SCIENTIFIC NOTEBOOK
No. 239
Valid Dates: 9/16/97-10/3/97

by
AMIT ARMSTRONG

Center for Nuclear Waste Regulatory Analyses
Southwest Research Institute
San Antonio, TX

SCIENTIFIC NOTEBOOK
No. 239
Valid Dates: 9/16/97-10/3/97

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Initial Entries

Scientific Notebook: 239

Issued to: Amit Armstrong, Research Engineer

Issue Date: September 16, 1997

By agreement with the CNWRA QA this Notebook is to be printed at approximate quarterly intervals. This computerized Scientific Notebook is intended to address the criteria of CNWRA QAP-001.

Table 0-1: Computing Equipment

Machine Name	Type	Operating System	Location
sisyphus.cnwra.swri.edu	Sun SPARC 20	SUNSolaris 2.5.1	Rm 210/Bldg.189
performer.cnwra.swri.edu	SGI Onyx	IRIX 5.3	Network
dopey.cnwra.swri.edu	Sun SPARC 10	SUNSolaris 2.5.1	Network

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Contents

1. Total System Performance Assessment (TSPA) KTI

Account Number: 20-5708-762
Collaborators: Gordon Wittmeyer

Objective: To prepare the TPA base case data for matrix porosity, saturated hydraulic conductivity and matrix permeability

9/20/97
Methodology:

1. Introduction

The matrix properties for unsaturated zone, saturated hydraulic conductivity, permeability, porosity, and van Genuchten beta, were estimated for each of the 6 stratigraphic layers for the base case scenario for TPA v3.1. The processed data for the matrix properties was selected from USGS draft report(Flint, 1996). The data provided in this report corresponds to different lithostratigraphic layers than the layers used in TPA v3.1. The data was analyzed and then processed to get either a single value or a probability density function (PDF) for TPA v3.1. The lithostratigraphic layer data from the report was assimilated into TPA layer data using depth data from DOE geologic model Integrated Site Model (ISM) v3.0. A cross section at the centroid of each of the 12 sub-areas provided the necessary depth data from ISM. A conceptual scheme was developed to define the corresponding layers in each of the 3 models.

The layers correspondence as depicted in Table 1 represents all layers, however, layers CHv and CHz are mutually exclusive in the main block of the repository horizon. The Chv layer is more common in northern sub-areas, whereas, CHz is more predominant in southern sub-areas. Therefore, the full thickness of layer tac is attributed to the layer CHv in all the sub-areas except for sub-areas 5 and 6, where it is attributed to layer CHz.

Table 1-1. Layer Correspondence in 3 Models

USGS Layers Flint, 1996	DOE Layers ISM v3.0	TPA Layers v3.1
TMN	tptmn	TSw
TLL	tptll	
TM2	tptln	
TM1		
PV3	tptpv3	
PV2	tptpv12	
BT1V		
BT1	tptbt1	CHv
CHV	tac	
CHZ		CHz
BT	tptbt	
PP4	tcpunw	
PP3	tcpw	PP
PP2		
PP1	tcplnw	UCF
BF3	tcbunw	UBF

2. Estimation of Matrix Porosity

The matrix porosity was estimated by determining the weighted arithmetic mean of USGS layers for each corresponding TPA layer using depth from ISM model. The mean porosity for each layer over 7 sub-areas was calculated by finding the arithmetic mean. The mean porosity for CHv was calculated by finding the arithmetic mean for sub-area 5 and 6 only.

Table 1-2. Mean Matrix Porosity for Each Layer

TPA Layer	Matrix Porosity
TSw	0.12
CHv	0.33
CHz	0.32
PP	0.28
UCF	0.28
UBF	0.12

3. Estimation of van Genuchten β Parameter

The van Genuchten β parameter was estimated by determining the weighted arithmetic mean of USGS layers for each corresponding TPA layer using depth from ISM model. The mean β parameter for each layer over 7 sub-areas was calculated by finding the arithmetic mean. The mean β parameter for CHv was calculated by finding the arithmetic mean for sub-area 5 and 6 only.

Table 1-3. Mean van Genuchten β Parameter for Each Layer

TPA Layer	van Genuchten β Parameter
TSw	1.5
CHv	1.3
CHz	2.3
PP	1.5
UCF	1.4
UBF	1.7

4. Estimation of Saturated Hydraulic Conductivity

The saturated hydraulic conductivity was estimated by determining the harmonic mean of USGS layers for each corresponding TPA layer using depth from ISM model. The mean hydraulic conductivity for each layer over 7 sub-areas was calculated by finding the geometric mean. The mean hydraulic conductivity for CHv was calculated by finding the geometric mean for sub-area 5 and 6 only.

Table 1-4. Mean Saturated Hydraulic Conductivity for Each Layer

TPA Layer	Mean Saturated Hydraulic Conductivity (m/s)
TSw	1.96E-12
CHv	1.95E-07
CHz	5.41E-11
PP	1.27E-10
UCF	0.31E-10
UBF	0.21E-11

5. Estimation of Permeability

The permeability for each layer was estimated from mean saturated hydraulic conductivity by multiplication factor (9.105E-8).

Table 1-5. Mean Permeability for Each Layer

TPA Layer	Permeability (m^2)
TSw	1.78E-19
CHv	1.77E-14
CHz	4.92E-18
PP	1.16E-17
UCF	2.82E-18
UBF	1.91E-19

6. Probability Distribution Function

The range was estimated for the mean saturated hydraulic conductivity for each layer. A typical range of 2 orders of magnitude was selected for the spread between 0.1% and 99.9%. The probability distribution was generated for this range assuming that the distribution is log-normal. The probability distribution functions are shown in Figure 1 through Figure 6.

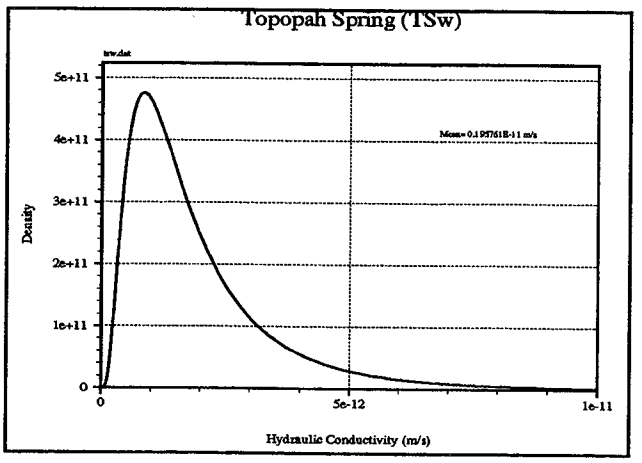

Figure 1-1. Probability Distribution Function for Layer TSw

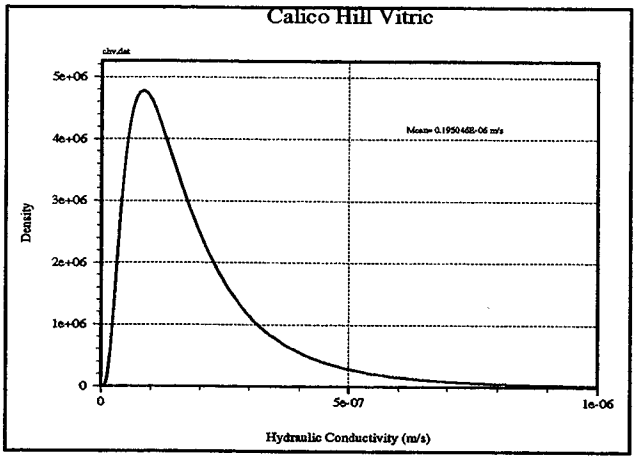

Figure 1-2. Probability Distribution Function for Layer CHv

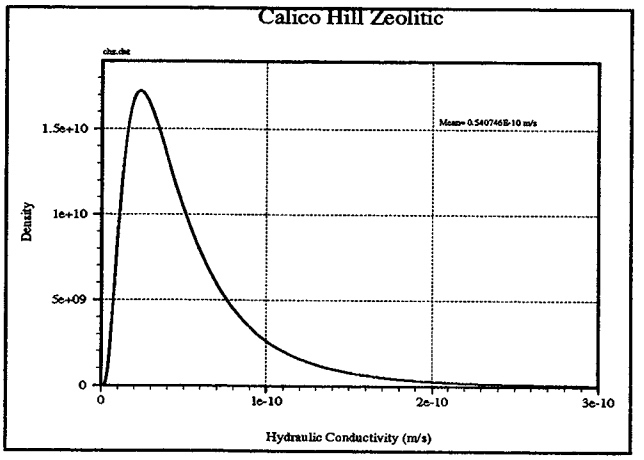

Figure 1-3. Probability Distribution Function for Layer CHz

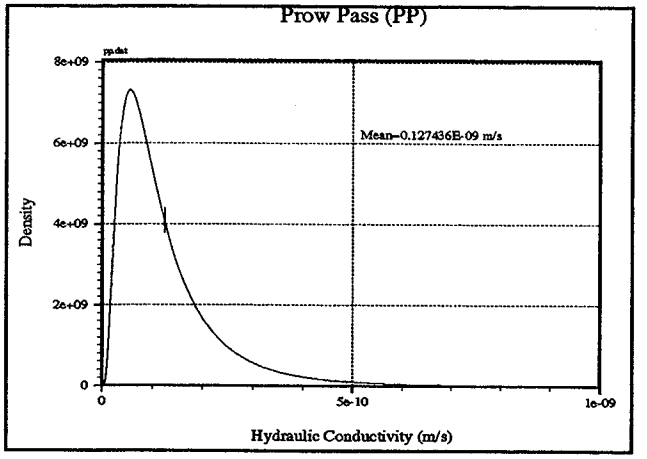

Figure 1-4. Probability Distribution Function for Layer PP

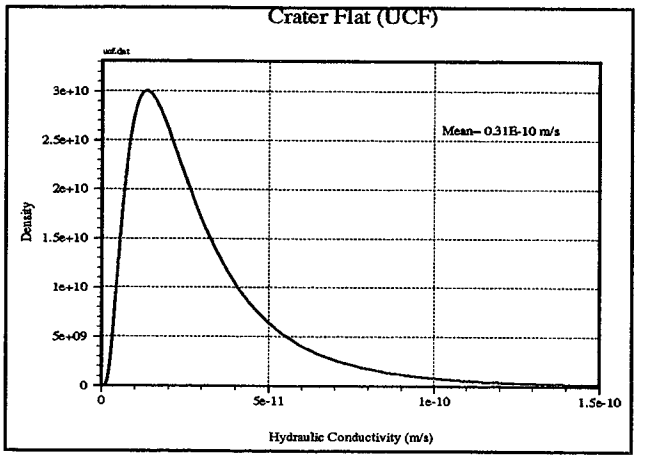

Figure 1-5. Probability Distribution Function for Layer UCF

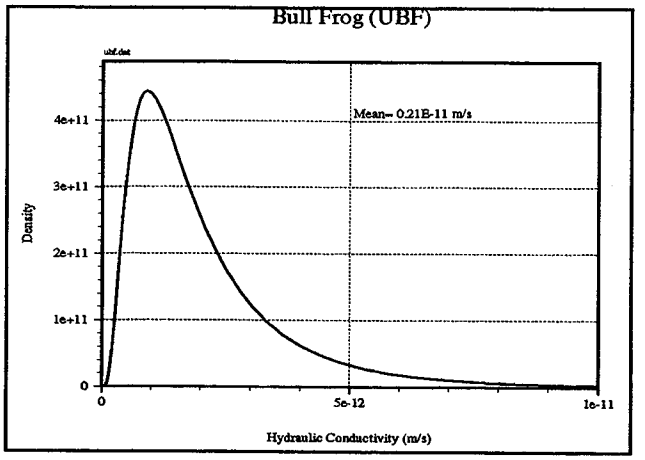

Figure 1-6. Probability Distribution Function for Layer UBF

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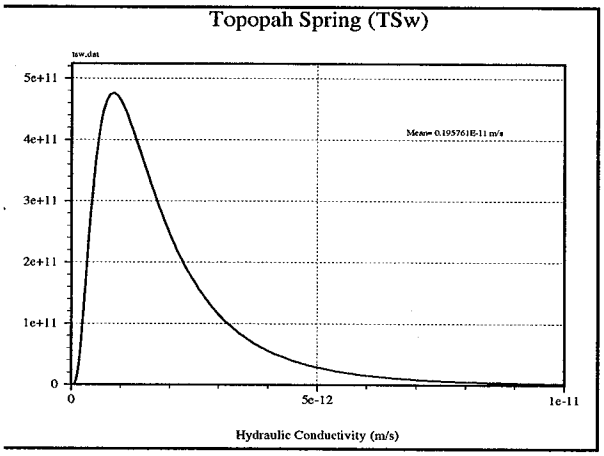

Figure 1-1. Probability Distribution Function for Layer TSw

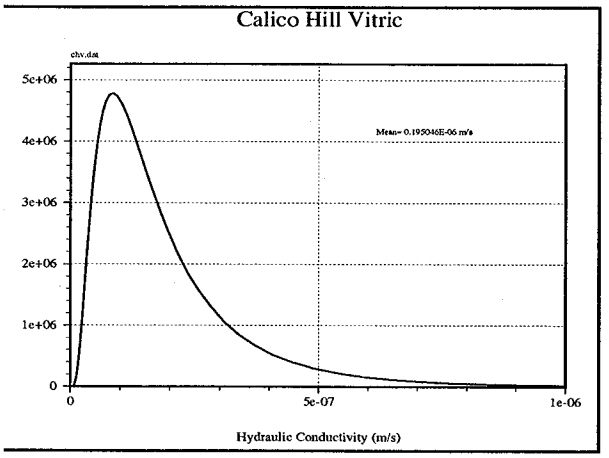

Figure 1-2. Probability Distribution Function for Layer CHv

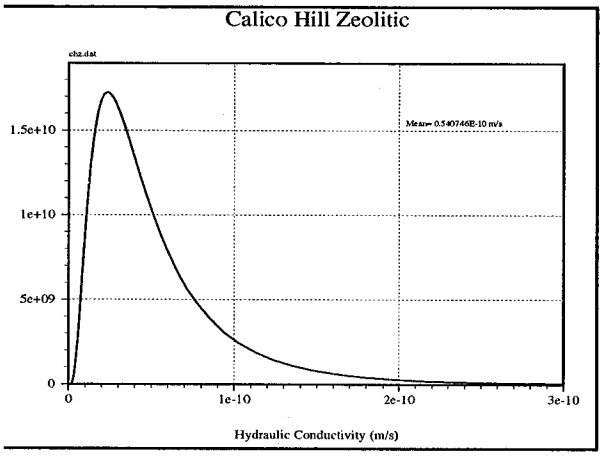

Figure 1-3. Probability Distribution Function for Layer CHz

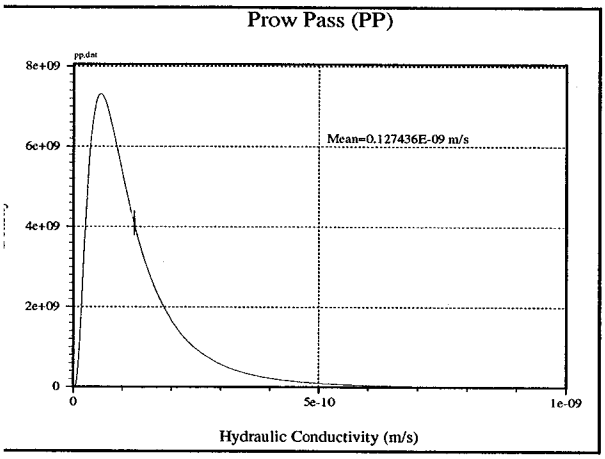

Figure 1-4. Probability Distribution Function for Layer PP

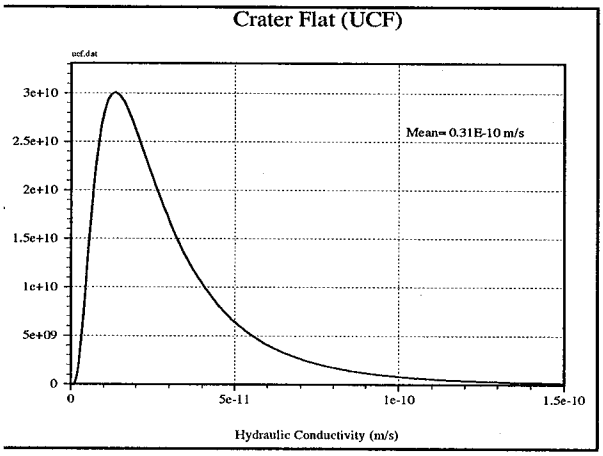

Figure 1-5. Probability Distribution Function for Layer UCF

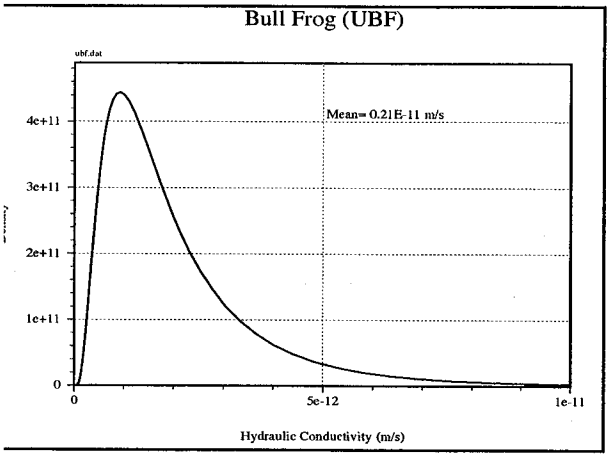

Figure 1-6. Probability Distribution Function for Layer UBF

December 22, 1999
Final Entry

All entries in notebook no. 239 are made by Amit Armstrong from 9/16/97 to 12/22/99.

No original text has been removed from this notebook.

12/22/99

Date: 10/29/99
Sender: Amit Armstrong
To: Bruce Mabrito, English Pearcy
Priority: Normal
Receipt requested
Subject: Scientific Notebook

From the Desk of Amit Armstrong

Bruce:

There are no new entries in the scientific notebook nos. 239 and 246 as I did not charge any time to these projects.

I will send you a printed version of notebook no. 214 on Monday.

Thanks,

Amit

Amit Armstrong
Senior Research Engineer
Geohydrology and Geochemistry Element
CNWRA/ Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
Phone: (210) 522-5182
Fax: (210) 522-5155
e-mail: aarmstrong@swri.org

Date: 8/2/99
Sender: Amit Armstrong
To: Bruce Mabrito, Asadul Chowdhury
Priority: Normal
Receipt requested
Subject: Re:Electronic Scientific Notebook - Status

Bruce:

I have no new entries in scientific notebooks 239 and 246. I am sending a copy of notebook no. 214 for binding and also an advance copy to you.

Thanks,

Amit

_____Reply Separator_____
Subject: Electronic Scientific Notebook - Status
Author: Bruce Mabrito
Date: 7/30/1999 8:54 PM

For the July 1, 1999 call for Electronic Scientific Notebooks, the following individuals have turned them in or provided a message that there were no entries.

C. Connor
D. Farrell
R. Fedors (turning in for D. Or)
A. Ghosh
B. Hill
R. Pabalan
S. Painter
S. Stothoff

Those who have not yet turned in an Electronic Scientific Notebook are:

A. Armstrong
R. Chen
R. Janetzke
P. La Femina
S. Mohtanty

I will be circulating a list to the EMs providing this information to them in somewhat more detail.
Bruce

S/N # 239

Date: 5/19/99
Sender: Amit Armstrong
To: Bruce Mabrito
Priority: Normal
Receipt requested
Subject: Re[3]:Electronic Scientific Notebooks - Second Call

Bruce:

The 9/98-12/98 period I was involved in the Atlas project. During 1/99-3/99 period I was involved in reviewing VA and writing the SZ studies report. No independent analyses were performed for these products. My current modeling effort for my AGU poster is being recorded in the scientific notebook #214.

In the past six months I have not worked in the projects related to notebook numbers 239 and 246.

If you have any questions, please let me know.

Thanks,

Amit

_____Reply Separator_____
Subject: Re[2]:Electronic Scientific Notebooks - Second Call
Author: Bruce Mabrito
Date: 5/13/1999 4:31 PM

Well, fellow Texas Tech alumni, if that is the case, how are you documenting your technical progress?

_____Reply Separator_____
Subject: Re:Electronic Scientific Notebooks - Second Call
Author: Amit Armstrong
Date: 5/13/99 9:47 AM

Bruce:

I have made no entries in electronic scientific notebook nos.. 214, 239, and 246.

Amit Armstrong

_____Reply Separator_____
Subject: Electronic Scientific Notebooks - Second Call
Author: Bruce Mabrito
Date: 5/12/1999 11:13 PM

On April 1, 1999, we placed the first call for "print outs" of electronic scientific notebooks or notification of no entries, or closing them out.

We received prompt response from the following individuals:

Rui Chen
Britt Hill
Roberto Pabalan
Scott Painter
Stu Stothoff

Thanks to you.

We are still looking for hard copy pages of electronic scientific notebook entries from January 1, 1999 through March 31, 1999 for the following individuals:

Amit Armstrong
Charles Connor
Amit Ghosh (although, he did promptly close out his electronic scientific notebook No. 167)
Sitakanta Mohanty

Electronic S/Notebooks 214, 239, 246

Date: 1/22/99
Sender: Amit Armstrong
To: Bruce Mabrito
Priority: Normal
Receipt requested
Subject: Re:Second Call for Electronic Scientific Notebooks

Bruce:

I have made no entries in electronic scientific notebook nos.. 214, 239, and 246.

Amit Armstrong

Reply Separator

Subject: Second Call for Electronic Scientific Notebooks
Author: Bruce Mabrito
Date: 1/22/1999 12:14 PM

CNWRA Electronic Scientific Notebook Holders:

Amit Ghosh and Bobby Pabalan have turned in printed copies of their (total of four) electronic scientific notebooks.

The remainder of CNWRA electronic scientific notebook holders (listed as addresses in this message) still owe QA a printed copy of their inputs from Oct. 1, 1998 through Dec. 31, 1998, or, an e-mail note stating they have made no entries.

A single, unbound copy can be provided to Maria Padilla or me. We keep the unbound copies in the QA Records Room and they will be bound when it is mutually decided they are complete or that a notebook is of sufficient volumn to warrent binding. Cal me if you have questions. We would appreciate you input soon. Bruce x 5149

cc: Stu Stothoff (via E. Pearcy)

Date: 11/20/98
Sender: Amit Armstrong
To: Bruce Mabrito
Priority: Normal
Receipt requested
Subject: Re:Status on Turn In/Response to Electronic Scientific Noteb

Bruce:

I have no new entries in Notebooks 214,239, and 246 this quarter.

Amit

_____Reply Separator_____

Subject: Status on Turn In/Response to Electronic Scientific Notebook
Author: Bruce Mabrito
Date: 11/15/98 10:41 PM

The "call" for electronic scientific notebooks from October 1, 1998 has yielded these results to date.

Responses from: Chuck Connor (s/n # 115 turned in); Randy Fedors ("no entries" email on s/n # 245); Amit Ghosh (no entries email on s/n # 250); Britt Hill (turned in s/n # 88 pages); Sitakanta Mohanty (no entries email for s/n # 170); Roberto Pabalan (no entries email on s/n # 185 and turn in of pages on s/n # 278);
Stu Stothoff (messages passed through E Pearcy) (no entries email on s/n # 163).

Those electronic scientific "notebooks" yet to be "heard from" are:
Amit Armstrong (s/n # 214, 239, 246)
Rui Chen (s/n # 254, 274)
Chuck Connor (s/n # 267)
Amit Ghosh (s/n # 167)
Scott Painter (s/n # 282)

As always, if we have numbers incorrectly listed, please let me know. If you have no entries to report, simply so state in an email to me and we will print that note and put it in the folder for this quarter. If you have pages to turn in, please follow QAP-001 and submit only the pages and do not bind them at this time).
Many thanks. Bruce