An aerial photograph of an industrial facility, likely a hazardous materials installation. The scene includes several large white cylindrical storage tanks, a parking lot with various vehicles (trucks, cars, and a silver SUV), and a blue building with a 'HERR'S' sign. A green fence runs across the foreground. The background shows a line of trees under a clear sky.

Vulnerability Assessment of Hazardous Materials Installations in Coastal Delaware

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Environmental Engineer

Joseph D. Brown, Sr., PE
Intern – University of
Delaware

Alex Rittberg
TMB Administrator

Disclaimer

This presentation was prepared using Federal funds under award NA11NOS4190109 from the Delaware Coastal Programs and the Office of Ocean and Coastal Resource Management (OCRM), National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the OCRM NOAA or the U.S. Department of Commerce.

Purpose:

- Identify Facilities under the regulatory authority of the Division of Waste and Hazardous Substances located in the path of rising water and storm surge
- Assess their vulnerability to damage
- Initiate Action Plans where appropriate

Major Challenge

Coordinating with all of the agencies involved with this issue:

- DEMA
- SERC and LEPCs
- DNREC Divisions
- EO41 Committee (all executive departments)

Other interested parties: University of Delaware, EPA, Army Corps, Municipalities

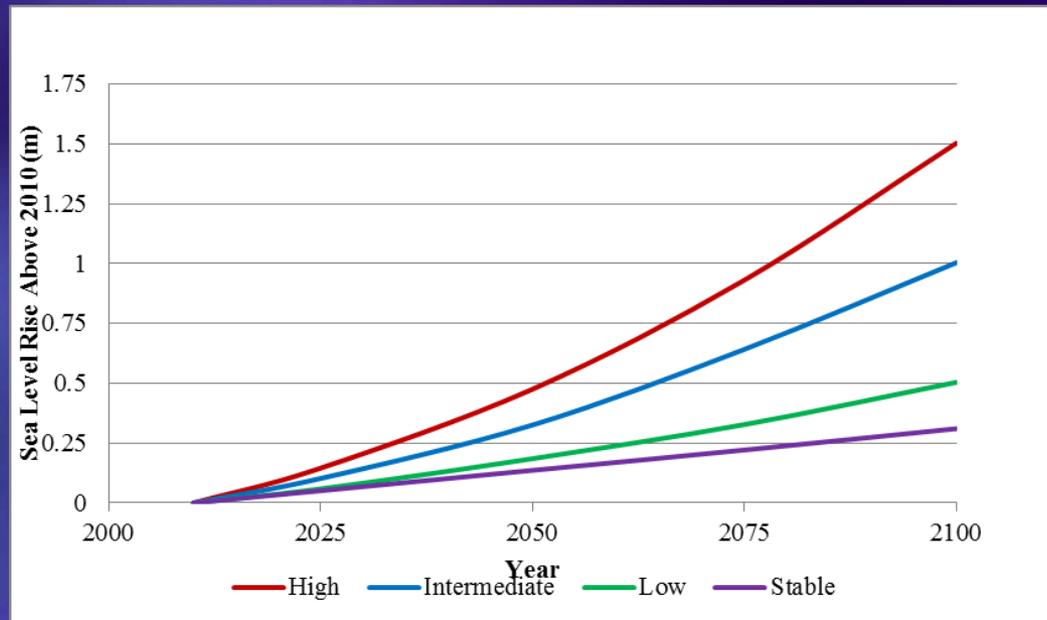
- Floodplain and Drainage Advisory Committee
- Bay Beaches Working Group
- Wetlands Advisory Committee
- State Sea Level Rise Advisory Committee
- Delaware Climate Change Steering Committee

Sea Level Rise(SLR) Scenarios

DNREC Sea Level Rise Scenarios

- Low - 0.5 meters (1.6 feet)
- Intermediate - 1.0 meters (3.3 feet)
- High - 1.5 meters (4.9 feet)

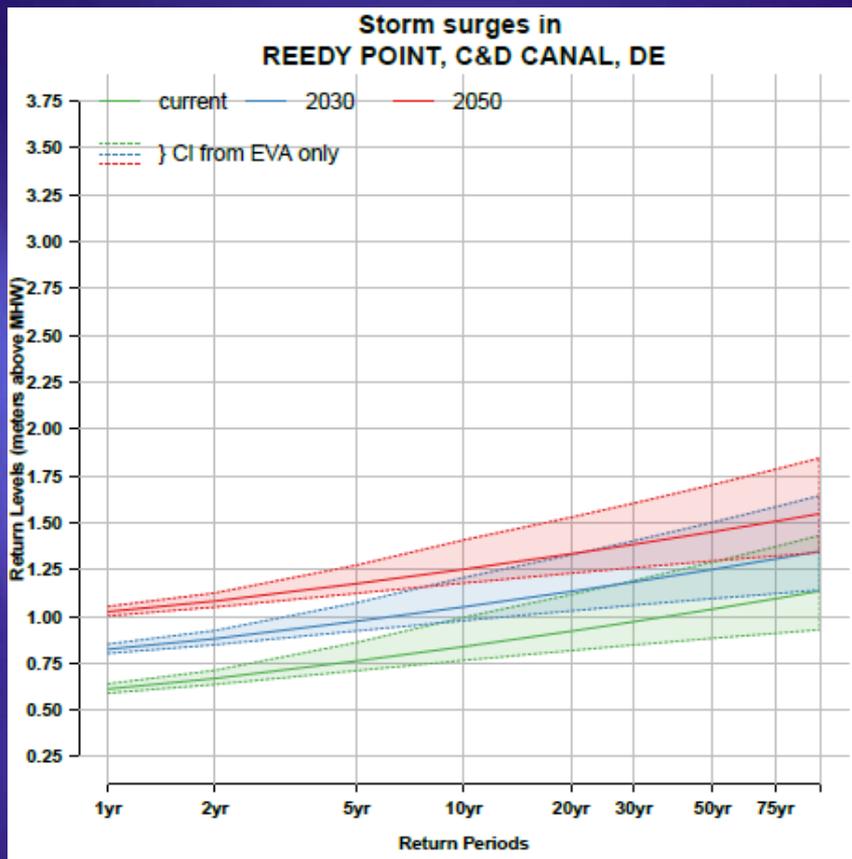
Estimated Sea Level Rise



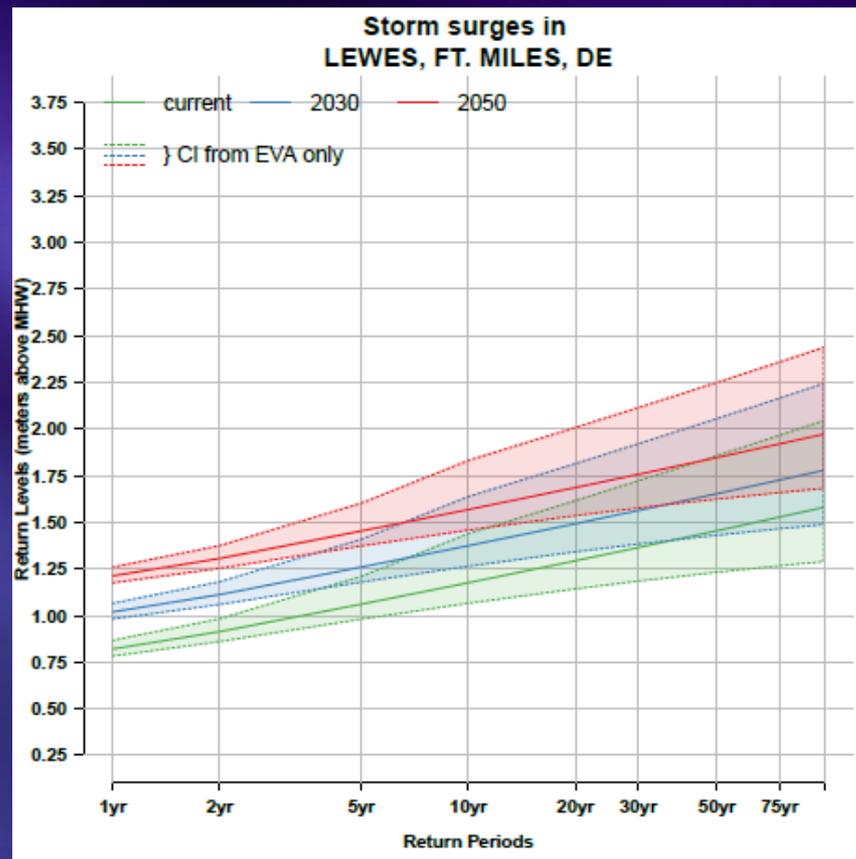
Source: DNREC Sea Level Rise Technical Workgroup, 2009.

Storm Surge Data

Return Level Curves



Source: Zervas , 2005.



Source: Zervas , 2005.

1.16 to **2.14** meters above MHHW

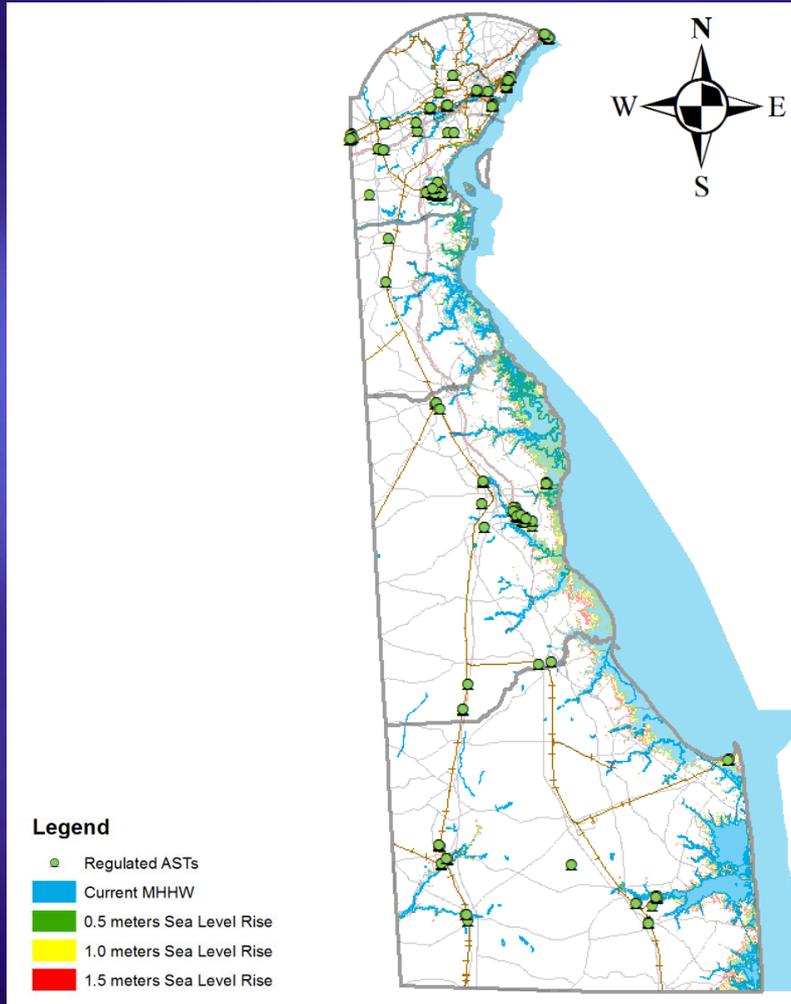
Hazard Matrix

Regulating Agency	Facility/ Vessel Type	Hazard						
		Leak	Catastrophic Failure	Floation Potential	Collision	Piping Failure	Explosion	Mechanical
TMB	UST	X	X			X		X
	AST	X	X	X	X	X	X	X
	Water Boiler	X	X	X	X	X	X	X
	Propane	X	X	X	X	X	X	X
	Refrigerant Systems	X	X		X	X		X
ARPP	Process	X	X		X	X	X	X
SIRS	SIRS Site	X						



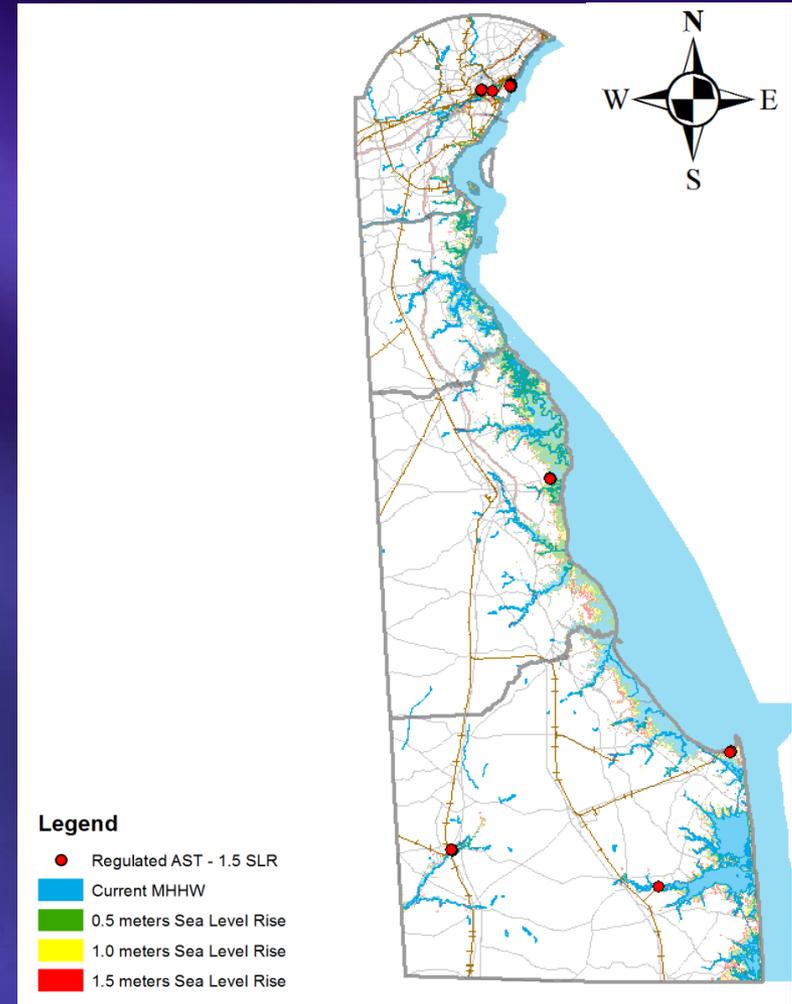
Aboveground Storage Tanks (ASTs)

Overall in Delaware:



Total ASTs = 1203

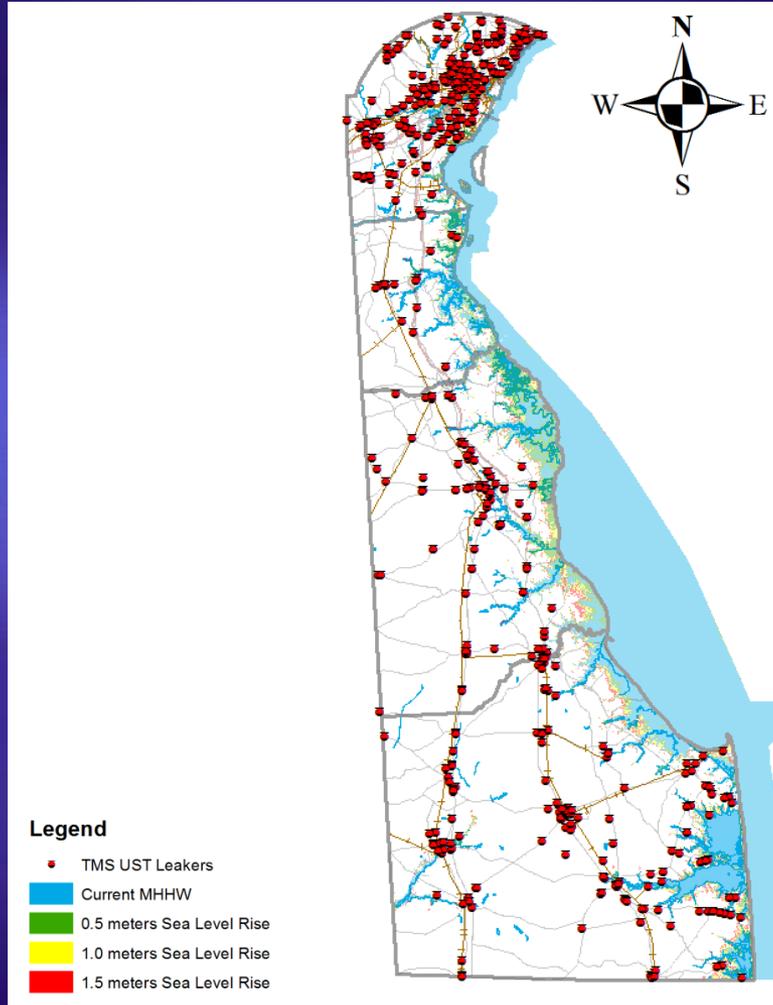
Subject to 1.5 meter Sea Level Rise:



65 ASTs Impacted (5%)

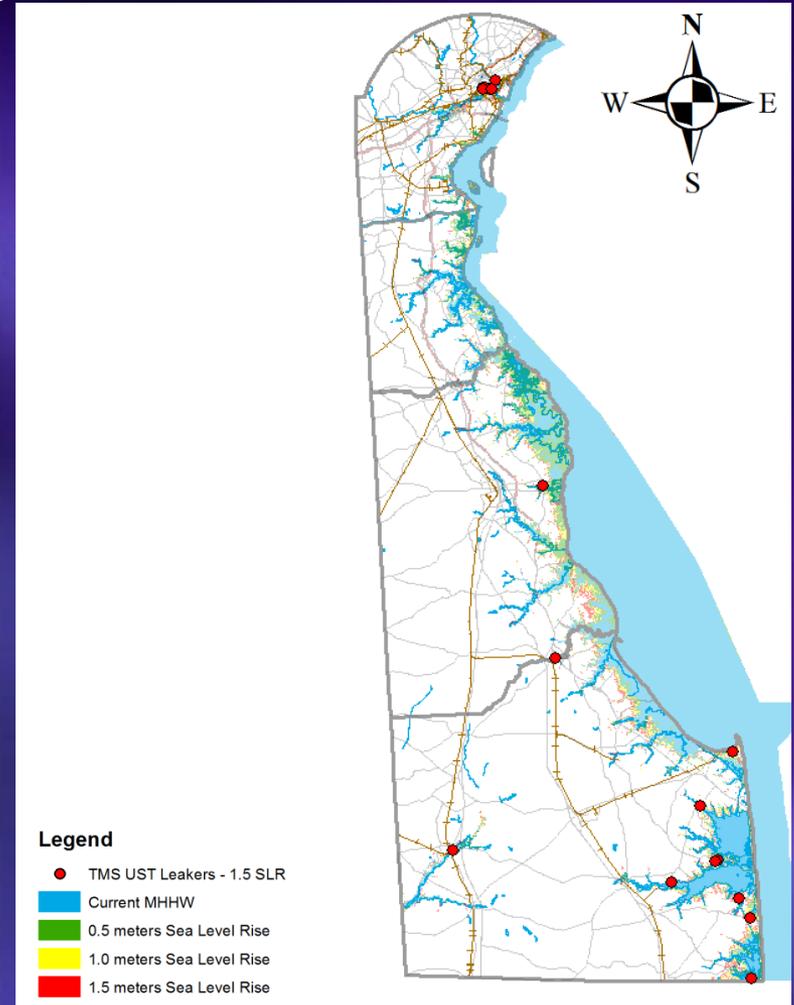
Leaking Underground Storage Tanks (LUSTs)

Overall in Delaware:



Total LUSTs = 612

Subject to 1.5 meter Sea Level Rise:

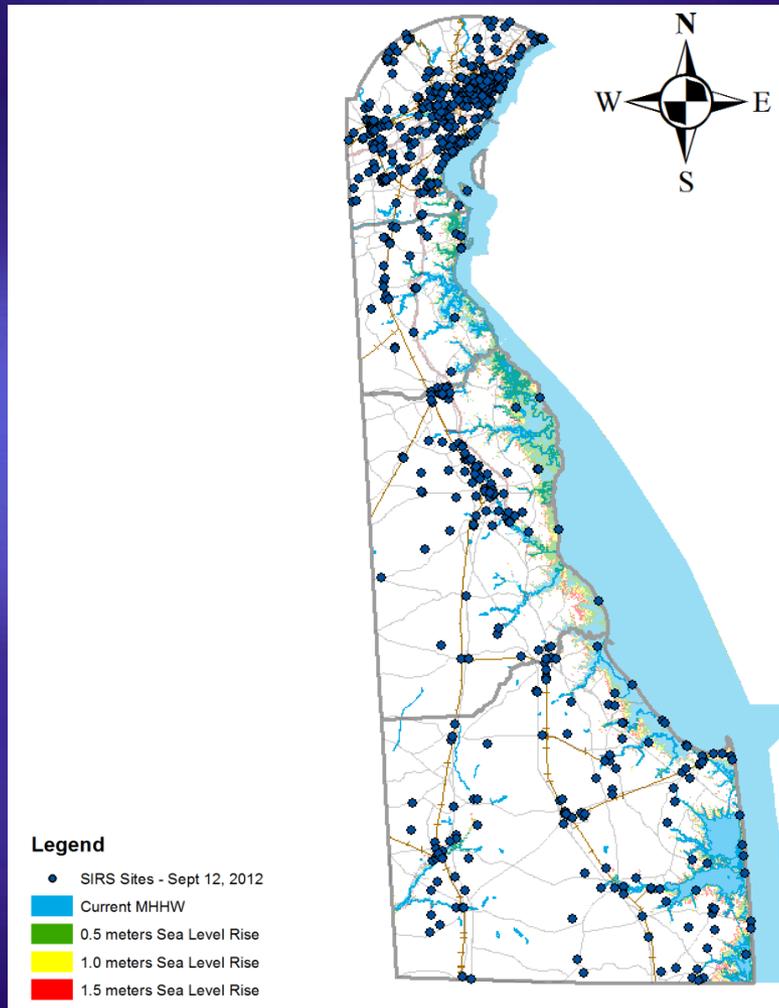


24 LUSTs Impacted (4%)

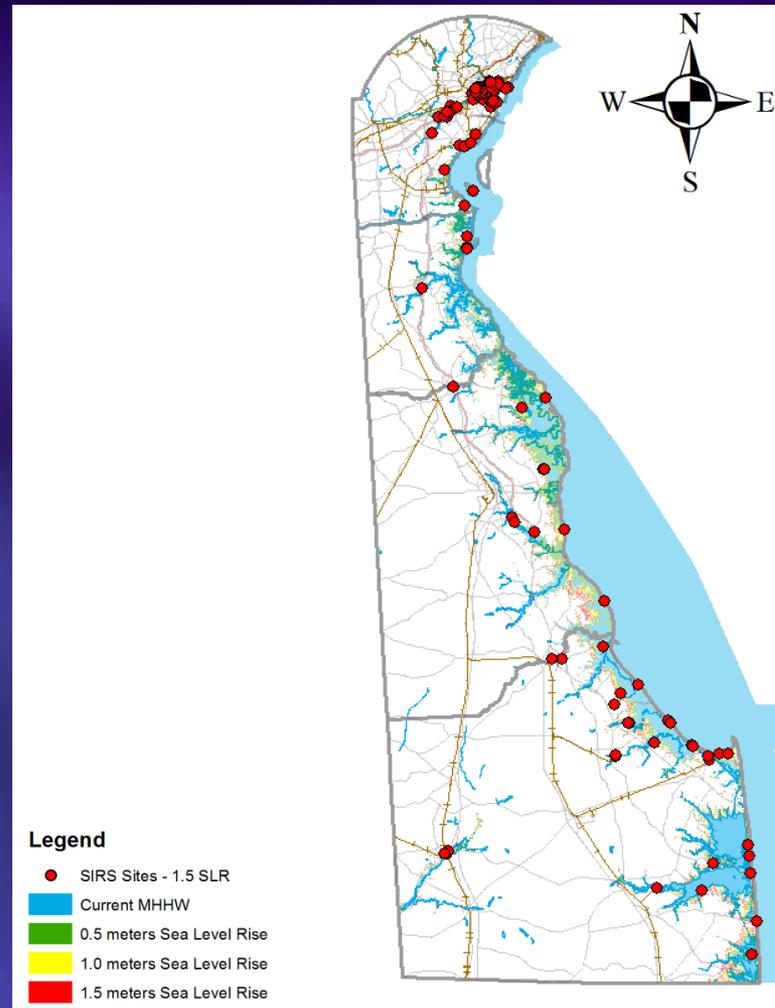
Site Investigation and Restoration Section(SIRS) Sites

Overall in Delaware:

Subject to 1.5 meter Sea Level Rise:



Total Sites = 843



175 Sites Impacted (21%)

Question for Vulnerable SIRS Sites

What would SIRS do differently in anticipation of future flooding of sites with sea water?



Preliminary thoughts for adjustments to current practice

- Continue to collect substantial quantitative data from soil samples in 3 dimensions.
- Assess leachability in flooded conditions.
- Evaluate geospatially to identify areas of more contaminant mass.
- Support mass removal and offsite disposal instead of “capping/covering”



- SADA Main Page
- Free Downloads
- Visualization
- Sampling
- Data Exploration
- Risk Assessment
- Geospatial Analysis
- Geospatial Simulation
- Decision Analysis
- Cost Benefit Analysis
- MARSSIM
- TRIAD
- Other Tools
- Technical Support

Spatial Analysis and Decision Assistance



Documentation

This page contains links to pdf files that describe different features of SADA.

SADA Version 5 User Guide and Example Files

Be sure to download the data files in the .zip file. The user guide will refer to them. Enjoy!

- [V5 User guide files -zipped](#)
- [V5 User Guide](#)

Past Versions

- [SADA 4.1 User's Guide](#)
- [SADA 4 Help File Online Directory](#)
- [SADA 3 Help File Online](#)
- [SADA 2.3 User's Guide](#)
- [SADA 3 Help File](#)
- [SADA 2.3 Training Manual](#)
- [Secondary Sampling Strategies](#)

What is a cleanup really?

- So far, what makes a site candidate for cleanup is concentration and toxicity.
- Alternative 1 could include contaminant mass and toxicity (eco and human)
- Alternative 2 could add leachability to mass and toxicity.



Draw an area of concern map

General | Soil | Ac-225 | (None) | Z = 0

Steps

1. See the data
2. Set up the site
3. Set GIS overlays
4. Set grid specs
5. Interpolation methods
6. Specify decision criteria
7. Set decision threshold type
8. **Show the results**
9. Autodocumentation
10. Manage model results
11. Cross validation
12. Format picture
13. Export to file

<<Back Help Next >>

Show The Results

Results

Show The Results

Log/Results

Site Extent

	Minimum	Maximum
Easting	26900	29200
Northing	21900	21900

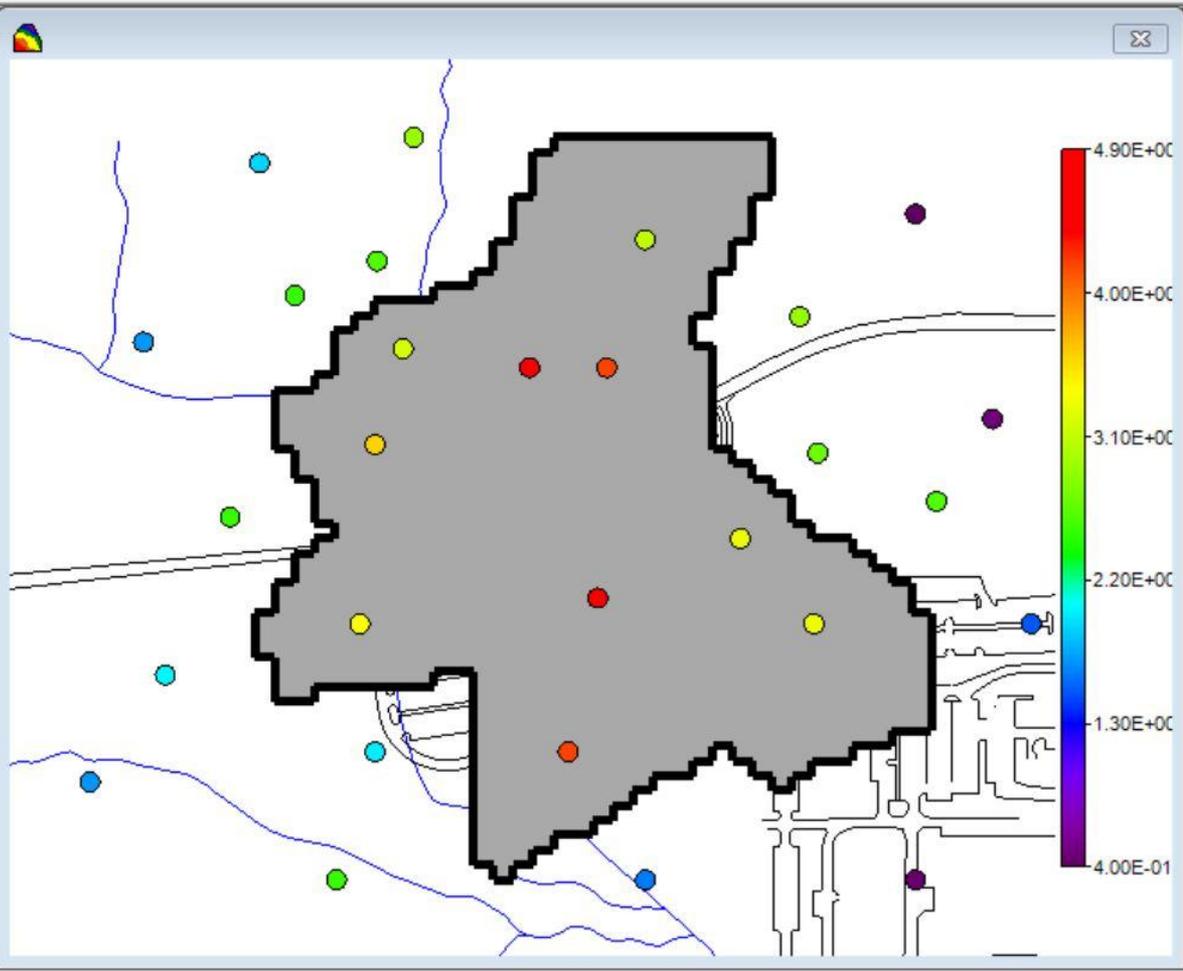
Vertical Layering Scheme

From	To	Active	Polygon
0	0	True	None

GIS Layers

Name	File
SADA Result	\SADA Result

Refresh View Layer





Draw an area of concern map

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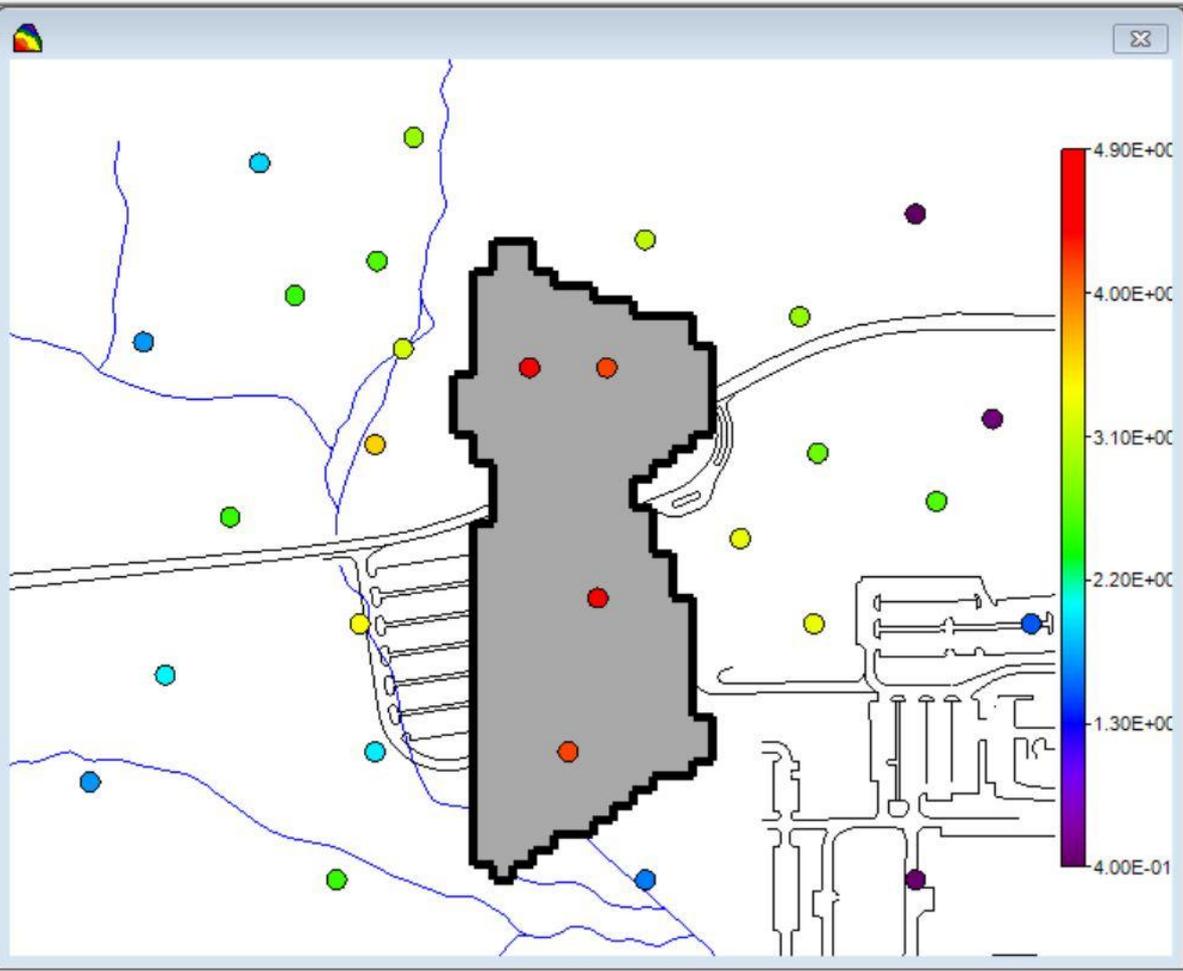
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0	0	True	None

GIS Layers

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SADA Result	\SADA Result

Refresh View Layer



The Next Step?:

- Develop a checklist for site inspections emphasizing:
 - Spill Containment
 - Buoyancy Potential
 - Electrical Grounding (Flammables)
 - Adequate Pipe Supports
 - Facility Location and Surrounding Topography
 - Proximity to Waters of DE
 - Overall Facility and Equipment Condition
- Prioritize Facilities on the “*At Risk*” list
- Continue Site Inspections/Evaluations of Facilities appearing on the “*At Risk*” list
- Further Develop the Storm Surge Scenario
- Regularly Revise the “*At Risk*” list



DWHS

**Site Investigation &
Restoration Section (SIRS)**

391 Lukens Drive

New Castle, DE 19720