HLWYM HEmails

From: Paul Bertetti
Sent: Tuesday, December 20, 2005 1:29 PM
To: Ronald Janetzke; Roland Benke; Patrick Laplante; Olufemi Osidele
Subject: Updated soil and ash Kd values for radionuclides (part of SCR 552)
Attachments: DCAGW.txt; ASHRMOVO.txt

Ron, Femi, Roland, and Pat,

I have attached two text files that contain the revised soil (DCAGW module) and ash (ASHRMOVO module) Kd values for TPA. The files follow the format and order (of radionuclides) found in the most recent tpa.inp file (ver 5.02d). These changes are part of SCR 552.

As discussed many moons ago, the Kd values have been modified in several ways:

1. Several recent data sets were reviewed in an effort to update, as much as possible, the Kd values used in the DCAGW and ASHRMOVO modules. Keeping in mind the nature of conservatism applied when determining Kd parameters (values used for transport calculations tend to be lower, while values used to estimate leaching tend to be higher), distributions from more recent publications were used when available.

2. For several radionuclides, Sheppard and Thibault (1990) remained the only reasonable reference. However, in several cases the distributions were taken from the loamy soil data rather then the sandy soil data (used previously). This is consistent with the methodology used in the recent DOE AMR Soil-Related Input Parameters for the Biosphere Model (Rev 02, 2004) and is consistent with the probability of sandy-loam type soil in the region.

3. For the soil Kds, log normal distributions using data from Sheppard and Thibault (1990) have been replaced by user supplied piecewise distributions that simulate truncated log normal distributions. To create the user supplied distributions, I used the example spreadsheet method provided by Osvaldo. Where defined minimum and maximum data were available for a nuclide, those values were used as the truncation points for the distribution. Where no specific data were available, the specified distributions were truncated at approximately the 2-sigma bounds (i.e., 5% and 95%) for the log normal distribution. Multiple data sources were used to determine appropriate min and max values.

4. The ash Kds (formerly constants) were replaced with the same user supplied piecewise distributions used for the soil radionuclides. Similar to the soil data, new data were used when available and loamy soils were assumed when a difference was apparent.

The "changes" are not particularly significant for the most part. Several distributions are revised upward (higher Kds), but given the low sensitivity of TPA results to the broad distributions used previously in DCAGW, I would not expect any significant changes in TPA estimates of dose as a result of these changes. In several cases, the changes simply restrict the range of Kds sampled (truncation of the distribution). However, the specific values for each nuclide (i) are now pinned to the most recent available data, (ii) remain appropriately conservative for their use while being updated to be consistent (or at least not completely out of whack) with Kd values used in the transport modules, and (iii) are internally consistent between the DCAGW and ASHRMOVO modules.

Although all of the comparison and development data are entered in a working spreadsheet, I would like to finish the complete documentation for the changes for entry into a notebook (and possibly as a small letter report that could be referenced or referred to more easily). In addition, I need to complete the short basis descriptions for the TPA Appendix A. It will take a few days to complete both of these (but that will be interrupted by the holidays).

Should you have any questions in the interim, please let me know.

Paul

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Mail Envelope Properties (pbertetti@cnwra.swri.edu20051220132900)

Subject: Updated soil and ash Kd values for radionuclides (part of SCR 552)
Sent Date: 12/20/2005 1:29:14 PM
Received Date: 12/20/2005 1:29:00 PM
From: Paul Bertetti

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Files	**Size**	**Date & Time**
MESSAGE	3506	12/20/2005 1:29:00 PM
DCAGW.txt	7231	
ASHRMOVO.txt	9697	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

**
usersuppliedpwisecdf
KD_Soil_Cm[cm3/g]
11
7666.0, 0.0
7785.4, 0.115
9604.6, 0.184
11849.0, 0.274
14617.9, 0.382
18033.7, 0.500
22247.8, 0.618
27446.7, 0.726
33860.4, 0.816
41772.8, 0.885
44260.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Pu[cm3/g]
12
316.0,   0.0
395.4,   0.115
742.5,   0.184
1394.1,   0.274
2617.6,   0.382
4914.8,   0.500
9228.0,   0.618
17326.6, 0.726
32532.7, 0.816
61083.7, 0.885
114691.4, 0.933
190000.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_U[cm3/g]
13
0.17,   0.0
0.27,   0.067
0.71,   0.115
1.86,   0.184
4.85,   0.274
12.7,   0.382
33.1,   0.500
86.5,   0.618
225.9, 0.726
589.9, 0.816
1540.7, 0.885
4023.9, 0.933
6000.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Am[cm3/g]
12
100.0,   0.0
192.5,   0.184
419.9,   0.274
916.0,   0.382

1998.2, 0.500
4359.0, 0.618
9509.1, 0.726
20743.7, 0.816
45251.9, 0.885
98715.8, 0.933
215345.7, 0.964
300000.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Np[cm3/g]
13
1.30, 0.0
1.92, 0.067
3.19, 0.115
5.31, 0.184
8.85, 0.274
14.7, 0.382
24.5, 0.500
40.9, 0.618
68.0, 0.726
113.3, 0.816
188.7, 0.885
314.2, 0.933
400.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Th[cm3/g]
9
1700.0, 0.0
2981.0, 0.500
5597.1, 0.618
10509.1, 0.726
19732.1, 0.816
37049.1, 0.885
69563.8, 0.933
130613.8, 0.964
170000.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Ra[cm3/g]
8
1262.0, 0.0
2230.5, 0.184
5653.3, 0.274
14328.4, 0.382
36315.5, 0.500
92042.0, 0.618
233281.2, 0.726
530000.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Pb[cm3/g]
8
800.0,   0.0
955.0,   0.274

2187.8, 0.382
5011.9, 0.500
11481.5, 0.618
26302.7, 0.726
60256.0, 0.816
100000.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Cs[cm3/g]
12
1000.0, 0.0
1380.2, 0.184
2038.6, 0.274
3010.9, 0.382
4447.1, 0.500
6568.2, 0.618
9701.2, 0.726
14328.4, 0.816
21162.8, 0.885
31257.0, 0.933
46166.1, 0.964
61287.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_I[cm3/g]
12
0.1, 0.0
0.12, 0.036
0.22, 0.067
0.41, 0.115
0.74, 0.184
1.35, 0.274
2.46, 0.382
4.48, 0.500
8.17, 0.618
14.88, 0.726
27.11, 0.816
43.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Tc[cm3/g]
15
0.01, 0.0
0.016, 0.115
0.027, 0.184
0.046, 0.274
0.079, 0.382
0.135, 0.500
0.232, 0.618
0.399, 0.726
0.684, 0.816
1.174, 0.885
2.014, 0.933
3.456, 0.964
5.930, 0.982
10.176, 0.992

16.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Ni[cm3/g]
16
60.0, 0.0
100.0, 0.036
141.3, 0.067
199.5, 0.115
281.8, 0.184
398.1, 0.274
562.3, 0.382
794.3, 0.500
1122.0, 0.618
1584.9, 0.726
2238.7, 0.816
3162.3, 0.885
4466.8, 0.933
6309.6, 0.964
8912.5, 0.982
6309.6, 1.0
**
usersuppliedpwisecdf
KD_Soil_Cl[cm3/g]
14
0.0, 0.0
0.010, 0.018
0.014, 0.036
0.019, 0.067
0.027, 0.115
0.037, 0.184
0.052, 0.274
0.072, 0.382
0.100, 0.500
0.139, 0.618
0.194, 0.726
0.270, 0.816
0.375, 0.885
0.4, 1.0
**
usersuppliedpwisecdf
KD_Soil_C[cm3/g]
13
1.12, 0.0
1.42, 0.067
2.36, 0.115
3.94, 0.184
6.6, 0.274
10.9, 0.382
18.2, 0.500
30.3, 0.618
50.4, 0.726
83.9, 0.816
139.8, 0.885
232.8, 0.933
299.0, 1.0

**
usersuppliedpwisecdf
KD_Soil_Se[cm3/g]
11
36.0, 0.0
38.1, 0.184
42.9, 0.274
48.4, 0.382
54.6, 0.500
61.6, 0.618
69.4, 0.726
78.3, 0.816
88.2, 0.885
99.5, 0.933
100.0, 1.0
**
usersuppliedpwisecdf
KD_Soil_Nb[cm3/g]
13
33.0,   0.0
42.5,   0.067
70.8,   0.115
117.9, 0.184
196.4, 0.274
327.0, 0.382
544.6, 0.500
906.9, 0.618
1510.2, 0.726
2514.9, 0.816
4188.1, 0.885
6974.4, 0.933
8500.0, 1.0
**

**
usersuppliedpwisecdf
KdOfUraniumInVolcanicAsh[cm3/g]
13
0.17, 0.0
0.27, 0.067
0.71, 0.115
1.86, 0.184
4.85, 0.274
12.7, 0.382
33.1, 0.500
86.5, 0.618
225.9, 0.726
589.9, 0.816
1540.7, 0.885
4023.9, 0.933
6000.0, 1.0
**
usersuppliedpwisecdf
KdOfCuriumInVolcanicAsh[cm3/g]
11
7666.0, 0.0
7785.4, 0.115
9604.6, 0.184
11849.0, 0.274
14617.9, 0.382
18033.7, 0.500
22247.8, 0.618
27446.7, 0.726
33860.4, 0.816
41772.8, 0.885
44260.0, 1.0
**
usersuppliedpwisecdf
KdOfPlutoniumInVolcanicAsh[cm3/g]
12
316.0, 0.0
395.4, 0.115
742.5, 0.184
1394.1, 0.274
2617.6, 0.382
4914.8, 0.500
9228.0, 0.618
17326.6, 0.726
32532.7, 0.816
61083.7, 0.885
114691.4, 0.933
190000.0, 1.0
**
usersuppliedpwisecdf
KdOfAmericiumInVolcanicAsh[cm3/g]
12
100.0, 0.0
192.5, 0.184
419.9, 0.274
916.0, 0.382

1998.2, 0.500
4359.0, 0.618
9509.1, 0.726
20743.7, 0.816
45251.9, 0.885
98715.8, 0.933
215345.7, 0.964
300000.0, 1.0
**
usersuppliedpwisecdf
KdOfThoriumInVolcanicAsh[cm3/g]
9
1700.0, 0.0
2981.0, 0.500
5597.1, 0.618
10509.1, 0.726
19732.1, 0.816
37049.1, 0.885
69563.8, 0.933
130613.8, 0.964
170000.0, 1.0
**
usersuppliedpwisecdf
KdOfRadiumInVolcanicAsh[cm3/g]
8
1262.0, 0.0
2230.5, 0.184
5653.3, 0.274
14328.4, 0.382
36315.5, 0.500
92042.0, 0.618
233281.2, 0.726
530000.0, 1.0
**
usersuppliedpwisecdf
KdOfLeadInVolcanicAsh[cm3/g]
8
800.0,   0.0
955.0,   0.274
2187.8, 0.382
5011.9, 0.500
11481.5, 0.618
26302.7, 0.726
60256.0, 0.816
100000.0, 1.0
**
usersuppliedpwisecdf
KdOfProtactiniumInVolcanicAsh[cm3/g]
13
110.0, 0.0
141.2, 0.067
235.1, 0.115
391.5, 0.184
652.0, 0.274
1085.7, 0.382
1808.0, 0.500

3010.9, 0.618
5014.1, 0.726
8349.9, 0.816
13904.9, 0.885
23155.8, 0.933
29000.0, 1.0
**
usersuppliedpwisecdf
KdOfActiniumInVolcanicAsh[cm3/g]
12
100.0,   0.0
192.5,   0.115
320.5,   0.184
533.8,   0.274
888.9,   0.382
1480.3, 0.500
2465.1, 0.618
4105.2, 0.726
6836.3, 0.816
11384.4, 0.885
18958.4, 0.933
24300.0, 1.0
**
usersuppliedpwisecdf
KdOfNeptuniumInVolcanicAsh[cm3/g]
13
1.30, 0.0
1.92, 0.067
3.19, 0.115
5.31, 0.184
8.85, 0.274
14.7, 0.382
24.5, 0.500
40.9, 0.618
68.0, 0.726
113.3, 0.816
188.7, 0.885
314.2, 0.933
400.0, 1.0
**
usersuppliedpwisecdf
KdOfSamariumInVolcanicAsh[cm3/g]
5
14000.0, 0.0
22925.4, 0.382
38177.4, 0.500
63576.6, 0.618
104000.0, 1.0
**
usersuppliedpwisecdf
KdOfCesiumInVolcanicAsh[cm3/g]
12
1000.0, 0.0
1380.2, 0.184
2038.6, 0.274
3010.9, 0.382

4447.1, 0.500
6568.2, 0.618
9701.2, 0.726
14328.4, 0.816
21162.8, 0.885
31257.0, 0.933
46166.1, 0.964
61287.0, 1.0
**
usersuppliedpwisecdf
KdOfIodineInVolcanicAsh[cm3/g]
12
0.1,   0.0
0.12, 0.036
0.22, 0.067
0.41, 0.115
0.74, 0.184
1.35, 0.274
2.46, 0.382
4.48, 0.500
8.17, 0.618
14.88, 0.726
27.11, 0.816
43.0, 1.0
**
usersuppliedpwisecdf
KdOfTinInVolcanicAsh[cm3/g]
11
125.9,   0.0
190.5,   0.274
309.0,   0.382
501.2,   0.500
812.8,   0.618
1318.3, 0.726
2138.0, 0.816
3467.4, 0.885
5623.4, 0.933
9120.1, 0.964
10000.0, 1.0
**
usersuppliedpwisecdf
KdOfSilverInVolcanicAsh[cm3/g]
16
10.0,   0.0
14.5,   0.036
25.1,   0.067
43.7,   0.115
75.9,   0.184
131.8,   0.274
229.1,   0.382
398.1,   0.500
691.8,   0.618
1202.3, 0.726
2089.3, 0.816
3630.8, 0.885
6309.6, 0.933

10964.8, 0.964
19054.6, 0.982
31622.8, 1.0
**
usersuppliedpwisecdf
KdOfPaladiumInVolcanicAsh[cm3/g]
13
11.0, 0.0
14.2, 0.067
23.6, 0.115
39.3, 0.184
65.4, 0.274
108.9, 0.382
181.3, 0.500
301.9, 0.618
502.7, 0.726
837.1, 0.816
1394.1, 0.885
2321.6, 0.933
2850.0, 1.0
**
usersuppliedpwisecdf
KdOfTechnetiumInVolcanicAsh[cm3/g]
15
0.01, 0.0
0.016, 0.115
0.027, 0.184
0.046, 0.274
0.079, 0.382
0.135, 0.500
0.232, 0.618
0.399, 0.726
0.684, 0.816
1.174, 0.885
2.014, 0.933
3.456, 0.964
5.930, 0.982
10.176, 0.992
16.0, 1.0
**
usersuppliedpwisecdf
KdOfMolybdenumInVolcanicAsh[cm3/g]
13
7.4, 0.0
9.5, 0.067
15.8, 0.115
26.3, 0.184
43.8, 0.274
73.0, 0.382
121.5, 0.500
202.4, 0.618
337.0, 0.726
561.2, 0.816
934.5, 0.885
1556.2, 0.933
2000.0, 1.0

**
usersuppliedpwisecdf
KdOfNiobiumInVolcanicAsh[cm3/g]
13
33.0, 0.0
42.5, 0.067
70.8, 0.115
117.9, 0.184
196.4, 0.274
327.0, 0.382
544.6, 0.500
906.9, 0.618
1510.2, 0.726
2514.9, 0.816
4188.1, 0.885
6974.4, 0.933
8500.0, 1.0
**
usersuppliedpwisecdf
KdOfZirconiumInVolcanicAsh[cm3/g]
13
135.0, 0.0
172.4, 0.067
287.1, 0.115
478.2, 0.184
796.3, 0.274
1326.1, 0.382
2208.3, 0.500
3677.5, 0.618
6124.2, 0.726
10198.5, 0.816
16983.5, 0.885
28282.5, 0.933
34550.0, 1.0
**
usersuppliedpwisecdf
KdOfStrontiumInVolcanicAsh[cm3/g]
13
3.0, 0.0
4.1, 0.067
6.8, 0.115
11.2, 0.184
18.7, 0.274
31.2, 0.382
51.9, 0.500
86.5, 0.618
144.0, 0.726
239.8, 0.816
399.4, 0.885
665.1, 0.933
900.0, 1.0
**
usersuppliedpwisecdf
KdOfSeleniumInVolcanicAsh[cm3/g]
11
36.0, 0.0

38.1, 0.184
42.9, 0.274
48.4, 0.382
54.6, 0.500
61.6, 0.618
69.4, 0.726
78.3, 0.816
88.2, 0.885
99.5, 0.933
100.0, 1.0
**
usersuppliedpwisecdf
KdOfNickelInVolcanicAsh[cm3/g]
16
60.0,   0.0
100.0, 0.036
141.3, 0.067
199.5, 0.115
281.8, 0.184
398.1, 0.274
562.3, 0.382
794.3, 0.500
1122.0, 0.618
1584.9, 0.726
2238.7, 0.816
3162.3, 0.885
4466.8, 0.933
6309.6, 0.964
8912.5, 0.982
6309.6, 1.0
**
usersuppliedpwisecdf
KdOfChlorineInVolcanicAsh[cm3/g]
14
0.0,   0.0
0.010, 0.018
0.014, 0.036
0.019, 0.067
0.027, 0.115
0.037, 0.184
0.052, 0.274
0.072, 0.382
0.100, 0.500
0.139, 0.618
0.194, 0.726
0.270, 0.816
0.375, 0.885
0.4,   1.0
**
usersuppliedpwisecdf
KdOfCarbonInVolcanicAsh[cm3/g]
13
1.12, 0.0
1.42, 0.067
2.36, 0.115
3.94, 0.184

6.6, 0.274
10.9, 0.382
18.2, 0.500
30.3, 0.618
50.4, 0.726
83.9, 0.816
139.8, 0.885
232.8, 0.933
299.0, 1.0
**