

**HOMESTAKE MINING COMPANY**

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August 2, 2000

Ms. Mary Heather Nobel  
Ground Water Section  
New Mexico Environment Department  
P.O. Box 26110  
Santa Fe, NM 87502

40-8903

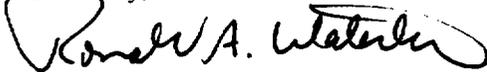
Re: In-Situ Biological Pilot Tests

Dear Ms. Nobel:

Please find enclosed a general work plan and scope for the in-situ biological treatment pilot tests that we are starting this month. Each test site location is identified on the site map. Figure 1 is a detail of the test at site C, figure 2 is a detail of the test at site D, and figure 3 is a detail of the test at site X.

If you have any questions please call me at (505) 287-4456 extension 12.

Sincerely,



Ronald A. Waterland  
Environmental Project Supervisor

Cc: Ken Hooks, NRC  
Petra Sanchez, EPA  
Roy Cellan, HMC

# INSITU BIOLOGICAL TREATMENT PILOT TEST GENERAL WORK PLAN AND SCOPE

## 1.0 GENERAL PROJECT DESCRIPTION

The project involves construction, startup, operation and monitoring of three pilot scale In-situ Anaerobic Biological Treatment Systems (ISABTS). Three sites are being tested to evaluate the operation and effectiveness of three differing methods for applying the ISABTS technology. The pilot scale test is being conducted subsequent to, and concurrently with, laboratory scale column testing that have proven to be highly successful.

## 2.0 PURPOSE AND OBJECTIVES

The purpose of the in-situ treatment is to evaluate the effectiveness and economics of applying anaerobic biological treatment to permanently remove molybdenum, uranium, and selenium from solution in the local alluvial aquifer.

The objective of the project is to gather sufficient data to demonstrate whether the groundwater standards can be met using ISABTS. A further objective is to examine the logistics of applying the technology at a substantially larger scale than implemented in the laboratory. Ultimately, should the testing demonstrate process success, logistical feasibility and economic viability, a full scale treatment system may be considered.

## 3.0 TEST DESCRIPTION

Following the testing at a laboratory scale, a specific carbon/nutrient mix was selected for implementation at all test sites. It was decided to use a consistent nutrient mix at all sites to reduce the number of variables being evaluated. The specific nutrient mix consists of molasses (carbon), phosphate, and a nitrogen source (CPN) in specific ratios relative to each other and at concentrations determined from the laboratory testing.

Three sites are selected for testing. These are:

**Site C** - Located south of the evaporation ponds. Includes monitoring wells C-1, C-2, C-13, and C-14. The injection wells for the introduction of the CPN mix are up-gradient wells C-4 and C-5. This test is to be conducted as a pulsed batch injection site. The nutrient mix is introduced into the two injection wells in pulses. Each well will receive a 1500 gallon injection of CPN mix water once per week. The pulsed injection approach relies on the natural groundwater gradient and dispersion characteristics to move and disperse the nutrients to induce biological activity and treatment. This system involves low equipment use, low energy use, small time expenditure, and may assist in avoiding potential biofouling due to the pulsed nature of the injection.

**Site X** – Located to the east of the Site offices. This site includes the “X” series wells X-13 thru X-27. It is anticipated that wells X21, X22, X23, X24, 1E, X26 and X27 will be injection wells and X13, 1A, X14, X15, X16, X17, X18, X19, and X20 will be monitoring wells. This site will be operated as a continuous injection site where injection water is dosed with the appropriate ratio and concentration of the CPN mixture. The resultant mixture is anticipated to sweep through the aquifer material, disperse to some degree and arrive at the monitoring wells fully reduced and treated. This system is relatively active and requires pumping and re-injection, but may result in more rapid and broader distribution of CPN and therefore a more rapid treatment.

**Site D** – Located between the tailings pile and the evaporation pond. This site includes the wells DNR, DM, 3K, and DN for monitoring and DO, DR and DS for injection of nutrients. This site will be operated as a reactive biological barrier site. Under the premise that source control will ultimately contain the migration of undesirable constituents from the tailings pile, the reactive barrier will allow hydraulic migration, but not chemical migration of molybdenum, uranium and selenium. To achieve this barrier, the continuous drip feed of concentrated CPN will be made into the injection wells.

The existing groundwater flow direction, rate, and quantity will determine the distribution and dispersion of the CPN material. This system is relatively passive and may be accomplished with essentially gravity alone. The creation of a biologically reactive zone encircling the tailings pile and treating/reacting with essentially all exiting waters could result in source control and eliminate the continual release of these constituents from the pile and immediate vicinity.

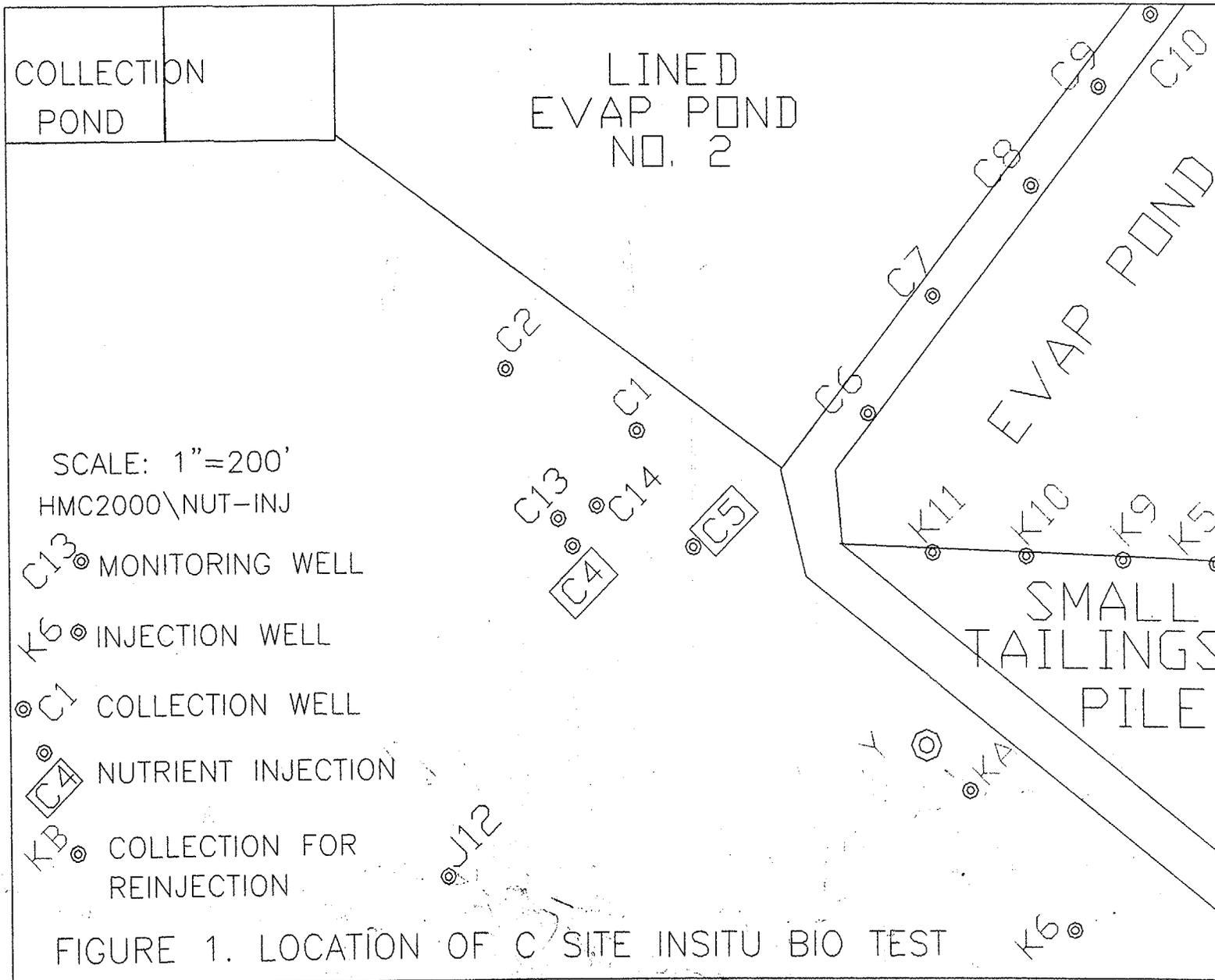
Monitoring of the wells will be conducted consistent with the site hydraulics and the expected travel time. Upon detection of the injected materials, or the secondary results of that injection, monitoring will be conducted on a weekly or semi-weekly basis. The basic constituent list for monitoring includes:

- Bicarbonate
- Total Alkalinity
- Sulfate
- Nitrate
- Orthophosphate
- Total Organic Carbon
- Molybdenum
- Uranium
- Selenium
- Iron
- Manganese
- PH
- Redox Potential
- Conductivity

#### **4.0 EXPECTATIONS AND SCHEDULE**

It is expected that all three systems will be operational by the second week of August at the latest. It is anticipated that all three systems will be successful in meeting State and site-specific NRC water quality criteria. Following the completion of approximately 6 months of pilot scale study, a report will be written evaluating the data and presenting future plans and proposals if any.





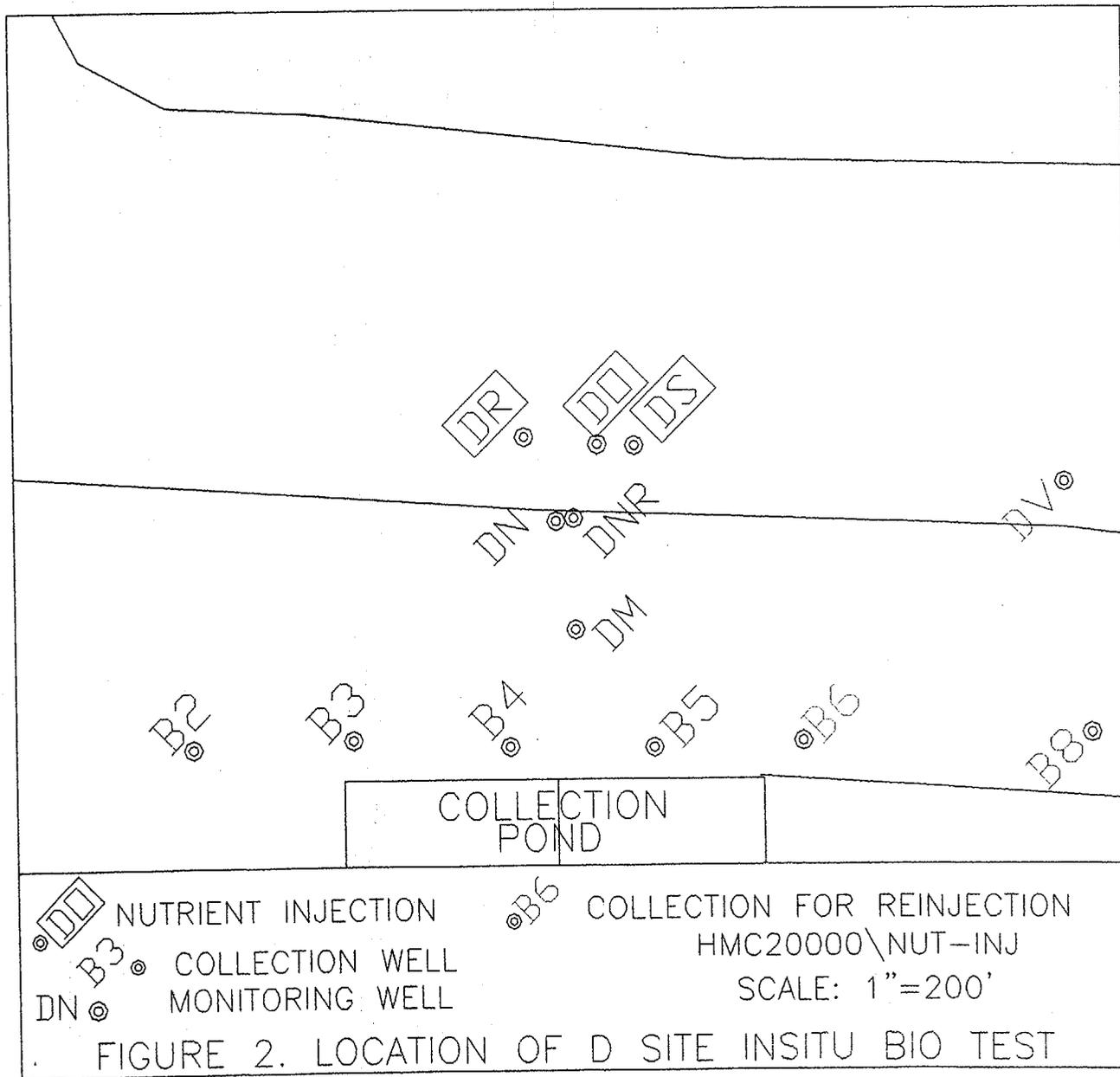


FIGURE 2. LOCATION OF D SITE INSITU BIO TEST

