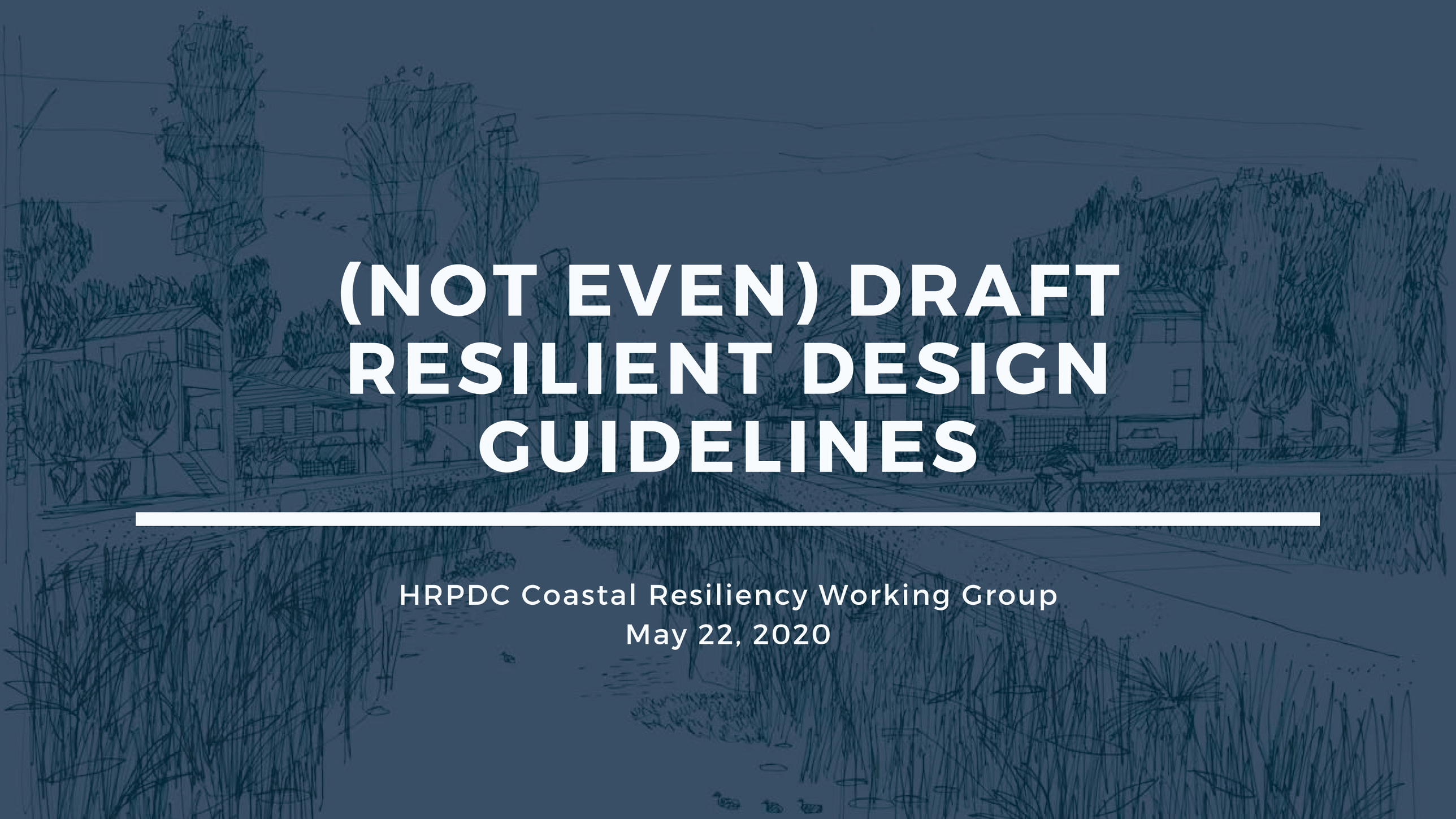


(NOT EVEN) DRAFT RESILIENT DESIGN GUIDELINES

HRPDC Coastal Resiliency Working Group

May 22, 2020

Agenda

Recent and current related efforts

The need for resilient design guidelines

Design standards

Comprehensive plans

Recent and Current Efforts

OCTOBER 2018

HRPDC adopts regional sea level rise scenarios

MAY 2020

Virginia Beach considering new Public Works Design Standards with sea level rise and precipitation projections

JANUARY 2021

VDOT considering new design standards with precipitation projections

THE PROBLEM

- Design standards are based on historic data
- Climate research suggests that conditions will continue to change into the future
- Recent research and analysis suggests that environmental conditions have changed since the major guidance documents
- Therefore we are constructing stormwater systems that are already undersized and it will only get worse

Adopting higher standards will be more expensive, but keeping the same standards will increase risk. Either way, there is a cost.

Resilient Design Guidelines

PROJECTIONS OF FUTURE CONDITIONS

Sea level rise - adopted October 2018
- 1.5' for 2020-2050
- 3.0' for 2050-2080
- 4.5' for 2080-2100

Precipitation - TBD

RECOMMENDATIONS FOR POLICIES AND REGULATIONS

Stormwater Management - TBD
- Design storm frequencies
- Design tailwater elevations
- Joint probability events

Floodplain Management - TBD
- Future floodplain mapping
- Freeboard

Topics for Today's Discussion

Rainfall

Future projections
Stationarity

Design Storm Frequencies

Multiple design storms
- Drainage area
- Project type
- Criticality

Tailwater Elevations

Sea level rise
Levels for individual water bodies

Compound Flooding

Joint probability pairs

PRECIPITATION PROJECTIONS

NOAA	VDOT	VIRGINIA BEACH	NOTHING
PROS: Already referenced in local codes. Authoritative.	PROS: Already in some local codes. Would apply to county secondary streets.	PROS: Already drafted and under consideration.	PROS: No cost or effort required.
CONS: May not include future conditions. Unknown if/when will occur.	CONS: Not expected until 2021. Statewide standard may not reflect conditions in Hampton Roads.	CONS: May conflict with later updates to VDOT or NOAA standards.	CONS: Does nothing to improve resiliency of region to current or future flood risk.

Questions for Precipitation Levels

Should we use observational data only or use climate projections?

What time horizon should we apply to stormwater management?

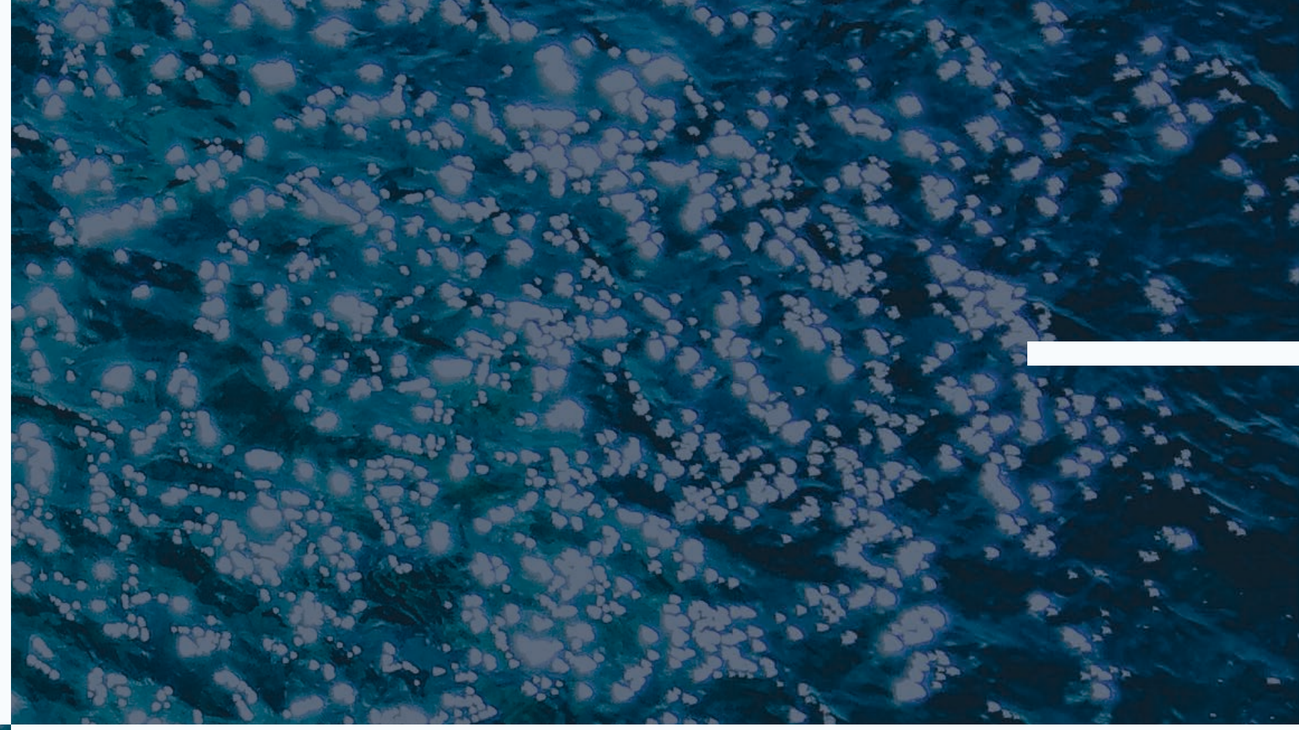
What emissions scenario should we use?

Design Storm Frequencies

Most localities appear to require a 10-year design storm

Some localities apply higher standards for certain types of facilities

Chesapeake and Virginia Beach base the design storm on the size of the drainage area



Chesapeake

< 200 Acres	10-year storm
≥ 200 Acres	50-year storm

Virginia Beach

< 300 Acres	10-year storm
300-500 Acres	25-year storm
≥ 500 Acres	50-year storm
Critical Infrastructure	100-year storm

Questions for Design Storm Frequencies

Should we require larger or more important projects to perform better?

Should different standards be based on drainage area? Criticality? Something else?

Design Tailwater Elevations

VDOT
No tidal elevation specified. 0.8 * pipe diameter default.

Norfolk
1.7' NAVD88

Chesapeake
3.6' NAVD88 (tidal)
2.3' NAVD88 (non-tidal)

Virginia Beach
Individual elevations for 9 tidal and non-tidal water bodies

Design Tailwater Elevations

Sea Level Rise

Virginia Beach is proposing to incorporate sea level rise into each design tidal elevation.

- 1.5' for non-critical infrastructure
- 3.0' for critical infrastructure

This includes a non-linear adjustment for some watersheds and some return periods.

Questions for Design Tailwater Elevations

Should we establish elevations for individual water bodies?

Should design tidal elevations factor in sea level rise? How much?

COMPOUND FLOODING

- Most communities appear to use a single combination of precipitation and tidal conditions as the design storm
- Virginia Beach is proposing the use of a suite of "Design Storm/Tide Joint Probability Pairs"

10-YR Design		25-YR Design		50-YR Design		100-YR Design	
Tide	Rain	Tide	Rain	Tide	Rain	Tide	Rain
10-YR	1-YR	25-YR	1-YR	50-YR	1-YR	100-YR	1-YR
1-YR	10-YR	2-YR	25-YR	2-YR	50-YR	3-YR	100-YR

Questions for Compound Flooding

Should we use joint probability events?

How many combinations should include? Which ones?

Question Summary

Rainfall

Observational data or climate projections?

What time horizon should we use?

What emissions scenario should we use?

Design Storm Frequencies

Should larger or more important projects perform better?

What should standards be based on?

Tailwater Elevations

Elevations for individual water bodies?

Should design tidal elevations factor in sea level rise?

Compound Flooding

Should we use joint probability events?

What combinations?

Comprehensive Plans

§15.2-2223.3

Requires localities in Hampton Roads to incorporate “strategies to combat projected relative sea-level rise and recurrent flooding” into their comprehensive plans

HB981

The Clean Energy and Community Flood Preparedness Act established the Virginia Community Flood Preparedness Fund to help pay for flood mitigation projects

Why a Model Comprehensive Plan Element?

Template for localities adding SLR to their plan based on regional datasets

Consistent metrics for each locality that can be aggregated at the regional or state level

Better integration between hazard mitigation plan and comprehensive plan

Establish minimum eligibility for state funding of projects or provide bonus for applications

Element Content

GIS/MAPS

- Floodplains (current, future)
- Sea Level Rise Inundation
- Erosion/shoreline change
- Vulnerable infrastructure, natural resources, etc.

DATA

- Sea level rise trends and projections
- Vulnerability assessments
- Impacts to natural resources, working waterfronts, infrastructure

ISSUES/POLICIES

- Impacts from flooding and inundation
- Shoreline management
- Adaptation strategies