G473 Lab 4 Key - Tsunami Run-Up Models

Key Concepts

(1) Tsunami - result of water volume displacement on seafloor in response to fault rupture and offset

Tsunamis may also be generated by submarine landslide displacement

(2) Tsunami Physics

A) Split wave directions
- seaward (distant tsunami)
- landward (local tsunami)

B) Wavelengths10's to 100's of km

C) wave velocity = square root of mean water depth
-higher velocity in deep water
-lower velocity as tsunami approaches shelf / land

(3) Wave Run-up

A) height of tsunami wave as it hits land

B) complex refraction / reflection of wave as it approaches land
- multiple wave pulses
- shore parallel reflection
- multiple run-up events possible

C) Wave Run-up Characteristics
- breaking waves very rare
- common behavior: rapid local rise in water level
(analogous to rapidly rising tide)

(4) Damage

A) Impact from floating debris

B) Ecosystem alteration
- back-bay inundation
- tsunami wash-over sands

C) strong currents

Lab Results

Step 1. Run-Up Heights

Model Height (m)	Model Height (ft)	Hazard Class
10.7 m	35 ft	High
8.2 m	27 ft	Mod. High
4.8 m	16 ft	Mod. Low

Step 3 - Results of Hazards Mapping at Newport and Lincoln City

Lincoln City, OR

Areas Potentially Inundated by Tsunami

- < 1% of Lincoln City proper by all hazard classes
- 50-60% of Taft
- 100% of Salishan Spit and Siletz Bay

Infrastructure Damage Potential

- Highway 101 Bridges across Siletz River and Devil's River lie within the run-up zone
- potential for bridge damage and highway cut off of Lincoln City from the north and south

Newport, OR

Areas Potentially Inundated by Tsunami

- Very low tsunami run-up risk given the model variables at hand
- <1% of Newport city at risk, mainly along the lower side near Yaquina Bay (however, the jetties at Yaquina inlet would likely dampen the effect)
- South Beach and South Newport (off map) may likely sustain more damage (particularly around the Hatfield Science Center area)

Infrastructure Damage Potential

- Yaquina Bay bridge may sustain some damage, might possibly create travel problems

Answers to Questions

(1) Fate of home on Salishan Spit - high risk and damage under all tsunami model scenarios

(2) Lincoln City, OR is at greater risk than Newport, mainly in the low-lying bay areas.

(3) Both areas are at risk with steep hillslopes and potential for earthquake-induced landslides.

(4) Points to think about in an emergency managment plan:

(A) Hazards - high hazard along Cascadia subduction zone and throughout the Pacific basin. Subduction zone earthquakes can be very high magnitude and of long duration, relatively speaking.

(B) Tsunami risk - variable along Oregon coast: low-lying areas and bays at greatest risk for tsunami inundation. Steep-relief coastal areas (rock headlands and marine terraces) are at lower risk of tsunami inundation, but may be at higher risk for earthquake-induced slope failure.

(C) Tsunami warning system - Pacific-wide warning system around basin margins, must be combined with earthquake alert systems.

(D) Evacuation - mobilize away from beach/bay areas, head for high ground. Problem - earthquake-induced landslides with road damage (will limit evacuation routes through Coast Range).

(E) Mitigation - planning / regulation of coastal development, Salishan Spit dwellings should not be allowed; if so, then no tax dollars should be made available to stabilize the area or pay for natural hazard damage! (my opinion... If there is clear knowledge of natural risk, then the homeowners should be 100% responsible for loss of life and property, not the taxpayers... this would include roads, bridges, etc. that service the at-risk area).

ARY CONTOUR INTERVAL 20 FEET

rt meters to feet multiply by 3.2808
rt feet to meters multiply by 0.3048
SENTS APPROXIMATE LINE OF MEAN HIGH WATER
GE OF TIDE IS APPROXIMATELY 5 FEET

ADJOINING 7.5' QUADRANGLE NAMES

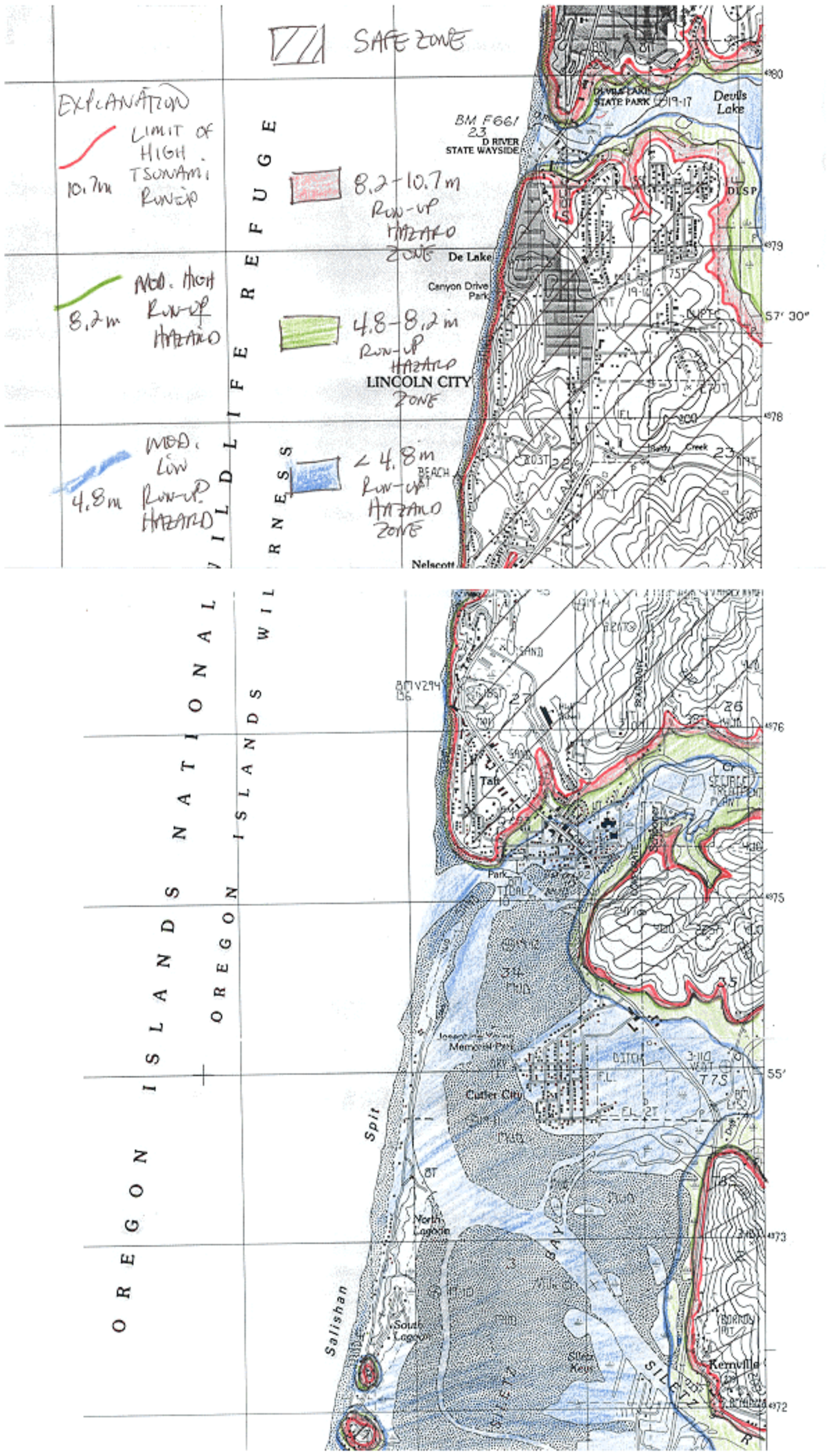
Interstate Route U.S. Route

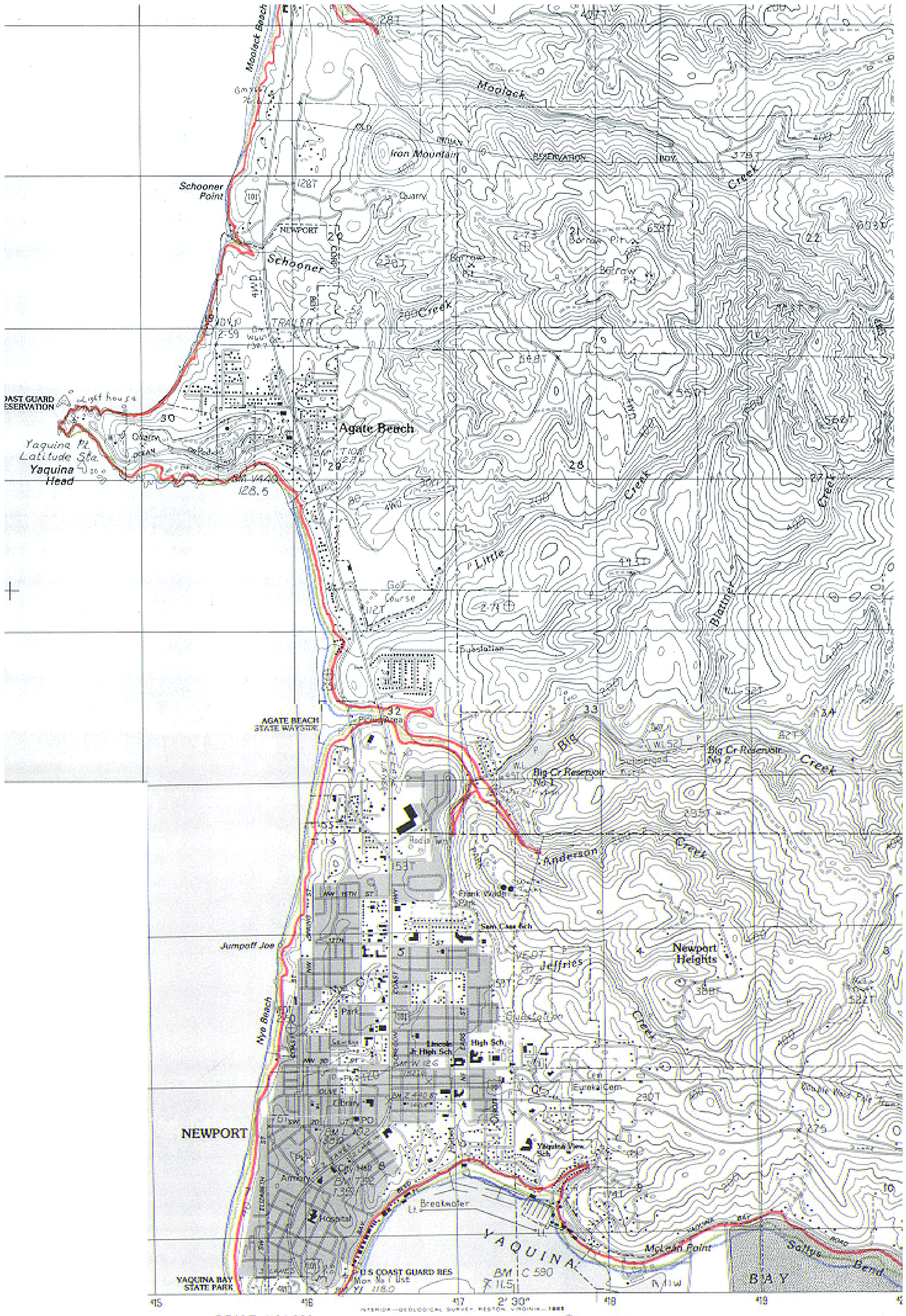
LINCOLN CITY,

PROVISIONAL EDI

Y, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092

44124-M1-TE-0





INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1985

SCALE 1:24 000

KILOMETERS 0 1 2

METERS 0 1000 2000

MILES 0 1

FEET 000 3000 4000 5000 6000 7000 8000 9000 10 000

CONTOUR INTERVAL 40 FEET

CONTROL ELEVATIONS SHOWN TO THE NEAREST 0.1 FOOT
OTHER ELEVATIONS SHOWN TO THE NEAREST FOOT

To convert meters to feet multiply by 3.2808
To convert feet to meters multiply by 0.3048

SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER

OREGON

QUADRANGLE LOCATION

1	2	3	1 2 Depoe Bay 3 Mowrey Landing
4		5	4 5 Toledo North 6
6	7	8	7 Newport South 8 Toledo South

ROAD LEGEND

Improved Road..

Unimproved Road..

Trail..

Interstate Route U.S. Rou

NEWPORT N