HLWYM HEmails

From: David Pickett
Sent: Monday, October 28, 2002 1:35 PM
To: vladimir cvetkovic; David Turner
Cc: Scott Painter; dpickett@swri.edu
Subject: RE: diameters

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Vladimir,

I volunteered to take on this task. Of course, it wasn't nearly as straightforward as I had figured. I hope there's some useful info for you here. I welcome Dave T. to fill in the gaps if he can.

Pages 384-387 of the TSPA-SR Model Report (MDL-WIS-PA-000002 REV 00) have a relevant discussion of colloid size effects along with parameter distributions. Note that, at least when these DOE reports were written, few site-specific grain-size data were available. Can you use pore sizes? Even those weren't available for the SZ tuff units.

Here's the colloid size distribution they use:

Size (nm)	Cumulative Probability
1	0
6	0.2
50	0.4
100	0.6
200	0.8
450	1.0

This is based on waste-form colloid characteristics. Dave T. has offered to provide you with some colloid size numbers he has come up with for groundwater colloids.

As for matrix grain or pore size, there a few sources of data.

UZ

The AMR ANL-NBS-HS-000028, Rev 00, discusses colloid size exclusion in the UZ. Grain size data were not available for the three UZ units they discuss, so they more or less just assumed: TSw4 = silt (2–20 µm), CH1v = coarse sand (200–2000 µm), and CH1z = fine sand (20–200 µm). Again, these are not site-specific data. They do calculate the percent of colloids that could enter each of these UZ matrix units based on *pore* size. They do not explicitly present the pore size distributions themselves. Maybe you can extract what you need from this:

Table 3. Percent of Colloids Allowed to Enter the Matrix Based on Size

	Colloid Size			
Units	450 nm	200 nm	100 nm	6 nm
TSw4	5	10	20	65
CH1v	45	50	55	85
CH1z	20	25	25	65

Another representation is in AMR ANL-NBS-HS-000026, Rev 00, again based on pore sizes of matrix units (not grain size):

Fraction of 100-nm colloids that can enter the matrix from the fracture based on size

Unit	fraction
TMN (TSW4)	0.29
TLL (TSW5)	0.39
TM2 (TSW6)	0.35
TMN1 (TSW7)	0.07
PV3 (TSW8)	0.10
PV2 (TSW9)	0.61
BT1a (CH1)	0.15
CHV	0.61
CHZ	0.27
BT (CH6)	0.08
PP4	0.02
PP3	0.79
PP2	0.35
PP1	0.43
BF3	0.26
BF2	0.04

SZ - Volcanic

I found nothing specific to the SZ tuff units. (Dave T.?) I think this is largely because DOE does not directly model colloid filtration in the SZ. They do use filtration theory to interpret field data, but they derive filtration and detachment rate constants without having to assume grain size or pore size distributions. They then use these rate constants as part of their development of probability distributions for colloids with irreversibly-attached radionuclides. This is all developed in AMR ANL-NBS-HS-000031, Rev 00 (SZ colloid transport). Let me know if you want to see the rate constants they derived.

SZ - Alluvium

There *are* grain size data here, but not substantially supported by field data (yet). For the alluvial aquifer, AMR ANL-NBS-HS-000031, Rev 00, posits a uniform grain size distribution with a minimum of 0.02 cm and a maximum of 0.11 cm. For colloid size, they use a uniform distribution from 6.0E-07 to 4.5E-05 cm. These are "site-specific" only in a very indirect way. I don't think any more up-to-date data from the ongoing alluvium studies have been published.

David P.

> -----Original Message-----
> From: vladimir cvetkovic [mailto:vdc@kth.se]
> Sent: Saturday, October 26, 2002 3:49 PM
> To: dturner@cnwra.swri.edu
> Cc: scott painter; dpickett@swri.edu
> Subject: diameters
>
>
> David --
>
> I am currently working on incorporating aquifer-colloid exchange into
> the transport modelling; the two processes are retardation and
> filtration.
> Although the
> classical
> filtration theory is known not to be applicable for field conditions,

> I nevertheless want to "predict" the filtration rate using this
> theory, and see what I get.
>
> For this purpose I need some site-specific information: a
> "representative"
> diameter
> of the colloids and a "representative" diameter of the aquifer grains.
> I am aware that this kind of "representative" data is hard (strictly
> impossible) to
> get; nevertheless
> I need some numbers, presumably ranges for the two diameters.
> Do you think
> you can provide me these ranges? Thanks!
>
> vladimir
>
>

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From: David Pickett

Created By: dpickett@cnwra.swri.edu

Recipients:
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Tracking Status: None
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