## Resource & Environmental Economics Field Examination

## May 2008

<u>Instructions:</u>

- You have a maximum of 4 hours to complete the exam.  This time commences at the end of the 15-minute reading period during which no writing is allowed.

- Please use your assigned "alpha letter" on every page to identify your exam.  Do not use your name or social security number.  Write on only one side of the page leaving at least one inch margins.  Also number each page and before turning in the exam make sure the pages are in order.

- You have four questions to answer of the following five.

1. The European Union (EU) has commissioned a "water rate competitiveness study". This study is motivated by: (1) increasing water depletion and scarcity in the EU, (2) disappointing impacts of existing regulations that were implemented to speed the adoption of water conservation practices by industry, and (3) interest about the potential performance of higher water rates (prices) in all sectors. One thrust of the study is to survey water rates used in other developed countries, as the EU does not want to "overprice" this production input and place EU industries at a competitive disadvantage in world product markets.

   Your tasks stem from the second motivation of the study, which is to assemble theoretical principles and economic advice about setting efficient water rates. The following questions are being posed to you, but you are also welcome to provide other rate-setting advice.

   a. In what theoretic way(s) might one claim that processed water sold to industries or households is underpriced? Be complete in your coverage. Define your terms and integrate mathematical or graphical models that underscore your points and theory.

   b. Is there arguably a double dividend to be gained if EU member countries raise water rates above levels that compensate governmentally owned water utilities for their costs of operation? Define your terms and explain your argument.

2. Stated choice modeling (SCM) is now very popular as a nonmarket valuation approach. In contrast, some still use the discrete choice contingent valuation method (CVM), or its variant, the double-bounded version proposed originally by Hanemann, Kanninen, and Loomis.

   a. Why do many believe that the SCM is a preferred approach to CVM?

   b. Does the evidence show that SCM is in fact a "better" approach? Explain what you mean by "better" here. [Hint: what is convergent validity?]

   c. What are critical concerns you might in fact have about the SCM approach? Explain two such concerns.

3. The Ogallala Aquifer in northwest Texas is a nonrenewable resource that is facing depletion. Lately, high crop prices have increased exploitation.

   a. How would you determine the optimal rate of exploitation?

   b. What policy approaches could you use to alter consumption to near optimal rates?

   c. What economic framework would you suggest be used to resolve the choice among the policy approaches you mention in your part b answer? Identify key data items needed to employ this framework.

   d. How would you handle the modeling of third-party impacts from irrigation return flow entering the region's surface waters?

4. Texas regulatory groups were recently confronted with proposals to allow the construction of 23 coal-fired power plants, but this was opposed by environmental groups based on environmental pollution grounds. However, Texas is expected to face a growing population that will almost certainly increase electricity demand. Suppose you are told by engineers that a linear projection of population and per capita electricity use shows electricity demand will increase by 50% and you are asked to respond to the following questions.

   a. Develop an argument based on economic theory that explains why the environmental groups might have opposed the coal-fired power plants?

   b. Why don't we greatly expand solar and/or nuclear power? Note that solar is little used today; nuclear generation capacity has not been augmented in 20 years.

   c. Should we believe the engineers electricity demand projections?

   d. How would you set up a modeling framework for the optimal mix of power plant fuels, and in your answer, explain what kind of information you would need to empirically apply this framework?.

5. Suppose a pulp mill has the right to discharge its wastes into a river. The total damages from the discharges are given by the formula:

   $$TD = 4Q + 5Q^2$$

   where Q is the quantity of wastes discharged. The total benefit to the pulp mill of discharges its wastes into the river are given by

   $$TB = 60Q - 2Q^2$$

   Given these data address the following

   a. What level of discharges would occur if the pulp mill ignored the damages caused by its wastes?

   b. What is the socially efficient level of discharges?

   c. The efficient level of discharges could by obtained by setting a standard. How would this work and what is the efficient standard?

   d. The efficient level of discharges could also be obtained by implementing economic incentives. What is the optimal incentive level in dollars per unit of discharge?

   e. If transaction costs were zero and negotiations occurred between the pulp mill and the people it damaged, what would be the optimal governmentally applied economic incentive? Why?

   f. If transaction costs of imposing the standard were nonzero, how would this factor into your framework?

   g. If it cost money to establish and administer economic incentives, how would this factor into your framework?