Examination Period 3: 2016/17

ENV200117N

Module Title: Contaminated Land
Level: Five
Time Allowed: Two hours

Instructions to students:

- Enter your student number **not** your name on all answer books.
- Answer all questions from **Section A**.
- Answer two questions from **Section B**.
- Begin each question in a separate page; label each page clearly with the number of the question you are answering.
- The use of a non-programmable calculator is permitted.
- Section A carries 40% of the overall marks.
- Section B carries 60% of the overall marks.
- Erasmus/overseas students are permitted to take a bilingual dictionary into the examination room but will not be permitted any extra time.
- Students are **not** permitted to remove this examination paper from the examination room. For all purposes the examination paper remains the property of the University of Northampton.

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Section A

Answer all questions.

Question 1

Differentiate between the following contaminated land terms:

a. targeted and non-targeted sampling strategies.

b. in-situ and ex-situ.

(4 marks)

Question 2

Explain the term “Soil Guideline Values”? Indicate how they are used in the assessment of contaminated land.

(5 marks)

Question 3

What is the statutory definition of contaminated land according to Part IIA EPA 1990 Section 78A(2)?

(4 marks)

Question 4

Explain why Containment was one of the most widely used techniques in land remediation and most commonly applied risk management technique.

(4 marks)

Question 5

Briefly state how Electrical Resistance Heating is used in conjunction with Soil Vapour Extraction to remove contaminants from soil.

(4 marks)

Question 6

Using a diagram demonstrate the function of an up-gradient vertical barrier in the prevention of migration of contamination in groundwater.

(5 marks)
Question 7
How can plants be used to stabilise contaminated soils and restrict environmental exposure of contaminants.

(3 marks)

Question 8
When considering the option of a Permeable Reactive Barrier as a suitable remediation technique, it is important to consider the hydrogeology of the site. Which four aspects of the hydrogeology should be considered?

(4 marks)

Question 9
Differentiate between bioventing and biosparging.

(2 marks)

Question 10
Name three land uses which are considered by CLEA.

(3 marks)

Question 11
With regard to contaminated land and its remediation what is the definition of the term “suitable for use.”

(2 marks)

(Section A total: 40 marks)
Section B

Answer two out of four questions.

Question 12

Evaluate the following statement:

“The conceptual model is a description of a site and its environment that encompasses what is known and what needs to be known in order to make project decisions.”

Under certain conditions it may be that natural conditions are such that risk can be contained without any kind of engineered purpose. In this instance Monitored Natural Attenuation may be considered as a viable option for the treatment of contaminated groundwater/soil.

a. Define Monitored Natural attenuation.  
(4 marks)

b. Summarise the processes which may occur during contaminant transport over time.  
(10 marks)

c. Demonstration, evaluation and monitoring of NA processes are based on the philosophy of lines of evidence. Discuss.  
(10 marks)

d. Assess the highlights and limitations of using MNA for site remediation.  
(6 marks)

(Total: 30 marks)

Question 13

Solidification and Stabilisation is an established technology that has been used over the past 20-30 years to treat a variety of wastes and contaminated soils including the management of radioactive wastes. Using case studies describe and evaluate these techniques.  
(30 marks)
Question 14

Soil Vapour Extraction and Air Sparging are both *in situ* technologies used in the remediation of contaminated land/groundwater. Briefly describe each technology and include the following in your answer:

a. Process variations. (12 marks)

b. Applicable media. (5 marks)

c. Applicable contaminants. (5 marks)

d. Highlights and limitations. (8 marks)

(Total: 30 marks)

Question 15

Bioremediation techniques and their application in the remediation of contaminated land have increased over recent years due to regulatory, economic and environmental pressures. Evaluate the use of such techniques addressing some of the following perceived constraints:

– Bioremediation does not work.
– Bioremediation is too slow.
– Bioremediation technologies are not readily available.

You should include a case study in your answer. (30 marks)