

G473 Environmental Geology
Landfill-Groundwater Lab 3 (Part 1 - Introduction)

Start working on this for Tuesday, 4/25/00... Assignment Due Thursday 4/27/00

Introduction

We will be using our VR Excursions Lab Manual for a number of exercises in the coming weeks. This serves as an introduction and practice run. The following is the recipe for this weeks lab.

(1) Run the virtual reality package using the CD ROM that accompanies the text

(A) you need to make sure that the computer you are using has a version of "Quicktime" already installed. Quicktime is an Apple software product that runs video and multi-media applications (for example your CD ROM). *Note:* If Quicktime is not installed on the computer, you will quickly find out, as you will see "Scripting Errors" when you try to use various parts of the CD ROM

To install Quicktime (if not already installed):

- place the CD ROM in drive
- click on "My Computer", and open the CD Drive icon
- go to the Quicktime Folder
- double-click on "Install.exe"
- Quicktime will install on the machine (use the "minimum installation option")

To run the VR Excursions Software Package

- place the CD ROM in drive
- click on "My Computer", and open the CD Drive icon
- double-click on VR Excursions Icon (the one with the movie projector)
- you should now enter into the "office"

(B) The VR "office" consists of the:

- reference bookshelf on the left
 - There are two bookshelves, click on the bar at the top to switch between the two.
- the desk with laptop computer in center
 - Click on the laptop to login as a user and to start working on the exercises (all you need to enter is your name in the Student 1 space)
 - when you log in, you also need to select which exercise you will be working on (e.g. Landfill Exercise 1)
- the Virtual Reality pallet on the right

(C) The bookshelf is reference reading material to support the activities and exercises in the lab manual. The following reference books are included on the CD (in order of appearance on the shelves)

VR Excursion overview (basics of the software)
Research Design (basics of research)
Technical Writing (guidelines for writing reports)
Hazardous Waste
Groundwater

Geologic Principles
Intro to Air Quality
Intro to Geologic Maps
Instrumentation (water level meters, pH meters, samplers, etc.)
Solid Waste Law
Gas and Leachate Management (at landfills)
Intro to Coal
Coal Sources
Fossil Fuel 1
Fossil Fuel 2
Power Plants
Gas Scrubbers (for cleaning air emissions)
Yucca Mtn Story (overview of Yucca Mtn)
Volcano Primer
Yucca Mtn Rocks
Yucca Mtn Earthquakes
Yucca Mtn Climate
Yucca Mtn Volcanic Risks
Nuclear Chemistry
Nuclear Cycle
Radiation Effects (on people)
Nuclear Repository Requirements (by Nuclear Reg. Commission)
Federal Regulations
Isotopic Dating
Yucca Mtn Questions and Answers

Test Driving VR Excursions

The first task is to get a feel for how to use VR Excursions. Try the "Quick Tour" exercise that is discussed on p. 30-32 of the lab manual. The tasks here include:

- (1) Log on as a user by clicking on the laptop icon
- (2) Read the instructions and take a quick tour of the software.

Overview of the Landfill Problem Set

Landfill Problem 1

- Collect groundwater elevation data (depth to water in wells)
 - 3 types of wells at landfill
 - Leachate wells
 - groundwater monitoring wells
 - methane / gas monitoring wells
- Collect basic groundwater quality data (pH and SC = specific conductance)
- Create a groundwater contour map
- Interpret groundwater flow directions

Landfill Problem 2

- Assess contamination of a local homeowner's well
- Collect groundwater elevation data / create groundwater contour map
- Determine volume of water contained in wells
- Sample groundwater for analysis

Landfill Problem 3

- Assess groundwater flow directions and contamination extent
- Analyze chemical data
- Collect more samples
- Design a well network for further monitoring / treating of contamination

Landfill Problem 4

- Examine methane problems
- Collect gas readings
- Analyze groundwater elevation data
- Assess gas migration pathways / extent of methane distribution

VR Landfill Lab Assignment 1

(Compile all your answers and work in a word-processed format)

Use the VR Bookshelf to complete the following:

(1) Read p. 1-7 in the VR Excursions Overview Book

(2) Use the Hazardous Waste Reference Book to define / discuss the following terms:

RCRA

Listed Wastes

(3) Use the Groundwater Reference Book to define / discuss the following terms / questions:

Why does groundwater flow? What are the controlling factors?

Examine the example in gwproblem-1. Explain how groundwater contour maps are created and what they are used for? Sketch out the example data set and groundwater contour map.

Work with the gwproblem-2 data set. What general relationships do you see with respect to hydraulic gradient and direction of groundwater flow?

Comment on how groundwater flow maps may be used to monitor landfill sites with respect to their environmental risk to society.

(4) Read over the Geologic Principles Reference Book and answer the following questions:

What is permeability and what is the controlling equation for groundwater flow?

What is the difference between "soil" and "rock"? Be very specific here and discuss in detail the physical differences.

What does the term "geotechnical" mean?

(5) Read through the Instrumentation Reference Book and answer the following questions:

What does a combination meter do and how does it work? What does pH and Specific Conductance measure? What do you think "normal" and "bad" readings would look like?

What does a sonic water level probe measure?

What does the gas meter measure? List all of the parameters.

What is the purpose of groundwater sampling and monitoring at a landfill?

(click on the well-volume text)... Draw a sketch of basic monitoring well geometry. What does GWE, L and BWE stand for?

Write the equation to determine the volume of water in a monitoring well.

(6) Read through the Solid Waste Law Reference Book, answer the following questions:

Define and comment on the following regulatory terms:

SWA, RRA, RCRA, CWA

Which regulations govern the operation of landfills. Discuss their significance.

Discuss the regulations that govern landfill design.

Discuss the regulations that govern landfill monitoring.

Discuss the regulations that govern landfill closure.

(7) Read through the Gas and Leachate Reference Book, answer the following questions:

What is "leachate"?

How is leachate related to landfill gas production?

How do RCRA landfills control and manage their leachate and gas emissions?

(8) Go out to the VR landfill site and collect groundwater elevation data, pH and SC for each of the wells listed in Table 3.1 on p. 40 of your lab book.

- Photocopy Table 3.1(p.40) and Fig. 3.3 (p. 42). Fill out your data table.

-Plot your groundwater elevation data on Fig. 3.3 and create a groundwater contour map. See instructions on p. 43 if you need help.