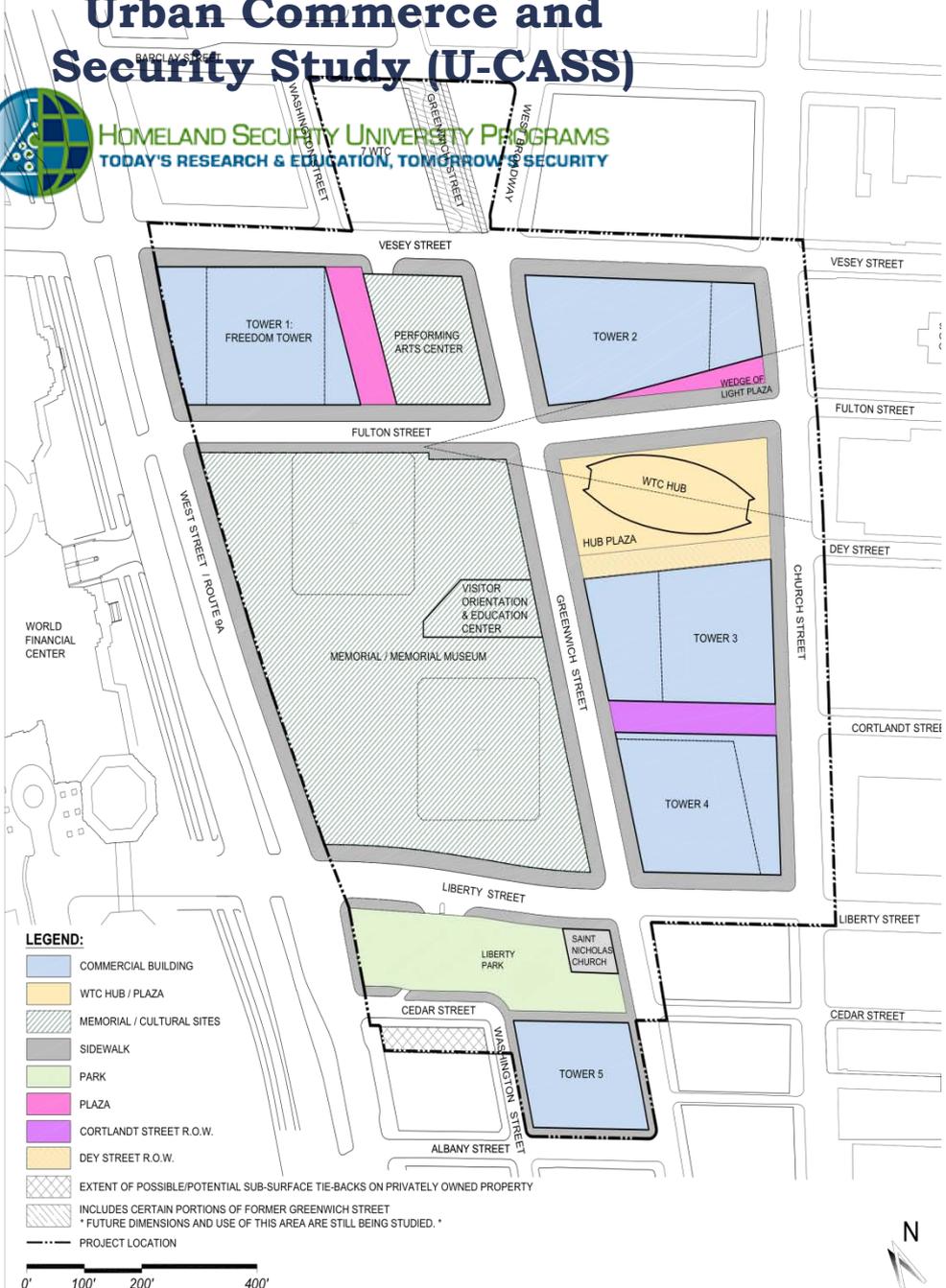
- Towers
- Memorial/Museum
- Transportation Hub
- Performing Arts Center
- Liberty Park

Lower Manhattan Development Corporation

LEGEND:

- COMMERCIAL BUILDING
- WTC HUB / PLAZA
- MEMORIAL / CULTURAL SITES
- SIDEWALK
- PARK
- PLAZA
- CORTLANDT STREET R.O.W.
- DEY STREET R.O.W.
- EXTENT OF POSSIBLE/POTENTIAL SUB-SURFACE TIE-BACKS ON PRIVATELY OWNED PROPERTY
- INCLUDES CERTAIN PORTIONS OF FORMER GREENWICH STREET
* FUTURE DIMENSIONS AND USE OF THIS AREA ARE STILL BEING STUDIED. *
- PROJECT LOCATION

0' 100' 200' 400'

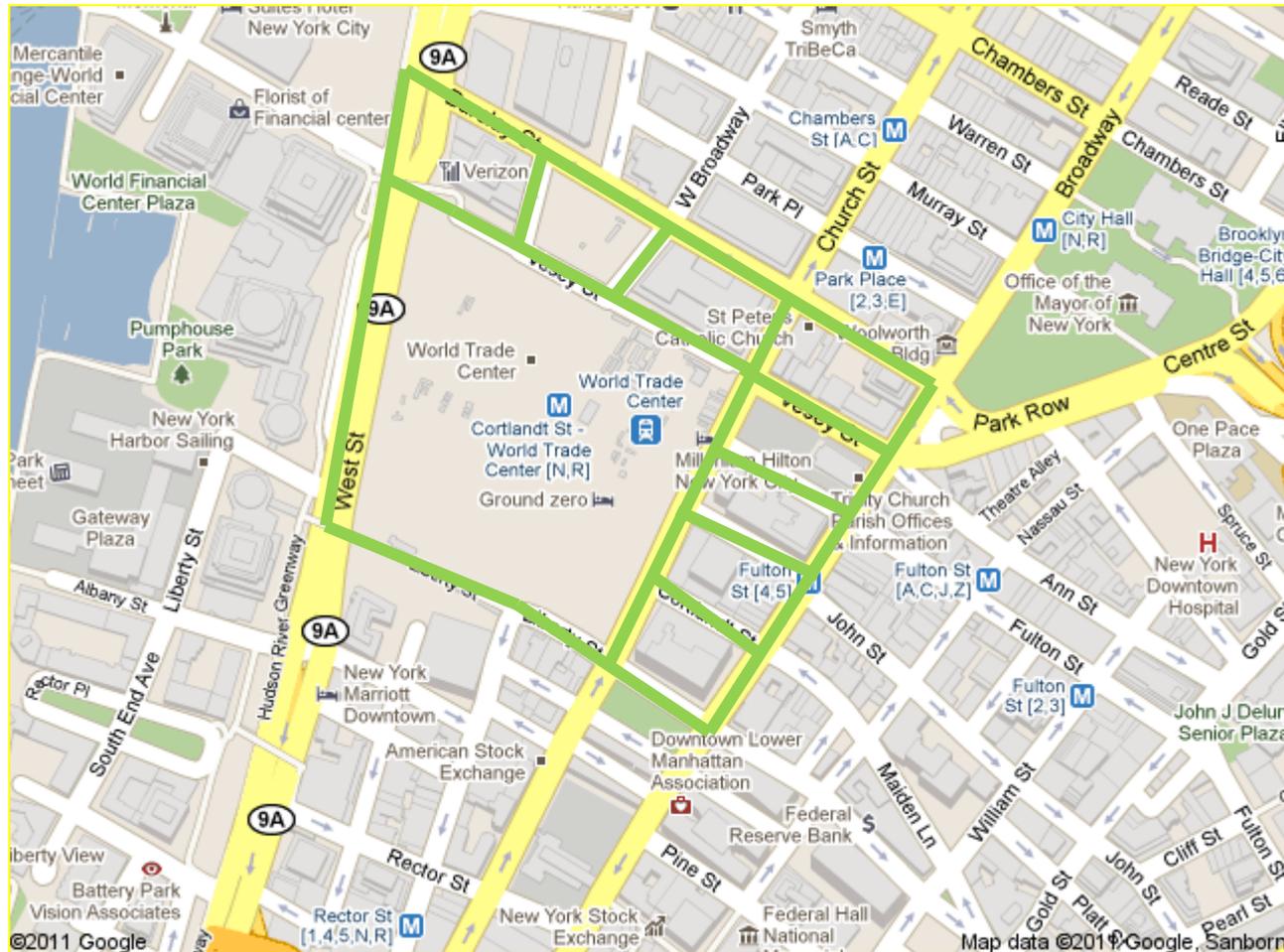


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PROPOSED AREA

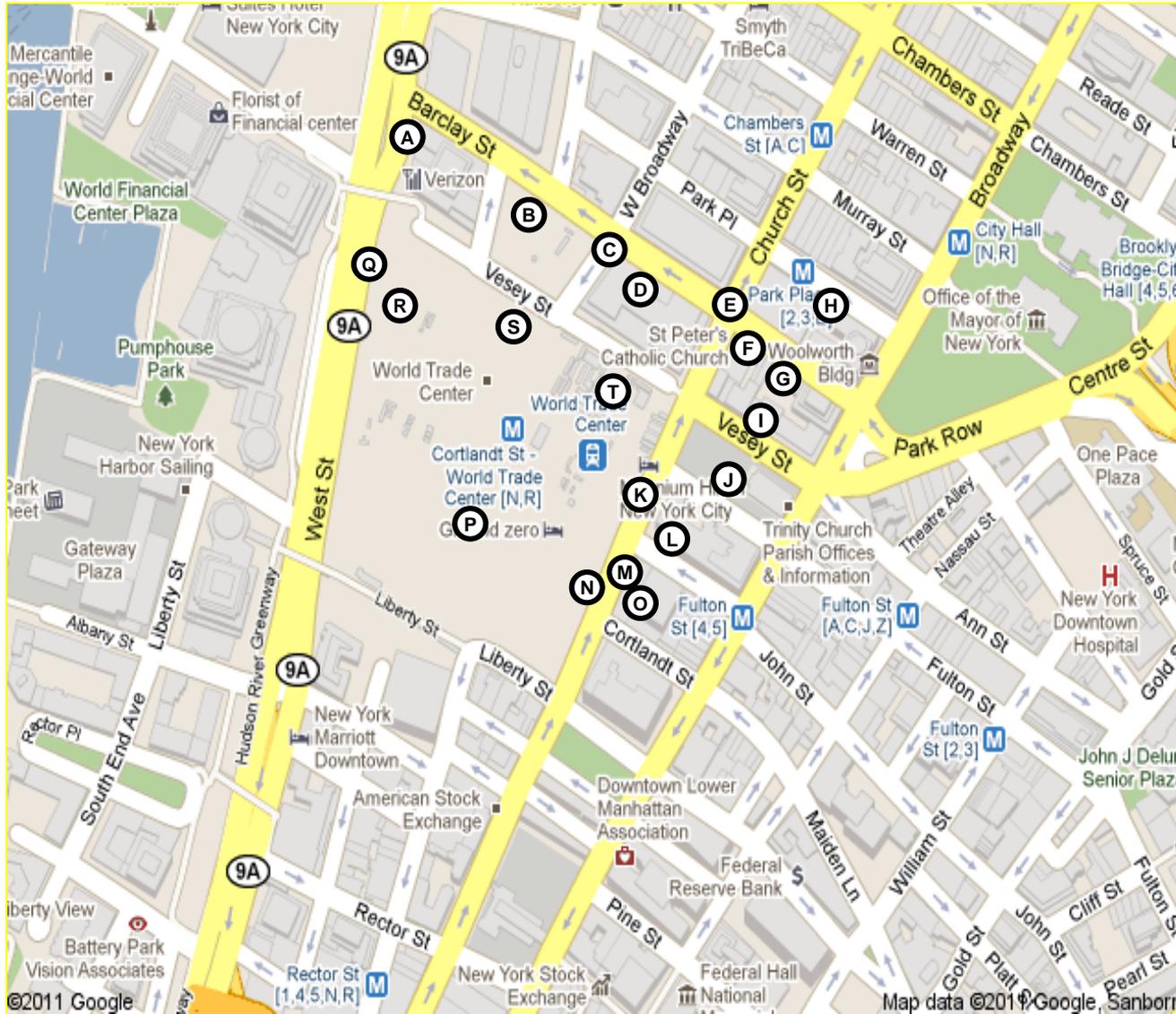


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KEY LOCATIONS IN THE PROPOSED AREA



- A. Verizon
- B. NY Academy of Sciences
- C. NY State Dept of Health
- D. US Post Office
- E. St. Peter's Church
- F. NY County Lawyers Association
- G. NYSC
- H. Woolworth Building
- I. Trinity Church Parish Offices & Information
- J. OMD USA
- K. Century 21
- L. BNY Mellon
- M. NY Hospital
- N. Brooks Brothers
- O. Scotia Capital
- P. Deutsche Bank
- Q. WestLQ AG NY Branch
- R. WKCR-FM NY
- S. World Trade Center
- T. Millenium Hilton NYC

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Simulation Modeling Approach

- Discrete-Event Modeling, keeping track of various events in the system
- Using ARENA Simulation Tool by Rockwell Software
- Also using OMNET++ in public domain
 - With William Pottenger (RU- Comp Sci.)
- User Interface for decision makers
- Graphical/textual output
- Various performance measures
 - Number of people on streets
 - Durations for counter measures
 - Physical Impact of countermeasures
 - Risk and Economic Measures

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Simulation Modeling of Urban Area People Dynamics

Two types of components in the model: Mobile and Stationary

Mobile: People, taxis/cars, buses

Stationary: Streets

People: Office workers, non-office workers, tourists, residents, passers-by, visitors

Buildings: Office, residential, hotel, restaurants, shops, subway stations, outdoors, others)

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Information associating people with buildings

Rates of people flow in and out of Stationary Components							
	Stationary Components						
Mobile Components	Offices	Residential Buildings	Hotels	Restaurants	Shops	Subway Stations	Outdoor s
Office Workers	zzz			zzz	z	zzz	zz
Non-office workers	z		zz	zz	zz	zzz	z
Tourists		z	zzz	zzz	zzz	zzz	zz
Residents		zzz		zzz	zzz	zzz	z
Passer-byes				z	z		z
Visitors		zz	z	z	z	z	z

Helps to assign destinations and probabilities for people movements on streets.

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Timing mechanism

- Rush hour/ebb hour
- Daily activities for every type of people
 - Work
 - Shopping
 - Lunch hour
 - Dinner hour
 - Strolling
- Daily schedule for office buildings, restaurants, residential, etc.
- Subway schedule
- Overall day time (e.g., 6AM – 11AM)

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Potential Counter Measures for Consideration

Block a street - either permanently or as a response to an incident

Access control in office and or residential buildings

Visible vehicle inspection, either at permanent or random locations

ID checks at buildings

Random searches of pedestrians

Metal detectors to enter stores

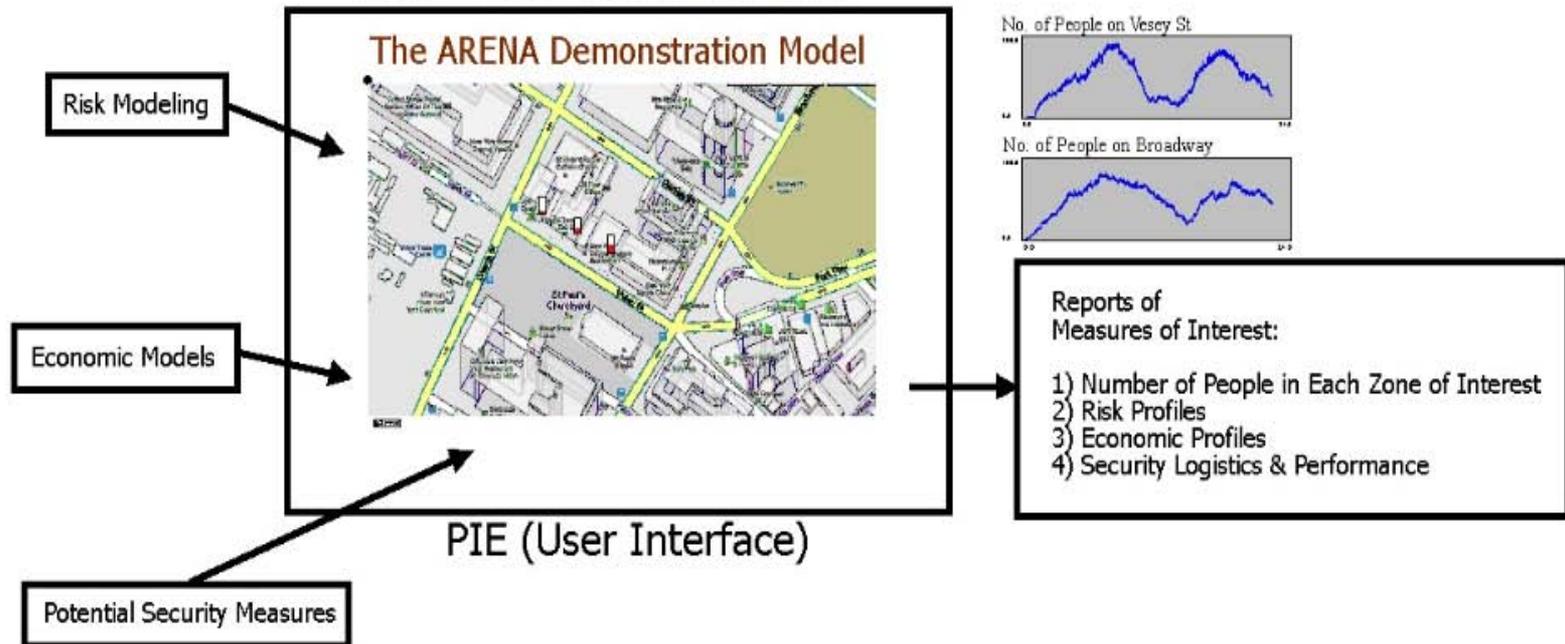
Metal detectors to enter the downtown area

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U-CASS Project Pedestrian Modeling in Lower Manhattan DHS - CCICADA & CREATE



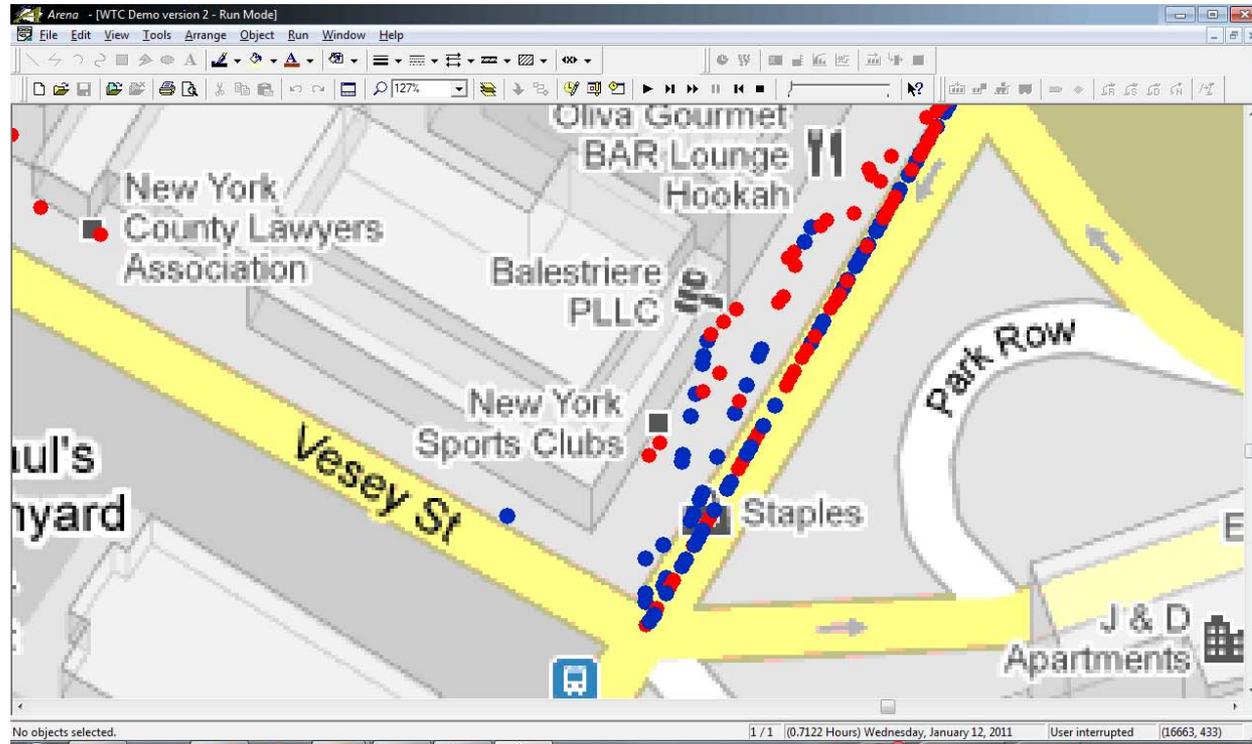
A quick look at the Model →

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A Snapshot from the model



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AERIAL VIEW OF THE CONSTRUCTION SITE



<http://www.dailymail.co.uk/news/worldnews/article-1249885/New-World-Trade-Center-9-11-aerial-images-ABC-News.html>

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3D VIEW OF WTC SITE (2018)

