Environmental Geology (Spring 2006) Mid-Term Lab Portfolio Contents:

Environmental Geology Spring 2006 Midterm Exam Study Guide

The Midterm Exam will be in 2 parts, the lab skills portion will be open book. You will be able to use your notes, conversion charts, answer keys, etc. to work on lab-style problems. Make sure you go over the answer keys before the exam, if you are still uncertain how to solve the problems, see me ASAP. The second part of the exam will be closed book, and consist of long-answer essay questions, short-answer terminology, perhaps some true/false.

Key Words

Introduction
Environmental Geology
- natural hazards
- environmental quality
  - water
  - soil
  - waste
- management
- natural resources
  - water
  - energy
  - mineral

Geologic Hazards
fluvial
mass wasting
coastal
karst
seismic
volcanic
coastal
death / destruction
anthropogenic
urbanization
hazard vs. risk
contaminants
health effects
environmental fate
industrial waste
biological waste
pollution

Oregon Natural Hazards
Overview

seismic / earthquake
subduction zone earthquake
intraplate earthquake
landslide
coastal erosion
volcanic activity
- ash zone
- lahar

tsunami
flood
stream bank erosion
quake-slide
quake-tsunami
flood-coastal erosion

Flood Hazards
Hydrologic cycle
Infiltration
Runoff
flood
discharge
continuity equation
Q=AV
bankfull discharge
magnitude-frequency
discharge-time
river stage
hydrograph
flood peak
flood peak lag
peak annual discharge
recurrence interval
runoff
infiltration
floodplain storage
drainage basin
watershed
drainage divide
drainage network
channel
floodplain
terrace
100-yr floodplain
floodplain management
flood hazard mitigation
flood hazard assessment
floodplain zoning

risk assessment
hazard vs. risk
urbanization
floodplain storage
dam - flood retention
climatic vs. geologic causes of flooding

Landfills / Coffin Butte

landfill
solid waste
liquid waste
municipal waste
residual waste
hazardous waste
industrial waste
composting
sludge ponds
injection wells
leachate
soil contamination
water contamination
seepage
surface runoff
sediment erosion
erosion control
air emissions
fugitive dust
methane generation
anerobic bacterial decay
methane
groundwater monitoring system
upgradient
downgradient
liner system
double liner system
geomembrane
geotextile
impermeable barrier
leachate containment
methane collection system
fugitive dust control
air pollution monitoring
vector control
erosion and sedimentation
borrow
fill
landfill closure
remedial action plan
erosion / sedimentation pond,
landfill closure,
daily cover,
disposal cell,
buffer zone,
active life,
fault / seismic activity,
seismic impact zone,
surface water,
methane monitoring system,
corrective action,
primary liner,
secondary liner,
drainage layer,
cover liner,
leachate treatment,
gas collection,
rock quarrying,
leachate lagoon,
waste screening,
radioactive waste,
permitted and non-permitted types of waste,
biomedical waste,
geomembrane,
quarterly water sampling,
split samples,
nested monitoring wells,
wastewater treatment system,
direct osmosis, reverse osmosis,
clay liner,
fire hazard,
Coffin Butte bedrock setting / hydrogeology (fractured basalt, pillow basalt, regolith/soil),
methane extraction well,
leachate collection system,
"the bubble",
sediment ponds

Dams and Rivers (OSU + paper)
Dam building
Dam removal
Fish passage
Endangered species act
River restoration
Sediment reservoir
1960's dam building era
Army corps of engineers
Federal dam relicensing 2010
Geomorphic effects
Fine sediment removal
Coarse bed armoring
Dam rich vs. dam poor countries
River ecology /dam effects
"blow and go"
"wedge incision model"
Knick point retreat
"delta progradation model"
Reservoir drawdown model
Sediment flux
Pulsing sediment release

OSU Water Policy Seminar / Klamath Basin 1
Water policy
Prior appropriations doctrine
Klamath Basin/Lake/River
Endangered species act
Lost River Sucker
Salmon
Fish populations / decline
Tribal fishing / water rights
Klamath Basin Project
Bureau of Reclamation
Irrigation
Snow pack
Wetlands
2001 K-Falls Crisis
2002 Klamath Fish Kill
Drought cycle
Irrigation / water use
Klamath Dams / hydroelectric
Dam relicensing
Fish passage / dams
Wildlife refuges / birds
Water rights adjudication
First in time; first in right
Prior appropriations doctrine
1957 Termination Policy
CA/OR Klamath water war
Trinity River / Sacramento River

Groundwater (video and lecture)
groundwater
meteoric water
porosity
permeability
horizontal permeability
vertical permeability
intergranular porosity
fracture porosity
solution cavities
total porosity
vadose zone
zone of saturation
phreatic zone
water table
groundwater flow
cone of depression
aquifer
aquitard
artesian aquifer
water table aquifer
confined aquifer
unconfined aquifer
consolidated aquifer
infiltration
groundwater contamination
contaminant plume
well
monitoring well
total depth
screened interval
sand pack
well casing
riser pipe
static water level
depth to water
drawdown

PSU Posters

Sheridan – stream temps on John Day
Fish populations
Stream temperature
Cold vs. warm water vs. fish habitat
How is temp related to fish?

Dietrich -Mickey Springs – Diatoms
Where is Mickey springs?
What is a diatom?
What are they made of?
Hotspring/geothermal
Extremophiles
Thermophiles
Sinter deposits

Braunsten-Williamson River
Where is the Williamson river?
How does it related to Klamath?
What was Mt. Mazama?
What is mazama now called?
How does the Williamson effect the Klamath basin?

Theule – slope stability at quarry
What is an earth flow?
What is a dip slope?
What is a sill? What is a “cut”? how about a “fill”?

Drazba – Lidar Mapping
Lidar – what is it? What is it used for? How can it be used to identify mass wasting hazards in western Oregon.

Possible essay questions and other concepts

DAMS (OSU Seminar by Gordon Grant and Graf Paper on Dams)

What are the geologic, geomorphic and environmental effects of dams on rivers? When were most of the dams built in the U.S.? Why is dam removal such a "hot topic" right now? How does the history of dam building relate to the current political status of dams and dam removal issues? What are the effects of removing dams. What global countries are most associated with dams? What countries are currently building dams?

What are the process differences between large dam removal and small dam removal? How is the stored sediment mobilized? Are both types of dam environments similar when removed? Can you sketch the differences between the two styles of dams?

How does geomorphology and understanding of rivers relate to public policy decisions on dam removal? Why is it important?

KLAMATH BASIN VIDEO

Where is the Klamath basin and what is the Klamath Basin project? What happened in 2000 and 2001 in Klamath basin? How are we being effected by the 2001 events today?

What is the prior appropriations doctrine? What is a water right adjudication? What does "first in time, first in right" mean? What is the issue relating to CA and OR in the Klamath basin?

What is the endangered species act? How does it relate to fish issues in the Klamath Basin?

Who are the critical players and water users in the Klamath Basin? Summarize the environmental issues associated with the Klamath basin.

How does the Trinity River relate to the Klamath basin story? Where is the water from the Trinity river going to? How does this relate to the 2001 story and the environmental crisis in the area this year?

What is the difference between geologic hazard and risk?

List and discuss anthropogenic vs. natural environmental geology problems.

List and discuss the types of environmental hazards (natural and manmade) in Oregon / PNW.

Rivers and Flood Hazards

Discuss flood hazards in western Oregon vs. eastern Oregon; what types of conditions lead to floods?
What are the significant climatic events in western Oregon that lead to flooding? What time of year? What processes?
How is the 100-yr floodplain determined and mapped out?

What is a rating curve? How do you calculate recurrence interval and probability of occurrence?

What is a flood hydrograph and how does it look when comparing a forested area to an urbanized area?

What types of meteorological events trigger landslides, floods, and debris flow hazards in Oregon?

LANDFILLS

What are the primary elements of a Subtitle D landfill? How does the liner system work? How is methane managed? How is leachate managed? Why are the active landfill cells covered with plastic? What is a groundwater monitoring system and how does it work? Why are some types of wasted accepted at Coffin Butte, but others are not? What is a monitoring well and why is it important to measure water depth? Do you think it a good idea to actively excavate in old, unknown, military waste? What would be some alternative approaches to determining the type of military waste at Coffin Butte? Why are the basalts underlying Coffin Butte so fractured, faulted, and folded? What is the primary source of permeability in the basalts underlying Coffin Butte?

Review Questions from Videos

Video 1: La Loma Prieta Earthquake

1. Where was the earthquake and how large was it?
2. Why must geologists get out and explore the surrounding areas of land quickly after and earthquake?
3. What is the most important information to get out to the public after an earthquake?
4. Describe the movement of the plates that caused the earthquakes.
5. Why was the shaking in the "marina area" much worse than other places?
6. What can we do to make old and new buildings safe?
7. What can we do to prepare for earthquakes?
1. The tectonics of what two plates was the Loma Prieta Quake a result of?
2. What was the magnitude of the Earthquake?
3. Where was the epicenter of the earthquake located?
4. What were the problems that the geological research teams encountered?
5. How far below the ground was the fault movement?
6. How far was the damage felt from the epicenter?
7. Why was the Bay Area so susceptible to damage from an earthquake?
8. What is being done in order to prepare for future quakes?

Video 2: Hanford Nuclear Cleanup

1. What was the nuclear plant built for?
2. Did the government know what the long term effects would be to the area?
3. What are downwinders?
4. Describe the Hanford site. Include the 100 zone, 200 zone, and buffer zones.
5. Are there effects on the Columbia River ¼ mile away from the plant? Explain.
6. Why can't we just leave the waste there and lock up the area?
7. Who is involved in the decision of cleaning up?
1. What was the nuclear power plant producing in Hanford, OR?
2. What river is thought to have suffered major environmental damage?
3. Why was Hanford such an ideal place to build this nuclear facility?
4. What does the "Deadly Mile" refer to?
5. How many radioactive reactors are there?
6. How many tons of possibly lethal fuel is sitting in the basins?
7. What is the major issue that still poses a threat to the water table?
8. What are researchers doing in order to attempt to clean up this highly contaminated area?

Homework / Exercise Skills

Be able to apply basic physics and geology principles to quantitative-style problem solving.
Be able to do unit conversions from English to metric units?
Be able to problem solve using your notes and calculator.
Can you plot hydrologic graphs on Excel? Can you calculate a flood recurrence interval using excel?

Can you calculate a basic water balance for a watershed, water-in, water-out, volume exchange, storage vs. inputs/outputs?

Can you calculate area, volume, discharge, velocity in the river or watershed? What are the units?