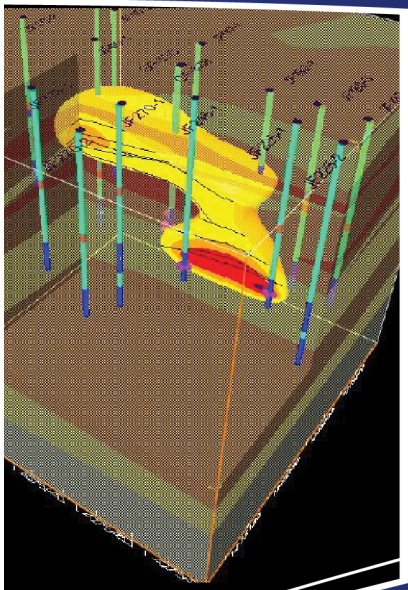
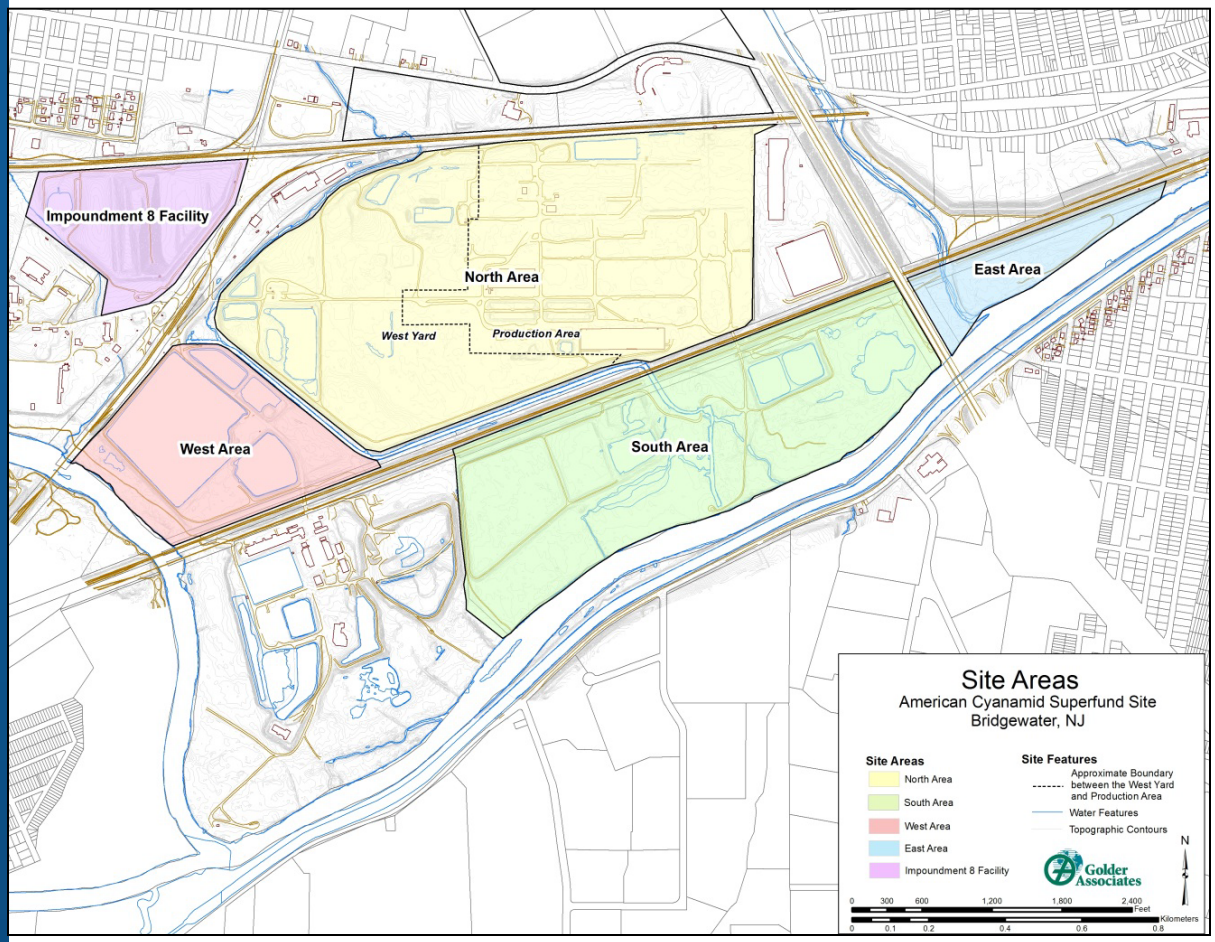


American Cyanamid Superfund Site

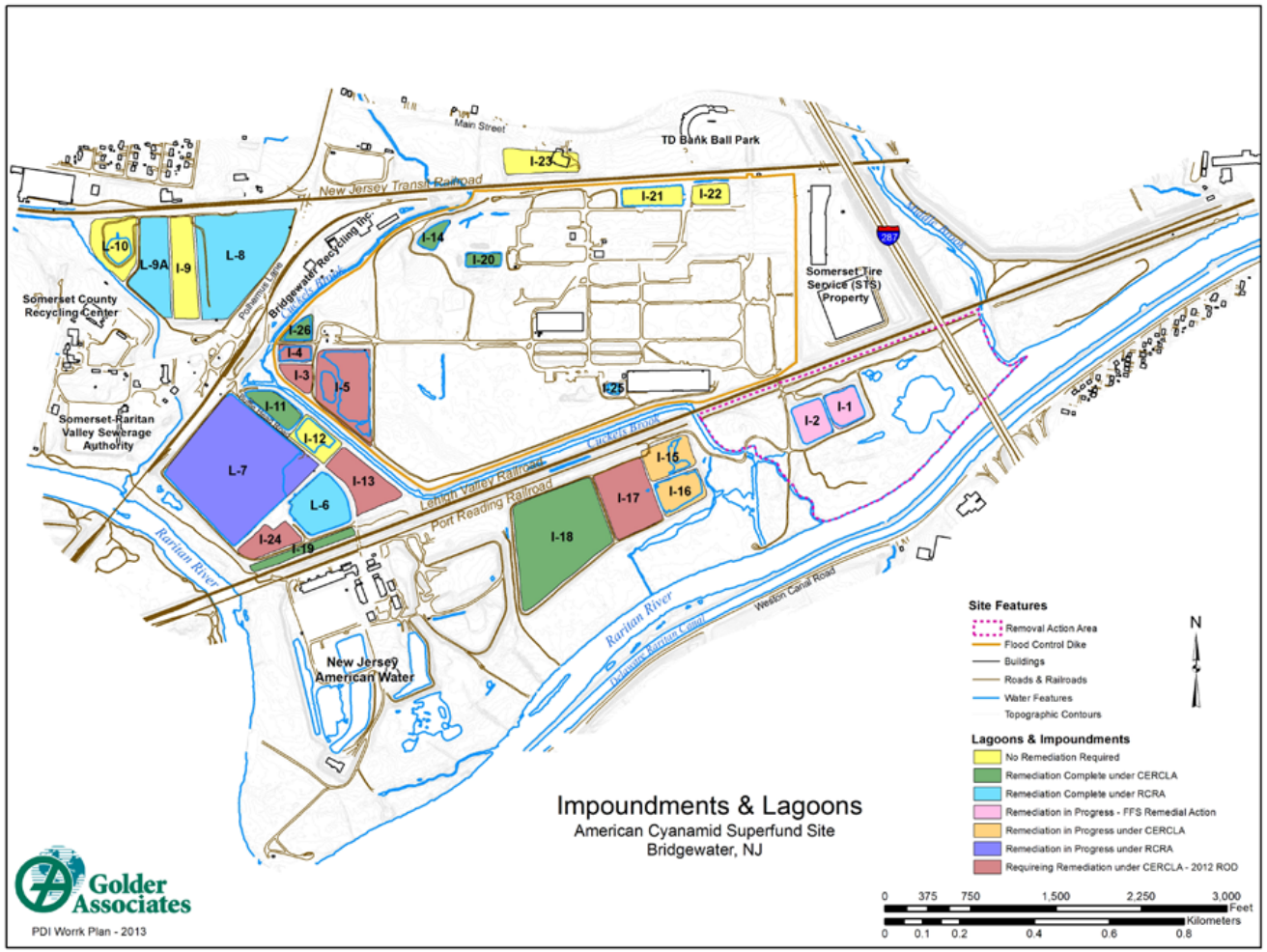
Joe Battipaglia, Region 2 RPM

Site Location & Background



- Located in Bridgewater Twp. in Central Northern NJ
- Pfizer acquired the property from Wyeth in 2009
- Residential/commercial area
- 435 acre site divided into 5 areas
- Entire site within flood hazard area, except impoundment 8 facility
- 10-12 ft flood control berm

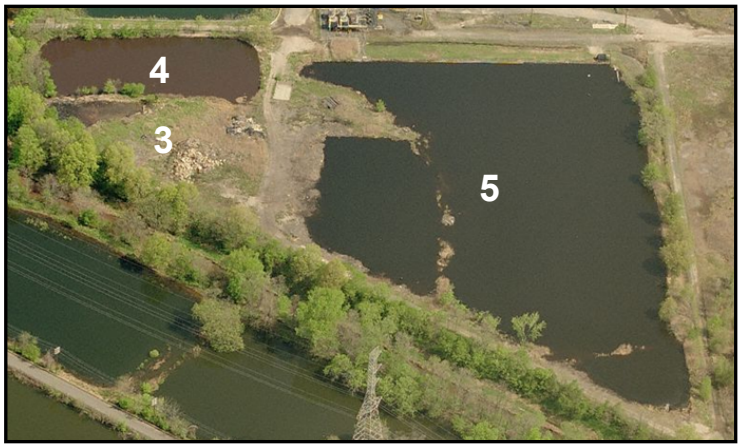
Contamination History



- From 1915 to 1999, manufacture of pharmaceuticals, chemical intermediates, petroleum-based products, dyes and pigments
- 27 impoundments/lagoons were constructed
- Impoundments, soil & groundwater contaminated with VOCs, SVOCs & metals
- Main COCs: benzene, 1,2-DCB, naphthalene, nitrobenzene & n-Nitrosodiphenylamine

Impoundments 3, 4 and 5

- Approx 10 acres total
- 10-17 feet deep
- Located within the flood control berm
- pH ranges from 1.3 to 9.9

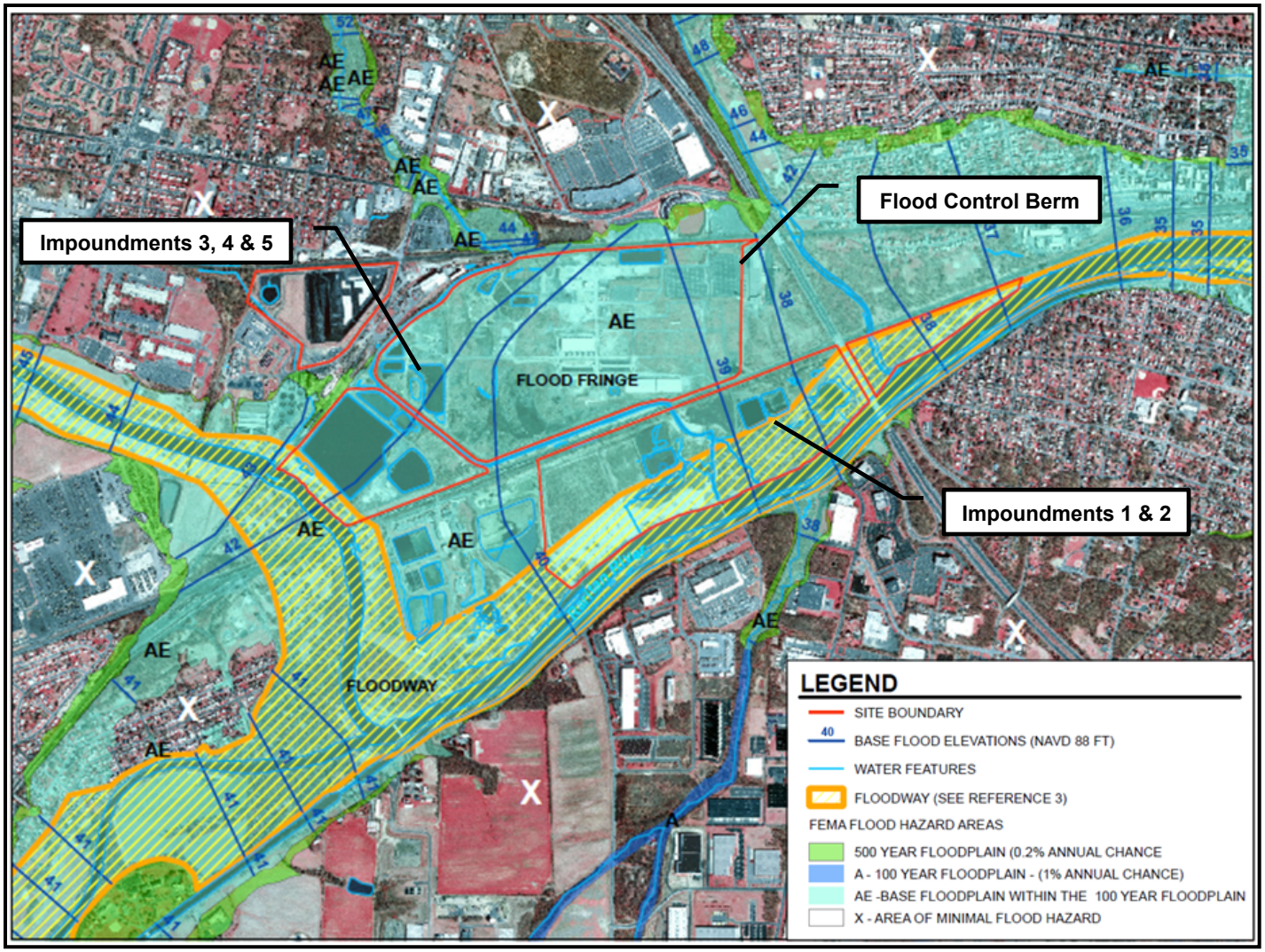


- Maximum concentrations of 36 ppm (benzene), 240 ppm (naphthalene), 75 ppm (nitrobenzene) and 30ppm (1,2-DCB)

Impoundments 1 & 2

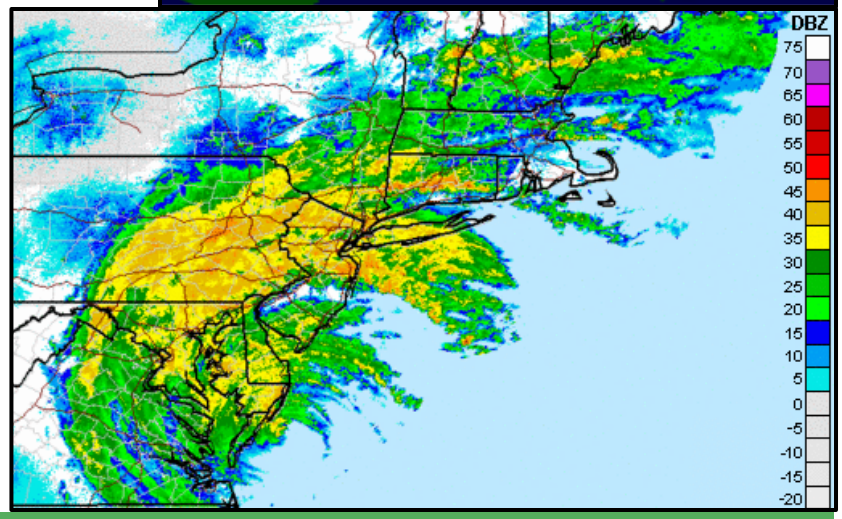
- Approx 2 acres each, 13-16 feet deep (about 6 feet below grade)
- Located outside of flood control berm (700 feet from Raritan River)
- Heterogeneous acid tar byproduct from refining coal light oil
  - Hard crumbly & viscous tarry layers
- pH ranges from 0.56 to 12.83
- Elevated VOCs and SVOCs, particularly BTEX and naphthalene
- Maximum benzene concentration of $207x10^6$ ug/kg (20.7%)

Flood Hazard Area Map



Hurricane Irene Summary

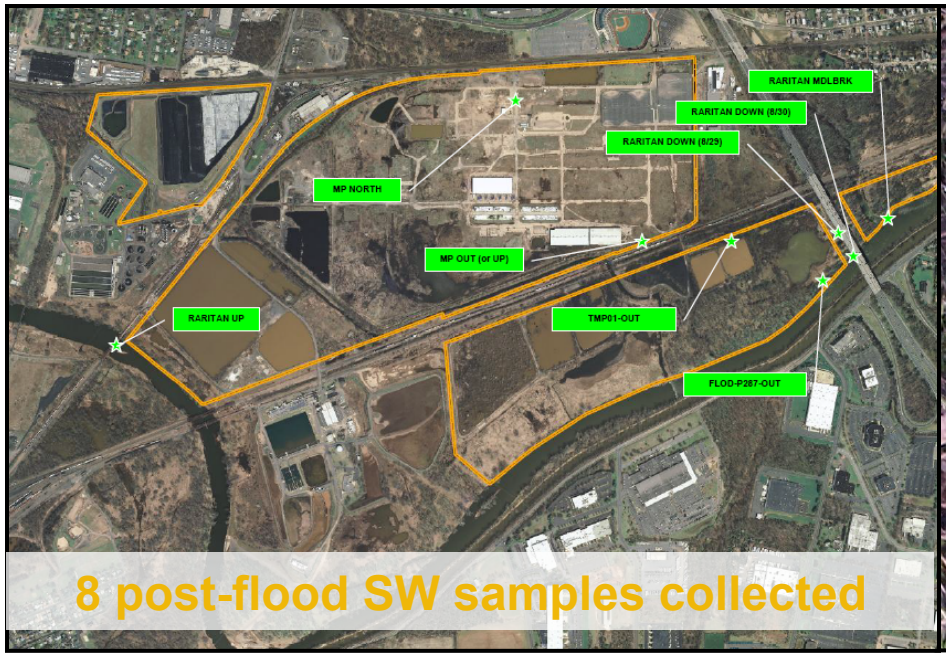
- Preceded by wet conditions (8”-16” of rainfall in the 3 weeks prior)
- NJ Governor declared state of emergency on Aug 25, 2011
- Up to 10” of rain in NJ from Aug 27-28, 2011 (Over 7” at site)
- Over 4M without power along East Coast
- All 21 NJ counties designated as a FEMA Major Disaster Area



Impoundments 1 & 2 Area (Looking SW)

Impacts on Impoundments 1 & 2

- Post-flood surface water sampling conducted from Aug 29 to Sep 2
- Post-flood berm inspection completed after flood waters receded
- No significant release occurred
- Some minor tar splatters observed on berm walls



8 post-flood SW samples collected

Post-Flood Modifications: Impoundments 1 & 2

- Synthetic liners installed as a cap to reduce the potential for mobilization of waste material
- Berm-reinforcing material installed on the exterior slopes of impoundments 1 and 2 to increase the strength of the berms and prevent scour during future flood events
  - Completed in October 2013
  - Can withstand water velocities in excess of 8ft/s
- Pilot study scheduled outside of hurricane season

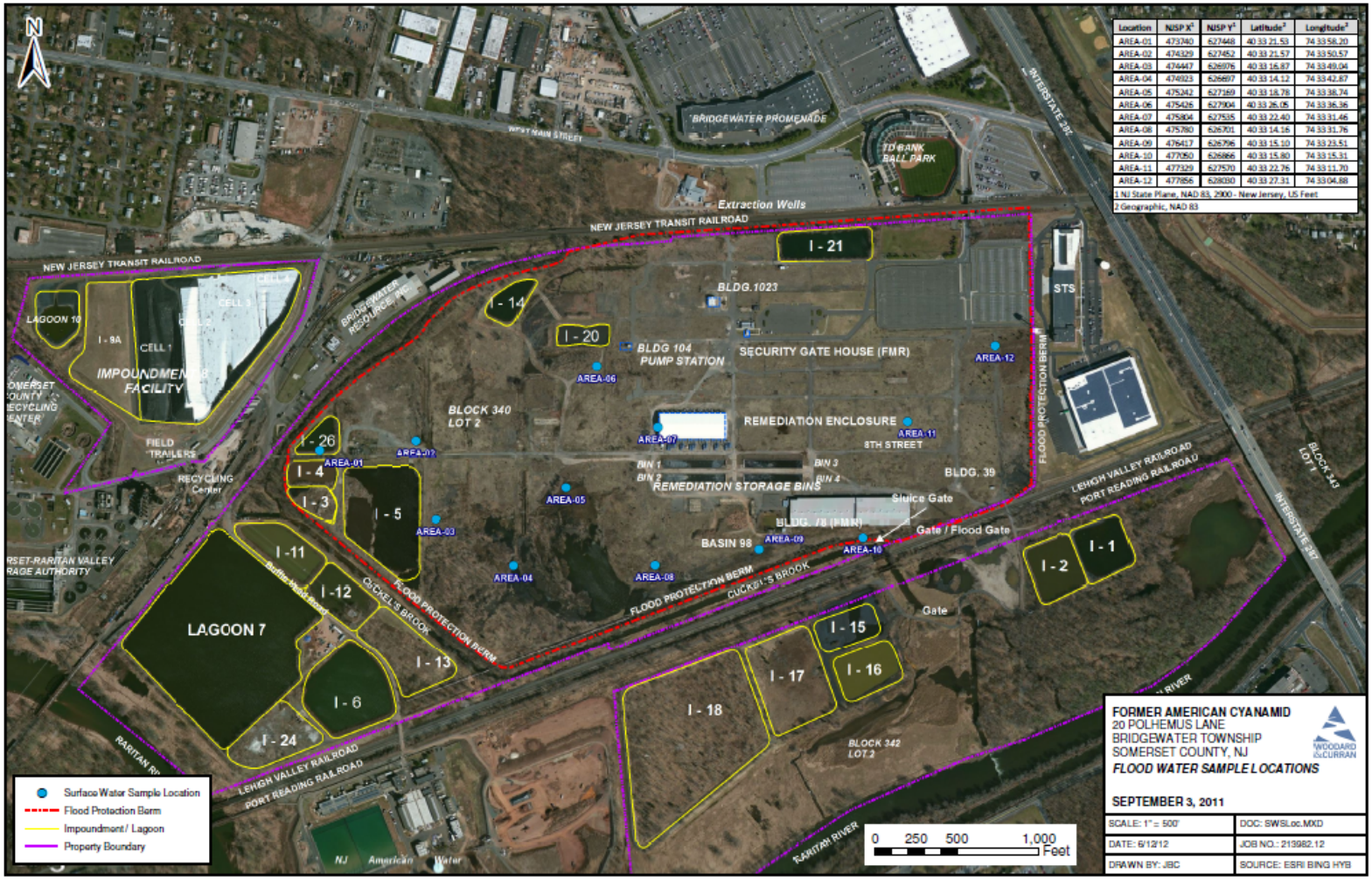
North Area (Looking East)

Site Trailers and Records Destroyed

Post-Flood Impacts to North Area

- 214 M gallons of standing water within North Area (5 ft high)
- Sluice gate for drainage of flood water concreted and dismantled
- Flood control berm, office trailers and records damaged
- No electrical power
- Groundwater extraction system to maintain hydraulic control in North Area did not operate for 30 days (no electricity or submersible pumps)

Post-Flood Surface Water Sampling



Location	NJSP X[1]	NJSP Y[1]	Latitude[2]	Longitude[2]
AREA-01	473340	627448	40 33 21.53	74 33 58.20
AREA-02	474329	627452	40 33 21.57	74 33 50.57
AREA-03	474447	626976	40 33 16.87	74 33 49.04
AREA-04	474823	626697	40 33 14.12	74 33 42.87
AREA-05	475242	627169	40 33 18.78	74 33 38.74
AREA-06	475426	627904	40 33 26.05	74 33 36.36
AREA-07	475804	627535	40 33 22.40	74 33 31.46
AREA-08	475780	626701	40 33 14.16	74 33 31.76
AREA-09	476417	626796	40 33 15.10	74 33 23.51
AREA-10	477050	626866	40 33 15.80	74 33 15.31
AREA-11	477329	627570	40 33 22.76	74 33 11.70
AREA-12	477856	628030	40 33 27.31	74 33 04.88

1 NJ State Plane, NAD 83, 2900 - New Jersey, US Feet
2 Geographic, NAD 83

Generator-powered pumps used to controllably discharge 152M gallons of flood water to Cuckel's Brook by Sept 28

Post-Flood Modifications: Remainder of Site

- Two flood plans developed
  - Flood Emergency Preparedness Plan
  - Flood Management and Response Plan
- Sluice gate repaired
- Office trailers relocated out of the floodplain
- Flood control berm repaired and armored
- All electrical instrumentation re-constructed 5 feet higher than Hurricane Irene levels
- Submersible pumps installed in the two bedrock groundwater extraction wells so that hydraulic control can be maintained throughout a flood event.

Other Impacts

- OU4 remedy selected in September 2012 ROD
  - Called for an impermeable multi-layered cap for over 60 acres and a 2-foot soil cap for over 130 acres
  - All engineered caps must be designed and constructed to withstand the effects of a 500-year flood event
  - Minimize flood storage loss
- Removal Action WWTP
  - WWTP constructed 1.2 feet higher than Hurricane Irene levels

Lessons Learned & Recommendations

- Relocate site office trailers outside of the floodplain or use trailers that can be relocated in advance of flooding
- Store waste and equipment outside of floodplain, if possible
- Implement a berm inspection program (semi-annual basis)
- Evaluate whether berm armoring is necessary
- Elevate critical electrical infrastructure
- Design and construct remedies that are able to withstand greater than 100-year flood events
- Develop flood plans including river stage monitoring, preparation procedures, evacuation plans, chain of command, etc.

Questions?

Additional Reference Slides

Impoundments 1 & 2 Area (Looking South)

North Area (Looking North)

Damaged Portion of Site's Flood Control Berm

Additional Reference Slide: Site Elevations

- Typical Raritan River Stage: 19 MSL
- Flood Plan Action Levels
  - Flood Alert: 26 MSL
  - Flood Warning: 28 MSL
  - Flood Emergency: 33 MSL
  - Site Evacuation: 38 MSL
- Flood control berm: 39 MSL
- Hurricane Irene: 42 MSL
- Impoundment 8 facility: 46 MSL
- All critical on-site electrical instrumentation: 47 MSL
- Removal action WWTP: 43.2 MSL