Rich Passage Long Term Beach Monitoring

Property Owner Updates

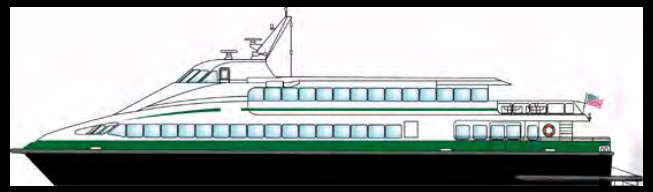
January 29 & 30, 2020

Jessica Côté, PE

BLUE COAST ENGINEERING

Kitsap Transit
Connecting Communities

History of passenger ferries on route



1986: Washington State Ferries (WSF) first passenger only ferry

1989: WSF adds faster vessel (24 kts)

1990: Investigation of shoreline damage concerns resulted in slow down (12 kts)

1990s: WSF established wake criterion

1998: WSF acquired 2 larger and faster vessels (37 kts)

1999: Property owners filed class action suit

2003: WSF stopped POF service to Bremerton

2004: Kitsap Transit Rich Passage Passenger Only Fast Ferry Research program began

2012: M/V Rich Passage 1 Validated and Tested

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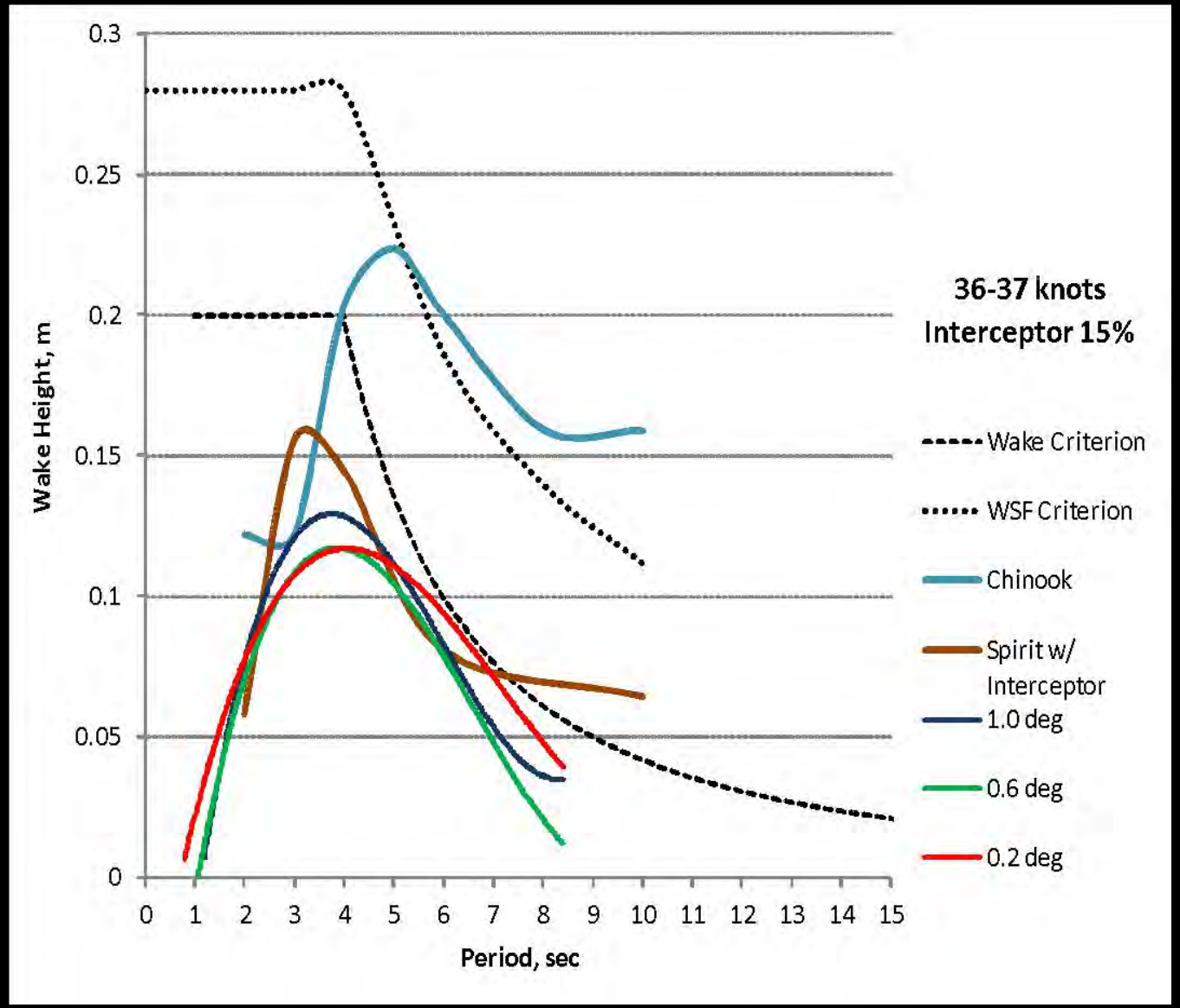
Kitsap Transit Connecting Communities

WSF Fast Ferry Wake Wash



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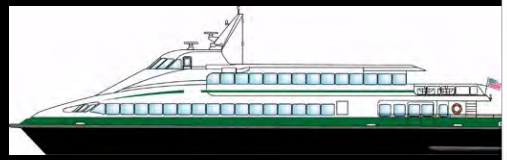
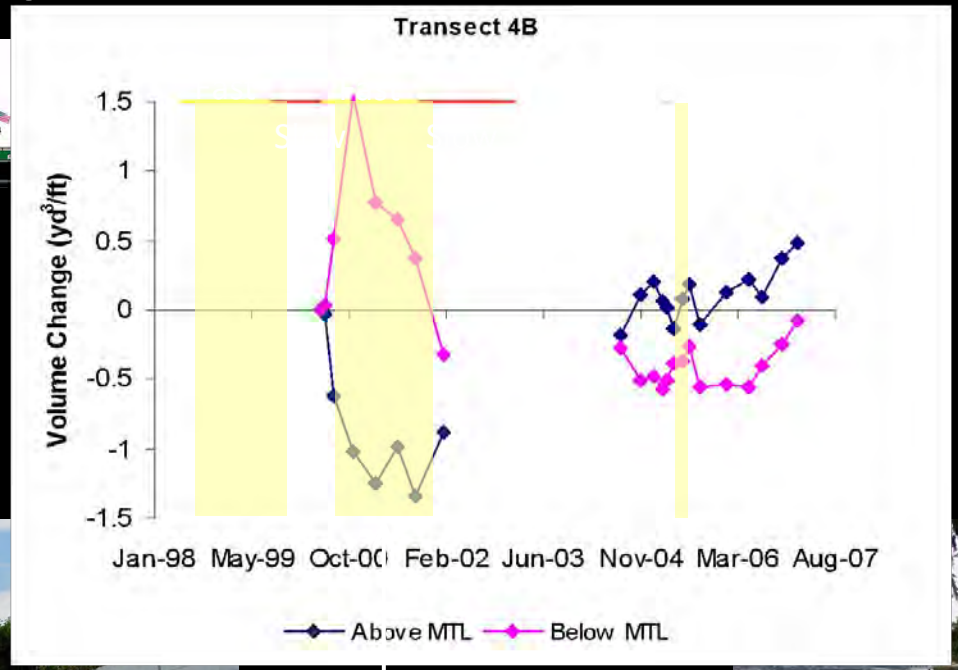
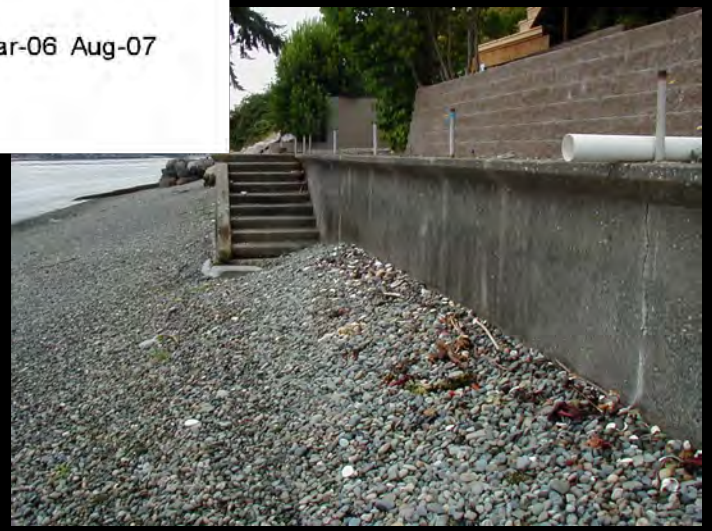
Kitsap Transit Connecting Communities

Beach Response to WSF POFF





JUL 2001



AUG 2004

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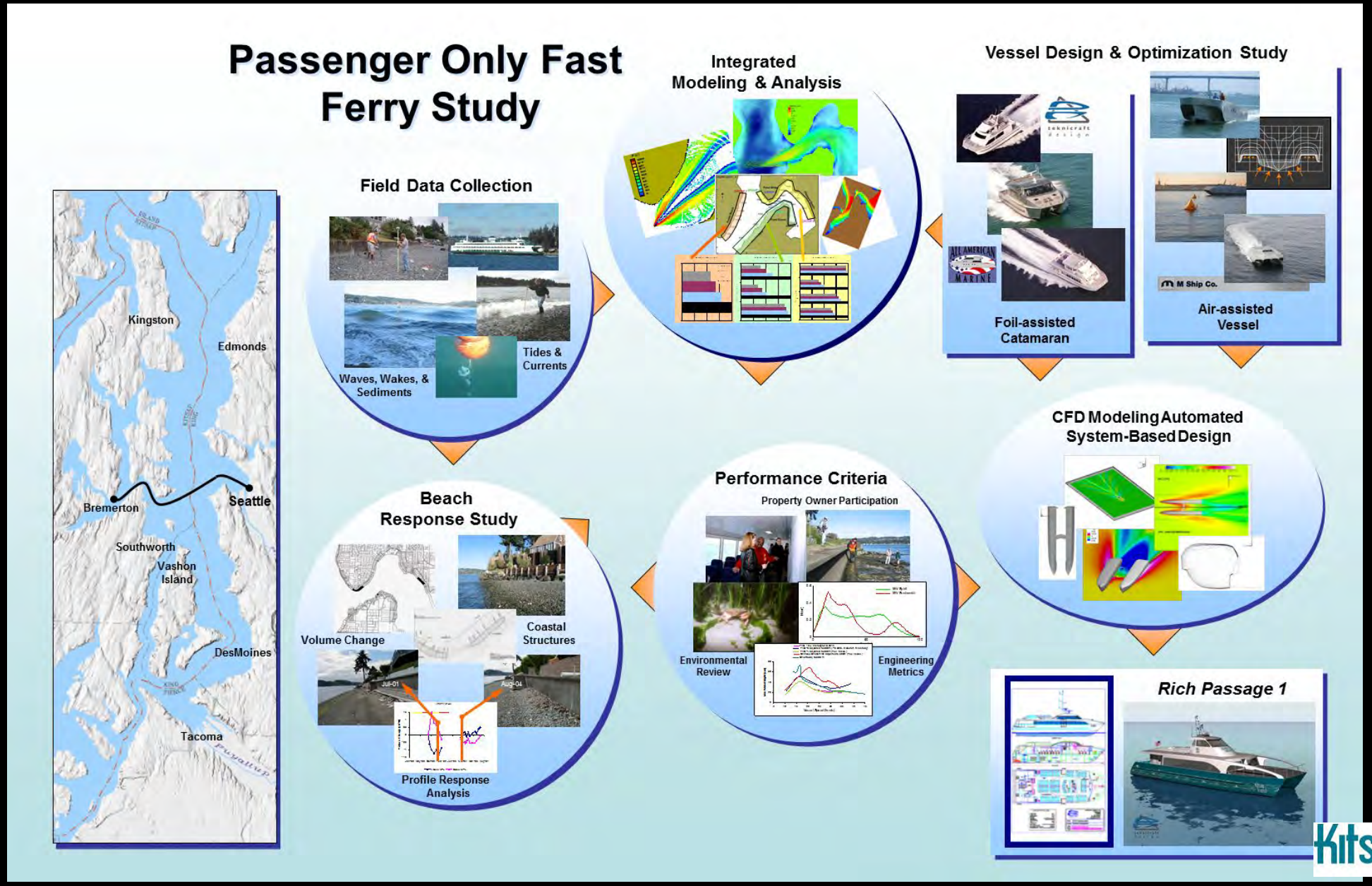
Kitsap Transit Connecting Communities

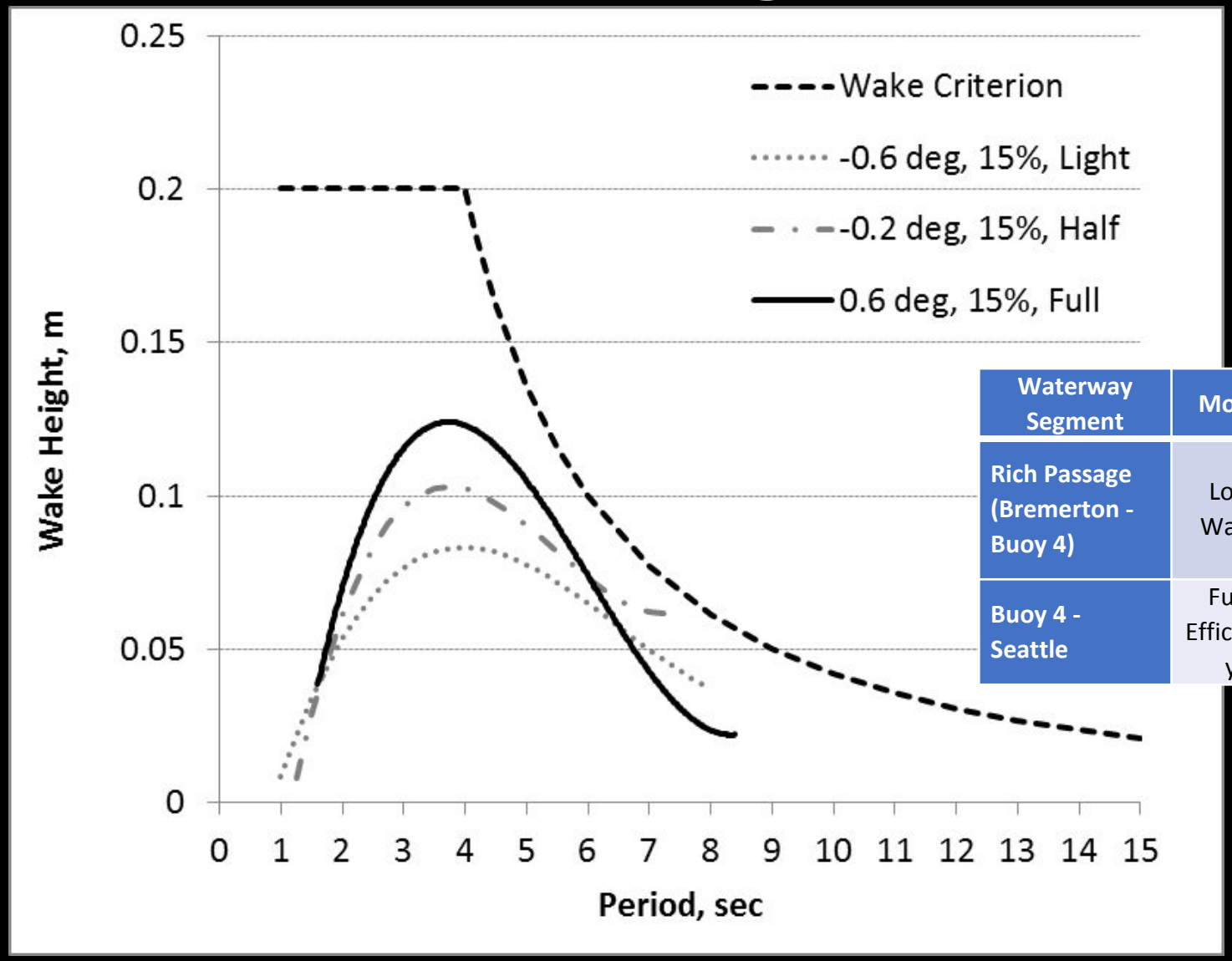
Research Program Design (2004 to 2012)



BLUE COAST ENGINEERING

Kitsap Transit Connecting Communities

Rich Passage Class Vessels



Waterway Segment	Mode	Passengers Onboard	Loading	Foil Angle Degrees	Interceptor Percent
Rich Passage (Bremerton - Buoy 4)	Low Wake	0 - 50	Light	-0.6	15%
		51 - 70	Half	-0.2	15%
		71 - 118	Full	0.6	15%
Buoy 4 - Seattle	Fuel Efficiency	0 - 118	ALL	0.6	0%

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Kitsap Transit Connecting Communities

Measurements from 2004 to 2012

Hydrodynamics

- Wind
- Wakes and waves
- Tidal currents
- Water levels

Morphology

- ❑ Sediments
- ❑ Beach Profiles
- ❑ Beach Photos
- ❑ Gravel Transport
- ❑ 3D Laser Scans

Environmental

- ❖ Biological Habitat
- ❖ Noise

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Kitsap Transit Connecting Communities

Rich Passage Beach Dynamics

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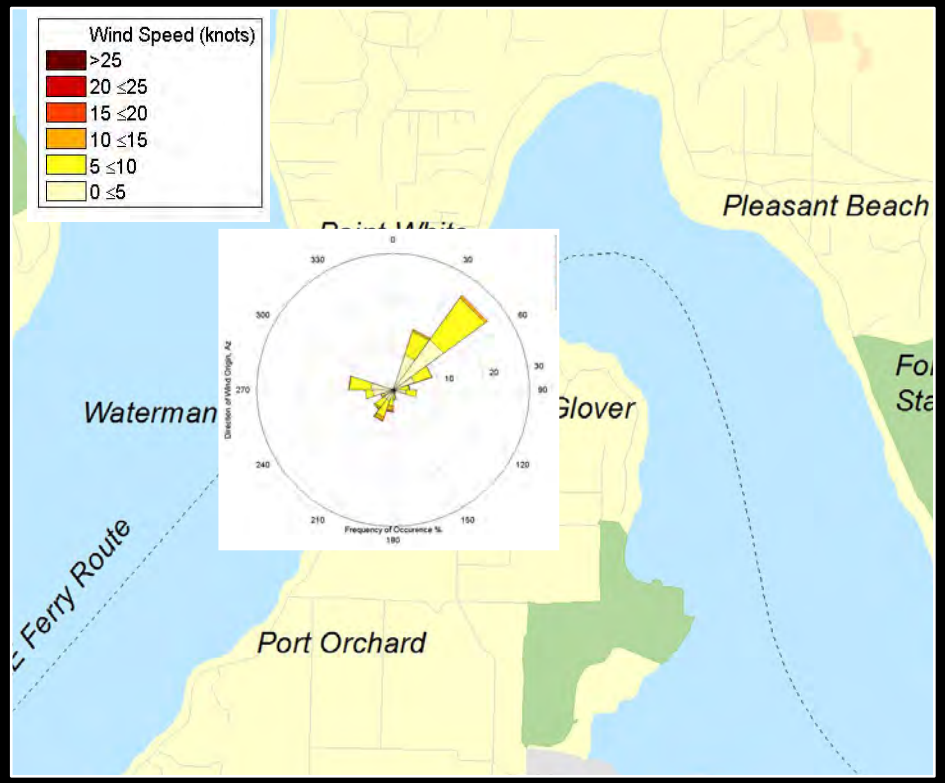
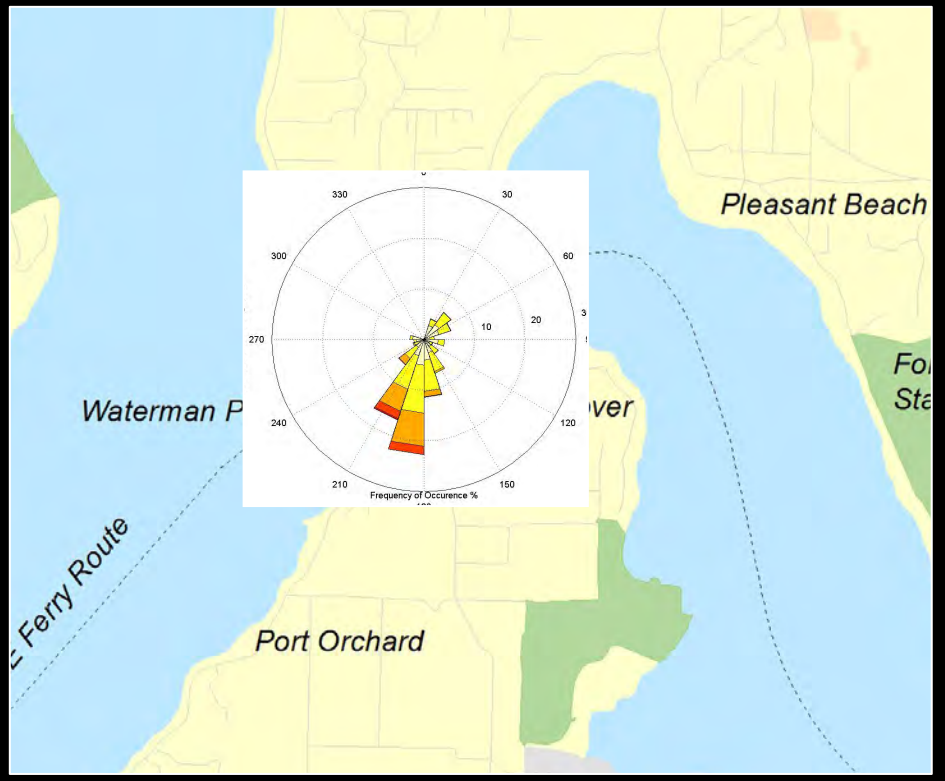
Kitsap Transit Connecting Communities

Wind Generated Waves

Summer Condition



Winter Condition



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Kitsap Transit Connecting Communities

Low energy wave environment

- Beach supply limited by structures
- Beaches shaped by large infrequent winter storms
- Beaches shaped by long term exposure to wakes
- Vessel wakes can be significant
- Used long term, high resolution monitoring to capture beach variability

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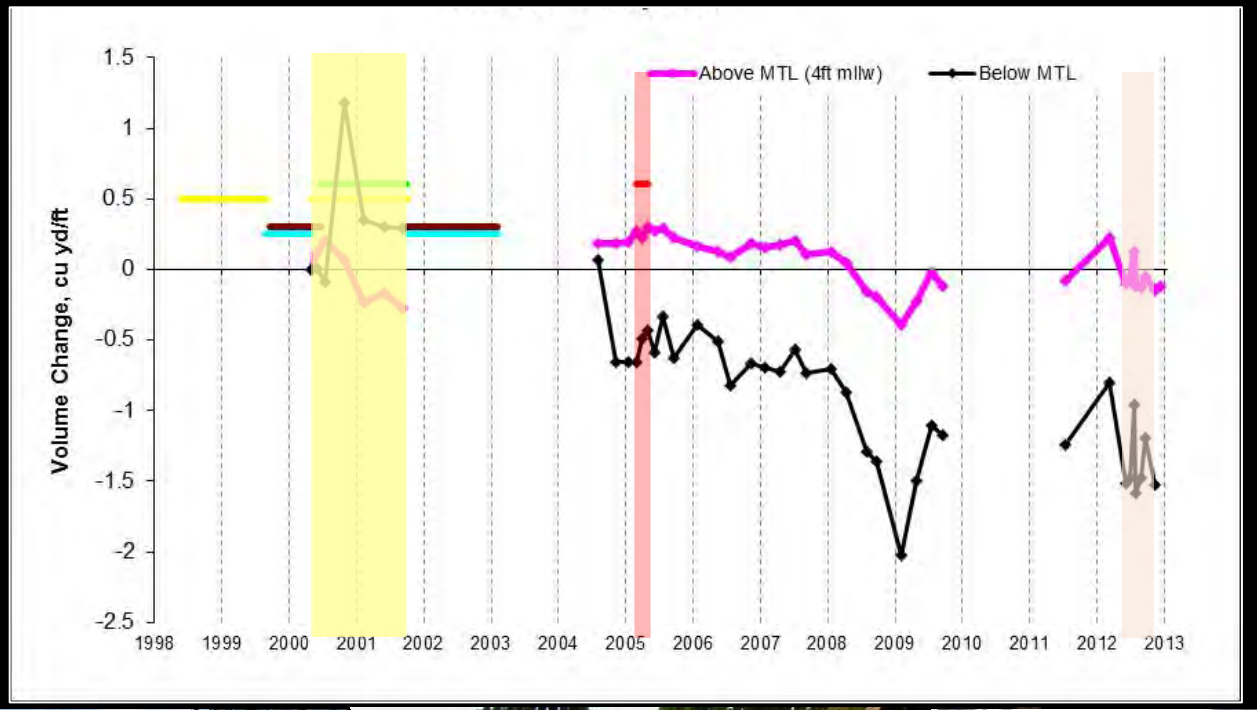
Kitsap Transit Connecting Communities

Beach Change 2004 to 2013



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Kitsap Transit Connecting Communities

2013 to 2019 Beach Monitoring

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Kitsap Transit Connecting Communities

Beach Monitoring Methods – Beach Photo Surveys

Extensive coverage of relative change of beach at bulkhead interface

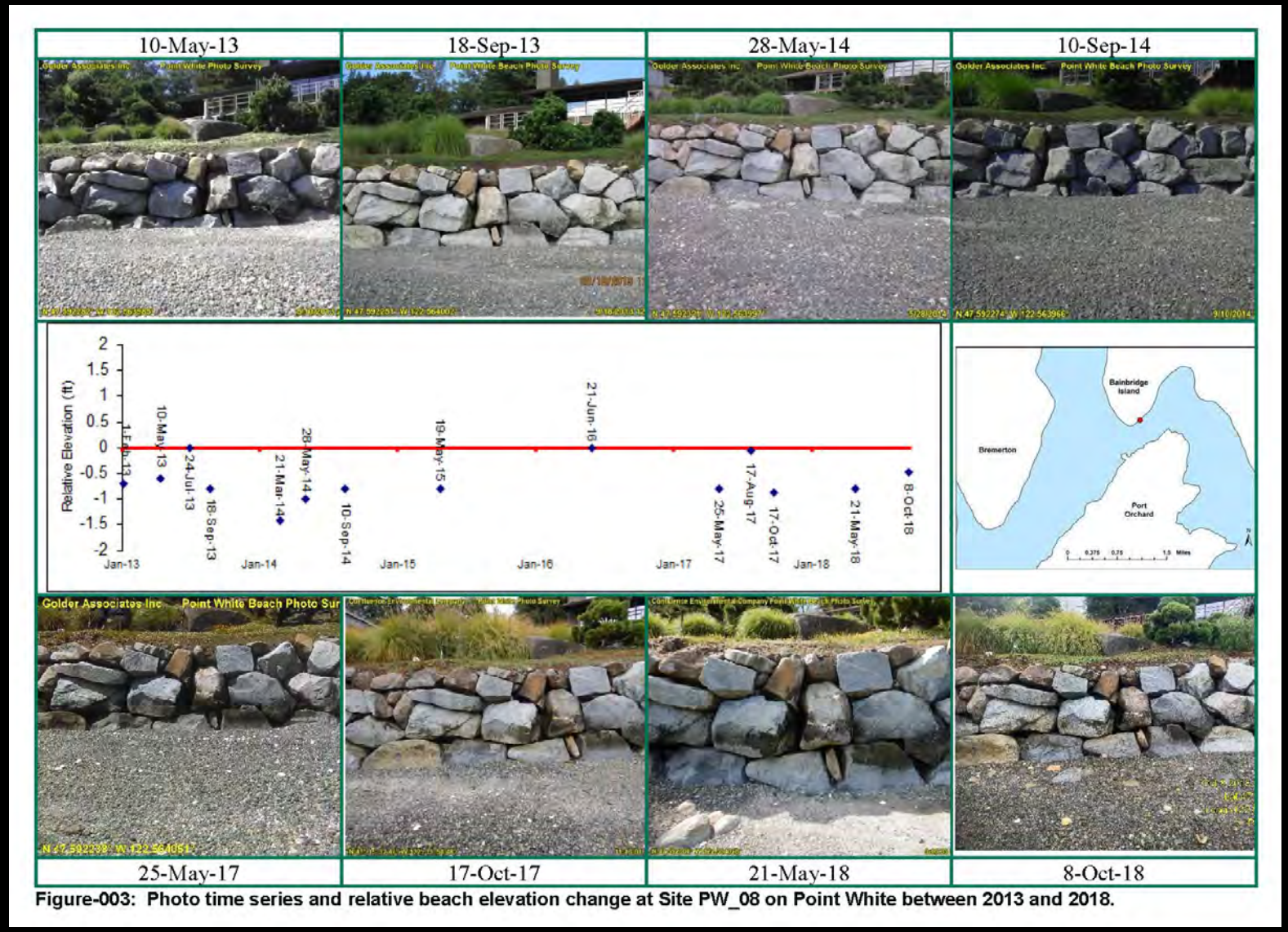

Figure-003: Photo time series and relative beach elevation change at Site PW_08 on Point White between 2013 and 2018.

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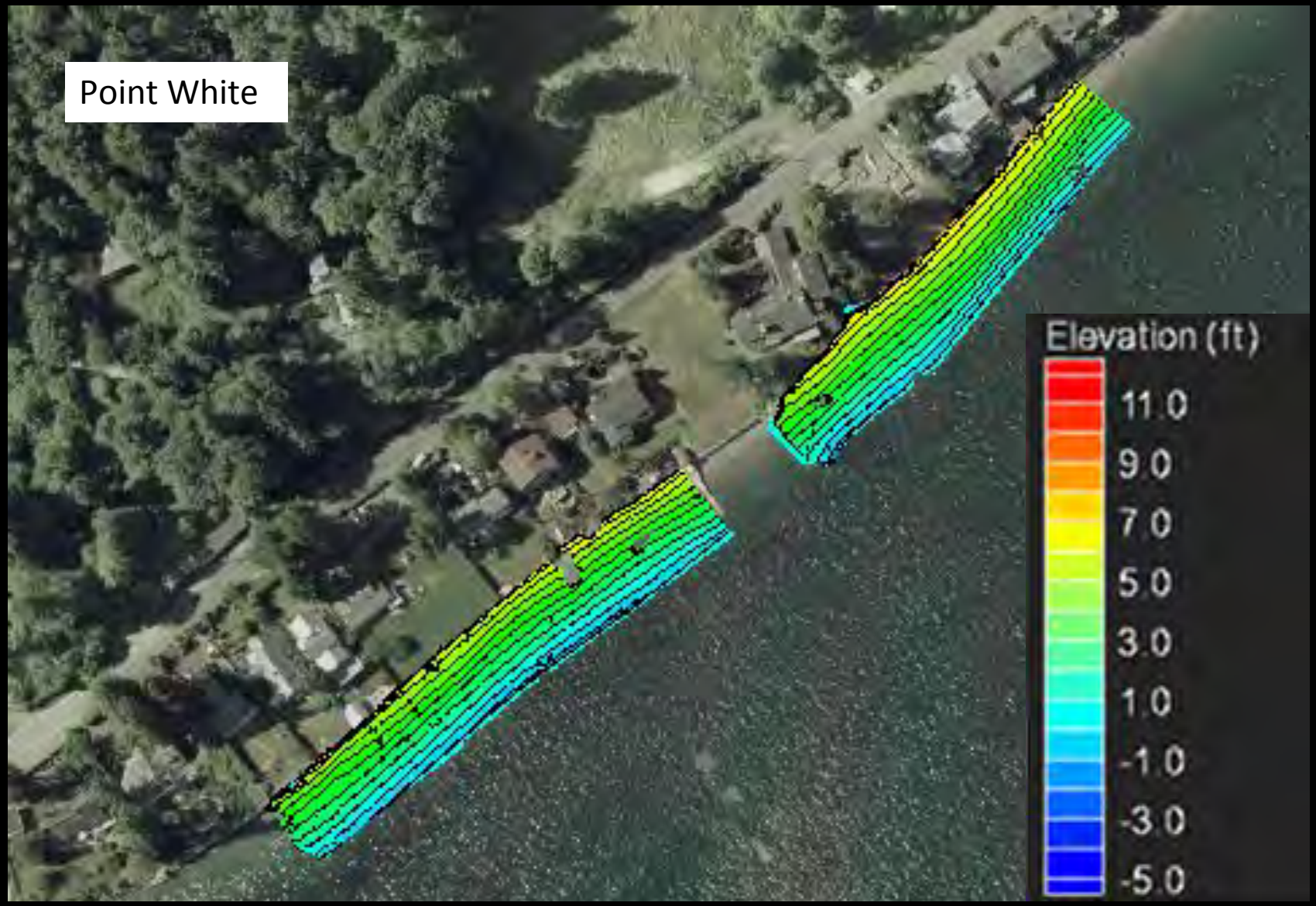
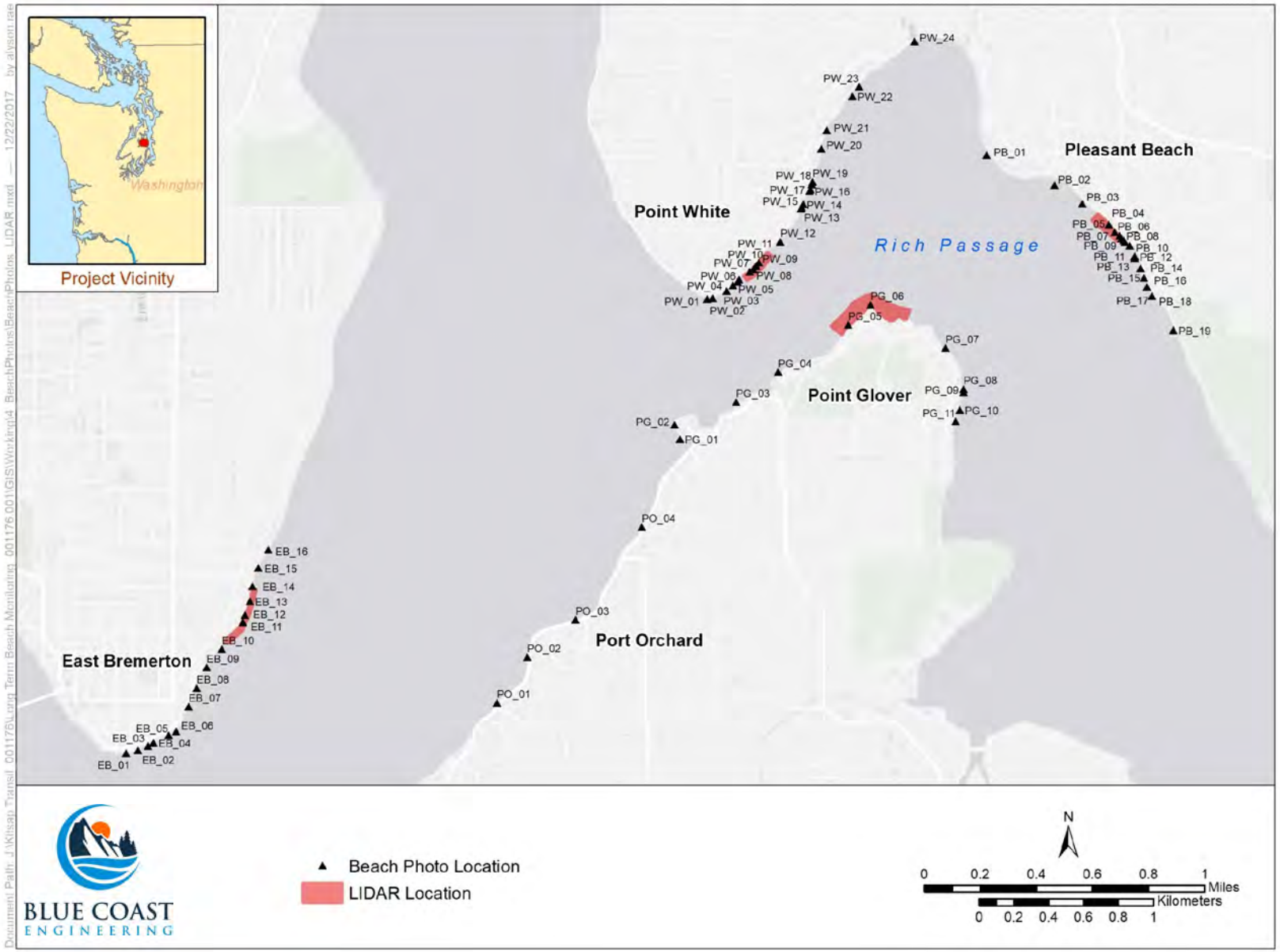
Beach Monitoring Methods – Laser Scanning Surveys

Precise measurement of beach elevations along one to two sections of four shoreline reaches



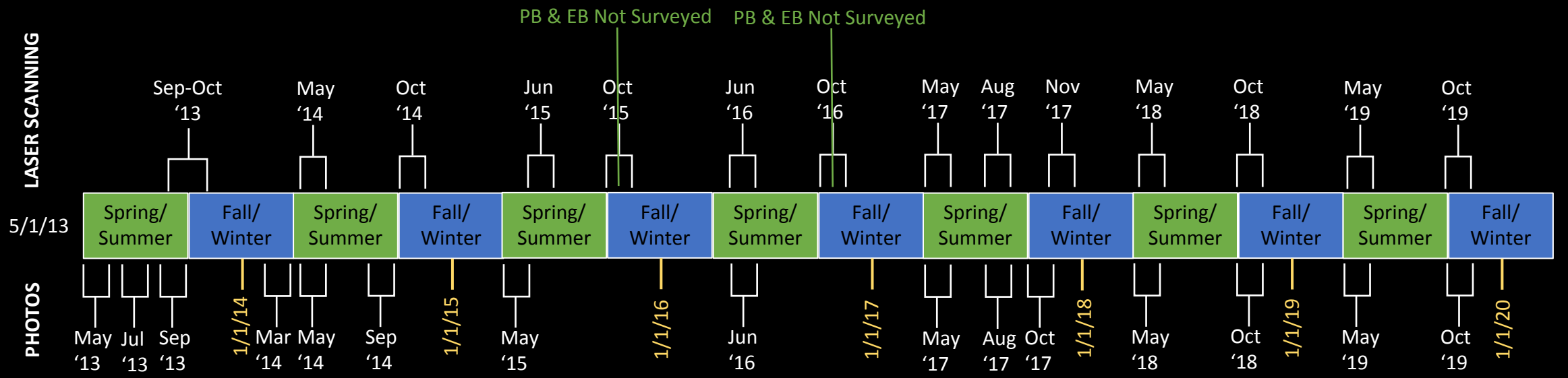
BLUE COAST ENGINEERING

Beach Monitoring Locations



BLUE COAST ENGINEERING

2013 to 2019 Beach Monitoring Timeline



LEGEND

Fall/Winter = October through April PB = Pleasant Beach

Spring/Summer = May through September EB = East Bremerton

BLUE COAST ENGINEERING

Kitsap Transit Connecting Communities

2017 – 2020 POFF Operations

Start Date	End Date	One Way Trips	Days per Week
July 10, 2017	October 28, 2017	80	6
October 30, 2017	November 30, 2017	60	5
December 1, 2017	May 4, 2018	80	5
May 5, 2018	September 29, 2018	100	6
September 30, 2018	May 1, 2019	80	5
May 1, 2019	September 22, 2019	120	6
September 23, 2019	October 19, 2019	140	6
October 19, 2019	May 1, 2020	80	5

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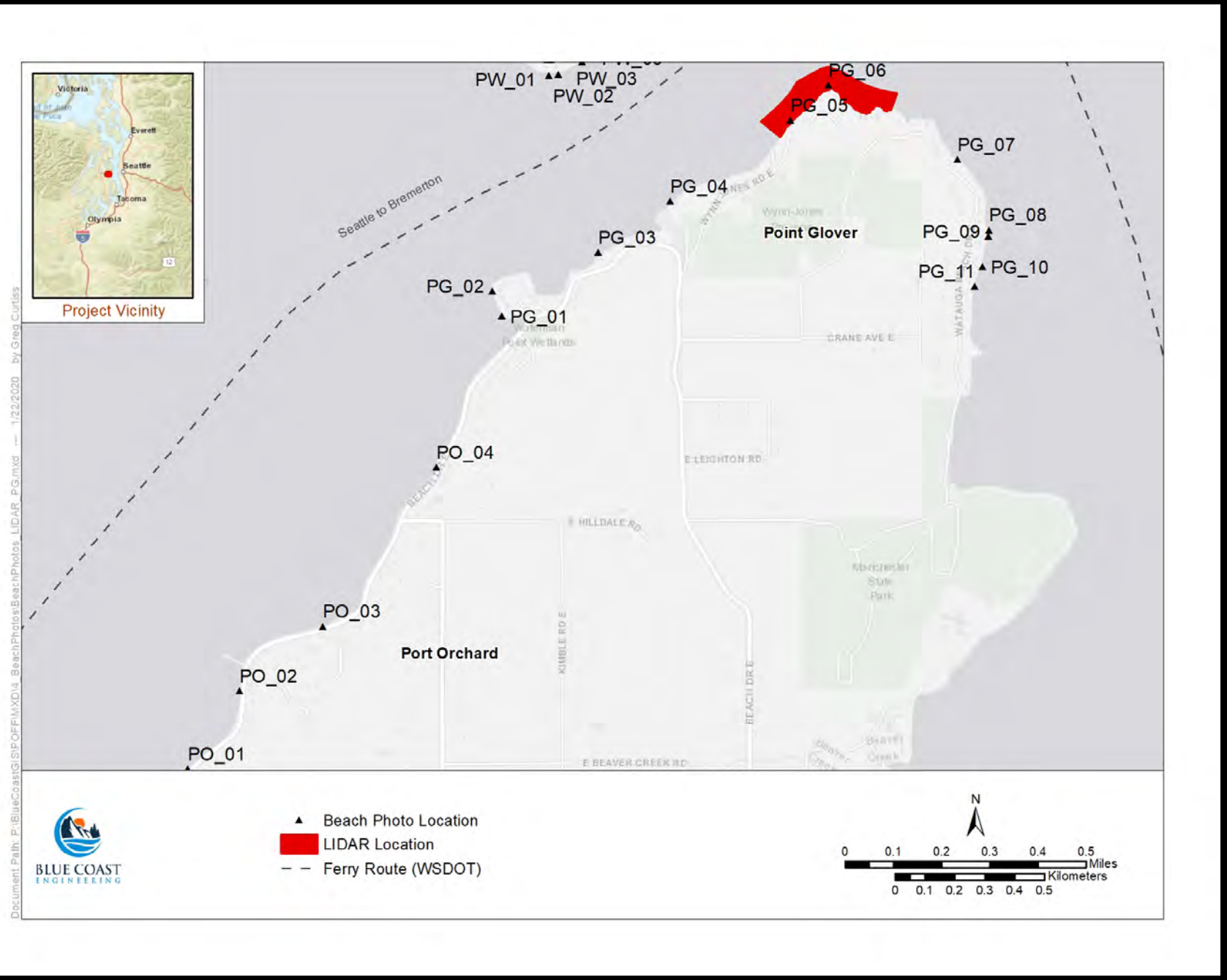
Kitsap Transit Connecting Communities

Monitoring Results

2019

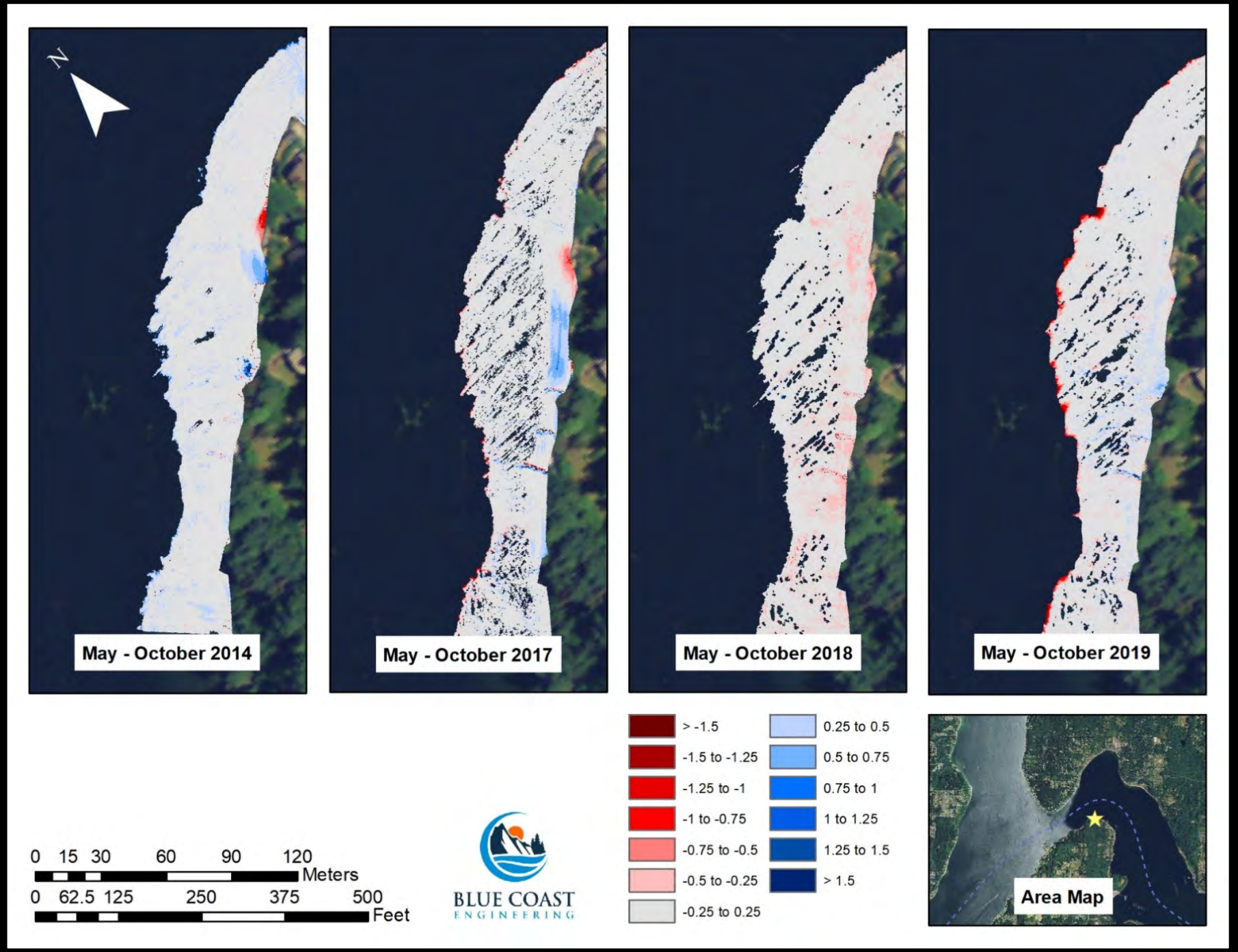
Beach Monitoring Locations: Point Glover / Port Orchard



BLUE COAST ENGINEERING

Point Glover West

- Most of shoreline shows very small seasonal changes
- Occurs within pockets between groins

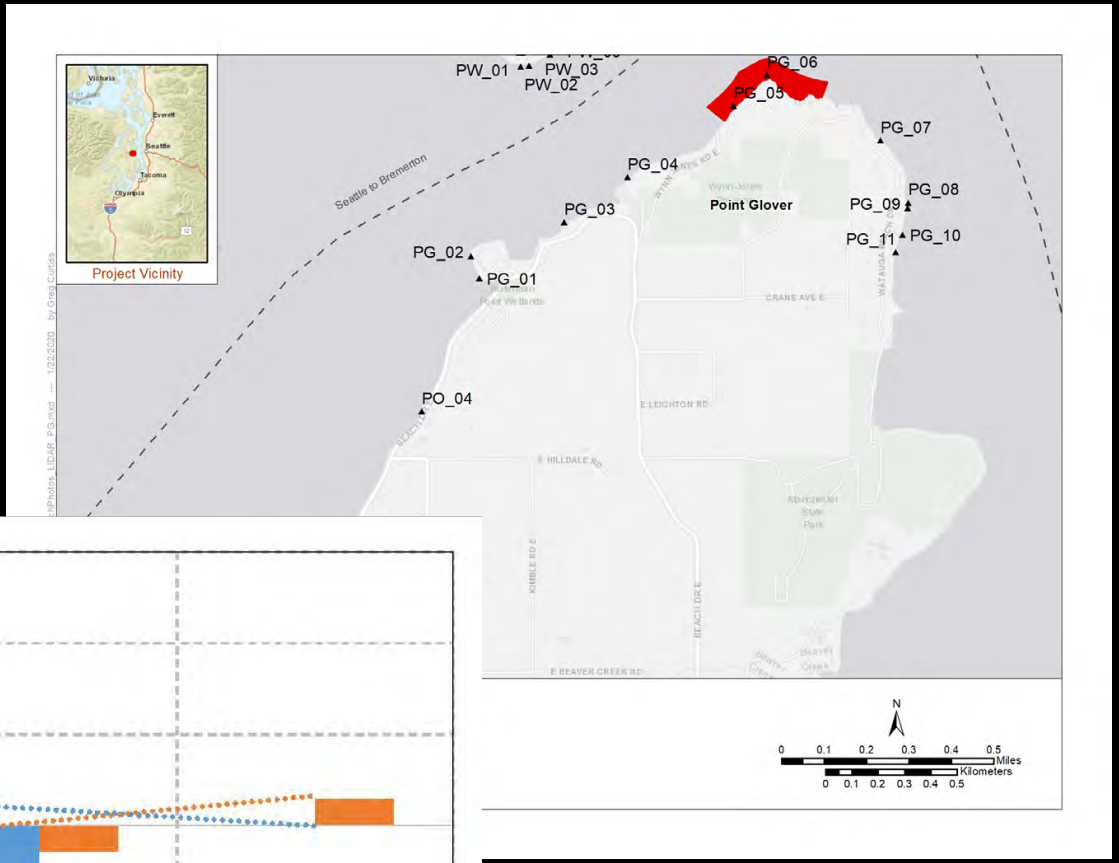


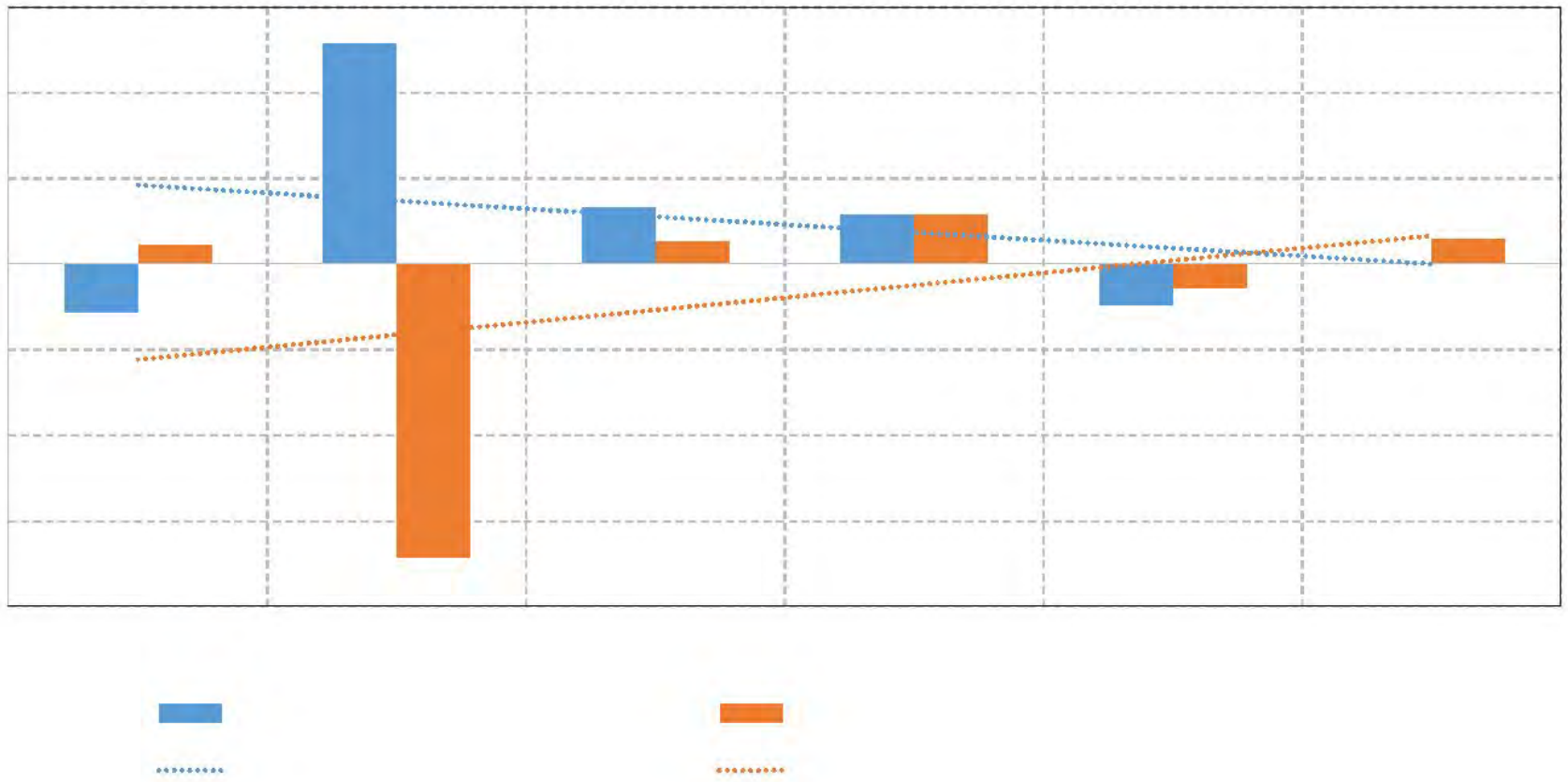
POINT GLOVER

VOLUME CHANGE – LASER SCANNING SURVEY

PGW = Point Glover East (Blue)

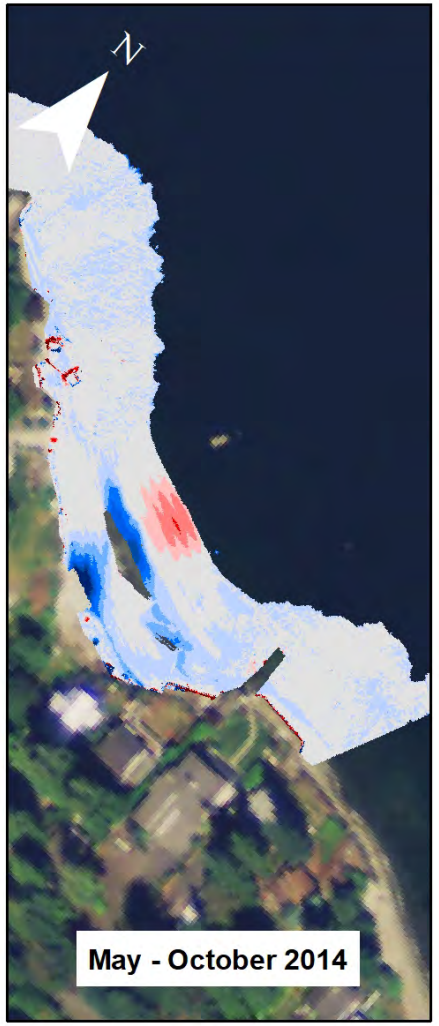
PGW = Point Glover West (Orange)

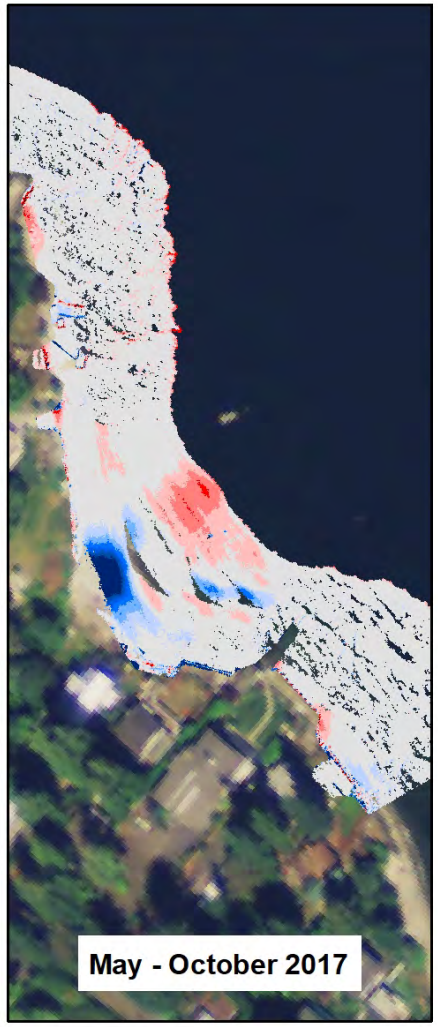


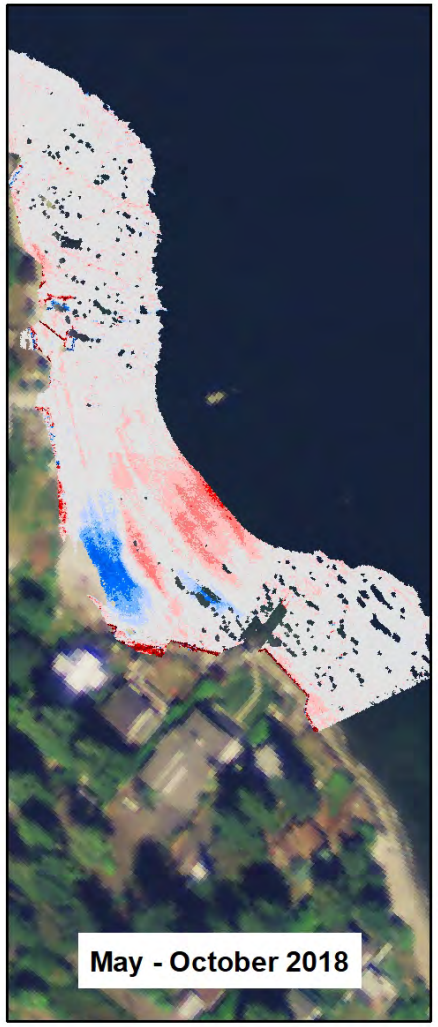


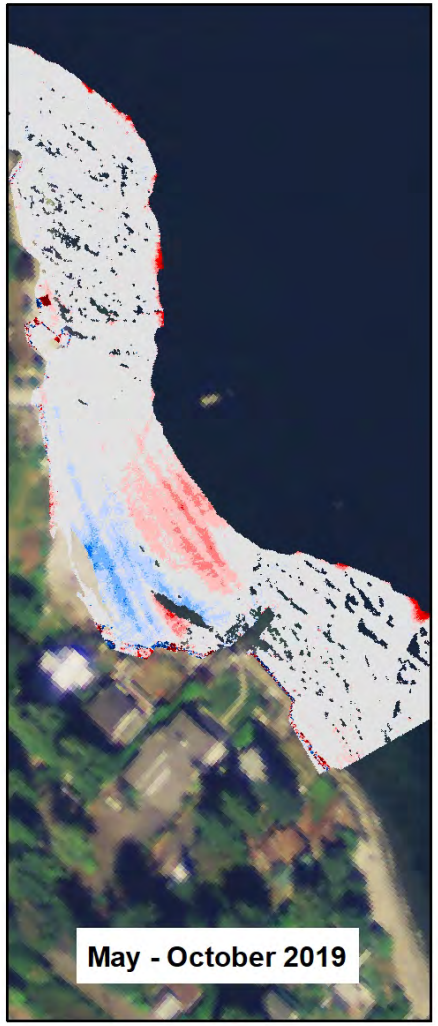
Point Glover East

- Most of shoreline shows very small seasonal changes
- Sediment transport driven by precipitation and creek discharge









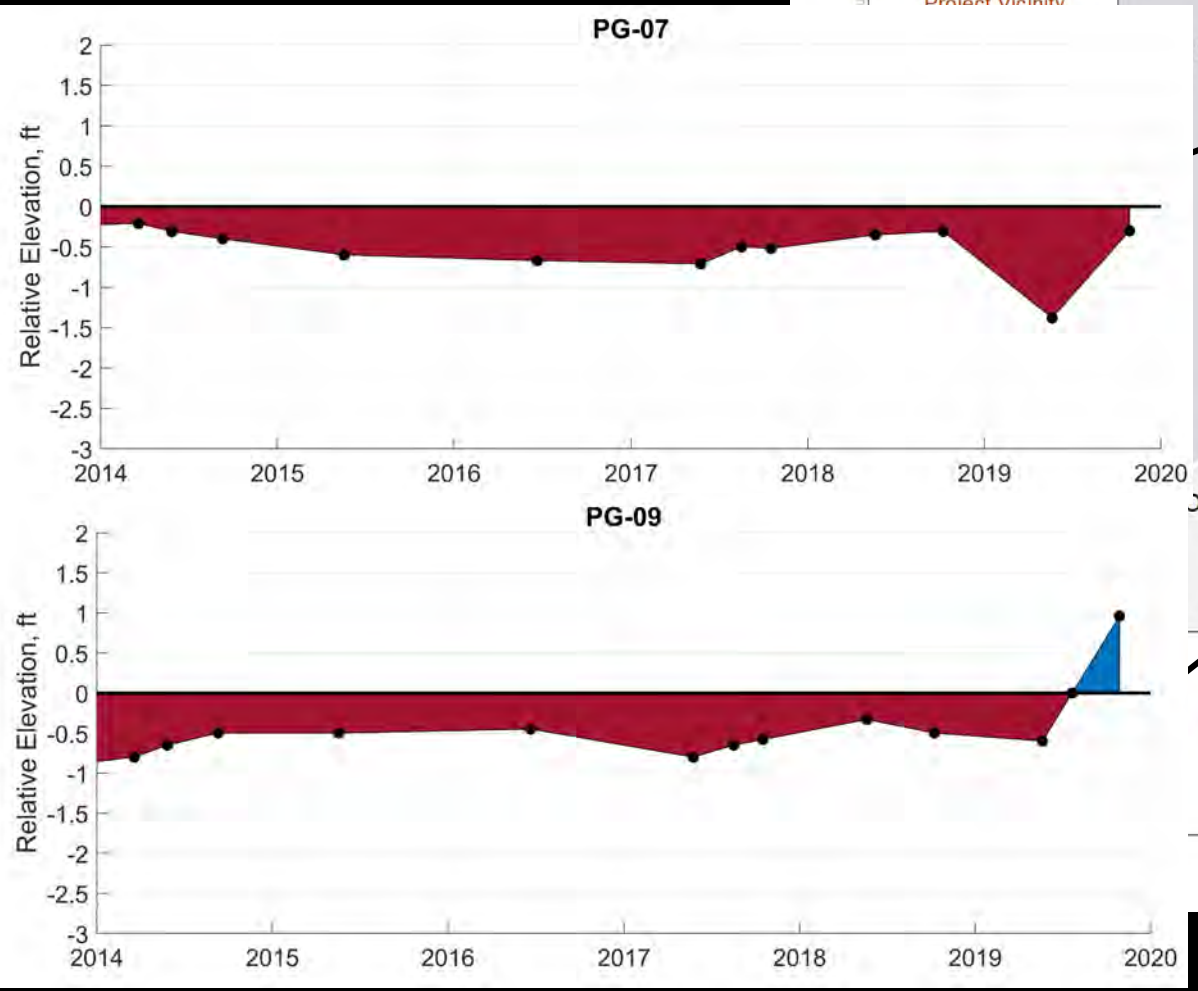
0 15 30 60 90 120
Meters
0 62.5 125 250 375 500
Feet

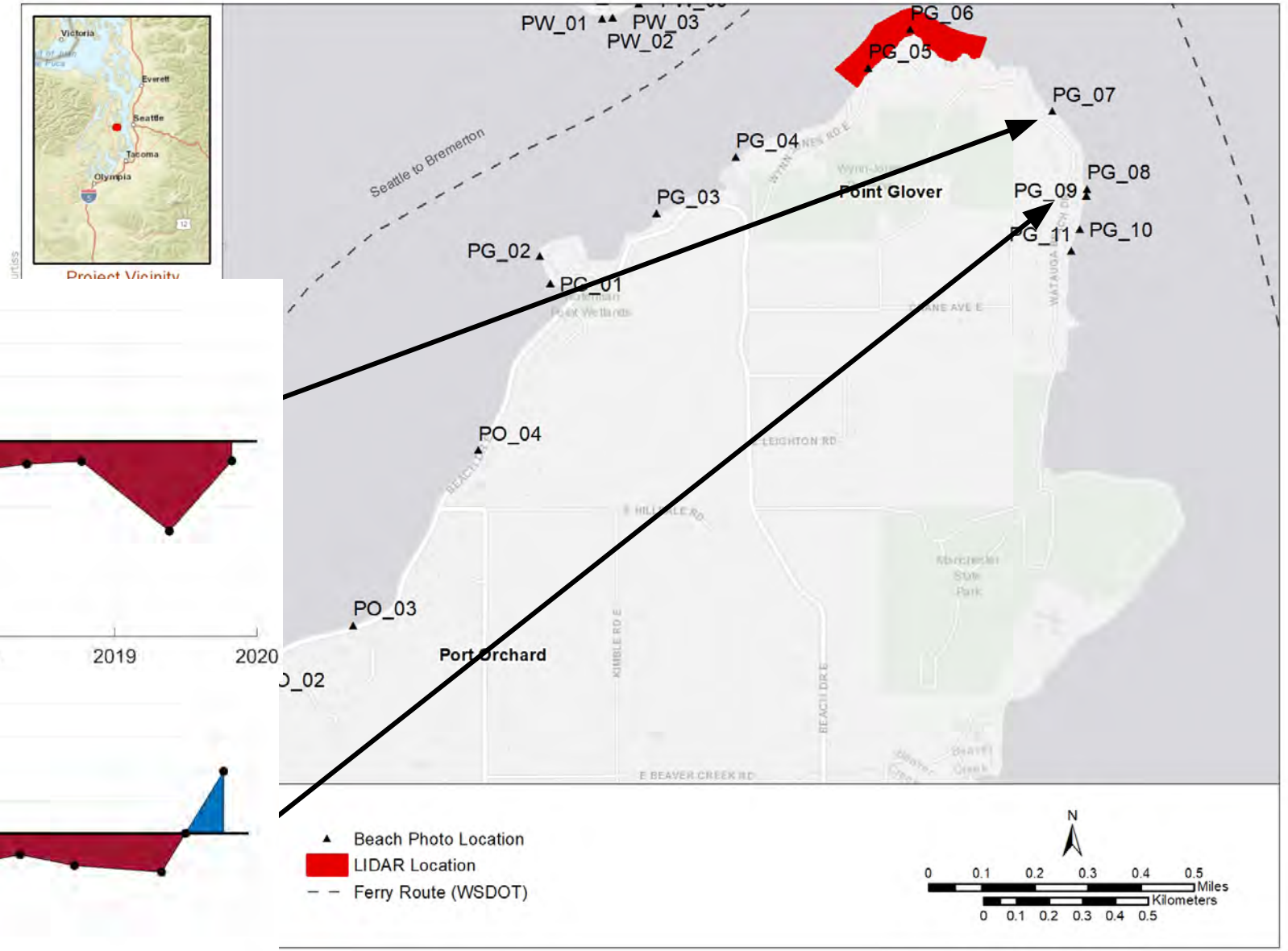
BLUE COAST ENGINEERING

> -1.5
-1.5 to -1.25
-1.25 to -1
-1 to -0.75
-0.75 to -0.5
-0.5 to -0.25
-0.25 to 0.25
0.25 to 0.5
0.5 to 0.75
0.75 to 1
1 to 1.25
1.25 to 1.5
> 1.5

POINT GLOVER

CHANGE RELATIVE TO 2005





Port Orchard

- Minimal change seasonally or annually
- No laser scanning as changes are too small

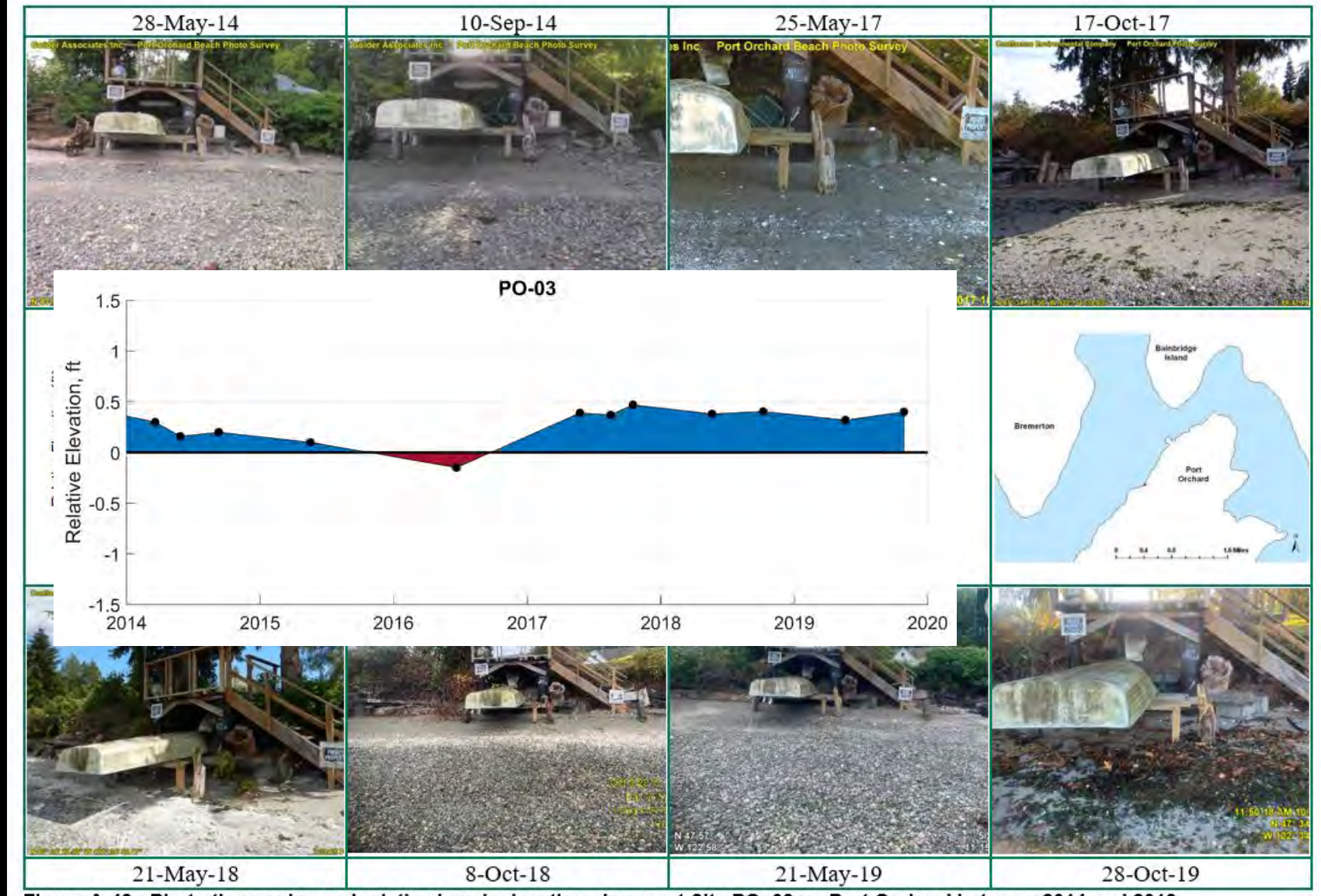
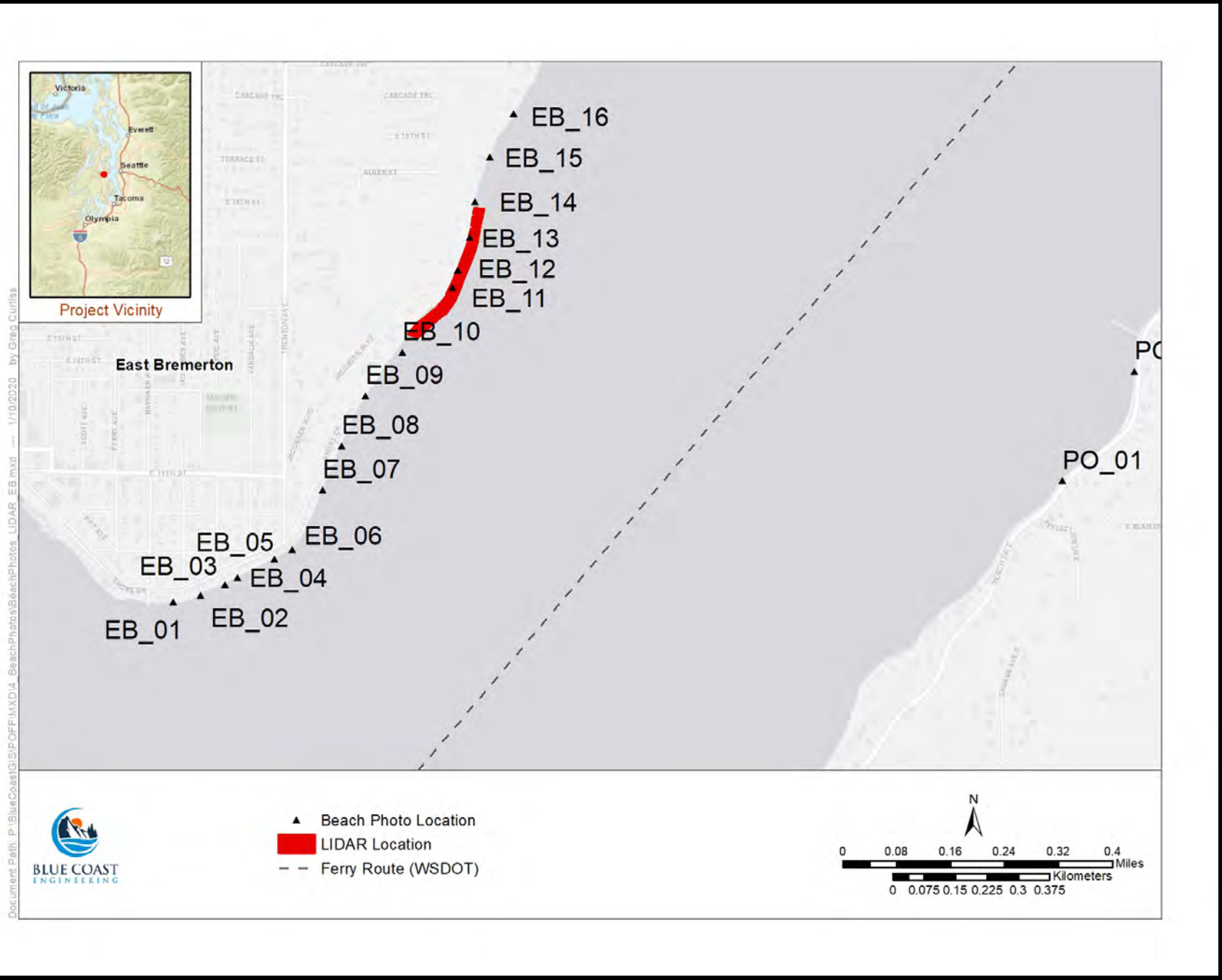


Figure A-49: Photo time series and relative beach elevation change at Site PO_03 on Port Orchard between 2014 and 2019.

BLUE COAST ENGINEERING

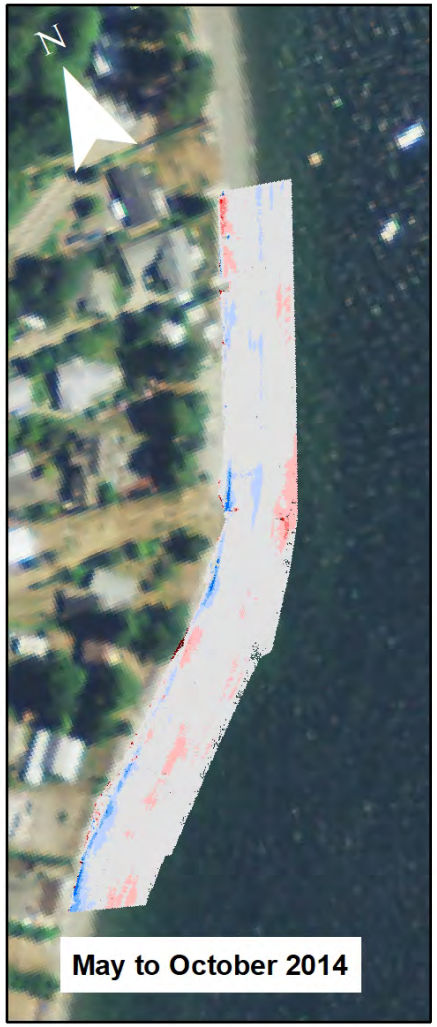
Beach Monitoring Locations: East Bremerton

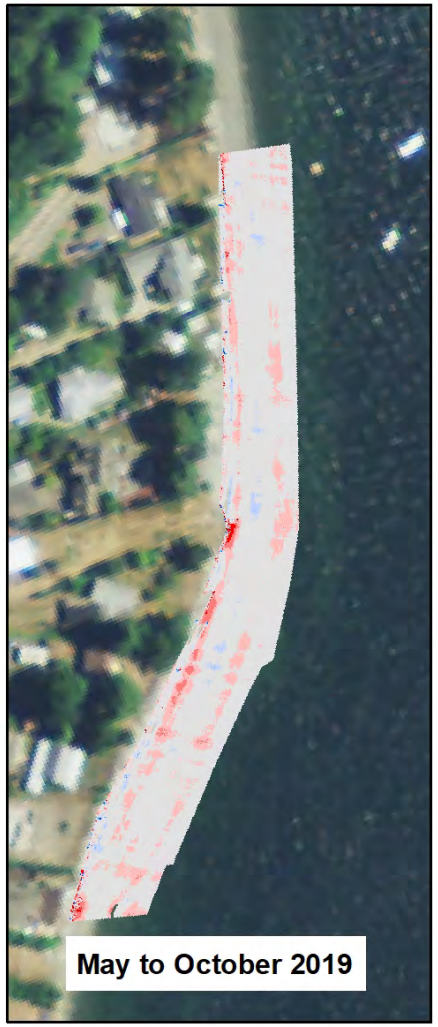


BLUE COAST ENGINEERING

East Bremerton

- Elevation changes are typically small (+/- 0.5 ft)

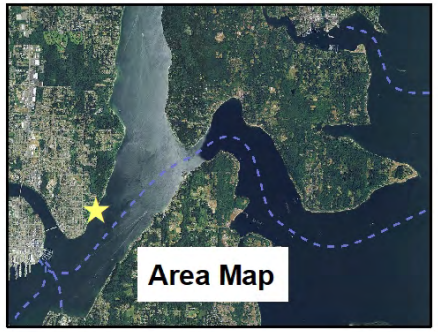




0 15 30 60 90 120 Meters
0 65 130 260 390 520 Feet

BLUE COAST ENGINEERING

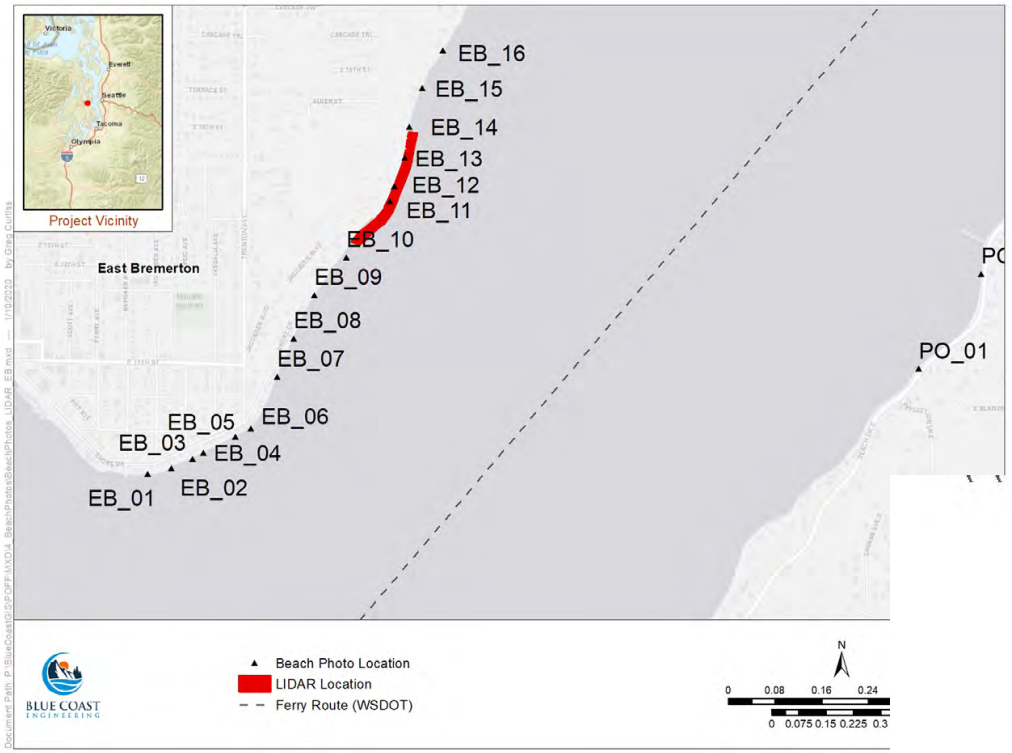
> -1.5
-1.5 to -1.25
-1.25 to -1
-1 to -0.75
-0.75 to -0.5
-0.5 to -0.25
-0.25 to 0.25
0.25 to 0.5
0.5 to 0.75
0.75 to 1
1 to 1.25
1.25 to 1.5
> 1.5

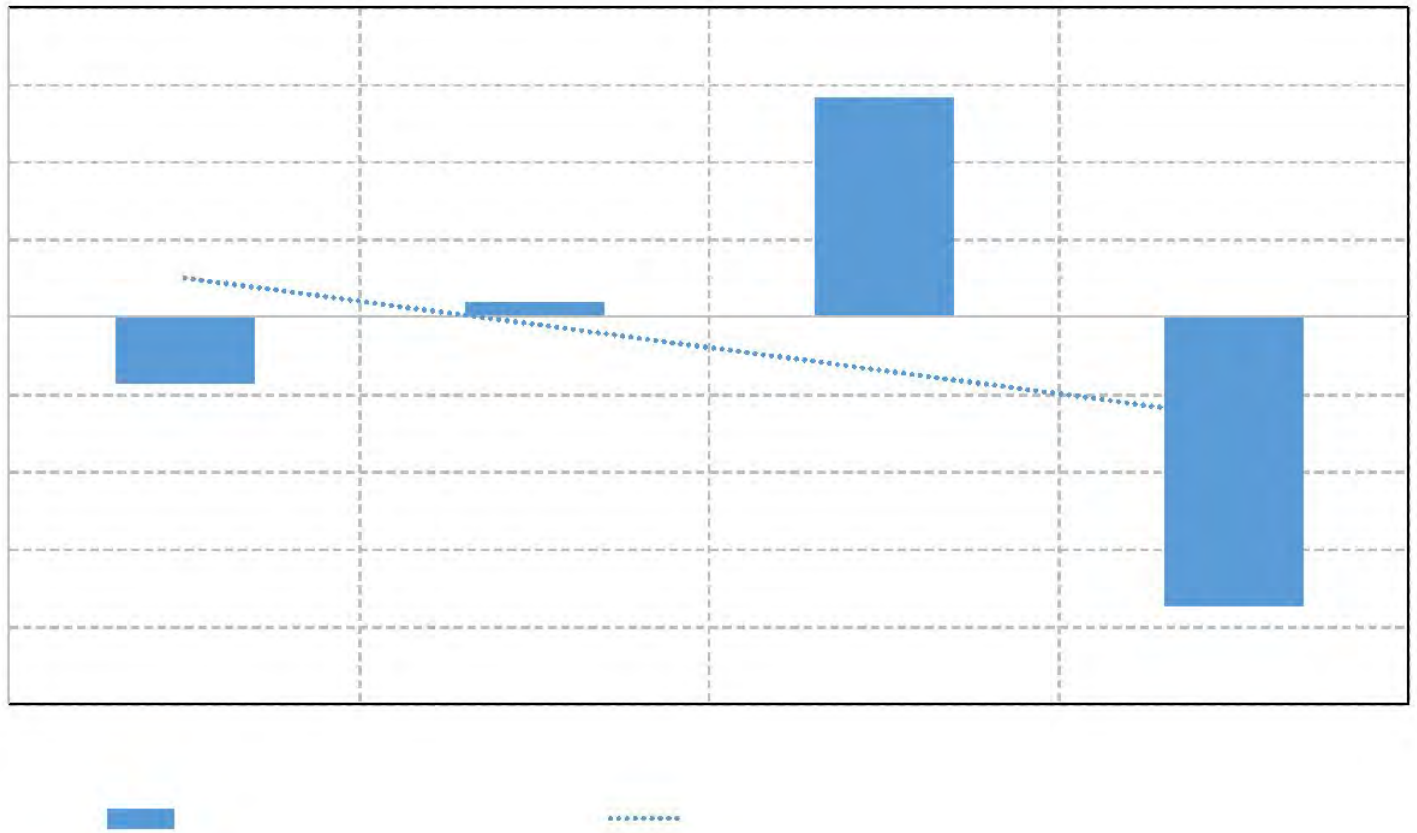


BLUE COAST ENGINEERING

E. BREMERTON

VOLUME CHANGE – LASER SCANNING SURVEY

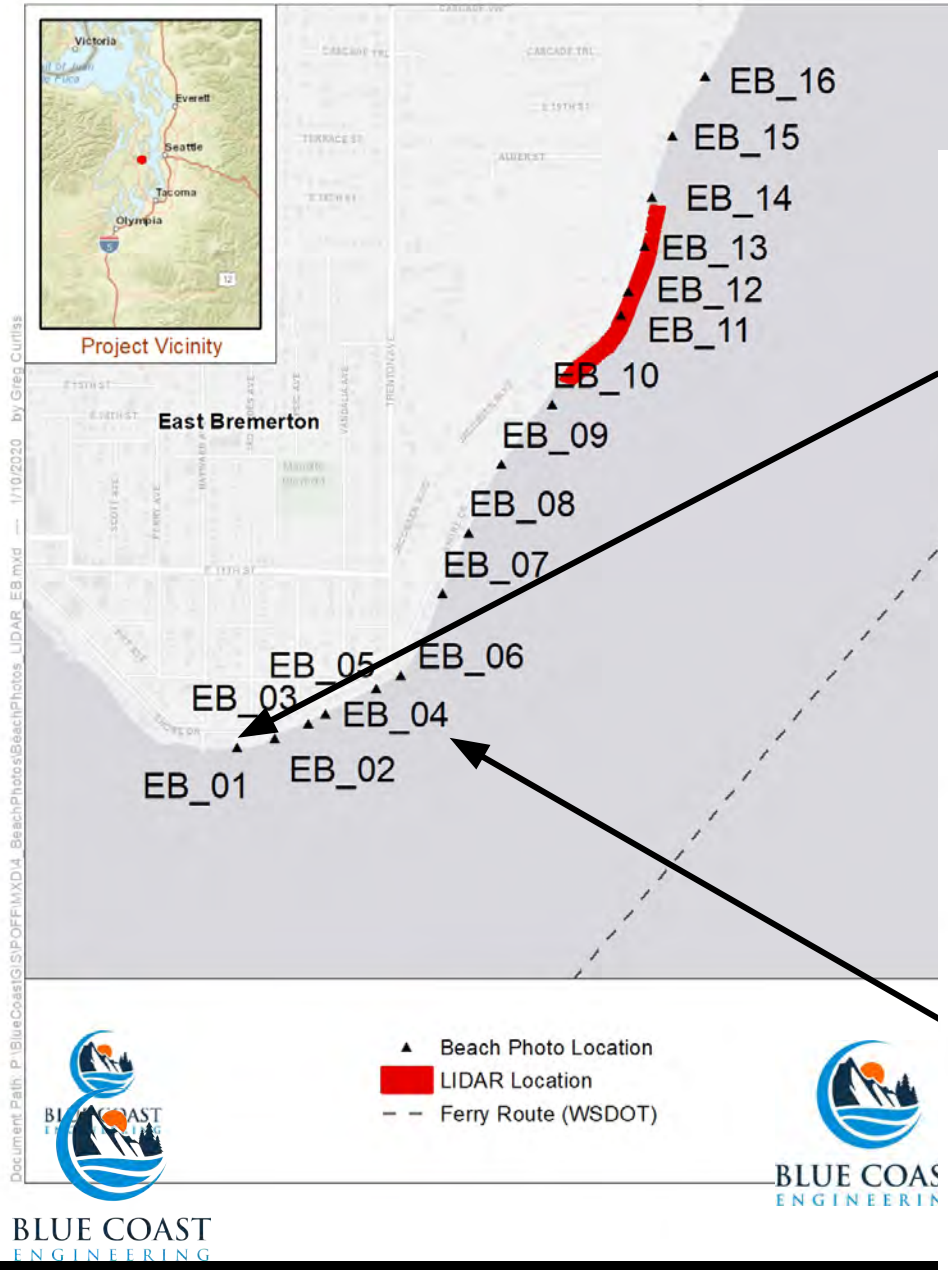


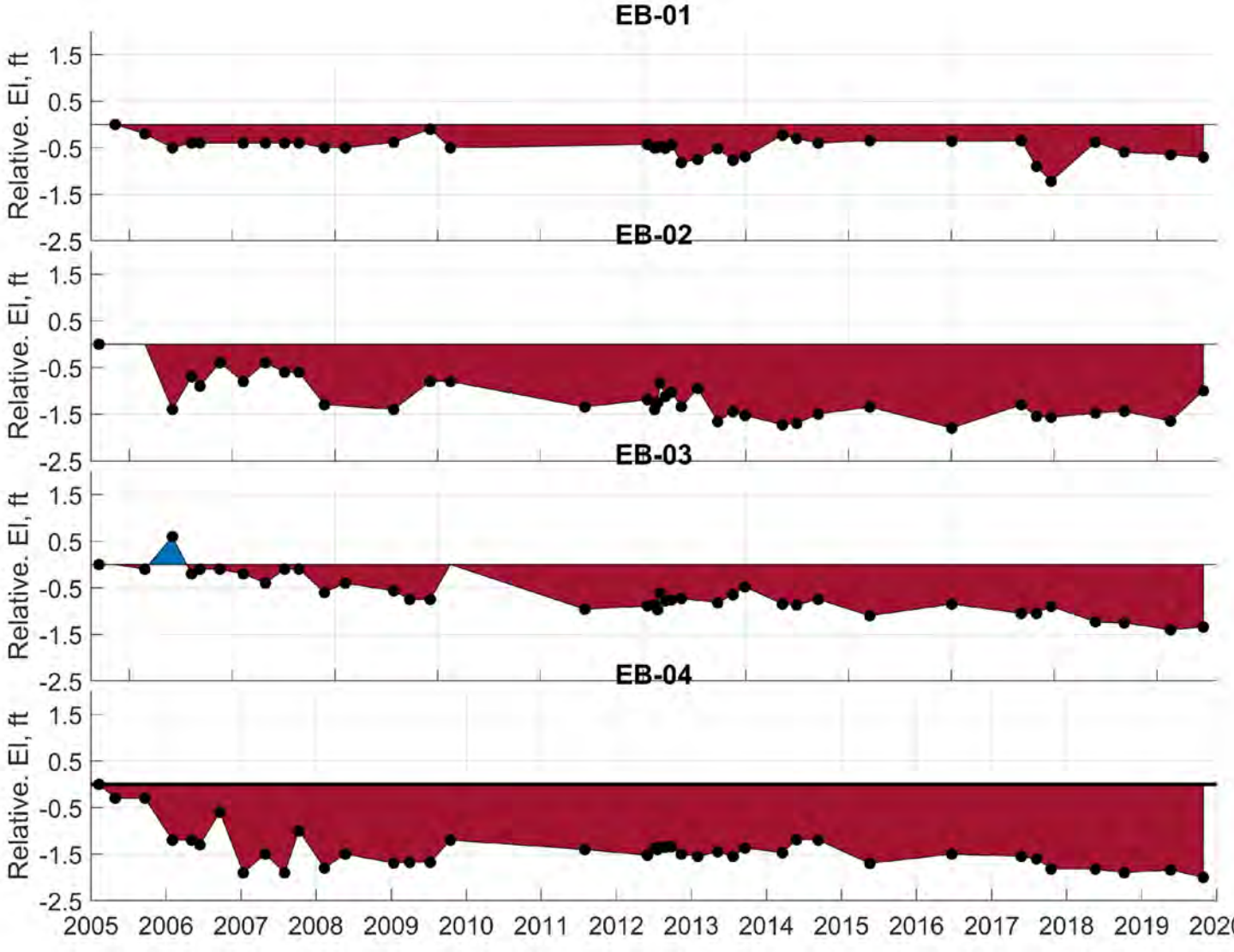


BLUE COAST ENGINEERING

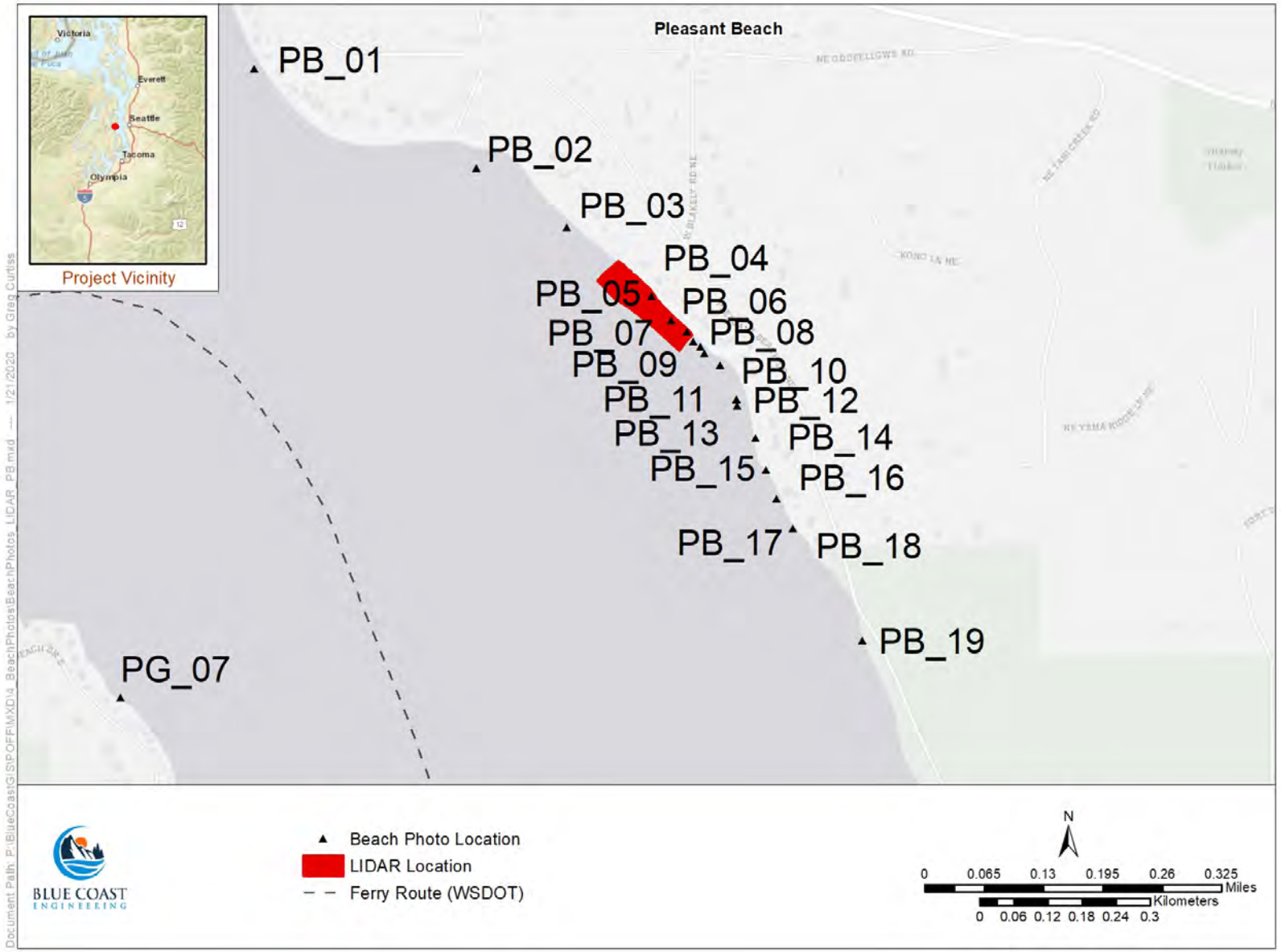
E. BREMERTON

CHANGE RELATIVE TO 2005





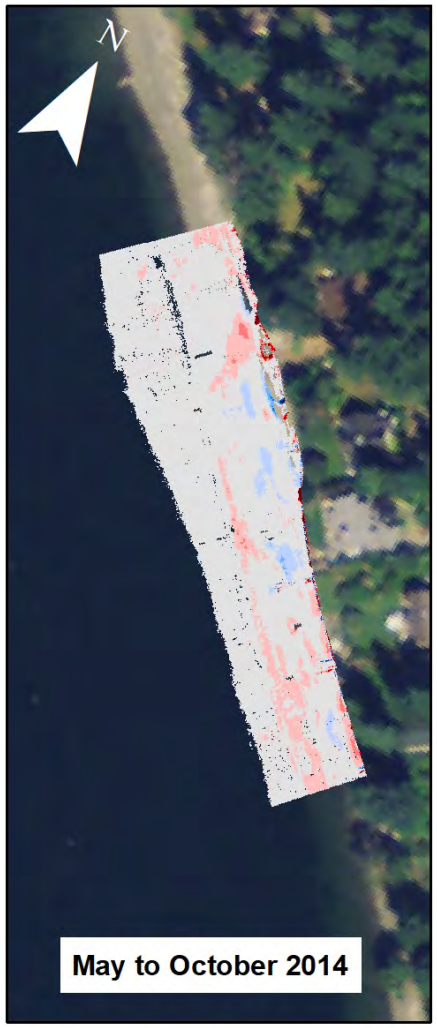
Beach Monitoring Locations: Pleasant Beach

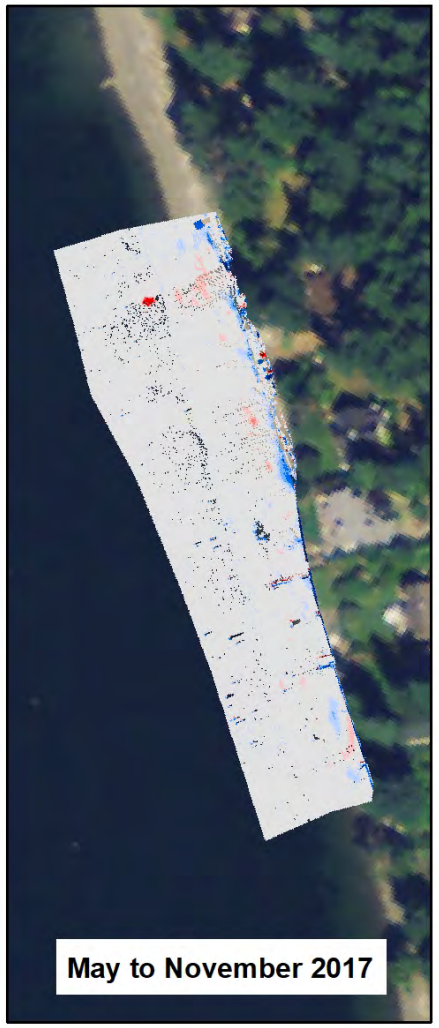


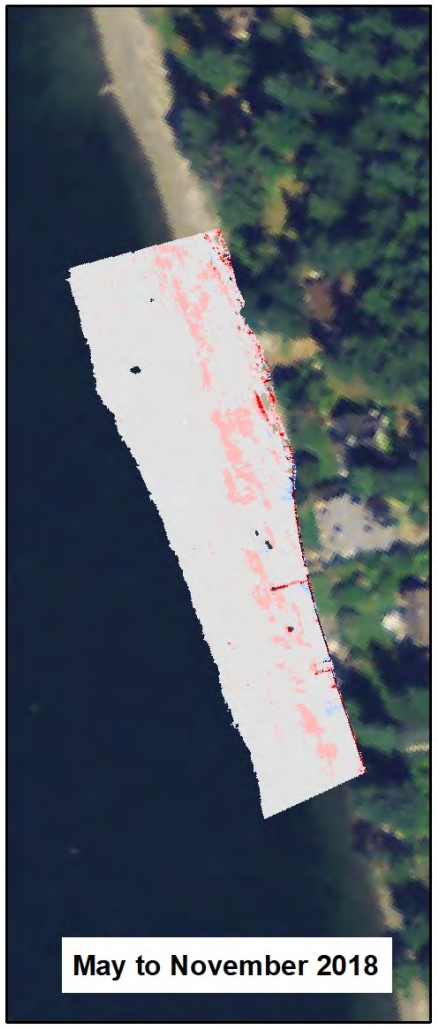
BLUE COAST ENGINEERING

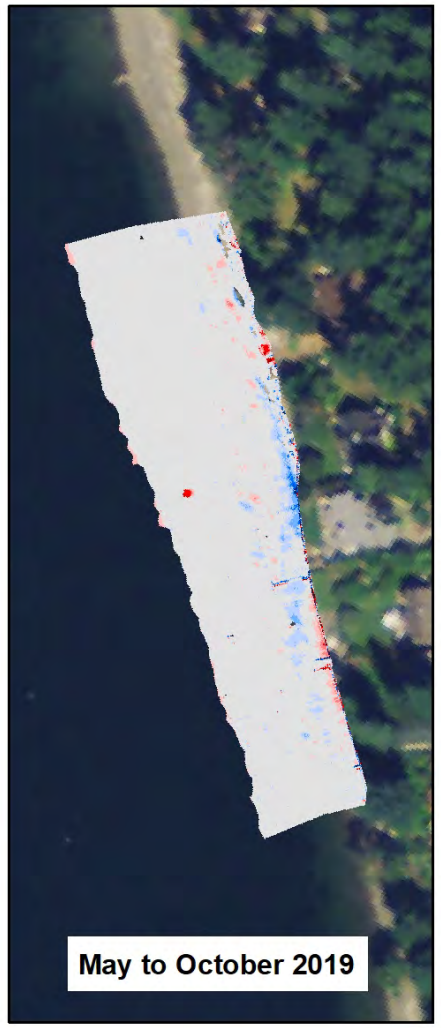
Pleasant Beach

- Changes are small (+/- 0.5 ft)
- Variable from year to year with storm events







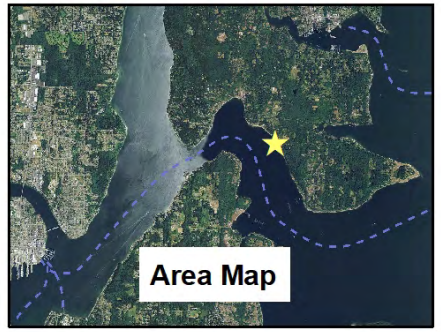


0 15 30 60 90 120 Meters

0 65 130 260 390 520 Feet

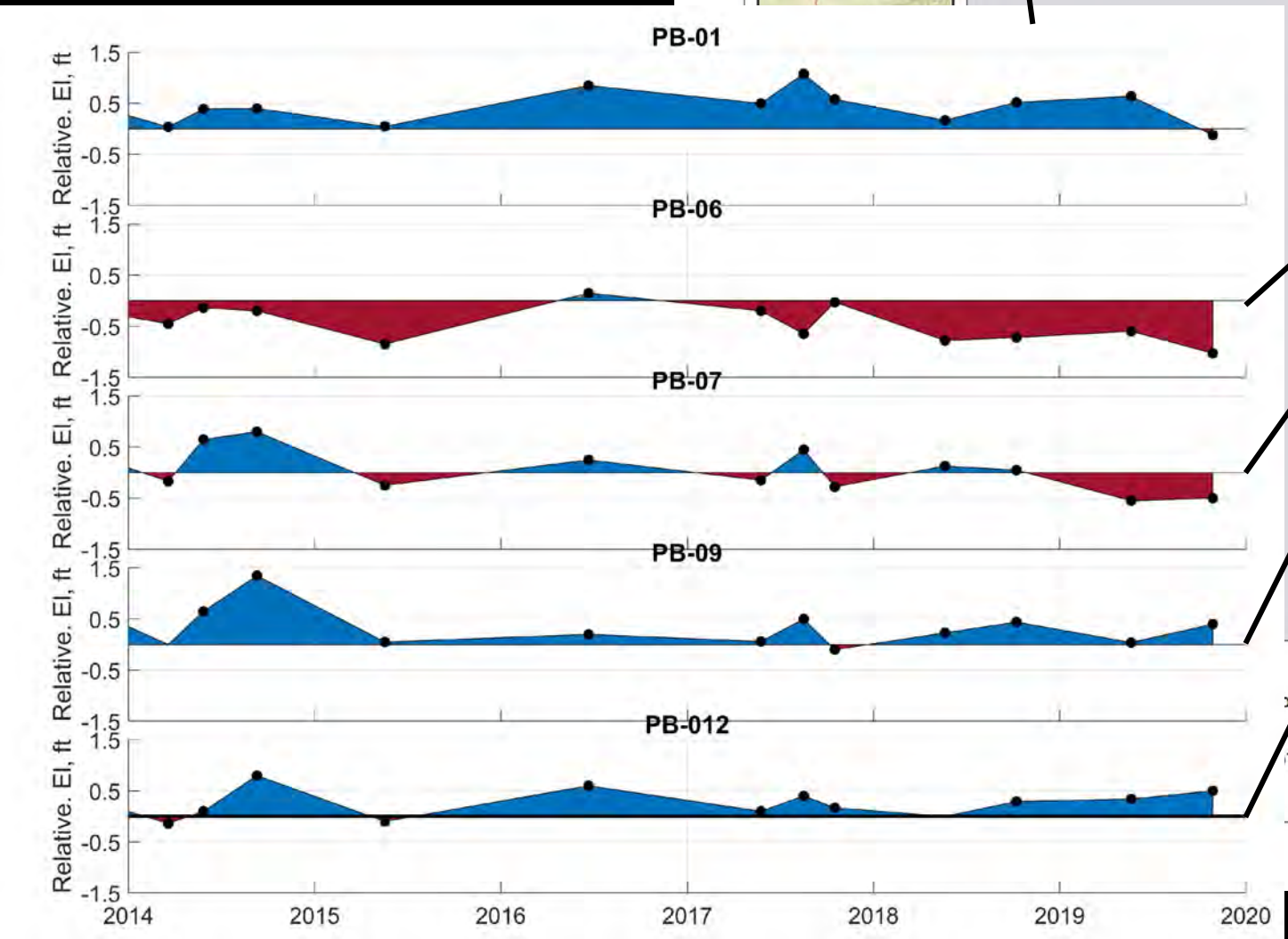
BLUE COAST ENGINEERING

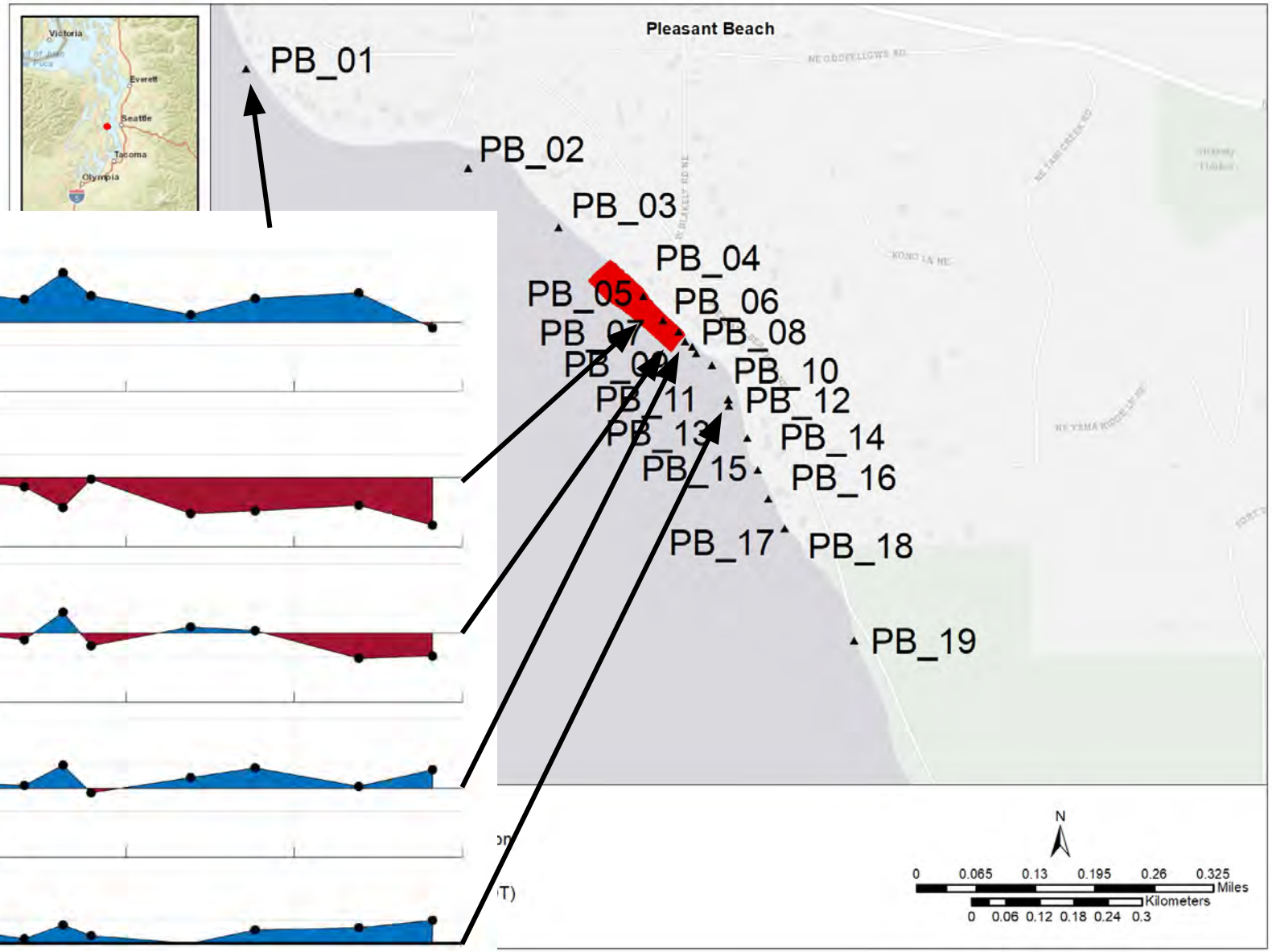
> -1.5	0.25 to 0.5
-1.5 to -1.25	0.5 to 0.75
-1.25 to -1	0.75 to 1
-1 to -0.75	1 to 1.25
-0.75 to -0.5	1.25 to 1.5
-0.5 to -0.25	> 1.5
-0.25 to 0.25	



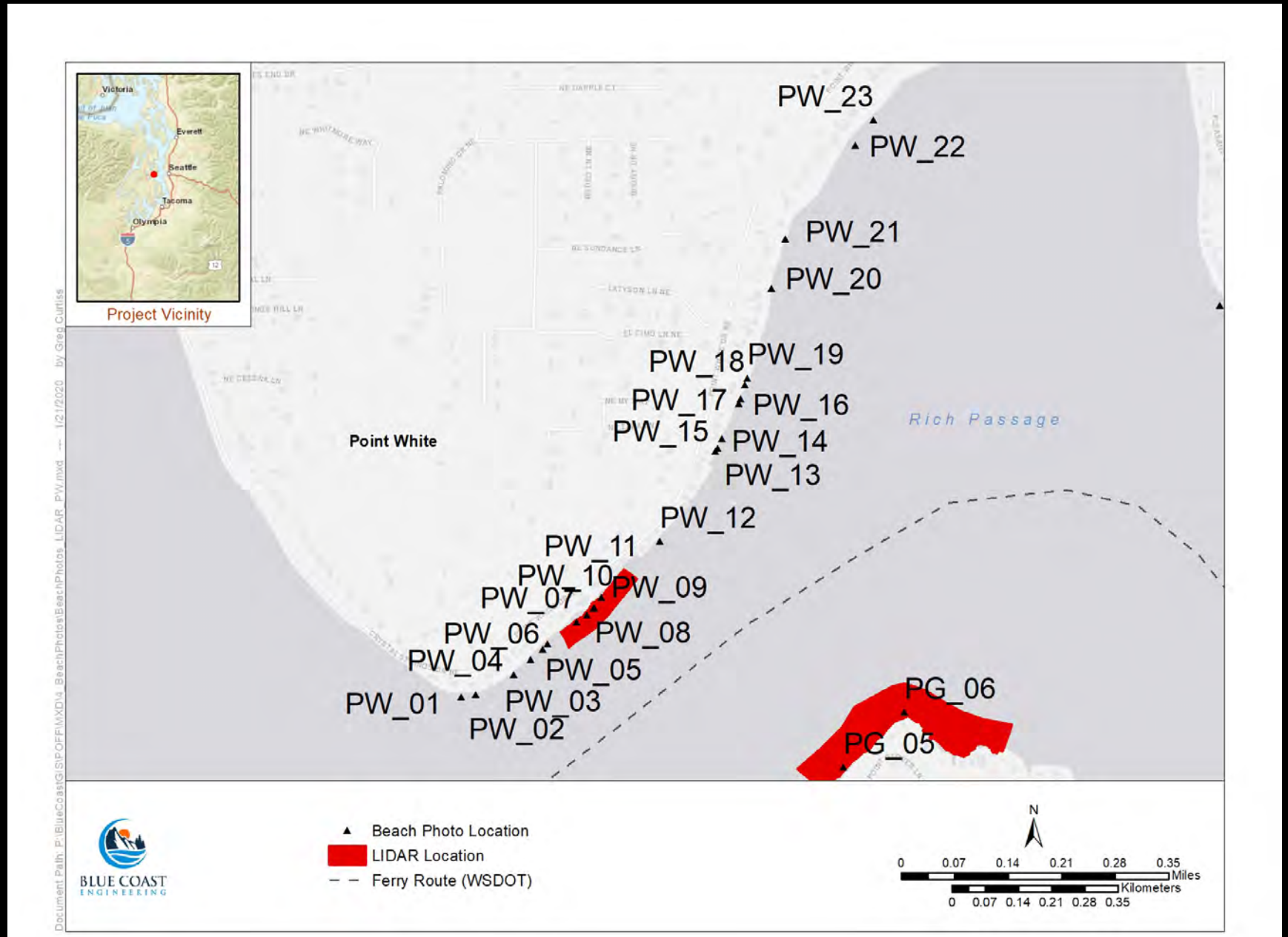
Pleasant Beach

CHANGE RELATIVE TO 2005





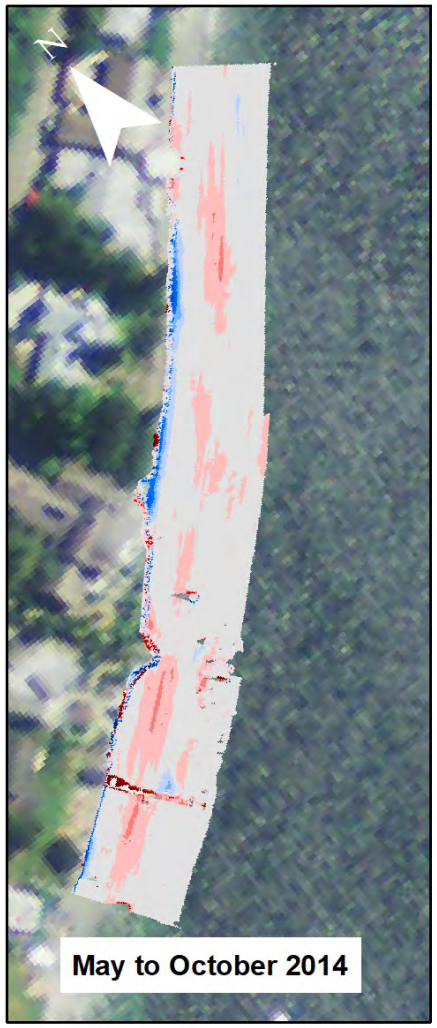
Beach Monitoring Locations: Point White



BLUE COAST ENGINEERING

Point White

- Most dynamic shoreline reach because of wind-waves
- Seasonal changes can be +/- 1 ft
- Net accretion in 2018 and net erosion in 2019

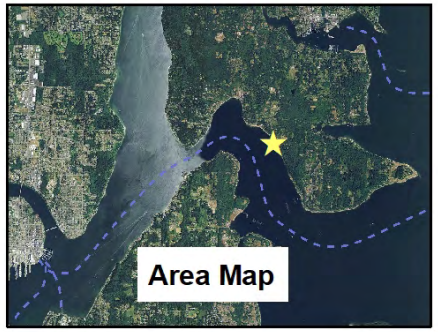


0 12.5 25 50 75 100 Meters

0 50 100 200 300 400 Feet

BLUE COAST ENGINEERING

> -1.5
-1.5 to -1.25
-1.25 to -1
-1 to -0.75
-0.75 to -0.5
-0.5 to -0.25
-0.25 to 0.25
0.25 to 0.5
0.5 to 0.75
0.75 to 1
1 to 1.25
1.25 to 1.5
> 1.5

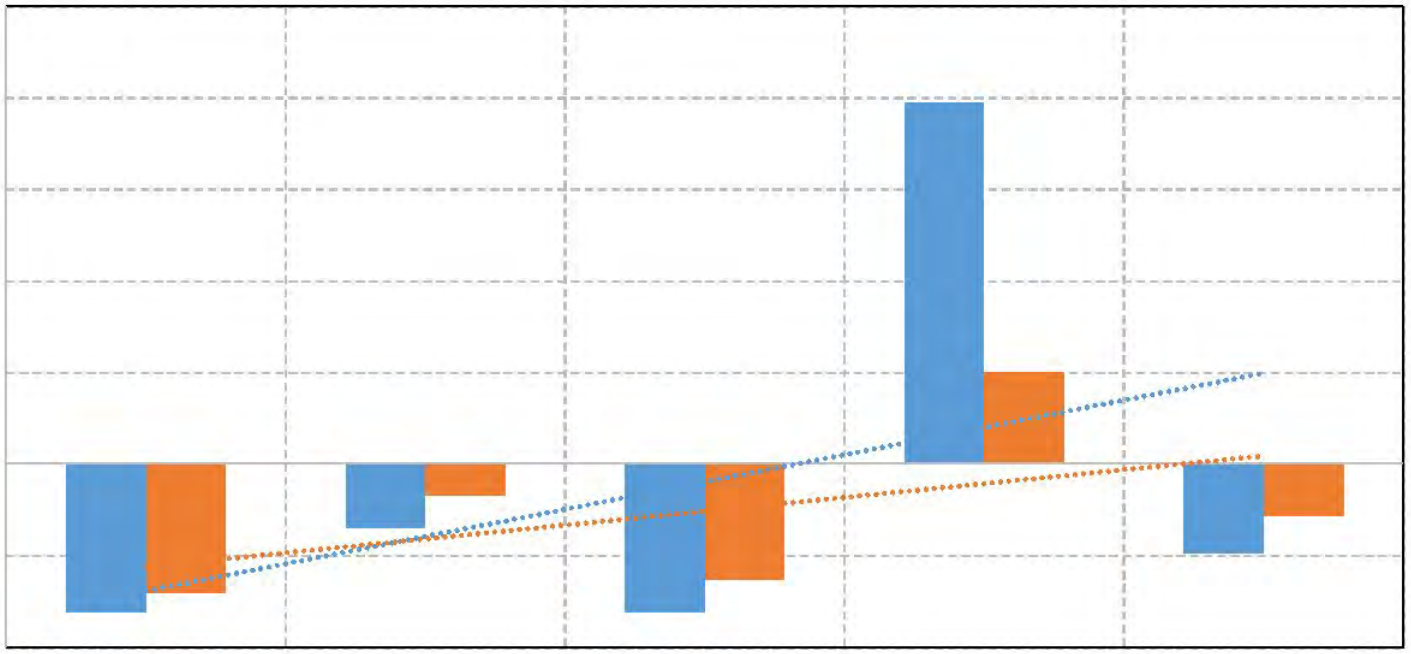


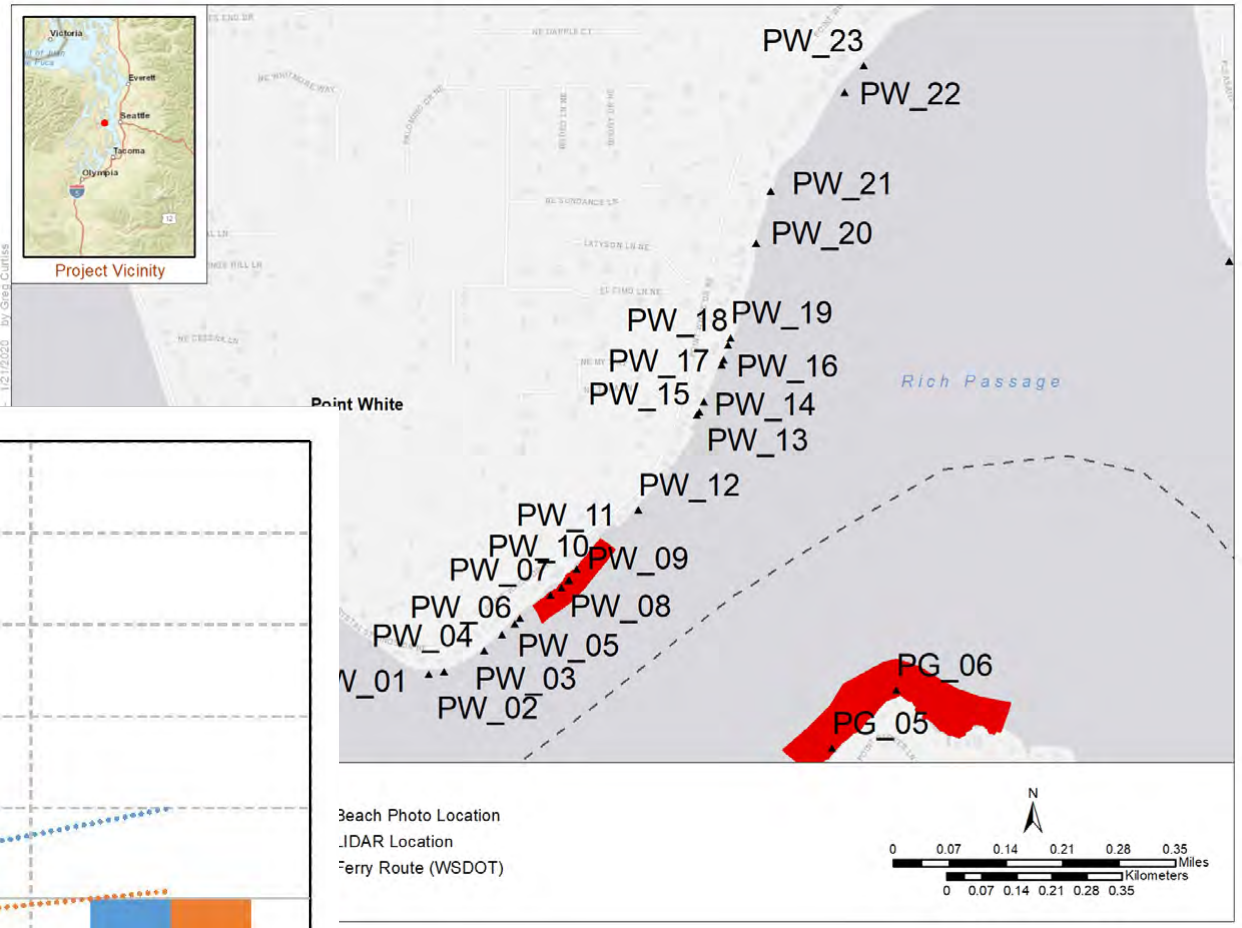
POINT WHITE

VOLUME CHANGE – LASER SCANNING SURVEY

PWS = Point White South

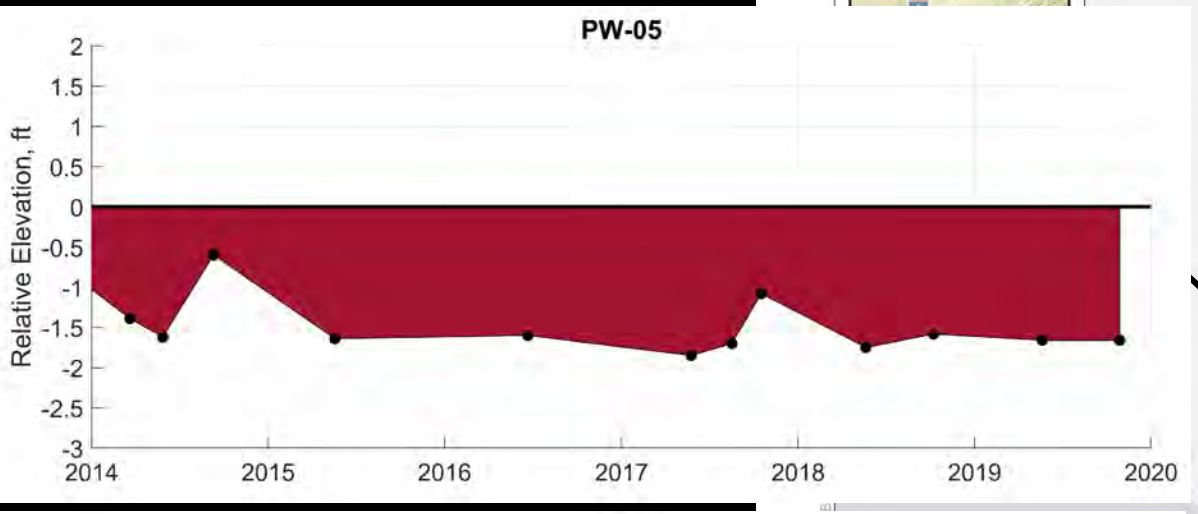
PWN = Point White North

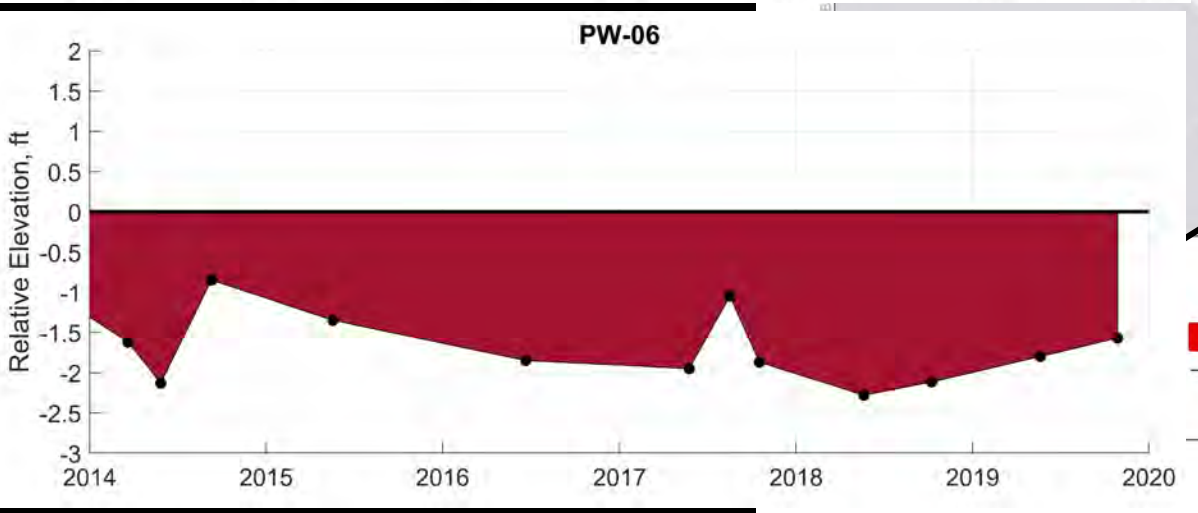


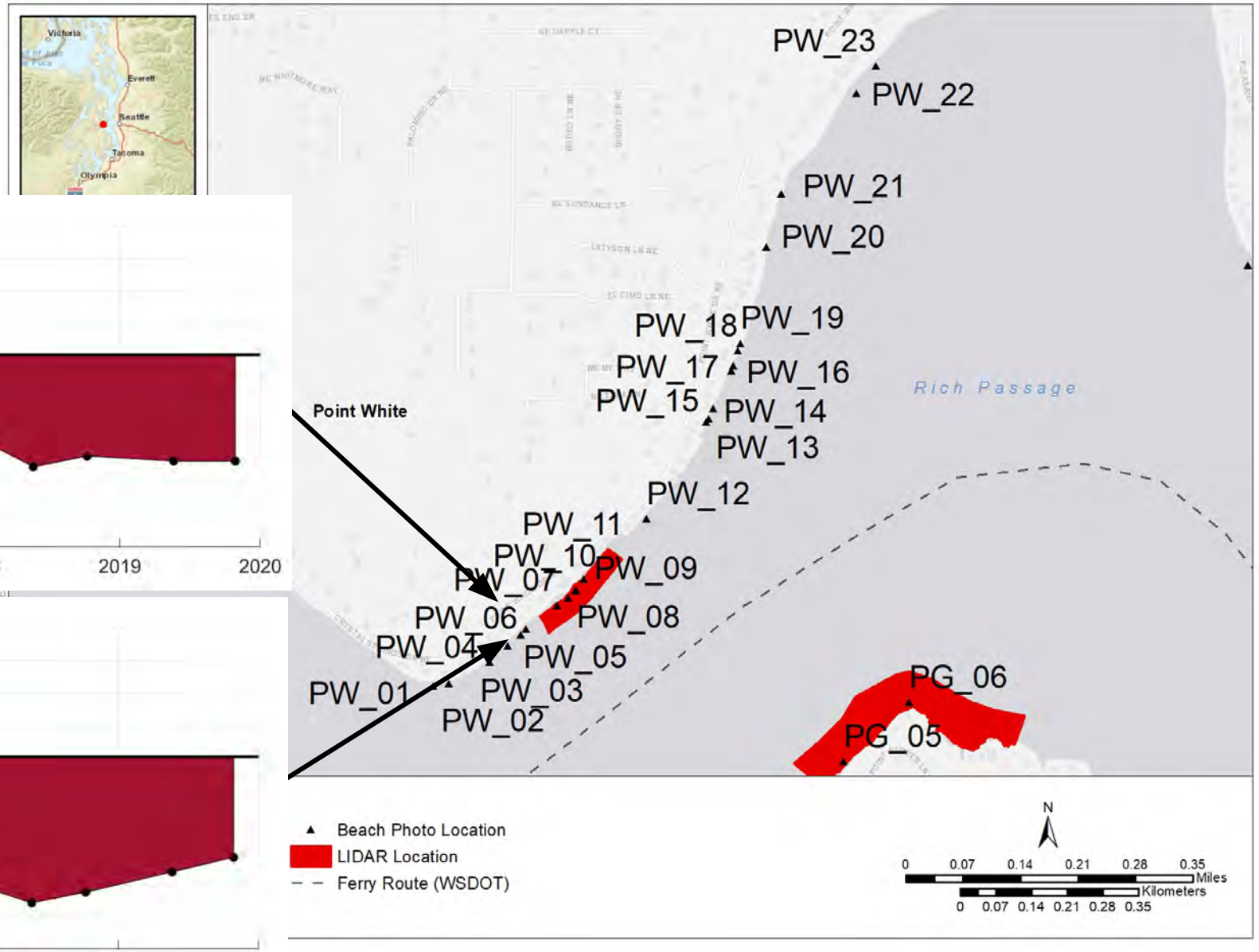


POINT WHITE

CHANGE RELATIVE TO 2005

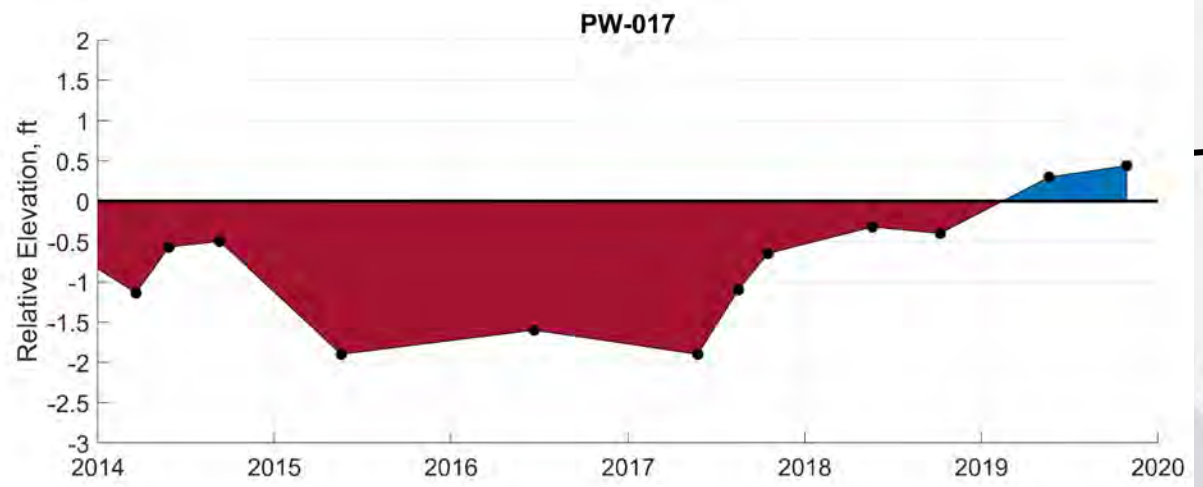


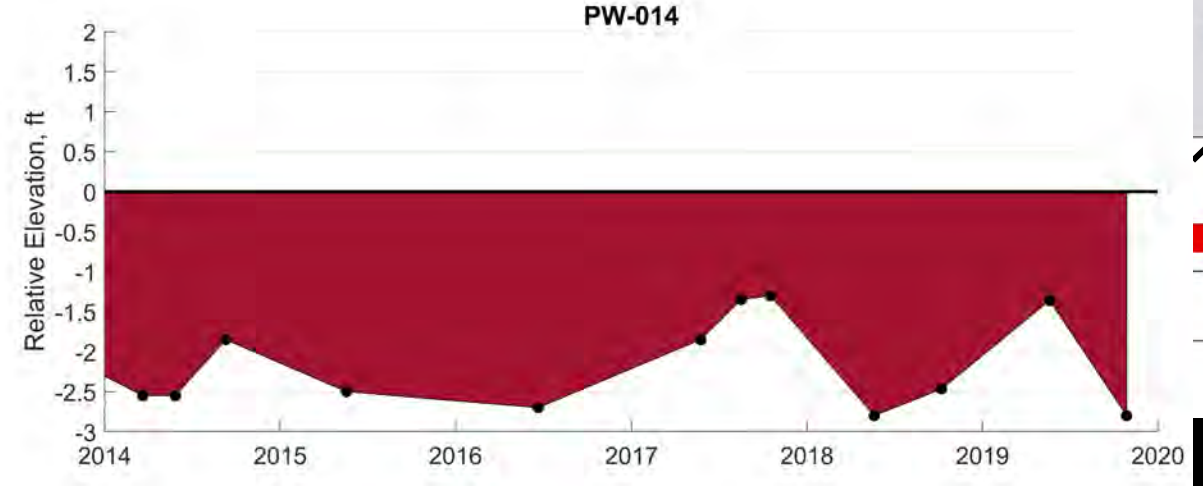


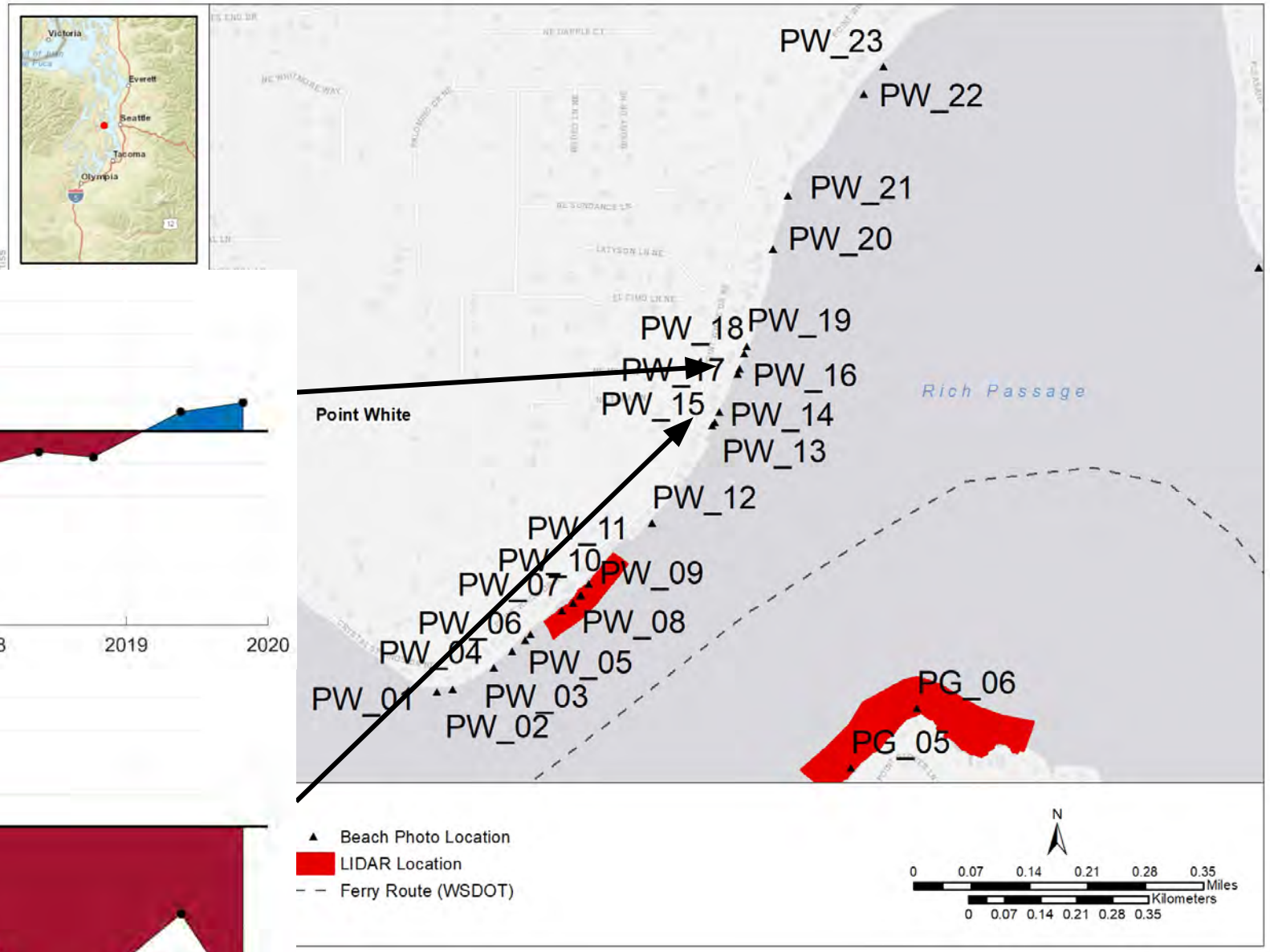


POINT WHITE

CHANGE RELATIVE TO 2005







2020 Monitoring

- May and October Beach Photo Surveys and Laser Scanning
- Operational changes:

BLUE COAST
ENGINEERING

Questions?

BLUE COAST
ENGINEERING