KETCHIKAN GATEWAY BOROUGH, AK
FLOOD RISK REVIEW MEETING

AUGUST 4, 2016

FEMA

Agenda

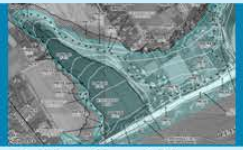
Flood Risk Review

- Background
- Flood Study Methodologies
- Risk Assessment Work
- RiskMAP Process
- Flood Study Process
- FEMA and State Contacts
- Review of Data/Changes from Existing Maps

RiskMAP, the NFIP and Hazard Mitigation Planning

RiskMAP

Increasing Resilience Together

	Deliver High-Quality Risk Data	Increase Awareness of Flood Risk	Promote Community Mitigation Actions
Goals			
			
Products	▪ Intuitive Flood Maps ▪ Credible data- reliable, accurate, watershed-based ▪ Illustrations of Flood Depths ▪ Valuable Flood Risk Assessments	▪ Tools to understand how flood risk has changed ▪ Continuous engagement with communities ▪ Enable communities to communicate flood risk to constituents	Support that allows communities to identify and risks and promote: ▪ Community resiliency ▪ Sustainability ▪ Reduced need for federal disaster assistance

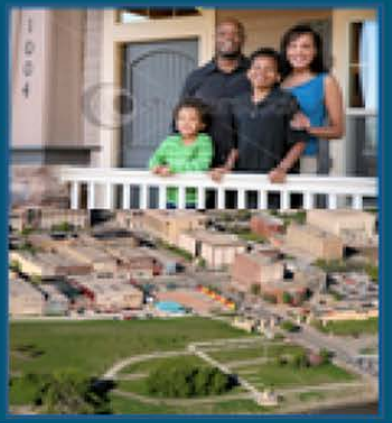
Processes

MITIGATION PLANNING

Enhance delivery of Risk MAP Products

Collaborate across all levels of government

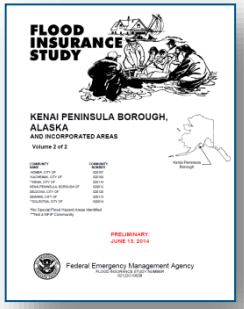
Reduce Risk to Lives and Property



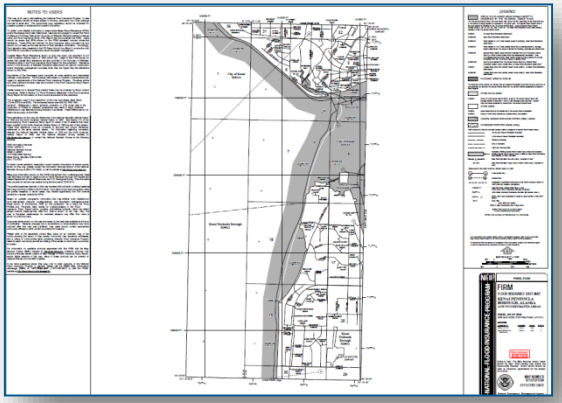
Regulatory & Non-Regulatory RiskMAP Products

Regulatory Products

- **Flood Insurance Study (FIS)**



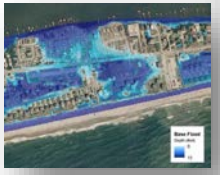
- **Flood Insurance Rate Maps (FIRM)**



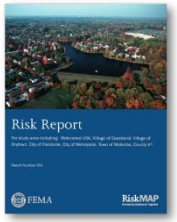
Non-Regulatory Products

- **Changes Since Last FIRM**

- **Flood Depth Grids**



- **HAZUS Risk Assessment**
- **Risk Report**



- **Risk Database**

How the National Flood Insurance Program (NFIP) Works

Three disciplines of the NFIP:

- **Mapping – Flood Studies**
- **Regulations**
- **Insurance**

Project Team

- FEMA Region X
- State of Alaska
- FEMA Contractor -STARR
- Ketchikan Gateway Borough Alaska
- City of Ketchikan
- City of Saxman

STARR
Strategic Alliance for Risk Reduction

KETCHIKAN GATEWAY BOROUGH
Alaska

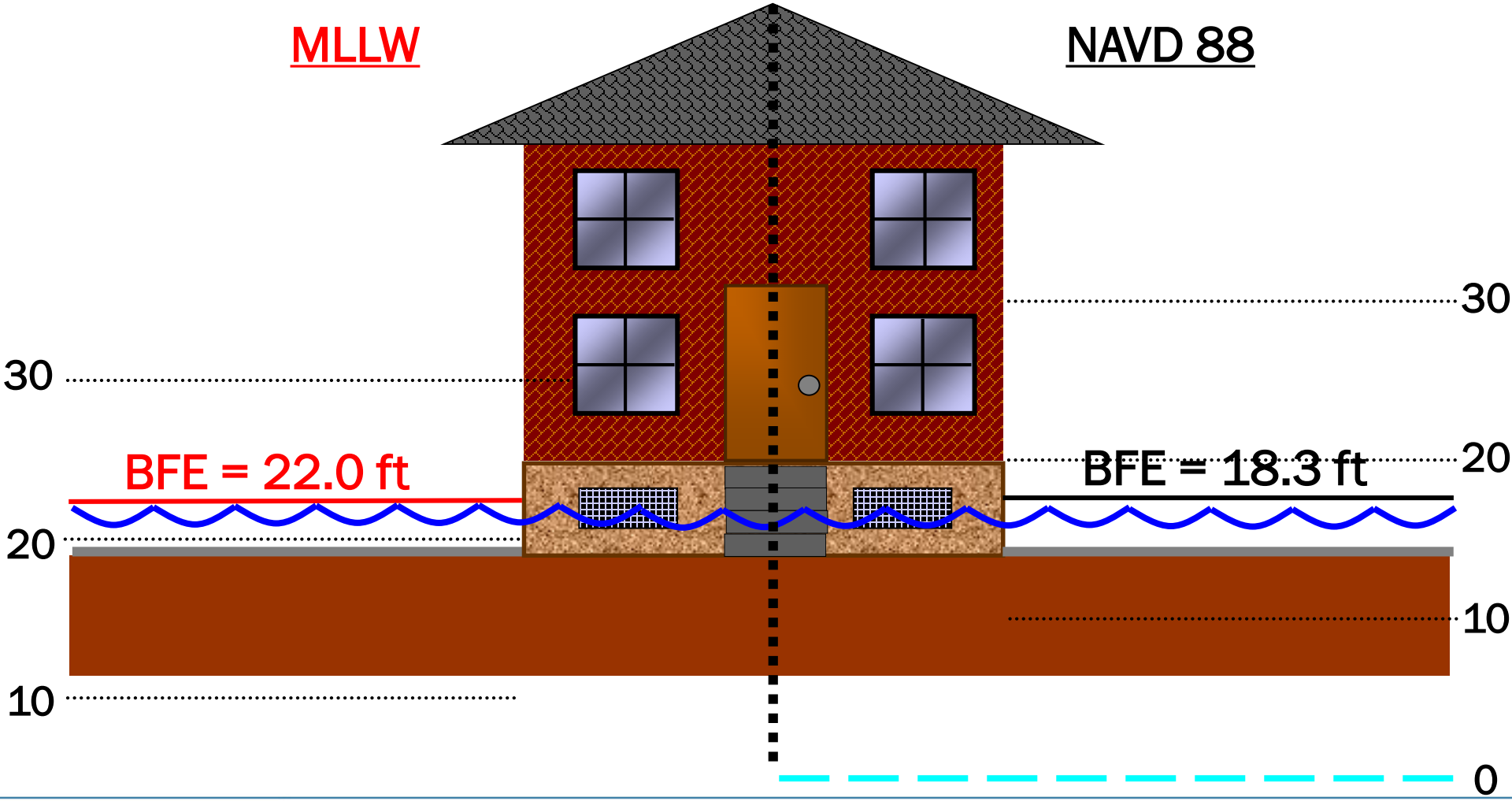
What's new

Vertical Datum Change

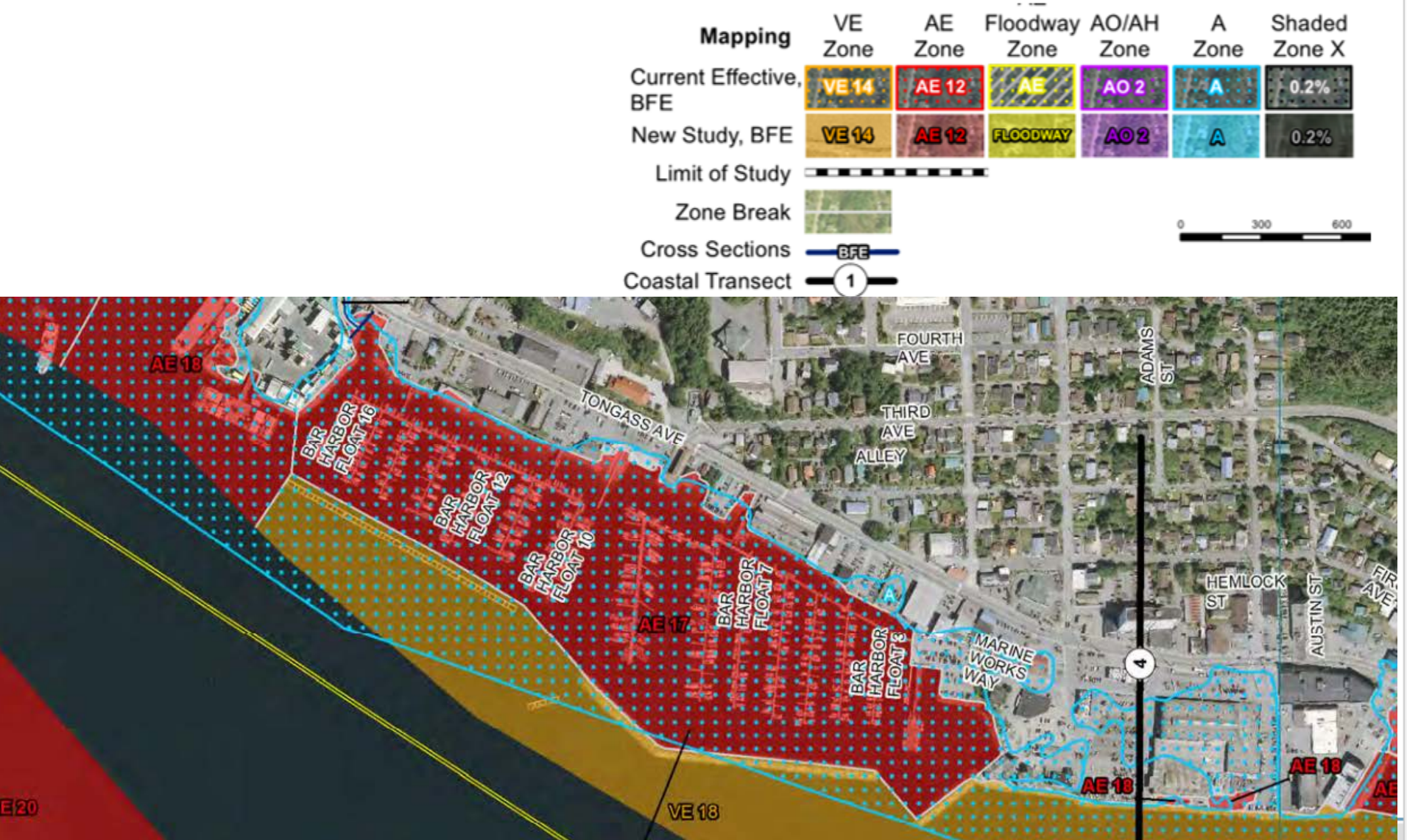
- **MLLW**
  - Mean Lower Low Water - **The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch**
- **NAVD 88**
  - Based on the density of the Earth instead of varying values of sea heights
  - More accurate
- **Conversion for Ketchikan, AK**
  - MLLW -3.7' = NAVD 88

Digital Flood Insurance Rate Maps

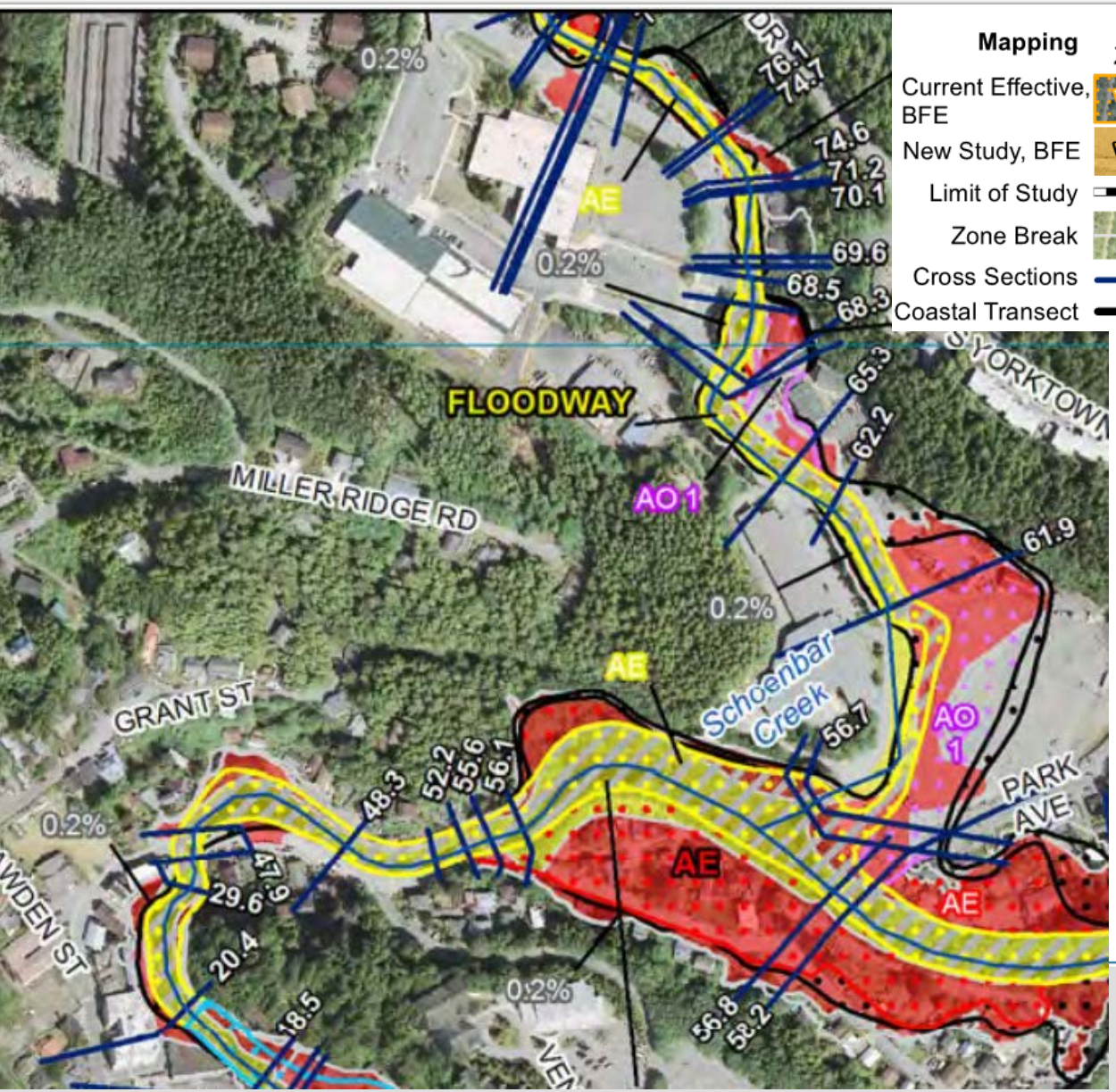
Vertical Datum and FIRMs (e.g. uses -3.7' conversion)



Draft Map Labeling Coastal



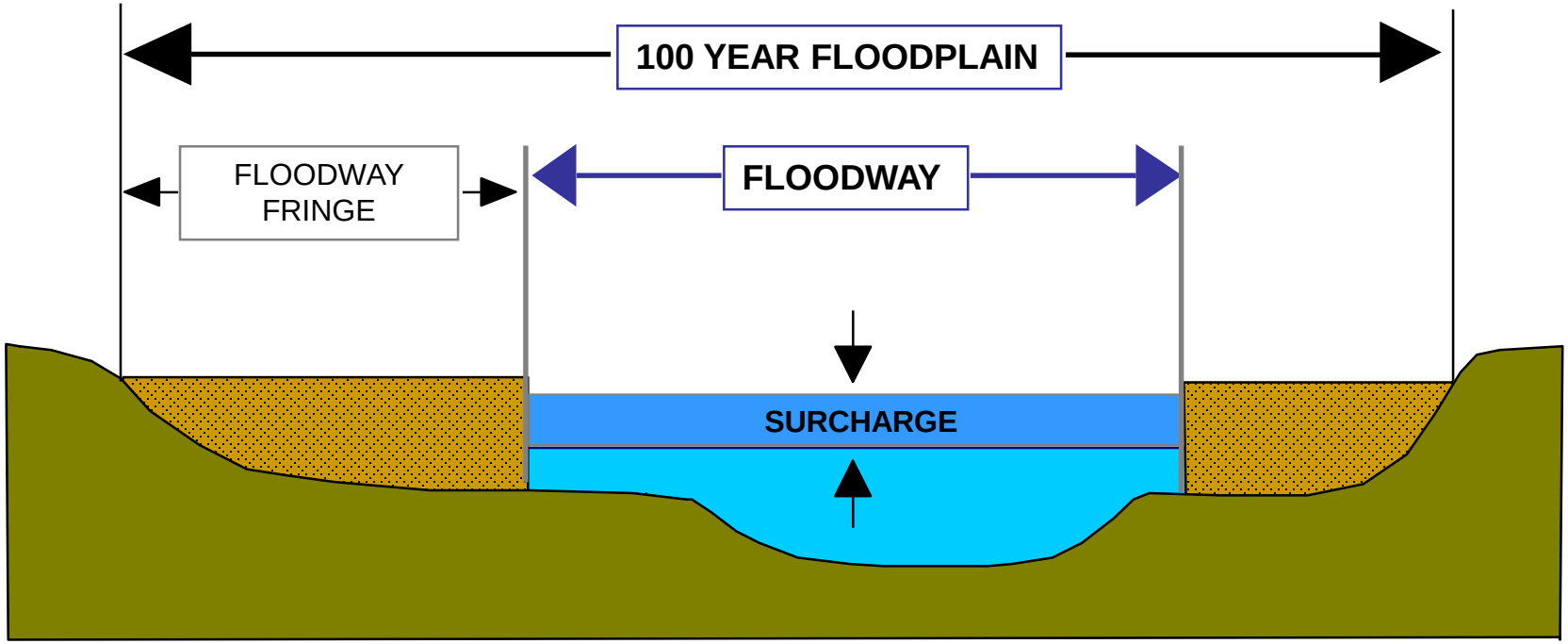
Draft Map Labeling
RIVERINE



Mapping	VE Zone	AE Zone	Floodway Zone	AO/AH Zone	A Zone	Shaded Zone X
Current Effective, BFE	VE 14	AE 12	AE	AO 2	A	0.2%
New Study, BFE	VE 14	AE 12	FLOODWAY	AO 2	A	0.2%
Limit of Study						
Zone Break						
Cross Sections			BFE			
Coastal Transect			1			

0 300 600

Floodway Schematic



FLOODWAY + FLOODWAY FRINGE = 100 YEAR FLOODPLAIN
SURCHARGE NOT TO EXCEED 1.0 FEET

Ketchikan Mapping Process

Ketchikan Discovery Meeting – August 7, 2013

Partnership Agreement – August 12, 2014

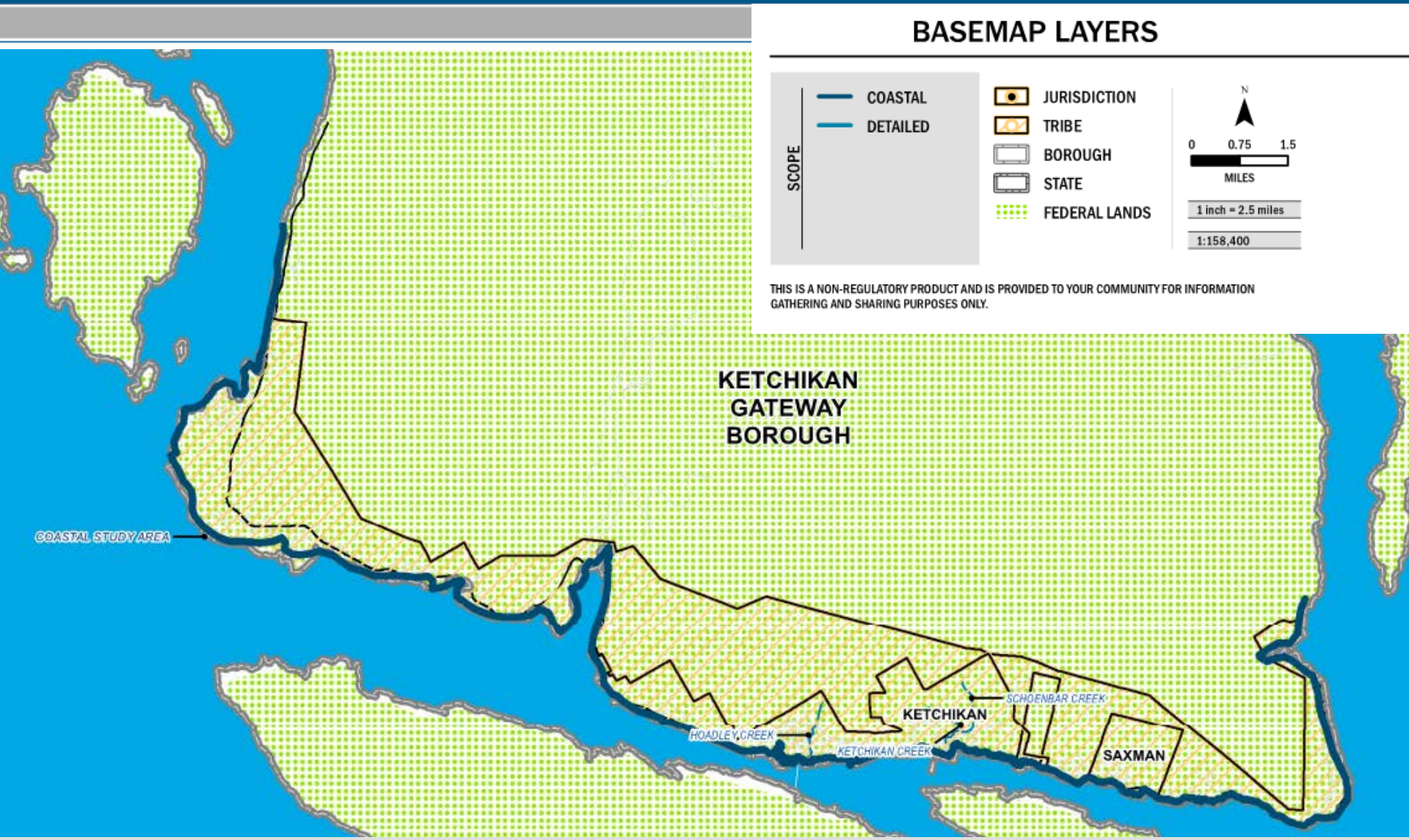
Draft Maps Provided – March 7, 2016

Flood Risk Review– August 4, 2016

SCOPE OF WORK

- LiDAR
- Field Survey
- Coastal
  - 60 miles of coastal analysis (12 transects)
- Riverine
  - Updated Detailed Studies (Hydrology and Hydraulics)
    - 0.8 miles of Hoadley Creek
    - 1.3 miles of Ketchikan Creek
    - 1.1 miles of Schoenbar Creek
  - Redelineation of Detailed Study
    - 0.1 miles of Carlanna Creek
- Risk MAP Products
  - Depth grids, Analysis Grids, Multi-hazard Risk Assessment, CSLF, BFE+1,2,3 Risk Report, Risk Database

SCOPE OF WORK



Field Survey Collection

- Collected by Atkins in August 2014
- Structures and cross sections were surveyed on the AE study reaches of the Hoadley Creek, Ketchikan Creek, and Schoenbar Creek
- Deliverables included field survey points, sketches, and photographs

RIVERINE STUDIES - HYDROLOGY

- Rainfall-Runoff model - Ketchikan Lake Dam based on 2009 WESCORP study
- Regression calculations based on 4 inputs
- Discharges computed for 0.2%, 1%, 2%, 4%, 10%, and 1% plus annual chance events

Comparison to effective Discharge

Hoadley Creek at Mouth

Event	Proposed Discharge (cfs)	Effective Discharge (cfs)	% Change
10%	580	390	+49%
2%	760	515	+48%
1%	**820**	**570**	**+44%**
0.2%	990	690	+43%

Comparison to effective Discharge

Ketchikan Creek at Mouth

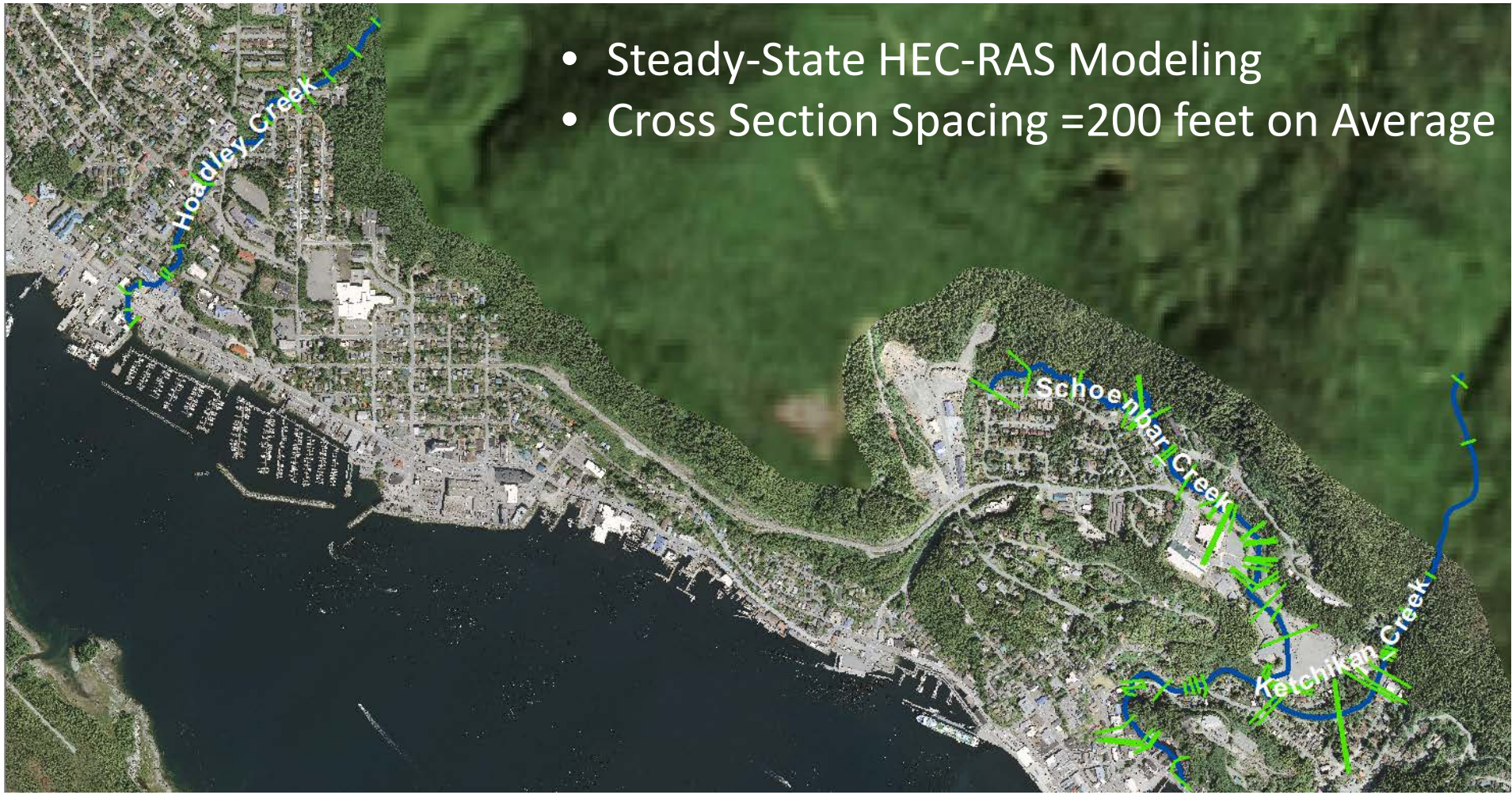
Event	Proposed Discharge (cfs)	Effective Discharge (cfs)	% Change
10%	4,460	4,200	+6%
2%	5,800	5,950	-3%
1%	**6,380**	**6,800**	**-6%**
0.2%	7,810	8,200	-4%

Comparison to effective Discharge

Schoenbar Creek at Mouth

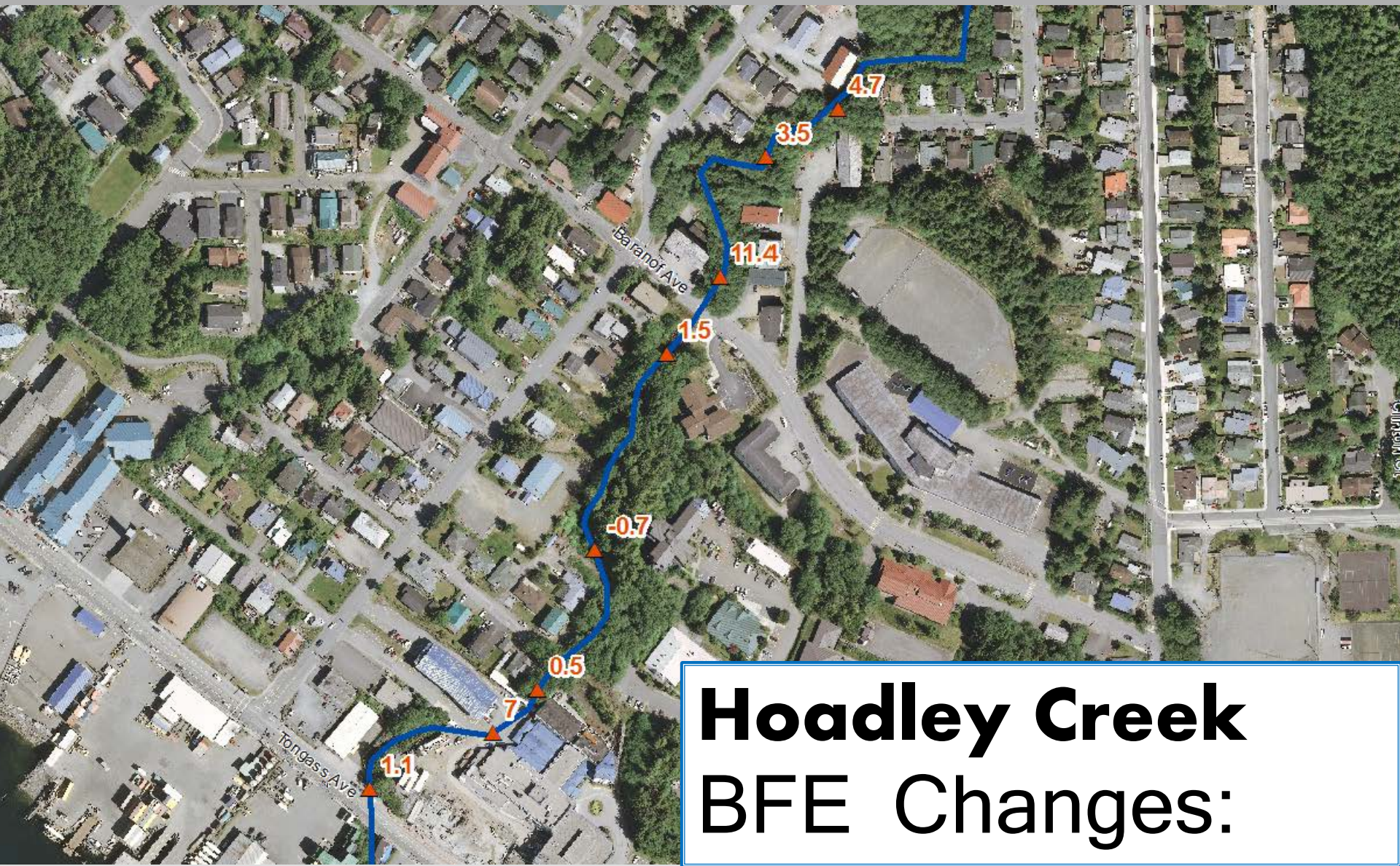
Event	Proposed Discharge (cfs)	Effective Discharge (cfs)	% Change
10%	850	620	+37%
2%	1,100	795	+38%
1%	**1,200**	**880**	**+36%**
0.2%	1,430	1,130	+27%

RIVERINE HYDRAULICS



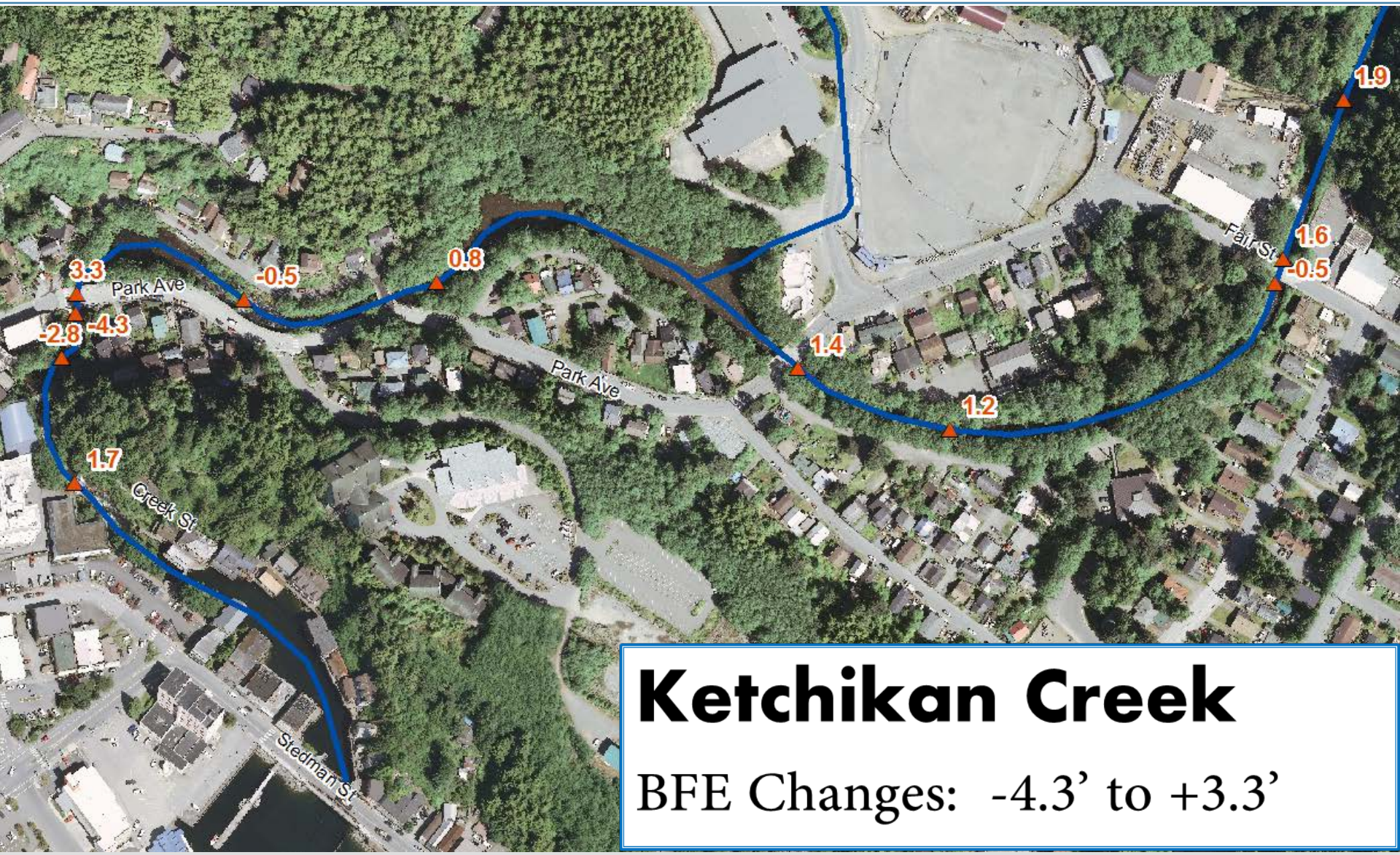
- Steady-State HEC-RAS Modeling
- Cross Section Spacing =200 feet on Average

Changes in Riverine BFE's



Hoadley Creek
BFE Changes:

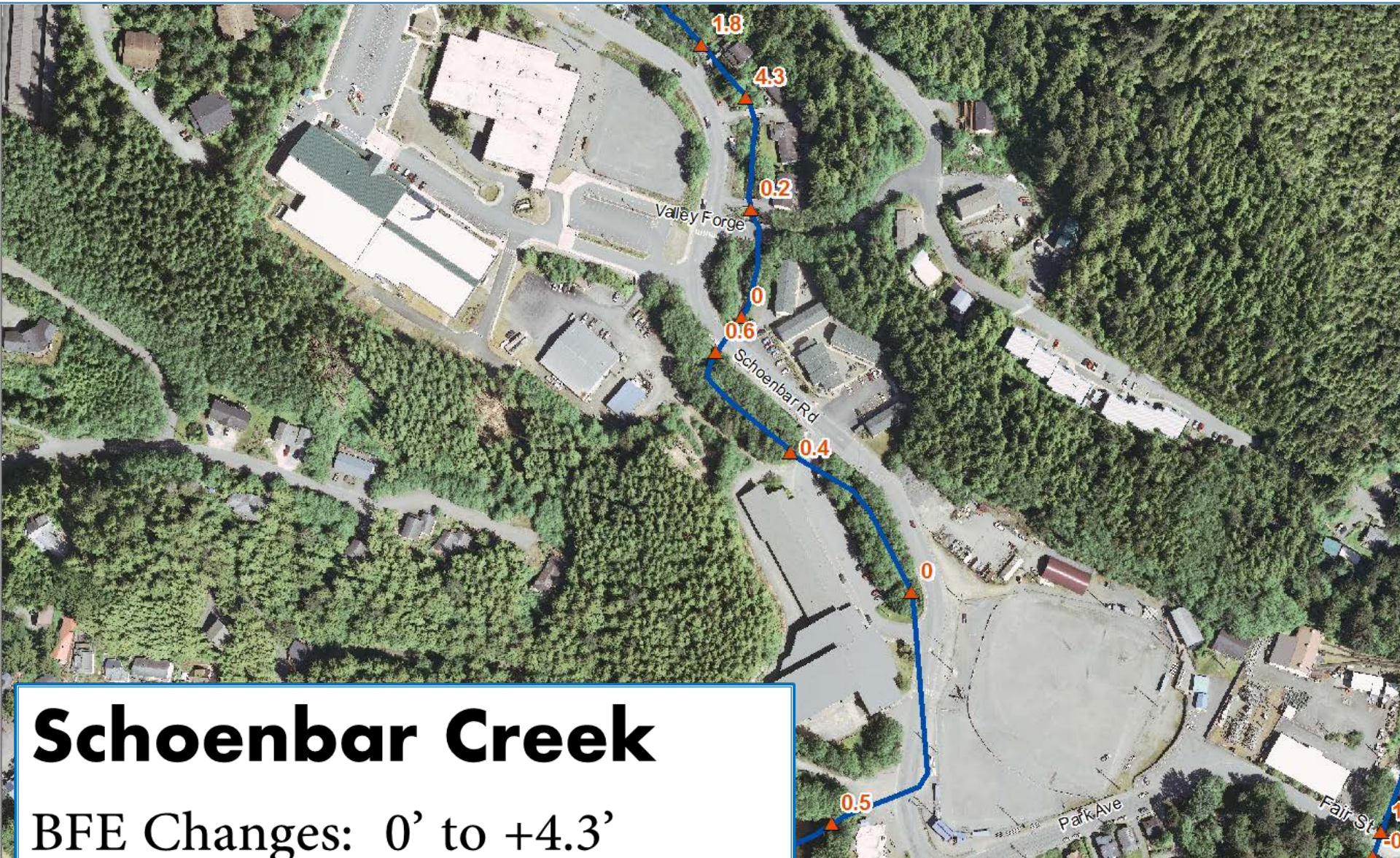
Changes in Riverine BFE's



Ketchikan Creek

BFE Changes: -4.3' to +3.3'

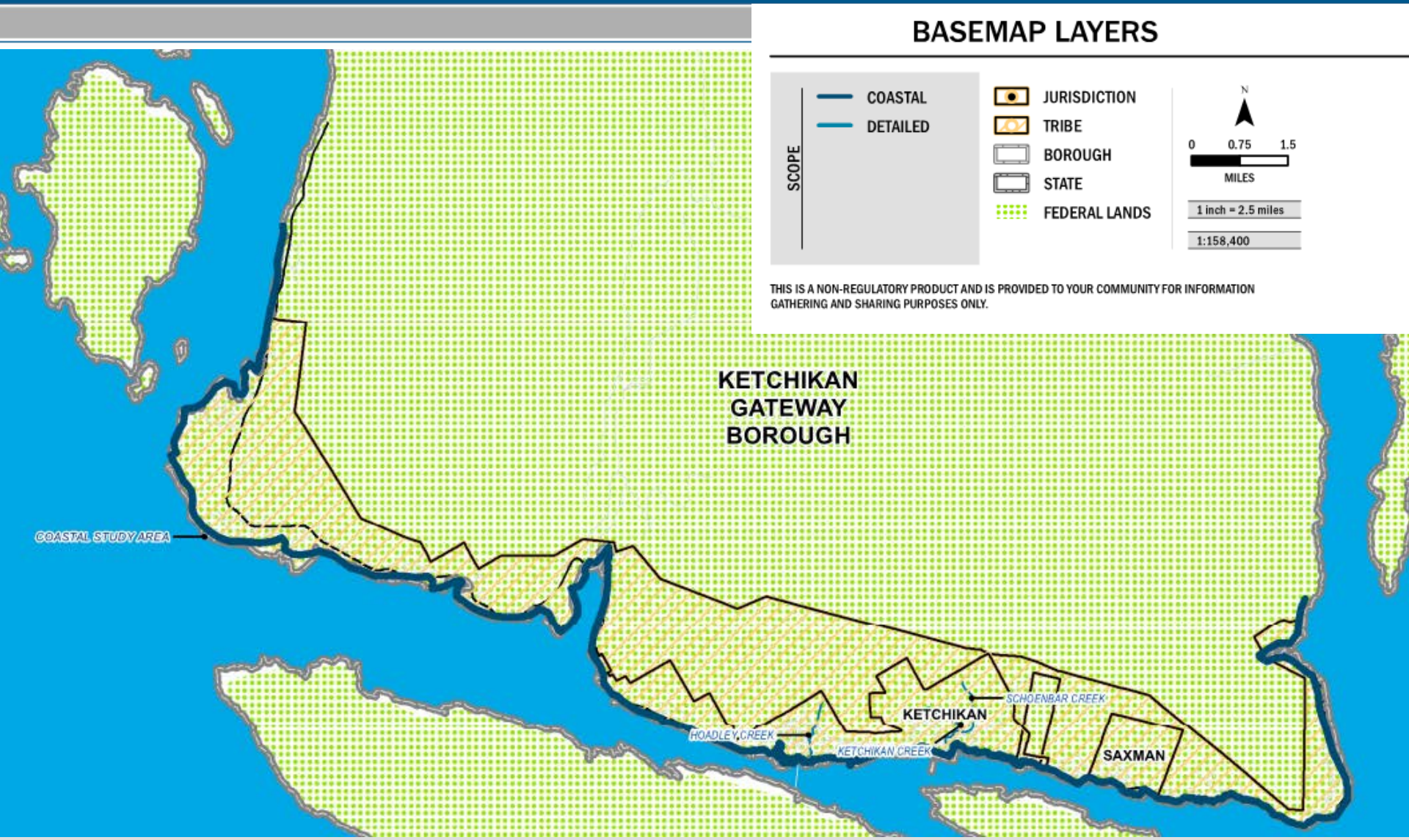
Changes in Riverine BFE's



Schoenbar Creek

BFE Changes: 0' to +4.3'

COASTAL MODELING



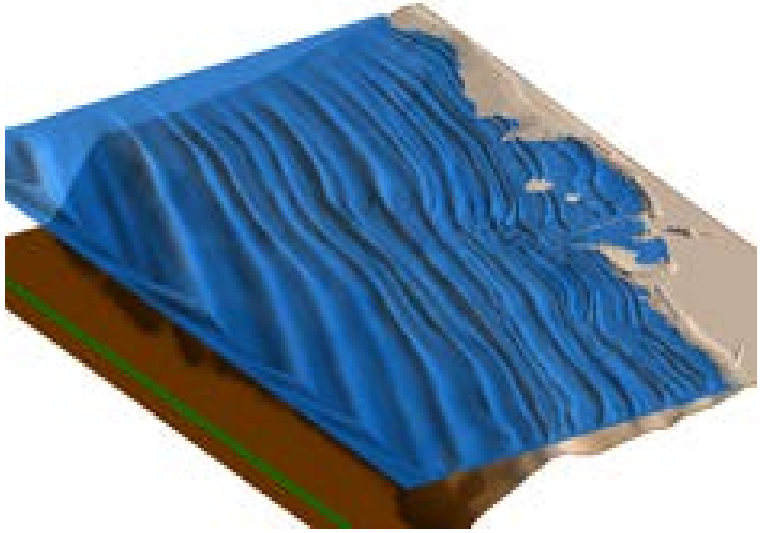
Coastal Analysis Modeling Comparison

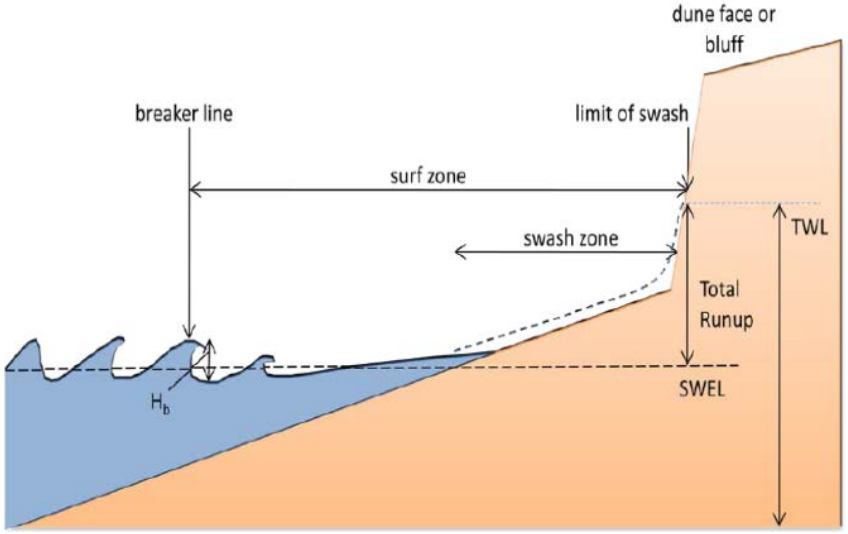
Guidelines for Coastal Flood Hazard Mapping and Analysis for Pacific Coast of the United States January 2005

	Old Approach	New Approach
Methodology	USACE Shore Protection Manual	FEMA Pacific Coast Guidelines
Wind data	Synthetic wind data	Measured wind data
Water Level Model	Water Level Gauge Data	Updated Historic Tide Gauge Data
Wave Model	1-Dimensional	2-Dimensional
Study Resolution	Calculations generalized over broad regions	Calculations using enhanced grid resolution
Topography	USGS Contour Maps	2014 LiDAR data

Coastal Flooding Overview

Regional Variation → ***Local Variation***





Tides, Storm Surge, El Niño → Wave Setup, Wave Runup

Modeling Process

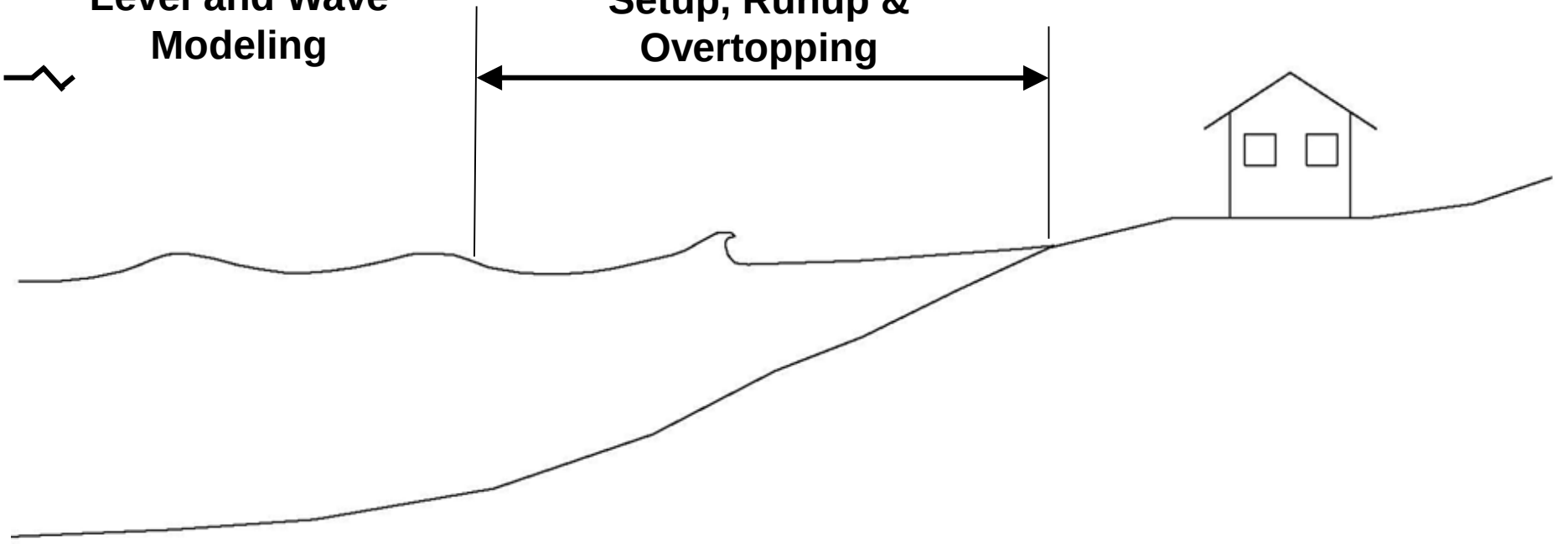
Regional Variation

Local Variation

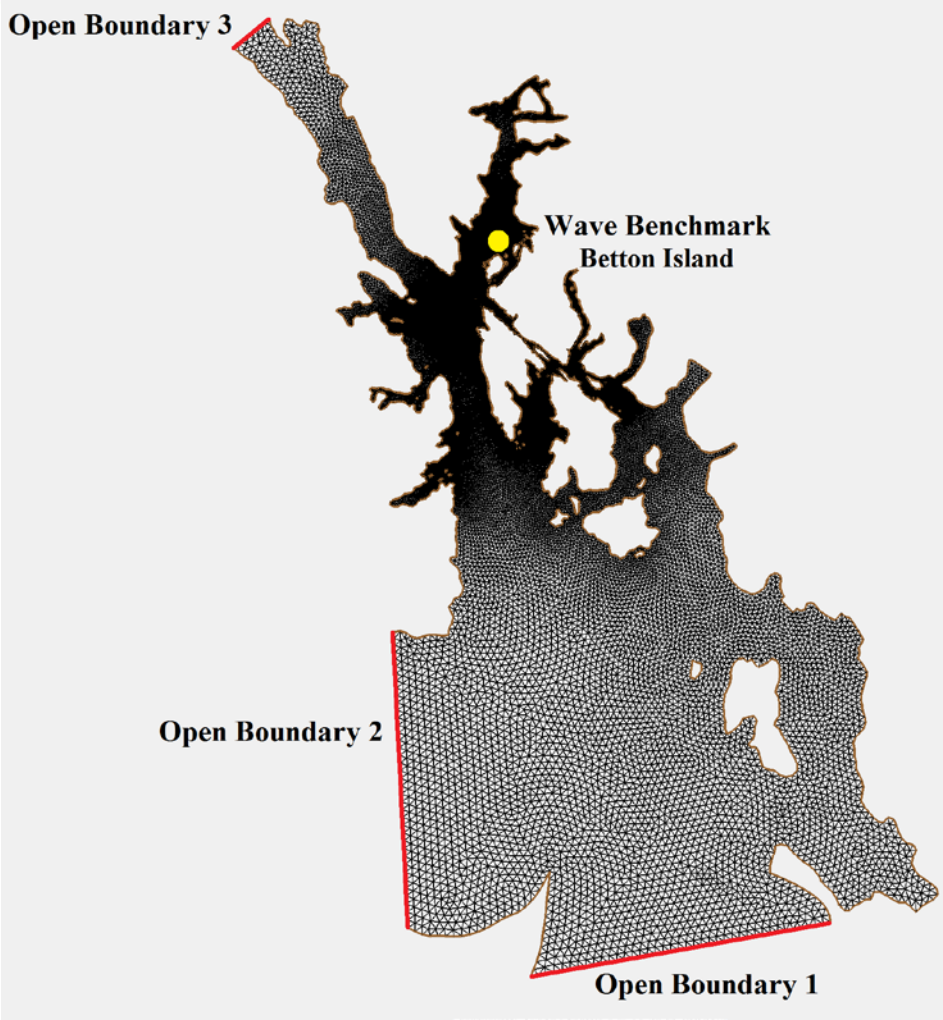
Step 1: Offshore Water Level and Wave Modeling

Step 2: Nearshore Wave Setup, Runup & Overtopping

Step 3: Floodplain Mapping

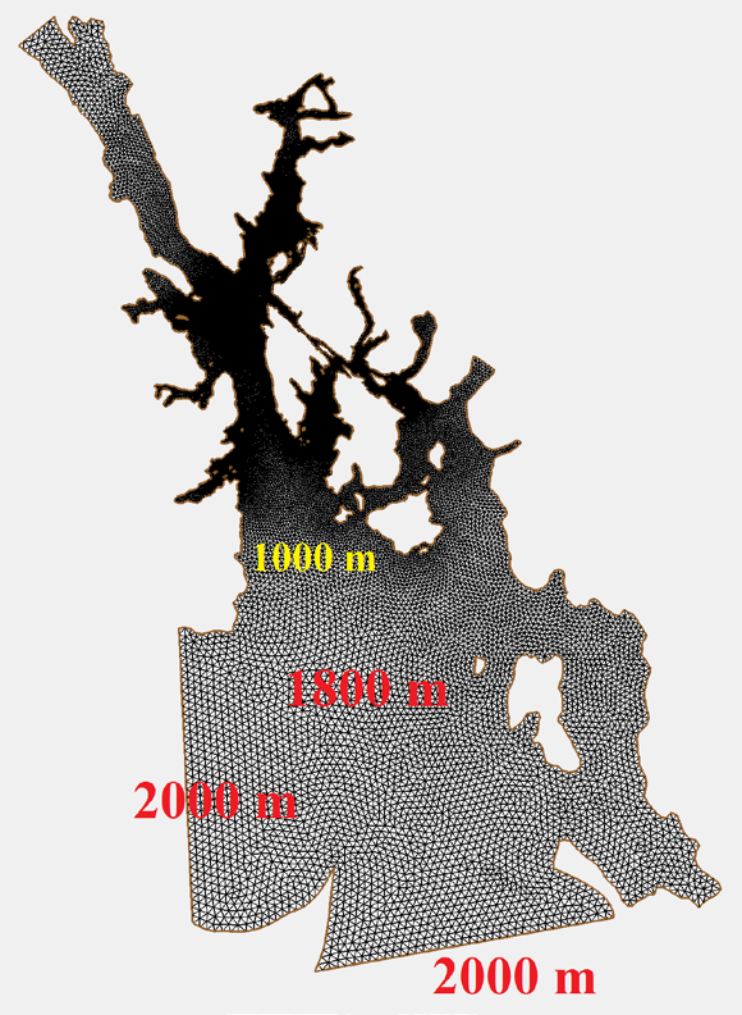


Step 1: Wave Modeling



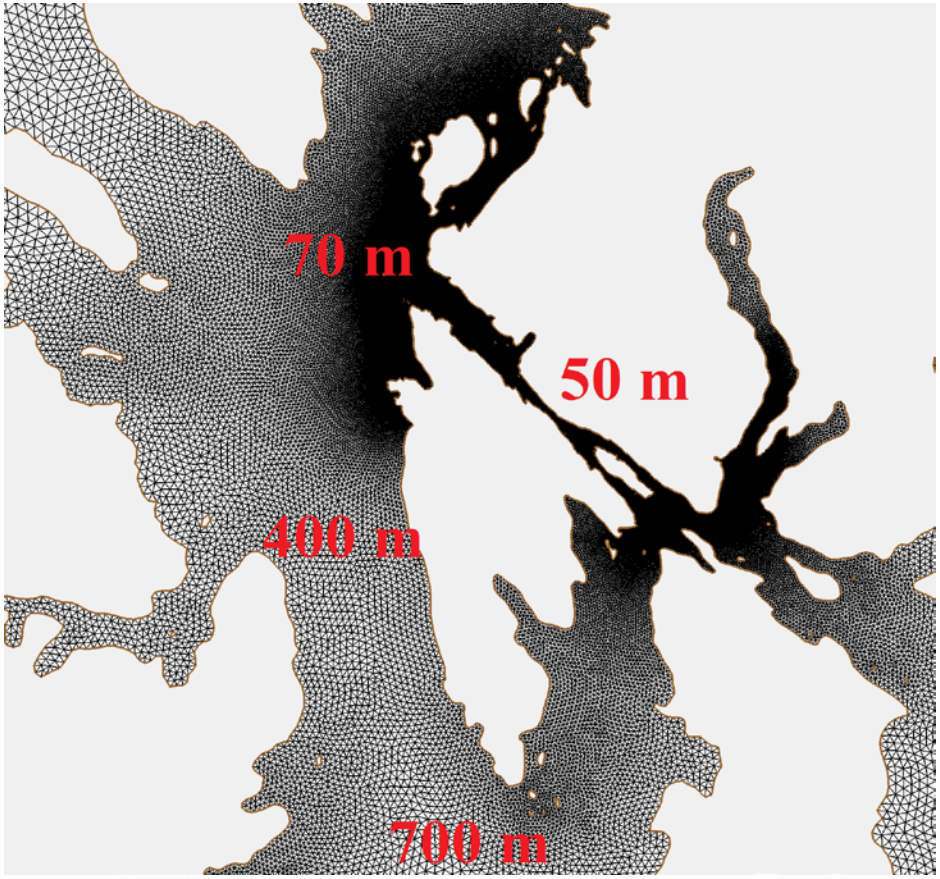
- SWAN (3rd Generation Wave Model)
- Wave Height, and Period, and Direction for 106 Storm Events (1973-2015, 43 Years)

Computational Mesh



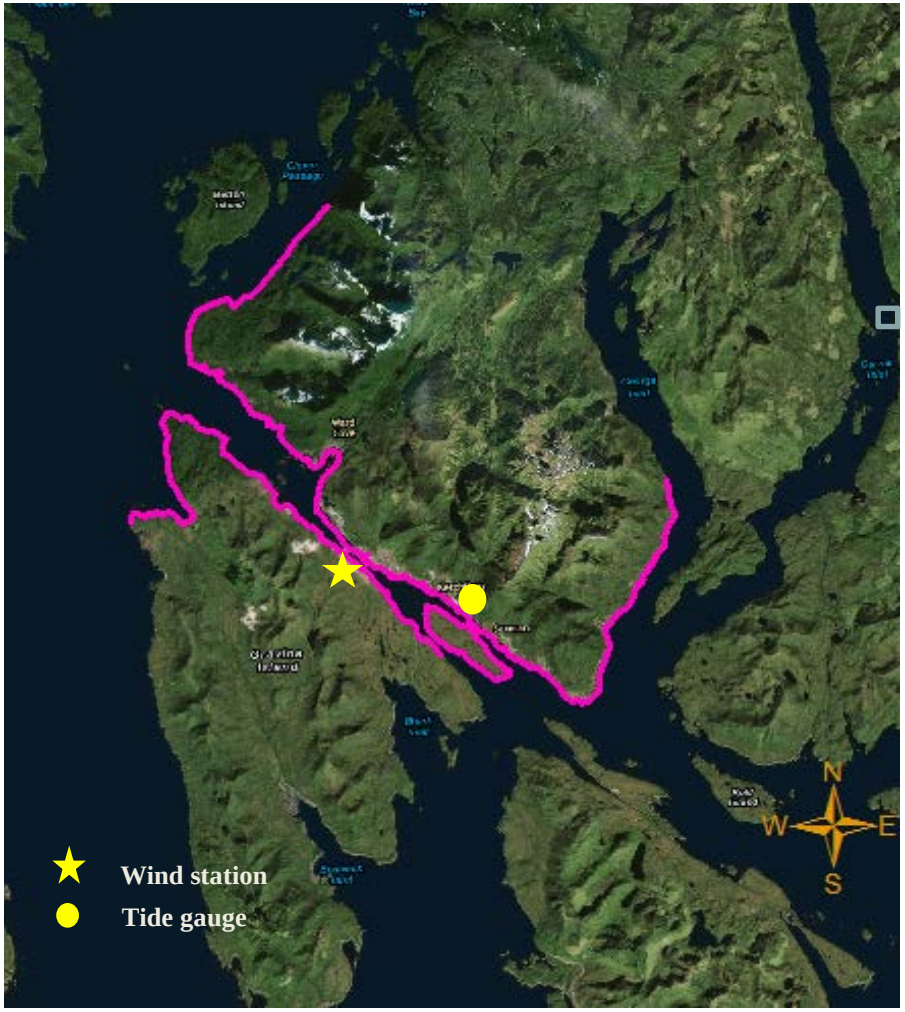
- Mesh Resolution Adequate to resolve wave generation, propagation, and all nearshore processes (Shoaling, Refraction, …)

Computational Mesh

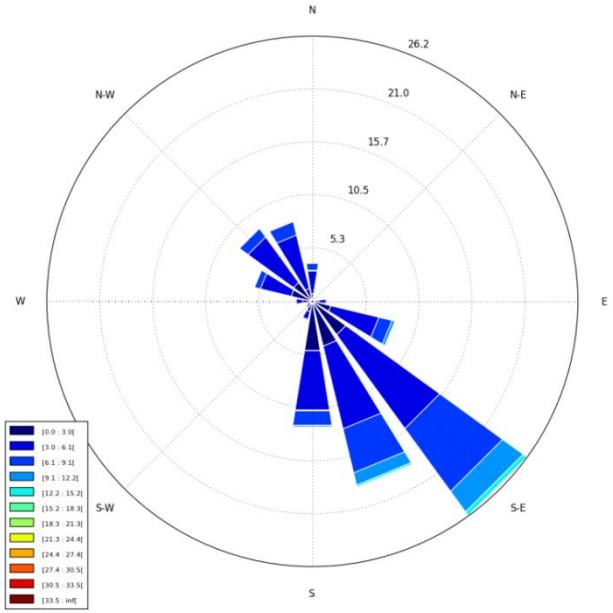


- Mesh Resolution Adequate to resolve wave generation, propagation, and all nearshore processes (Shoaling, Refraction, …)

Wave Modeling – Input Data

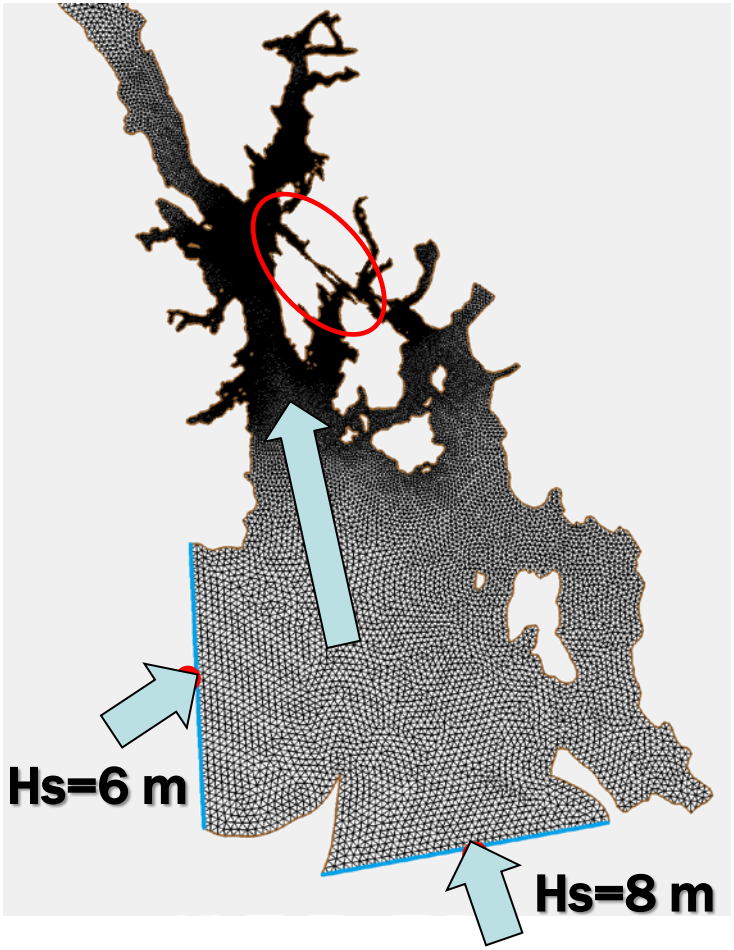


- Water Level (NOAA Tide Gauge)
- Wind (Ketchikan Airport)



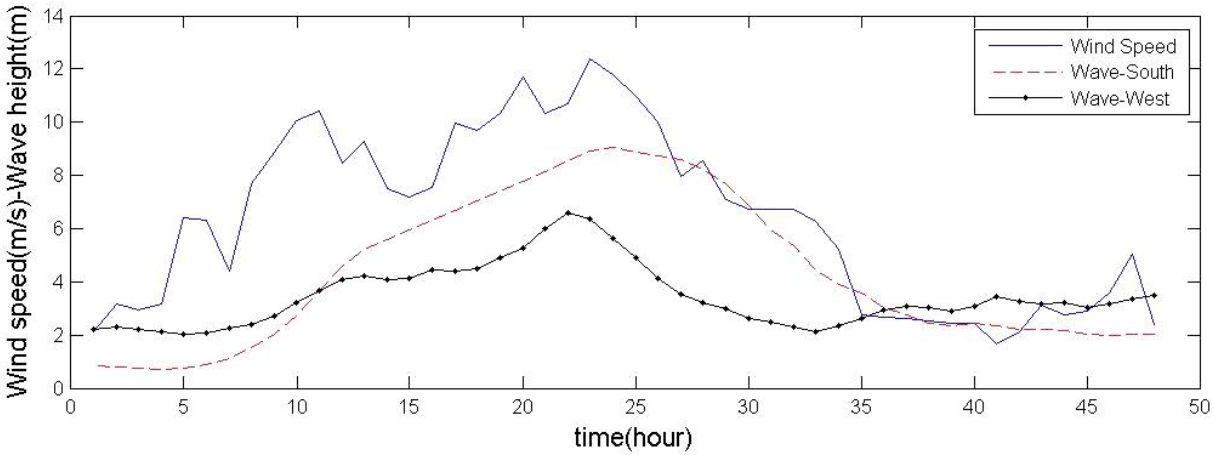
Wind Rose

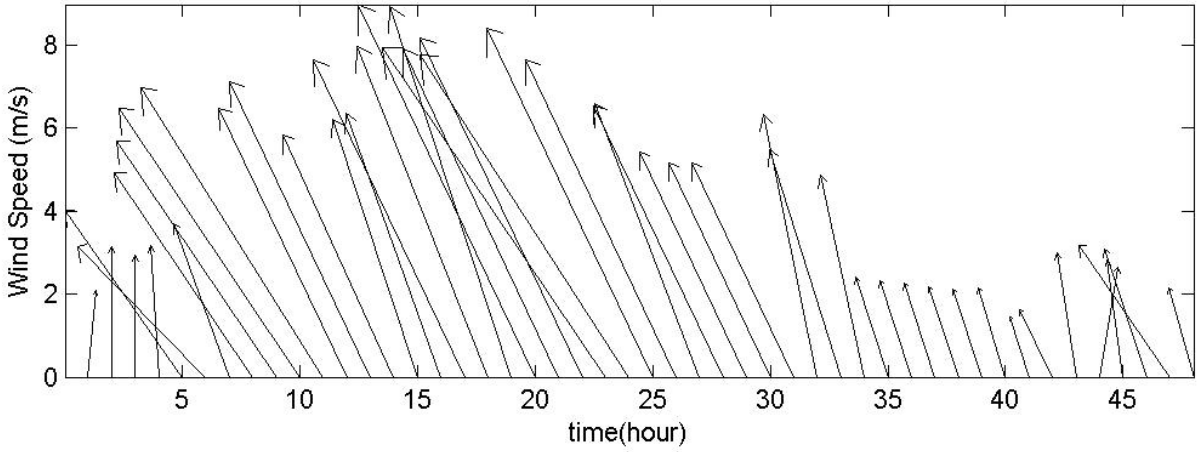
Wave Modeling – Input Data



- Water Level (NOAA Tide Gauge)
- Wind (NCDC)
- Offshore Wave (Buoy)

Wave Modeling – Offshore Wave

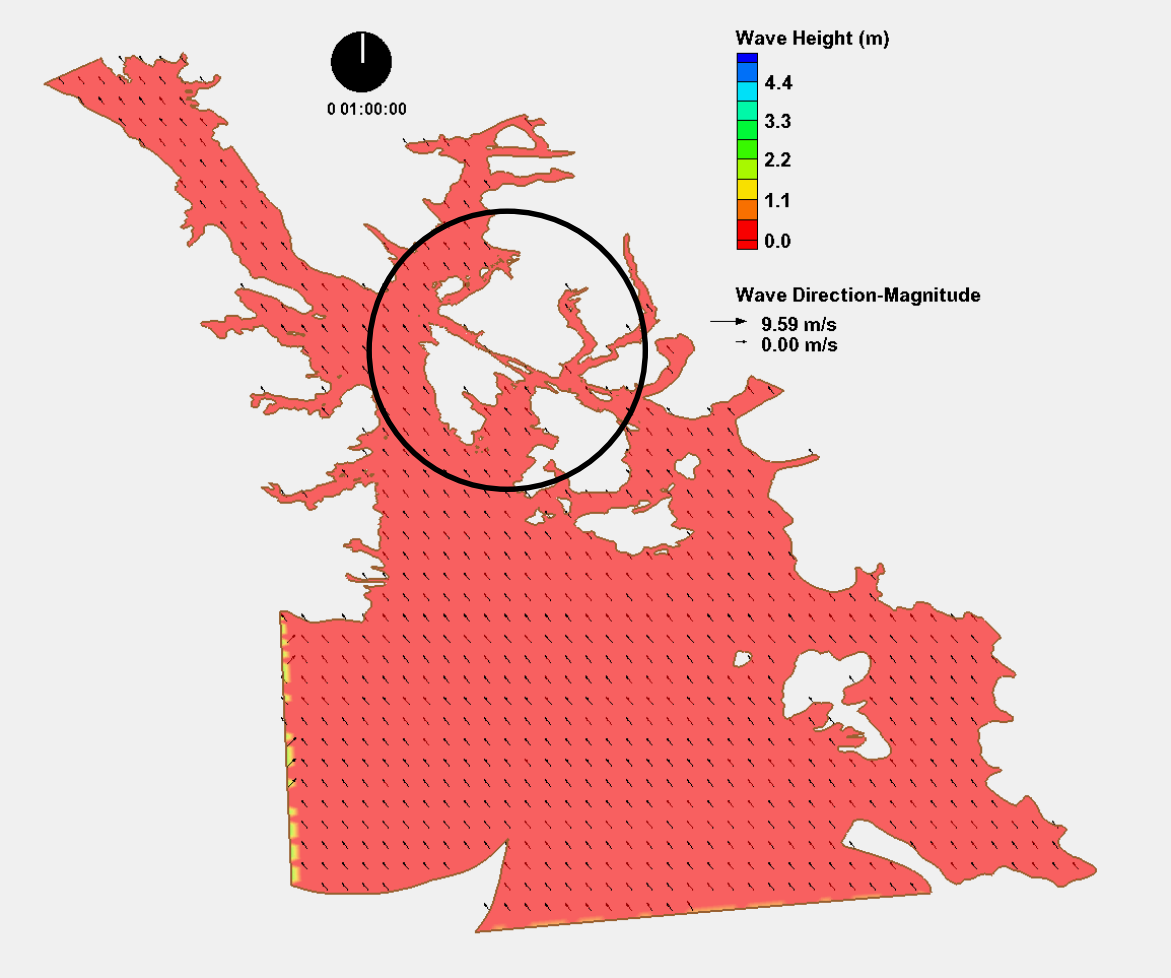




Wave Modeling – Offshore Wave

Only Wave at Boundary

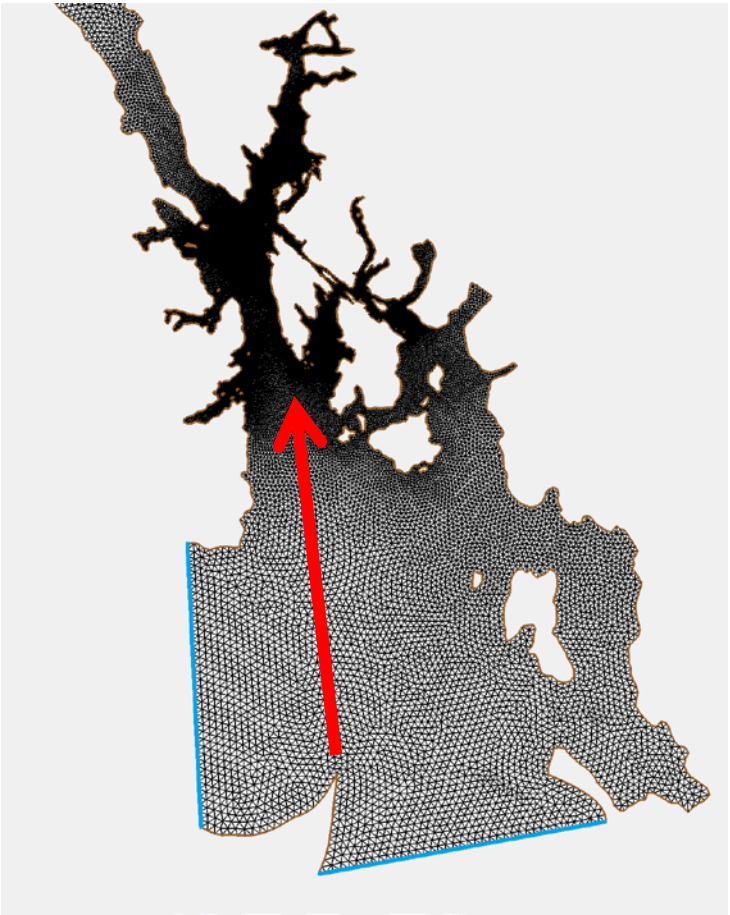
No Wind Force



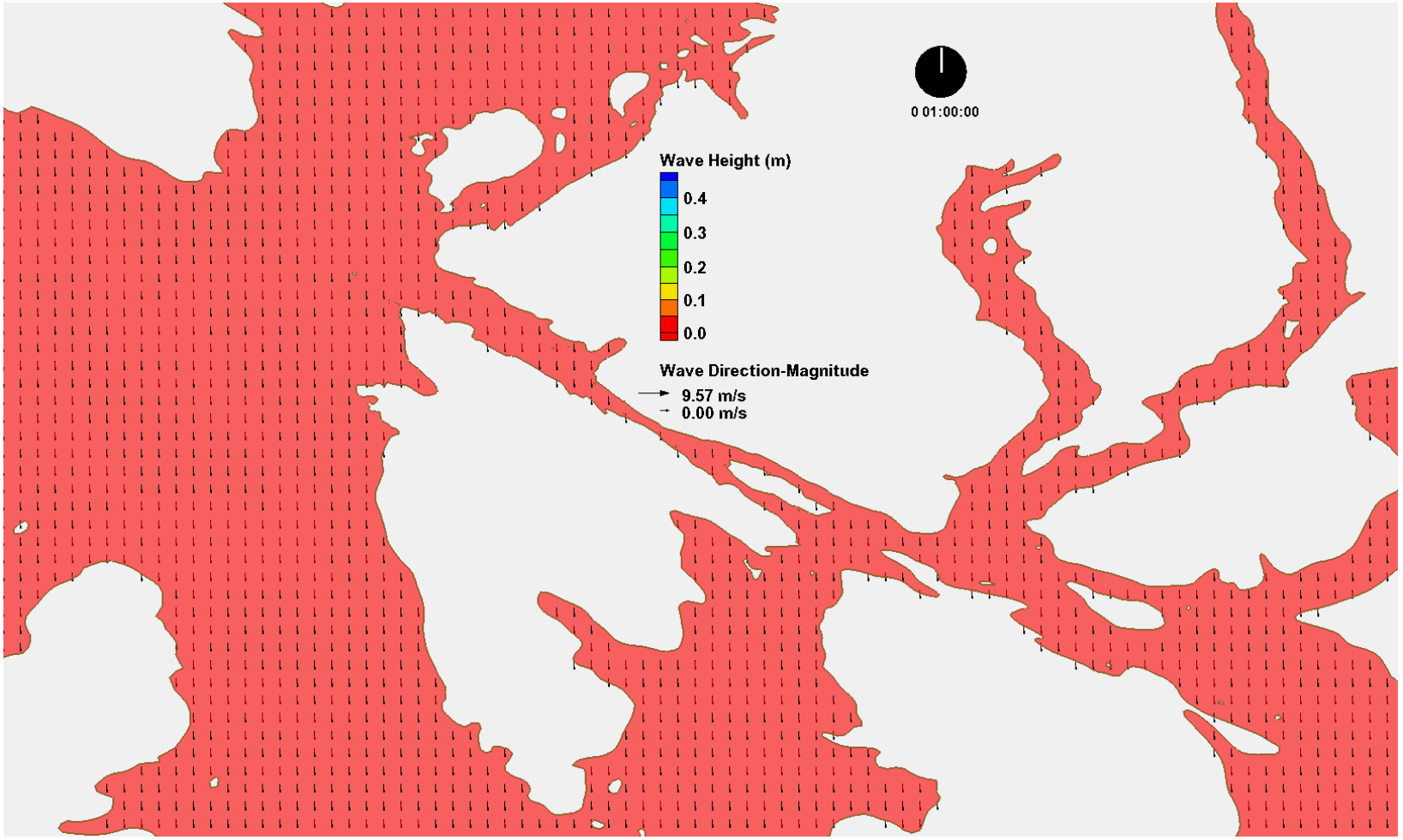
Wave Modeling – Offshore Wave

1 - Wind Only
2 - Wind + Boundary Wave

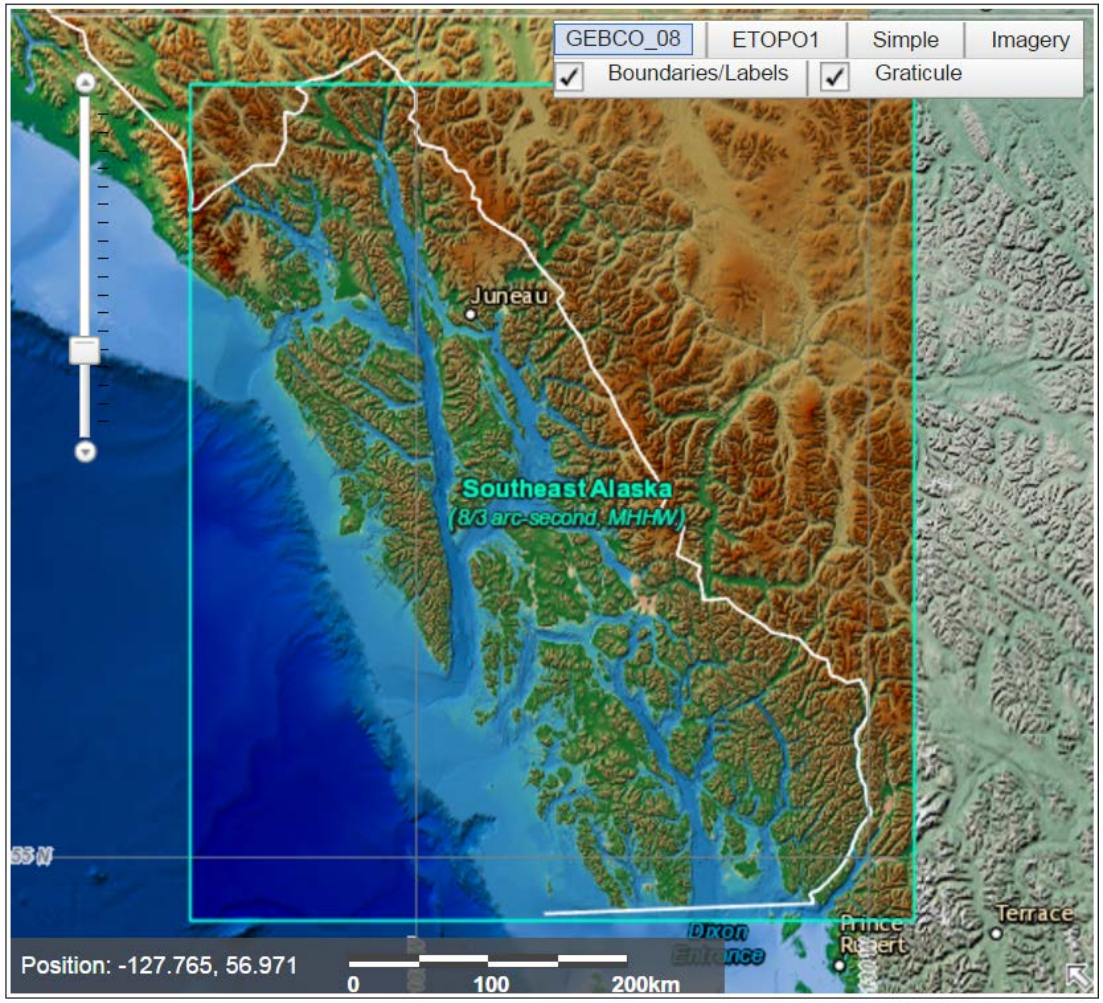
2 minus 1 = offshore wave influence



Wave Modeling – Offshore Wave



Wave Modeling – Input Data

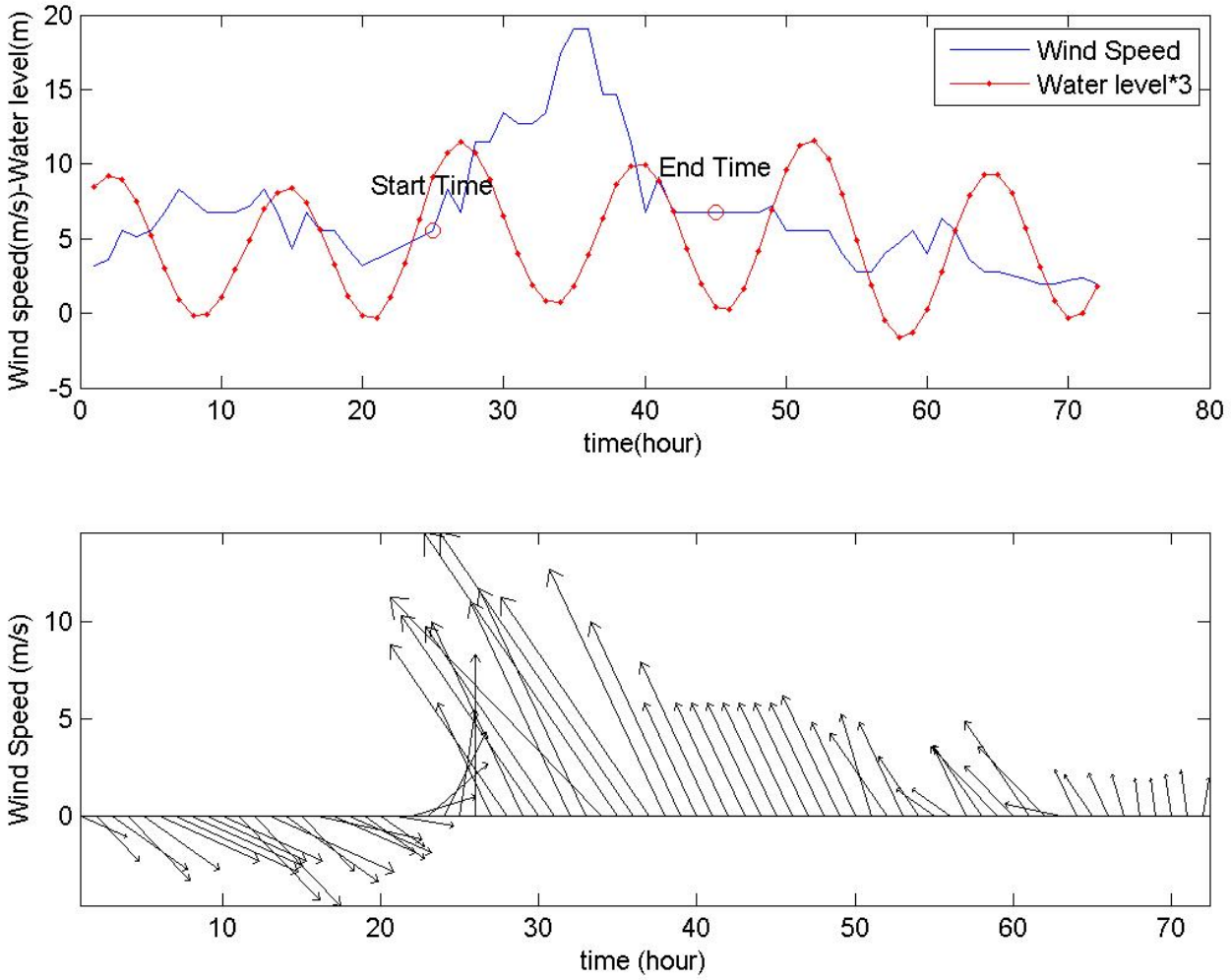


- Water Level (NOAA Tide Gauge)
- Wind (NCDC)
- Bathymetry (NGDC)

Wave Modeling - Sample Event

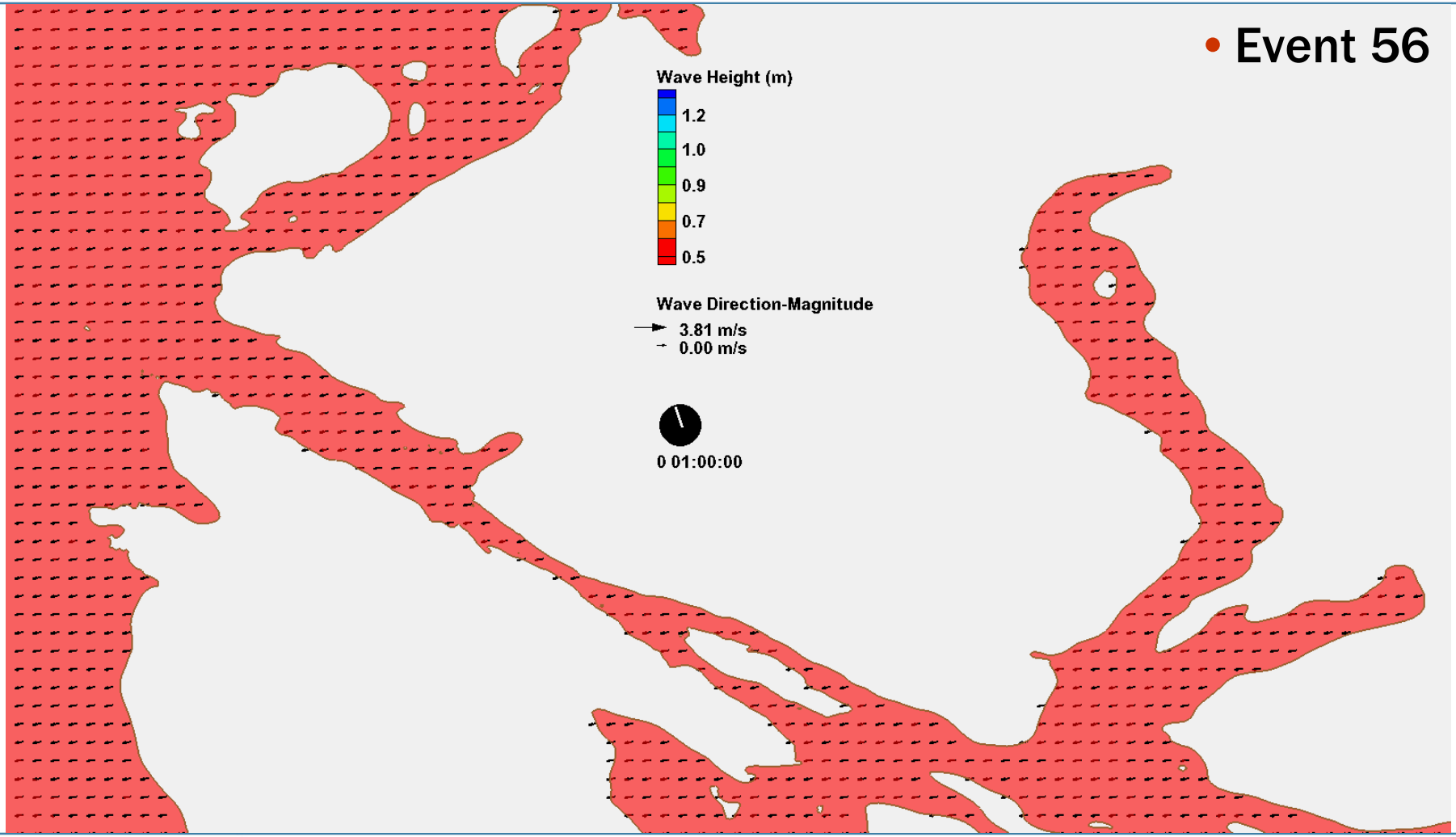
- Event 56

  South East



Wave Modeling - Sample Result

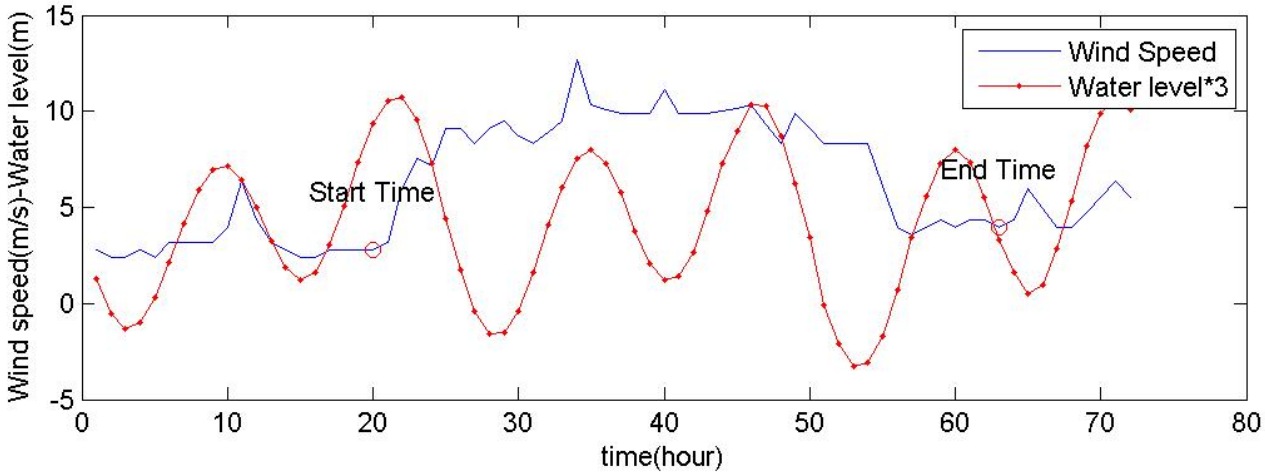
- Event 56

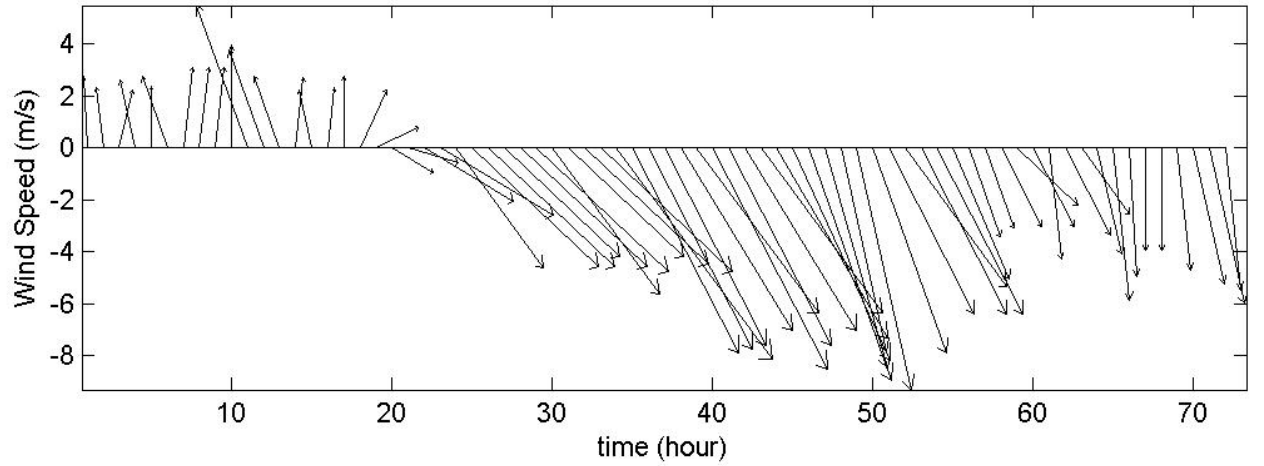


Wave Modeling - Sample Event

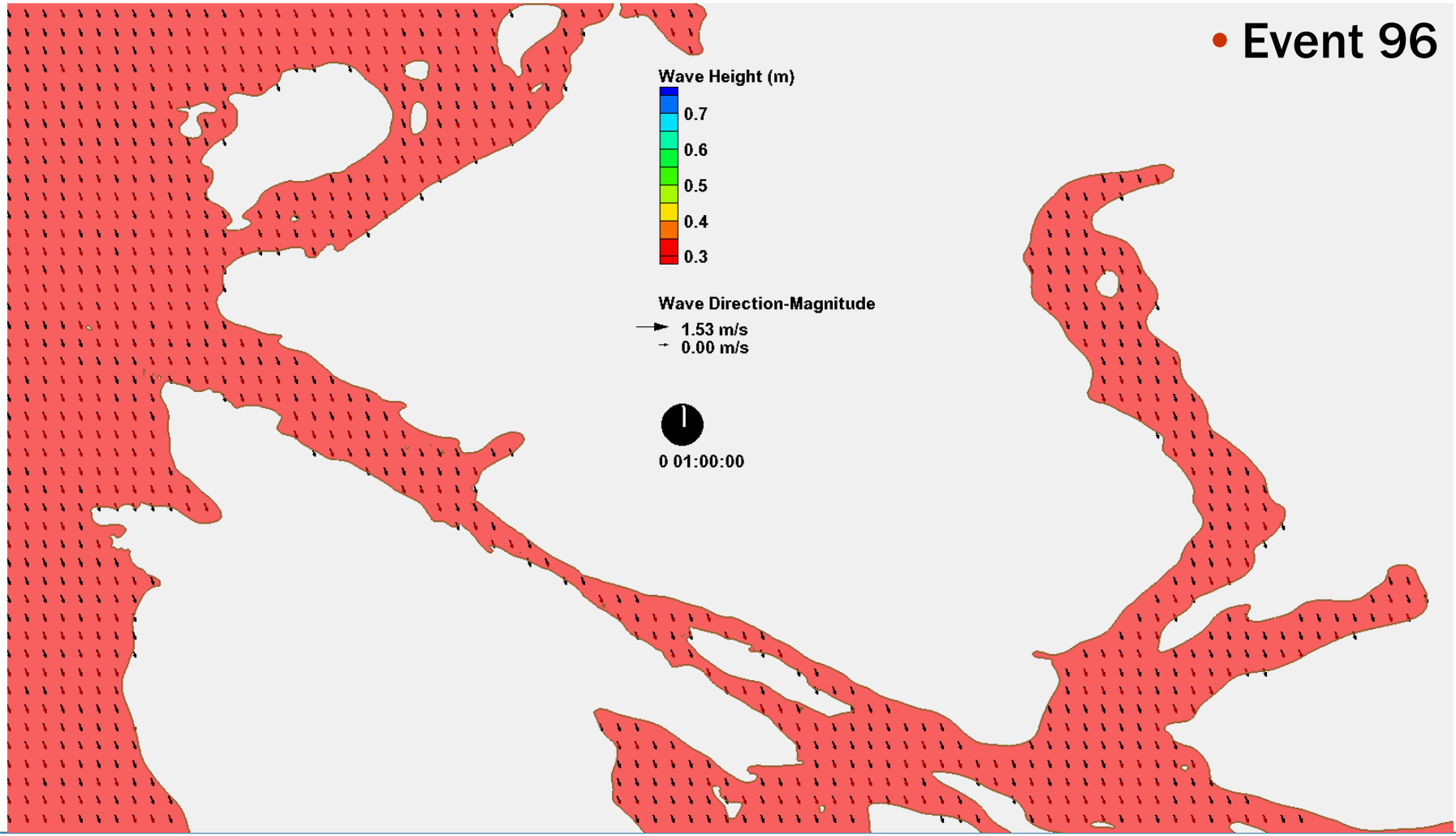
- Event 96

  North West





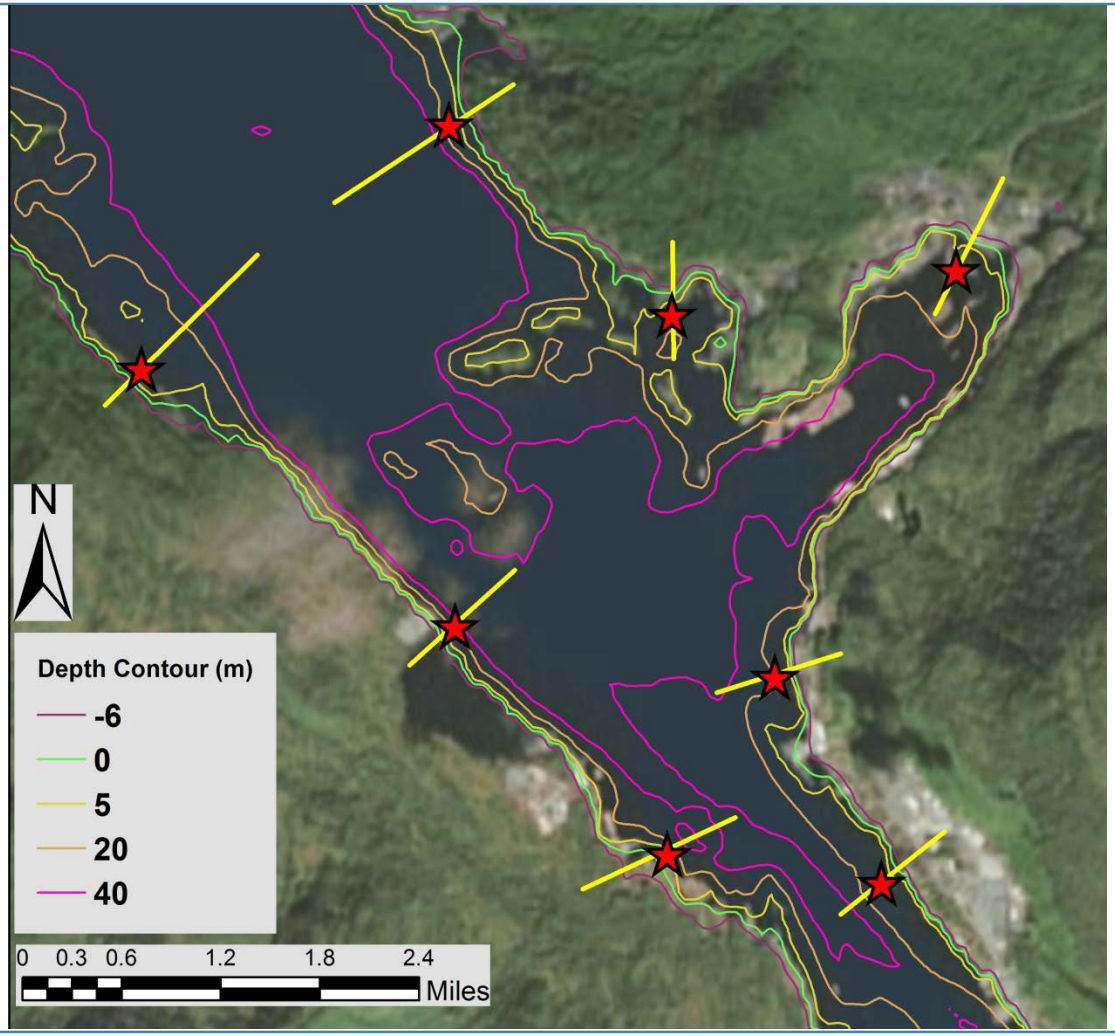
Wave Modeling - Sample Result



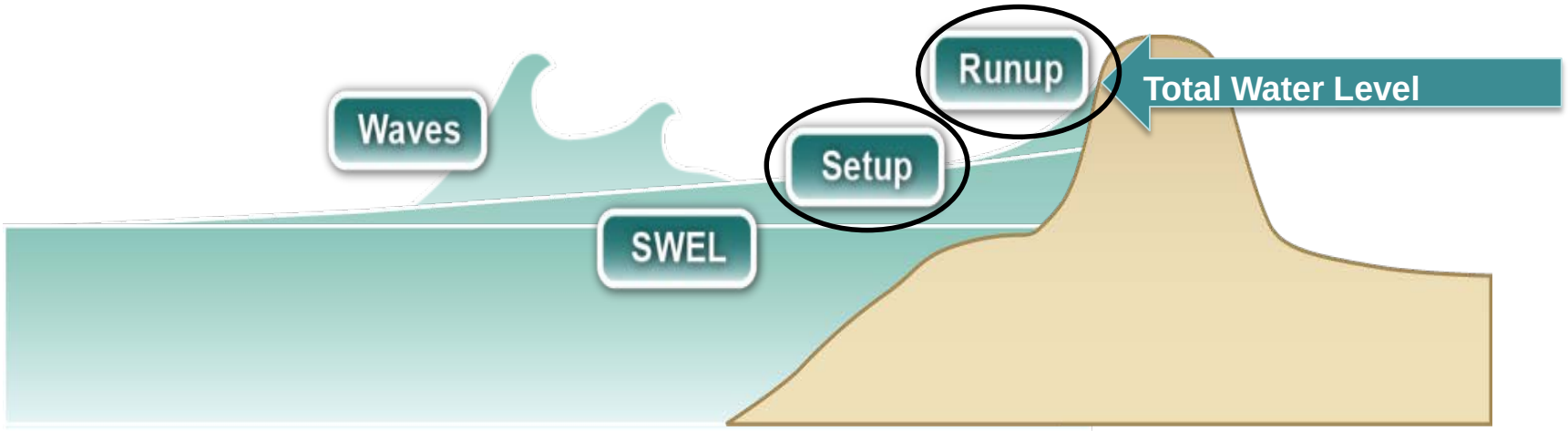
- Event 96

Wave Modeling - Outputs

- Wave information selected at the breaker line (***Outside the surfzone***)



Step 2: Wave Setup and Runup (Transect Analysis)



Wave Height

Wave Period

SWEL

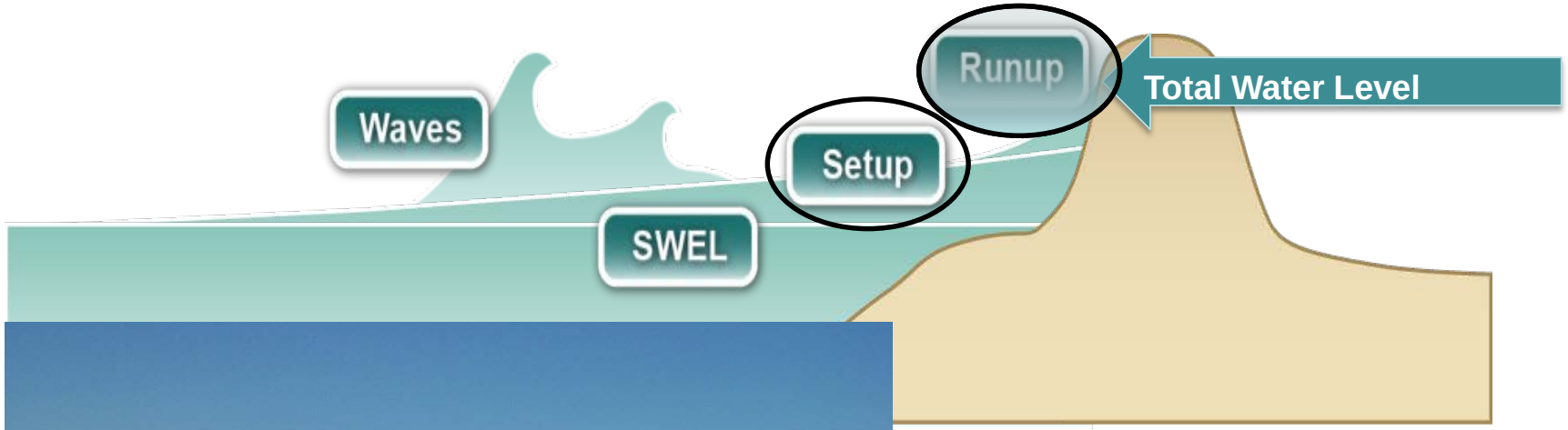
Profile Slope

→

Wave Setup

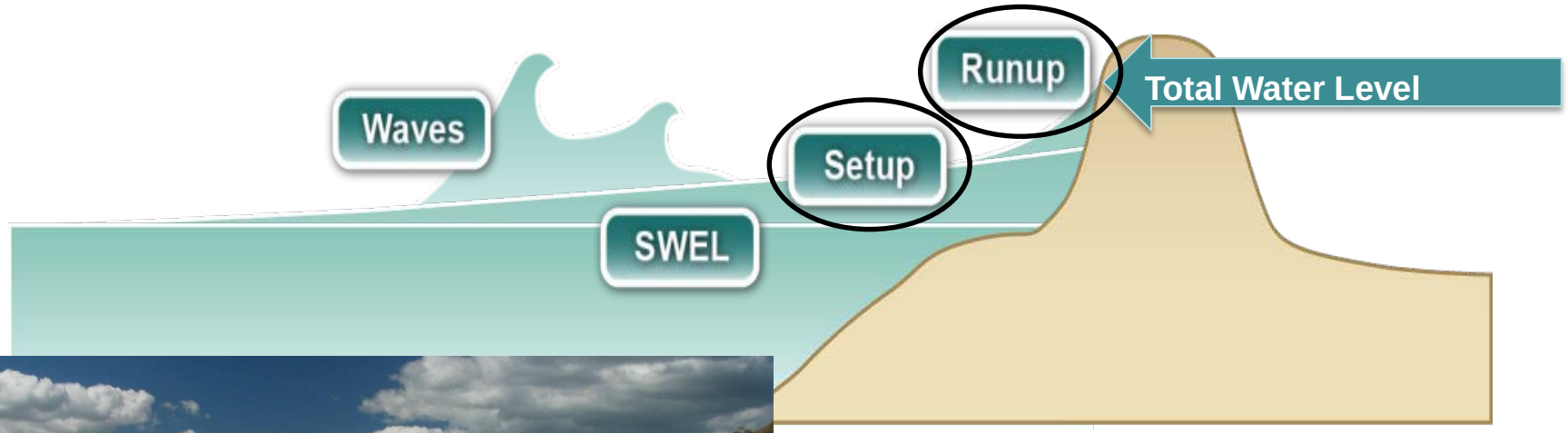
Wave Runup

Step 2: Wave Setup and Runup (Transect Analysis)



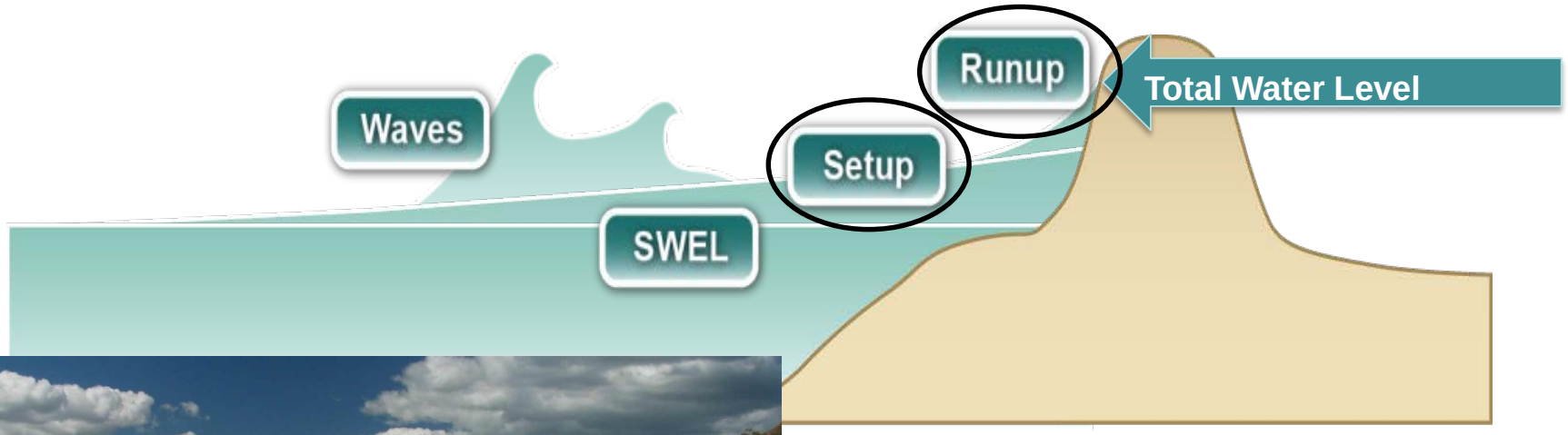
Mild Slopes (Beaches)

Step 2: Wave Setup and Runup (Transect Analysis)



Steep Slope
(Bluffs/Bulkheads)

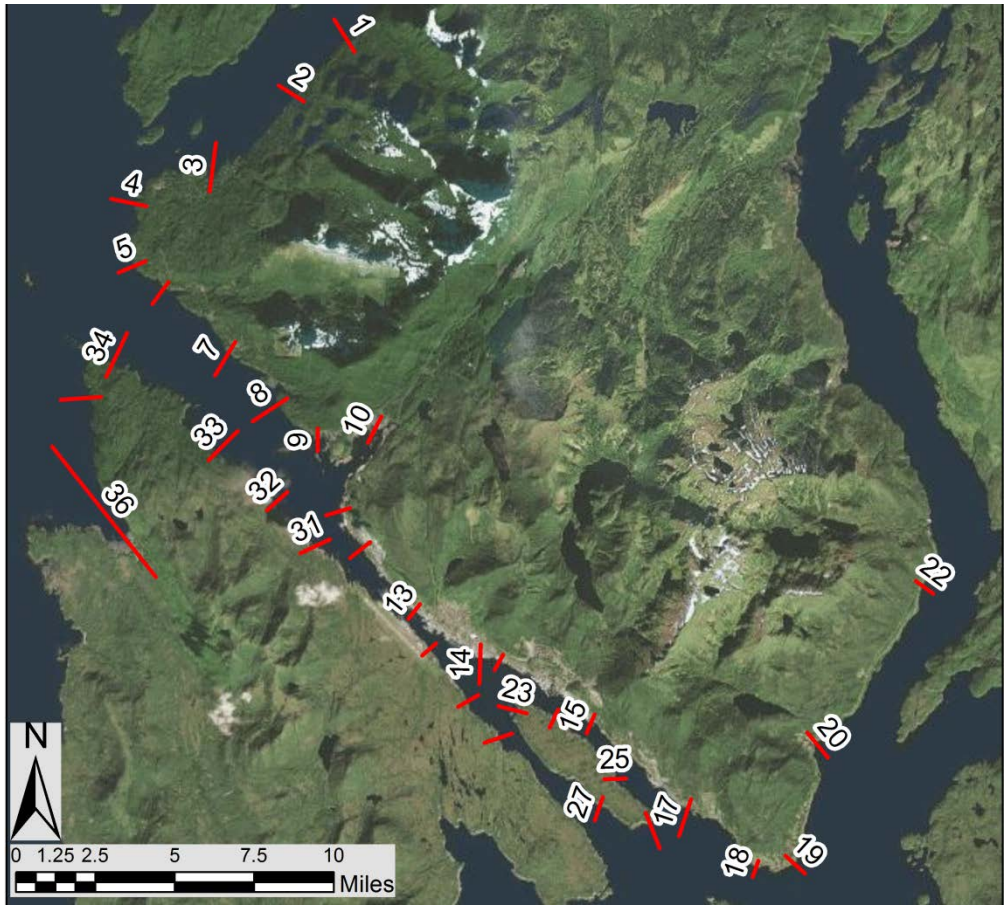
Step 2: Wave Setup and Runup (Transect Analysis)



Steep **Slope**
(Bluffs/Bulkheads)

Step 2: Wave Setup and Runup (Transect Analysis)

36 Transects Initially, 12 Transects Presented



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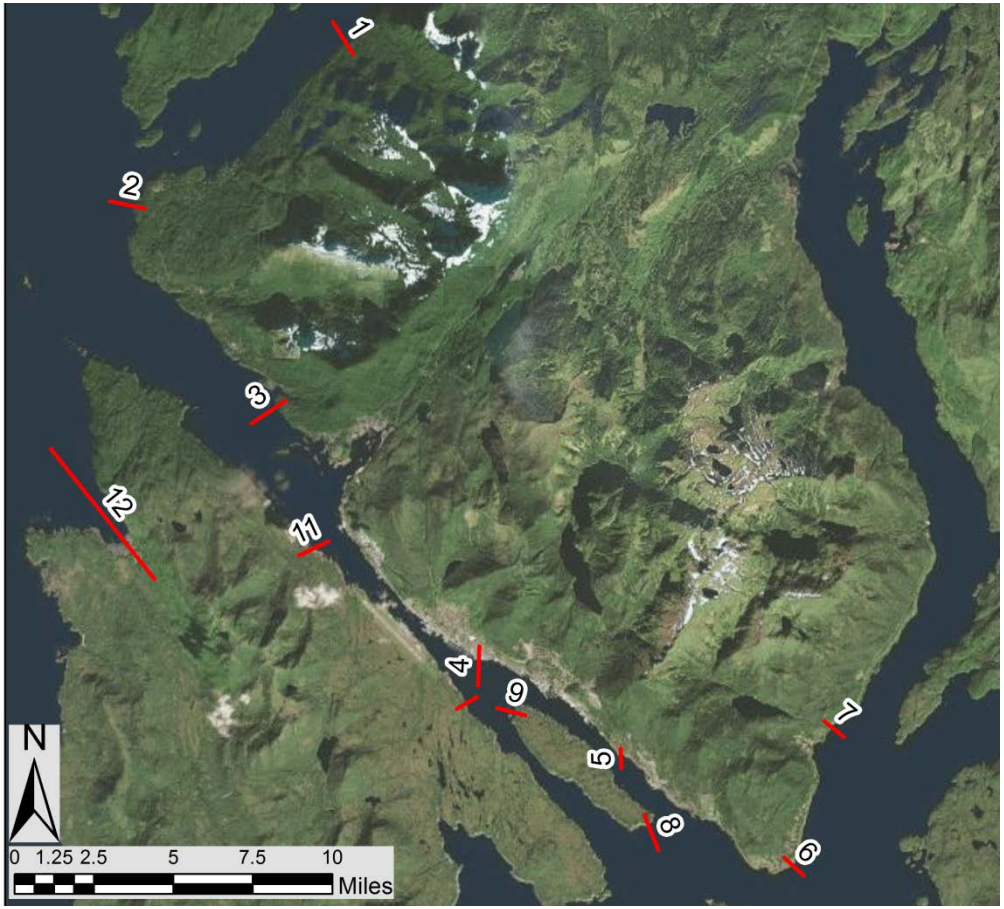
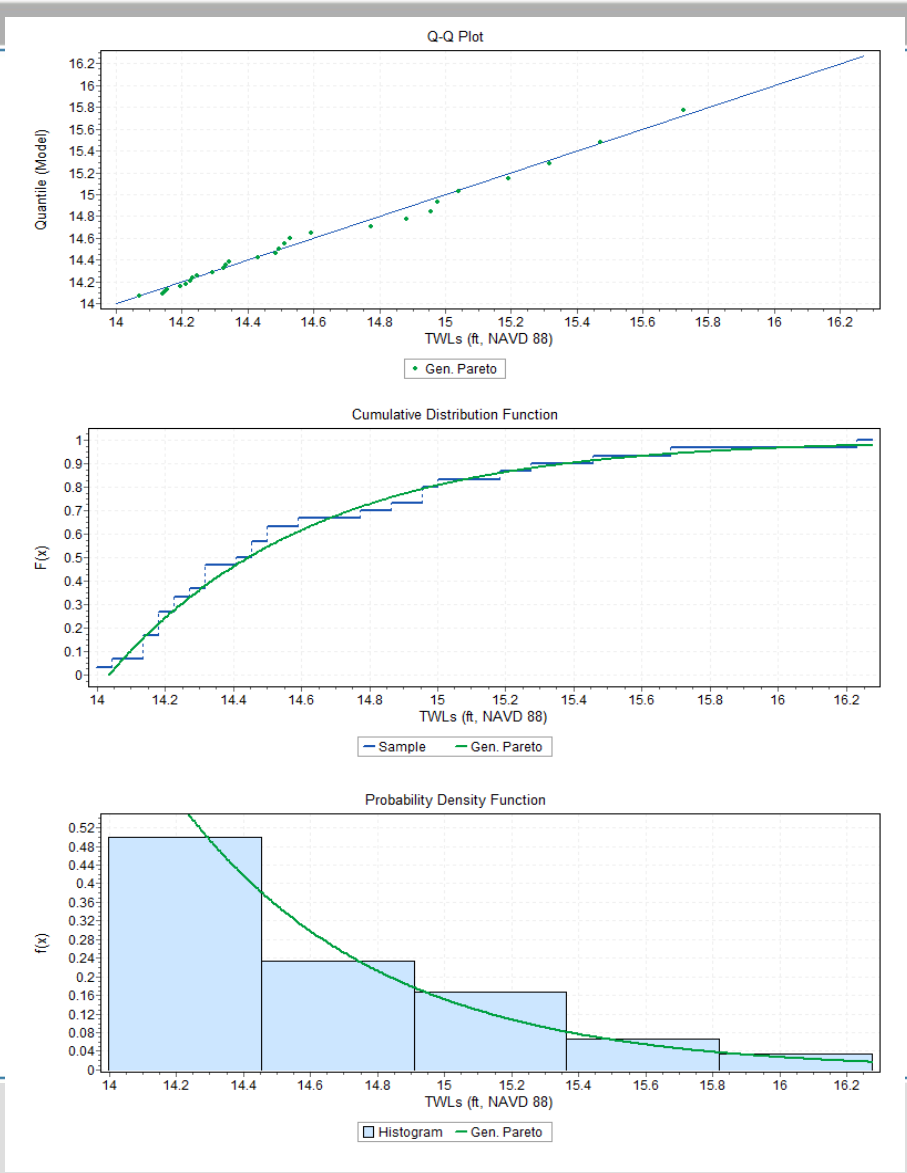


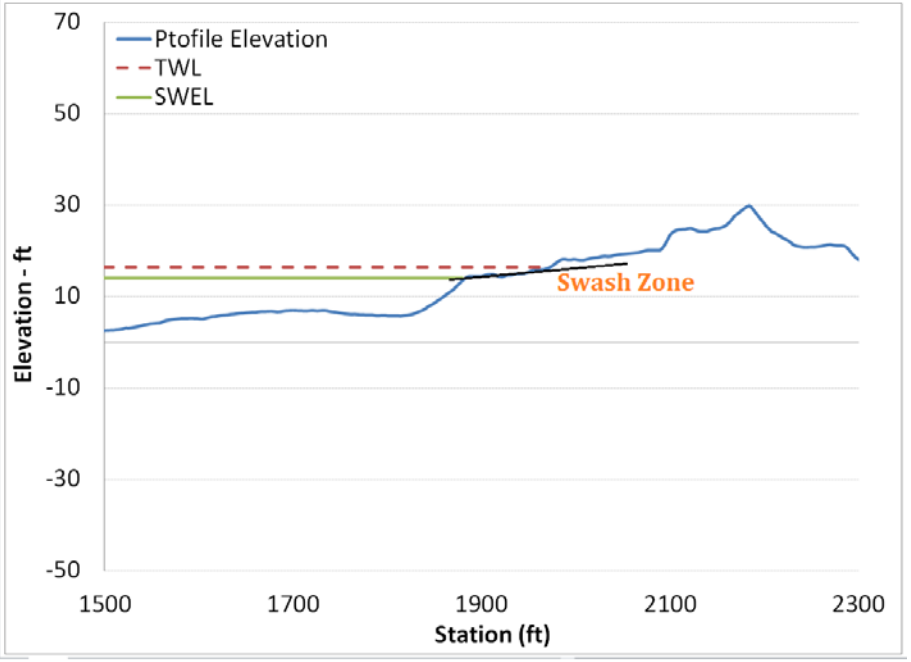
100 YEAR TWL



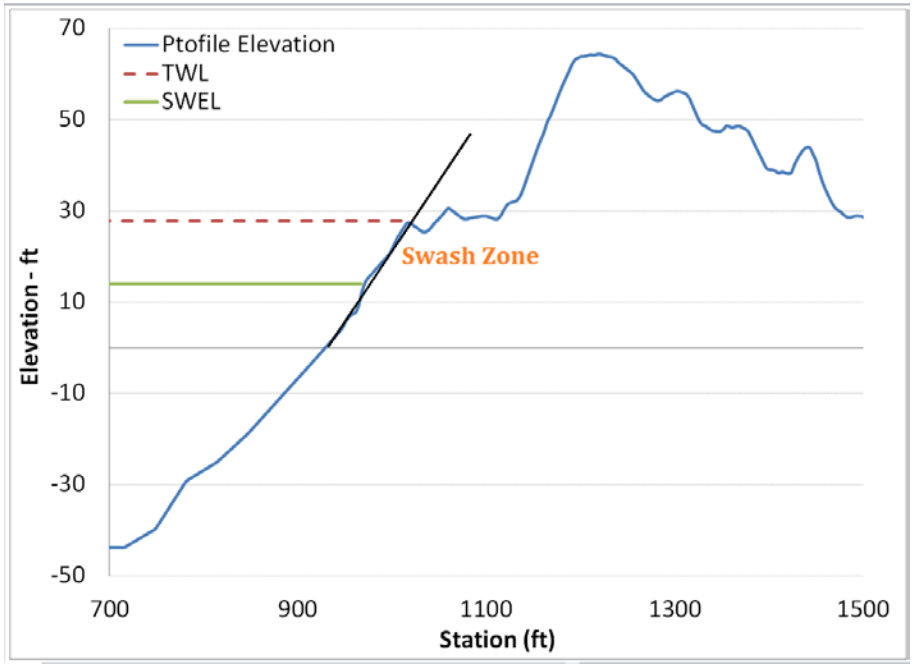
- 43-year record of flood elevations at each transect
- Fit probability distributions to the data at each transect
- Read 0.2%, 1%, 2%, etc. annual chance flood elevations at each transect from distributions

100 YEAR TWL

Mild Slope Shore - Low BFE



Steep Slope Shore - high BFE

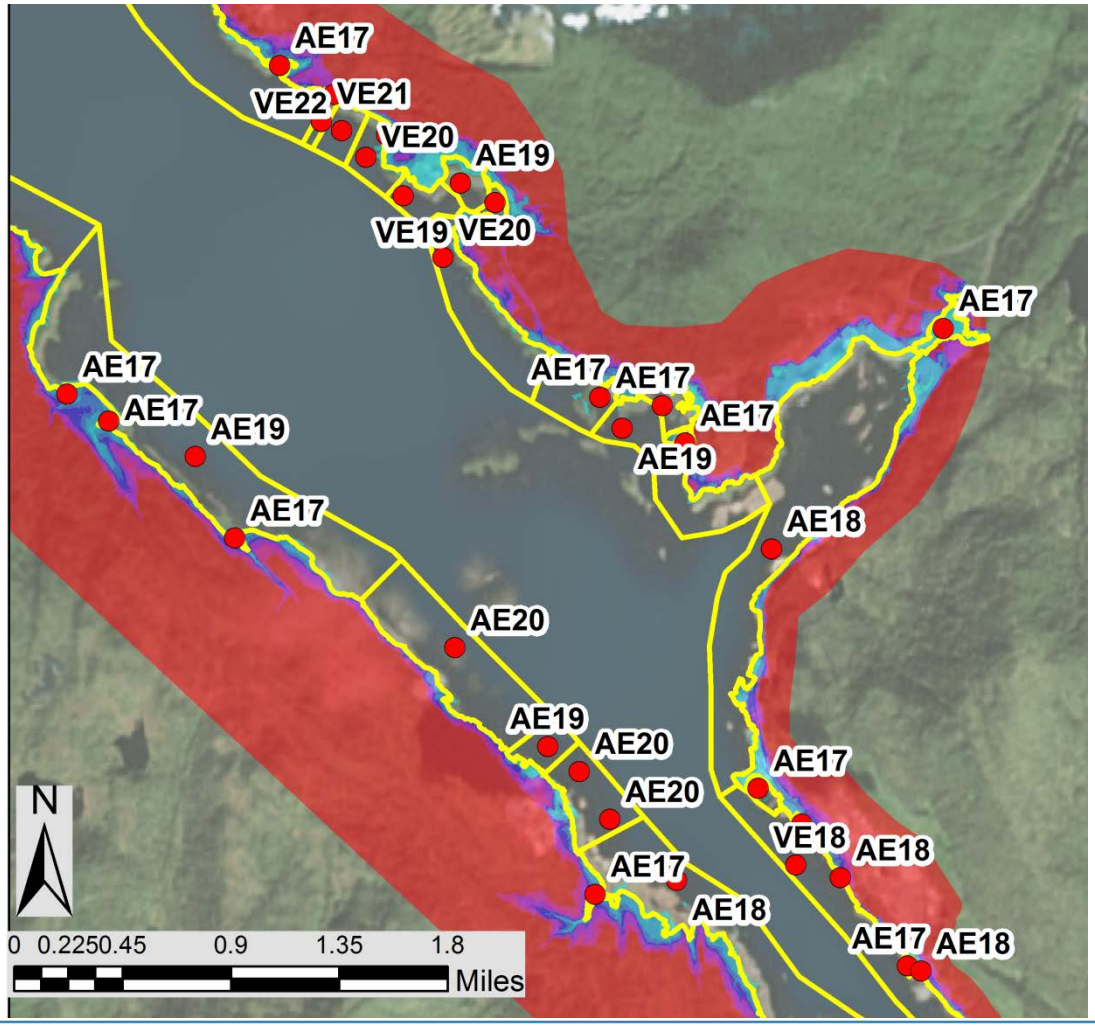


Step 3: General Mapping

ZONE	BFE
AE if TWL < SWL + 3’ VE if TWL ≥ SWL + 3’	TWL Rounded to Nearest Foot

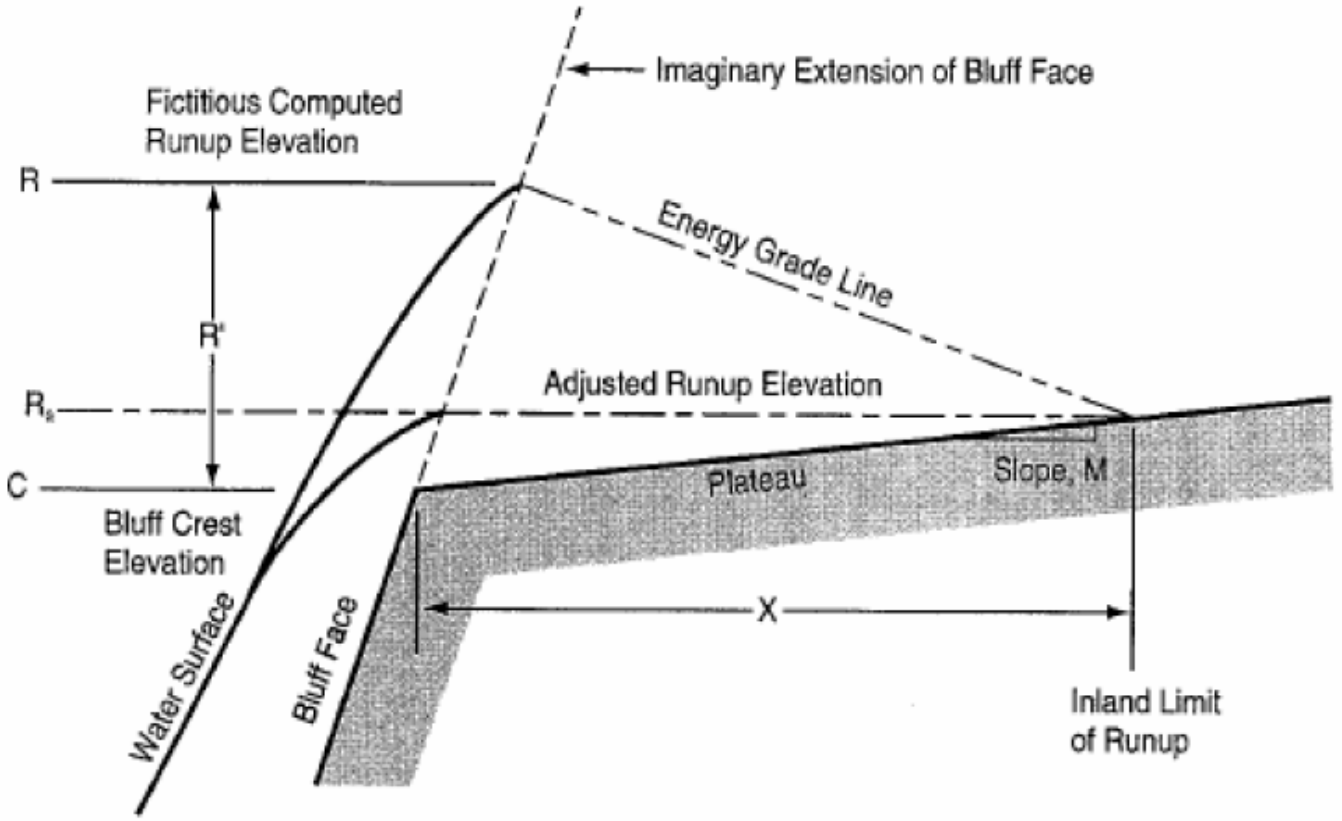
Delineation	Zone Breaks
Follow Contour of TWL	Break along the Coast Where Shoreline Characteristics

Step 3: General Mapping – Delineation and Zone Breaks



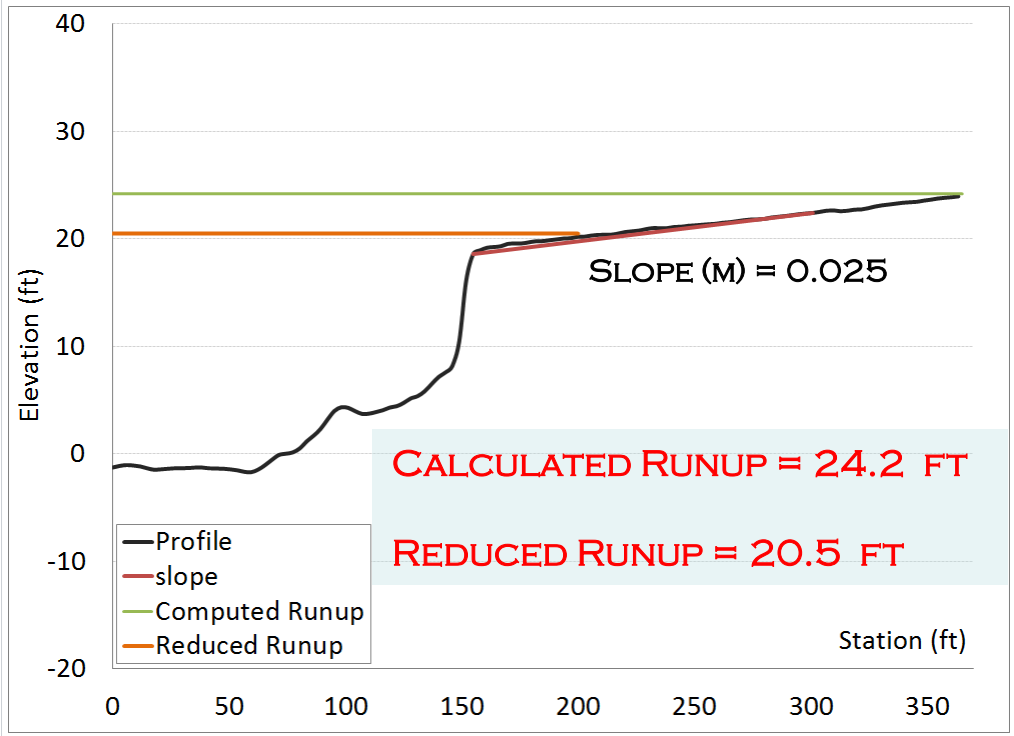
Step 3: Identifying Special Mapping Areas - Plateaus

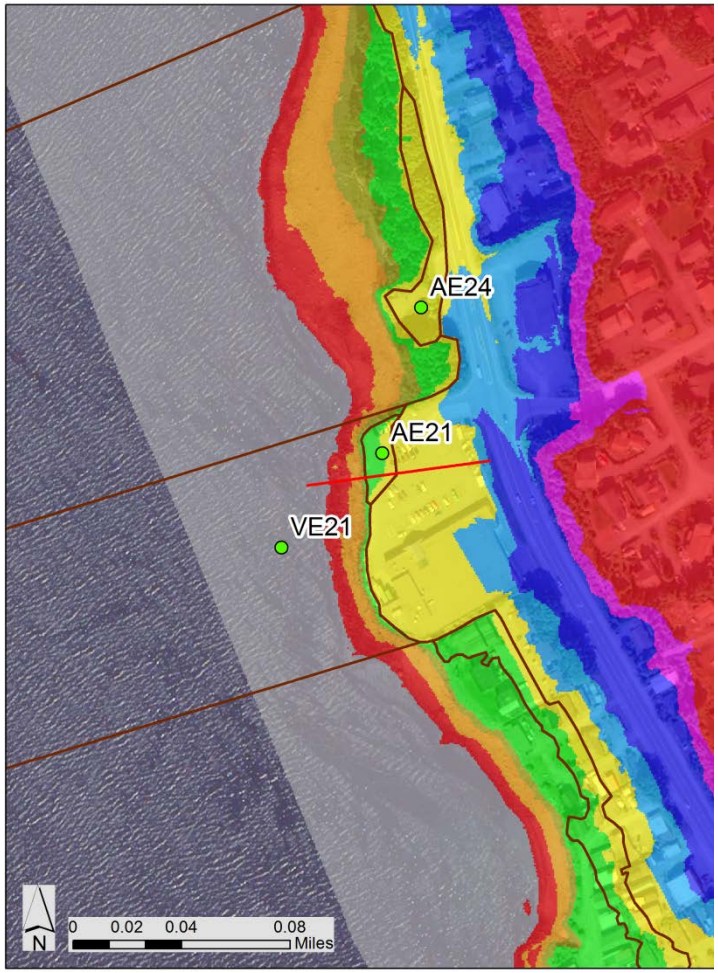
Runup Reduction of Plateau



Step 3: Identifying Special Mapping Areas - Plateaus

Runup Reduction of Plateau

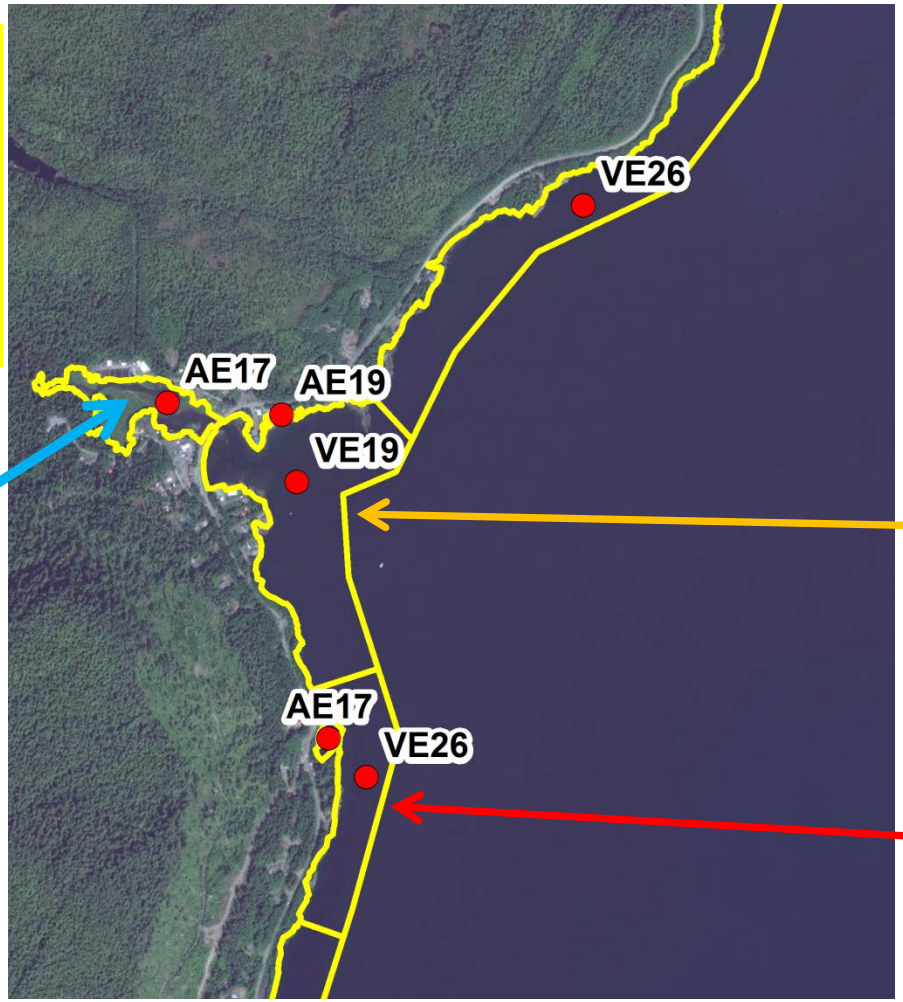




FAQ – Variation in BFE's Along the Coast

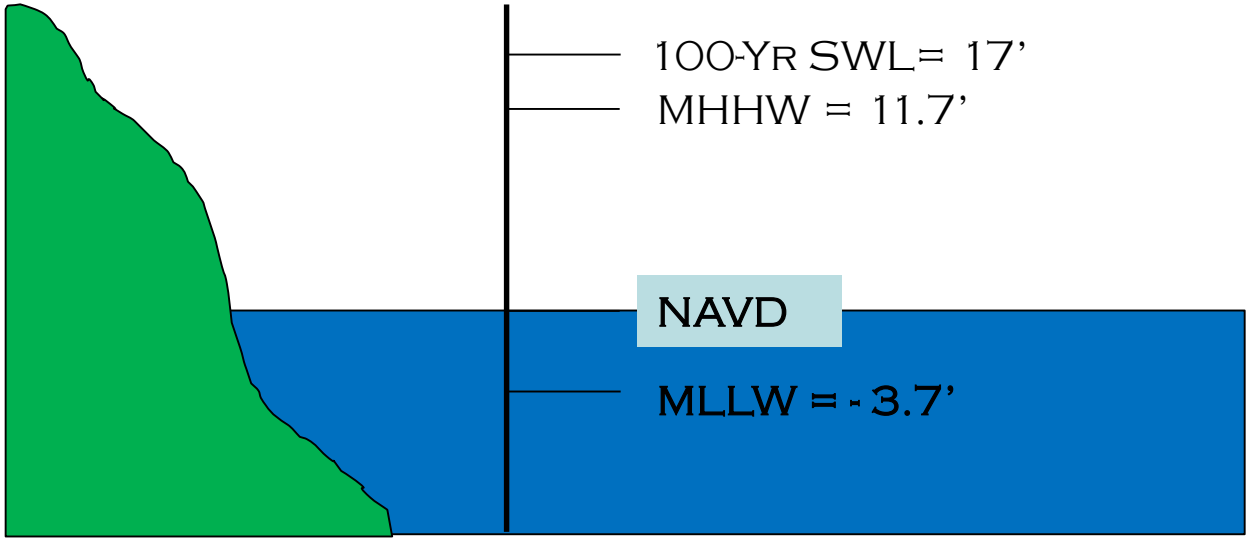
Main Factor:

- Geometry
- Change in Slope
- Wave Properties



Sheltered Area

FAQ – Datums



Non-Regulatory Products

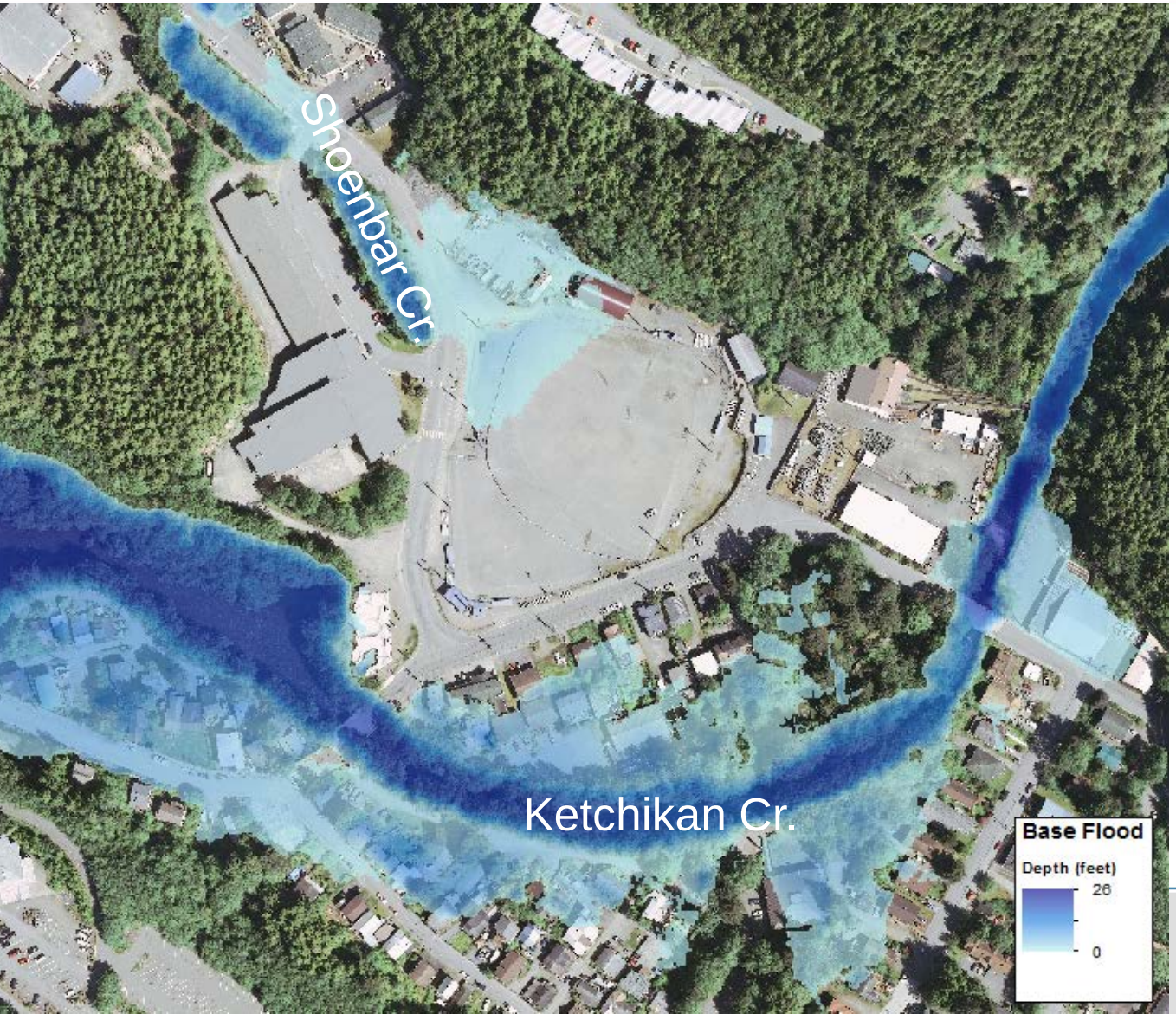
- Changes Since Last FIRM
- Depth Grids
- BFE+ Grid
- Multi-hazard Risk Assessment
  - Hazus Risk Assessment
  - Vulnerability Assessment
- Risk Report
- Risk Database

Use of Risk MAP Products

- Supplement regulatory products (FIRM/FIS)
- Provide data to inform Hazard Mitigation Plans
- Can guide land use and development plans
- Can inform incident response plans

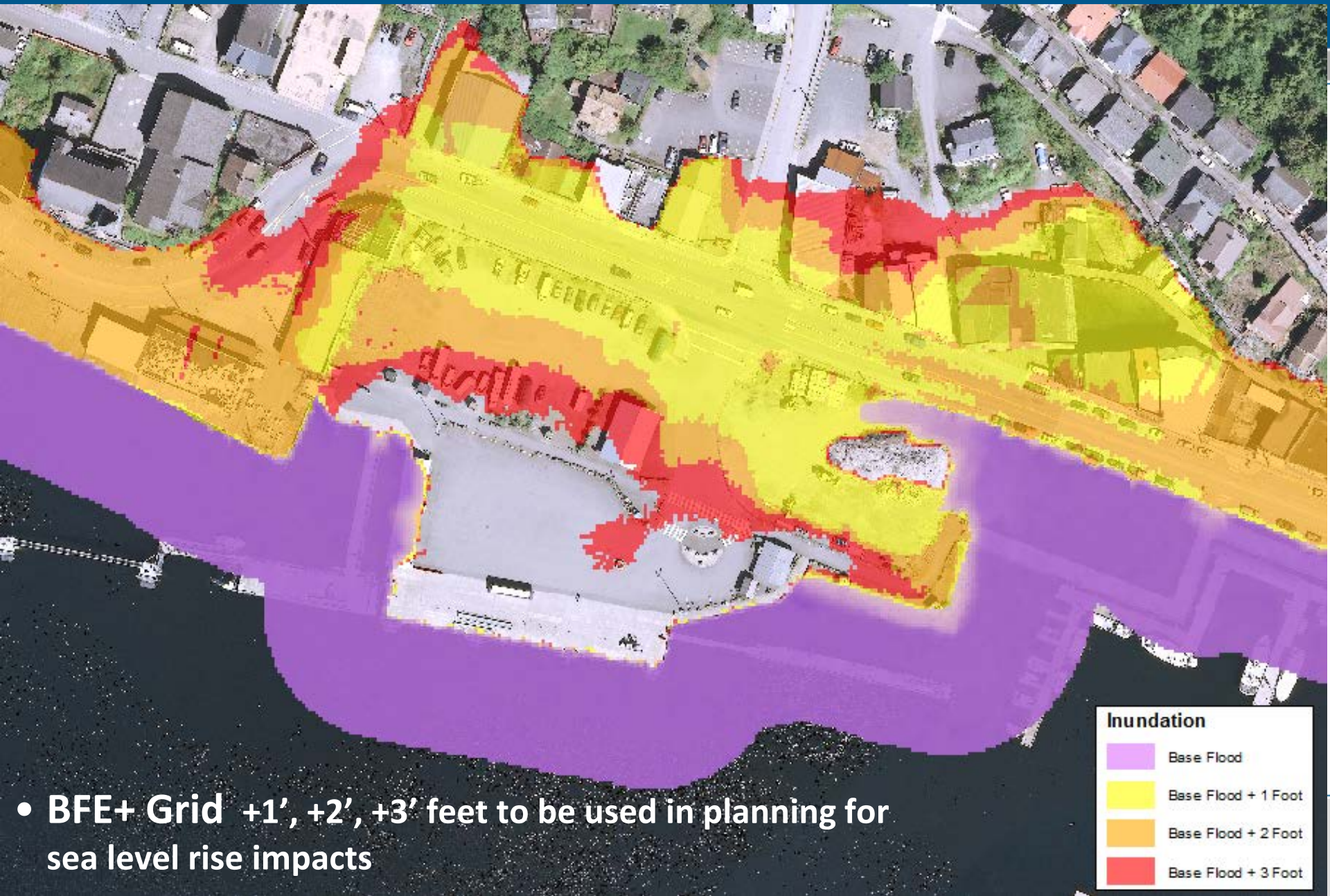

Changes Since Last FIRM
Shoenbar Cr.
Unchanged
SFHA Increase
SFHA Decrease
SFHA Increase
SFHA Increase
Ketchikan Cr.
SFHA Increase
Unchanged

Flood Depth Grids



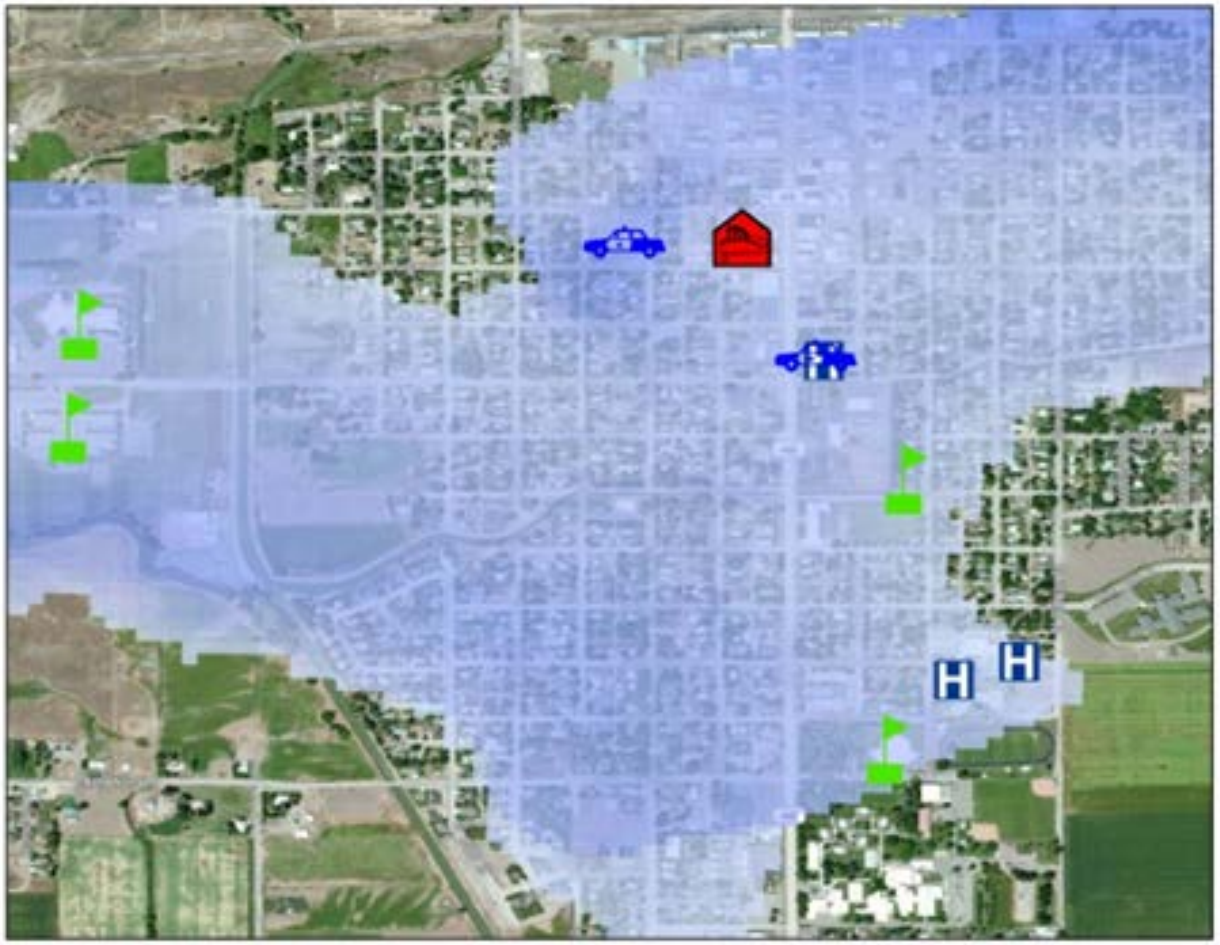
- Riverine: 10%, 4%, 2%, 1%, 1%+& 0.2% Annual Chance Floods (Hoadley Creek, Shoenbar Creek, and Schoenbar Creek)
- Coastal: 1% Flood

Flood Depth Grids



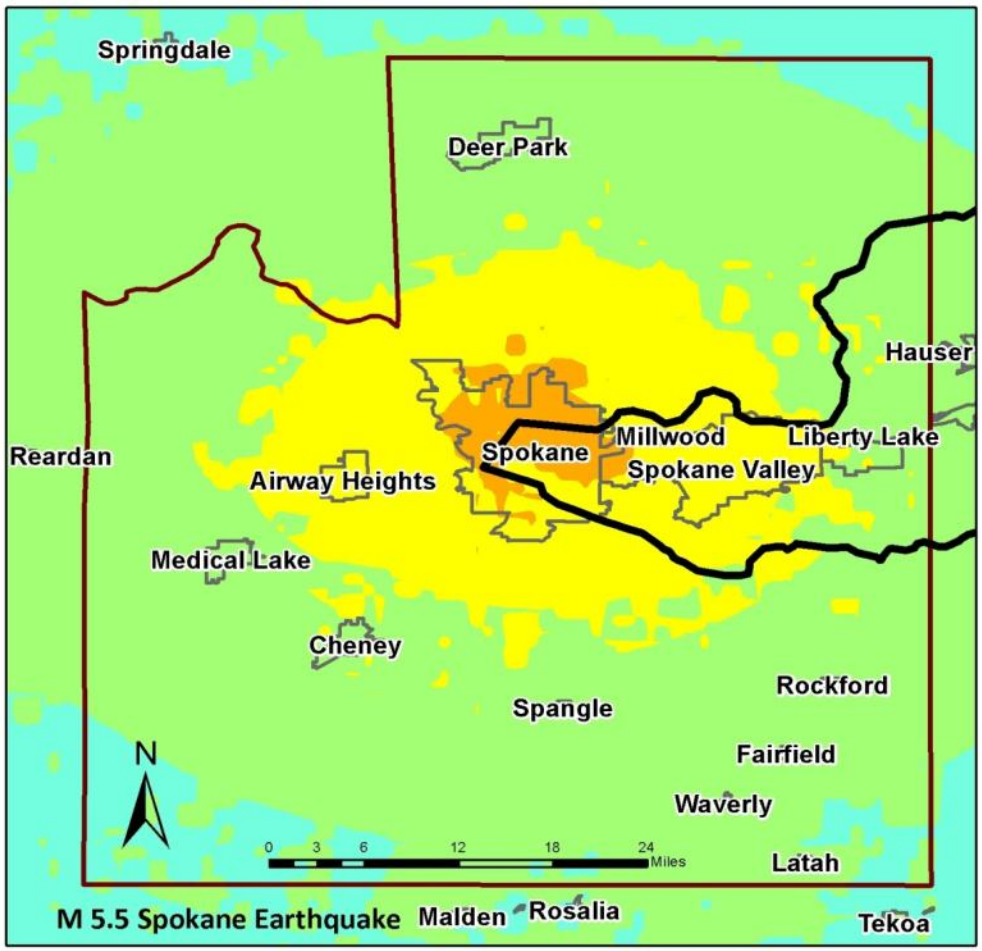
- **BFE+ Grid** +1', +2', +3' feet to be used in planning for sea level rise impacts

Hazus-MH Risk Assessments



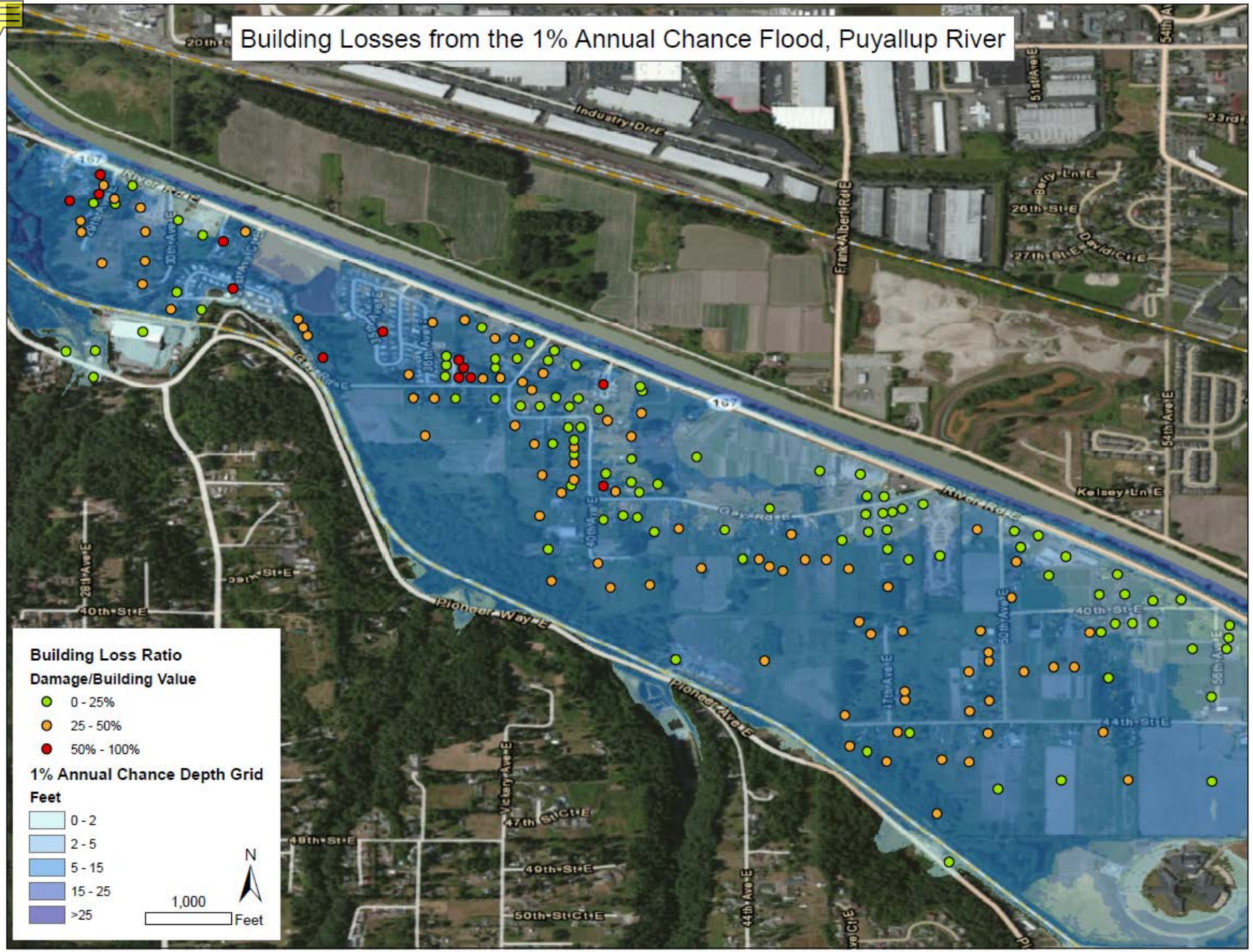
- Multiple Scenario flood and earthquake events
- Estimated Potential Losses
- Population, Debris, and Essential Facility Impacts

Multi-Hazard Assessments



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<.17*	*.17-1.4*	*1.4-3.9*	*3.9-9.2*	*9.2-18*	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	*8.1-16*	*16-31*	*31-60*	*60-116*	*>116*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

- Flood
- Earthquake
- Tsunami
- Dam failure


Building Losses from the 1% Annual Chance Flood, Puyallup River
Building Loss Ratio
Damage/Building Value
0 - 25%
25 - 50%
50% - 100%
1% Annual Chance Depth Grid
Feet
0 - 2
2 - 5
5 - 15
15 - 25
>25
N
1,000
Feet
Industry Dr E
River Rd E
Gary Rd E
Pioneer Way E
Pioneer Ave E
Frank Albert Rd E
Kelsey Ln E
David Ct E
Barry Ln E
20th St E
26th St E
27th St E
40th St E
44th St E
47th St Ct E
49th St E
50th St Ct E
54th Ave E
51st Ave E
50th Ave E
44th Ave E
40th Ave E
36th Ave E
30th Ave E
28th Ave E
Victory Ave E
167

Output

Address	Building Value	Occupancy Type	Building Loss	Loss Ratio
2802 RIVER RD E	$7,100	Mobile Home	$5,500	**78%**
2623 31ST AV E	$174,800	Mobile Home	$132,000	**75%**
3707 GAY RD E	$15,000	Mobile Home	$10,000	**68%**
3107 36TH AVCT E	$10,300	Mobile Home	$6,800	**66%**
2411 28TH AV E	$52,400	Mobile Home	$34,000	**65%**
4109 GAY DR E	$6,600	Mobile Home	$4,200	**64%**
3705 GAY RD E	$23,100	Mobile Home	$13,900	**61%**
2518 29TH AV E	$18,200	Mobile Home	$10,400	**58%**
XXX 28TH STCT E	$1,430,6000	Mobile Home	$819,300	**57%**
4034 RIVER RD	$363,200	Mobile Home	$198,400	**55%**
3103 36TH AVCT E	$3,500	Mobile Home	$1,800	**52%**

Outreach Inserts

FEMA

Severe Storms

LOCAL HISTORY

All areas of Spokane County are vulnerable to sever
annually. Affects can range from minor disruptions in
major structural damage and business closures. The best
before, *during*, and *after* severe stroms occur. As a reside
recognize the risks associated with your area and to star
around your own home and local community. This har
simple steps you can take today as well as offer multipl
overall risk from severe winter weather and storms.

UNDERSTANDING YOUR RISK

In recent years, Spokane County has experienced severe
occur frequently with sustained gusts of up to 50 mph. Fu
heavy rain and wind. Drifting often results from blizzard
of snow in compact areas. Ice and hail storms can dam
both private and public infrastructure throughout the are

DATE	April 1972	Nov. 1981	Dec. 1995	April 1996	Nov. 1996	Dec. 1996	Dec .1996	May 1997
TYPE OF STORM	Tornado	Wind	Rain, Flood, & Wind	Rain, Flood, & Wind	Ice Storm	Winter storm, Ice, Wind, & Gale Warning	Winter storm, Ice, Wind, Gale, Landslide & Avalanche	Tornado and Thunder-storm

REDUCING YOUR RISK

BEFORE

- Design and landscape your home with wildfire safety in mind. Select materials and plants that help contain fire rather than fuel it.
- Plant fire resistant shrubs and trees; Hardwood trees are *less* flammable than evergreen, pine, eucalyptus or fir trees.

- Regularly clean gutters and roof.
- Have your chimney cleaned and inspected at least twice a year, contact your local fire department for exact specifications regarding spark arrester installations.
- Use 1/8-inch mesh screens beneath porches, decks, floor areas and the home itself. Screen opening to floors, roof, and attic so that burning embers cannot accumulate.

DURING

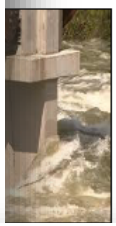
- If advised to evacuate your home, do so immediately. Be sure to take your disaster supply kit, lock your home, and choose a route that travels away from the fire hazard.
- If you haven't received evacuation orders, FEMA recommend following precautions:
  - Gather fire tools such as rake, axe, handsaw/chainsaw, and
  - Close outside attic, eaves and basement vents, windows doors. Remove flammable drapes and curtains.
  - Shut off any natural gas or fuel supplies at the source.
  - Close all doors inside the house to prevent draft. Open the fireplace, but close the fireplace screen.

Floods

SPOKANE COUNTY

ORY

non natural disaster in Spokane County, some even resulting in local and federal
ons in recent years. Several bodies of water in the County flood every two to five
the Spokane and Little Spokane Rivers, and Latah Creek, causing concern for
both inside and out of the floodplain. Floods have the potential to contaminate
upplies, foul septic systems, inundate electrical and heating systems, and even
er to rise and seep into basements or low-lying structures. If floodwaters
enough level, they may restrict access to certain roads or neighborhoods,
gency responders from reaching residents in times of crisis. The following
help you identify a variety of simple steps you can take today as well as offer
m approaches to reducing the overall risk from flooding.



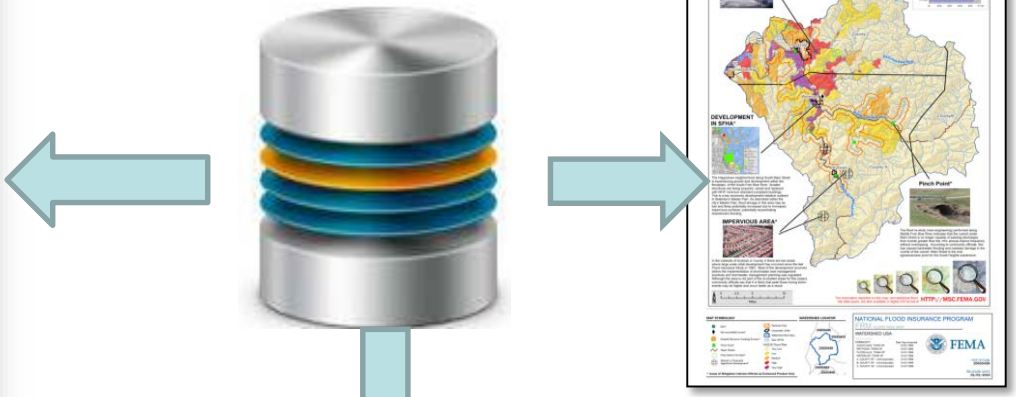
Preparing your Home for Wildfire

In order to make your home as defensible as possible against wildfire risk, there are a host of measures that can be taken. This list is not exhaustive, but does provide a number of safety measures to better protect your property during fire season. It is recommended that you create a 30 to 100 foot safety zone around your home. Within this area, you can take steps to reduce potential exposure to flames and radiant heat. Homes built within pine forests should have a *minimum* safety zone of 100 feet. If your home sits on a steep slope, additional safety precautions should be taken. Contact your local fire department or forestry service for additional information.

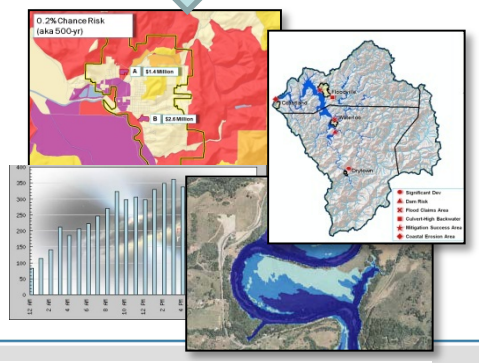
- ✓ Rake leaves, dead limbs and twigs. Clear all flammable vegetation.
- ✓ Remove leaves and rubbish from under structures.
- ✓ Thin a 15-foot space between tree crowns, and remove limbs within 15 feet of the ground.
- ✓ Remove dead branches that extend over the roof.
- ✓ Prune tree branches and shrubs within 15 feet of a stovepipe or chimney outlet.
- ✓ Ask the power company to clear branches from powerlines.
- ✓ Remove vines from the walls of the home.

Deliverables

Flood Risk Database



Flood Risk Map



Ad-Hoc Flood Risk Analyses

Proposed Project Schedule
Timeline of events

- **Flood Risk Review Meeting for Community Staff …..August 4, 2016**
- **Preliminary maps issued ……..~December 2016**
- **CCO Meeting/Open House Meeting……. ~January 2017**
- **Appeal Period and Draft Multi-Hazard Risk Report……..~March 2017**
- **End of Appeal Period ……..~June 2017**
- **FEMA issues "Letter of Final Determination (LFD)" ……..September 2017?**
  - to communities and publishes the BFEs in the Federal Register
  - Communities have 6 months to adopt the study before the data becomes "effective". *Failure to adopt results in suspension from NFIP*
- **Risk MAP Resilience Workshop and Delivery of Final Flood Risk Report and Risk Assessment Database ……December 2017?**
- **Effective date ……March 2018?**

Appeals & Comments

- Submit to your community officials
- Community bundles all the comments and forwards them to Region 10 Support Center

FEMA Region X Service Center
20700 44th Ave. W., Suite 110
Lynnwood, WA 98036

- Forms are available here at the open house

Letters of Map Change (LOMC) (ways to appeal at any time)

- **Letter Of Map Amendment (LOMA) -** for property owners who believe a property was incorrectly included in a floodplain, primarily through showing that the lowest elevation of the structure is above the 1% flood elevation.
- **Letter of Map Revision (LOMR) –** for communities to submit better technical information to change a floodplain or to reflect physical changes made to the floodplain.

(LOMA) Hotline - 1-877-FEMA-MAP

FEMA Coastal Outreach Website

www.fema.gov/coastal-flood-risks

Plan, Prepare & Mitigate › Protecting Homes › Flood Hazard Mapping ›
Coastal Flood Risks: Achieving Resilience Together

Follow FEMA:

- Safer, Stronger, Protected Homes & Communities
- Protecting Homes
  - Flood Insurance
  - Flood Hazard Mapping
    - Change my Flood Zone Designation
    - Letter of Map Amendment Information
    - User Groups
    - Risk MAP
    - Cooperating Technical Partners
    - Living with Levees
    - Status of Map Changes
    - Forms, Documents, and

Coastal Flood Risks: Achieving Resilience Together

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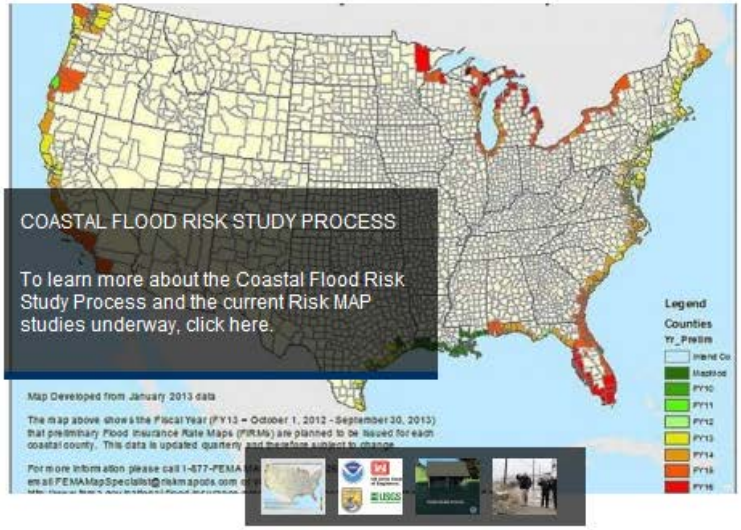

Related Links

- Coastal Flood Risk Study Process
- Coastal Flood Risk Resources
- Coastal Frequently Asked Questions
- National Flood Insurance Program (NFIP)

Information Tables

Flood Insurance	Flood Study / Engineering	Property Identification & Digital Mapping
State Table	City Table	Floodplain Regulations

Property Identification and Digital Mapping Table

- Determining if one is in a Flood Zone
- If yes, what type of flood zone is one in (AE, A, AO, AH, V, VE, Shaded X, unshaded X)
- Ability to add layers to help better locate a property (orthophotos, parcel data)
- Print a map of your property and the flood zone
- Where one should go next for more information (Insurance, Floodplain Regulations)

Flood Insurance Table

- When is flood insurance required?
- What is the flood insurance rate structure for the zone one is in (AE, A, AO, AH, V, VE, Shaded X, unshaded X)?
- What are my best options to get the lowest rate?

Floodplain Regulations Table

- What are the building requirements/restrictions for the zone one is in (AE, A, AO, AH, V, VE, Shaded X, unshaded X)
- What are the building requirements/restrictions for a floodway?

Community Table

- City Floodplain Regulations
- Emergency Management Capabilities
- Locally Available Hazard Mitigation Plans

State Table

- State Flood Mapping Priorities
- Risk Reducing Strategies
- State Floodplain Regulations

Flood Study/Engineering Table

- How does one determine the 1% flood?
- What areas were updated?
- What information was used (topography, bathymetry, models, assumptions)?
- What is the process to appeal the information and/or provide better information?

Questions & Comments

FEMA:		
Flood Study Engineer:	**Ted Perkins**	**(425) 487-4684**
Risk Analyst/GIS Specialist:	**Amanda Siok**	**(425) 487-4626**
NFIP Insurance Specialist:	**Deb Gauthier**	**(425) 487-2023**
Floodplain Management Spec.:	**Karen Wood-McGuiness**	**(425) 487-4675**
Mitigation Planner:	**Brett Holt**	**(425) 487-4553**
State of Alaska Contacts:		
State RiskMAP Coordinator	**Sally Cox**	**(907) 269-4588**
State NFIP Coordinator	**Jimmy Smith**	**(907)-269-4132**
STARR PM:	**Tiffany Coleman**	**(859) 422-3024**
Flood Insurance Information:	**www.floodsmart.gov**	