

*Formerly Applied Environmental-SEC Donohue*

May 7, 1993

RUST Environment & Infrastructure Inc.
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Tel. (303) 469-6660 • FAX (303) 469-6665Mr. Randy Ogg
EG&G Rocky Flats, Inc.
P.O. Box 464, Building 080
Golden, Colorado 80402-0464Re: Revision 1 to Technical Memorandum 1
Solar Ponds Phase I RFI/RI Implementation

Dear Randy:

A combined double-ring infiltrometer and instantaneous profile test has been proposed in Technical Memorandum 1 for implementation under the Operable Unit (OU4) Phase I RI/RFI investigation. This test would provide an estimate of steady state infiltration under ponded conditions and allow relationships to be developed between matric potential, unsaturated hydraulic conductivity, and moisture content. However, determination of these hydraulic relationships depends on the success of using time domain reflectometry (TDR) probes to calibrate the neutron probe and predict volumetric moisture content. The use of TDR probes at the RFP has been only moderately successful, as evidenced by difficulties encountered at Operable Unit 2 and in field tests conducted on material obtained from OU4. We have concluded that even successful completion of these tests would not lead to a significantly enhanced understanding of water movement and contaminant transport in the vadose zone at OU4.

First, the proposed double ring infiltrometer tests simulate infiltration under ponded conditions that are not likely to exist at OU4 for extended periods of time. Within the ponds, standing water is isolated from the underlying soils by relatively impermeable liners. The effects of the liners are not adequately simulated by the test. Second, only two double ring tests have been proposed due to the level of effort associated with implementation. Two tests will not yield sufficient information on the variability of infiltration within OU4 for sitewide vadose zone water balance purposes. Although the unsaturated hydraulic parameters determined from the tests will be useful, we do not believe they warrant the level of effort associated with each double ring infiltrometer test. Furthermore, if the TDR probes do not function correctly in OU4 soils, no relationships between soil moisture and matric potential can be developed using the originally proposed configuration.

As a result of these perceived difficulties, an alternative approach is proposed. After reviewing the literature, we have determined that the most appropriate alternative to the double ring infiltrometer test is a single ring infiltrometer test conducted using the Guelph permeameter (Reynolds and Elrick, 1990)¹. Advantages to this approach are as follows:

- Multiple tests will be conducted to determine the site-wide variability of infiltration at OU4 due to the relatively low cost of this test. A total of five to ten tests is envisioned. Locations will be selected to reflect site variability in soil type, disturbance, and topographic slope;

¹ Reynolds, W.D., and D.E. Elrick, 1990. Ponded Infiltration from a Single Ring: I. Analysis of Steady Flow. Soil Science Society of America Journal, V. 54 pp. 1233 - 1241.



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- RUST Environment and Infrastructure currently has access to a Guelph permeameter. If this method is unsuccessful, the investment in time, effort, and equipment will be lower than the proposed double ring infiltrometer;
- This test can be conducted near neutron access tubes and the information can be used to explain variations in moisture profiles at different sites and to calibrate or validate numerical models of moisture movement at monitoring sites; and
- The equipment installation procedure is suitable for gravelly soils (Sotter et al., 1982)².

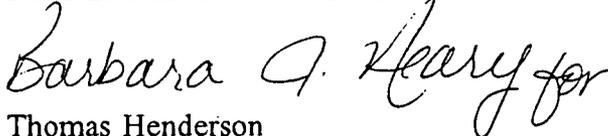
The single ring infiltration test can be used to determine saturated hydraulic conductivity, matric flux potential, sorptivity, and provide an estimate of pore-water air-entry pressure and soil capillarity index.

The relative simplicity of the single ring infiltration test allows collection of data similar to that proposed earlier for the double ring infiltration test, but at a greater number of test locations. The greater range of site conditions investigated using the single ring test will allow a more accurate evaluation of the variability inherent in soil hydraulic conditions. The advantages of single ring infiltrometer testing described above make this technique superior to the previously proposed double ring test, and are recommended.

Please contact me with any questions you may have regarding this recommendation.

Sincerely,

RUST Environment & Infrastructure



Thomas Henderson
Senior Geochemist

cc: S. Paris EG&G
K. Ruger EG&G
N. Kiusalaas RUST E&I
J. Uhlinger RUST E&I
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² Sotter, D.R., Clothier, B.E., and E.R. Harper, 1982. Measuring Saturated Hydraulic Conductivity and Sorptivity using Twin Rings. Australian Journal of Soil Research, V. 20, pp. 295 - 304.