This worksheet calculates the time-dependent breakthrough concentration of Tc-99 at the bottom of the vadose zone assuming that the source concentration is constant and that transport is by advection and dispersion only with retardation (adsorption). C.K.Ho 7/8/05

Parameters:

Initial Inventory (Ci)	16
Source Concentration (solubility limited) (pCi/L)	8.53E+04
Half-life (yrs)	2.12E+05
decay constant (1/yr)	3.27E-06
moisture content	0.095
Kd (mL/g)	0.5
Bulk density (kg/m^3)	2385
R	13.55263
Thickness (m)	5
Specific activity (Ci/g)	0.017
Solubility (mg/L)	5.00E-03
Total Porosity	0.1
Darcy infiltration velocity (m/year)	0.034
Pore velocity (m/year)	0.357895
Longitudinal dispersivity (m)	0.5

Time (years)	Concentration at vadose exit (pCi/L)	Concentration - full solution (pCi/L)
0		
10	0	0
20	3.23673E-05	5.88E-05
30	0.096961785	0.168696
40	5.308211293	8.877479
50	58.15405684	93.74985
60	283.9731274	442.3902
70	872.2392875	1316.105
80	2003.20172	2933.68
90	3787.920197	5394.591
100	6249.845122	8671.086
110	9337.444177	12641.65
120	12949.3674	17134.65
130	16959.56711	21965
140	21236.9938	26958.84
150	25658.54179	31966.87
160	30116.44666	36869.71
170	34521.4398	41577.81
180	38803.15017	46028.66
190	42908.86379	50182.65
200	46801.43607	54018.58
210	50456.88134	57529.53
220	53861.96019	60719.16
230	57011.94433	63598.63
240	59908.64541	66184.19
250	62558.73756	68495.17
260	64972.36677	70552.58
270	67162.02642	72378
280	69141.66374	73992.79
290	70925.98674	75417.58
300	72529.92764	76671.88
310	73968.28773	77773.95
320	75255.39316	78740.57
330	76404.94779	79587.1
340	77429.88683	80327.47
350	78342.30186	80974.22
360	79153.4136	81538.6
370	79873.55597	82030.64
380	80512.19742	82459.26
390	81077.97024	82832.36
400	81578.71231	83156.93
410	82021.51221	83439.11
420	82412.76374	83684.32
430	82758.21643	83897.29
440	83063.02667	84082.2
450	83331.81129	84242.69
460	83568.69363	84381.93
470	83777.35109	84502.7
480	83961.0584	84607.44
490	84122.72671	84698.24
500	84264.94119	84776.95

510	84389.99513	84845.16
520	84499.92009	84904.27
530	84596.51455	84955.48
540	84681.36901	84999.85
550	84755.8892	85038.28
560	84821.31627	85071.58
570	84878.74557	85100.41
580	84929.14308	85125.38
590	84973.36027	85147.01
600	85012.14718	85165.74
610	85046.16434	85181.96
620	85075.99302	85196
630	85102.14461	85208.17
640	85125.06886	85218.7
650	85145.16113	85227.82
660	85162.76887	85235.72
670	85178.19736	85242.56
680	85191.71468	85248.48
690	85203.55624	85253.61
700	85213.92869	85258.05
710	85223.0134	85261.9
720	85230.96948	85265.23
730	85237.93655	85268.11
740	85244.03704	85270.61
750	85249.37832	85272.78
760	85254.05453	85274.65
770	85258.1482	85276.28
780	85261.73167	85277.69
790	85264.86834	85278.91
800	85267.61374	85279.96
810	85270.01657	85280.88
820	85272.11945	85281.67
830	85273.95975	85282.36
840	85275.57017	85282.95
850	85276.97938	85283.47
860	85278.21245	85283.92
870	85279.29138	85284.3
880	85280.23538	85284.64
890	85281.06131	85284.93
900	85281.78392	85285.18
910	85282.4161	85285.4
920	85282.96916	85285.59
930	85283.45299	85285.76
940	85283.87625	85285.9
950	85284.2465	85286.02
960	85284.57038	85286.13
970	85284.8537	85286.22
980	85285.10152	85286.3
990	85285.31829	85286.37
1000	85285.5079	85286.43