Flood Control and Levee Safety in Oregon

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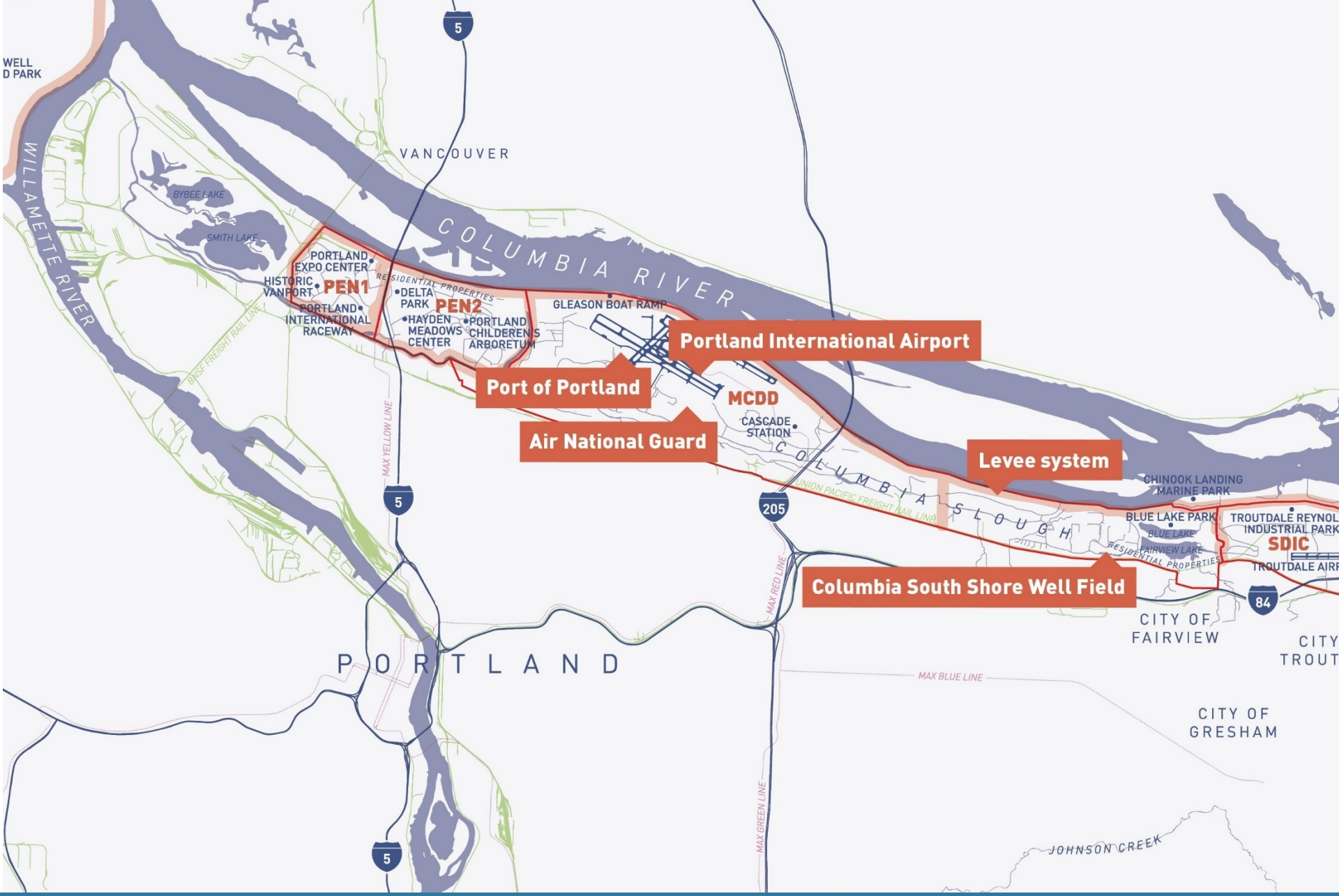
Mike Meyer, P.E. Cornforth Consultants



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The levees' protection and impact

40% of Port of Portland facilities

12 Million tons of goods move through Facilities

$5.3 billion in assessed property value

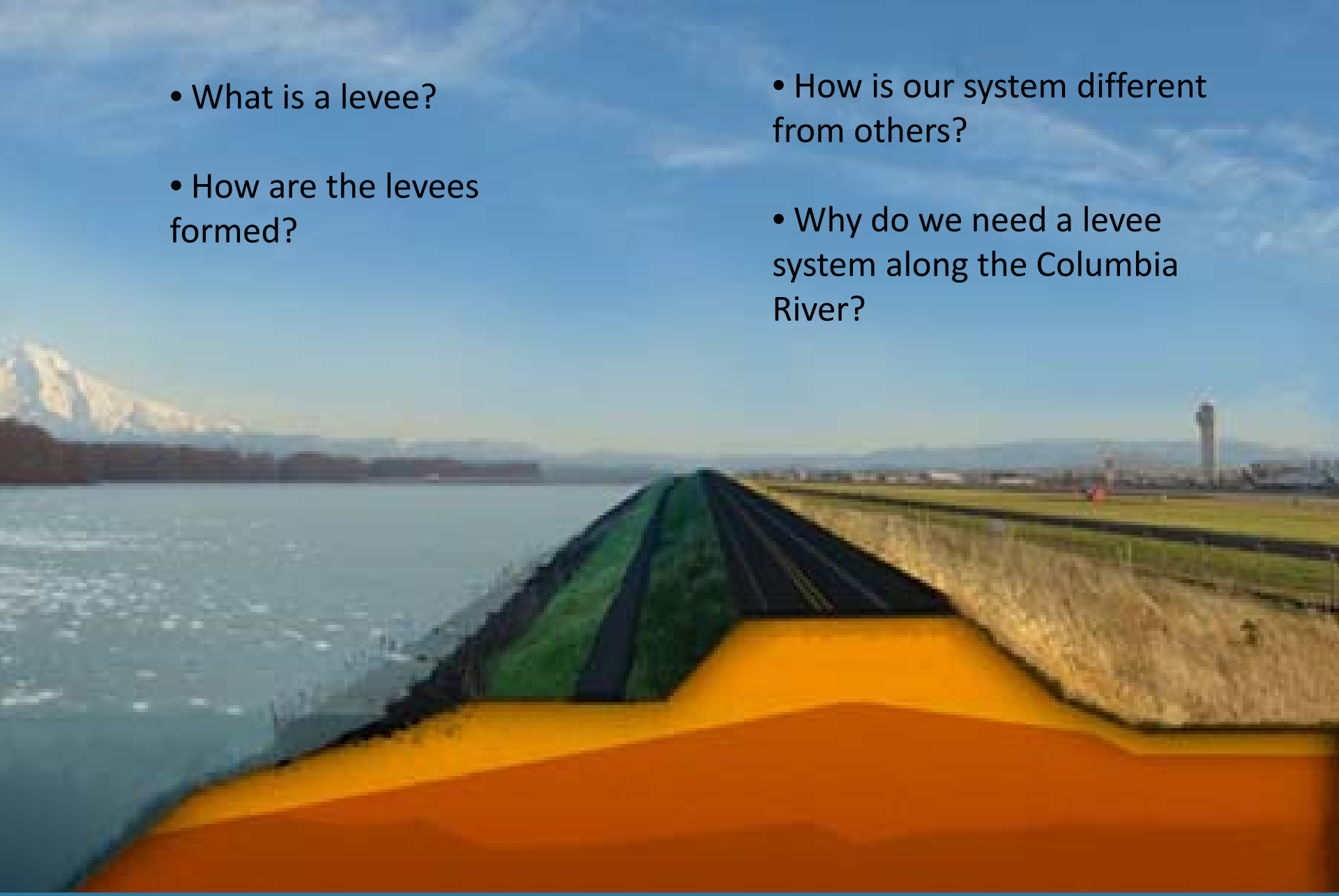
Across four cities

Residential neighborhoods

Thousands of Oregonians flood safety

10% of jobs in Multnomah County

Majority in industrial, manufacturing, and transport.



- What is a levee?
- How are the levees formed?
- How is our system different from others?
- Why do we need a levee system along the Columbia River?

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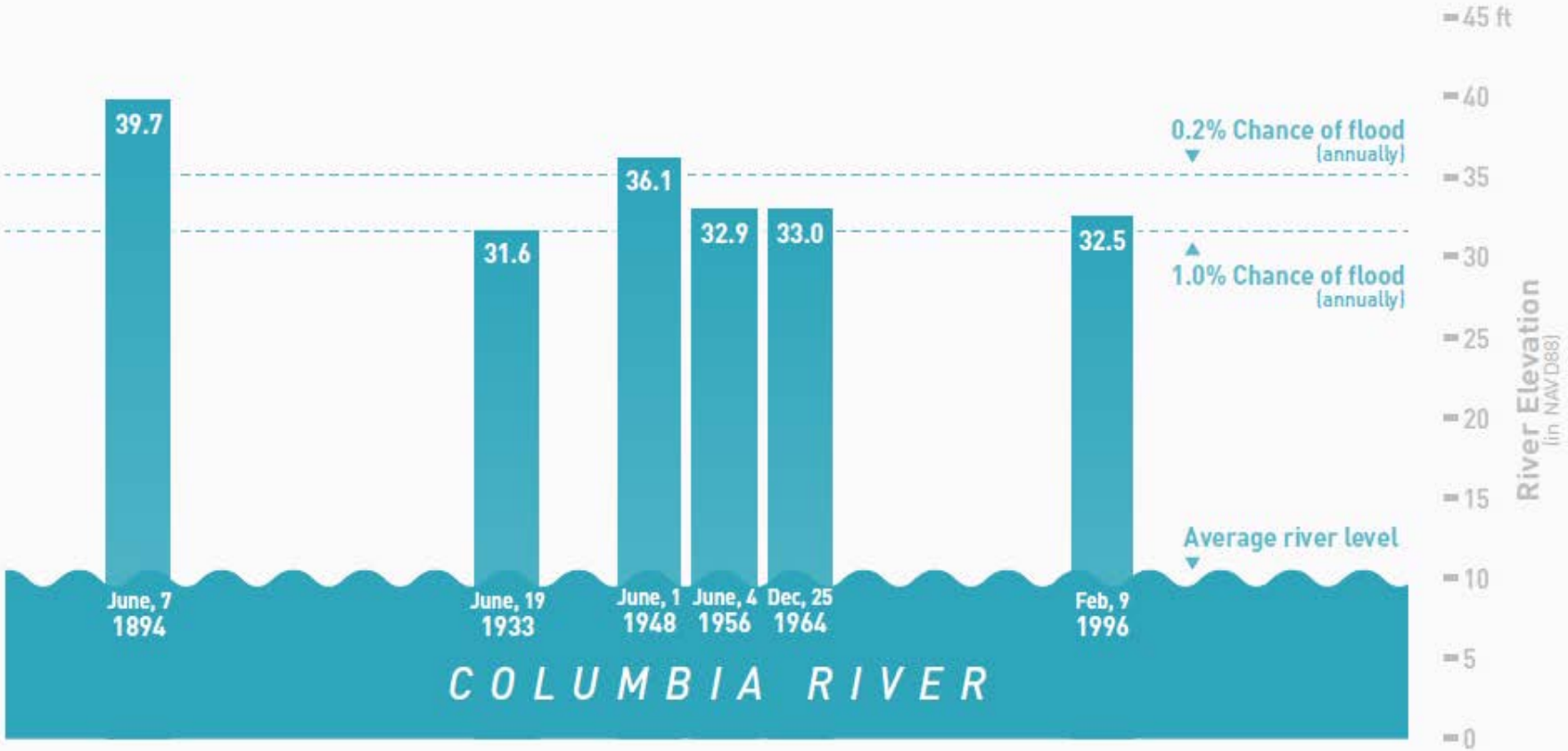


High Water Event Timeline

Columbia River at Vancouver Gage

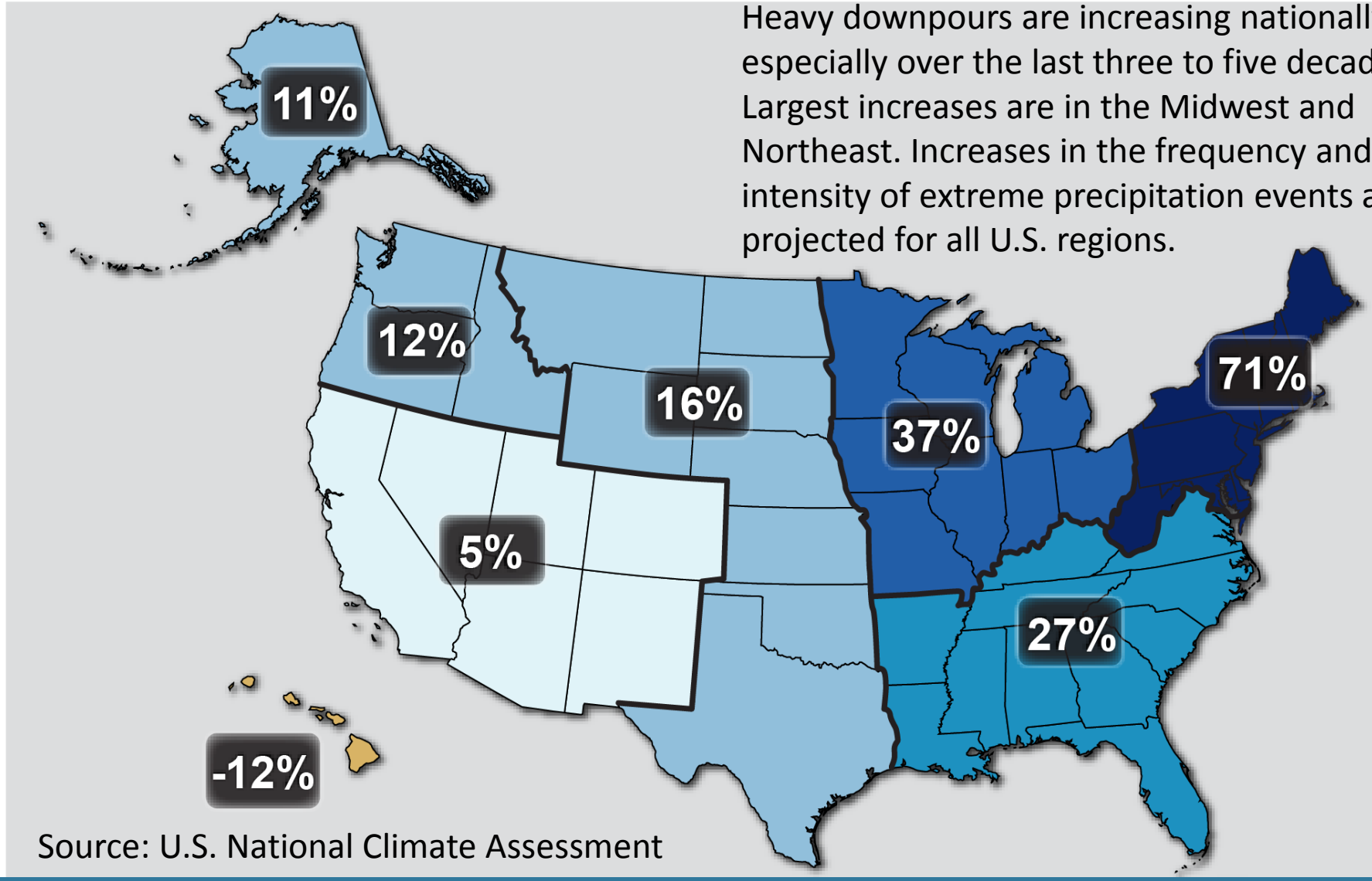
1948 Flood – Railroad Embankment Breach at Vanport

1948 Flood – Columbia Slough breach

Current Challenges

- Preserving public safety in a changing climate
- Funding and governance
- Maintaining status in federal programs

Observed Change in Very Heavy Precipitation



Heavy downpours are increasing nationally, especially over the last three to five decades. Largest increases are in the Midwest and Northeast. Increases in the frequency and intensity of extreme precipitation events are projected for all U.S. regions.

Source: U.S. National Climate Assessment

Flood Protection Infrastructure

- ASCE Report Card gives levees D- nationally
- Historically, improvements have been reactionary
- Cities are learning that investment pays dividends

Federal Levee Oversight

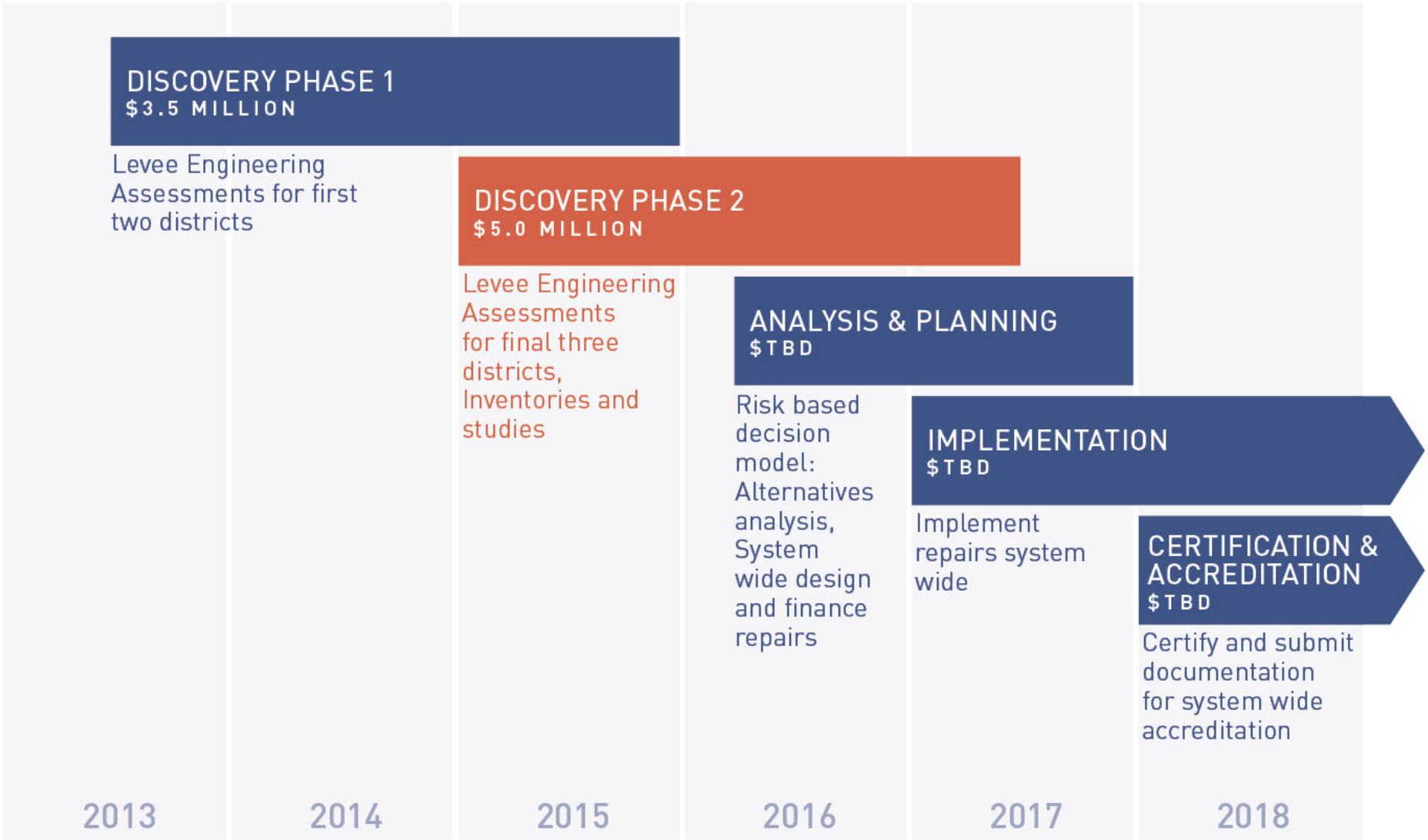
FEMA

Federal Emergency Management Agency
National Flood Insurance Program

Cities voluntarily participate in the program.	*P1 & P2 Status*: Accredited, not certified *MCDD &SDIC Status:* Accredited, Certification expires in 2017	US Army Corps of Engineers plays a limited and defined role.

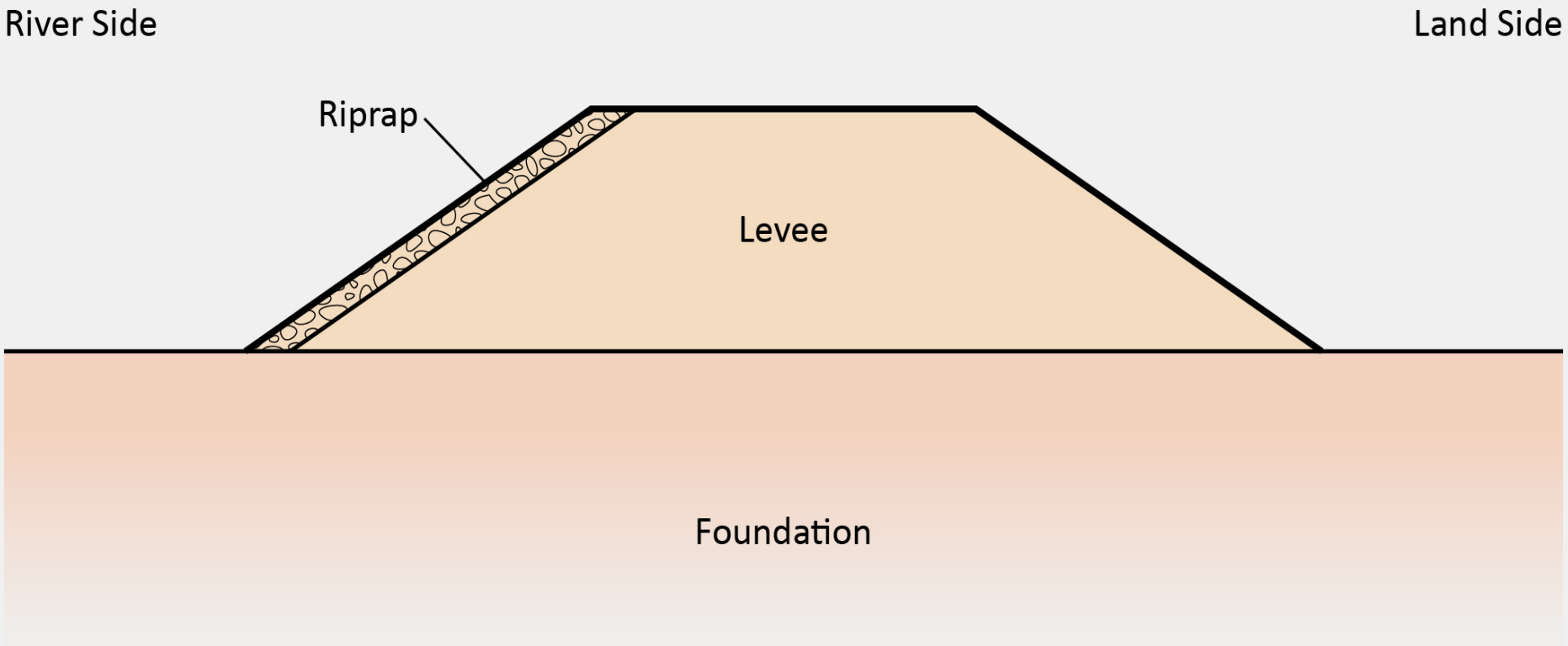
Why Accredit a Levee?

- Accreditation confirms the levees were constructed and are being maintained to protect against flooding.
- Any issues that prevent accreditation pose public safety risks to the people and property protected by the levees.


DISCOVERY PHASE 1
$3.5 MILLION
Levee Engineering Assessments for first two districts
DISCOVERY PHASE 2
$5.0 MILLION
Levee Engineering Assessments for final three districts, Inventories and studies
ANALYSIS & PLANNING
$TBD
Risk based decision model: Alternatives analysis, System wide design and finance repairs
IMPLEMENTATION
$TBD
Implement repairs system wide
CERTIFICATION & ACCREDITATION
$TBD
Certify and submit documentation for system wide accreditation
2013
2014
2015
2016
2017
2018

Levee Accreditation 101

44 CFR 65.10 Certification Requirements



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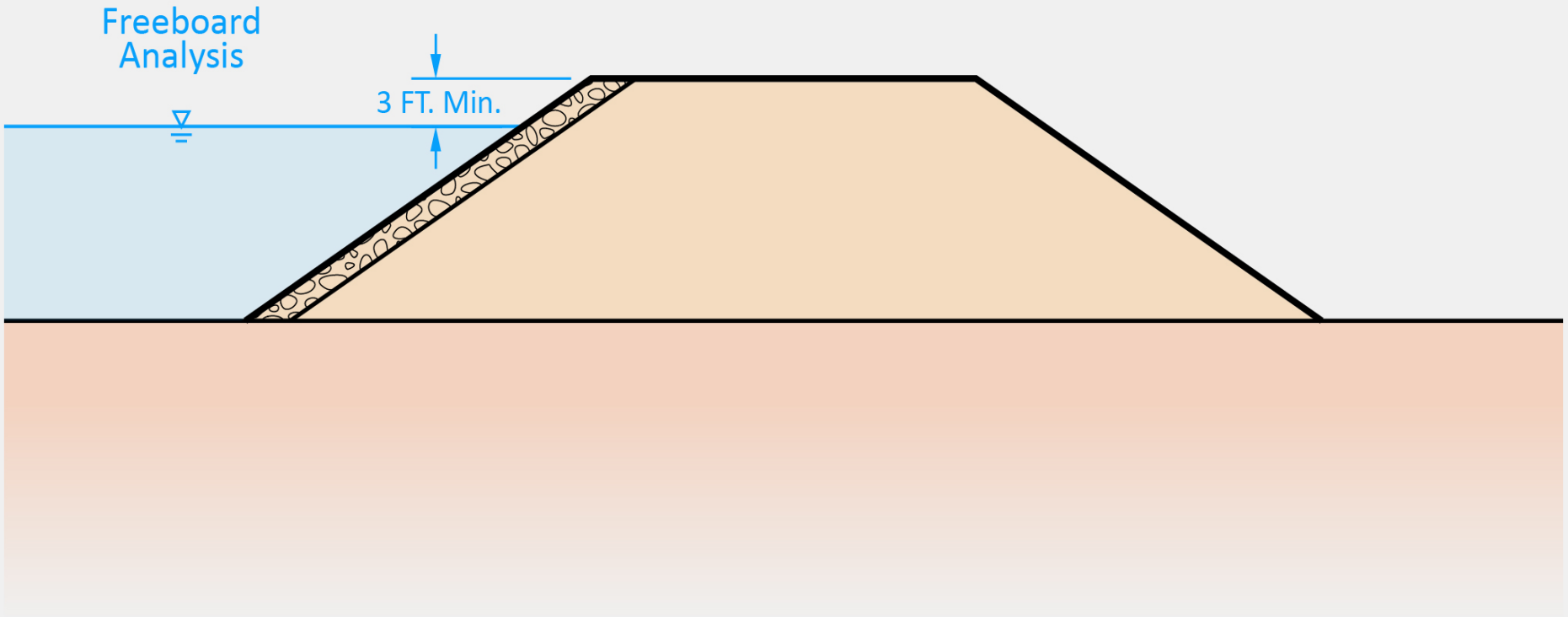

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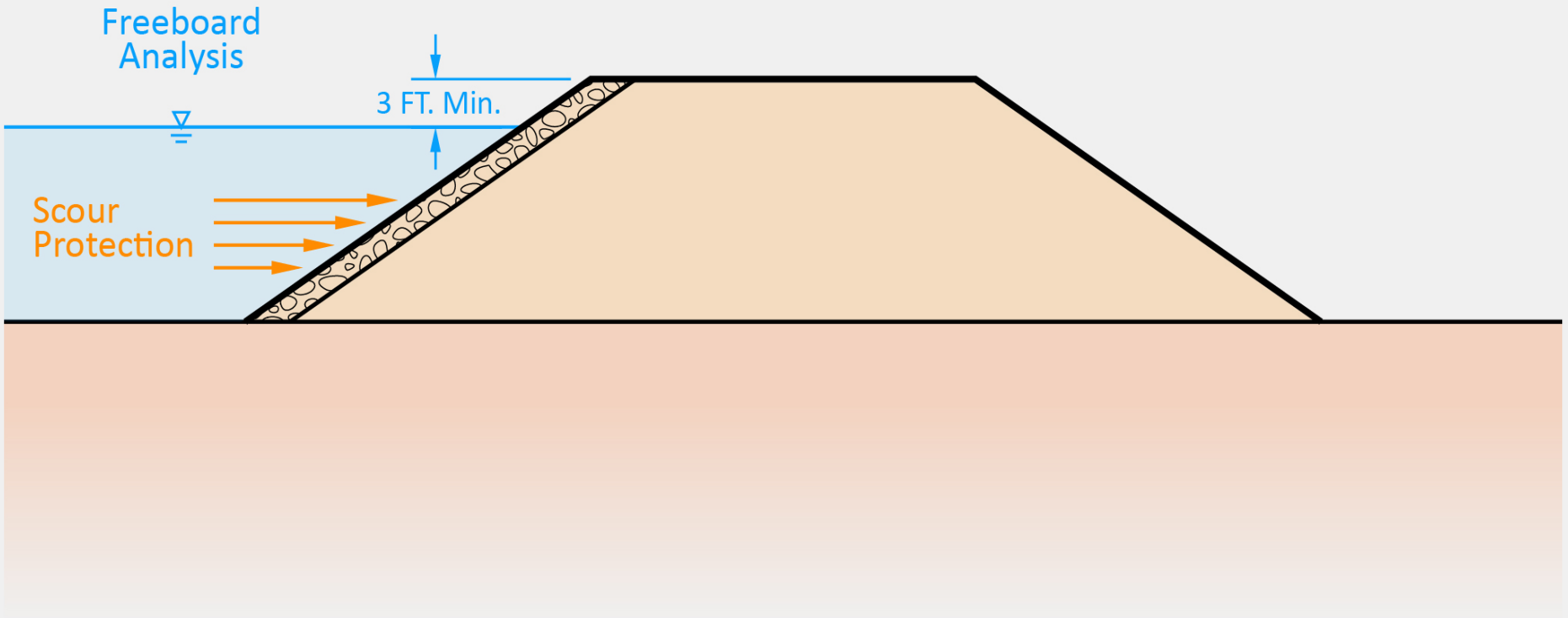

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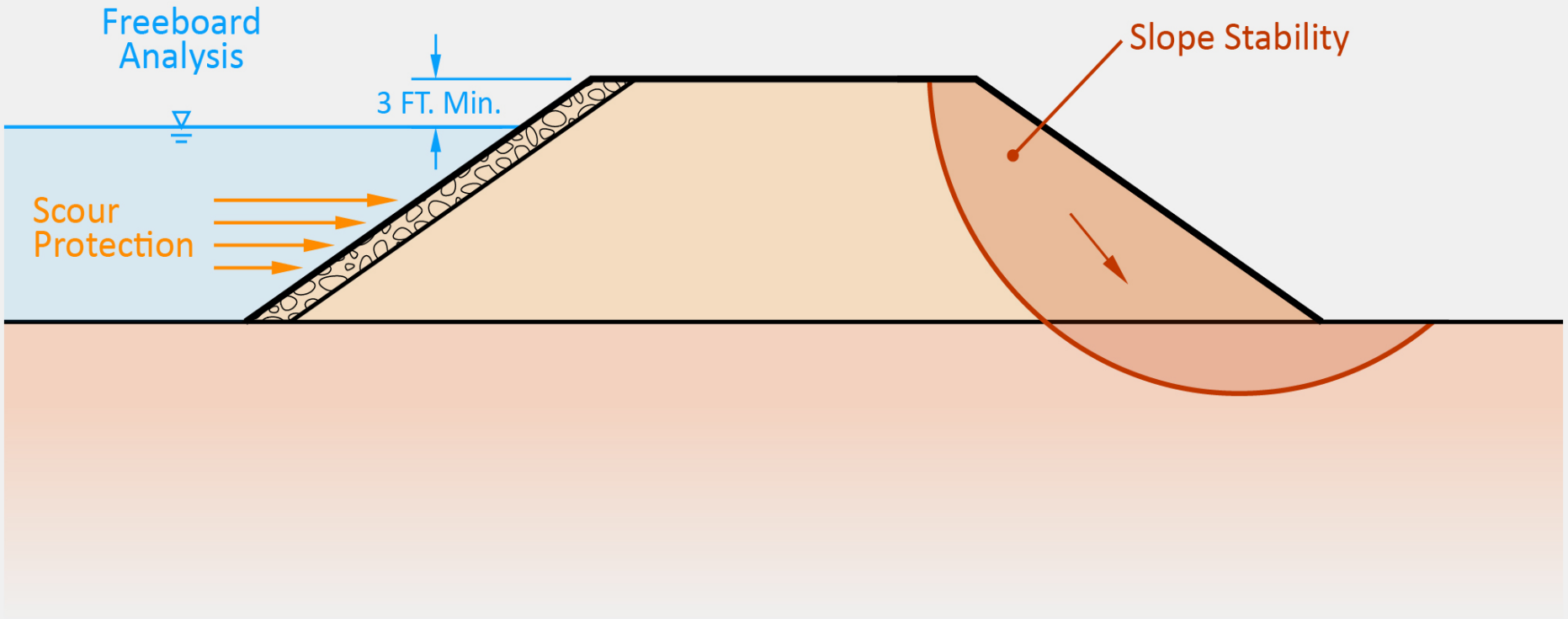

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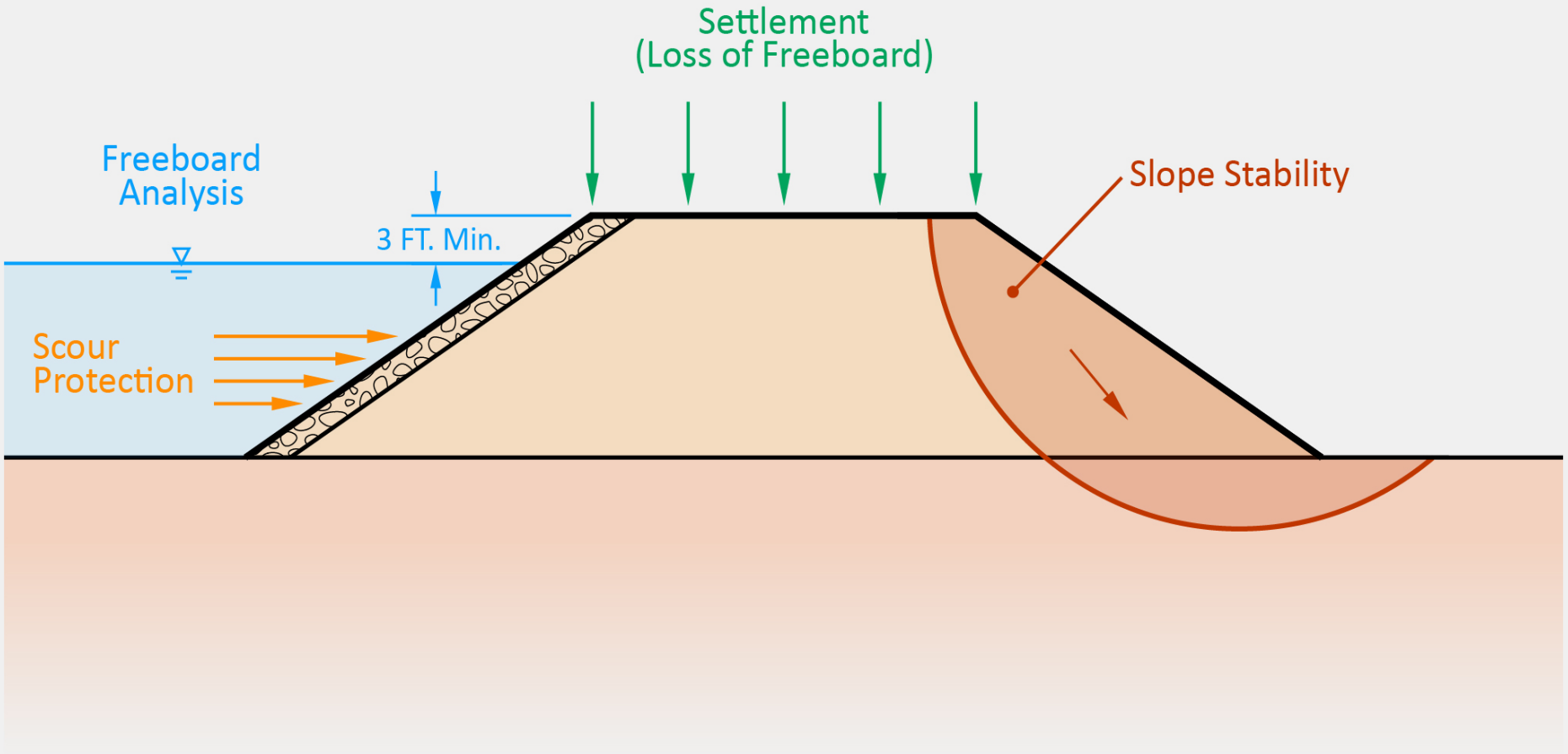

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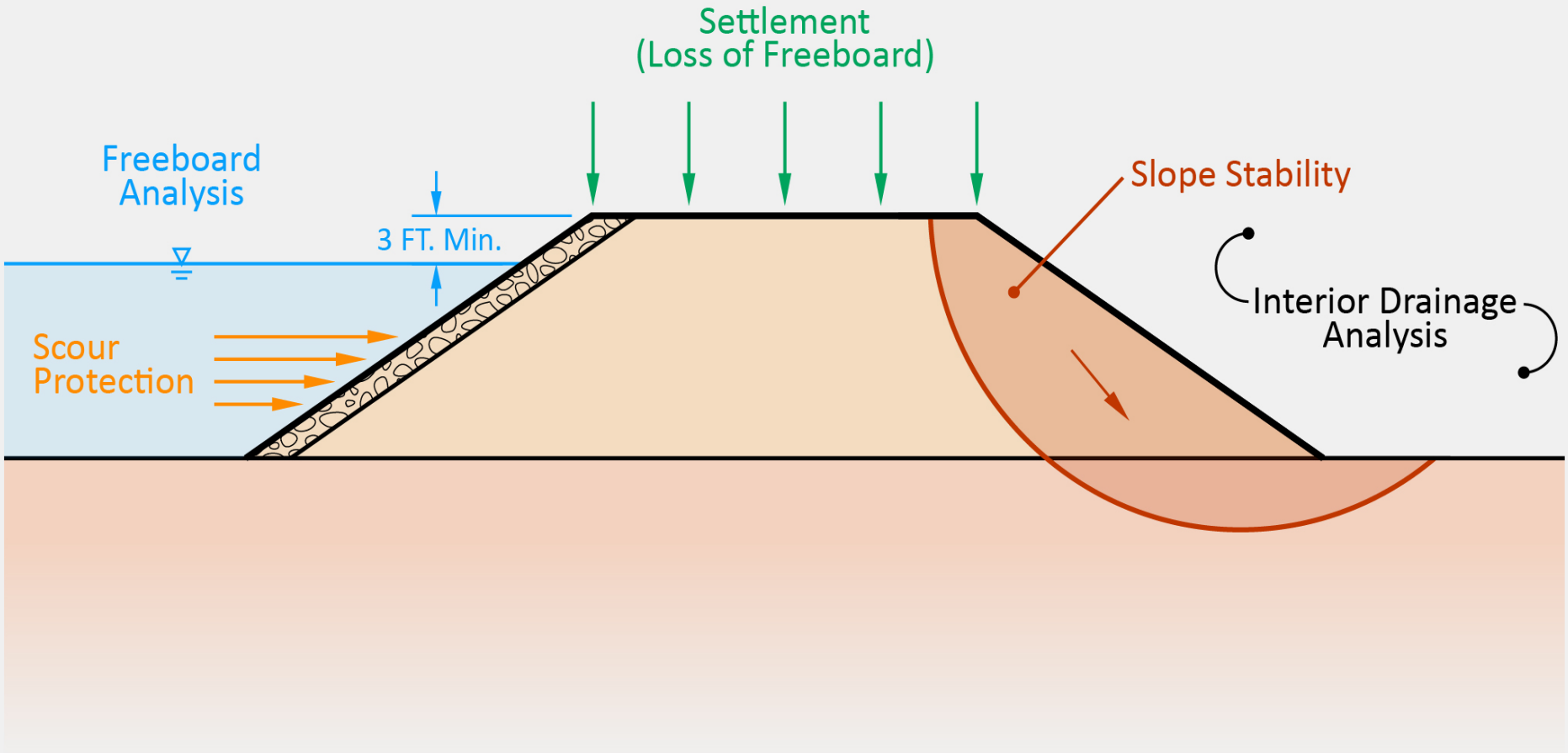

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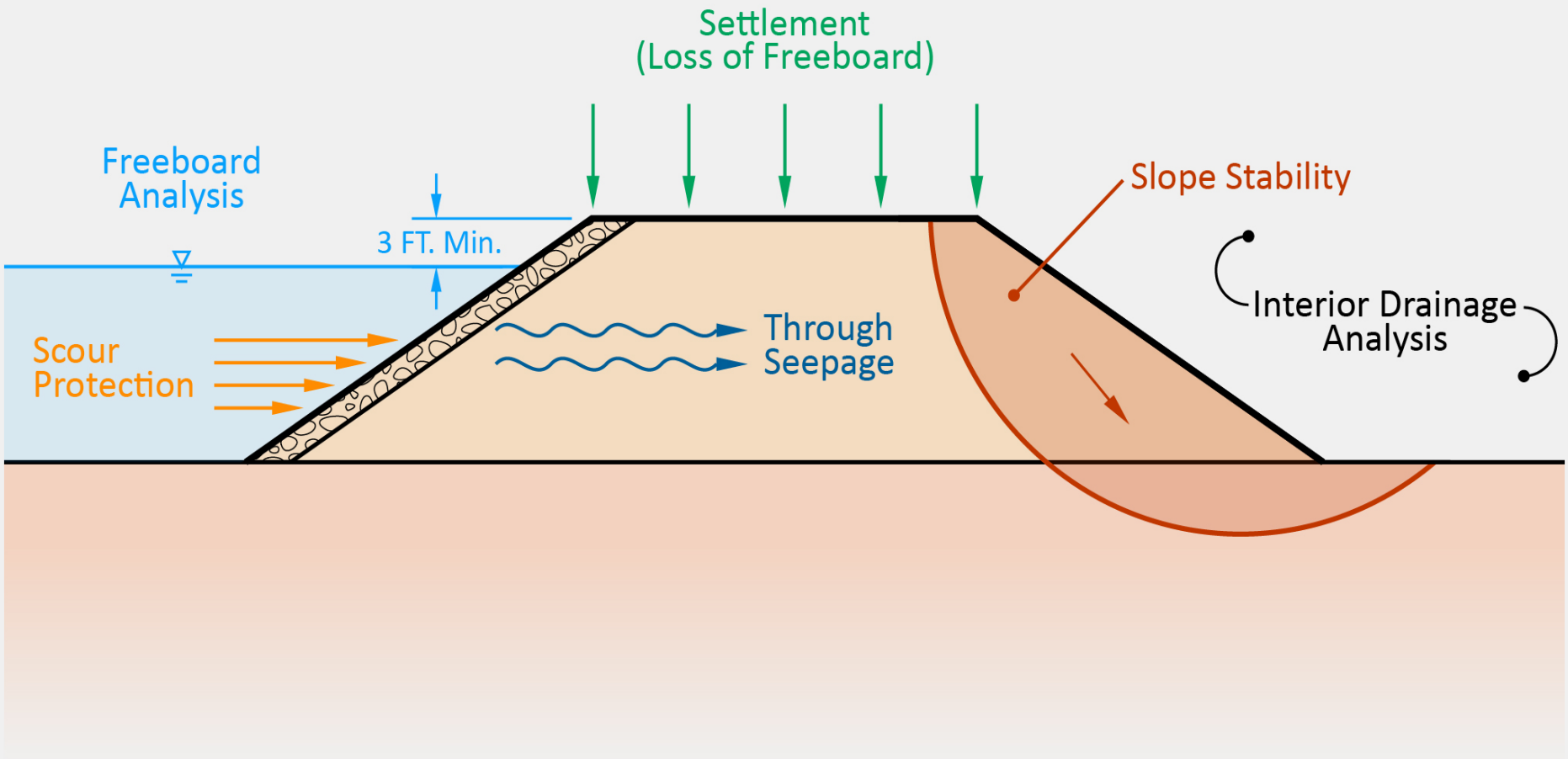

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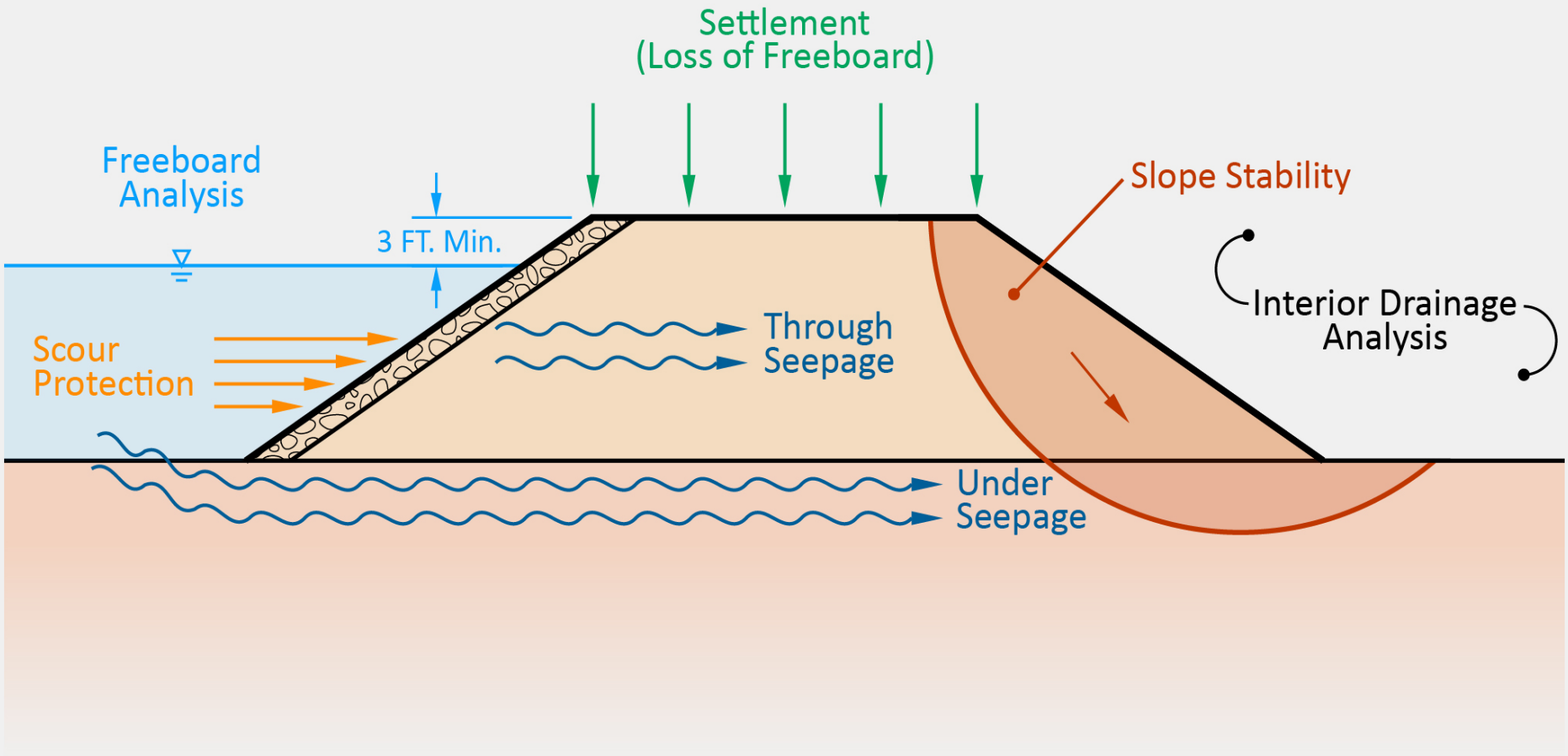

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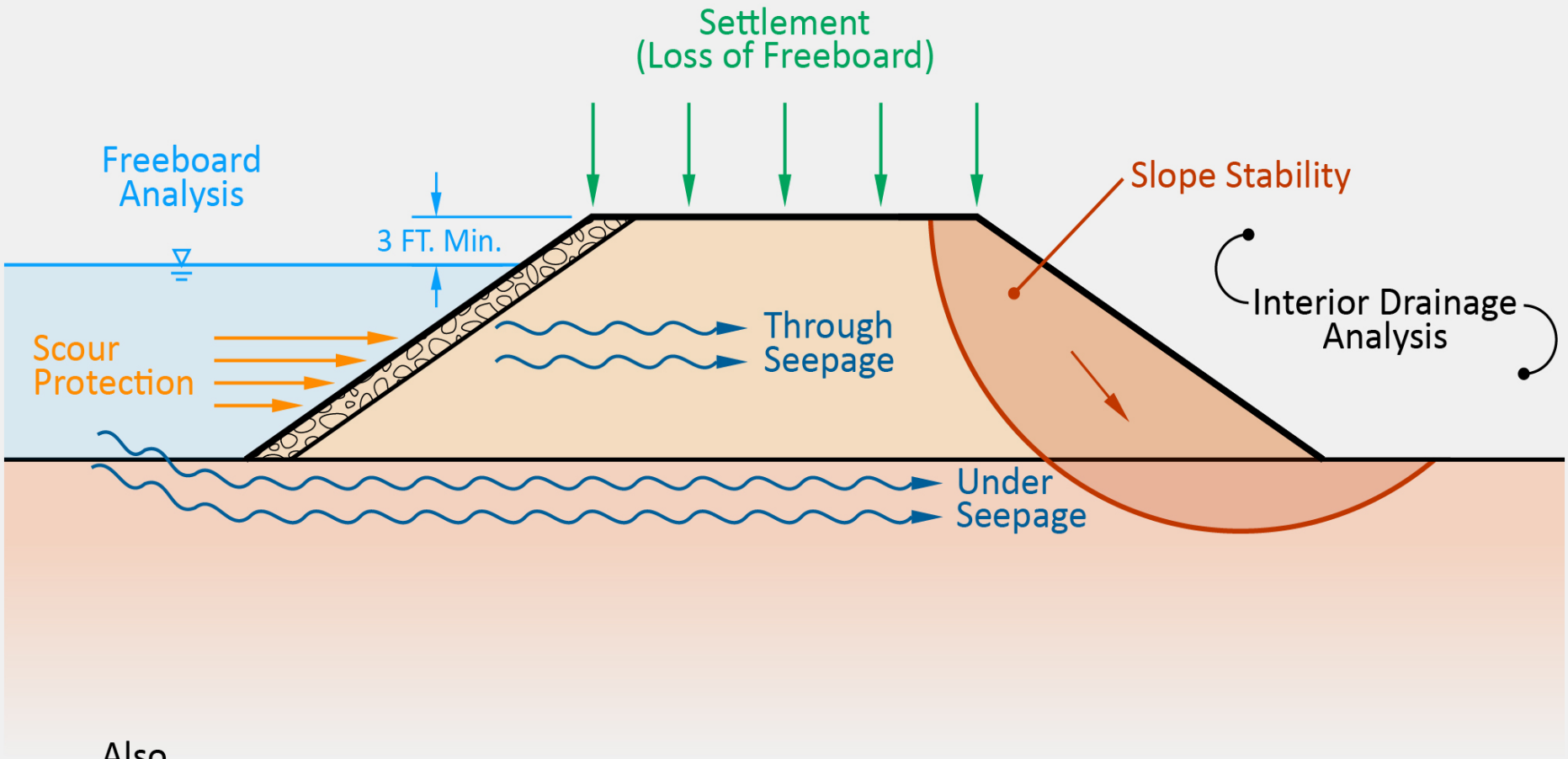


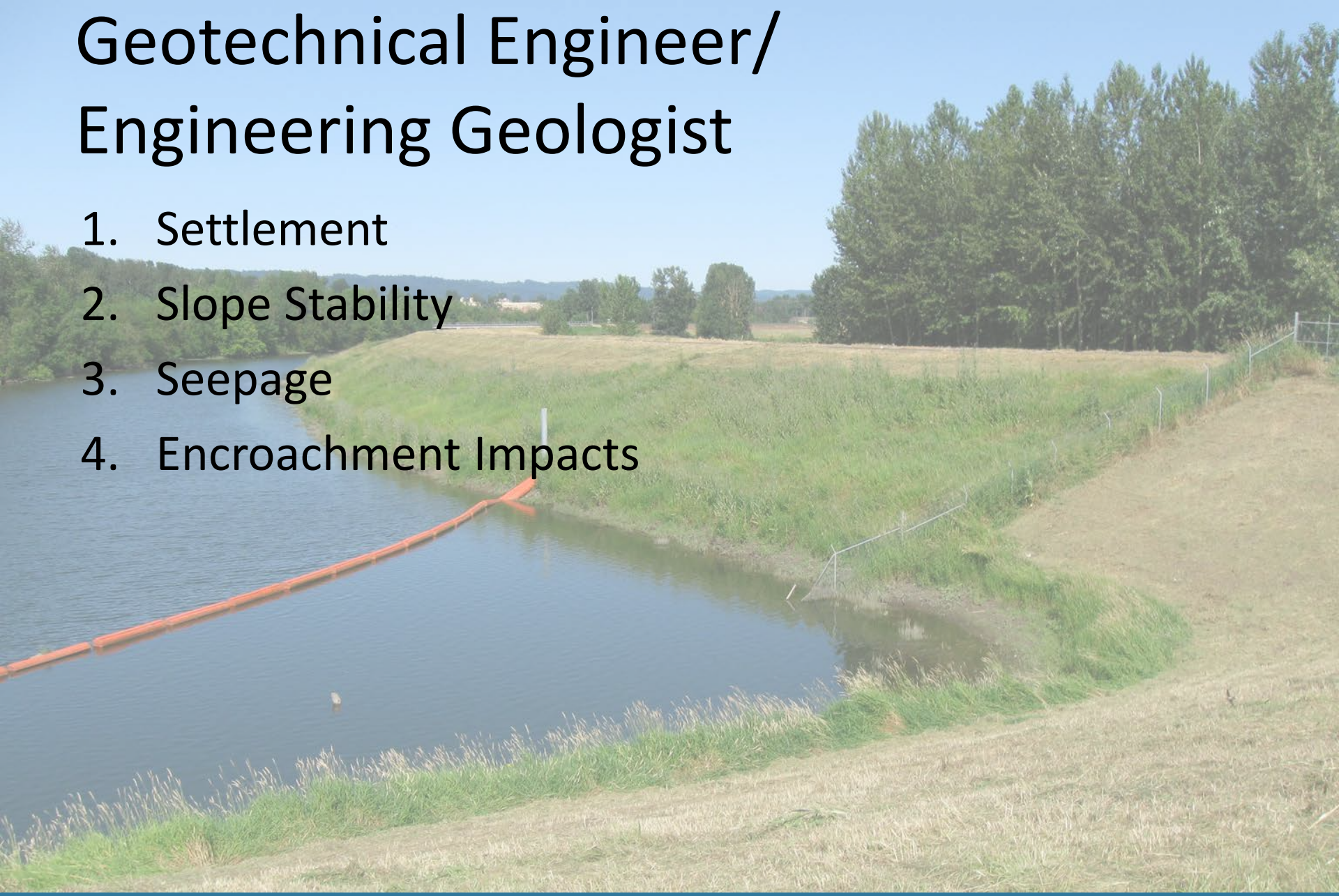
Also

- Check Closure Structure Design
- Operation and Maintenace Manuals
- Encroachments

What Specialists Needed?

Geotechnical Engineer/ Engineering Geologist

1. Settlement
2. Slope Stability
3. Seepage
4. Encroachment Impacts

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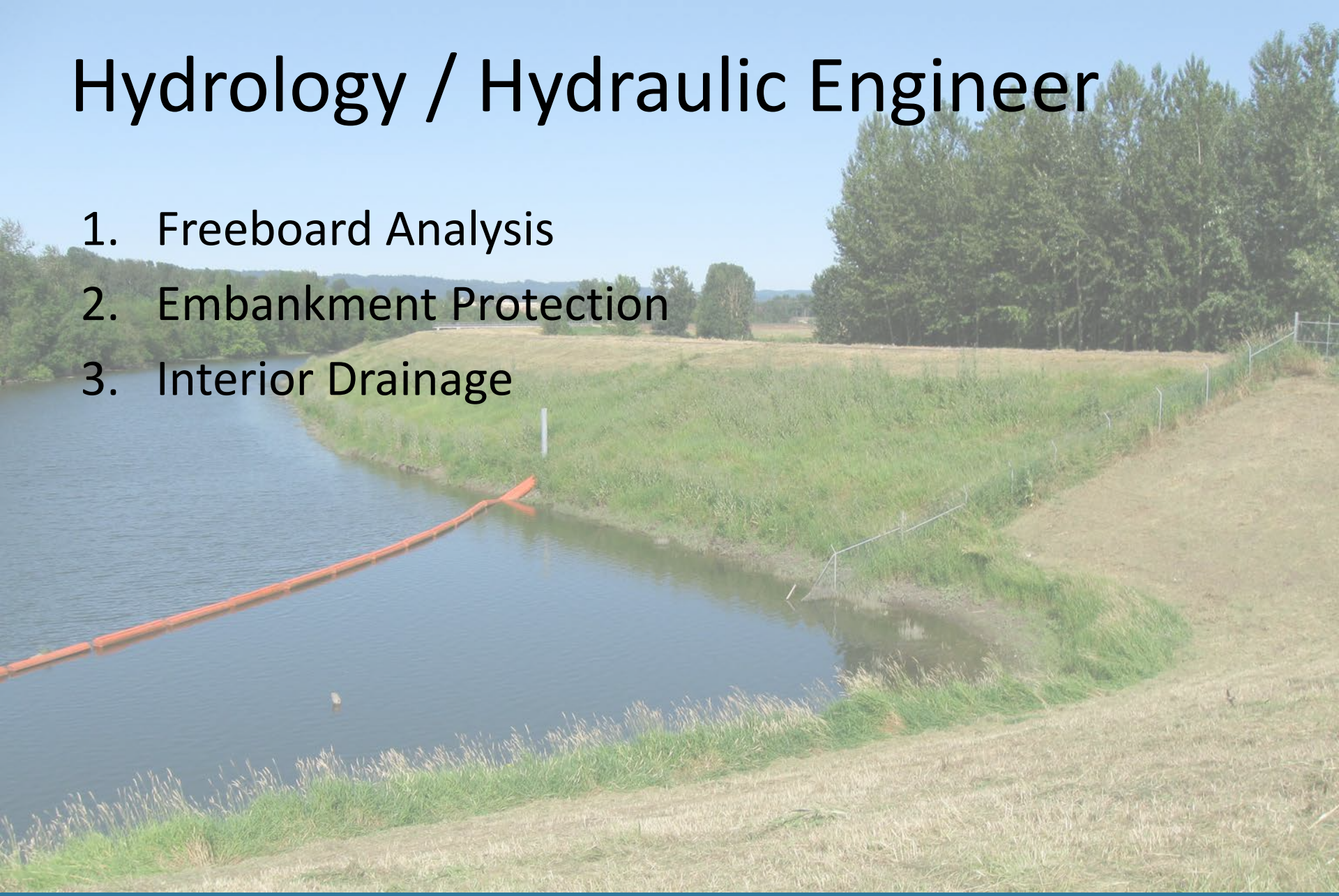
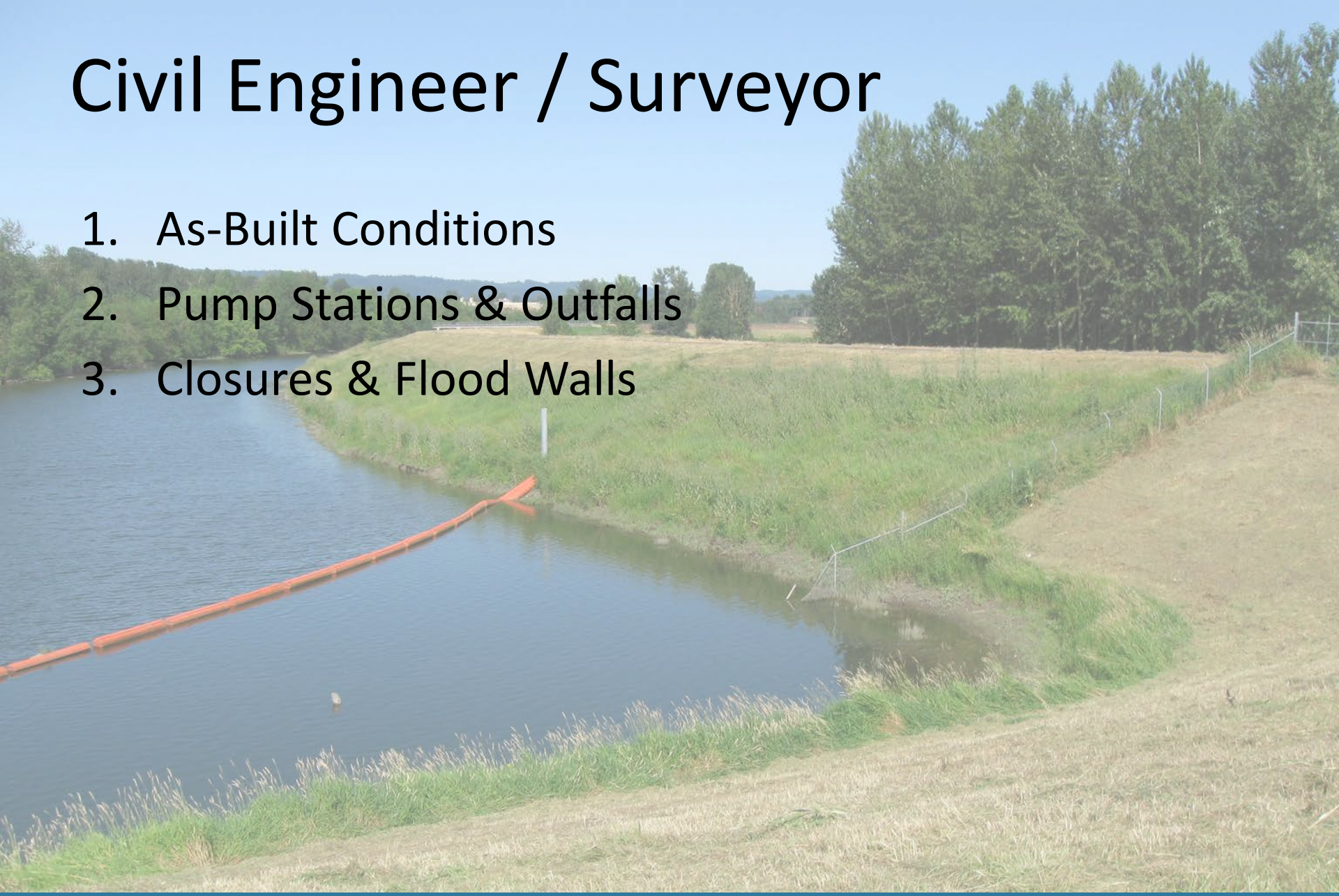
Hydrology / Hydraulic Engineer

1. Freeboard Analysis
2. Embankment Protection
3. Interior Drainage



Civil Engineer / Surveyor

1. As-Built Conditions
2. Pump Stations & Outfalls
3. Closures & Flood Walls



Phased Approach

- Phase 1 – Background Review / Gap Study
- Phase 2 – Field & Laboratory Investigations
- Phase 3 – Engineering Analyses
- Phase 4 – Summarize & Submit to FEMA

Drilling Guidelines

- From USACE Manuals / Technical Letters

1. EC 1110-2-6067 “USACE Process for the National Flood Insurance Program (NFIP) Levee System Evaluation”
2. ETL 1110-2-569 “Design Guidance for Levee Underseepage”

Design Guidance for Underseepage

1. Need adequate amount of subsurface exploration
2. Minimum of 3 borings every 1,000 feet
3. Performed at riverside toe, landward side toe, and crest
4. Use geophysics in between as needed
5. More borings in urban/problem areas

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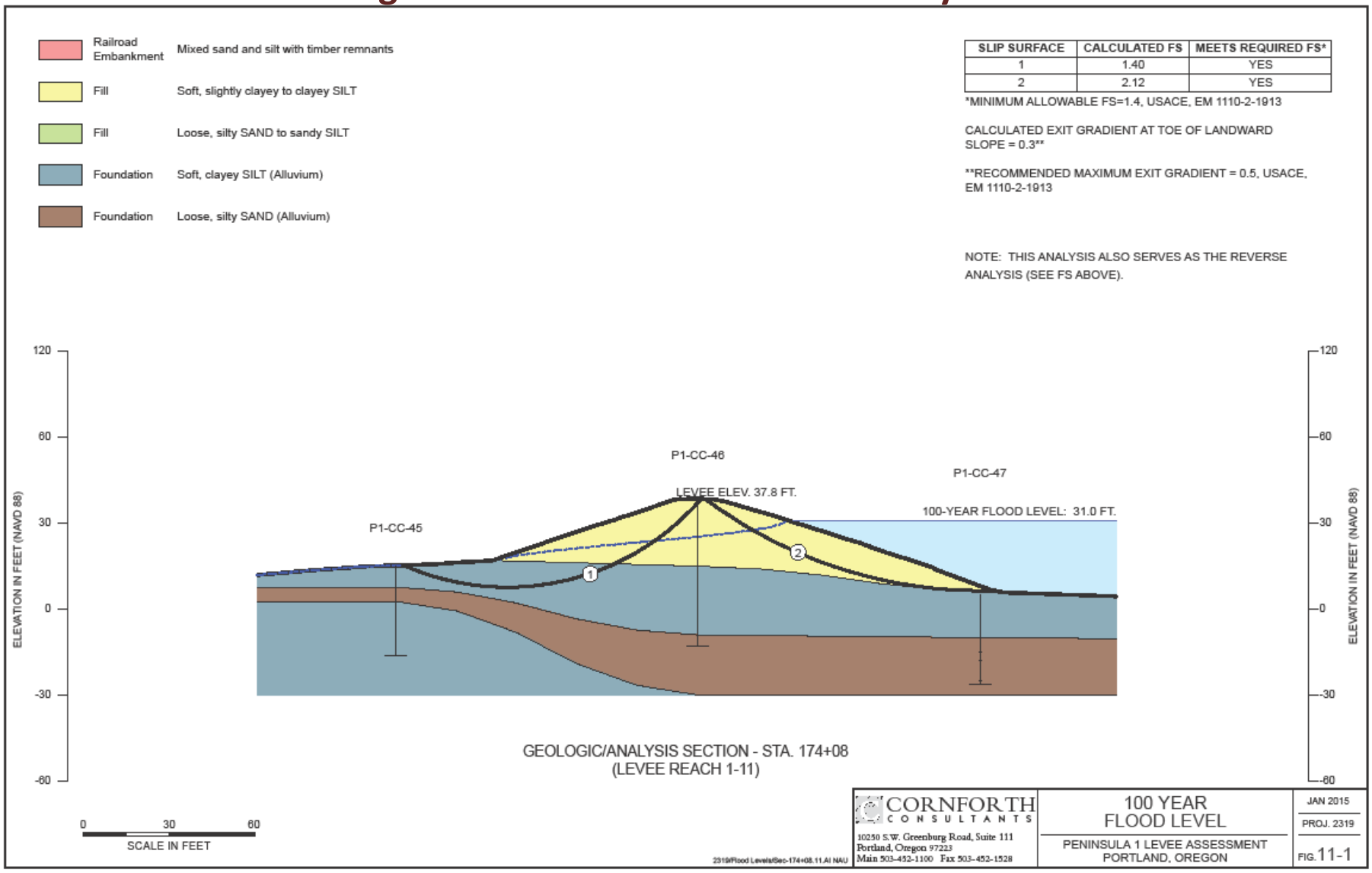
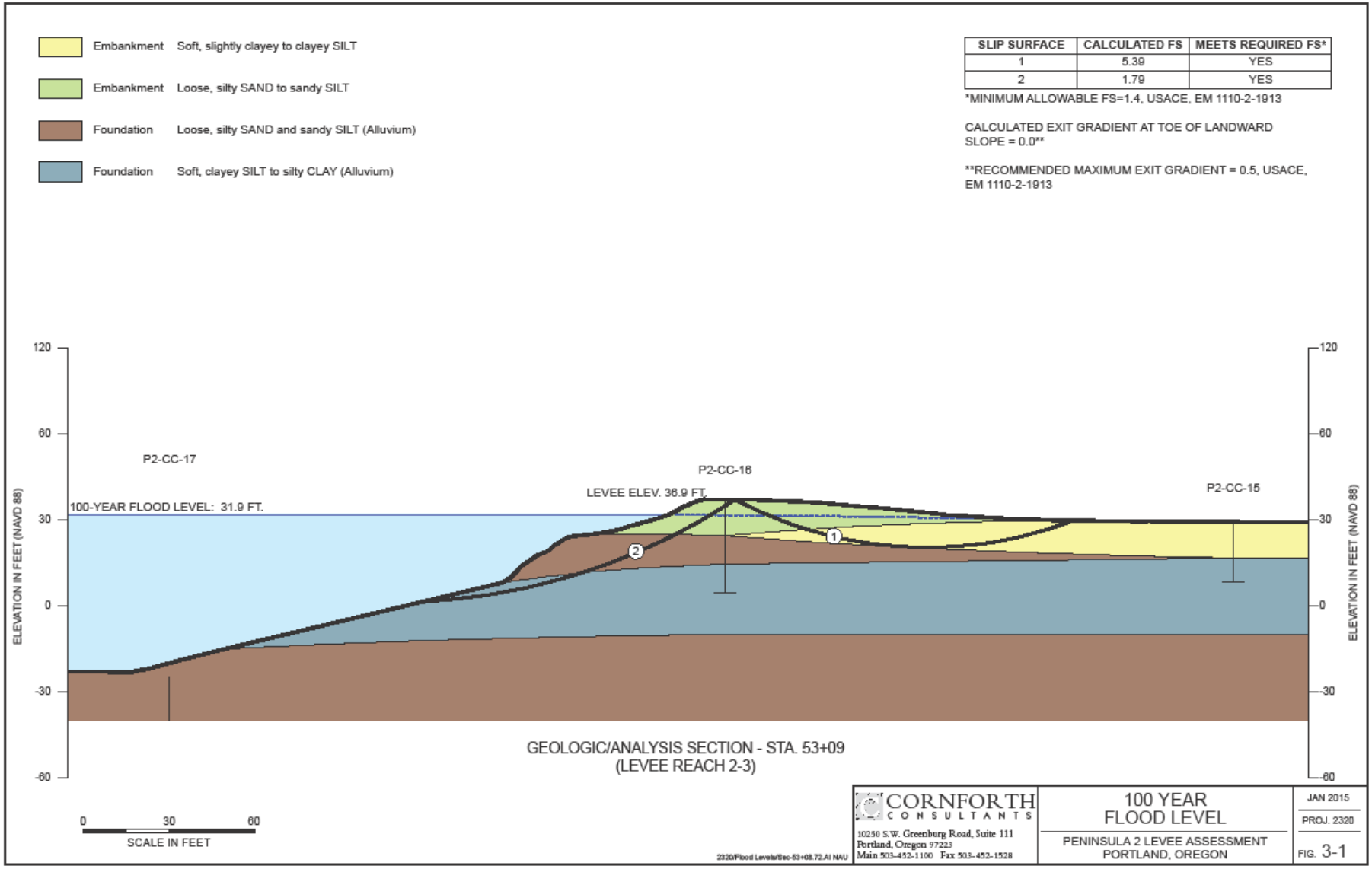
PEN 1 – Columbia Slough Levee near PIR - 100 Year Analysis



PEN 2 – Bridgeton Road Levee - 100 Year Analysis



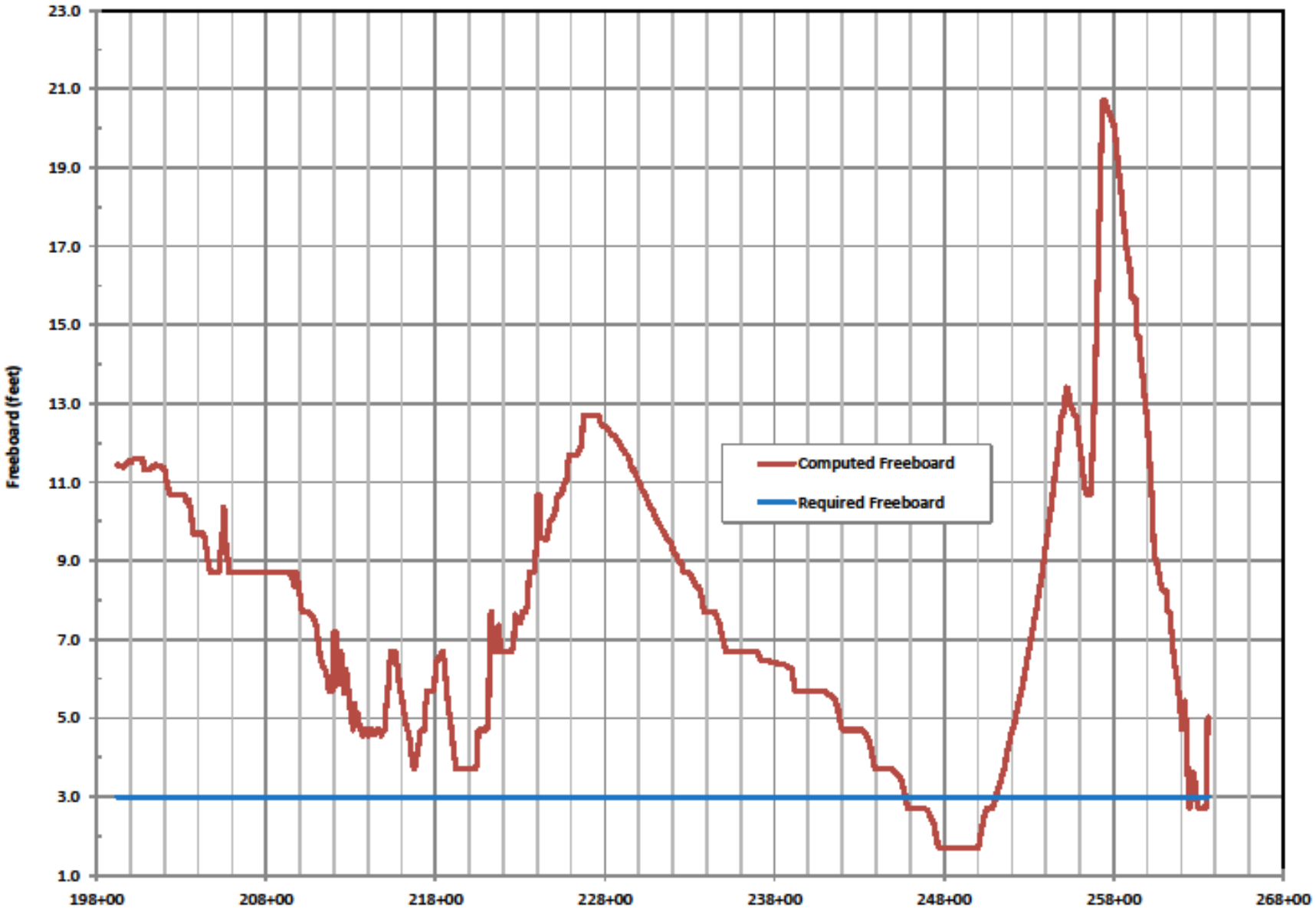
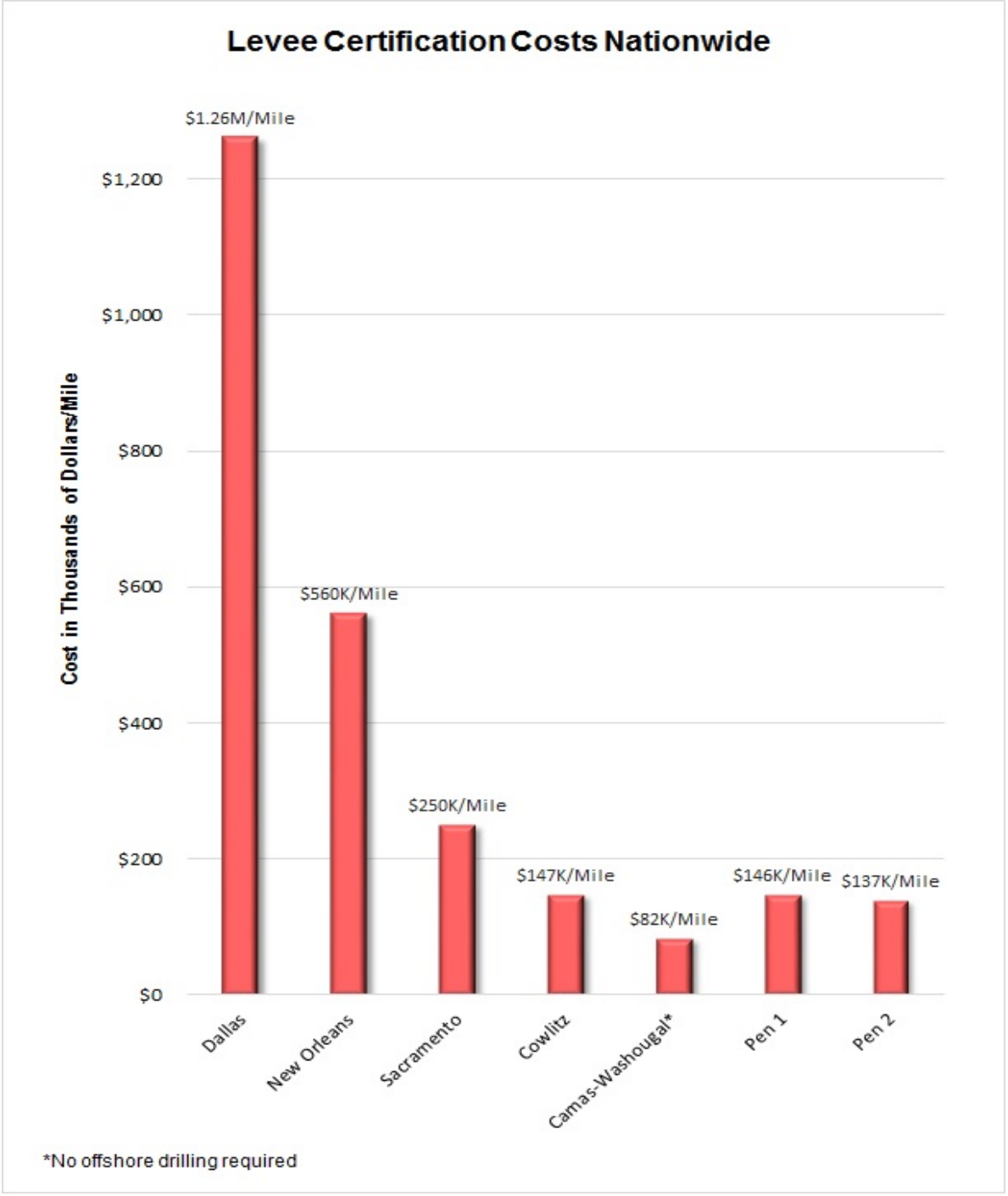


Figure 5 - PEN 1 "Cross Levee" Computed Versus Required Freeboard


Levee Certification Costs Nationwide
Cost in Thousands of Dollars/Mile
$1.26M/Mile
$560K/Mile
$250K/Mile
$147K/Mile
$82K/Mile
$146K/Mile
$137K/Mile
$1,200
$1,000
$800
$600
$400
$200
$0
Dallas
New Orleans
Sacramento
Cowlitz
Camas-Washougal*
Pen 1
Pen 2
*No offshore drilling required

We don’t have a flooding problem, we have a land use problem.

Floods are acts of god but flood losses are acts of man.

Contact Info:

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Mike Meyer – Cornforth Consultants
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Additional Resources:

www.floodsmart.gov
http://www.mcdd.org/levee-accreditation/