

**UNIVERSITY OF SOUTH AUSTRALIA.  
SCHOOL OF NATURAL & BUILT ENVIRONMENTS.**

**ENVIRONMENTAL ENGINEERING N  
ENGG 3002 – [012769]**

**Semester 1, July 2004**

**TIME ; 3 hours.**

**Students will be allowed 15 minutes reading time before the examination commences.**

**OPEN BOOK EXAMINATION.**

**NO SPECIAL AIDS REQUIRED.**

**Notes to Students:-**

- **Answer 5 questions only of the 10 in the paper.**
- **Answer each question in a separate booklet.**
- **All questions are of equal value but the marks for the various parts are not.**
- **Dictionaries are permitted.**

**Question 1****20 Marks**

a) Following 6 short answer questions are valued at **1 Mark** per question.

- If you were writing a report for a road construction project what Commonwealth Act would contain useful environmental definitions?
- Which principle under ecologically sustainable use identifies that where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- If autotrophs were removed from a food web would there be more or less food for heterotrophs?
- An environmental consultant described a project site near Adelaide as containing a rare plant species. What South Australian Act would the consultant of used to determine what was rare?
- A plant species is
  - a) a group of closely allied individual plant types which can not reproduce with each other
  - b) the assemblage of different plant type living together in a particular area
  - c) a group of closely allied individual plant types which can reproduce with each other
- Where can you find information about heritage values for a town?

b) List 6 different environmental attributes in the ecosystem that should be monitored prior, during and after an engineering construction project. For each attribute provide an example of what could be measured. **[6 Marks]**

c) Using words draw a food chain containing an autotroph, a heterotroph, a herbivore, a carnivore and a degrader. Indicate energy flows using arrows. Label all organisms and provide a definition for each word underlined. **[8 Marks]**

**Question 2****20 Marks**

- a) Discuss the principles of Aquifer Storage and Recovery (limit your answer to 10 lines) **[4 Marks]**
- b) What are the important factors that need to be considered in establishing (designing) an ASR **[6 Marks]**
- c) Define the term porosity **[2 Marks]**
- d) Porosity of clay varies from 40% to 70% while that of sand vary from 25% to 50%. In designing solid waste landfill depots, EPA has recommended to provide a clay liner to the bottom of the landfill. Discuss the necessity of this liner and the reasons to select clay despite its high porosity nature. **[8 Marks]**

**Question 3****20 Marks**

- a) Define the term 'Risk' as applied to Environmental Impact/Hazards **[1 Mark]**
- b) Explain with examples; how a hierarchy of risks, may be associated with a single initiating event. (eg the various risk scenarios associated with driving a car and having an accident) **[3 Marks]**
- c) Discuss the difference between individual and societal risk, and how these influence risk based decision making **[2 Marks]**
- d) Provide an outline of the risk assessment process **[4 Marks]**
- e) Design and planning decisions may be based on engineering calculations using known parameters at one end of the spectrum, and on purely qualitative risk assessment estimates at the other. Discuss the relative merits of both approaches and draw conclusions as to the most appropriate approach **[10 Marks]**

**Question 4****20 Marks**

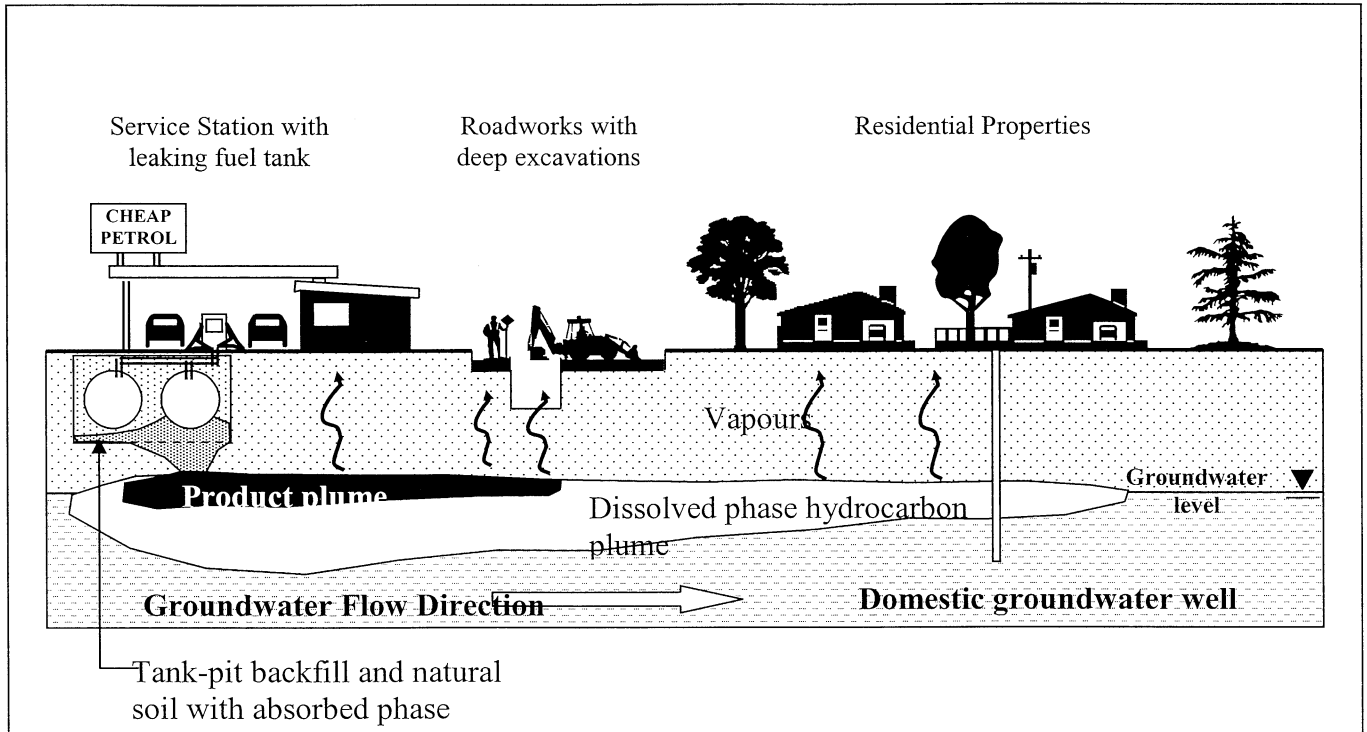
Plan and write a short essay comparing one case study with which you are familiar, to the lecture notes provided on Management of Mine Tailings and Waste Dumps.

You may use either the case study you submitted for the assigned tutorial, or the Peak Gold case which was part of the tutorial.

The emphasis of the marking will be on your *comparison*, not a recital of points of information.

The essay should include the following:

- A clear description of *where and how* your case fits into the framework of your 15 pages of lecture notes
- One or two paragraphs on the general environmental advantages or disadvantages of your case
- Comparisons of your case with the relevant section of the lecture notes in terms of *both technical and environmental* factors. This comparison must be specific – ie. where did they go wrong, what could have been done better, what are the advantages of this method, etc.

**Question 5****20 Marks**

- Explain why site contamination exists in this scenario. **[4 Marks]**
- Identify the health and environmental impacts. **[2 Marks]**
- What assessment measures should be implemented? **[4 Marks]**
- What remediation or management measures could be implemented for this scenario? **[5 Marks]**
  - In what order should the remediation or management measures be implemented? **[5 Marks]**

**Question 6****20 Marks**

What is the purpose of rehabilitation?

**[10 Marks]**

Planning is the key to successful rehabilitation. Explain with examples where appropriate:

- Why this is so?.
- When it should be done?.
- The components of a rehabilitation plan.

**[10 Marks]**

**Question 7****20 Marks**

Monitoring the air quality of our environment requires standards to be met which ensure the provision of clean safe ambient air. This involves identifying the pollutant, measuring its concentration, & frequency of occurrence and comparing that with the maximum acceptable limit of the pollutant.

- a) List the commonly monitored pollutants, their averaging period, maximum concentration allowed & the relevant measuring instrument. **[5 Marks]**
- b) In the monitoring of particulate dusts the move is from PM<sub>10</sub> to PM<sub>2.5</sub> explain why **[4 Marks]**
- c) Describe the environmental effects emanating from the use of explosives in open cut quarrying or road construction in forming a cutting through a right of way. **[6 Marks]**
- c) In monitoring explosive blasting practices undertaken in mining or civil construction projects, outline the measuring equipment used & the parameters measured. **[5 Marks]**

**Question 8****20 Marks**

Under certain circumstances, low-lying coastal soils, particularly those in the north-east of Australia, can pose a risk to the environment (e.g. death of fish populations, disease).

Describe the particular set of conditions, which are required to form the risk, and the actions that might trigger the particular reactions, which will lead to environmental damage.

Discuss the implications for various land use in such areas.

As an engineer working on a near coastal site, how might you detect the potential for this particular problem to exist in the soils you may have to deal with?

**Question 9****20 Marks**

What are the considerations that must be undertaken when looking to develop a site for domestic landfill operations for a large urban area such as Adelaide?

Address the social, heritage, cultural and environmental concerns (including the desirable nature of the site) and how these are best protected by employing state of the art practices in implementing the landfill operation.

Discuss these state of the art practices briefly and include the issues of waste control and transportation in your discussion.

**Question 10****20 Marks**

In framing regulations that are regarded as necessary to protect the public & other stakeholders from developments that might adversely impact on the environment. Discuss two strategies that may deliver the compliance being sought by the regulator

What tools do the regulators have to verify that the approved applicant has indeed performed due diligence on the development undertaking