

FLOODING AND SEA LEVEL RISE

Coastal Zone Conversion Permit Act



Quick Stats on the 14 Sites

- Formosa and Standard Chlorine have no mapped flood risk
- 10 sites within coastal high hazard area
- 8 sites within a mapped 1% chance flood zone
- 5 sites significantly within 3' sea level rise inundation area
- 10 sites significantly within area inundated by a combination of coastal flooding and sea level rise



Flooding and Sea Level Rise Provision

Section 7014(c)(5) of the Coastal Zone Conversion Permit Act states:

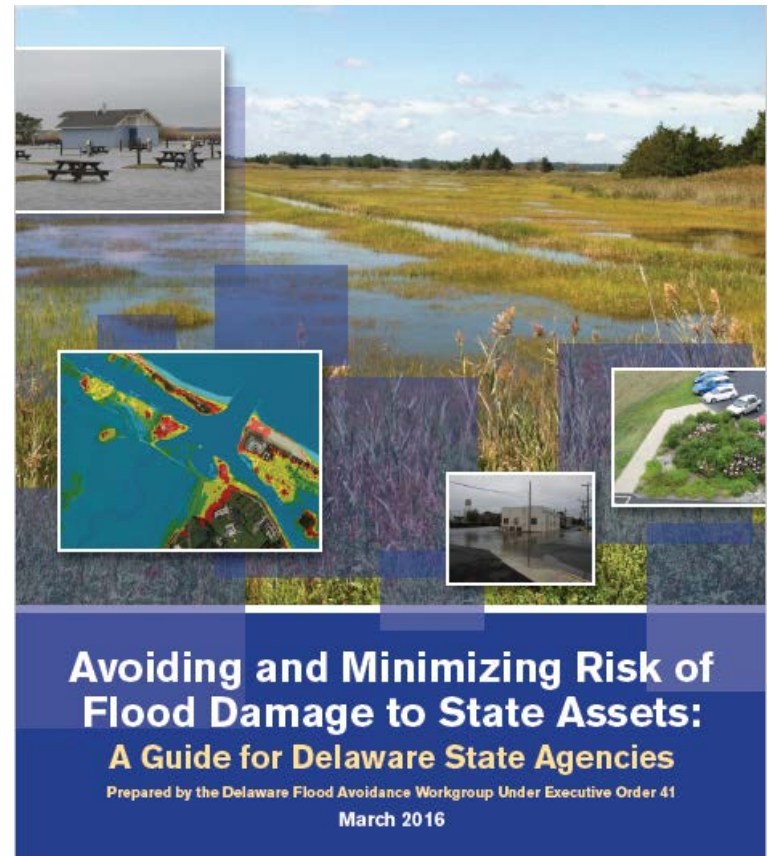
“An application for a conversion permit...must include...a plan to prepare the site for potential impacts of sea level rise and coastal storms over the anticipated useful life of the facility and infrastructure in connection with the applied-for use.”

Breaking It Down...

- A plan
 - What are the components?
 - What is the goal?
 - Eliminate risk? Reduce risk?
- Potential impacts of sea level rise and coastal storms
 - How should these impacts be identified?
- Anticipated useful life of the facility and its associated infrastructure
 - How is this defined and how can future risk be identified?

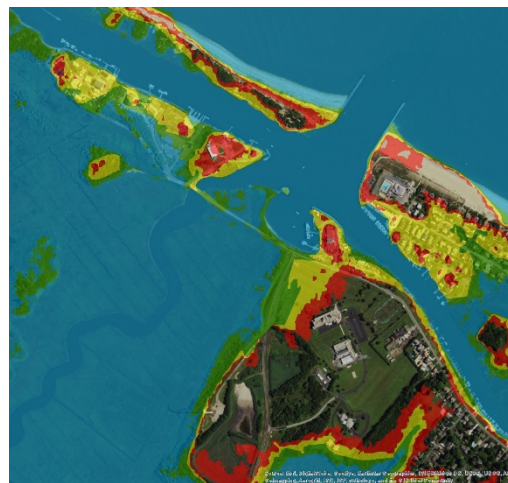
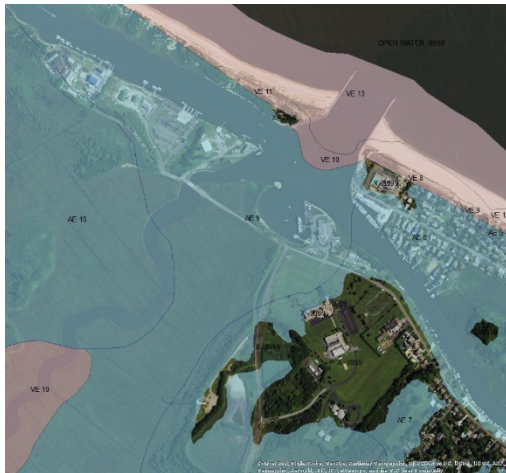
Existing Land Use and Development Rules and Regulations for Flooding

- Senate Bill 64 Floodplain and Drainage Advisory Committee Recommendations
- County and Municipal Floodplain Regulations
- State guidance on Flood Risk Avoidance issued through EO 41 (Markell)



Existing Maps to Identify Flood Risk

- FEMA Floodplain Map
- Delaware Sea Level Rise Map
- Delaware Flood Risk Adaptation Map



FLOODPLAIN DISCUSSION



The background is a light blue gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance. The text is centered on the page.

FLOODING AND SEA LEVEL RISE

COASTAL ZONE CONVERSION PERMIT ACT

GREG WILLIAMS, CFM
DNREC – DIV. OF WATERSHED STEWARDSHIP

STATE NFIP COORDINATOR

GREGORY.WILLIAMS@STATE.DE.US



FEMA'S NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

- Voluntary program established on Aug. 1, 1968
- New Castle County joined on Dec. 3, 1971



FLOOD INSURANCE RATE MAPS (FIRM)

- Effective dates in Delaware
 - New Castle County – February 4, 2015
 - Kent County – June 20, 2018
 - Sussex County – June 20 2018

FLOOD INSURANCE RATE MAPS (FIRM) USES

- Flood insurance premium calculation of risk
- Floodplain management
 - Compliance with floodplain ordinance / building code

RESOURCES TO VIEW DATA

- FEMA National Flood Hazard Layer (NFHL) Viewer
- Delaware Flood Tool <https://de.gov/floodplanning>
- New Castle County GIS Map Viewer

FEMA FLOOD INSURANCE RATE MAP LIMITATIONS

- FIRMs show an analysis of flood scenario based on past events and data
- Indicate areas of high, moderate, and low risk
- Future conditions are not taken into account
- Margin of error in calculations
- Mother nature is unpredictable
- Conditions continuously change – one map will not suffice

FEMA FLOOD INSURANCE RATE MAP LIMITATIONS

- Don't account for the following:
 - Shoreline erosion, wetland loss, subsidence, and relative sea level rise
 - Upland development or topographic changes
 - Degradation or settlement of levees and floodwalls
 - Changes in storm climatology (rainfall frequency and severity)
 - The effects of multiple storm events

OTHER CONSIDERATIONS

- Few if any standards exist for development immediately adjacent to the high risk floodplain or outside mapped floodplains
- Approximately 25% of flood damages nationally occur to structures outside the FEMA high risk floodplain



FEMA FEDERAL REGULATIONS

- 44 CFR 59 & 60 – minimums
- Participation in the NFIP requires adoption of at least the federal minimum floodplain management regulations
 - Community has the ability to adopt higher standards
 - CRS program rewards adoption of higher standards

The image features a light blue gradient background with several realistic water droplets of various sizes scattered in the corners. The droplets have highlights and shadows, giving them a three-dimensional appearance. The word "QUESTIONS?" is centered in the middle of the page in a bold, black, sans-serif font.

QUESTIONS?

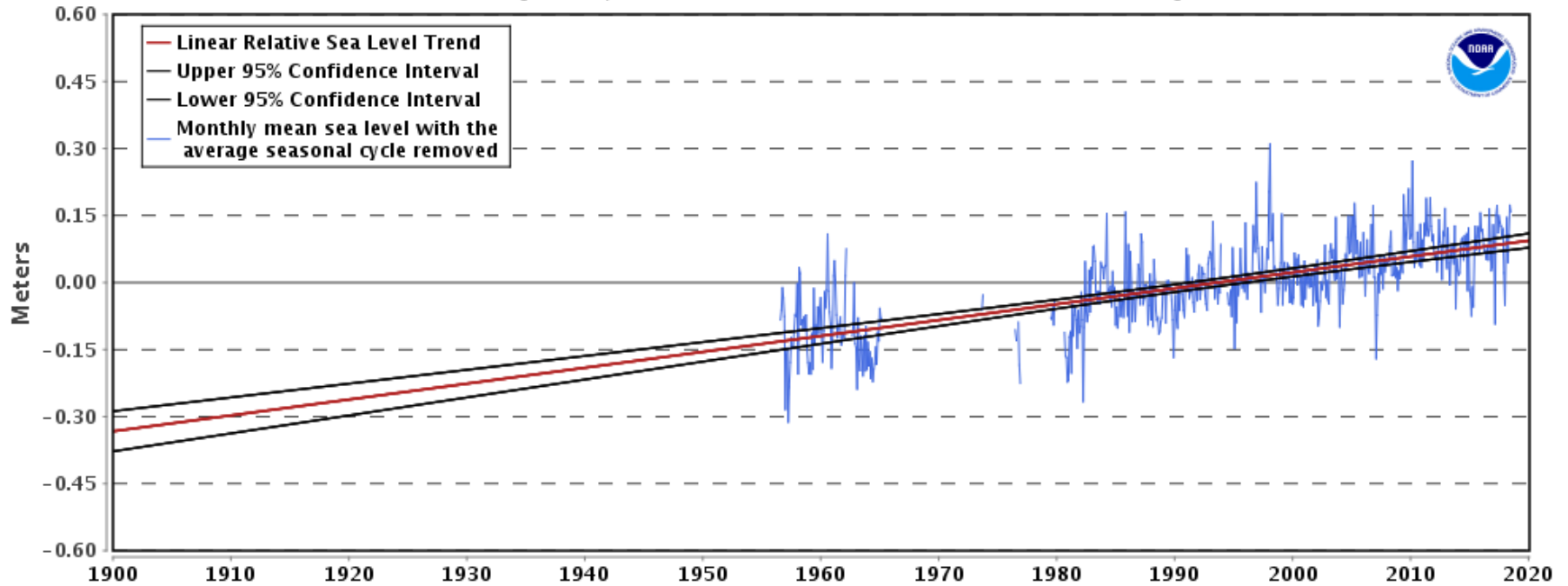
Sea Level Rise



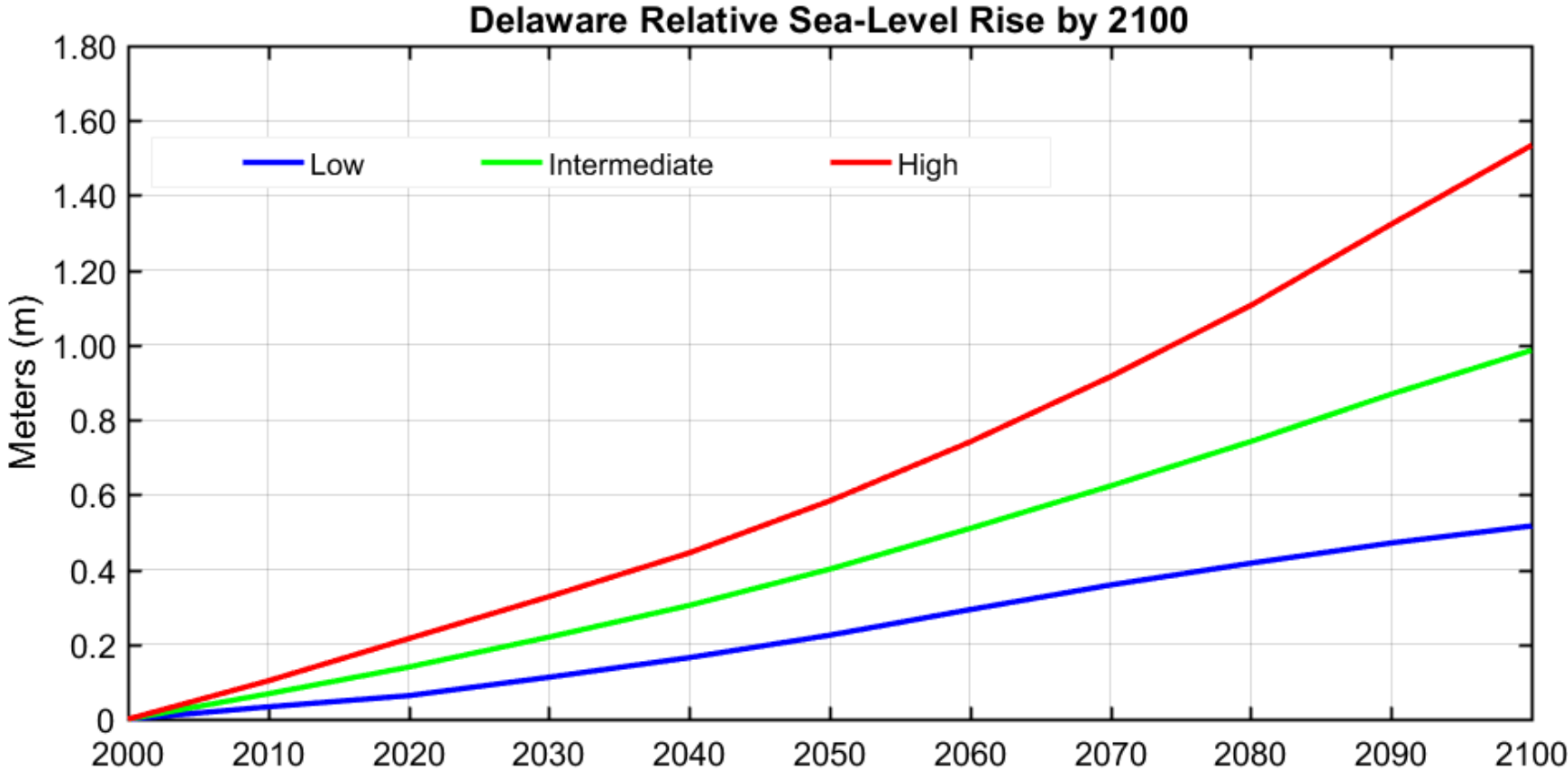
Long Term Sea Level Rise Trend

8551910 Reedy Point, Delaware

3.56 +/- 0.47 mm/yr

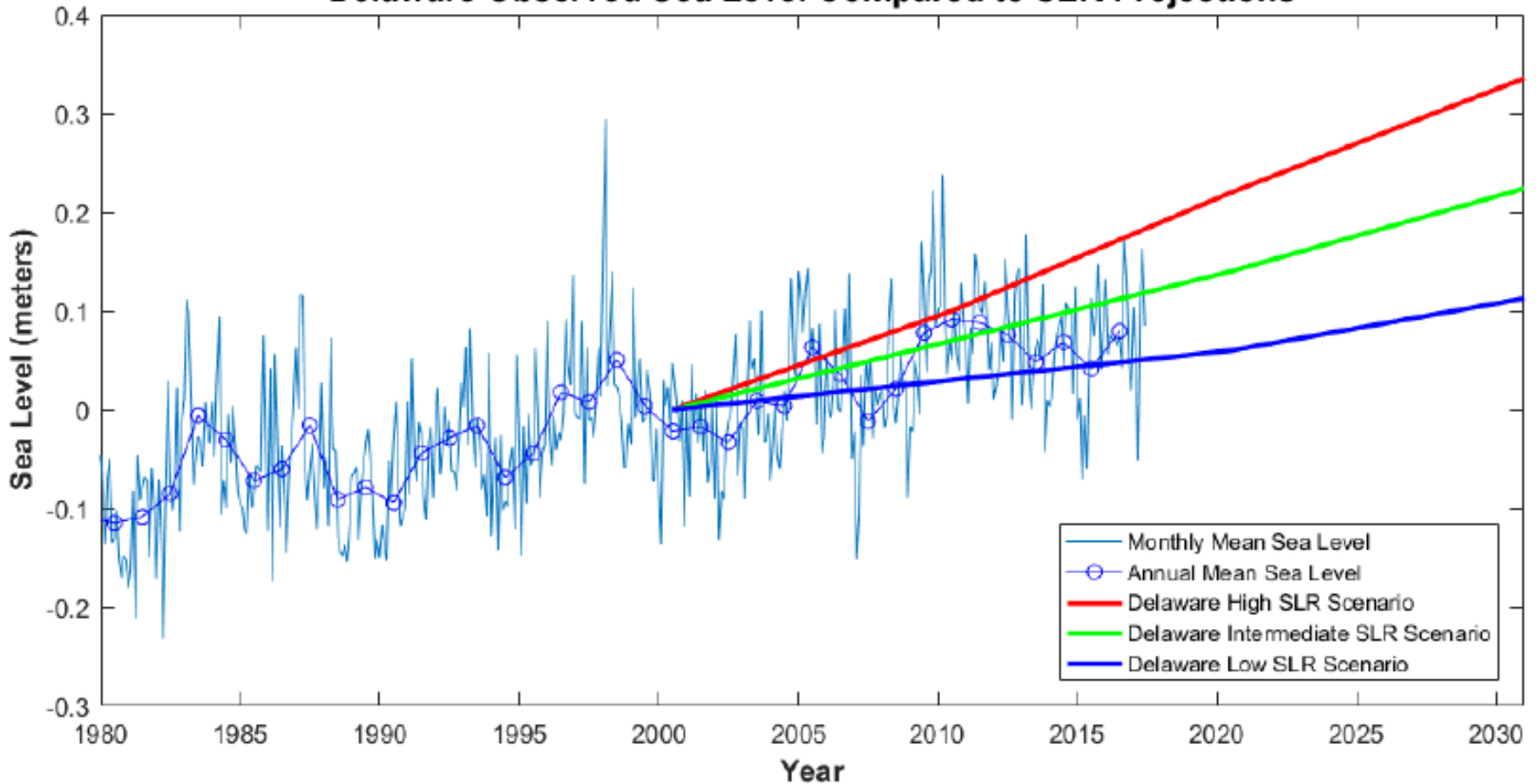


Sea Level Rise Scenarios (Updated 2017)



*Based upon the 'business as usual' case of future greenhouse gas emissions

Delaware Observed Sea Level Compared to SLR Projections



*“Sea level rise observations are extremely noisy, but the trend is clear!”
- John Callahan, Delaware Geological Survey*

In table format....

Year	SLR Scenarios for Delaware				
	5% (Low)	17%	50% (Inter.)	83%	95% (High)
2030	0.11 m / 0.36 ft	0.16 m / 0.53 ft	0.22 m / 0.76 ft	0.28 m / 0.92 ft	0.33 m / 1.08 ft
2050	0.22 m / 0.72 ft	0.30 m / 0.98 ft	0.40 m / 1.21 ft	0.50 m / 1.64 ft	0.58 m / 1.90 ft
2080	0.42 m / 1.38 ft	0.55 m / 1.80 ft	0.74 m / 2.43 ft	0.95 m / 3.12 ft	1.11 m / 3.64 ft
2100	0.52 m / 1.71 ft	0.70 m / 2.30 ft	0.99 m / 3.25 ft	1.29 m / 4.23 ft	1.53 m / 5.02 ft

*Based upon the “business as usual” case of future greenhouse gas emissions

Upper Bound Planning

- There remains uncertainty about Antarctic ice sheet contribution
- 1 in 20 chance that SLR will exceed 95% level
- Small odds vs. severe consequences

Upper Bound estimates from various sources (in meters)

	USGCRP NCA (2014) Max	NOAA SLR Report (2017) Max	NOAA SLR Report (2017) 99.9%	Miller et al. (2013) Max	Jevrejeva et al. (2014) Max	Jackson and Jevrejeva (2016) 99%	Kopp et al (2014) 99.0%	Kopp et al (2014) 99.5%	Kopp et al (2014) 99.9%
Global	2.00	2.50	2.40	2.70	1.90	2.22	1.55	1.76	2.47
Delaware		3.44	3.28				1.93	2.13	3.01

New Sea Level Rise Inundation Maps

- Utilized high-rez elevation data
- Bathtub model
- Now in 1 ft increments
 - Allows for user flexibility
- Screening and planning tool, not predictive
- Not to be used for site design
- More info at www.dgs.udel.edu/slr



Example Inundation Map – Chloramone Site

- Map indicates the Mean Higher High Water line with 3', 5' and 7' of sea level rise
- Does not incorporate storm surge, rainfall, or wave action
- This map should not be used as the sole basis for determining future flood risk

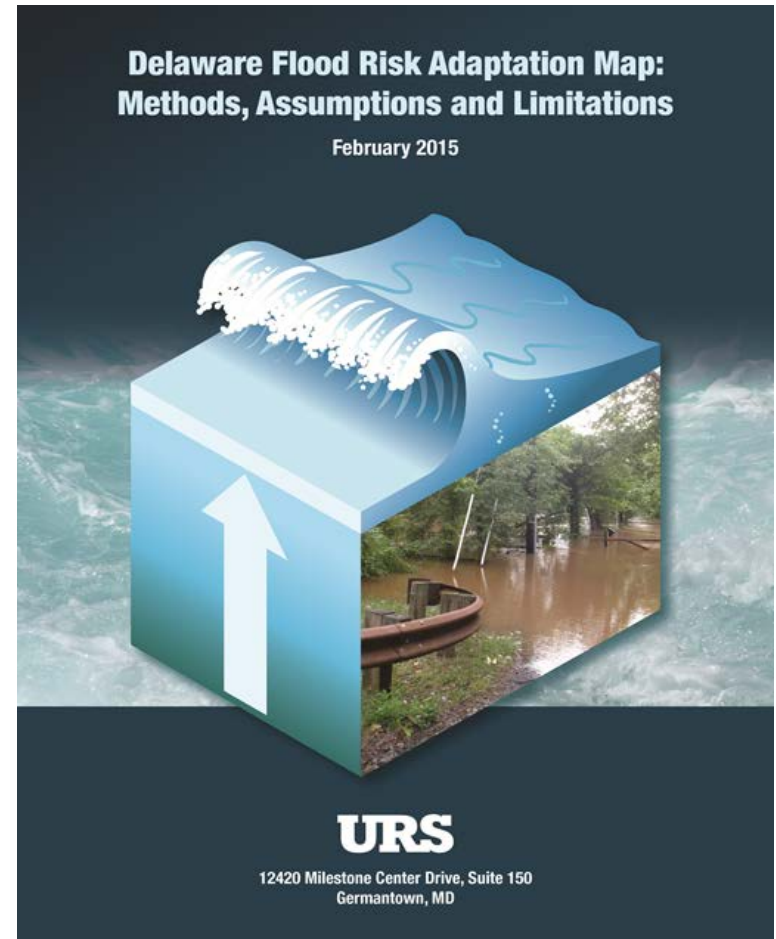
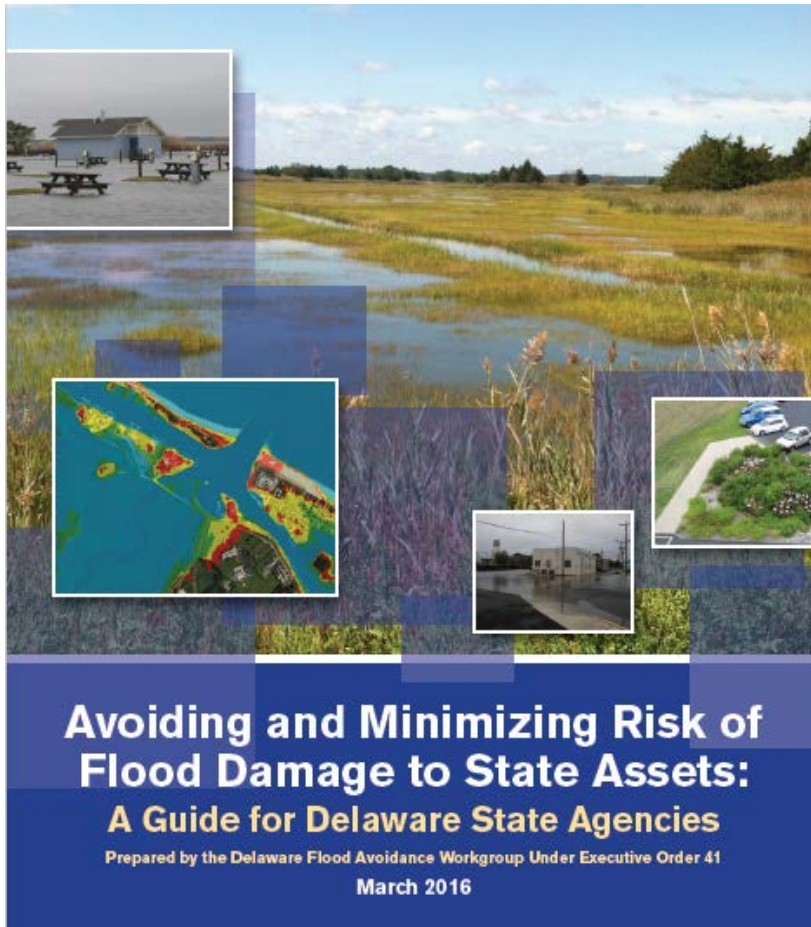


Executive Order 41 (Markell): Helped prepare the state for climate impacts

- Required State Agencies to:
 - Develop policies and plans
 - GHG Emission Reductions
 - Agency Adaptation recommendations
 - Take on-the-ground action to reduce flood risk to state assets
 - Avoid new projects in flood prone areas
 - Plan for future flood levels in projects
 - Use green infrastructure where possible
 - Use 18" of freeboard above the future flood level

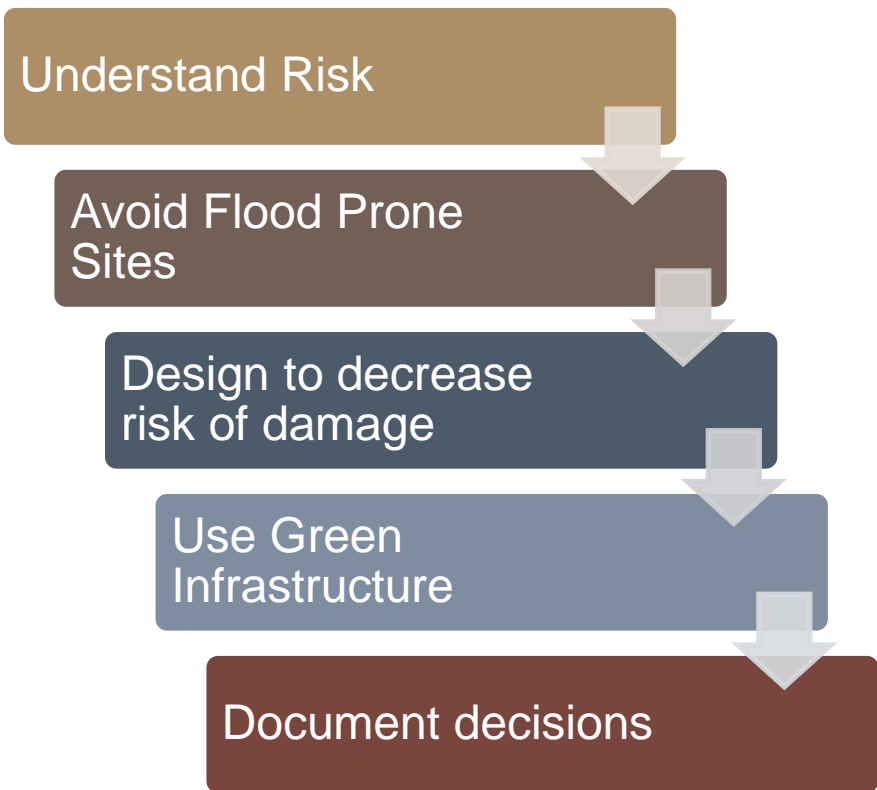


Combining Risk of Flooding and Sea Level Rise into a Comprehensive Tool



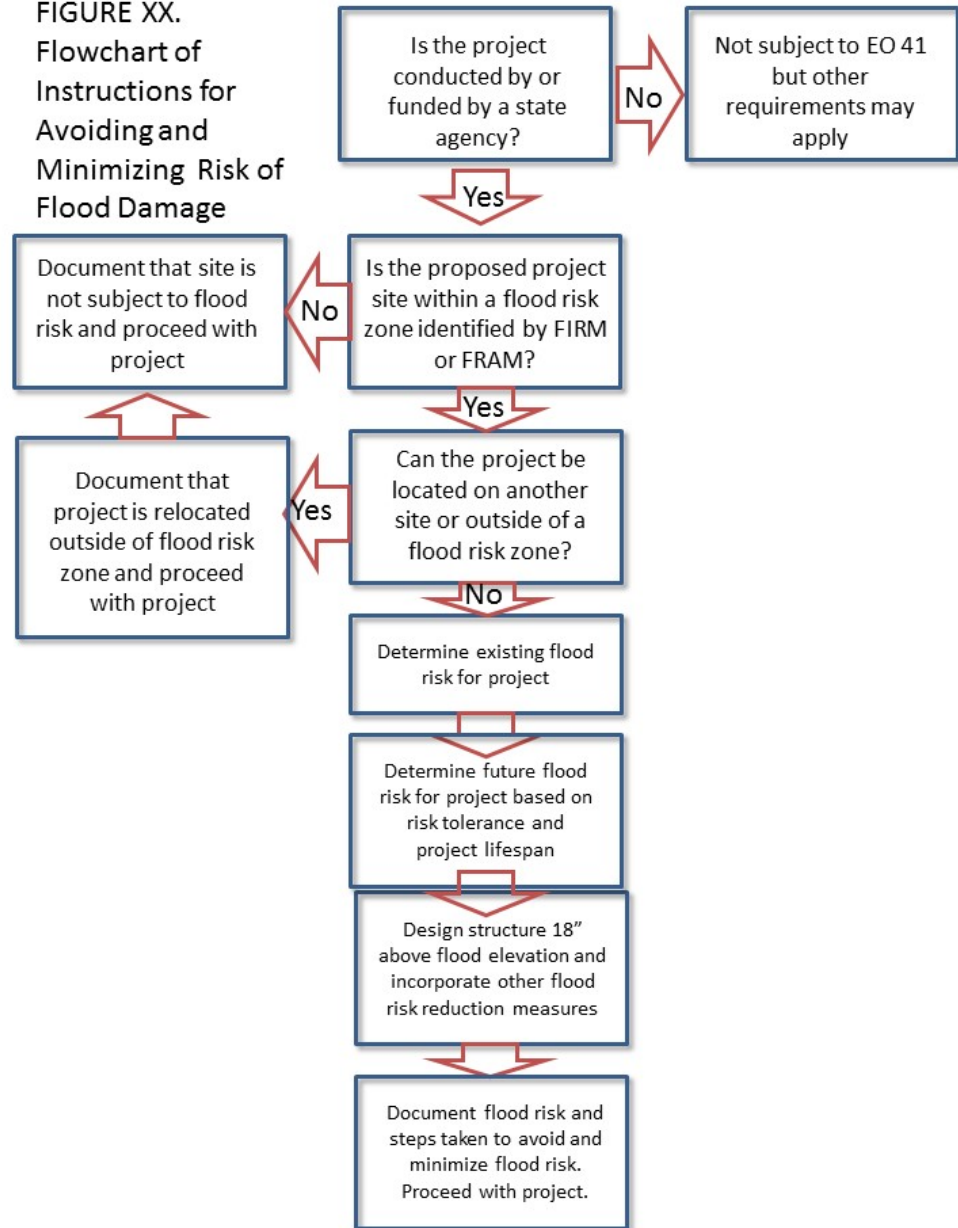
Avoiding and Minimizing Risk of Flood Damage to State Assets: A Guide

- To help state agencies comply with EO 41
 - Required for state agencies
 - Useful for many others
- Contains:
 - Principles for flood avoidance
 - Step-by-step instructions
 - Mapping information



Steps to Minimizing and Avoiding Flood Risk (Outlined EO 41 Guidance)

FIGURE XX.
Flowchart of
Instructions for
Avoiding and
Minimizing Risk of
Flood Damage

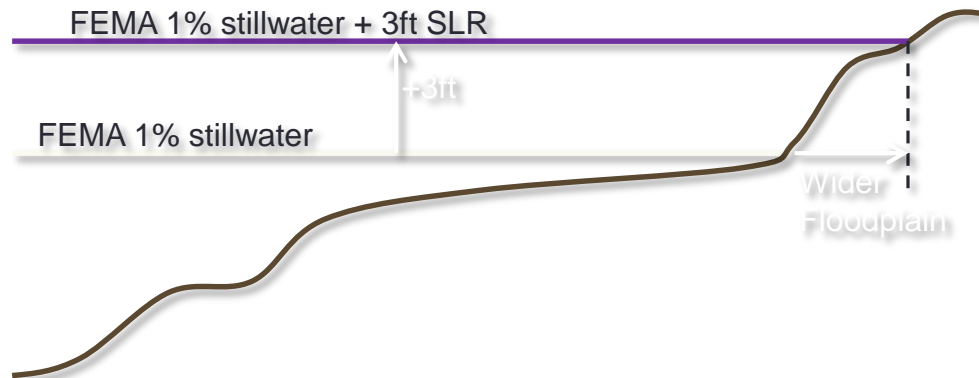
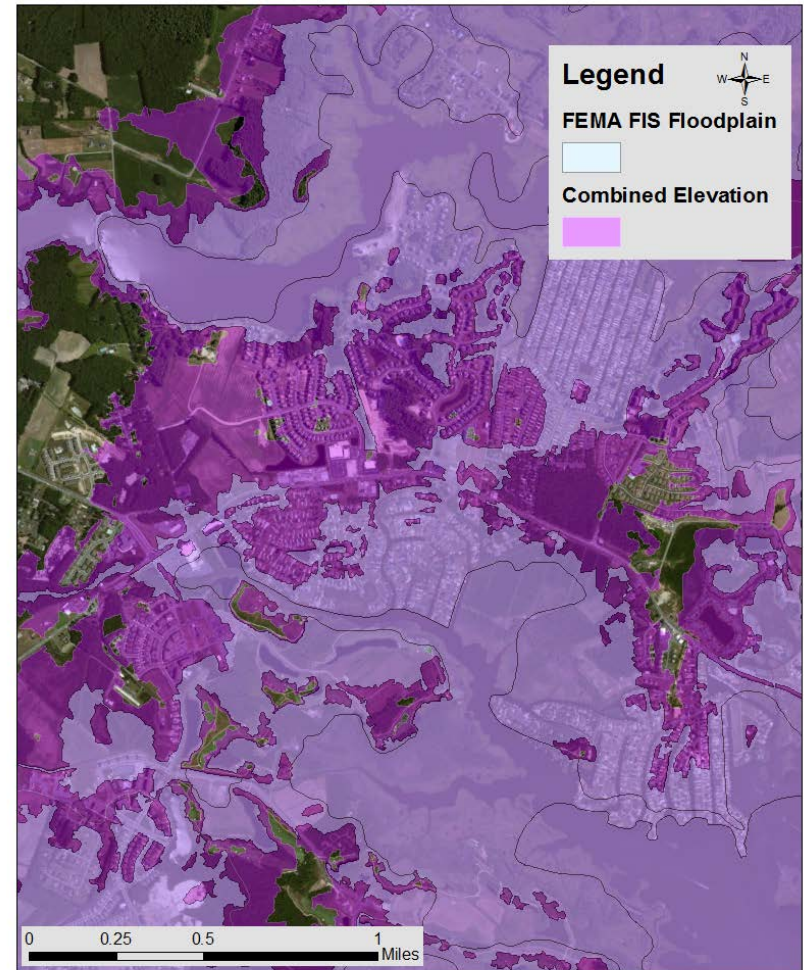


Determining Future Flood Risk

- Select most appropriate SLR planning scenario
 - Based on risk-tolerance
- Determine SLR height for project lifespan
 - Based on scenario graph
- Add SLR height to base flood elevation to determine future flood risk
- Avoid building in this area.
- If not possible, conduct additional studies and determine risk reduction strategies
 - Add 18" freeboard
 - Green infrastructure
 - Shoreline stabilization
 - Etc.

Creating the Flood Risk Adaptation Maps (FRAM)

- **Step 1:** Create the floodplain boundary of the combined hazard based on the inundation area 3ft of sea level rise on top of the FEMA 1% stillwater.
- **Step 2:** VE and AE zones were merged to become CE zones, AO zones were converted to CD zones and X zones were converted to OS zones.





FRAM: larger floodplain, higher flood elevations/flood depth and different zone designations

Left figure: FEMA FIS map



Right figure: FRAM



Limitations of FRAM

- Greater **wave action** further inland due to increased flood depths not modelled
- More **severe erosion** due to sea level rise and greater waves action not studied
- **Human management** actions not accounted for
- Long-term **shoreline changes** not accounted for
- Rainfall impacts not included



FRAM Map Uses

- Screening tool for future flood risk
- Planning tool for variety of purposes
- Not to be used for engineering purposes



Chloramone site. Purple indicates inundation area of 1% storm and sea level rise combined from FRAM.

Next Steps – Processes to Consider?

- Components of a plan
 - Flesh out a list, based upon required county elements and provisions of the state flood risk avoidance guidance
- Potential Impacts of Sea Level Rise and Coastal Storms
 - Flesh out procedure for identifying impacts, based upon county floodplain rules and state guidance
- Useful Lifespan
 - Utilize state flood risk avoidance guidance as basis for selecting future flood levels to plan for

BULK PRODUCT TRANSFER

REGULATORY DEFINITION

‘Bulk product’ “means loose masses of cargo such as oil, grain, gas and minerals, which are typically stored in the hold of a vessel. Cargoes such as automobiles, machinery, bags of salt and palletized items that are individually packaged or contained are not considered bulk products in the application of this definition.”

SCENARIOS

Bulk Product Scenario at any of the 14 Heavy Industry Use Sites	Allowable under original CZA?	Allowable under CZCPA?	Type of Permit
Export or import grain as bulk product to/from Africa	No	Yes	Conversion Permit
New manufacturing facility (not heavy industry) wants to import palm oil as bulk product from Africa to a new dock and use all the product in its manufacturing process at the site	Yes	N/A (not a heavy industry)	CZA permit
Manufacturing facility wants to ship, as bulk product, excess palm oil brought in by ship to sister facility in Pennsylvania	No	No	None, not allowed. Only grain can be shipped outside of coastal zone.
Manufacturing facility wants to ship, as bulk product, excess bulk palm oil brought in by ship to sister facility in Coastal Zone	No	Yes	Conversion Permit. Bulk products can be shipped and utilized within Coastal Zone.

SCENARIOS, CONT'D

Bulk Product Scenario at any of the 14 Heavy Industry Use Sites	Allowable under original CZA?	Allowable under CZCPA?	Type of Permit
New chemical processing facility plant wants to build a dock to service their own operations.	No	Yes	Conversion Permit – heavy industrial use
Facility wants to build a dock to import/export bulk product for an adjacent facility in the Coastal Zone.	No	Yes	Conversion Permit required for the bulk product transfer facility.
Facility wishes to import grain by ship via dock and send to facility in Maryland by rail	No	Yes	Conversion Permit required for the bulk product transfer facility.

QUESTIONS

- What documentation is necessary to verify whether bulk products imported are only sent to facilities within the Coastal Zone? Fully utilized in the operation of one or more facilities within the Coastal Zone?
- How can we verify whether bulk products exported are produced by one or more facilities within the Coastal Zone?
- What should the reporting requirements be for bulk product transfer facilities to ensure compliance with the Act?
- What should the reporting requirements be for facilities that import bulk products for their own use?
- What should the reporting requirements be for bulk product grain?

OTHER DISCUSSION

- Questions
- Information Resources

CZCPA RAC

▶ Work Groups

Work Groups

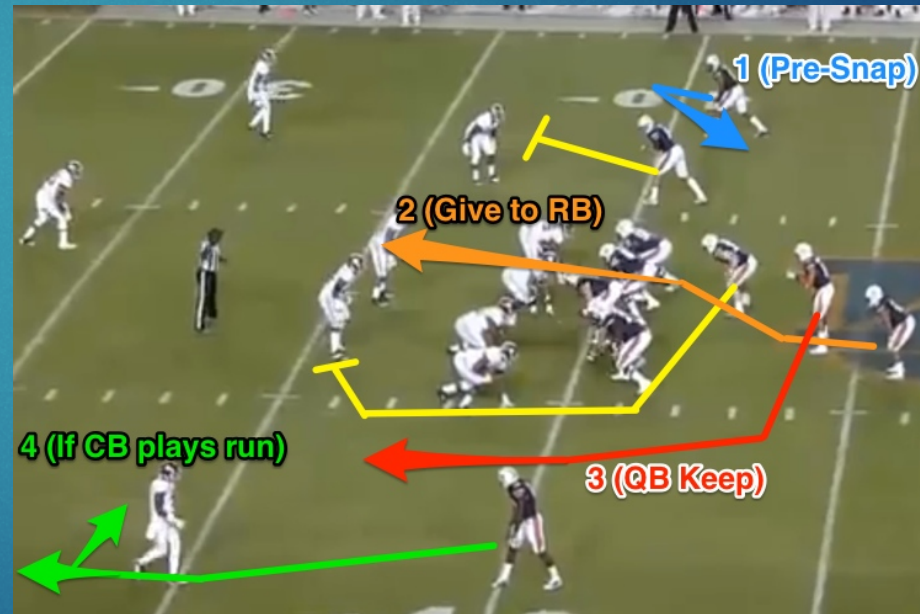
Work Groups correspond to the requirements of the statute

- ▶ CZCPA § 7014- An application for a conversion permit must include:
 - ▶ “The environmental impact and economic effect of the existing or previous use.”
 - ▶ “An offset proposal....”
 - ▶ “Evidence of financial assurances....”
- ▶ Work Groups:
 - ▶ Environmental Impact
 - ▶ Economic Effect
 - ▶ Offsets
 - ▶ Risk Evaluation and Financial Assurance

Work Group Charges

- ▶ Delve into each of the topics of environmental impacts, economic impacts, offsets and financial assurance and develop technically feasible options for the RAC to consider.

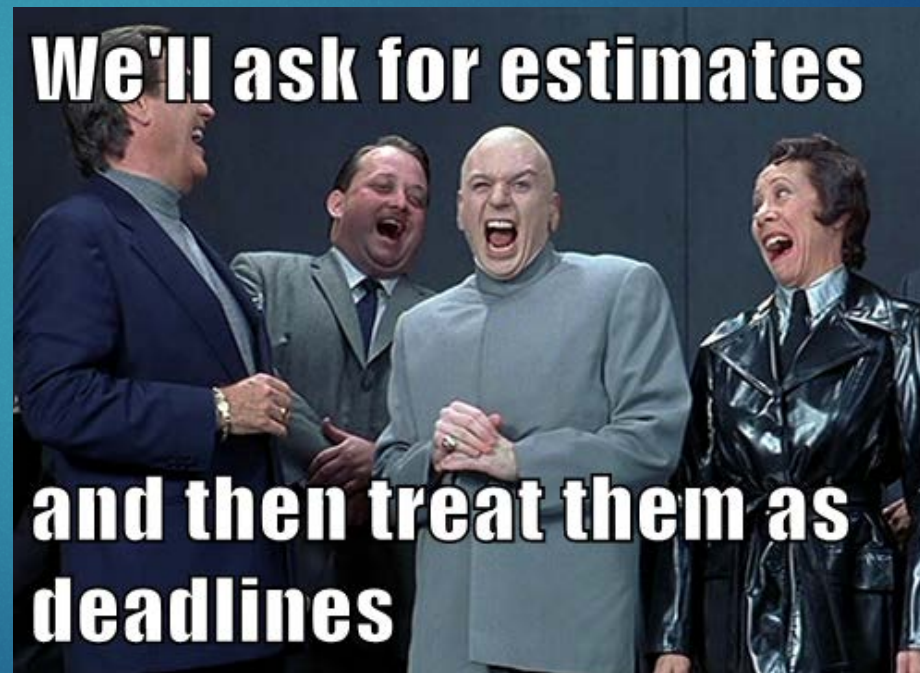
Proffer options-RAC decides



[This Photo](#) by Unknown Author is licensed under [CC BY-NC-ND](#)

Deadlines for Reports from Work Groups to RAC

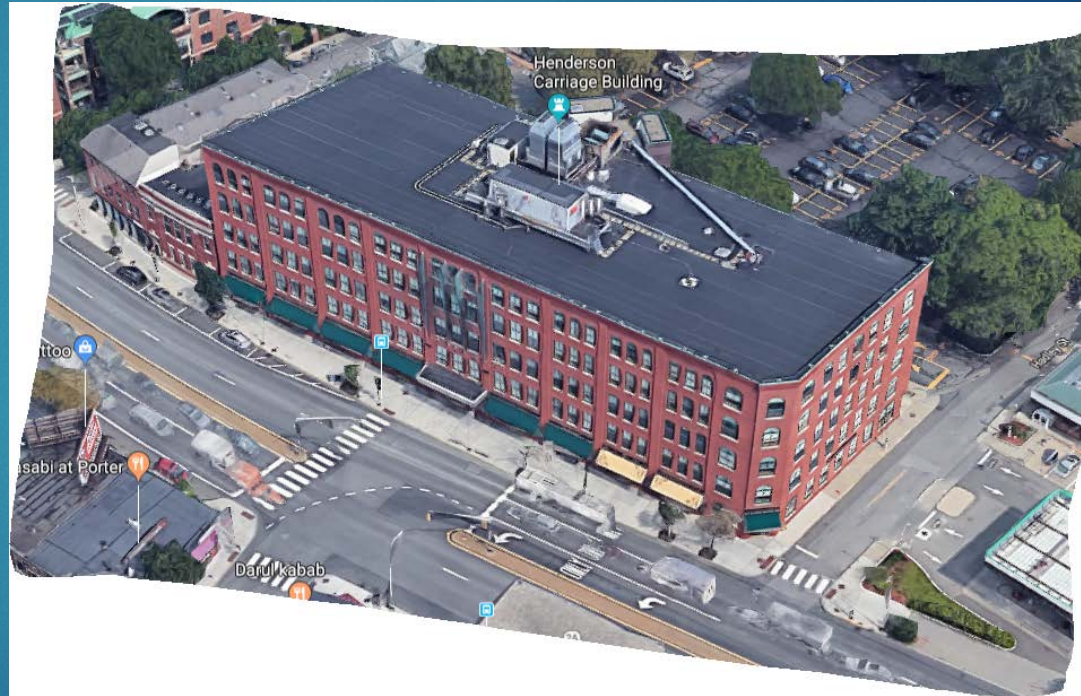
- ▶ Economic Effects
 - ▶ Draft report due October 1, 2018; final due November 1, 2018
- ▶ Financial Assurance
 - ▶ Draft report due October 1, 2018; final due November 1, 2018
- ▶ Environmental Impacts
 - ▶ Draft report due November 1, 2018; final due December 1, 2018
- ▶ Offsets
 - ▶ Draft report due November 1, 2018; final due December 1, 2018



[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

WG Consultant: Industrial Economics, Inc. (IEc)

- Cambridge, MA
- Founded 1981
- > 100 Employees with specialties ranging from economics to science and environmental management
- Photograph snipped from Google Maps and Map data © 2018 Google



IEc Expertise: Some Examples of Relevant Projects

- Valuation of Ecosystem Services Provided by Wetlands in Delaware
- Assessment of water quality at impact locations vs baseline for a Superfund site
- Technical support to the Louisiana Coastal Protection and Restoration Authority in development of Natural Resource Damage Restoration ranking program



IEc Team

- ▶ Michael Donlan, IEC President & Principal (Offsets)
 - ▶ Expert in management of multidisciplinary natural resource and economic damage assessments.
- ▶ Chiara Trabucchi, IEC Director & Principal (Financial Assurance)
 - ▶ Expert in financial assurance and the design of financial settlement frameworks tailored for the protection of the public trust.
- ▶ Leslie Genova, Consultant IV (Economic Impacts)
 - ▶ More than 17 years of consulting experience conducting and managing complex, multi-dimensional analyses.
- ▶ Rachel DeVecchio, Consultant IV (Environmental Impacts)
 - ▶ Nationally recognized expert in environmental assessment.



DNREC – Division of Waste and Hazardous Substances

Marjorie Crofts, Director WHS
August 21, 2018

Division of Waste and Hazardous Substances Remedial Programs

Tank Management

- Leaking Underground Storage Tanks
- Leaking Above Ground Storage Tanks

Solid and Hazardous Waste Management

- RCRA Corrective Action

Site Investigation and Restoration

- Superfund
- HSCA Enforcement
- Voluntary Cleanup Program
- Brownfields

Division of Waste and Hazardous Substances

Tank Management Section – 7 Del C. Chapter 74 & 74A

- Leaking Underground Storage Tanks – Delegated Federal Program
- Leaking Aboveground Storage Tanks – Established by Delaware Law only, no Federal counterpart.

Division of Waste and Hazardous Substances

Leaking Underground & Above Storage Tank Program

- Designed to keep working facilities open, so standards based on restricted use.
- Investigation and remediation based only on product in a regulated tank and any area impacted by a release from a tank, not the entire site.
- If a regulated tank goes out of use, is replaced or a release is detected, then soil samples must be taken to determine if remediation is required.

Division of Waste and Hazardous Substances

Solid and Hazardous Waste Management Section – 7 Del C Chapter 63

RCRA Corrective Action modeled after the Federal Resource Conservation and Restoration Act.

- Only for sites that were a hazardous waste treatment, storage or disposal facility was located.
- Only requires investigation and remediation of areas where hazardous waste management occurred or there is evidence of a release as opposed to the entire site.
- Remedial standards the same as HSCA.

Site Example



Division of Waste and Hazardous Substances

Site Investigation and Restoration Section – 7 Del.C. Chapter 91 Hazardous Substances Cleanup Act (HSCA)

- Remedial standards for restricted (commercial) and unrestricted (residential) use set by regulation and modeled after EPA's CERCLA regulations.
- Entire site investigated.

Site Investigation and Restoration Section

Remedial Programs:

1. Superfund – EPA Lead, Governor must petition EPA to add a site to the National Priorities List
2. HSCA Enforcement Program – You caused the problem, you refuse to address it, we step in and either make you do it or the State does it and seeks cost recovery.
3. Voluntary Cleanup Program (VCP) - You caused the program and you want to clean it up with the State's oversight.
4. Brownfield Development Program – You did NOT cause the problem, but want to redevelop the site. State will only go after the Responsible Party if there are off-site impacts or if the BF Developer backs out of the program.

What is the impact if a remediated site gets redeveloped?

- ❑ Remedial standards would remain the same for heavy industry.
- ❑ Depends on how the redevelopment will impact remedial actions already completed (e.g. a cap).
- ❑ If remedy is not complete, may speed up remediation.

Sites in Programs

Regulated ASTs

- Chloromone/Kuehne
- DE Storage and Pipeline
- Oceanport

RCRA Corrective Action

- DuPont Edge
Moor/Chemours
- General Chemical
- Motiva/Refinery
- Oxy Chem

Superfund

- Standard
Chlorine/Metachem
- Formosa/Stauffer Chemical

Voluntary Cleanup Program

- CitiSteel
- Kaneka
- Sun Oil
- Uniqema