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Assessing Extreme Climate Events Under CLCPA

Presenters:

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Assessing Extreme Climate Events Under CLCPA – Climate Leadership and Community Protection Act

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- Presentation Summary
  - Regulatory and Design Background
  - Extreme Weather Events
  - Relevance for Solid Waste Facilities
  - NYS Guidance Documents
  - CLCPA Assessment Methodology
  - Project Example

Disclaimer: This presentation is not intended to provide an exhaustive view of the requirements of the CLCPA Act or design methodologies for addressing extreme climate events, but rather to give an overview of how Solid Waste Facilities might execute the project assessments required by the regulation.

Regulatory Background - CRRA

- Community Risk and Resiliency Act (CRRA)
- Signed into law in 2014
- *Originally CRRA focused on Coastal Areas and flooding as a result of Superstorm Sandy*
- Required applicants for permits or projects getting state funding in a number of specified programs to demonstrate that future physical climate risk due to **sea-level rise, storm surge and flooding** had been considered in project design

Regulatory Background - CLCPA

- Climate Leadership and Community Protection Act (Climate Act or CLCPA)
- Passed 2019, signed early 2020
- Requires the State to achieve a carbon free electricity system by 2040
- Reduce greenhouse gas emissions 40 percent below 1990 levels by 2030 and 85 percent by 2050
- Section 7(3) of CLCPA - DEC is required to prioritize the reduction of GHG emissions and co-pollutants in Disadvantaged Communities
- Scoping Plan – Framework for implementation by industry - issued at the end of 2022
  - DAR-21 – Guidance for Determining GHG emissions
  - Impacts to Disadvantage Communities (DAC)

Regulatory Background - CLCPA

Amended CRRA in 2019

- Official Sea-level Rise Projections
- Consideration of future physical climate risk
- Smart Growth Public Infrastructure Policy Act Criteria
- Guidance on Natural Resilience Measures
- Model Local Laws Concerning Climate Risk

- *Section 9 of CLCPA added requirement to existing CRRA that applicants for major permits under ECL Article 70 (includes SWF Facilities) must demonstrate that future physical climate risk has been considered*
- Expanded consideration of future climate hazards
- Mitigation requirements

Amended CRRA Considerations

- Permit applicants must demonstrate that future physical climate risk has been considered
  - Greater Rainfall Volumes
  - Future Flood Risk
  - Coastal Storm Surge
  - Extreme Temperatures
  - Wind
  - Power Outages
  - Snowfall
  - Drought
  - Availability of water & other natural resources needed by the community

State of the Practice - Stormwater

- Construction projects over 1-acre disturbance (generally)
  - SPDES General Permit for Stormwater Discharges from Construction Activity
  - GP-0-20-001 - through Jan 28, 2025
- Operating solid waste facilities
  - MSGP- Multi Sector General Permit for Stormwater Discharges Associated with Industrial Activity
  - GP-0-23-001 through March 7, 2028
- Locally Regulated
- 2015 New York State Stormwater Design Manual

State of the Practice - Stormwater (Cont.)

What are the design manuals suggesting for stormwater volume criteria?

- 2- to 10-year (24-hour) storm events for conveyance
- 10- and 100-year (24 hour) st

What are those events?

One Hundred Year/24-hour Design Storms

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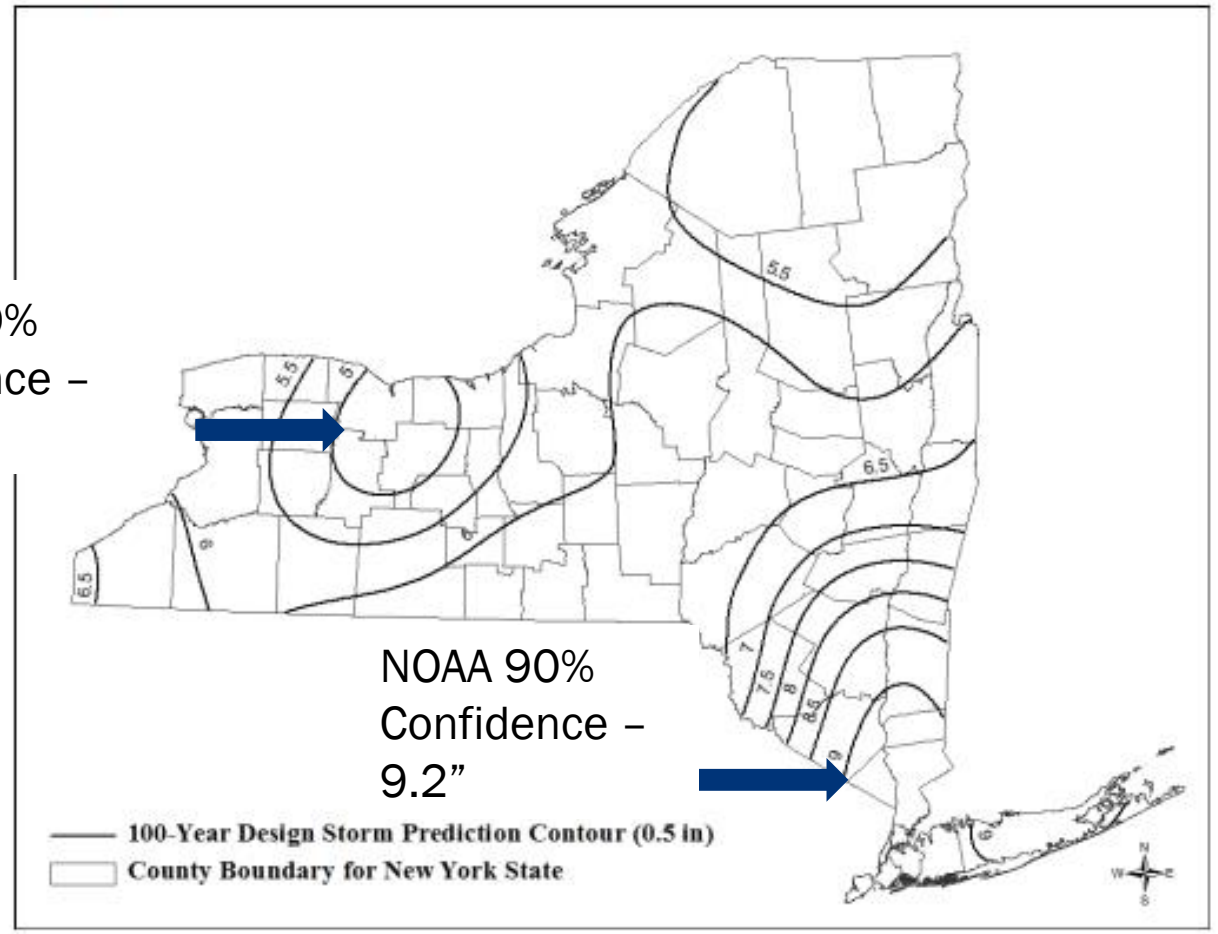
Figure 4.4: One Hundred-Year Design Storm in New York State (NYSDEC, 2013)



NOAA 90% Confidence – 4.7”

NOAA 90% Confidence – 9.2”

State of the Practice – Stormwater/Part 360

- Generally – Divert Stormwater water from operating areas
- For landfills
  - Demonstrate that the stormwater system is designed to manage a 100-year, 24-hour design storm from the landfill site without sustaining damage.
  - Evaluate impacts on the stormwater/run-off to conveyance systems which would be anticipated from a 500-year storm – use for contingency plan
  - Evaluate impacts on the portion of the landfill's leachate collection and removal system, that does not have intermediate or final cover material placed, which would result from a 500-year storm

State of the Practice - Flooding Considerations

Part 360

- Part 360.8 - Prohibits new or expanded facilities in flood areas w/o appropriate assessment/mitigation
- Land Application Prohibited in designated flood zones
- Surface impoundments (land app storage) constructed above the special flood hazard area

Local Approvals

- Consistent with FEMA Floodplain Management Requirements
- Filling in the 100-year floodplain required additional analysis and is not always feasible (ties back up to first bullet)

What are Extreme Weather Events?

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FORBES > BUSINESS

BREAKING

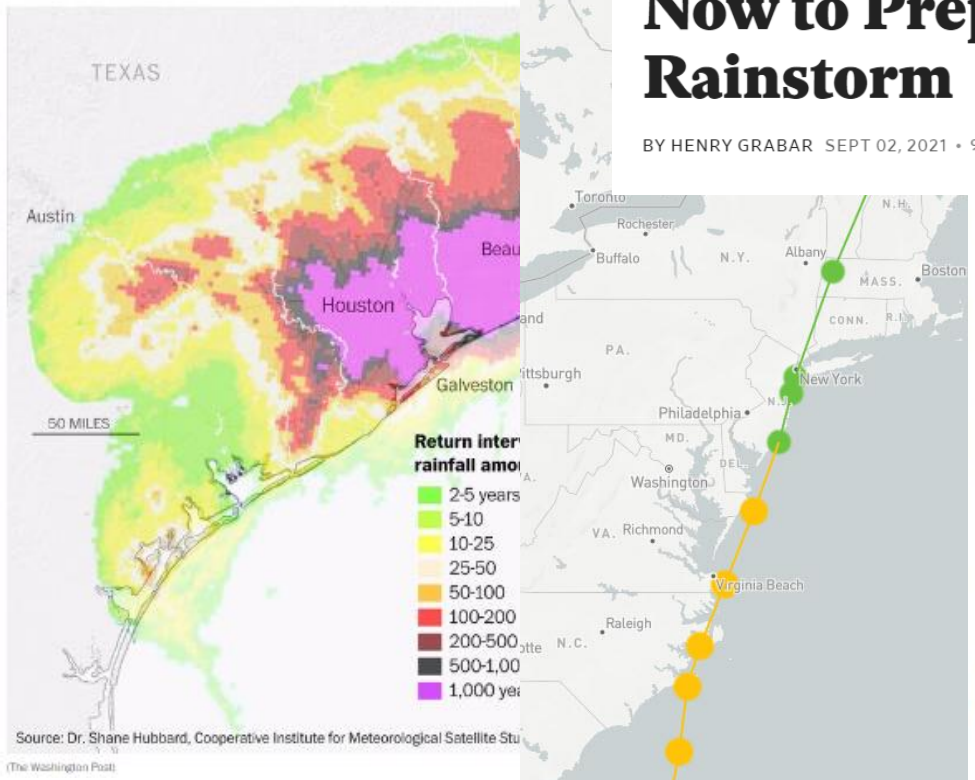
U.S. Has Year Rai Summe

Darreonna Davis Forb
Temporary, Explainer

CAPITAL WEATHER GANG

Harvey is a 1,000-year flood event unprecedented in scale

By Jason Samenow
August 31, 2017 at 1:56 p.m. EDT



METROPOLIS

What New York City Can Do Right Now to Prepare for the Next Biblical Rainstorm

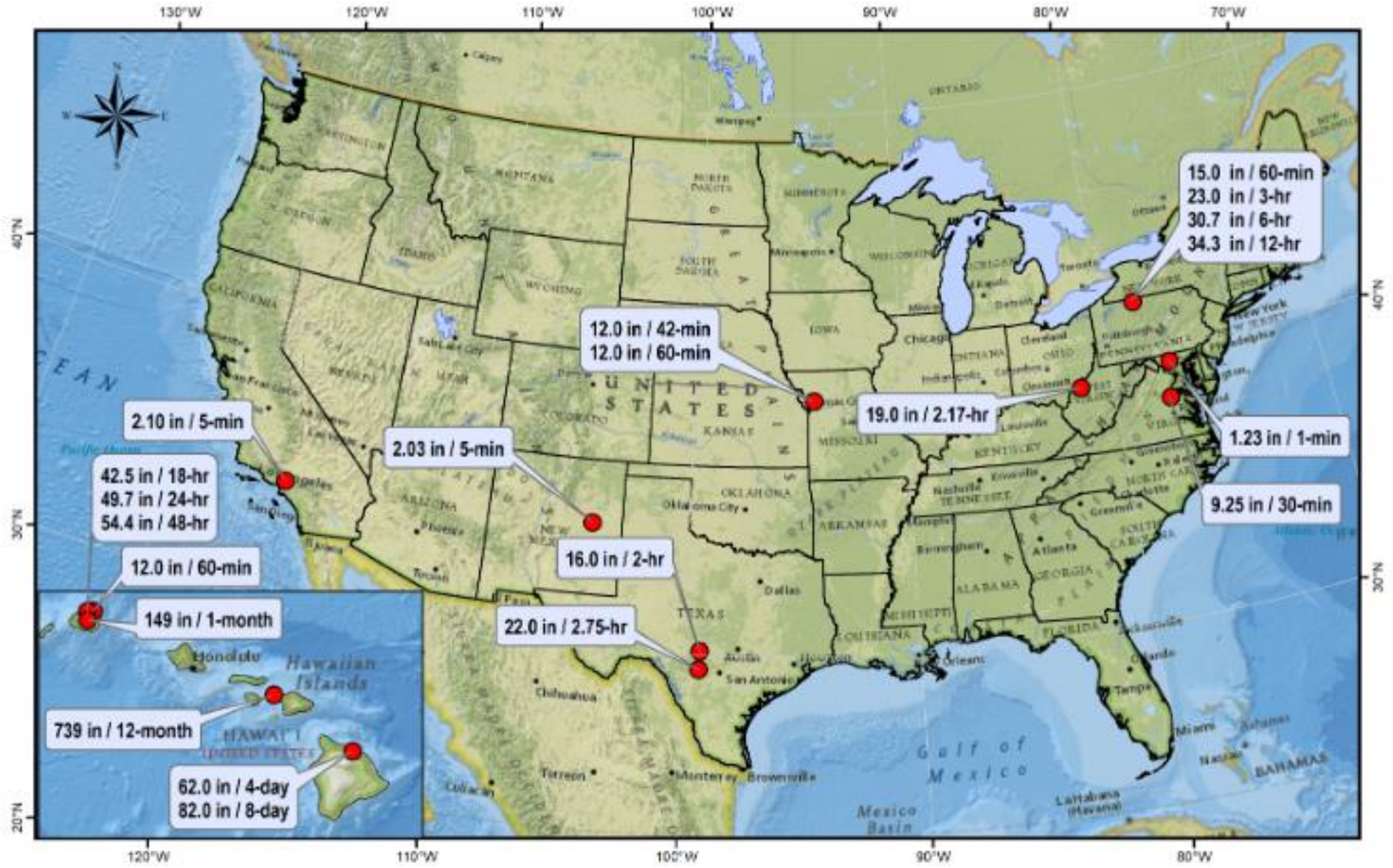
BY HENRY GRABAR SEPT 02, 2021 • 9:30 AM

NWS New York NY
@NWSNewYorkNY

We've seen numerous flash floods in our area. Several reports from the
a look at
ere:

10:20 AM · Jul 10, 2023 · **22.5K** Views

Greatest Observed Point Precipitation Values - US



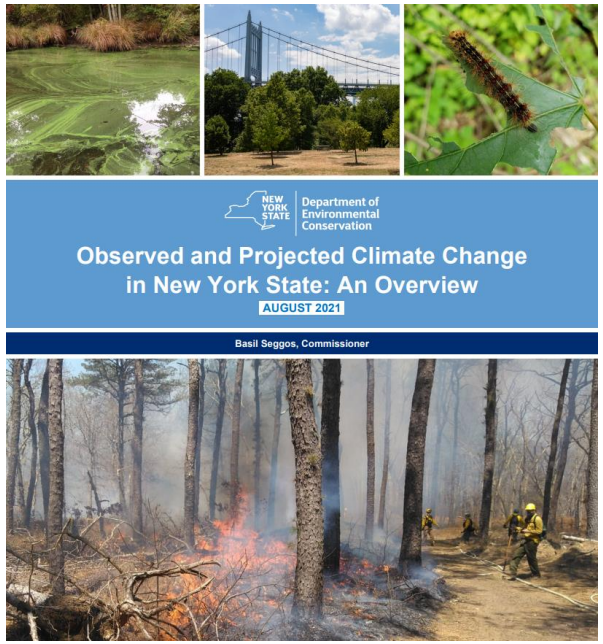
Source – National Weather Service – HDSC USA Record Point Precipitation Measurements, Office of Water Prediction

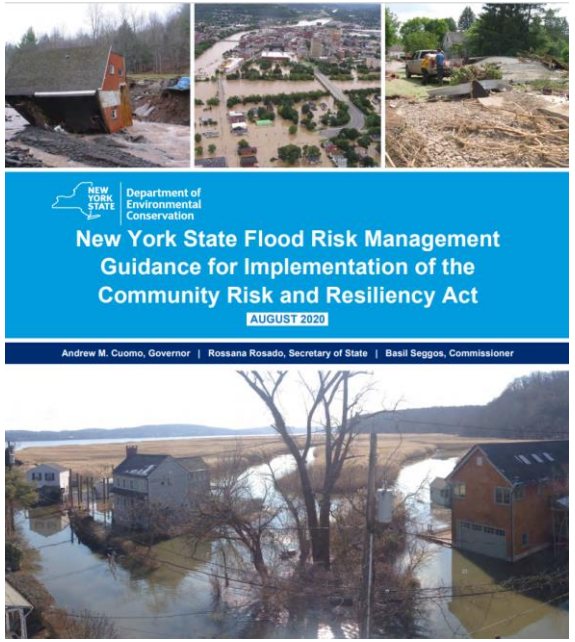
Why is it important for our solid waste infrastructure?

- 2005 Hurricane Katrina – 38 - 55 million cy
- 2012 Superstorm Sandy – 5.5 million cy in NY
- 2015 Oklahoma Ice Storms – 1 million cy
- 2015 Hurricane Matthew (Atlantic Coast) – 7 million cy
- 2016 Central Louisiana Floods – 5 million cy
- 2016 Severe Storms – West Virginia - $20 million in debris management costs
- 2017 – Hurricane Harvey – 16 million cy

NYS Guidance Documents

- New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act
- Observed and Projected Climate Change in New York: An Overview





CLCPA Assessment Methodology

- Consideration of future climate risks pursuant to CRRA
  - Are extreme weather events (e.g., wind, extreme rainfall, flooding) going to create environmental hazards?
  - Will critical infrastructure stop working during extreme weather events?
    - Will this impact disadvantage communities, private property, public health, etc.?
  - Are utilities (leachate, stormwater, electricity) going to be overloaded?
- Mitigation may be required when there is significant risk
  - Operational vs. Structural

Project Example – Greater Rainfall Volumes

- Landfill Permitting Project
  - Phase 1 (Pre-Development) – 2030
  - Phase 5 (Closure) – 2050
- Stormwater system design
  - Can the system convey more intense rainfall? Will it flood?
- Leachate generation
  - Increase in leachate generation due to more precipitation
  - Available storage capacity for leachate generation during different operational stages

Project Example – Greater Rainfall Volumes & Stormwater System Design

- Example site in Western New York → ClimAID Region 1
- Table 3: Projected changes in average annual precipitation for seven ClimAID regions of NY

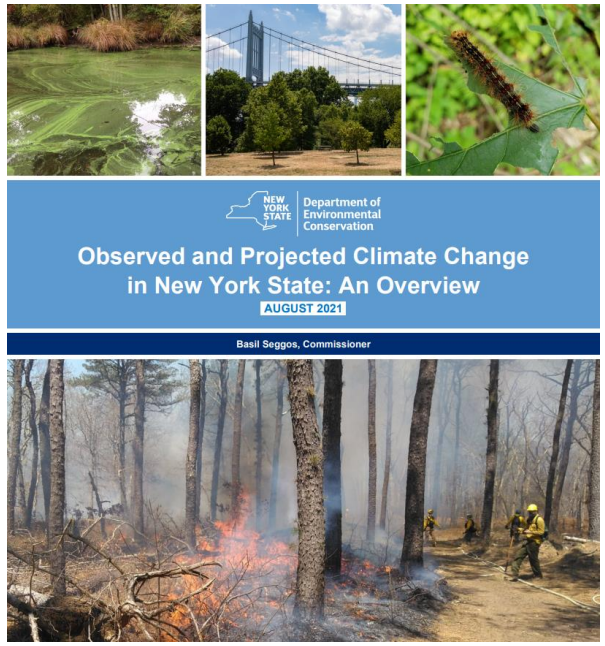


Figure 1. The seven ClimAID regions

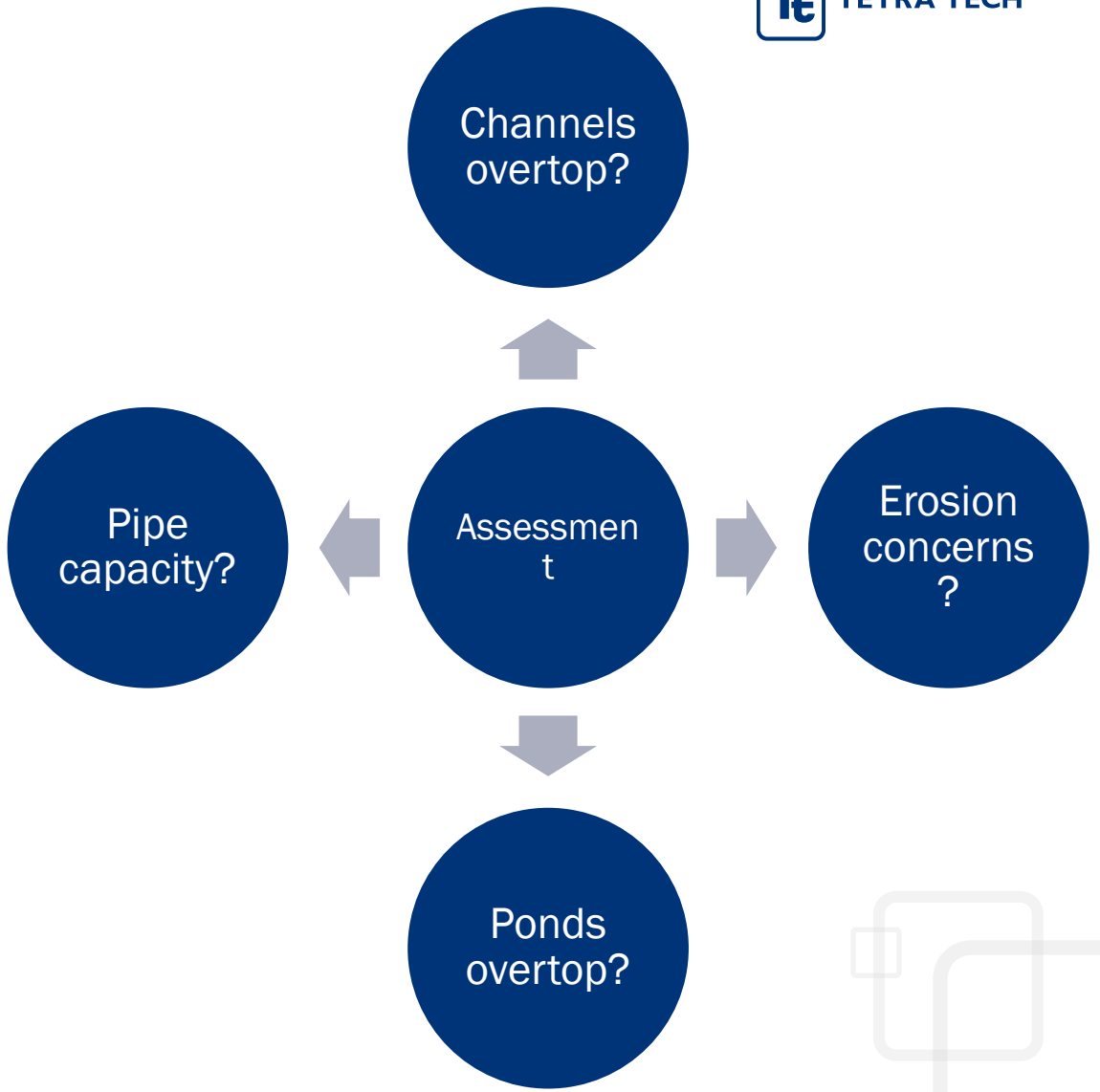
Table 3. Projected changes in average annual precipitation for seven ClimAID regions of New York[58]

	Low Estimate (10th percentile)	Middle Range (25th to 75th percentile)	High Estimate (90th percentile)
Region 1 (Rochester): Baseline (1971–2000) 34.0"			
2020s	0%	+2 to +7%	+8%
2050s	+2%	+4 to +10%	+12%
2080s	+1%	+4 to +13%	+17%
2100	-3%	+4 to +19%	+24%

Project Example – Greater Rainfall Volumes & Stormwater System Design

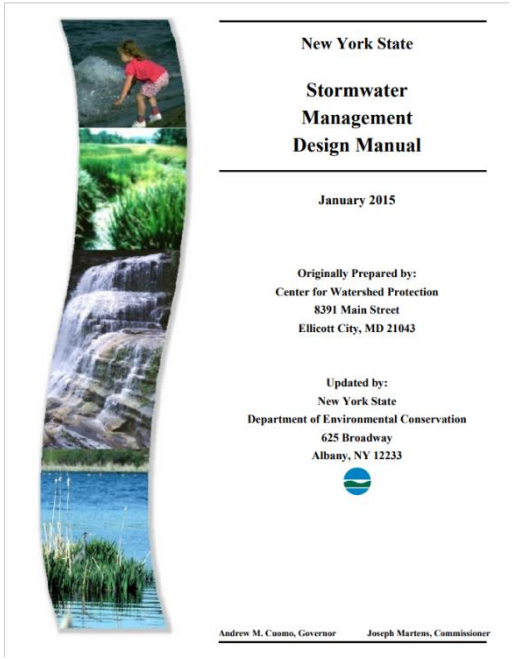
- Part 360 regs already require landfills to assess 500-year storm event
- Default to 500-year storm event for extreme storm event assessment
- Compare to 100-year storm

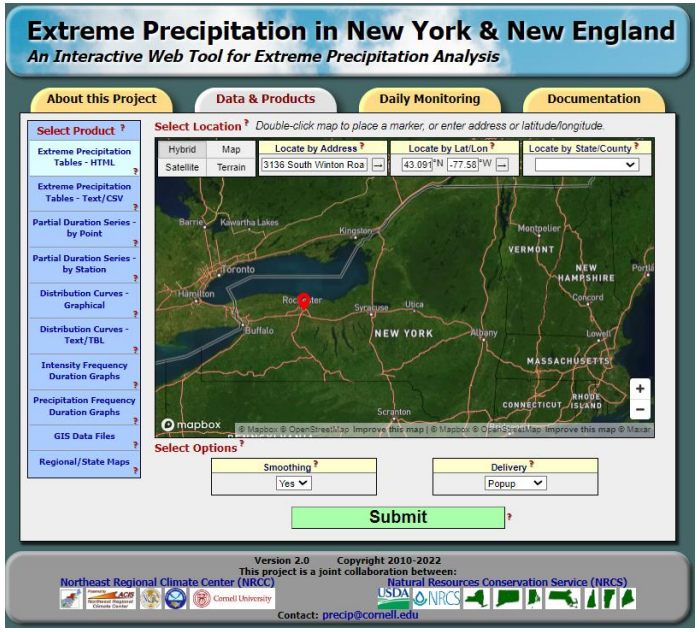
Project Location: Western, NY	
100-year, 24-hr storm	500-year, 24-hr storm
5.24 in.	7.58 in.



Project Example – Greater Rainfall Volumes & Stormwater System Design

- 2015 NYS Stormwater Management Design Manual
- Northeast Regional Climate Center (NRCC) website for rainfall distributions: http://precip.eas.cornell.edu/





	1hr	2hr	3hr	6hr	12hr	24hr	48hr
1yr	0.70	0.89	1.12	1.33	1.57	1.84	2.06
2yr	0.85	1.08	1.35	1.60	1.87	2.16	2.42
5yr	1.05	1.36	1.70	2.00	2.32	2.65	2.99
10yr	1.25	1.62	2.02	2.38	2.74	3.11	3.51
25yr	1.56	2.05	2.54	2.97	3.40	3.82	4.33
50yr	1.85	2.44	3.02	3.52	4.01	4.48	5.08
100yr	2.20	2.92	3.60	4.18	4.73	5.24	5.96
200yr	2.61	3.50	4.27	4.95	5.57	6.14	7.01
500yr	3.27	4.43	5.37	6.19	6.92	7.58	8.66

Project Example – Greater Rainfall Volumes & Stormwater System Design

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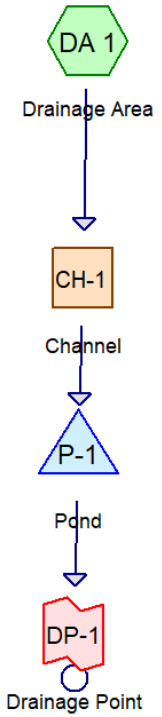
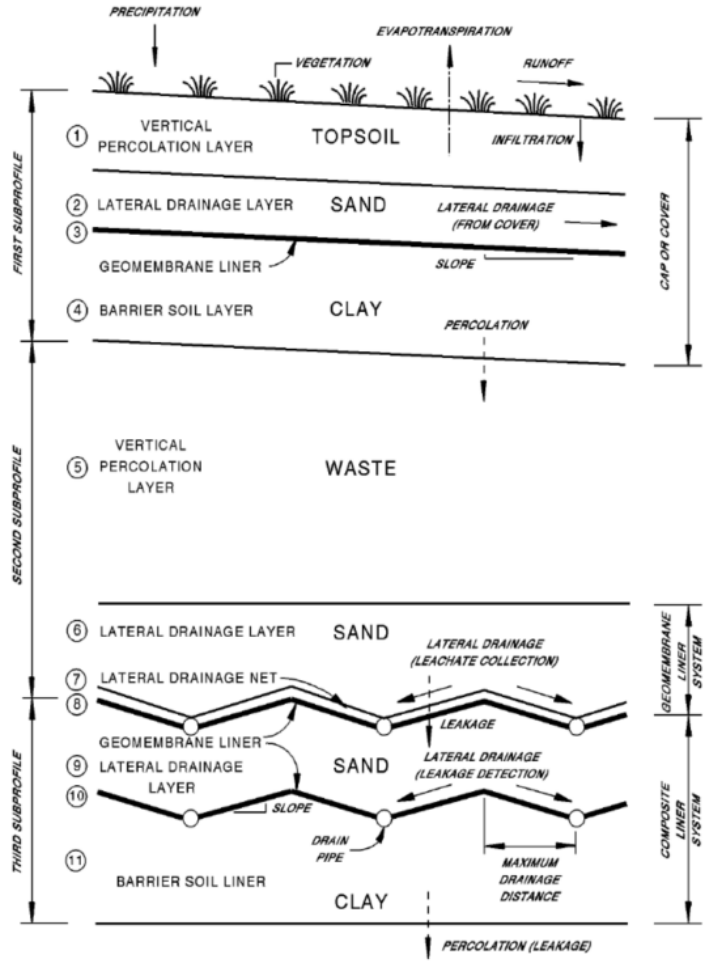
- HydroCAD modeling of rip-rap channels and stormwater pond at 5-acre landfill

Rip Rap Channel (2.5-ft Depth)		
	100-year, 24-hr storm	500-year, 24-hr storm
Flow Depth	1.88’	2.25’
Freeboard	0.62’	0.25’
Velocity	3.74 fps	4.24 fps

Stormwater Pond (10,550 CF Capacity, Max Elev. 374’)		
	100-year, 24-hr storm	500-year, 24-hr storm
Water Elevation	373.22’	373.74’
Freeboard	0.78’	0.26’



Project Example – Greater Rainfall Volumes & Leachate Storage Capacity



Schematic of Landfill Profile Illustrating Typical Landfill Features

LEACHATE PRODUCTION

MAX

- Pre-Development (Phase 1)

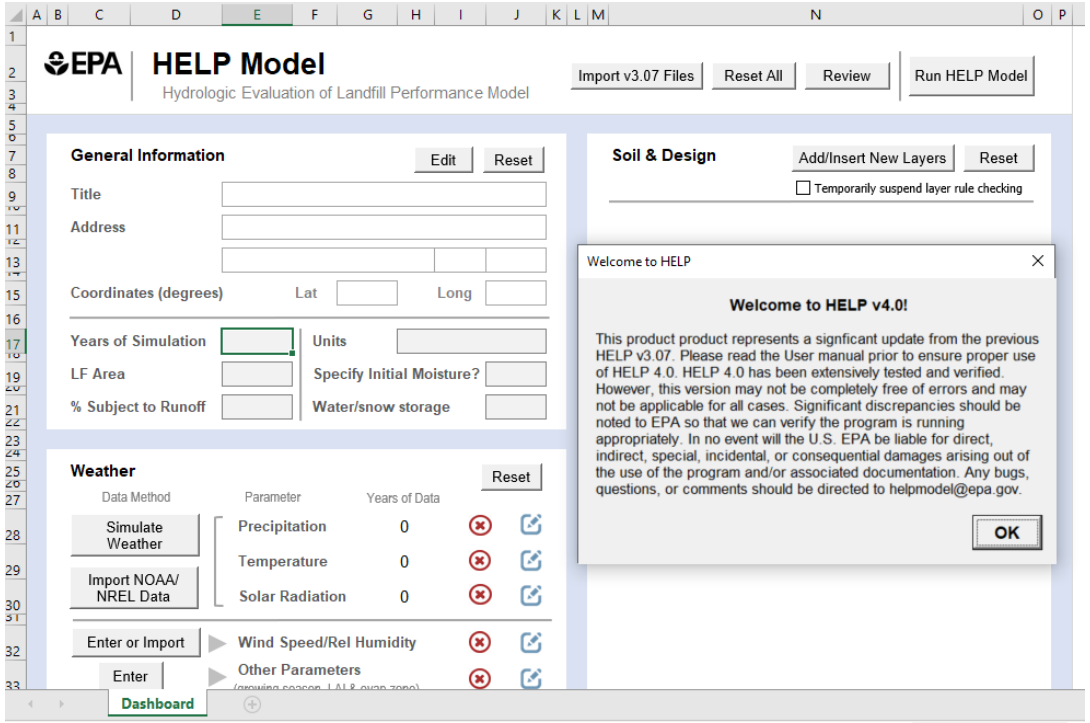
- Active Operations (Phases 2-4)

MIN

- Closure (Phase 5)

Project Example – Ways to Estimate Leachate Generation

- EPA HELP model
  - Tool to model landfill leachate generation
  - Inputs: weather, soil, and landfill design data
- Historical leachate generation data
  - Specific to site
  - Provides more accurate picture of landfill performance



Project Example – Greater Rainfall Volumes & Leachate Storage Capacity

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Phase	Year	On-Site Leachate Storage Capacity (gal)	Design Leachate Generation Rate (gal/day)	Storage Time (days)	Increased Annual Rainfall (High Estimate)	Adjusted Leachate Generation Rate (gal/day)	Adjusted Storage Time (days)
Phase 1	2030	1,500,000	75,000	20	9.33%	82,000	18
Phase 2	2035	1,500,000	50,000	30	10.00%	55,000	27
Phase 3	2040	1,500,000	47,500	31	10.67%	52,567	28
Phase 4	2045	1,500,000	42,500	35	11.33%	47,317	31
Phase 5/Closure	2050	1,500,000	35,000	42	12.00%	39,200	38

2020	8%
2050	12%

→ Interpolate precipitation increase for desired year →

$$\text{e.g.}, y = 8\% + \left[\left(\frac{2030-2020}{2050-2020}\right)(12\% - 8\%)\right] = 9.33\%$$

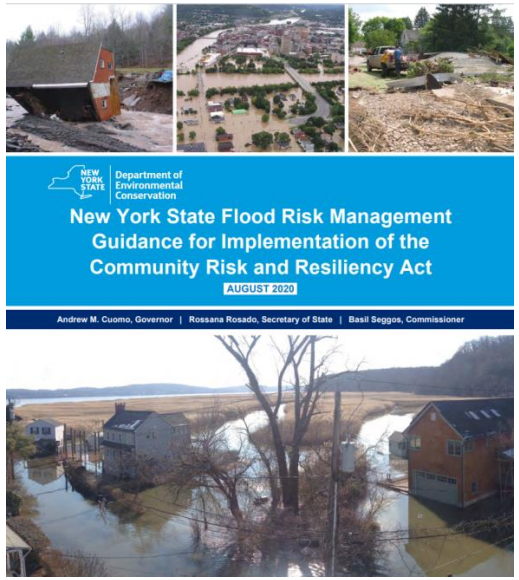
Table 3. High Estimate of Projected Changes to Annual Average Precipitation, *Observed and Projected Climate Change in New York: An Overview*

Project Example – Greater Rainfall Volumes at Landfill

- Conclusions:
  - Stormwater conveyance system
    - Channel and pond capable of carrying extreme storm event without overtopping
  - Leachate contingency storage capacity
    - Facility does have enough leachate storage time to determine disposal in event of emergency
    - Increased rainfall does not significantly impact leachate storage capacity throughout project lifetime
    - Most of the facilities operating today will be on their way to final cover installation future
  - Some facilities may require more detailed/refined assessments

Increased Flood Risk

- FEMA FIRMs → 100-year flood elevation
- Typically used in funding and regulatory programs
- Floods of all likelihoods are expected to increase in depth and extent due to climate change
- SFRMG guideline elevations are recommended as replacements for 100-year floodplain
- Base Flood Elevation: 100-year flood elevation, as defined by FEMA FIRM



TUESDAY, AUG 27, 2019 · 9AM

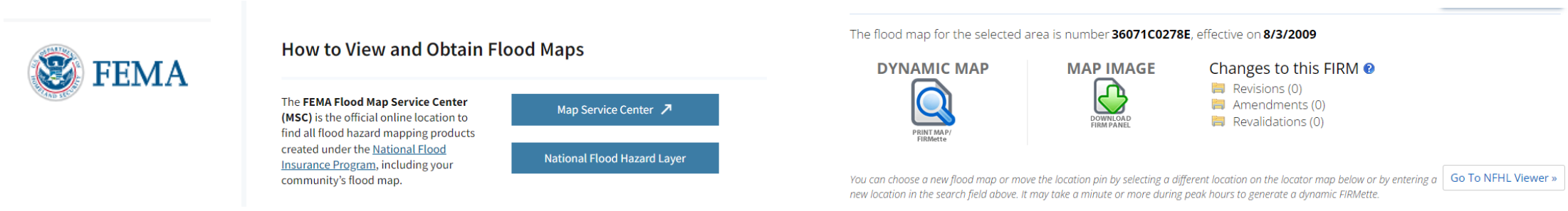
‘100-year’ floods will happen every one to 30 years, according to new coastal flood prediction maps

JEN A. MILLER · OFFICE OF ENGINEERING COMMUNICATIONS

Increased Flood Risk – Methodologies

- NYSFRMG identifies 3 general flood-risk management guideline elevations for consideration in project siting and design

1. Adding 2’ (3’ for critical facilities) of freeboard to the BFE and extending this level to intersection with the ground
2. Vertical flood elevation and corresponding horizontal floodplain from the 0.2-percent annual chance flood (500-year flood)
3. Other elevation determined by a climate-informed science guideline elevation for which adequate science is available



Project Example – Increased Flood Risk

- Existing Transfer Station Permit Renewal
- Add 3’ to BFE, as defined by FEMA FIRM for the site
- Determine extent of future flooding with the new floodplain elevation
- Assessment questions:
  - Waste handling and storage areas within floodplain?
  - What structures within floodplain?
    - Tipping Floor, Scales, Scale House, Loadout Tunnels
- Operational Mitigation efforts:
  - In anticipation of flood, clear waste handling and storage areas if within floodplain

Summary/Takeaways

- Extreme weather events are occurring more frequently
- Consider vs Design – How is the facility impacted by extreme weather?
- Will facilities pose a threat to the following in an extreme weather event:
  - Human health
  - Environment
  - Public Infrastructure or Services
  - Disadvantaged Communities
  - Private Property
- Operational vs. Structural **Mitigation** Efforts
- Some facility assessments may need to be more refined than others

Questions?

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