TECHNICAL REVIEW COMMENT SHEET
Saltstone Facility

UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE	Document Review Record SRR-CWDA-2009-00009, R0	
Document No./Title: **SRNL-STI-2008-00421, Hydraulic and Physical Properties of Saltstone Grouts and Vault Concretes**	Rev. No.: 0	Doc. Date: November, 2008
Reference: 3/25/09 – 3/26/09 NRC Onsite Observation Report for Saltstone (NRC Document No. ML091320439)		

No.	Comments	Comment Resolution
SRNL-STI-2008-00421, Hydraulic and Physical Properties of Saltstone Grouts and Vault Concretes		
ML091320439 #10	Clarify whether bleedwater was leaking from sealed containers during the hydraulic properties study, when the report indicated the samples were sealed	The saltstone samples were prepared in split mold cylinders designed to produce 2.8 inch diameter by 6 inch long samples and to allow easy removal of the samples from the cylinders. The split mold cylinder with one longitudinal cut was held together by a clamp and a white cap on the bottom to produce a cylinder into which the saltstone grout was poured. After pouring the grout into a cylinder, the top was also capped. This design was recommended by the vendor to meet the dimensional requirements for measurement as well as provide a non-destructive method for removing the cured sample just prior to measurement. With freshly poured saltstone grout and a relatively high water to premix ratio, the salt solution is able to separate from the mix prior to curing. Consequently, we were not able to prevent some leakage of this bleed liquid from the cylinders at the joints. In the next round of testing, we designed a system with no joints in which leakage was precluded. The dimensions were acceptable to the vendor and removal of the cured grout sample could be accomplished without damaging the cast piece.

TECHNICAL REVIEW COMMENT SHEET
Saltstone Facility

UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE	Document Review Record **SRR-CWDA-2009-00009, R0**	
Document No./Title: **SRNL-STI-2008-00421, Hydraulic and Physical Properties of Saltstone Grouts and Vault Concretes**	Rev. No.: 0	Doc. Date: November, 2008
Reference: 3/25/09 – 3/26/09 NRC Onsite Observation Report for Saltstone (NRC Document No. ML091320439)		

No.	Comments	Comment Resolution
ML091320439 #11	Clarify the impact of changing pore solution concentration on measured hydraulic properties on page 8 of this Report.	The DDA, ARP/MCU, and SWPF simulants were formulated to simulate the anticipated composition of the salt solution as outlined in Tables 2, 3, and 4, respectively. As outlined in Section 3.1.4 of the report, the DDA, ARP/MCU, and SWPF permeants were formulated based upon geochemical modeling to assess the potential for chemical reactions (i.e. precipitation) between the simulants and grout that could potentially impact the hydraulic and physical property testing. Any such post sample preparation potential precipitation could have resulted in the measurement of artificially lower saturated hydraulic conductivities. The results of the geochemical modeling were used to develop permeants essentially equivalent to the simulants except for the exclusion of the minor phosphate and aluminate constituents. Aluminate and phosphate ions are reactive constituents in the hydration reactions and the intent was to preclude additional reactions which would not be representative of the disposal process at the SDF. The recipes for the DDA, ARP/MCU, and SWPF permeants are given in Tables 2, 3, and 4. The bottom line was that the permeant formulation was modified from that of the simulant to preclude any potential post sample preparation precipitation which could have resulted in the measurement of artificially lower saturated hydraulic conductivities.

TECHNICAL REVIEW COMMENT SHEET
Saltstone Facility

UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE		**Document Review Record** **SRR-CWDA-2009-00009, R0**	
Document No./Title: **SRNL-STI-2008-00421, Hydraulic and Physical Properties of Saltstone Grouts and Vault Concretes**		Rev. No.: 0	Doc. Date: November, 2008
Reference: 3/25/09 – 3/26/09 NRC Onsite Observation Report for Saltstone (NRC Document No. ML091320439)			

No.	Comments	Comment Resolution
ML091320439 #12	Explain how uncertainty will be addressed for moisture characteristic curves that are fit to data reported on page 18 of the Report.	Insufficient saltstone moisture characteristic curve data are currently available for each of the saltstone types (i.e. DDA, ARP/MCU, and SWPF) to adequately define uncertainty about the curves. Additionally current PORFLOW modeling indicates that at the anticipated matrix potentials (i.e. typically less than 1000 cm), the saltstone remains essentially saturated. This means that the saltstone is modeled at its saturated hydraulic conductivity value (i.e. lower unsaturated hydraulic conductivites are not used). This makes the saltstone moisture characteristic curve a moot point in relation to the current modeling. Unless it becomes evident that the saltstone moisture characteristic curves play a more important role in modeling than currently evident, it is not recommended that substantial effort be expended developing uncertainty about the Saltstone moisture characteristic curves.

UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE	Document Review Record SRR-CWDA-2009-00009, R0	
Document No./Title: **SRNL-STI-2008-00421, Hydraulic and Physical Properties of Saltstone Grouts and Vault Concretes**	Rev. No.: 0	Doc. Date: November, 2008
Reference: 3/25/09 – 3/26/09 NRC Onsite Observation Report for Saltstone (NRC Document No. ML091320439)		

No.	Comments	Comment Resolution
ML091320439 #13	Justify the use of logarithmic averages for recommended hydraulic property values on p. 19.	Various statistics have been used to characterize the central tendency of a data distribution, including the arithmetic mean, geometric mean, median and mode among others. The logarithmic average is more commonly known as the geometric mean. The arithmetic and geometric means are identical for symmetric distributions, and the choice between arithmetic and geometric (logarithmic) averaging is inconsequential. However, the arithmetic and geometric means differ for skewed distributions. The geometric mean is more representative of the median, which is typically preferred over the arithmetic mean as a measure of central tendency for skewed distributions. The median is relatively insensitive to outliers (and skewness in general) and can be viewed as a typical value from the distribution. Environmental properties that vary over orders of magnitude are often assumed to have a log-normal distribution. The geometric (logarithmic) mean is identical to the median value for this distribution. The use of arithmetic averaging of saturated hydraulic conductivity for sample sets with a small sample size that includes a potential outlier with a significantly greater value (i.e., order of magnitude or greater) gives a disproportionate weighting to the potential outlier and significantly skews the average. The use of logarithmic averaging, as discussed above, results in a more realistic average when potential outliers are included in the data set, and it is essentially identical to arithmetic averaging when a potential outlier with a significantly greater value is not present in the data set (compare saltstone arithmetic averages with logarithmic averages in Table 30).