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

ENVIRONMENTAL ENGINEERING N
ENGG 3002 – [012769]

Semester 1, July 2005

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 6 in the paper.**

  Note! Q2 is for Mining students, Q3 is for Civil students

- **Answer each question in a separate booklet,**
  Ensure your name & ID is recorded on each booklet

- **All questions are not of equal value.**

- **Dictionaries are permitted.**

Q1. Environmental Planning [20]

The South Australian state government has proposed to build a new development in an area of native forest. Provide a written report that outlines what your manager will need to consider in regards to the environment before the development commences. The report needs to contain details on the following topics:-

a) definition of the environment

b) definition of ecological sustainable use

c) what environmental parameters need attention

d) legislation in regards to threatened species

e) how to obtain information on heritage and cultural importance

f) what social impacts and amenity of the area should be considered

g) what is native title

h) factors to consider regarding community education

i) what to measure and when in regards to possible environmental impacts

Q2. Minesite rehabilitation *(Mining Students)* **[20]**

a) Briefly comment on the mining process and the potential impacts on the environment during:

- *Exploration*
- *Extraction*
- *Processing*
- *Transport*
- *Final use*

b) The key to successful minesite rehabilitation is planning prior to commencement of mining so as to prevent or significantly reduce impacts during and after the operation. Discuss the following three essential elements of successful rehabilitation giving examples where possible

- *Rehabilitation objectives*
- *Site description*
- *Detailed site plan*

c) Discuss the processes involved in the formation of acid rock drainage (ARD), the environmental impacts of ARD and potential remediation methods. Why is constant monitoring essential during remediation?

Q3. Acid-sulfate soils *(Civil Students)* occur naturally throughout the world. **[20]**

i. What is the origin of such soils and in what landform might they be found?

ii. Why are these soils problematic, and what engineering or agricultural processes can exacerbate these problems?

iii. When appraising a construction site, what factors would indicate acid-sulphate soil might be present and what testing would you do to confirm this?

iv. What techniques would be appropriate in managing earthworks on such a site?

Q4. Environmental Risk [20]

When examining the environmental risks of a given project whether it be the construction of a gas pipeline, a bridge spanning a busy waterway or the clean up of site contamination at a disused petrol station.

We need to establish the Strategic & Risk Management context.

Select one of the above projects or similar that you may be familiar with, what are the hazards you perceive in the undertaking? List them **[5]**

Having identified the hazards in your selected project, there are two considerations that determine the risk, what are they? & how are they evaluated? **[5]**

In evaluating the risks which is it that consider to have the most serious risk ranking & why? **[5]**

What criteria will decide if the project is acceptable to proceed or what remediation actions will need to be put in place? **[5]**

Q5. Groundwater Hydrology [19]

i) Define the term porosity

ii) Discuss why sand is hydraulically more conductive than clay.

iii) State differences between confined and unconfined aquifers.

iv) An underground storage tank has discharged diesel fuel into groundwater. A drinking-water well is located 200m downgradient from the fuel spill. To ensure the safety of the drinking-water supply, a monitoring well is drilled halfway between the drinking-water well and the fuel spill. The difference in hydraulic head between the drinking-water well and the monitoring well is 40cm (with the head in the monitoring well higher) if the porosity is 39% and hydraulic conductivity is 45m/day, how long after it reaches the monitoring well would the contaminated water reach the drinking water well? True groundwater velocity is equal to V_d/n, where V_d is the Darcy's velocity and n is the porosity. Assume the pollutants moves at the same speed as the groundwater.

Q6. This is a 'catchall' question with many parts. You are required to provide only short answers, which may be in dot point format. **[21]**

i. Tailing Dam containment areas are short term storages & pose 3 areas of community concern, what are they & why? **[3]**

ii. Describe the effect of liquefaction on tailing storages and how is it likely to occur, what checks would warn of such an occurrence? **[3]**

iii. Site contamination is caused by what & what criteria must be established before such is designated? **[3]**

iv. What are the likely impacts on human & ecological health of site contamination? **[3]**

v. Environmental Management systems operated by Newmont Mining & Adelaide Brighton Cement recognize their environmental risks, would you expect their risks to be widely different? Explain! **[3]**

vi. The EPA monitor air quality in Adelaide & regional industrial areas, describe the data collected from High Volume samplers? how do they measure odour contamination? What equipment is used to survey areas such as Pt. Pirie, Mt. Gambier & Birkenhead **[3]**

vii. Use of explosives in civil & mining projects produce ground vibrations & air over-blast pressures, what are considered non acceptable measures & how are they monitored **[3]**