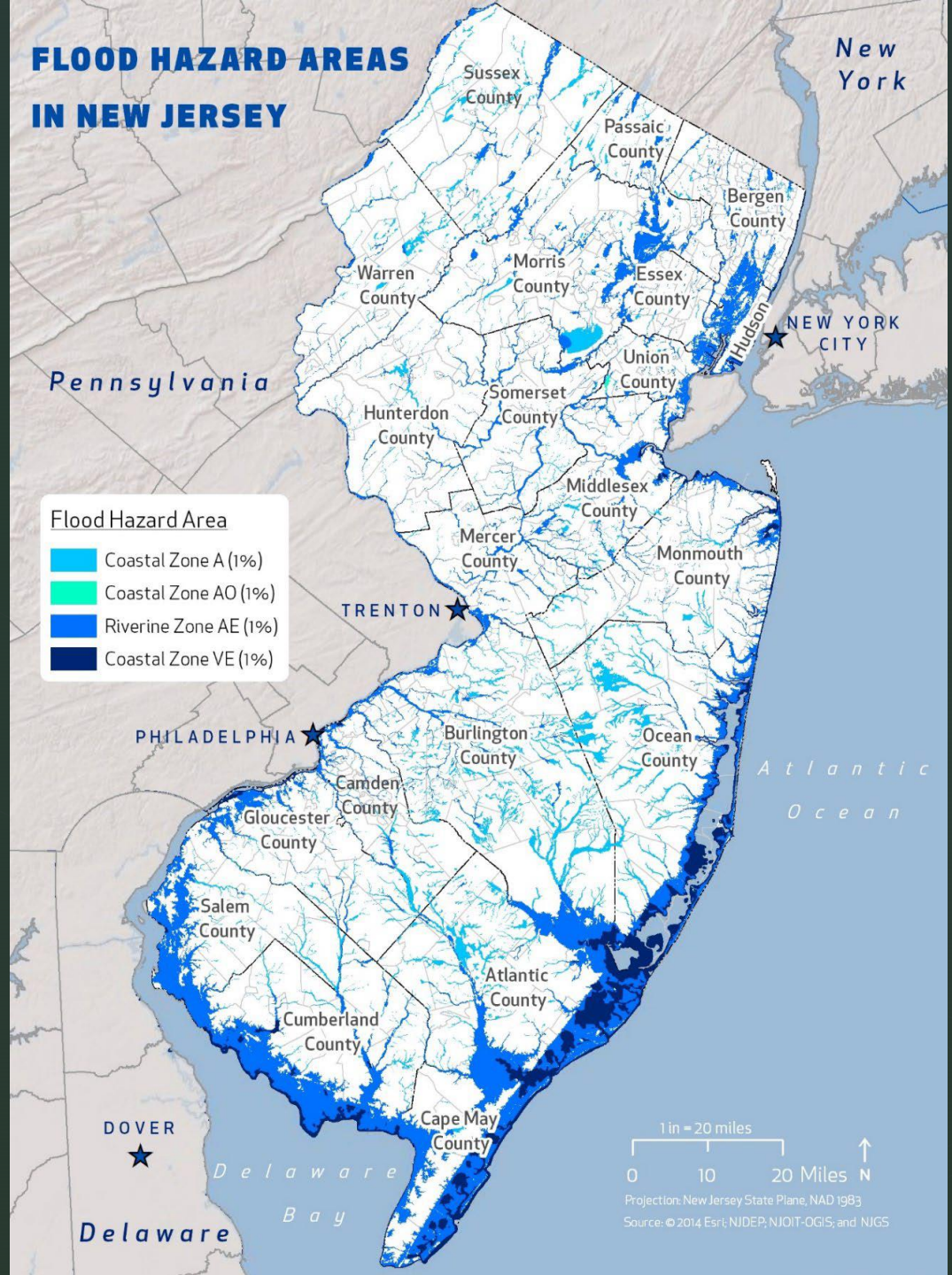
NEW JERSEY'S REGULATORY RESPONSE TO A CHANGING CLIMATE

INLAND FLOOD PROTECTION RULE

State of New Jersey
Department of Environmental Protection
24 July 2023

FLOOD RISK ASSESSMENT

- New Jersey's colonial settlements were along navigable waterways.
- As a result, many of the State's population centers are located within flood hazard areas today.
- Older development was often built without regard for potential flood risk.



FLOOD RISK ASSESSMENT

- Flood risk is generally measured by what has happened in the past.
- Based on data collected over the past 50+ years, as shown on FEMA flood insurance rate maps.
- Not an accurate predictor of today's flood risk.
- Not a sound methodology for predicting flood risk due to climate change.

FLOOD RISK ASSESSMENT

- People need to be aware of flood risks when buying, renting, occupying or developing property.
- Mapping is a good starting point to assess risk but flooding often exceeds mapped floodplain limits.
- Floods don't stop at a line on a map.

SNAPSHOT OF NJ

- Population 9.267 million (2021)
- Most densely populated state in the nation
- Approximately 16% of NJ lies within a flood hazard area
- According to 2019 State Hazard Mitigation Plan, NJ has:
  - $241 billion of general building stock exposure to the 1% annual chance flood
  - Roughly 3 million properties not covered by an NFIP policy
  - 16,809 repetitive loss properties (73% are single family homes)
  - 1,238 severe repetitive loss properties (83% are single family homes)
  - 1,707 critical facilities and infrastructure located in the 1% flood hazard area
- $15.3 billion in obligations under post-disaster grants (1990-2021)
- Highest foreclosure rate in the nation, with one in every 605 properties in some stage of foreclosure (Experian, 2018)

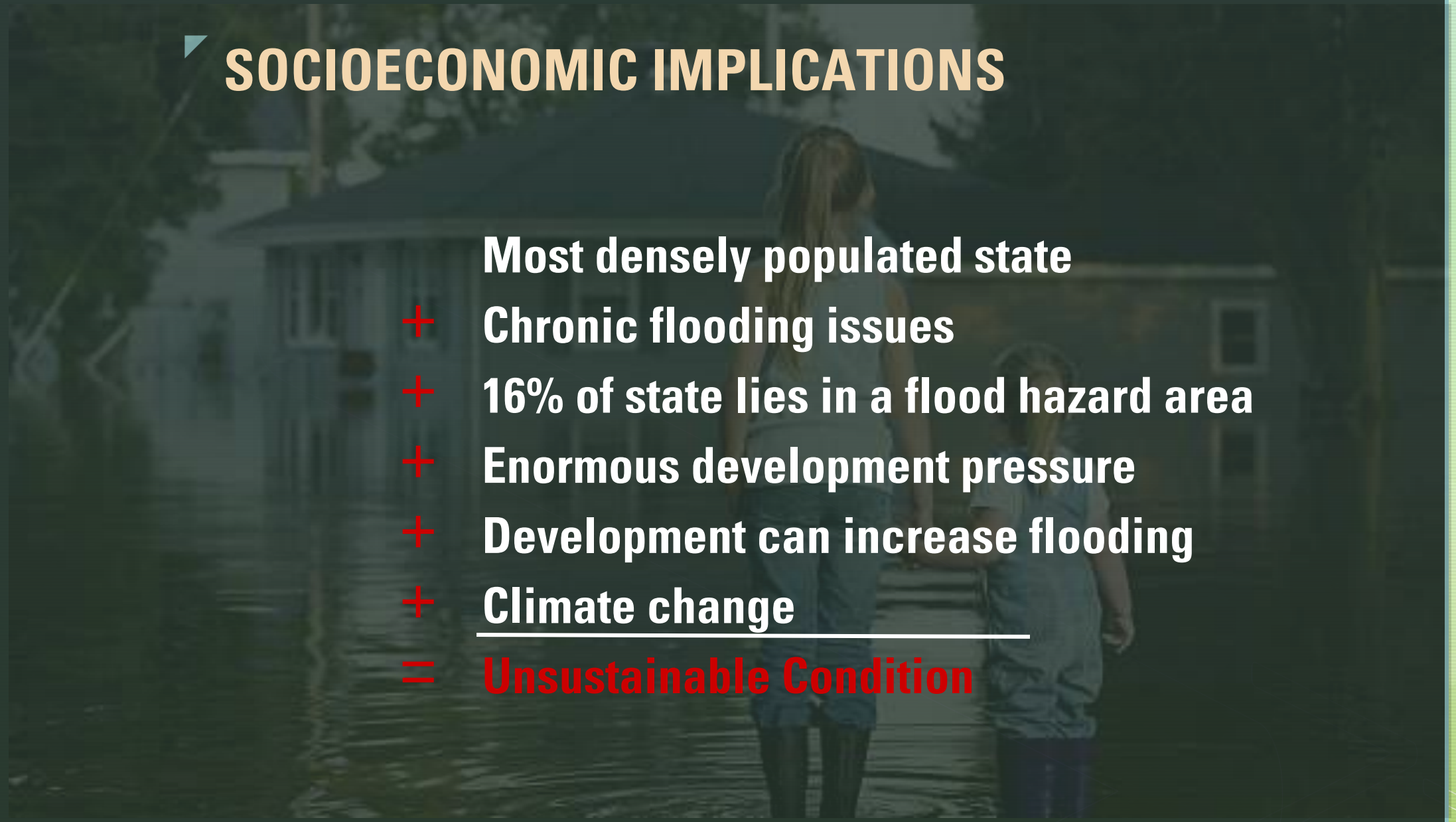
“Flooding is NJ’s #1 Natural Hazard” (FEMA, August 4, 2004)

STATEWIDE FLOODPLAIN MANAGEMENT

- Longstanding statewide program dating back to 1929
- NJ design flood in fluvial areas is calculated as 125% of the 1% peak discharge and is always at least one foot above FEMA's 1% elevation
- One foot of freeboard required above design flood elevation for buildings and roads
- Statewide 0% flood storage displacement standard
- Critical buildings and multi-residence buildings in fluvial areas must have "dry access" during flood events
- Progressive statewide stormwater management policies
- Progressive stream corridor protection standards

Despite the above, flood damage in NJ continues to increase.

SOCIOECONOMIC IMPLICATIONS



Most densely populated state

\+ Chronic flooding issues

\+ 16% of state lies in a flood hazard area

\+ Enormous development pressure

\+ Development can increase flooding

\+ Climate change

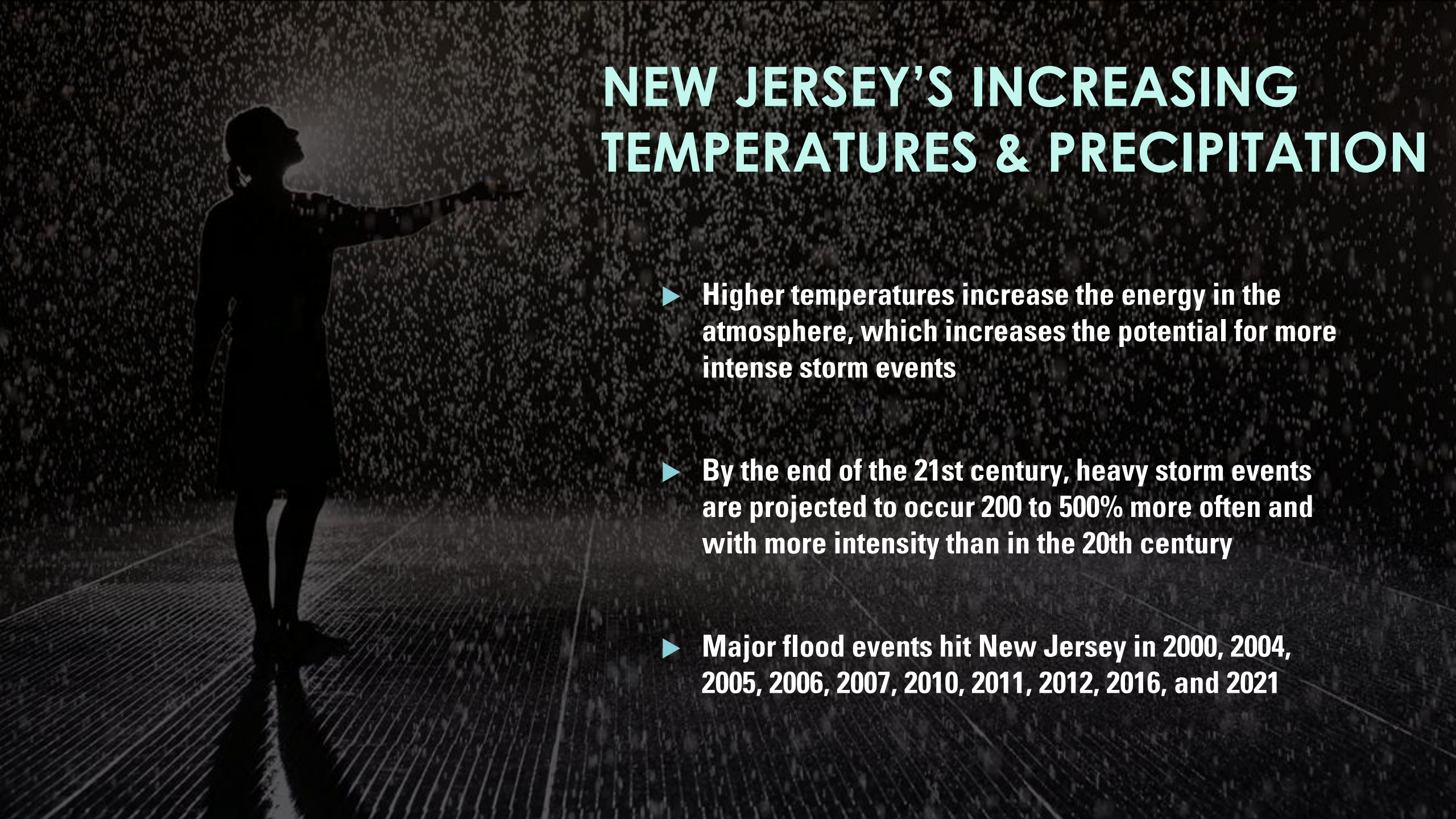
= **Unsustainable Condition**

Executive and Administrative Orders

EO 100 signed by Governor Murphy

AO 2020-01 signed by Commissioner McCabe

- Directed NJDEP to integrate climate change considerations, including sea level rise and chronic flooding into its regulatory and permitting programs

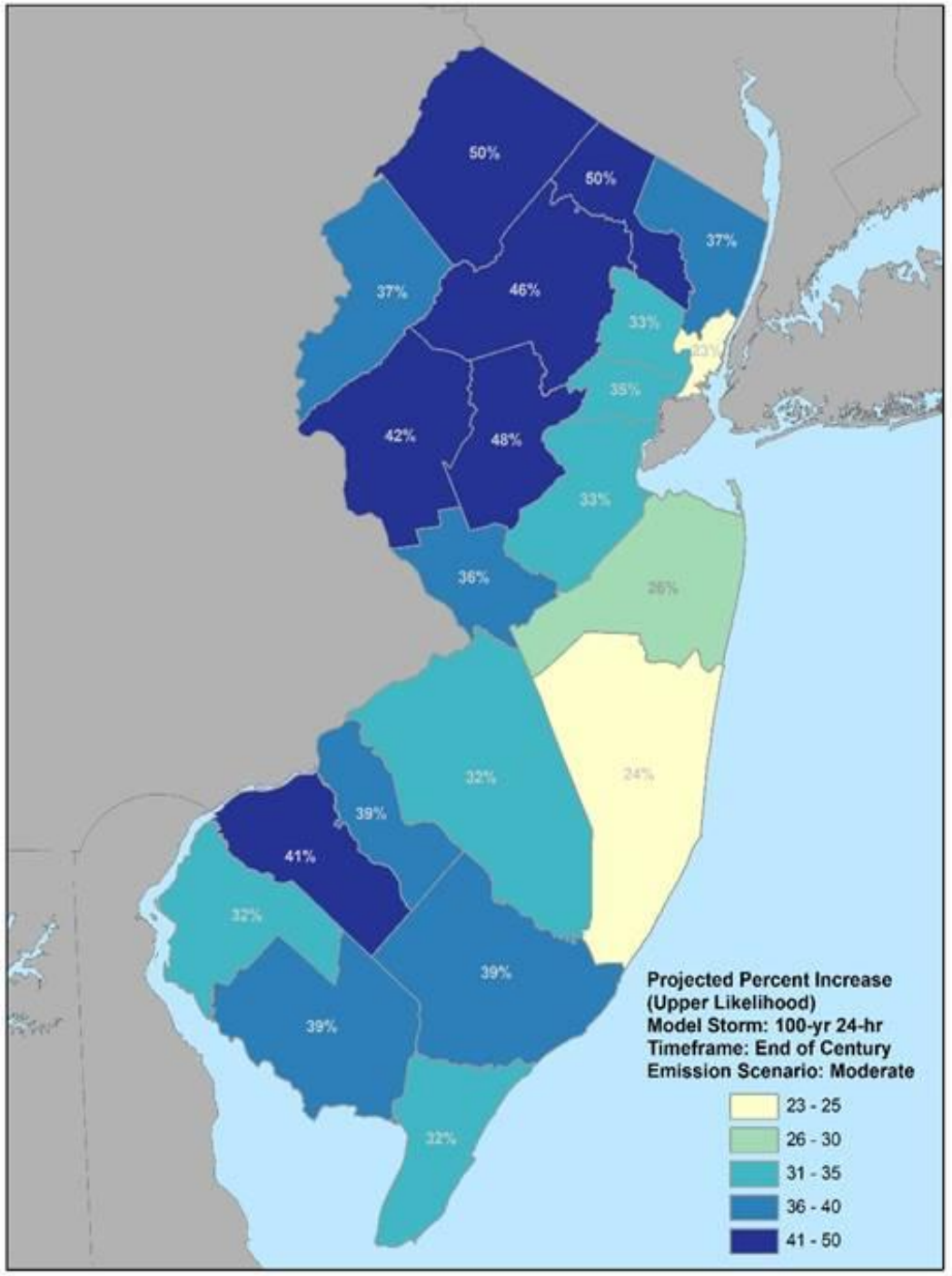


NEW JERSEY'S INCREASING TEMPERATURES & PRECIPITATION

- Higher temperatures increase the energy in the atmosphere, which increases the potential for more intense storm events
- By the end of the 21st century, heavy storm events are projected to occur 200 to 500% more often and with more intensity than in the 20th century
- Major flood events hit New Jersey in 2000, 2004, 2005, 2006, 2007, 2010, 2011, 2012, 2016, and 2021

▸INTENSIFYING RAINFALL & FLOODING IN NEW JERSEY

- The data presently used to analyze flood potential in waterways and in the design of stormwater infrastructure is outdated and includes data only through 1999.
- The precipitation expectations that presently guide state policy, planning and development criteria do not accurately reflect current precipitation intensity conditions.



November 2021: NJDEP and the Northeast Regional Climate Center, a National Oceanic and Atmospheric Administration (NOAA) partner, released studies showing past and projected increases in precipitation

CURRENT PRECIPITATION

Since 1999:

- The 2-year storm has increased as much as 5%
- The 10-year storm has increased as much as 7%
- The 100-year storm has increased as much as 15%

FUTURE PRECIPITATION

Over the coming decades:

- The 2-year storm is likely to increase by as much as 24%
- The 10-year storm likely to increased as much as 27%
- The 100-year storm likely to increased as much as 50%

More Rain = More Stormwater Runoff

More Runoff = Increased Riverine Flow

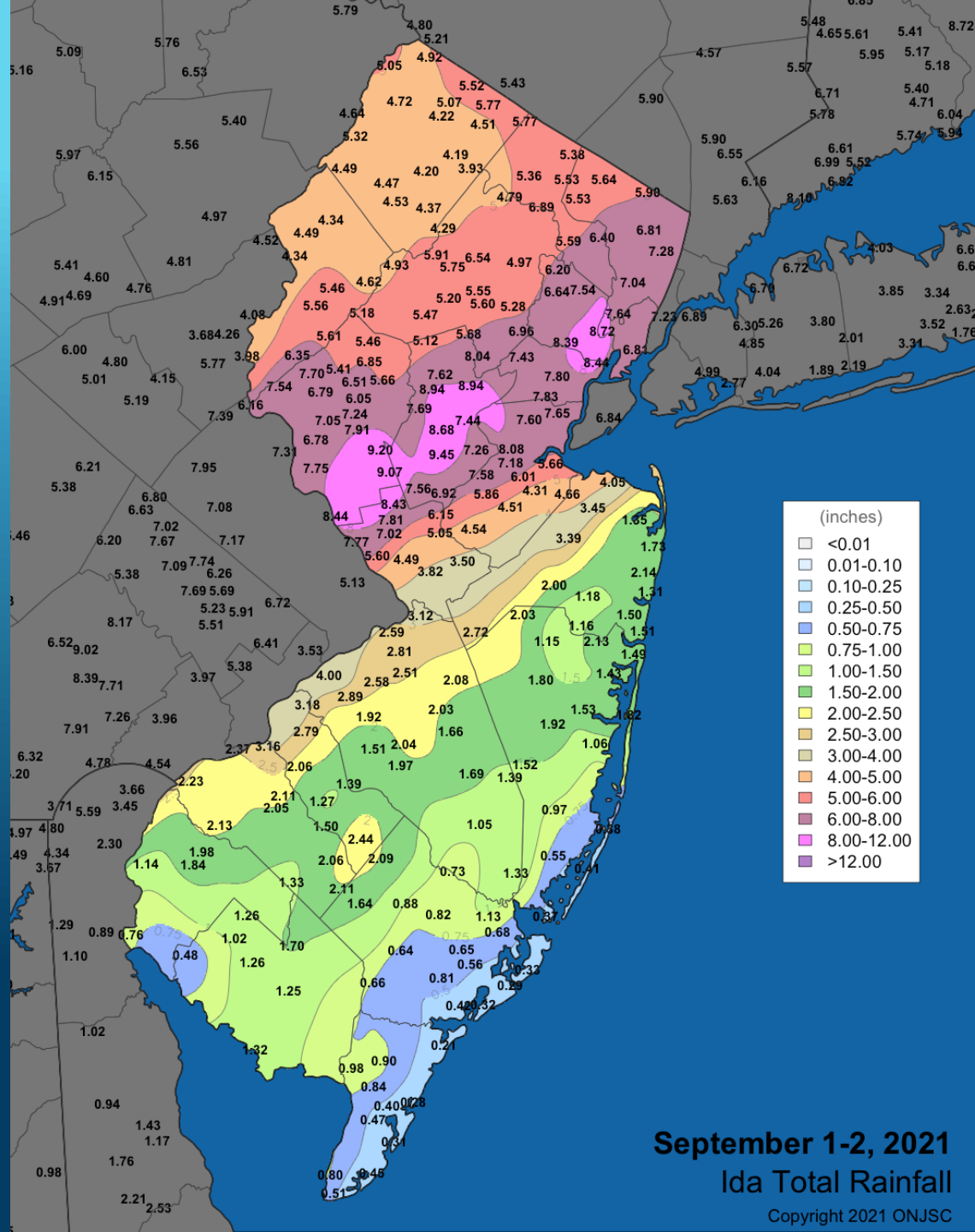
More Flow = Higher Flood Elevations

EFFECTS OF INCREASING PRECIPITATION

- Adds stress on already overtaxed infrastructure and overwhelms stormwater management systems
- Increased fluvial flood depths
- Increased risk to life and property

REMNANTS OF TROPICAL STORM IDA

- September 1, 2021
- Record rainfalls reported
  - State Climatologist: Newark experienced the highest one-hour rainfall total (3.65 inches) ever recorded there
  - National Weather Service documented over 10 inches of rainfall in parts of Hunterdon, Essex, Middlesex and Union Counties



IDA COMPARED WITH FLOOD HAZARD RULES: CASE STUDIES

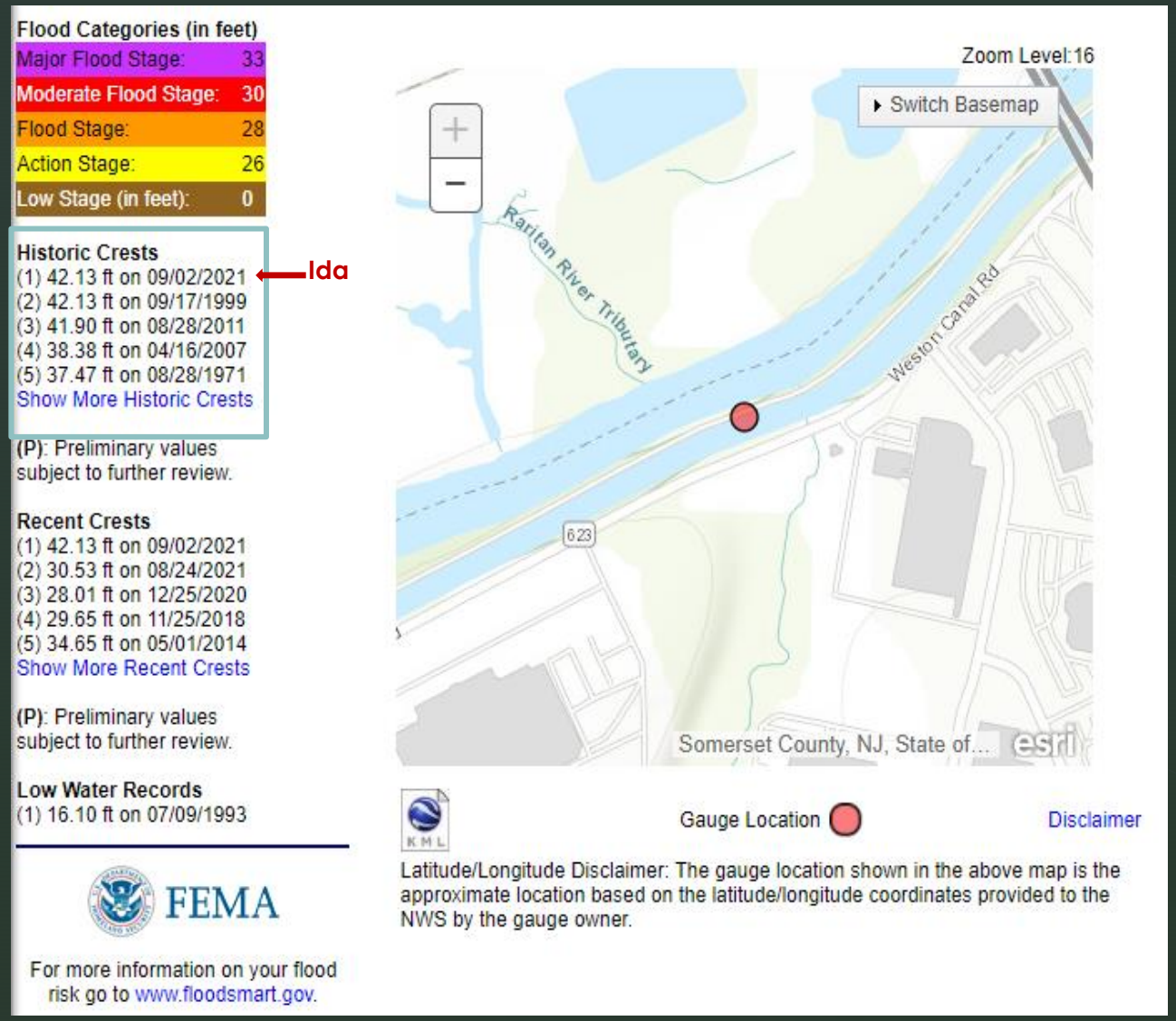
Prior FHACA Rules set the design flood elevation (DFE) as the higher of:

- Flood elevation mapped by NJDEP (where available)
- FEMA 100-year elevation plus 1 ft

Ida case studies show average elevations of 3.1 feet above FEMA's 100-year flood elevation.

- This is 2.1 ft higher than the prior DFE

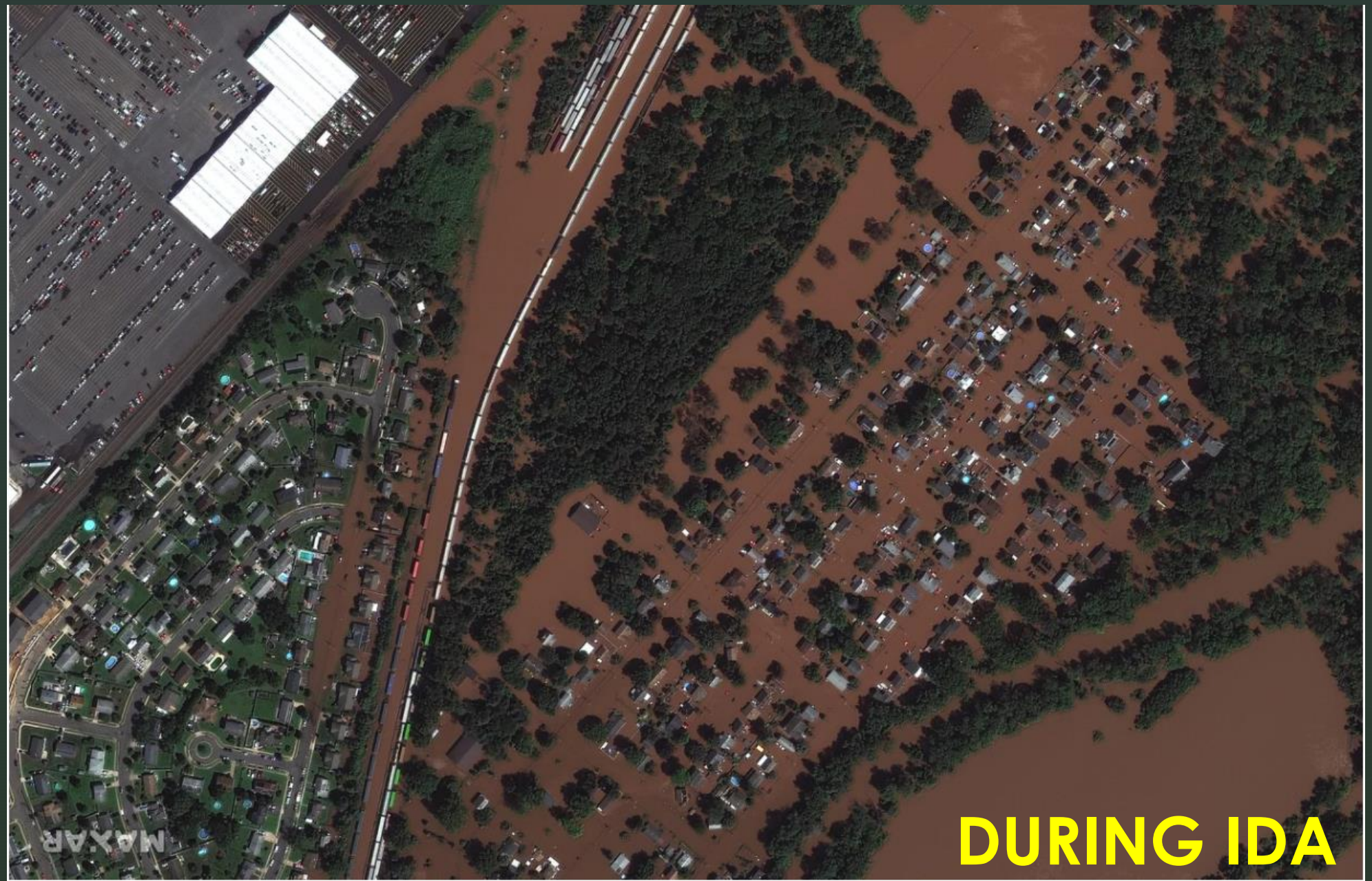
RARITAN RIVER AT BOUND BROOK



- Flooding during Ida equaled 1999's Hurricane Floyd, which was the highest elevation ever recorded at Bound Brook.
- The 500-year flood elevation at this location has been exceeded three times since 1999.

MILLSTONE RIVER AT MANVILLE

MILLSTONE RIVER AT MANVILLE



MILLSTONE RIVER AT MANVILLE

PRE-IDA

POST-IDA

INLAND FLOOD PROTECTION RULE
Adopted 7/17/23

Applies to:

- Stormwater Management rules, N.J.A.C. 7:8
- Flood Hazard Area Control Act rules, N.J.A.C. 7:13

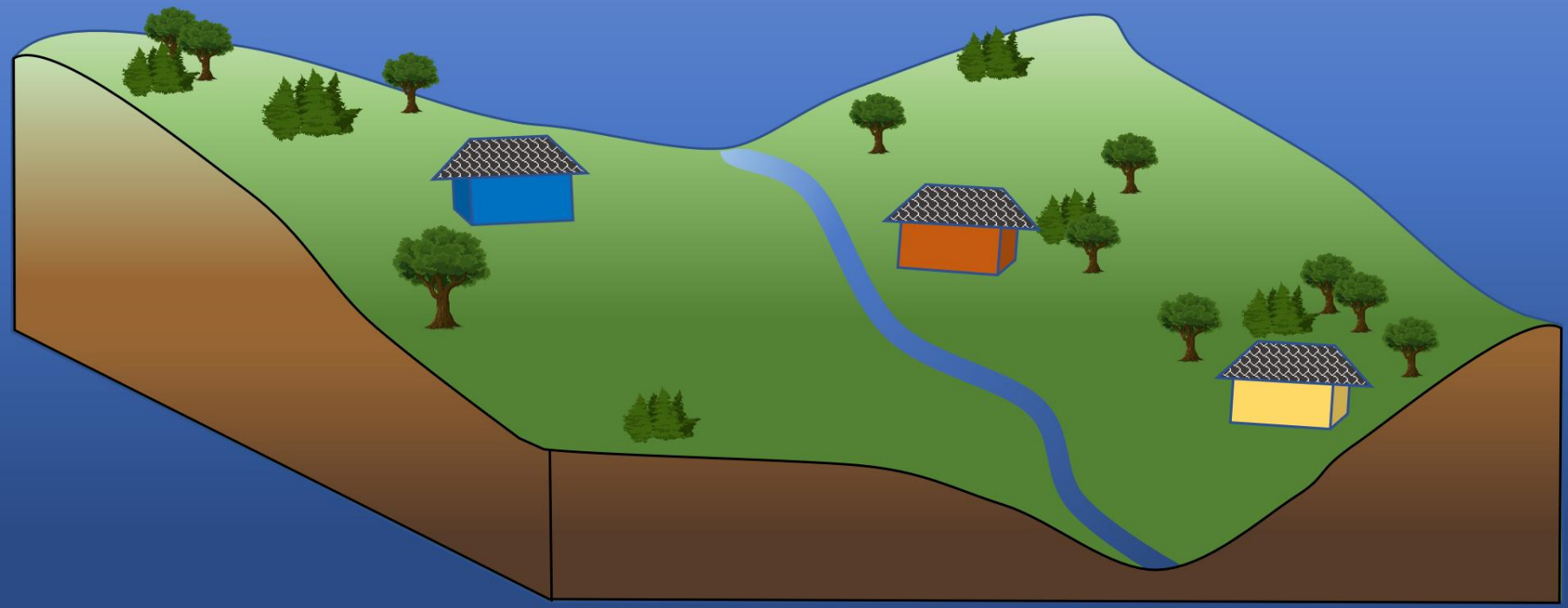
SWM Key Points:

- Requires stormwater systems to be designed to manage runoff for both today's storms and anticipated future storms.
- Prevents use of Rational and Modified Rational methods for stormwater calculations.

FHA Key Points:

- Raises fluvial design flood elevations by two feet when State/FEMA flood mapping is used.
- Requires use of future projected precipitation when calculating flood elevations.
- Ensures that permits and authorizations under the FHACA rules meet minimum NFIP standards.

Effect of New Flood Hazard Area Design Flood Elevation



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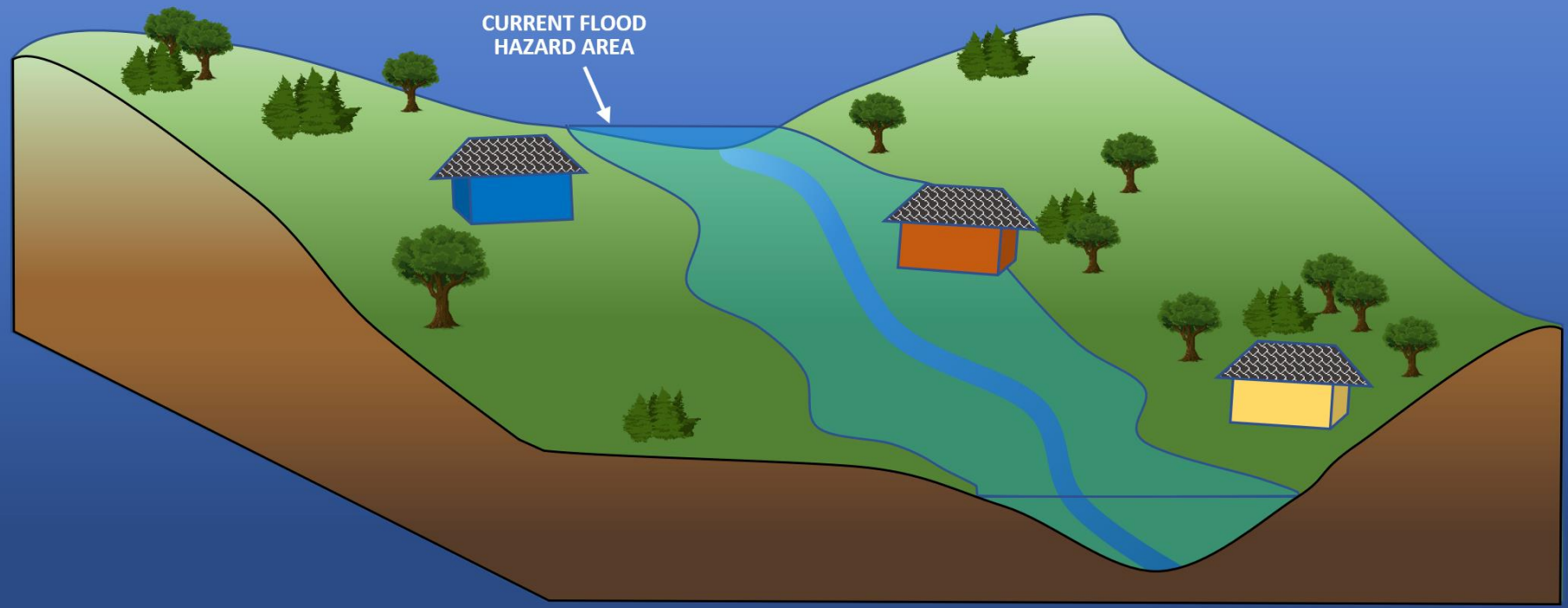

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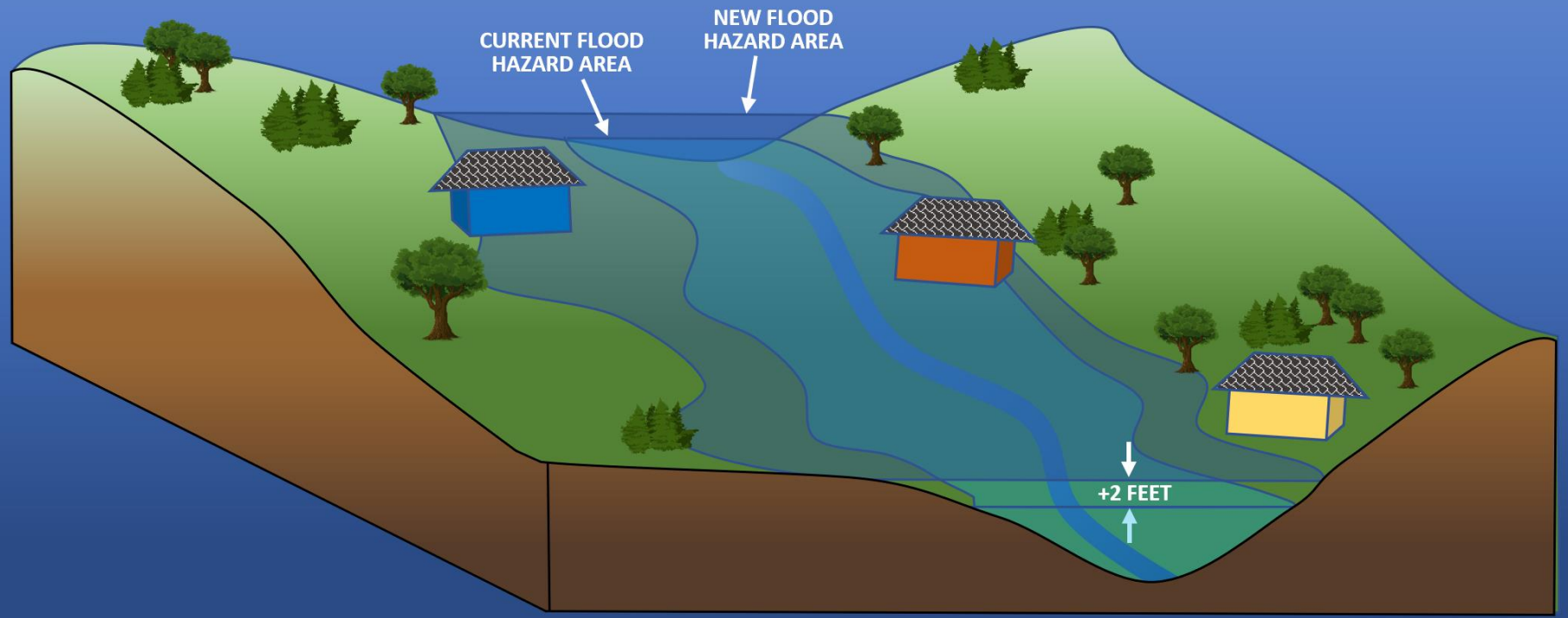
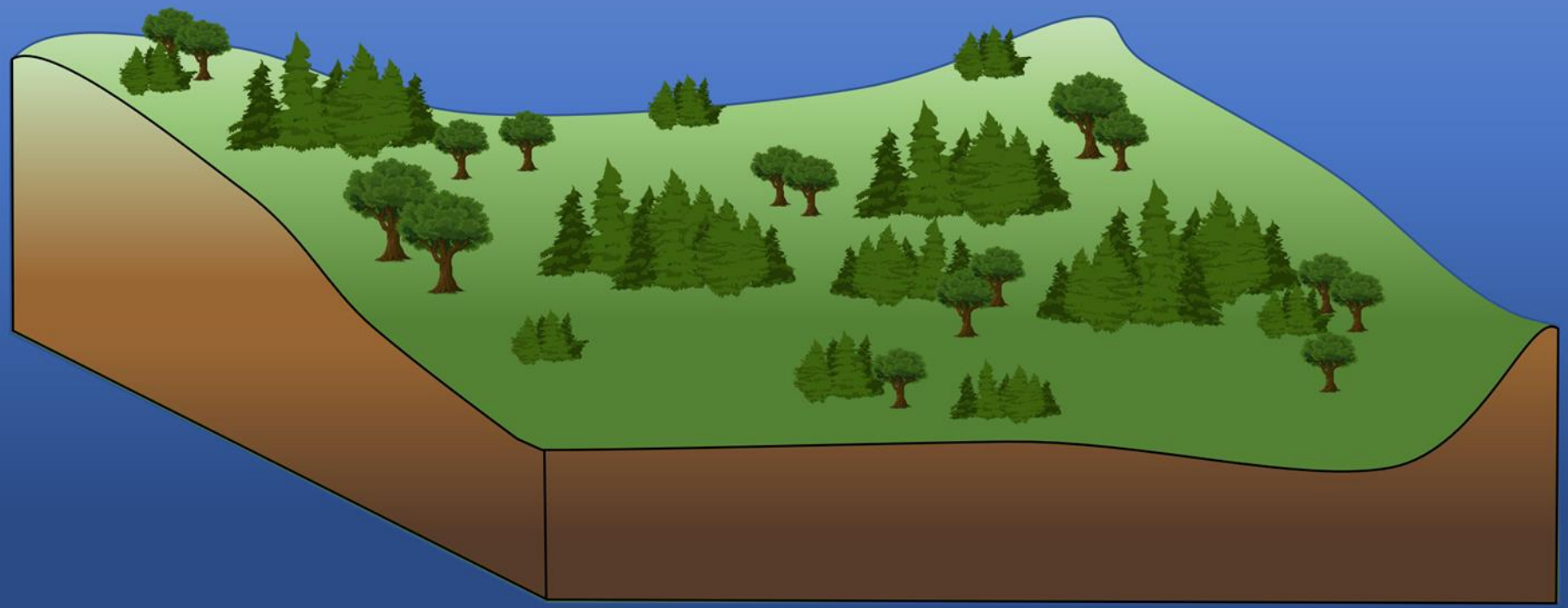


STORMWATER EXAMPLE:

2.5 Acre Site

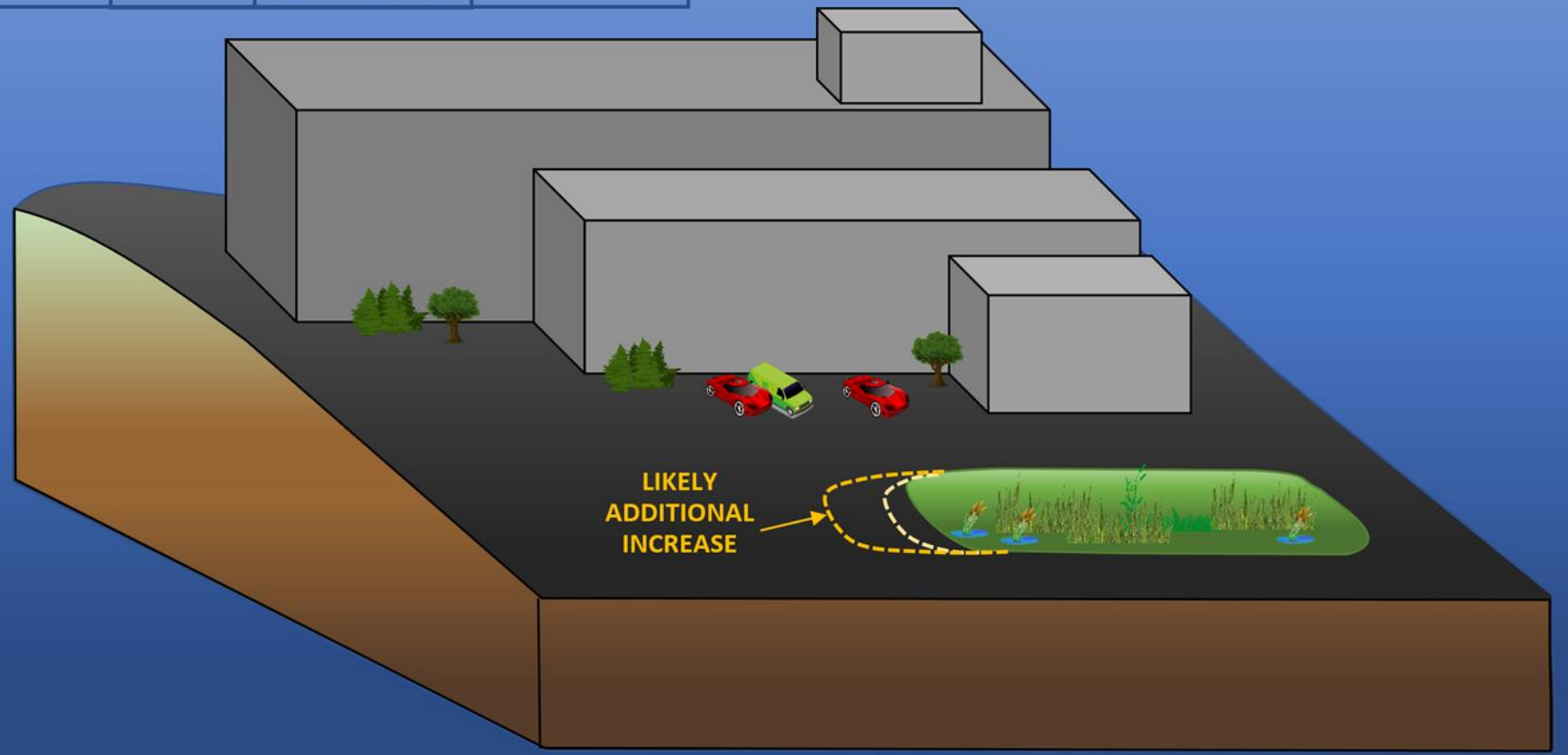
Existing Conditions: Forested and Undeveloped

Sussex County



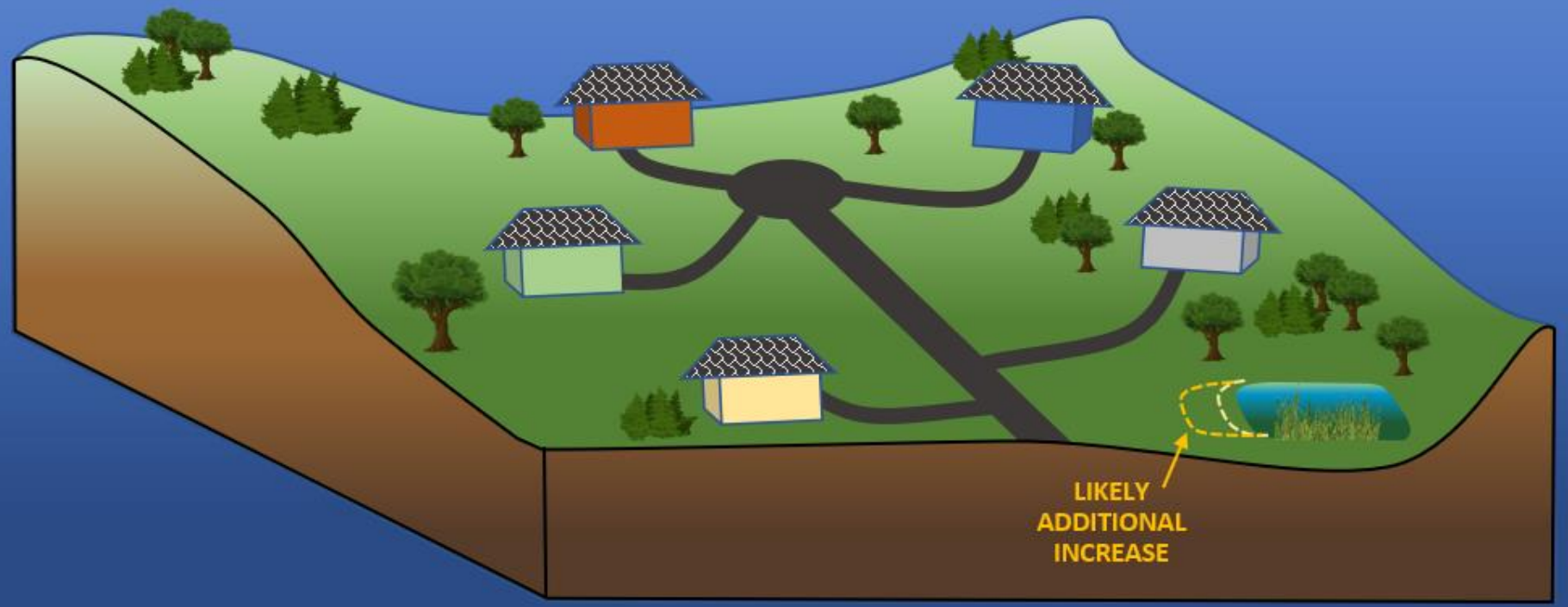
SIZE OF BMP (% OF SITE)

	Existing (1999 data)	New Current (2019 data)	New Future (2100 projection)
Soil A	11.0%	11.0% +0.0%	11.7% +0.7%
Soil B	8.8%	9.0% +0.2%	11.3% +2.5%
Soil C	8.6%	9.0% +0.4%	11.1% +2.4%
Soil D	11.2%	11.4% +0.2%	13.6% +2.4%



SIZE OF BMP (% OF SITE)

	Existing (1999 data)	New Current (2019 data)		New Future (2100 projection)	
Soil A	4.1%	4.1%	+0.0%	4.7%	+0.6%
Soil B	3.9%	4.1%	+0.2%	5.5%	+1.6%
Soil C	4.3%	4.5%	+0.2%	5.9%	+1.6%
Soil D	5.9%	6.1%	+0.3%	8.0%	+2.1%



Stormwater Management Rules

Section 1.2: Definitions

- "Public roadway or railroad" means a pathway for use by motor vehicles or trains that is intended for public use and is constructed by, or on behalf of, a public transportation entity. A public roadway or railroad does not include a roadway or railroad constructed as part of a private development, regardless of whether the roadway or railroad is ultimately to be dedicated to and/or maintained by a governmental entity.

- "Public transportation entity" means a Federal, State, county, or municipal government, an independent State authority, or a statutorily authorized public-private partnership program pursuant to P.L. 2018, c. 90 (N.J.S.A. 40A:11-52 et seq.), that performs a public roadway or railroad project that includes new construction, expansion, reconstruction, or improvement of a public roadway or railroad.

Stormwater Management Rules

Section 1.6: Applicability to Major Development

If a project needs any of the following permits or authorizations:

- Flood Hazard Area
- Freshwater Wetlands
- CAFRA
- Waterfront Development
- Highlands

And a technically complete application was submitted to NJDEP prior to 7/17/23

Then the whole project is not subject to the new standards

Provided the submitted application includes a stormwater management review component

Stormwater Management Rules

Section 1.6: Applicability to Major Development

Note: We now use the term "legacy" instead of "grandfather" to describe applications that are not subject to new rules.

Applications that will not "legacy" a project:

- Applicability Determinations
- Flood Hazard Area verifications
- Freshwater Wetlands LOI
- Applications that do not include a stormwater management review component
  - For example, stand-alone Freshwater Wetlands applications that do not trigger stormwater even if the overall project is a major development
- Applications that are not technically complete prior to 7/17/23
  - If an application was received prior to 7/17/23 and it is subsequently found to be technically complete within the pre-review period, then it is "legacied."
  - If an application was received prior to 7/17/23 and it is subsequently found to NOT be technically complete within the pre-review period, then it is NOT "legacied" – even if the problems are fixed later.

Stormwater Management Rules

Section 1.6: Applicability to Major Development

- Projects that do not require WLM approval can be "legacied" if certain local approvals under the MLUL are obtained prior to date of rulemaking.
- Municipalities must amend their municipal stormwater ordinance within one year of the rulemaking.
- Projects covered by RSIS must meet new standards immediately (unless covered by N.J.A.C. 7:8-1.6(b)1).

Stormwater Management Rules

Section 1.6: Applicability to Major Development

Additional "legacy" provision for certain public roadway and railroad projects at N.J.A.C. 7:8-1.6(f):

- "Notwithstanding any rule to the contrary, a major development for any public roadway or railroad project conducted by a public transportation entity that has determined a preferred alternative or reached an equivalent milestone before (the effective date of this rulemaking), shall be subject to the stormwater management requirements in effect prior to (the effective date of this rulemaking)."

Public transportation entities must demonstrate that the project has reached this milestone prior to rule adoption.

- The logic is that these projects have already undergone a significant level of planning such that revising the project now to meet new rules would not be practicable.

Stormwater Management Rules

Section 1.6: Applicability to Major Development

Note: There are now two tiers of potential "legacying:"

- Technically complete applications received prior to the March 2, 2021, rulemaking (that incorporated green infrastructure requirements) are subject to the Stormwater Management Rules prior to March 2, 2021

We now have three sets of Stormwater Management Rules depending on when a technically complete application is received – or when a public transportation entity determines a "preferred alternative:"

- Prior to March 2, 2021
- Between March 2, 2021, and July 17, 2023
- After July 17, 2023

Stormwater Management Rules

Subchapter 5. Design and Performance Standards for Stormwater Management Measures:

Two new tables at N.J.A.C. 7:8-5.7 for adjusting NOAA Atlas 14 precipitation for 2019 and 2100:

Table 5-5:
Current Precipitation Adjustment Factors

County	2-Year Design Storm	10-Year Design Storm	100-Year Design Storm
Atlantic	1.01	1.02	1.03
Bergen	1.01	1.03	1.06
Burlington	0.99	1.01	1.04
Camden	1.03	1.04	1.05
Cape May	1.03	1.03	1.04
Cumberland	1.03	1.03	1.01
Essex	1.01	1.03	1.06
Gloucester	1.05	1.06	1.06
Hudson	1.03	1.05	1.09
Hunterdon	1.02	1.05	1.13
Mercer	1.01	1.02	1.04
Middlesex	1.00	1.01	1.03
Monmouth	1.00	1.01	1.02
Morris	1.01	1.03	1.06
Ocean	1.00	1.01	1.03
Passaic	1.00	1.02	1.05
Salem	1.02	1.03	1.03
Somerset	1.00	1.03	1.09
Sussex	1.03	1.04	1.07
Union	1.01	1.03	1.06
Warren	1.02	1.07	1.15

Use this to adjust 1999 rainfall to 2019

Table 5-6:
Future Precipitation Change Factors

County	2-Year Design Storm	10-Year Design Storm	100-Year Design Storm
Atlantic	1.22	1.24	1.39
Bergen	1.20	1.23	1.37
Burlington	1.17	1.18	1.32
Camden	1.18	1.22	1.39
Cape May	1.21	1.24	1.32
Cumberland	1.20	1.21	1.39
Essex	1.19	1.22	1.33
Gloucester	1.19	1.23	1.41
Hudson	1.19	1.19	1.23
Hunterdon	1.19	1.23	1.42
Mercer	1.16	1.17	1.36
Middlesex	1.19	1.21	1.33
Monmouth	1.19	1.19	1.26
Morris	1.23	1.28	1.46
Ocean	1.18	1.19	1.24
Passaic	1.21	1.27	1.50
Salem	1.20	1.23	1.32
Somerset	1.19	1.24	1.48
Sussex	1.24	1.29	1.50
Union	1.20	1.23	1.35
Warren	1.20	1.25	1.37

Use this to adjust 1999 rainfall to 2100

Stormwater Management Rules

Subchapter 5: Design and Performance Standards for Stormwater Management Measures

N.J.A.C. 7:8-5.4 Groundwater recharge standards

- Where an applicant proposes to recharge the increase of stormwater runoff volume from pre-construction to post-construction, they will now need to calculate these volumes using the projected year 2100 two-year storm in Table 5-6

N.J.A.C. 7:8-5.6 Stormwater runoff quantity standards

- Applicants now need to demonstrate compliance for six different sets of precipitation:

Year 2019 precipitation:

- Existing and proposed 2-year storm
- Existing and proposed 10-year storm
- Existing and proposed 100-year storm

Year 2100 precipitation:

- Existing and proposed 2-year storm
- Existing and proposed 10-year storm
- Existing and proposed 100-year storm

Necessary to ensure that the BMPs will work for today's runoff and also for future runoff

Stormwater Management Rules

Subchapter 5. Design and Performance Standards for Stormwater Management Measures

N.J.A.C. 7:8-5.7 Calculation of stormwater runoff and groundwater recharge

- Design engineers must use NRCS methodology to determine runoff values
- Can no longer use the "Rational Method" for peak flow or the "Modified Rational Method" for hydrograph computations

Flood Hazard Area Control Act rules

Section 1.1: Purpose and Scope

Section 1.2: Definitions

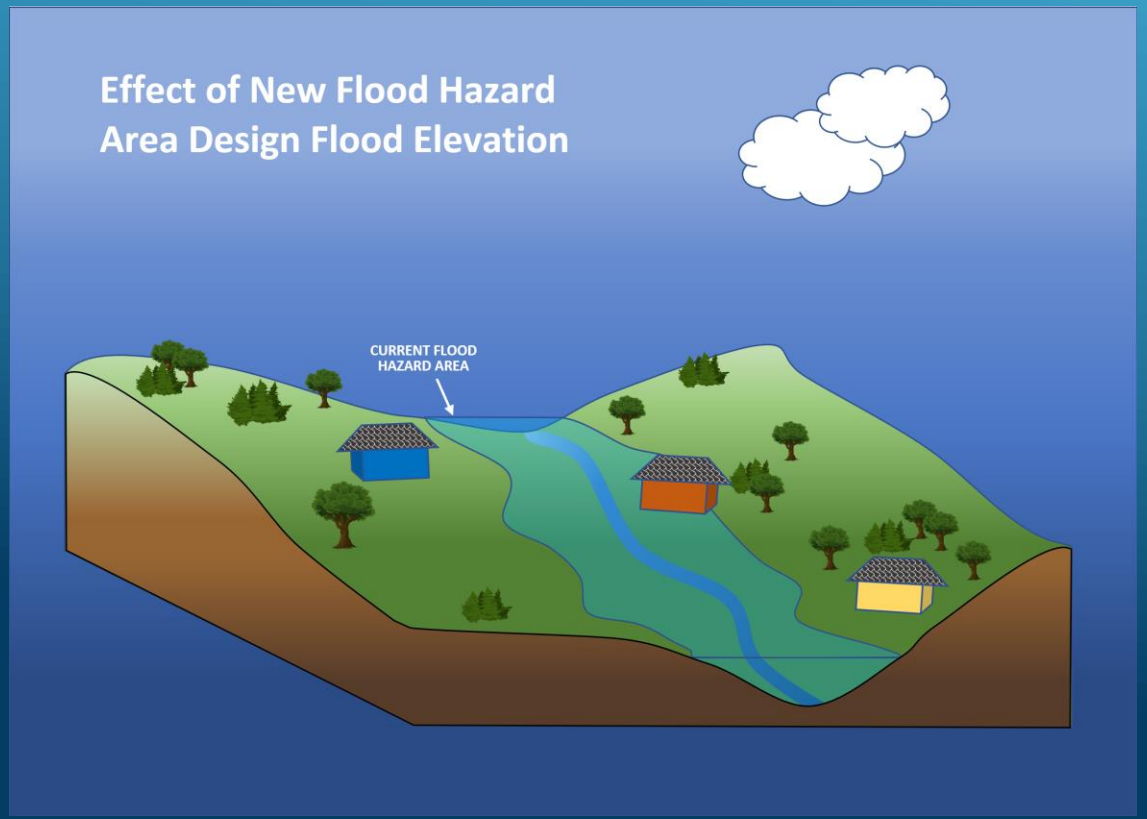
- Added references to climate change in the rules' purpose and scope at section 1.1 and in the definition of "flood hazard area design flood" at section 1.2.

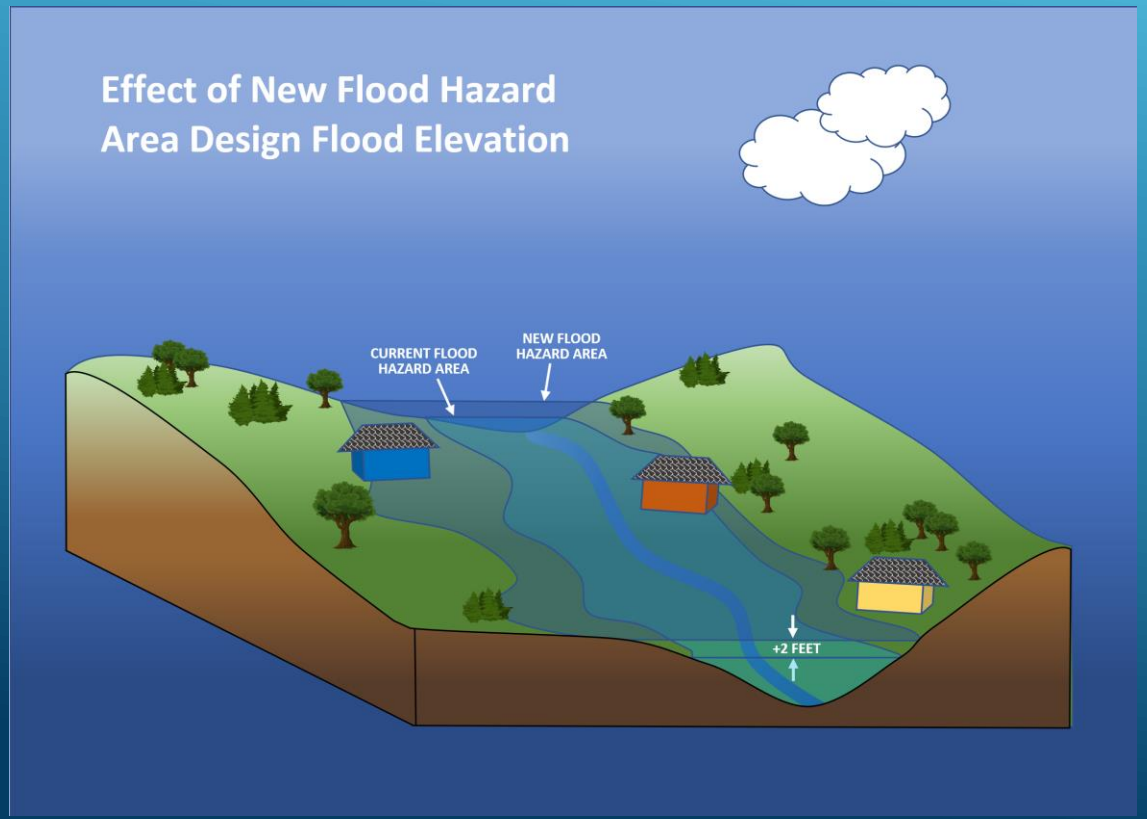
- New definition for "public transportation entity" at section 1.2 to match new definition in Stormwater Management Rules

Flood Hazard Area Control Act rules

Section 2.1: When a Permit or Authorization Is Required

All regulated activities in the prior and expanded flood hazard area are subject to the new standards except in four cases:



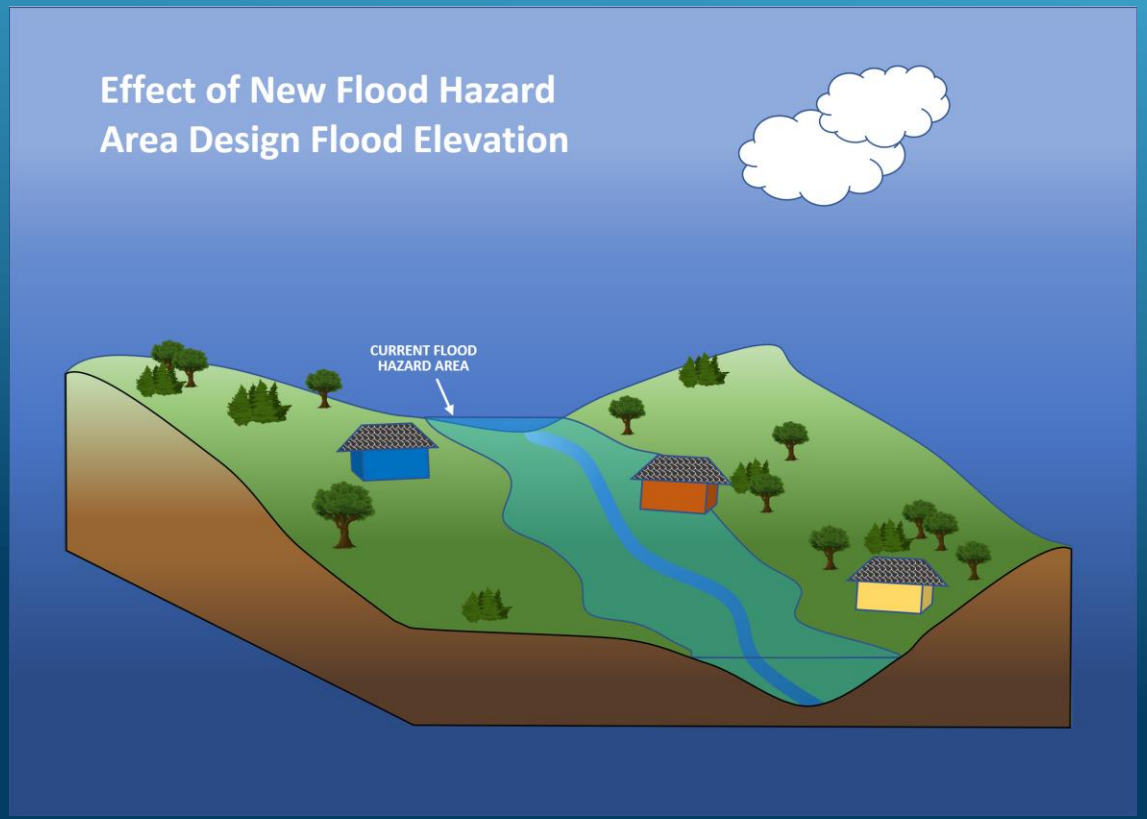


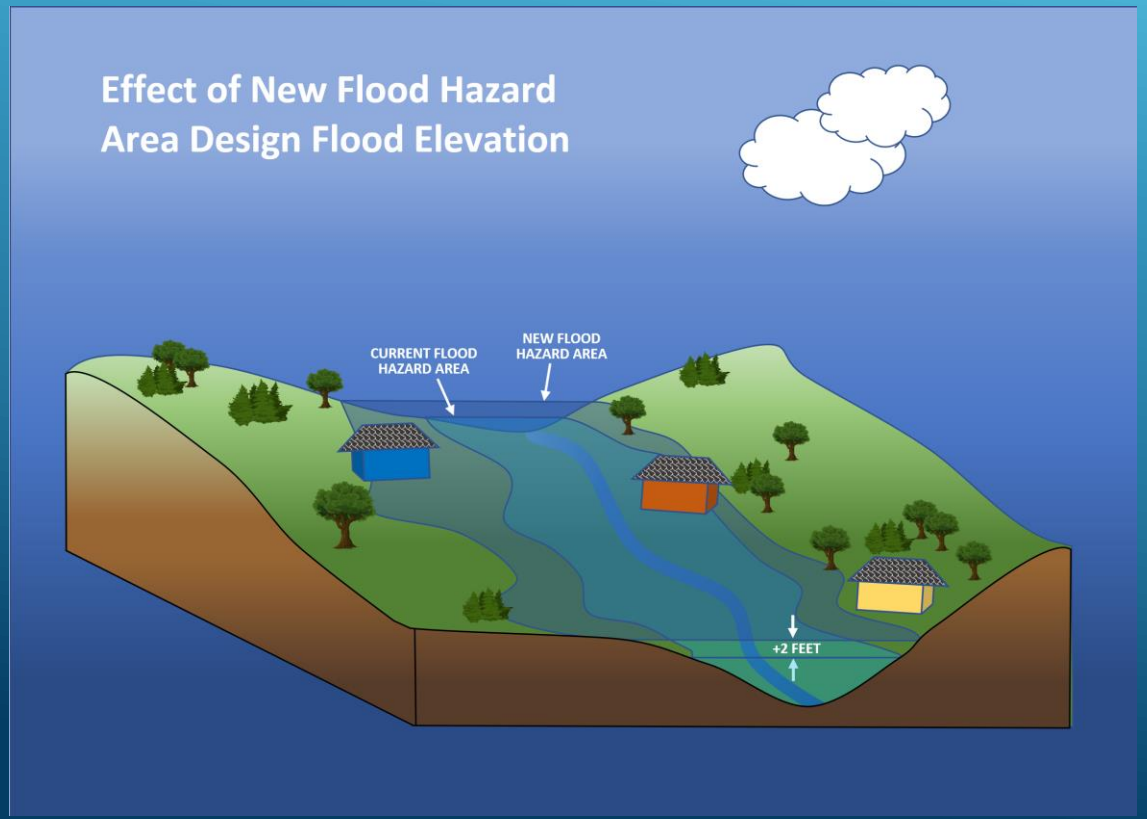
Flood Hazard Area Control Act rules

Section 2.1: When a Permit or Authorization Is Required

Case #1: The regulated activity is part of a project that has a valid FHA permit (see N.J.A.C. 7:13-2.1(c)1i)

- Example: Three-unit subdivision: If the red house has a valid permit, the blue house is "legacied."



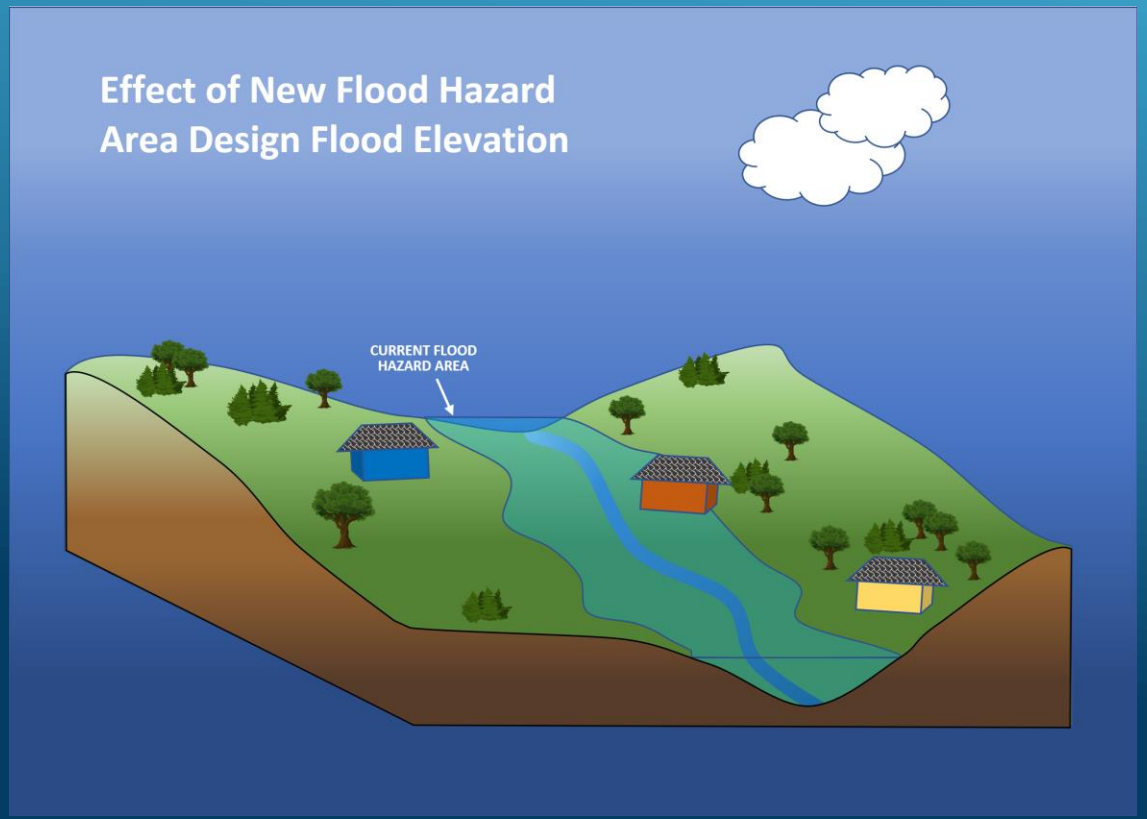


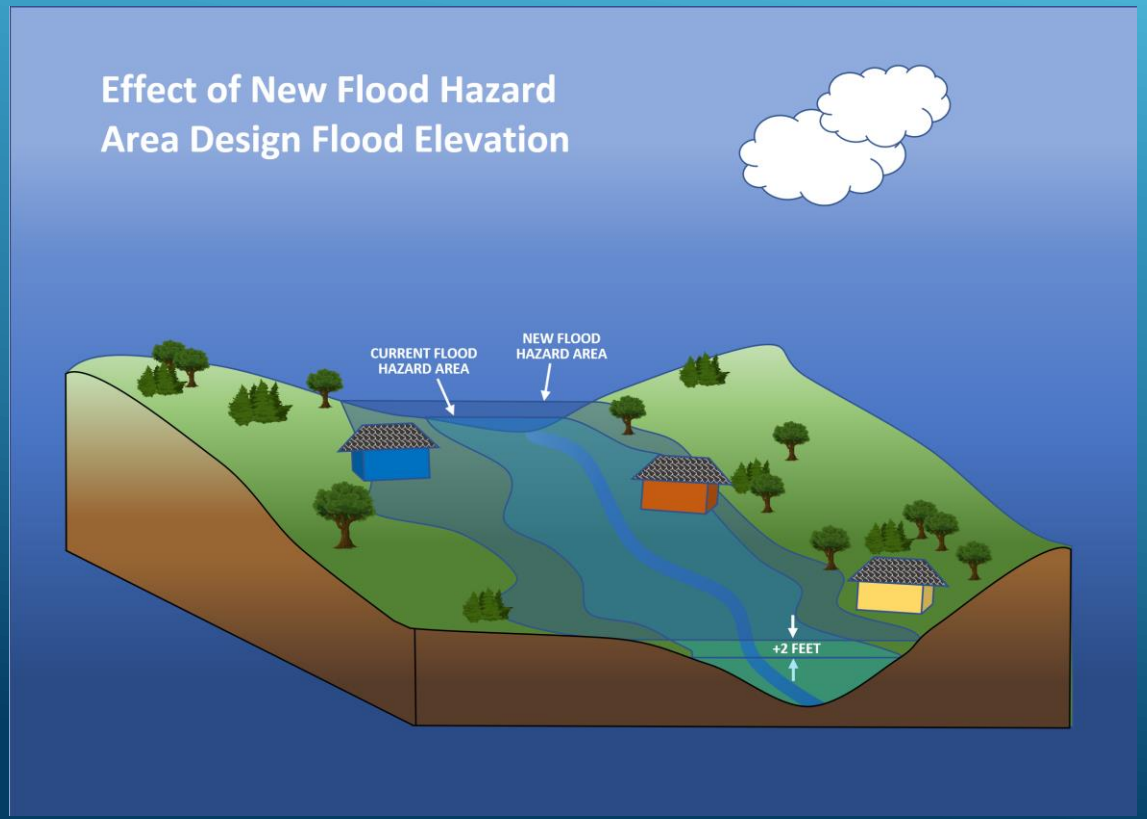
Flood Hazard Area Control Act rules

Section 2.1: When a Permit or Authorization Is Required

Case #2: The regulated activity is part of a project that needs an FHA permit and a technically complete application for such was submitted to NJDEP prior to 7/17/23 (see N.J.A.C. 7:13-2.1(c)1ii)

- Example: Three-unit subdivision: If a technically complete application for the red house was received prior to 7/17/23, the blue house is "legacied."





Flood Hazard Area Control Act rules

Section 2.1: When a Permit or Authorization Is Required

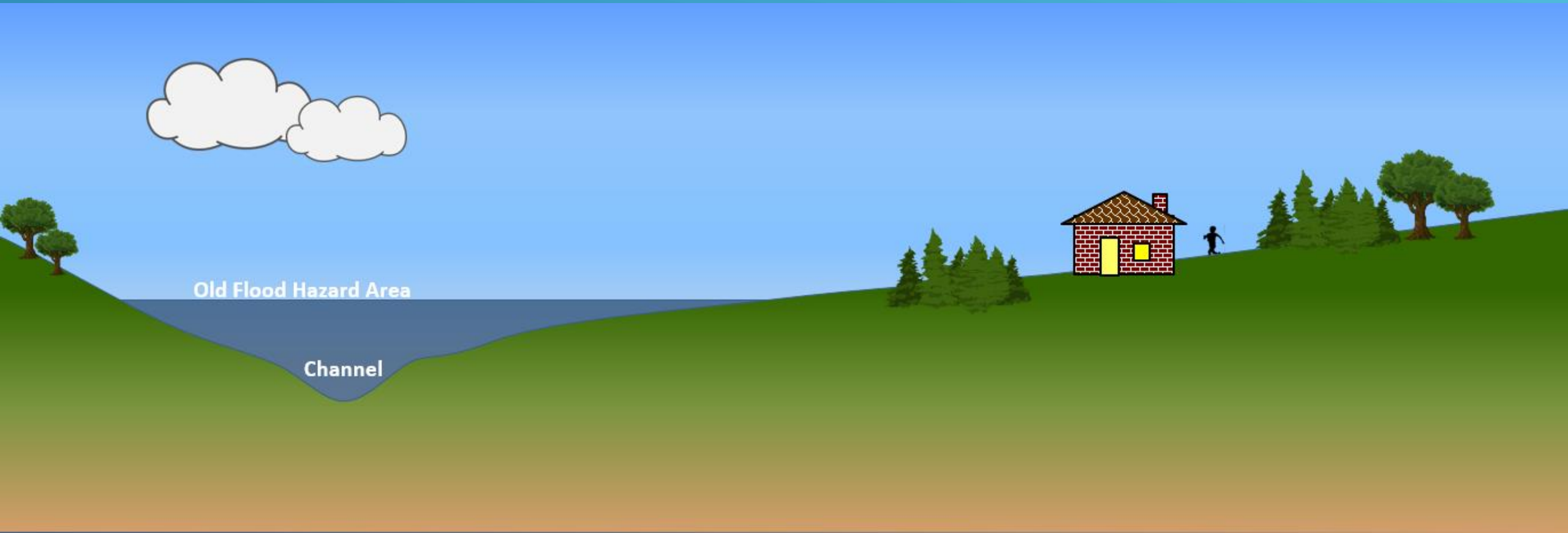
Case #3: The regulated activity is part of a project that did not need an FHA permit prior to 7/17/23 but it received one of the following municipal approvals prior to 7/17/23 (see N.J.A.C. 7:13-2.1(c)4i):

1. **Preliminary or final site plan approval;**
2. **Final municipal building or construction permit;**
3. **Minor subdivision approval where no subsequent site plan approval is required;**
4. **Final subdivision approval where no subsequent site plan approval is required; or**
5. **Preliminary subdivision approval where no subsequent site plan approval is required**

Flood Hazard Area Control Act rules

Section 2.1: When a Permit or Authorization Is Required

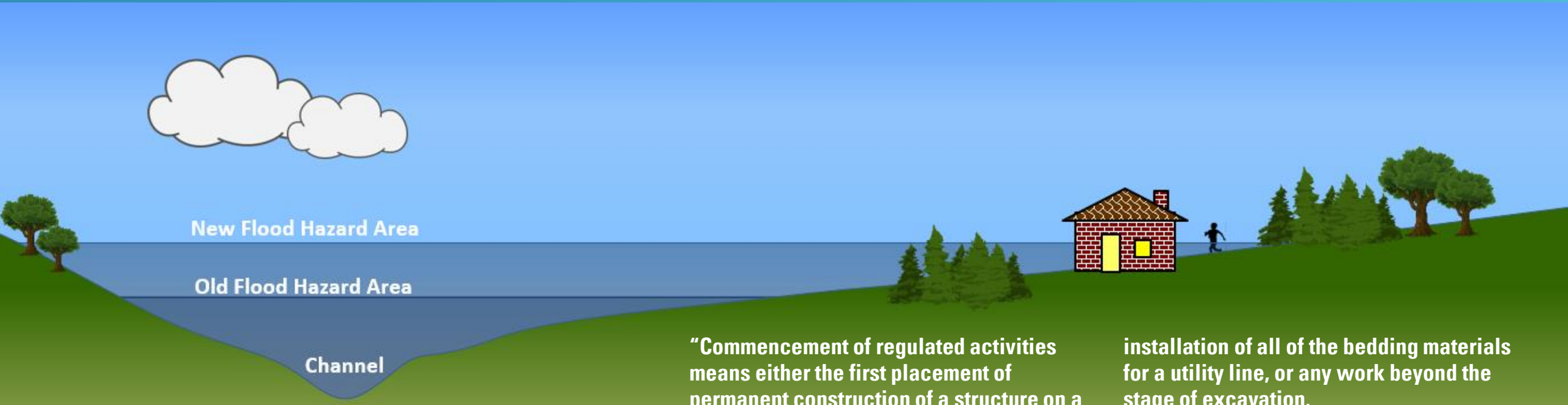
Case #4: The regulated activity is part of a project that did not need an FHA permit prior to 7/17/23 and construction commenced prior to 7/17/23 (see N.J.A.C. 7:13-2.1(c)4ii)



Flood Hazard Area Control Act rules

Section 2.1: When a Permit or Authorization Is Required

Case #4: The regulated activity is part of a project that did not need an FHA permit prior to 7/17/23 and construction commenced prior to 7/17/23 (see N.J.A.C. 7:13-2.1(c)4ii)



"Commencement of regulated activities means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, the placement of subsurface improvements for a roadway, the installation of all of the bedding materials for a utility line, or any work beyond the stage of excavation.

Permanent construction does not include land preparation, such as clearing, grading, and filling."

Flood Hazard Area Control Act rules

Subchapter 3: Determining the Flood Hazard Area and Floodway

Method 1: Department delineation

- New design flood elevation is 2 feet above NJFHADFE shown on Department delineation

Method 2: FEMA tidal method

- Unchanged – will be addressed in upcoming NJPACT proposal

Method 3: FEMA fluvial method

- New design flood elevation is 3 feet above FEMA 1% flood elevation

Flood Hazard Area Control Act rules

Subchapter 3: Determining the Flood Hazard Area and Floodway

Method 4: FEMA hydraulic method

- Use 125% of FEMA's 1% peak flow rate to calculate flood elevation
- New design flood elevation is 2 feet above the calculated elevation

Method 5: Approximation method

- Flood elevations in the table and for overtopped roadways were increased by 1 foot

Method 6: Calculation method

- Use adjustment factors listed at new Table 3.6B to determine 1% peak flow rate using 2100 precipitation, and increase by 125%
- Same multipliers used in SWM rules

Flood Hazard Area Control Act rules

Subchapter 3: Determining the Flood Hazard Area and Floodway

Note: Obtaining a flood hazard area verification or applicability determination prior to rulemaking does not exempt a new project from the new standards.

- Verifications and APDs are a snapshot in time of our jurisdiction.
- Just like freshwater wetlands LOIs, site conditions can change over time.

Flood Hazard Area Control Act rules

Subchapter 3: Determining the Flood Hazard Area and Floodway

Under existing N.J.A.C. 7:13-5.3(e), an applicant can rely on verification unless …

"the Department determines that the verification is based on inaccurate or incomplete information, in which case the Department may void the original verification and issue a new verification reflecting the actual conditions on the site.

For example, the verification may be revised to reflect additional flood hazard areas or riparian zones identified after verification issuance; or if a threatened or endangered species habitat is disclosed or discovered after the verification was issued, the Department may correct the width of the riparian zone."

Flood Hazard Area Control Act rules

Subchapter 3: Determining the Flood Hazard Area and Floodway

- If a person received a verification under the current rules, and subsequently applies for a permit or authorization after the adoption of new flood elevations, the project will need to be revised to reflect the rules in place at the time of application.

- The verification would then be reissued, concurrently with the permit, along with any necessary revisions to ensure the verification accurately depicts flooding on site.

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Section 6.7: Conditions Applicable to a Permit-by-Rule or to an Authorization Pursuant to a General Permit-by-Certification or a General Permit

Section 10.1: Requirement to Obtain an Individual Permit

- Most standards in FHACA rules far exceed federal minimums.

- New standard ensure that activities authorized under the FHACA rules do not fall below minimum federal requirements under the NFIP.

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SECTION 12.6: Requirements for a Railroad, Roadway, and Parking Area

- **Under N.J.A.C. 7:13-12.6(b), the Department shall issue an individual permit to construct or reconstruct a railroad or public roadway only if:**
  1. **The travel surface of the railroad or public roadway is constructed at least one foot above the flood hazard area design flood elevation; or**
  2. **The applicant is a public transportation entity and certain conditions apply.**

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SECTION 12.6: Requirements for a Railroad, Roadway, and Parking Area

Flexibility is provided to public transportation entities in these three situations:

i. The project is limited in scope and consists solely of safety or state of good repair improvements to a lawfully existing railroad or roadway, such that there is no reasonable opportunity to elevate as part of the project's overall scope and purpose; **or**

ii. Prior to the (the effective date of this rulemaking), the project reached a milestone in its development and design, such elevating would necessitate reevaluation of the selected preferred alternative or equivalent milestone, a significant redesign, or significant modifications or additions to private land acquisition plans, whether in fee or easement; **or**

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SECTION 12.6: Requirements for a Railroad, Roadway, and Parking Area

iii. Strict compliance with the elevation standards would result in one or more of the following:

(1) Prohibitively high construction costs or construction costs that are disproportionately high compared with any benefit that would be obtained by strict compliance;

(2) A design that necessitates excessive volumes of fill that exceed the flood storage displacement limits, for which flood storage cannot feasibly be created in compensation either onsite or offsite;

(3) A design that does not meet necessary transportation safety, geometric design, or access point requirements, such as those adopted by the American Association of State Highway and Transportation Officials;

(4) A design that causes unavoidable adverse impacts to the environment (including, but not limited to, impacts to the channel, riparian zone, or aquatic or terrestrial resources) that cannot be adequately mitigated; **or**

(5) A design that exacerbates flooding or causes unavoidable adverse impacts to offsite properties or preexisting drainage patterns.

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SECTION 12.6: Requirements for a railroad, roadway, and parking area

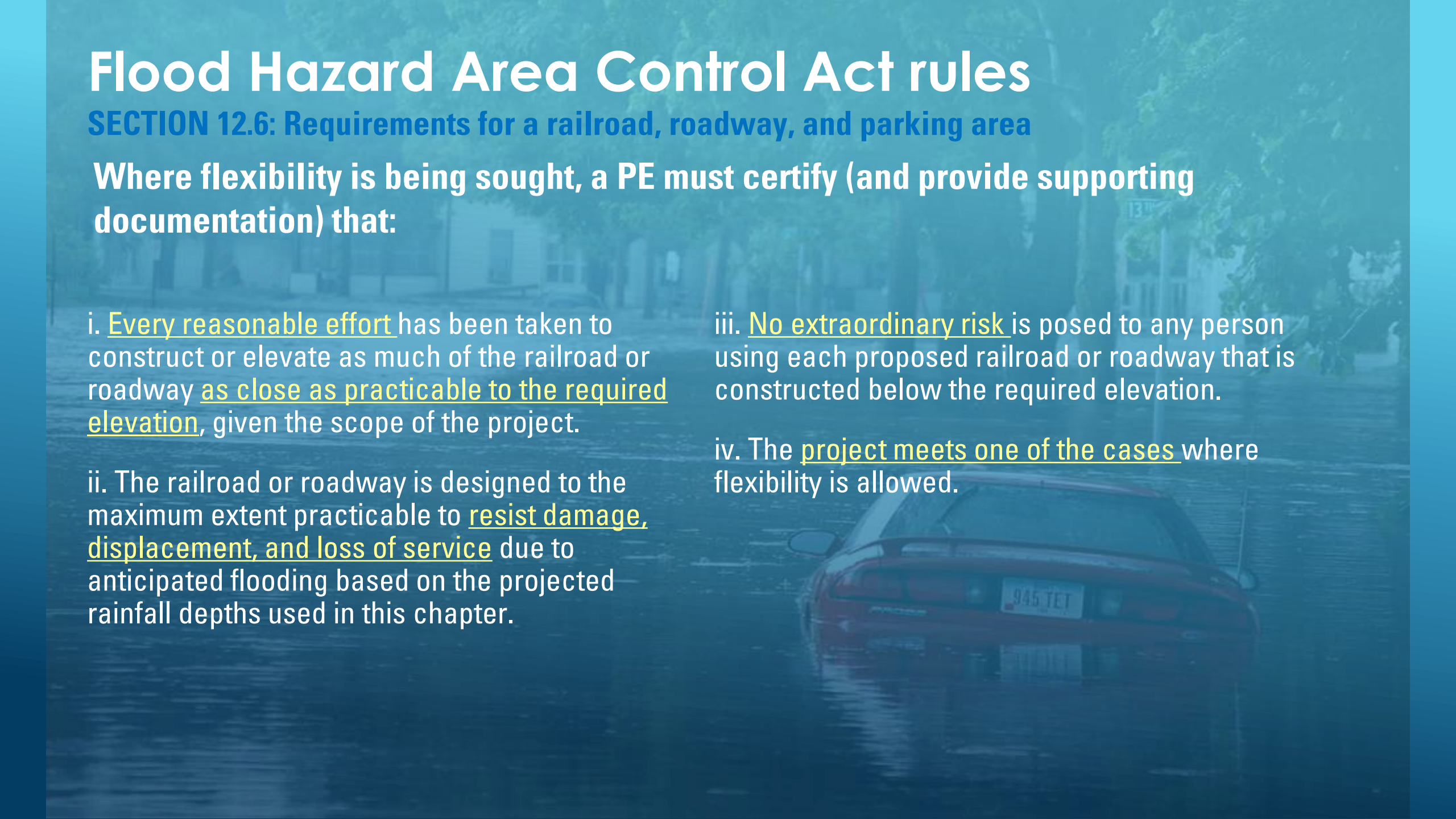
Where flexibility is being sought, a PE must certify (and provide supporting documentation) that:

i. Every reasonable effort has been taken to construct or elevate as much of the railroad or roadway as close as practicable to the required elevation, given the scope of the project.

ii. The railroad or roadway is designed to the maximum extent practicable to resist damage, displacement, and loss of service due to anticipated flooding based on the projected rainfall depths used in this chapter.

iii. No extraordinary risk is posed to any person using each proposed railroad or roadway that is constructed below the required elevation.

iv. The project meets one of the cases where flexibility is allowed.



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SECTION 12.6: Requirements for a railroad, roadway, and parking area

Note: an adequate number of permanent signs must be posted in prominent locations along any new, reconstructed, or expanded section of railroad or roadway that is not elevated, alerting the public to the likelihood of flooding based on the projected rainfall depths used in this chapter.

QUESTIONS?