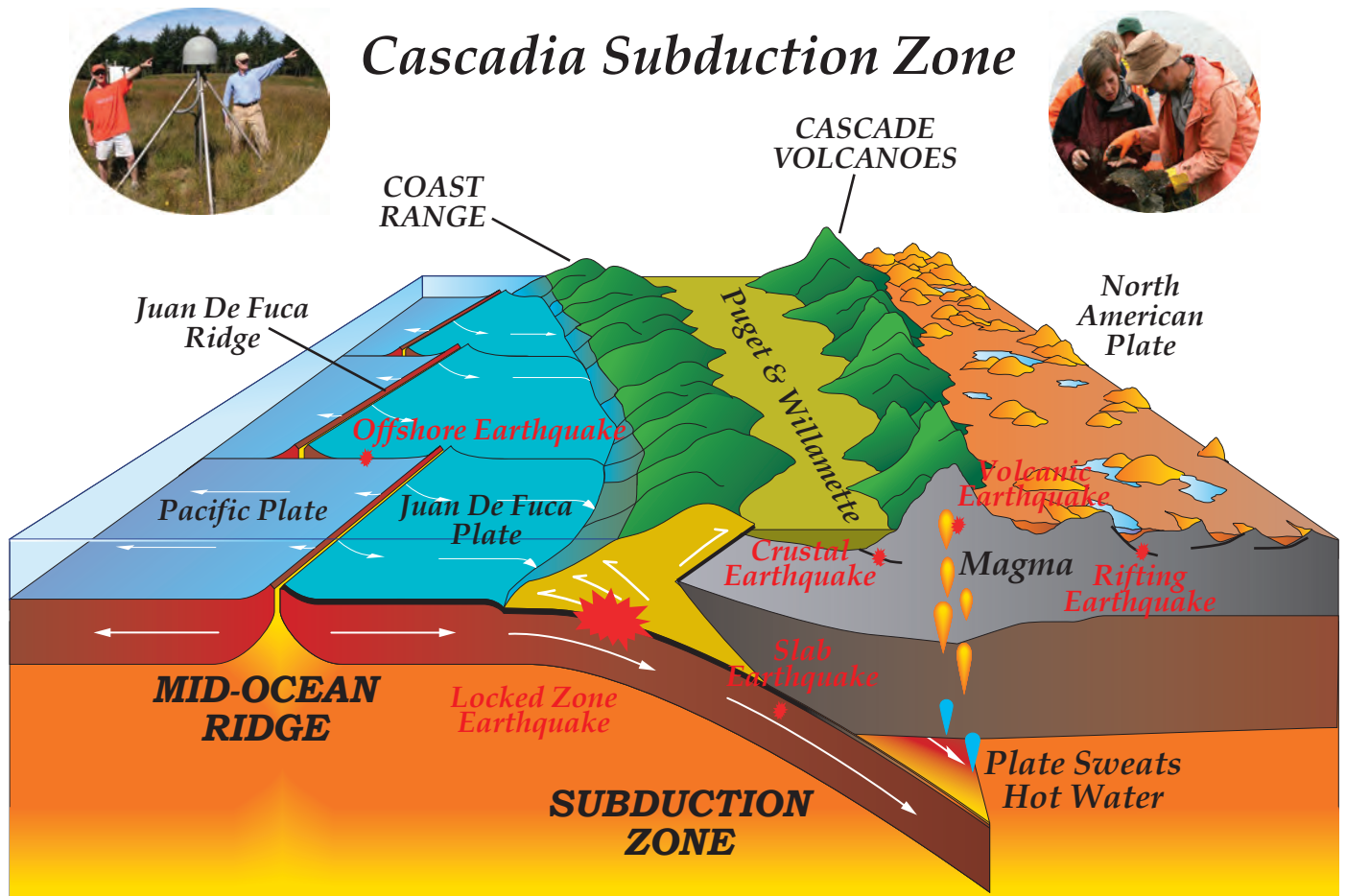


# CEETEP Field Trip Guide

## October 12, 2013



*Cascadia EarthScope Earthquake and Tsunami Education Program (CEETEP)*  
*October 11-14, 2013*



**CEETEP Convener cell phone numbers**

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## CEETEP Field Trip Guide – October 12, 2013

- **DEPART Columbia Hall at Clatsop Community College (CCC) (9 am)**
- Driving (9-9:15 am)
- **Stop 1 – Astoria GPS station (9:15-9:45 am) ..... Pg 1**
- Driving (9:45-10:45 am)
- **Stop 2 – Long Beach (10:45-11:45 am) ..... Pg 4**
- Driving (11:45 am-12 pm)
- **Lunch – One Pacific Coast Bank, Ilwaco (12-12:45 pm) ..... Pg 7**
- **Stop 3 – Ilwaco Tsunami Evacuation Walk (12:45-1:45 pm) ..... Pg 8**
- Driving (1:45-2:30 pm)
- **Stop 4 – Niawiakum River Tsunami Geology (2:30-4:30 pm) ..... Pg 8**
- Driving (4:30-5:30 pm)
- **ARRIVE Columbia Hall at CCC (5:30 pm) ..... Pg 9**

### Stop 1 – Astoria GPS station (Latitude: 46.207373; Longitude: -123.768364)

Directions – The GPS station is at the Coast Guard Station on Tongue Point in Astoria (Figure 1). If you come to the Tongue Point guardhouse separated from the rest of the group, tell them you are with the

group visiting the Coast Guard Station and they should let you through. The GPS equipment is on a small shed on the pier to the left from the main buildings as you enter the Coast Guard area (Figure 2). Park in the lot near the coast guard buildings and walk out to the pier.

*Figure 1. Driving directions and map from CCC to Tongue Point.*

**A Clatsop Community College**  
1651 Lexington Ave  
Astoria, OR 97103

1. Head **west** on **Lexington Ave** toward **16th St**
2. Turn right onto **16th St**
3. Turn right onto **Marine Dr**
4. Continue onto **U.S. 30 E/Leif Erickson Dr**
5. Turn left onto **Maritime Rd**
6. Slight left onto **Tongue Point Rd**  
*Partial restricted usage road*
7. Turn left at **Pier St**
8. Take the 1st right onto **Tongue Point**
9. Slight left to stay on **Tongue Point**

**B Tongue Point**





*Figure 2. Coast Guard Station at Tongue Point. GPS station location and parking.*

**Topics to consider**

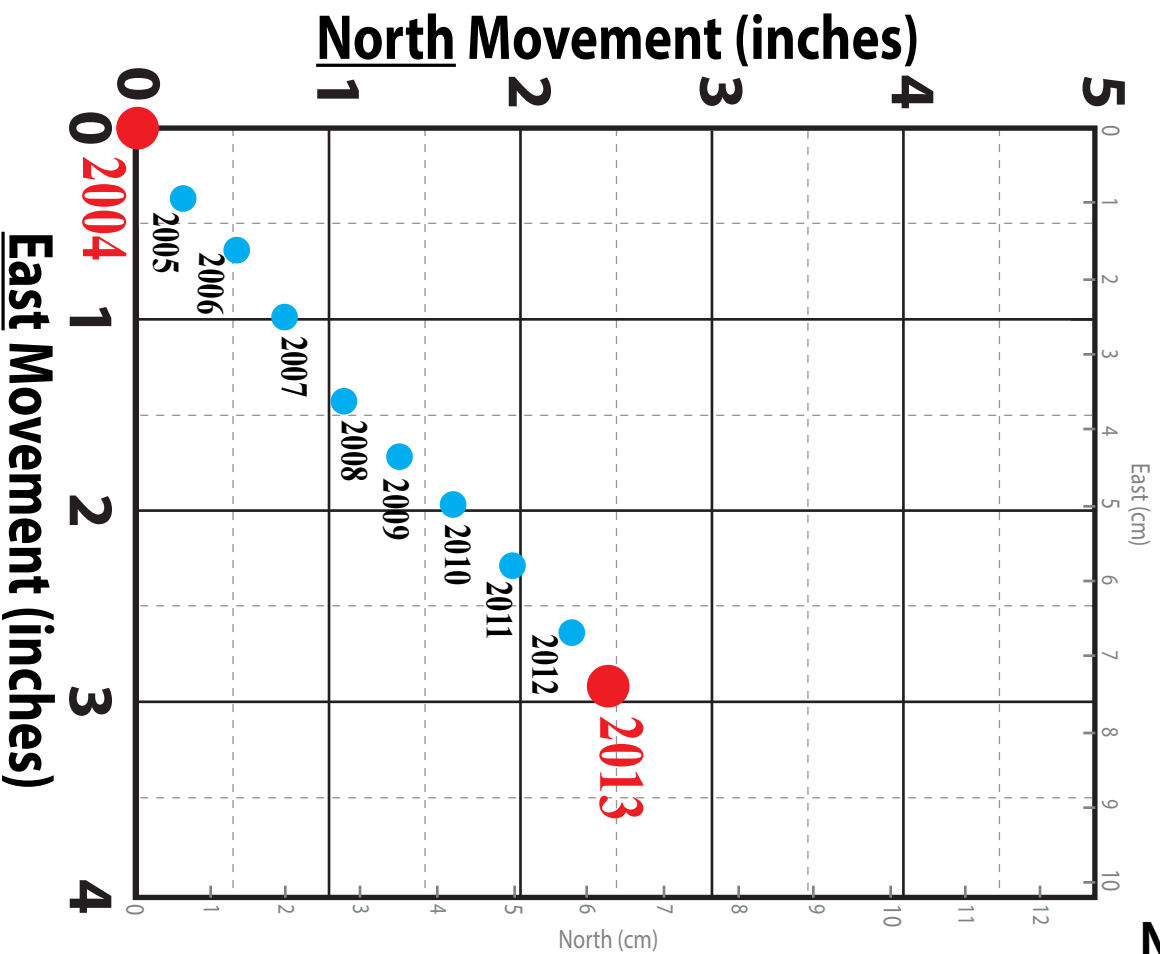
**Refer to the Astoria Station GPS Data Card (Figure 3).**

*Figure 3. (next page) Astoria GPS Station annually-averaged position data 2004-2013* →

# Astoria, Oregon GPS Station

## Yearly Movement, 2004 - 2013

(Referenced to Stable North America)



The dots on this card show the motion of the Astoria GPS station over the past nine years. Because the station is anchored into hard rock beneath the soil, the dots represent the year-to-year movement of the Astoria region toward the northeast.

Orient this graph toward the north, tape it to the floor, and think about the questions below.

1. How far has the Astoria region moved since the year 2004? At what rate (inches per year) is the region moving? At that rate, how far has the region moved since the year 1700?
2. Why is the region moving toward the northeast?
3. The last big earthquake in the Pacific Northwest occurred in the year 1700. What will happen to the Astoria region when the next big earthquake occurs?

Station TPW2 from the EarthScope Plate Boundary Observatory (<http://pbo.unavco.org>). GPS time series data provided by UNAVCO (<http://www.unavco.org>). Data as of August 29, 2013.

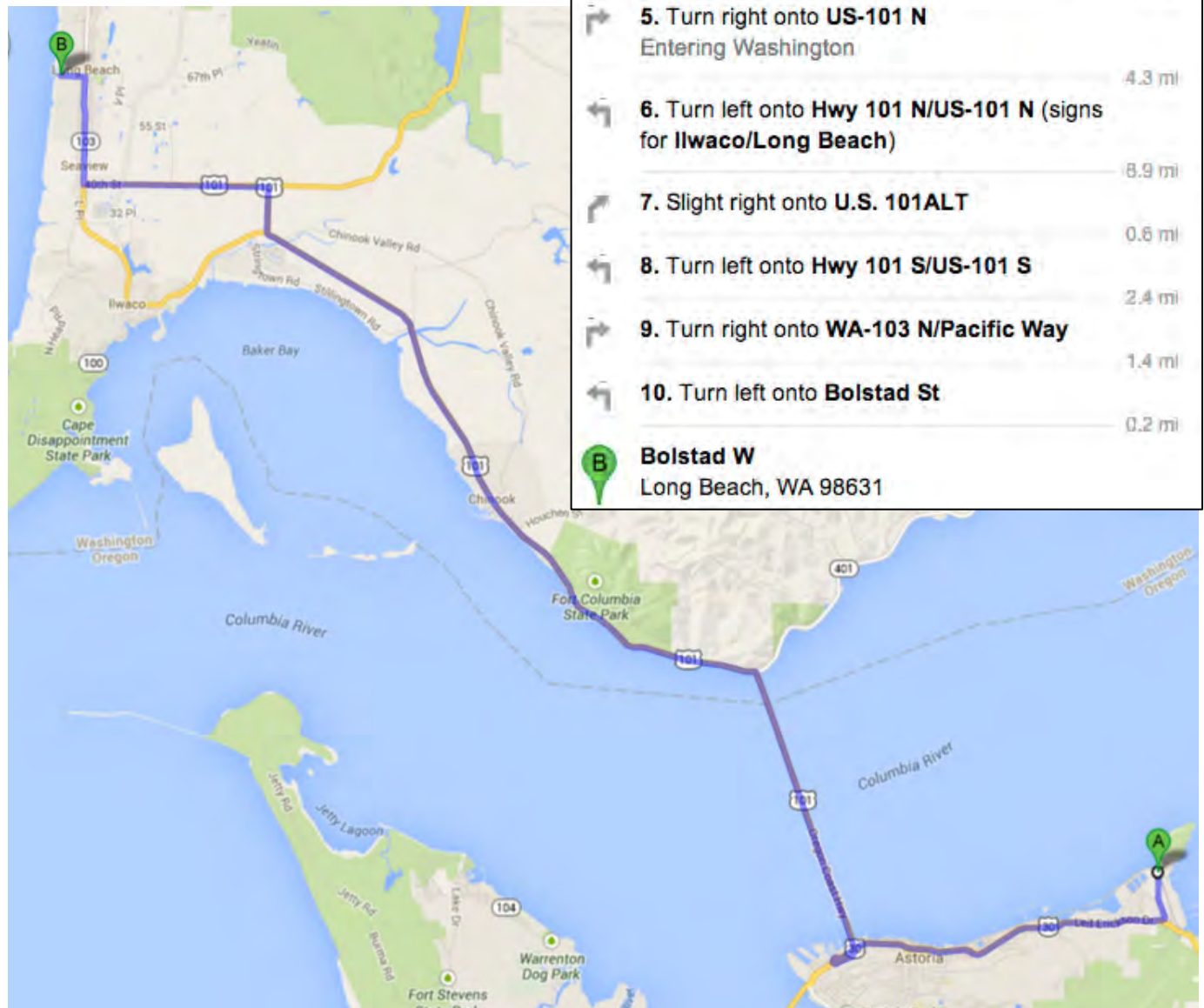
Card developed by the Cascadia EarthScope Earthquake and Tsunami Education Program (<http://ceetep.oregonstate.edu>). CEETEP is sponsored by a grant from the EarthScope Program of the National Science Foundation (<http://www.earthscope.org>) to Oregon State University, the University of Portland, and Central Washington University.



## Stop 2 – Long Beach, Discovery Trail access point

Directions – Drive from Tongue Point to Long Beach, WA (Figure 4). We will be driving out towards to the edge of the beach where the Discovery Trail crosses Bolstad Rd (Figure 5). Park as near the Discovery Trail as you can and then meet in the small covered area.

Figure 4. Driving directions and map from Tongue Point to Long Beach, WA.



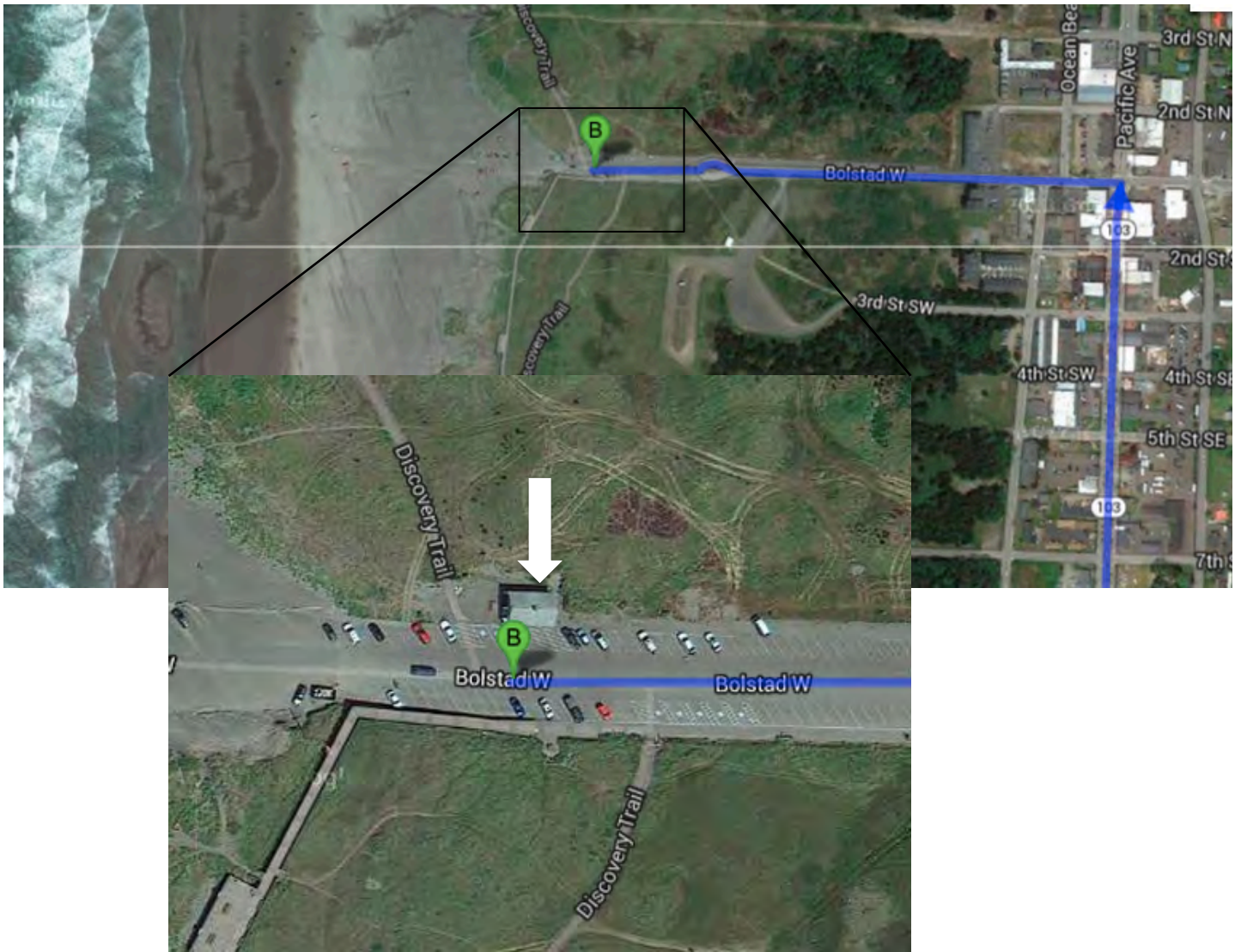


Figure 5. Bolstad W and Discovery Trail parking area.

**Topics to consider** (see also Figures 6-8 and the guide cover for reference)

1. How far offshore is the boundary between the Juan de Fuca and North American plates?
2. How deep is the top of the subducting Juan de Fuca Plate beneath Long Beach?
3. If a great earthquake occurred right now, what would you do?
4. What are some options that Long Beach could consider to increase community safety and resilience?
5. How might you use a site like this to engage your audience (students; park/museum visitors; the general public) on earthquake science and preparedness?





Figure 7. Proposed vertical evacuation strategy for Long Beach, WA as developed in a series of community meetings run by the Washington Emergency Management Department's Safe Haven Project. ([http://www.emd.wa.gov/hazards/documents/haz\\_SafeHavenReport\\_Pacific.pdf](http://www.emd.wa.gov/hazards/documents/haz_SafeHavenReport_Pacific.pdf))

Figure 6. Tsunami evacuation map for Long Beach and Ilwaco region. (WA DNR [http://www.dnr.wa.gov/Publications/ger\\_tsunami\\_evac\\_longbeach.pdf](http://www.dnr.wa.gov/Publications/ger_tsunami_evac_longbeach.pdf))

#### LONG BEACH: DESCRIPTION OF PREFERRED STRATEGY

The second community meeting produced a preferred strategy (see Table 6) with the following components:

- One large, multi-purpose berm located behind the elementary school. The berm will either be used as bleachers, with ball game spectators sitting on the grassy slope leading to the top of the berm, or as a playfield, with the grassy area on top of the berm serving as a sports field. The berm will accommodate approximately 1,000 evacuees and will be prioritized for construction since it will provide refuge for children.
- To provide evacuation for the general population, four smaller berms will be constructed along the east side of the community. Each berm will accommodate approximately 500 evacuees and will be built after the large berm near the school is constructed.
- Additionally, an elevated city hall is desired. The city will pursue this element as money becomes available from federal, state, or other funds.
- The 67th Place assembly area will serve as a site for long-term evacuation and provide access to emergency supplies.

Table 6: Preferred strategy for Long Beach

LONG BEACH	
CONCEPTUAL LOCATIONS	SAFE HAVEN TYPE
N Place & 41st Place	Berm
Washington Avenue South & 5th Street South	Berm
Washington Avenue South & 2nd Street South	Berm
Washington Avenue & 13th Street South	Berm
Q Street & 26th Street North	Berm
67th Place (west)	Pacific County Assembly Area
67th Place (east)	Pacific County Assembly Area



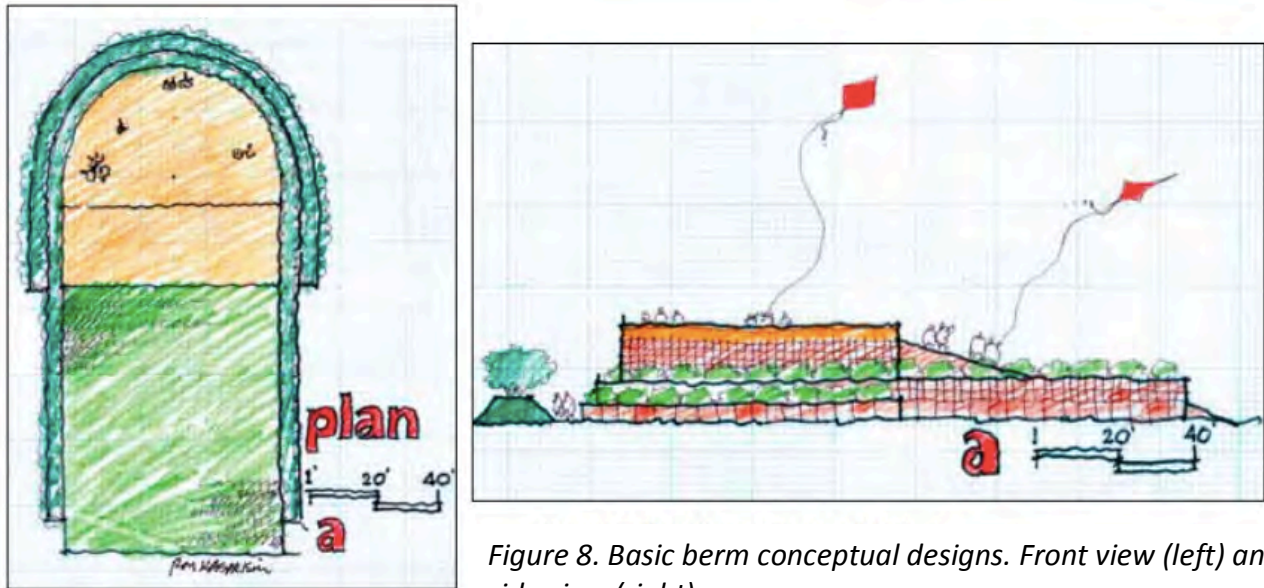


Figure 8. Basic berm conceptual designs. Front view (left) and side view (right).

([http://www.emd.wa.gov/hazards/documents/haz\\_SafeHave\\_nReport\\_Pacific.pdf](http://www.emd.wa.gov/hazards/documents/haz_SafeHave_nReport_Pacific.pdf))

### Lunch – One Pacific Coast Bank, Ilwaco waterfront

Directions: We will be having lunch in the One Pacific Coast Bank meeting room down by the Ilwaco waterfront (Figure 9). Park as close as you can to the bank and come on in. The conference room is on the south side of the building adjacent to the harbor

Figure 9. Driving directions and map from Long Beach to Ilwaco.

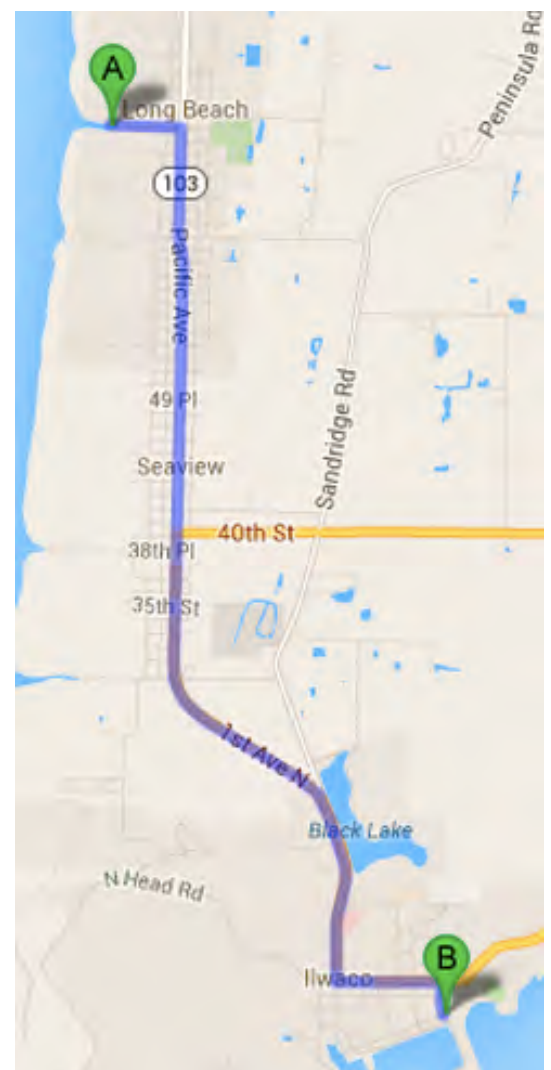
A

**Bolstad W**  
Long Beach, WA 98631

1. Head **east** on **Bolstad W** toward **Ocean Beach Blvd** 0.2 mi
- ➡ 2. Turn right onto **Pacific Ave** 1.9 mi
- ➡ 3. Continue onto **US-101 N/1st Ave N** 1.3 mi
- ⬅ 4. Turn left onto **Spruce St E** 0.4 mi
- ➡ 5. Turn right onto **Elizabeth Ave SE** 0.1 mi
- ➡ 6. Take the 2nd right onto **Howerton Ave SE**  
Destination will be on the left 7 ft

B

**203 Howerton Ave SE**  
Ilwaco, WA 98624



### Stop 3 – Tsunami Evacuation Walk from Ilwaco’s waterfront

Directions – We will leave from and return to the Ilwaco waterfront.

#### Topics to consider

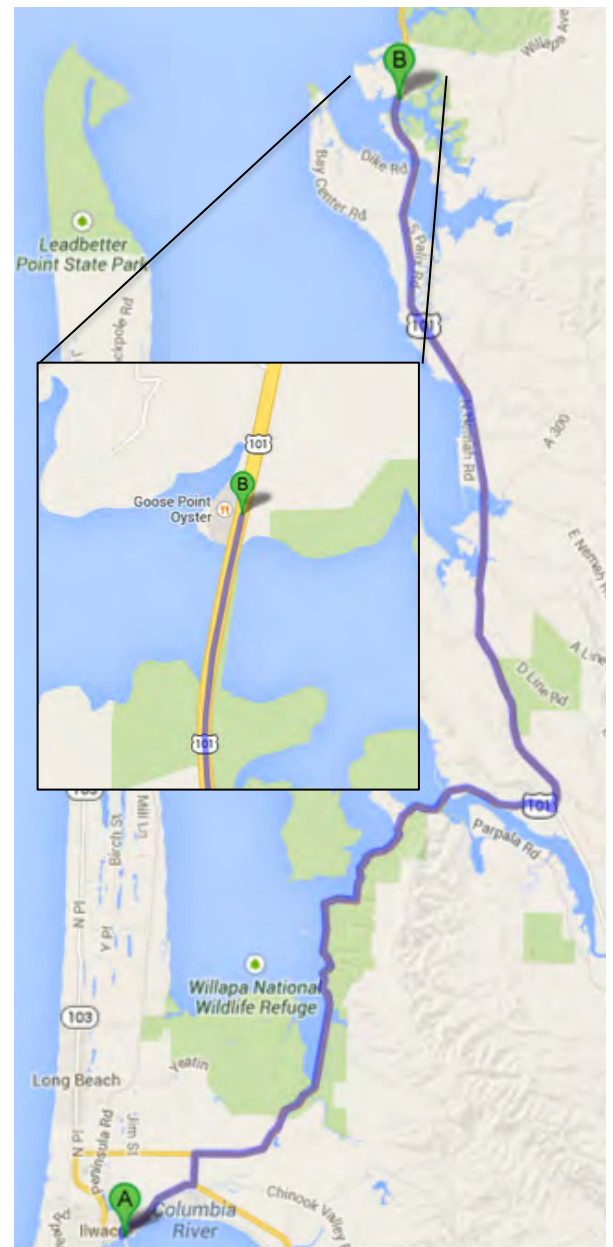
1. How straight forward was the evacuation route?
2. Could more be done to clarify the route? If so, what?
3. What other issues come to mind regarding a Community Inventory of Hazards?

### Stop 4 – Tsunami Geology at the Niawiakum River

Directions – Drive from Ilwaco to Goose Point Oyster (Figure 10). Park either along the east side of Hwy 101 immediately north of the bridge over the Niawiakum River OR on the opposite side of Hwy 101 in the parking area of Goose Point Oyster factory. Please do not park in the parking area for the retail outlet of Goose Point Oyster.

Figure 10. Driving directions and map from Ilwaco to Goose Point Oyster access point to the Niawiakum Rv.

<p><b>A</b></p> <p><b>203 Howerton Ave SE</b> Ilwaco, WA 98624</p> <p><b>1. Head northeast on Howerton Ave SE toward Outer Harbor Way SE</b></p> <p><b>2. Turn left onto Elizabeth Ave SE</b></p> <p><b>3. Take the 2nd right onto Hwy 101 S/US-101 S/Spruce St E</b> Continue to follow Hwy 101 S/US-101 S</p> <p><b>4. Turn left onto U.S. 101ALT</b></p> <p><b>5. Turn right onto Hwy 101 N/US-101 N</b></p> <p><b>6. Turn left to stay on Hwy 101 N/US-101 N</b> Destination will be on the left</p> <p><b>B</b></p> <p><b>Goose Point Oyster</b> U.S. 101 Bay Center, WA 98527</p>	<p>7 ft</p> <p>0.1 mi</p> <p>1.8 mi</p> <p>0.6 mi</p> <p>13.1 mi</p> <p>15.1 mi</p>
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## Topics to consider

1. What are the different geologic layers observed in the cores?
2. What sequence of events can explain the observed layers?
3. How would you use these geologic observations to engage your audience in earthquake/tsunami science and preparedness?

Return to CCC

1. Head **south** on **Hwy 101 S/US-101 S** toward **S Bend Palix Rd** 15.1 mi

2. Turn left onto **WA-4 E** 4.7 mi

3. Turn right onto **WA-401 S/Lewis and Clark Trail Hwy** 12.1 mi

4. Turn left onto **US-101 S/Astoria - Megler Bridge**  
Continue to follow US-101 S  
Entering Oregon 4.3 mi

5. Turn left onto **U.S. 30 E/W Marine Dr**  
(signs for **Astoria City Center/Hospital**) 0.9 mi

6. Turn right onto **7th St** 443 ft

7. Turn left at the 2nd cross street onto **Commercial St** 0.5 mi

8. Turn right onto **16th St** 0.4 mi

9. Turn left onto **Lexington Ave**  
Destination will be on the right 486 ft

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