Table 3-8 Wet soil calibration results for various saturation values

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Wet soil saturation - 80%								**Density 1.97 g/cm3**
Uniform	ap00p	2	13	10148	17130	43715	33992	45041
	ap01p	4	27	11197	20270	54724	41916	56234
	ap02p	6	40	11409	21130	58208	44466	59794
	ap03p	8	53	11508	21596	59414	45180	60971
	ap04p	10	67	11466	21419	59252	45156	60844
	ap05p	12	80	11409	21472	59830	45475	61400
Lump Soil with UO_2 3.5 g/cm^3	bp00p	2	13	48891	83314	258416	174121	266543
	bp01p	4	27	14289	36310	123997	84024	127058
	bp02p	6	40	3728	13383	48363	33228	49399
	bp03p	8	53	938	4561	17654	12255	18020
	bp04p	10	67	240	1502	6235	4343	6356
	bp05p	12	80	58	521	2149	1531	2197
Wet soil saturation - 50%								**Density 1.88 g/cm3**
Uniform	aq00p	2	13	10521	17532	44507	34688	45860
	aq01p	4	27	11759	21112	56718	43545	58344
	aq02p	6	40	12117	22315	60616	46281	62237
	aq03p	8	53	11916	22258	61552	46937	63205
	aq04p	10	67	11982	22467	62245	47414	63832
	aq05p	12	80	11937	22465	62396	47645	64084
Lump Soil with UO_2 3.5 g/cm^3	bq00p	2	13	50349	84728	260997	176531	269408
	bq01p	4	27	15585	38457	130181	88400	133428
	bq02p	6	40	4293	14741	53337	36588	54489
	bq03p	8	53	1128	5289	20156	13951	20566
	bq04p	10	67	308	1944	7632	5376	7770
	bq05p	12	80	89	688	2672	1906	2731

Table 3-8 Wet soil calibration results for various saturation values

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Wet soil saturation - 20%								**Density 1.79 g/cm^3**
Uniform	ar00p	2	13	11004	18231	45578	35718	47024
	ar01p	4	27	12328	22223	58802	45361	60465
	ar02p	6	40	12691	23225	62933	48261	64615
	ar03p	8	53	12669	23500	64450	49459	66168
	ar04p	10	67	12541	23620	64953	49837	66696
	ar05p	12	80	12774	23669	64723	49577	66493
Lump Soil with UO_2 3.5 g/cm^3	br00p	2	13	52012	86221	263897	178809	272454
	br01p	4	27	17016	40829	136771	93326	140294
	br02p	6	40	4932	16281	58097	40071	59381
	br03p	8	53	1418	6238	23325	16361	23809
	br04p	10	67	401	2345	9037	6402	9224
	br05p	12	80	114	849	3430	2451	3515

Table 3-9 Waste matrix model calibration results for various soil densities

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.39 g/cm^3								
Uniform	ak00p	2	13	12649	20555	52898	40363	54505
	ak01p	4	27	14869	26223	72575	54310	74594
	ak02p	6	40	15281	28138	80593	59789	82789
	ak03p	8	53	15551	28728	84058	62006	86172
	ak04p	10	67	15530	29109	85708	62816	87838
	ak05p	12	80	15441	29157	85750	62838	87876
Lump Soil with UO_2 3.5 g/cm^3	bk00p	2	13	57575	91581	287382	189964	296650
	bk01p	4	27	22561	49823	179024	115044	183443
	bk02p	6	40	7925	23473	92537	58602	94374
	bk03p	8	53	2766	10593	44836	28389	45641
	bk04p	10	67	974	4725	21283	13481	21625
	bk05p	12	80	365	2044	9747	6135	9901
Density 1.30 g/cm^3								
Uniform	al00p	2	13	13194	21248	54479	41643	56148
	al01p	4	27	15703	27560	75752	56772	77836
	al02p	6	40	16243	29533	84505	62709	86731
	al03p	8	53	16653	31137	89112	65687	91269
	al04p	10	67	16217	30707	90994	66514	93246
	al05p	12	80	16400	31408	91478	67216	93691
Lump Soil with UO_2 3.5 g/cm^3	bl00p	2	13	59106	92880	289531	191799	299058
	bl01p	4	27	24434	52399	186934	120047	191598
	bl02p	6	40	9032	25584	100639	63796	102762
	bl03p	8	53	3313	12110	50982	32292	51919
	bl04p	10	67	1224	5623	25443	16008	25863
	bl05p	12	80	459	2589	12287	7815	12504

Table 3-9 Waste matrix model calibration results for various soil densities

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.20 g/cm^3								
Uniform	am00p	2	13	13884	22197	56273	43130	58059
	am01p	4	27	16650	28963	79279	59487	81460
	am02p	6	40	17603	31781	90120	66784	92488
	am03p	8	53	17899	32909	95280	70236	97709
	am04p	10	67	17896	33401	97202	71296	99544
	am05p	12	80	17938	33952	99071	72903	101644
Lump Soil with UO_2 3.5 g/cm^3	bm00p	2	13	61280	94555	292149	193957	301907
	bm01p	4	27	26735	55536	196110	126119	201182
	bm02p	6	40	10541	28599	110628	70324	113010
	bm03p	8	53	4061	14072	59396	37282	60472
	bm04p	10	67	1605	6916	30776	19396	31288
	bm05p	12	80	614	3362	15623	9806	15874
Density 1.10 g/cm^3								
Uniform	an00p	2	13	14690	23171	58088	44795	59962
	an01p	4	27	17761	30531	83120	62409	85421
	an02p	6	40	18839	33981	95771	71232	98278
	an03p	8	53	19209	35528	102505	75645	105084
	an04p	10	67	19451	36172	105513	77651	108178
	an05p	12	80	19726	36915	107215	78934	109869
Lump Soil with UO_2 3.5 g/cm^3	bn00p	2	13	63049	95689	293422	195141	303425
	bn01p	4	27	29243	58609	204834	132102	210187
	bn02p	6	40	12304	31675	121399	77097	124067
	bn03p	8	53	5079	16420	68115	42836	69398
	bn04p	10	67	2147	8498	37395	23382	38017
	bn05p	12	80	946	4411	20242	12695	20553

Table 3-9 Waste matrix model calibration results for various soil densities

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.00 g/cm^3								
Uniform	ao00p	2	13	15505	24155	60168	46467	62146
	ao01p	4	27	19291	32743	87735	66238	90280
	ao02p	6	40	20617	36678	102351	76146	105050
	ao03p	8	53	21211	38696	110761	82024	113621
	ao04p	10	67	21405	39535	114759	84409	117624
	ao05p	12	80	21719	40351	117857	86687	120726
Lump Soil with UO_2 3.5 g/cm^3	bo00p	2	13	65322	97721	295434	197271	305712
	bo01p	4	27	32005	62004	214151	138549	219939
	bo02p	6	40	14295	34937	132867	84276	135809
	bo03p	8	53	6354	19320	78659	49646	80198
	bo04p	10	67	2844	10369	44918	28220	45709
	bo05p	12	80	1289	5744	25405	15962	25856

Table 3-10 Comparison of soil and waste matrix results

Source Model	Relative Difference (Soil-Waste)/Waste [%]				
	185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Relative Difference between Waste Matrix @ 1.39 g/cm3 and Dry Soil @ 1.60 g/cm3					
Uniform	-6%	-6%	-9%	-6%	-9%
	-8%	-8%	-13%	-9%	-12%
	-8%	-9%	-14%	-11%	-14%
	-9%	-9%	-15%	-12%	-15%
	-9%	-9%	-16%	-12%	-15%
	-9%	-9%	-16%	-11%	-15%
Lump Soil with UO2 3.5 g/cm3	-4%	-3%	-6%	-4%	-6%
	-11%	-8%	-15%	-10%	-15%
	-17%	-14%	-24%	-17%	-23%
	-24%	-21%	-30%	-24%	-30%
	-29%	-26%	-37%	-29%	-37%
	-43%	-31%	-42%	-35%	-42%
Relative Difference between Waste Matrix @ 1.39 g/cm3 and Saturated Soil @ 1.90 g/cm3					
Uniform	-17%	-15%	-16%	-14%	-16%
	-22%	-20%	-22%	-20%	-22%
	-23%	-22%	-25%	-23%	-25%
	-24%	-24%	-27%	-25%	-27%
	-23%	-23%	-28%	-25%	-28%
	-24%	-24%	-27%	-25%	-27%
Lump Soil with UO2 3.5 g/cm3	-13%	-8%	-9%	-7%	-9%
	-33%	-24%	-28%	-24%	-28%
	-48%	-39%	-43%	-39%	-43%
	-61%	-51%	-56%	-52%	-56%
	-71%	-62%	-66%	-63%	-66%
	-80%	-72%	-74%	-71%	-73%

Table 3-11 Calibration results for dry soil with UO_2 lump containing 350 g ^{235}U

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.73 g/cm^3								
Lump	ca01p	4	350	410289	655526	1902904	1302560	1975156
Soil with UO_2	ca02p	6	350	73929	179198	572495	395556	588873
3.5 g/cm^3	ca03p	8	350	15224	52428	180043	126142	184487
	ca04p	10	350	3496	16192	57953	41201	59268
	ca05p	12	350	826	4917	19077	13720	19527
Density 1.60 g/cm^3								
Lump	cb01p	4	350	426006	671134	1940168	1329124	2014618
Soil with UO_2	cb02p	6	350	83114	194579	622438	428044	640520
3.5 g/cm^3	cb03p	8	350	19057	60968	208996	145577	214138
	cb04p	10	350	4677	20056	72492	51227	74126
	cb05p	12	350	1263	6913	25862	18494	26432
Density 1.40 g/cm^3								
Lump	cc01p	4	350	448333	690608	1993043	1363715	2070400
Soil with UO_2	cc02p	6	350	99788	220713	704801	483875	725963
3.5 g/cm^3	cc03p	8	350	25710	76860	262612	181544	269284
	cc04p	10	350	7290	28176	101426	71179	103757
	cc05p	12	350	2083	10577	40303	28290	41228
Density 1.20 g/cm^3								
Lump	cd01p	4	350	472973	710641	2042638	1395929	2123052
Soil with UO_2	cd02p	6	350	119959	247162	790047	537869	814208
3.5 g/cm^3	cd03p	8	350	35244	95976	326190	223479	334566
	cd04p	10	350	11354	39045	140136	96595	143357
	cd05p	12	350	3856	16389	61588	42971	62938
Density 1.00 g/cm^3								
Lump	ce01p	4	350	497502	728119	2081615	1421717	2165613
Soil with UO_2	ce02p	6	350	144147	278549	882511	598561	909974
3.5 g/cm^3	ce03p	8	350	48210	118903	402497	273603	413221
	ce04p	10	350	17162	52716	190483	130195	194953
	ce05p	12	350	6819	25358	93605	64365	95636

Table 3-12 Calibration results for wet soil with UO_2 lump containing 350 g ^{235}U

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 2.03 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	cf01p	4	350	379766	627542	1834702	1250004	1901668
	cf02p	6	350	54513	145927	476948	327357	489848
	cf03p	8	350	9385	35838	127451	88582	130457
	cf04p	10	350	1681	9235	34902	24525	35694
	cf05p	12	350	350	2386	9723	6859	9960
Density 1.90 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	cg01p	4	350	391471	639357	1870269	1272136	1939544
	cg02p	6	350	61239	158686	519982	354480	534204
	cg03p	8	350	11458	42245	148849	103140	152488
	cg04p	10	350	2247	11650	43643	30580	44606
	cg05p	12	350	475	3273	12992	9221	13291
Density 1.70 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	ch01p	4	350	412289	657999	1929382	1310985	2001884
	ch02p	6	350	73420	179932	591314	400688	607679
	ch03p	8	350	15335	53028	188609	129647	193103
	ch04p	10	350	3526	16388	61885	42773	63206
	ch05p	12	350	926	5309	20974	14740	21422
Density 1.50 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	ci01p	4	350	435704	680060	1986454	1349964	2061632
	ci02p	6	350	89954	205229	672096	454368	691130
	ci03p	8	350	21464	67297	236801	161262	242658
	ci04p	10	350	5476	23049	86344	59144	88308
	ci05p	12	350	1538	8391	32730	22466	33360
Density 1.30 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	cj01p	4	350	457999	699074	2037054	1383633	2115879
	cj02p	6	350	106726	232423	760113	511439	782097
	cj03p	8	350	29402	84160	297001	200478	304289
	cj04p	10	350	8717	32214	120822	82244	123541
	cj05p	12	350	2696	12736	49989	34443	51030

Table 3-13 Calibration results for waste matrix with UO_2 lump containing 350 g ^{235}U

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.39 g/cm^3								
Lump	ck01p	4	350	439149	687323	2060718	1375534	2136873
Soil with UO_2	ck02p	6	350	93509	213914	744108	481580	764073
3.5 g/cm^3	ck03p	8	350	23150	72457	278221	178823	284382
	ck04p	10	350	6195	25872	107209	68585	109315
	ck05p	12	350	1714	9348	41826	26724	42578
Density 1.30 g/cm^3								
Lump	cl01p	4	350	451039	695533	2082377	1389039	2159453
Soil with UO_2	cl02p	6	350	101923	225576	783321	507517	804778
3.5 g/cm^3	cl03p	8	350	26531	79651	307526	196219	314205
	cl04p	10	350	7951	30273	124614	79422	126996
	cl05p	12	350	2331	11707	51362	32638	52309
Density 1.20 g/cm^3								
Lump	cm01p	4	350	464467	705017	2104407	1405682	2184009
Soil with UO_2	cm02p	6	350	112773	241059	829317	538244	852788
3.5 g/cm^3	cm03p	8	350	31622	89966	342836	219135	350574
	cm04p	10	350	9700	35802	146739	93157	149642
	cm05p	12	350	3075	14468	63768	40249	64952
Density 1.10 g/cm^3								
Lump	cn01p	4	350	477283	715867	2123042	1420715	2203810
Soil with UO_2	cn02p	6	350	123460	255571	876012	567644	900706
3.5 g/cm^3	cn03p	8	350	37133	100388	380634	242997	389537
	cn04p	10	350	12312	42387	171059	109163	174465
	cn05p	12	350	4267	18239	78916	49782	80329
Density 1.00 g/cm^3								
Lump	co01p	4	350	492023	728757	2142034	1435737	2225076
Soil with UO_2	co02p	6	350	136261	271527	921216	597346	947960
3.5 g/cm^3	co03p	8	350	42798	111691	420363	268079	430331
	co04p	10	350	15318	49621	200200	126428	204191
	co05p	12	350	5702	22843	98135	61668	100018

Table 3-14 Detector offset results for dry soil with UO_2 lump containing 350 g ^{235}U

Source Model	Case	Det Offset [in]	Cut Depth [in]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.73 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	da11p	3	4	310312	518437	1485298	1025876	1540426
	da12p		6	59351	149786	475722	329534	488993
	da13p		8	13013	45278	154698	108781	158404
	da14p		10	3101	14130	50748	36000	51904
	da15p		12	735	4462	16835	12128	17206
	da21p	6	4	159429	289023	819723	574131	849821
	da22p		6	32503	89796	283188	199613	290899
	da23p		8	7794	29018	98818	70513	101241
	da24p		10	1964	9664	34419	24803	35181
	da25p		12	513	3281	12125	8840	12405
	da31p	9	4	71934	141527	397004	283009	411292
	da32p		6	14249	44109	140742	100744	144517
	da33p		8	3562	15322	52312	37706	53561
	da34p		10	991	5403	19467	14078	19923
	da35p		12	267	1937	7253	5291	7401
	da41p	12	4	32648	68952	189801	137785	196629
	da42p		6	5679	20042	65498	46739	67160
	da43p		8	1409	7061	24902	18034	25464
	da44p		10	391	2459	9504	6911	9723
	da45p		12	112	945	3756	2754	3866
	da51p	15	4	15281	34306	94687	69185	97864
	da52p		6	2057	8881	30899	22132	31658
	da53p		8	458	2991	11709	8344	11954
	da54p		10	136	1200	4764	3451	4873
	da55p		12	37	400	1794	1304	1844

Table 3-14 Detector offset results for dry soil with UO_2 lump containing 350 g ^{235}U

Source Model	Case	Det Offset [in]	Cut Depth [in]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.40 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	db11p	3	4	344730	552977	1590767	1092486	1650896
	db12p		6	83193	188364	596134	410982	613798
	db13p		8	22507	68205	229527	160359	235326
	db14p		10	6459	25310	90264	63435	92368
	db15p		12	1998	9958	36427	25986	37244
	db21p	6	4	187508	323983	924360	642326	958089
	db22p		6	49042	119390	375978	262053	386703
	db23p		8	14012	45300	154850	108734	158723
	db24p		10	4353	18281	64699	45898	66170
	db25p		12	1411	7273	27005	19307	27596
	db31p	9	4	88839	166766	469988	332193	487242
	db32p		6	23149	63774	201245	142113	206929
	db33p		8	7294	26188	88357	63138	90593
	db34p		10	2369	10978	39406	27973	40316
	db35p		12	820	4459	16891	12264	17335
	db41p	12	4	43074	85320	235921	169389	244886
	db42p		6	10556	31669	99749	71636	102443
	db43p		8	3217	13432	45706	32669	46787
	db44p		10	1145	5789	21142	15115	21603
	db45p		12	383	2482	9698	7022	9922
	db51p	15	4	21245	44508	122533	89087	126967
	db52p		6	4419	15414	50034	35920	51330
	db53p		8	1458	6531	22803	16355	23375
	db54p		10	489	2876	10948	7946	11158
	db55p		12	191	1280	5094	3730	5207

Table 3-14 Detector offset results for dry soil with UO_2 lump containing 350 g ^{235}U

Source Model	Case	Det Offset [in]	Cut Depth [in]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.00 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	dc11p	3	4	393061	595859	1701726	1166546	1768196
	dc12p		6	123149	244540	767835	523257	791610
	dc13p		8	42899	107529	360270	246415	369997
	dc14p		10	15993	49520	174419	120021	178627
	dc15p		12	6386	23301	86788	59927	88690
	dc21p	6	4	226385	366138	1047352	723297	1086722
	dc22p		6	78410	166314	521538	357777	536867
	dc23p		8	29857	78418	262206	180921	269185
	dc24p		10	11924	38261	133366	92430	136448
	dc25p		12	4964	18779	68667	47840	70224
	dc31p	9	4	117036	204057	578388	403492	599515
	dc32p		6	41835	97880	305362	212572	314558
	dc33p		8	17221	49345	164229	114217	168451
	dc34p		10	7220	25055	88775	61937	90804
	dc35p		12	3219	13188	48178	33764	49257
	dc41p	12	4	60765	112046	314459	222956	326157
	dc42p		6	21086	53154	167227	117642	172200
	dc43p		8	8934	27981	94110	66137	96324
	dc44p		10	3968	15212	53199	37390	54445
	dc45p		12	1800	8199	29789	21198	30463
	dc51p	15	4	32961	63466	173989	125530	180525
	dc52p		6	10350	28719	90668	64423	93199
	dc53p		8	4622	15648	52172	37131	53436
	dc54p		10	2061	8801	30912	22058	31593
	dc55p		12	921	4772	18105	12727	18502

Table 3-15 Detector offset results for wet soil with UO_2 lump containing 350 g ^{235}U

Source Model	Case	Det Offset [in]	Cut Depth [in]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 2.03 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	dd11p	3	4	279380	484217	1403477	964951	1454296
	dd12p		6	42486	117584	386526	265693	396806
	dd13p		8	7713	30448	106788	74625	109224
	dd14p		10	1458	7940	29897	21048	30589
	dd15p		12	282	2071	8315	5946	8522
	dd21p	6	4	137249	260981	747195	520668	773331
	dd22p		6	22162	67614	219998	153909	225702
	dd23p		8	4274	18392	65212	45683	66659
	dd24p		10	938	5354	19560	13862	19962
	dd25p		12	177	1355	5680	4002	5806
	dd31p	9	4	58646	121334	344120	243174	355875
	dd32p		6	8815	30559	101583	71668	104183
	dd33p		8	1828	8673	32421	22817	33142
	dd34p		10	393	2626	10378	7337	10622
	dd35p		12	85	718	3228	2285	3288
	dd41p	12	4	24769	55271	157281	113239	162879
	dd42p		6	3141	13089	45338	31909	46364
	dd43p		8	562	3712	14507	10187	14797
	dd44p		10	135	1135	4808	3408	4935
	dd45p		12	39	352	1610	1119	1645
	dd51p	15	4	11038	26467	75979	54748	78433
	dd52p		6	1170	5697	21086	14870	21539
	dd53p		8	186	1458	6511	4467	6649
	dd54p		10	62	553	2382	1683	2430
	dd55p		12	7	154	751	529	768

Table 3-15 Detector offset results for wet soil with UO_2 lump containing 350 g ^{235}U

Source Model	Case	Det Offset [in]	Cut Depth [in]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.70 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	de11p	3	4	309165	517700	1509912	1032191	1565096
	de12p		6	59372	149955	489754	334435	503172
	de13p		8	13010	45793	162145	111214	165899
	de14p		10	3176	14617	54292	37952	55463
	de15p		12	771	4623	18413	12896	18801
	de21p	6	4	160203	291914	838818	581084	868410
	de22p		6	33052	90185	293271	202673	301126
	de23p		8	7867	29471	103519	71765	105851
	de24p		10	1957	9737	36705	25476	37493
	de25p		12	524	3302	13326	9318	13614
	de31p	9	4	72547	143420	408375	287407	422361
	de32p		6	14574	44775	147088	103070	150993
	de33p		8	3652	15782	55796	39339	57117
	de34p		10	1059	5634	21085	14739	21539
	de35p		12	269	1884	7701	5470	7876
	de41p	12	4	32600	69015	195954	139540	202761
	de42p		6	5694	20251	68474	48556	70200
	de43p		8	1407	7338	26546	18638	27149
	de44p		10	438	2665	10548	7545	10811
	de45p		12	129	1010	4109	2906	4214
	de51p	15	4	15225	34213	97308	70405	100771
	de52p		6	2223	9414	32784	23258	33579
	de53p		8	477	3110	12691	8870	12990
	de54p		10	177	1245	5138	3595	5232
	de55p		12	44	451	2035	1423	2078

Table 3-15 Detector offset results for wet soil with UO_2 lump containing 350 g ^{235}U

Source Model	Case	Det Offset [in]	Cut Depth [in]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.30 g/cm^3								
Lump Soil with UO_2 3.5 g/cm^3	df11p	3	4	353314	561438	1632692	1112412	1694536
	df12p		6	89417	198516	642738	435742	661408
	df13p		8	25565	74778	260676	177307	267167
	df14p		10	7758	29166	107093	73252	109475
	df15p		12	2544	11681	45881	31504	46896
	df21p	6	4	193612	331736	963039	661341	997435
	df22p		6	53985	128713	414458	283702	425886
	df23p		8	16553	51518	179572	123100	183914
	df24p		10	5386	21647	78825	54374	80539
	df25p		12	1796	8821	34562	23961	35351
	df31p	9	4	94394	175142	500377	349291	518130
	df32p		6	25818	69270	224872	155467	231100
	df33p		8	8435	29878	104673	72235	107144
	df34p		10	2968	12957	47968	33182	49039
	df35p		12	1076	5601	22094	15444	22541
	df41p	12	4	45837	90545	255757	181152	264962
	df42p		6	11747	35012	114571	80353	117493
	df43p		8	4040	15481	55015	38407	56272
	df44p		10	1480	7025	26882	18707	27477
	df45p		12	517	3115	12749	8896	13035
	df51p	15	4	23107	47962	133780	95881	138518
	df52p		6	5274	17690	58932	41527	60421
	df53p		8	1647	7674	28254	19652	28869
	df54p		10	658	3720	14206	9938	14509
	df55p		12	242	1663	7040	4891	7176

Table 3-16 Calibration results for dry soil with UO_2 lump containing 700 g ^{235}U

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 1.73 g/cm^3								
Lump	fa02p	6	700	216652	445066	1353543	933071	1397463
Soil with UO_2	fa03p	8	700	43699	129485	422440	296158	434068
3.5 g/cm^3	fa04p	10	700	9911	39207	137176	97067	140443
	fa05p	12	700	2280	12397	44752	32105	45810
Density 1.60 g/cm^3								
Lump	fb02p	6	700	236054	470152	1429190	983753	1476107
Soil with UO_2	fb03p	8	700	51169	144854	476741	331524	489766
3.5 g/cm^3	fb04p	10	700	12521	47554	164087	115600	168246
	fb05p	12	700	3217	15953	58542	42053	59910
Density 1.40 g/cm^3								
Lump	fc02p	6	700	270183	514104	1557680	1067502	1609528
Soil with UO_2	fc03p	8	700	65727	174842	572403	394052	588067
3.5 g/cm^3	fc04p	10	700	18197	62970	220585	153461	225977
	fc05p	12	700	5413	23952	86956	61088	88766
Density 1.20 g/cm^3								
Lump	fd02p	6	700	305602	554552	1681068	1149186	1738674
Soil with UO_2	fd03p	8	700	86158	209680	686296	470990	705726
3.5 g/cm^3	fd04p	10	700	26898	84308	294005	203374	301256
	fd05p	12	700	9092	35274	128149	89582	131022
Density 1.00 g/cm^3								
Lump	fe02p	6	700	344761	597414	1804874	1228231	1867775
Soil with UO_2	fe03p	8	700	111566	249078	808622	552732	832786
3.5 g/cm^3	fe04p	10	700	39297	111193	381745	262051	391504
	fe05p	12	700	14794	51423	185428	127134	189671

Table 3-17 Calibration results for saturated soil with UO_2 lump containing 700 g ^{235}U

Source Model	Case	Cut Depth [in]	Mass ^{235}U [g]	Detector Count Rate [/min]				
				185 keV	150-200 keV	75-200 keV	> 100 keV	> 75 keV
Density 2.03 g/cm^3								
Lump	ff02p	6	700	177592	389555	1200233	826385	1238124
Soil with UO_2	ff03p	8	700	28160	94443	319766	221784	327829
3.5 g/cm^3	ff04p	10	700	5190	23968	87753	61310	89695
	ff05p	12	700	1067	6364	24302	17369	24845
Density 1.90 g/cm^3								
Lump	fg02p	6	700	192355	410742	1273925	869900	1314172
Soil with UO_2	fg03p	8	700	33549	107405	363409	251114	372950
3.5 g/cm^3	fg04p	10	700	6630	29332	106106	74246	108570
	fg05p	12	700	1376	8138	31980	22431	32692
Density 1.70 g/cm^3								
Lump	fh02p	6	700	219050	449004	1391654	946949	1435386
Soil with UO_2	fh03p	8	700	43102	129519	438655	301389	449771
3.5 g/cm^3	fh04p	10	700	9491	39214	143424	99644	146838
	fh05p	12	700	2292	12613	47853	33508	48982
Density 1.50 g/cm^3								
Lump	fi02p	6	700	248976	490170	1515460	1029869	1564701
Soil with UO_2	fi03p	8	700	57639	157677	531042	362365	545179
3.5 g/cm^3	fi04p	10	700	14436	53109	192789	132448	197222
	fi05p	12	700	4018	19011	71883	50240	73431
Density 1.30 g/cm^3								
Lump	fj02p	6	700	282552	530542	1632742	1106383	1686882
Soil with UO_2	fj03p	8	700	73114	188116	635799	429965	652760
3.5 g/cm^3	fj04p	10	700	21126	70878	254860	173164	260899
	fj05p	12	700	6724	28191	106141	73131	108457

4 Conclusions

The calibration results in Table 3-6 through Table 3-8 provide maximum observed net count rates for soil-based media ensuring that ^{235}U average concentrations in excess of 0.1 g/L are not present within view of the survey meter for various assumed cut depths and various material compositions.

The representative waste matrix results in Table 3-9 demonstrate that the soil-based calibration values are more limiting for wet or dry densities of 1.60 g/cm^3 or greater.

The results of the analysis of a single lump of UO_2 containing 350 g ^{235}U shown in Table 3-11 through Table 3-13 provide limiting calibration values at which certain administrative controls on remediation operations are activated.

Results for various detector lateral offsets relative to the 350 g lump location are presented in Table 3-14 and Table 3-15.

Results for a lump of soil containing 700 g ^{235}U as UO_2 (100 wt.% ^{235}U) are presented in Table 3-16 and Table 3-17 for dry and saturated conditions, respectively.

5 References

[1] NSA-TR-09-15 Rev. 1, Nuclear Criticality Safety Assessment of Buried Waste Exhumation and Contaminated Soil Remediation at the Hematite Site.

[2] R. D. Carter, G. R. Kiel, and K. R. Ridgway, "Criticality Handbook," Atlantic Richfield Hanford Co. Report ARH-600 (1968).

[3] J. D. Briesmeister, MCNP - A General Monte Carlo N-Particle Transport Code - Version 5. (2003).

Attachment 1

List of Files on Attached Media

This attachment contains a listing and description of the files contained in the attached DVD of this document (Attachment 2). The file attributes on the DVD are as follows:

Files on Attachment 2			
Name	**Size**	**Last write date**	**CRC32**
	78 719 555	16-02-2011 21:39:09	
Excel	<DIR>	16-02-2011 21:38:20	
Run	<DIR>	16-02-2011 21:33:56	
Src	<DIR>	16-02-2011 21:39:09	
\Excel	11 007 851	16-02-2011 21:38:20	
soil_v1106.xlsm	11 007 851	16-02-2011 21:37:26	3edf39a6
\Run	67 574 605	16-02-2011 21:33:56	
v1.0	<DIR>	16-02-2011 21:34:17	
v1.1	<DIR>	16-02-2011 21:36:45	
\Run\v1.0	769 079	16-02-2011 21:34:17	
np00p	5 052	26-05-2010 10:46:16	943571ab
np00p.out	104 524	26-05-2010 10:46:16	4532bddb
np01p	5 053	26-05-2010 10:46:16	6a09b571
np01p.out	104 524	26-05-2010 10:46:16	678bfa3c
np02p	5 055	26-05-2010 10:46:16	198dea9c
np02p.out	104 512	26-05-2010 10:46:16	7fd39403
np03p	5 055	26-05-2010 10:46:16	75bc9b82
np03p.out	104 819	26-05-2010 10:46:17	ad45ed9b
np04p	5 057	26-05-2010 10:46:17	a9b5982a
np04p.out	105 235	26-05-2010 10:46:17	a3cda005
np05p	5 056	26-05-2010 10:46:17	c26ce001
np05p.out	104 108	26-05-2010 10:46:17	77d4f81a
np07p	5 062	26-05-2010 10:46:15	889b1a1a
np07p.out	105 967	26-05-2010 10:46:16	737dbae7
\Run\v1.1	66 805 526	16-02-2011 21:36:45	
aa00p	7 400	06-02-2011 03:31:16	e4c87c9e
aa00p.out	123 522	07-02-2011 00:11:50	f925b6ad
aa01p	7 403	06-02-2011 03:31:17	a72efb02
aa01p.out	123 617	07-02-2011 00:11:50	21accfd2
aa02p	7 404	06-02-2011 03:31:17	633fb10a
aa02p.out	123 522	07-02-2011 00:11:50	d64a0b6d
aa03p	7 405	06-02-2011 03:31:17	948b4337
aa03p.out	123 522	07-02-2011 00:11:50	eb9caa2e
aa04p	7 408	06-02-2011 03:31:17	e883e66d
aa04p.out	123 522	07-02-2011 00:11:50	c98dc7a5
aa05p	7 408	06-02-2011 03:31:17	92baeea7
aa05p.out	123 237	07-02-2011 00:11:52	f75e6c96
ab00p	7 400	06-02-2011 03:31:17	f8f22e97
ab00p.out	123 522	07-02-2011 00:11:52	da5c2779
ab01p	7 403	06-02-2011 03:31:17	554a6962
ab01p.out	123 617	07-02-2011 00:11:52	bb897e69
ab02p	7 405	06-02-2011 03:31:17	577561e6
ab02p.out	123 237	07-02-2011 00:11:52	5e3b355f

ab03p	7 405	06-02-2011 03:31:17	6e23e528
ab03p.out	123 522	07-02-2011 00:11:52	e54c9623
ab04p	7 408	06-02-2011 03:31:17	36fc7cca
ab04p.out	123 522	07-02-2011 00:11:53	a7f29bcd
ab05p	7 407	06-02-2011 03:31:17	27a389b6
ab05p.out	123 522	07-02-2011 00:11:53	709abaf0
ac00p	7 400	06-02-2011 03:31:17	cb494de8
ac00p.out	123 617	07-02-2011 00:11:53	f530f92a
ac01p	7 403	06-02-2011 03:31:17	a39ac2d6
ac01p.out	123 522	07-02-2011 00:11:53	6d31b46e
ac02p	7 405	06-02-2011 03:31:17	0db37dbd
ac02p.out	123 522	07-02-2011 00:11:53	25af4c15
ac03p	7 405	06-02-2011 03:31:17	68cdbd28
ac03p.out	123 712	07-02-2011 00:11:53	8ca309a2
ac04p	7 408	06-02-2011 03:31:17	78f8e9b0
ac04p.out	123 522	07-02-2011 00:11:54	63a2b6cb
ac05p	7 408	06-02-2011 03:31:17	1c1191b9
ac05p.out	123 522	07-02-2011 00:11:54	4b943880
ad00p	7 400	06-02-2011 03:31:17	415451a6
ad00p.out	123 617	07-02-2011 00:11:54	c2fa2594
ad01p	7 403	06-02-2011 03:31:17	7cb787e0
ad01p.out	123 522	07-02-2011 00:11:54	c3c2e86b
ad02p	7 405	06-02-2011 03:31:17	815178d2
ad02p.out	123 522	07-02-2011 00:11:55	df713cf9
ad03p	7 405	06-02-2011 03:31:17	3ee88a4b
ad03p.out	123 522	07-02-2011 00:11:55	9de0cf46
ad04p	7 408	06-02-2011 03:31:17	080efc07
ad04p.out	123 522	07-02-2011 00:11:55	182389ac
ad05p	7 408	06-02-2011 03:31:17	b8e00504
ad05p.out	123 712	07-02-2011 00:11:55	a349ee23
ae00p	7 400	06-02-2011 03:31:17	4e70f0eb
ae00p.out	123 332	07-02-2011 00:11:55	74c5d1e6
ae01p	7 402	06-02-2011 03:31:17	c910b6d9
ae01p.out	123 617	07-02-2011 00:11:55	8d5f4365
ae02p	7 405	06-02-2011 03:31:17	22a1b140
ae02p.out	123 617	07-02-2011 00:11:56	0bd9b648
ae03p	7 404	06-02-2011 03:31:17	3dbcd893
ae03p.out	123 522	07-02-2011 00:11:56	da309912
ae04p	7 408	06-02-2011 03:31:17	01cb9a63
ae04p.out	123 522	07-02-2011 00:11:56	95514296
ae05p	7 408	06-02-2011 03:31:17	900c21b9
ae05p.out	123 522	07-02-2011 00:11:56	16d63184
af00p	7 399	06-02-2011 03:31:17	40945bb1
af00p.out	123 859	07-02-2011 00:11:56	24d653e9
af01p	7 401	06-02-2011 03:31:17	daefea3d
af01p.out	123 859	07-02-2011 00:11:56	856d0f82
af02p	7 405	06-02-2011 03:31:17	31747a79
af02p.out	123 954	07-02-2011 00:11:57	95fc712a
af03p	7 405	06-02-2011 03:31:17	f1b45be9
af03p.out	123 574	07-02-2011 00:11:57	c8eb7a9a
af04p	7 407	06-02-2011 03:31:17	73209815
af04p.out	123 859	07-02-2011 00:11:57	b8c4a91e
af05p	7 408	06-02-2011 03:31:17	6ddcb013
af05p.out	123 859	07-02-2011 00:11:57	42b25286

ag00p	7 399	06-02-2011 03:31:17	55d682d3
ag00p.out	123 859	07-02-2011 00:11:57	afb5b09f
ag01p	7 403	06-02-2011 03:31:17	594004c0
ag01p.out	123 859	07-02-2011 00:11:58	f01a9a95
ag02p	7 405	06-02-2011 03:31:17	ac56f90d
ag02p.out	123 859	07-02-2011 00:11:58	364f5c85
ag03p	7 405	06-02-2011 03:31:17	5ec9a3a1
ag03p.out	123 859	07-02-2011 00:11:58	22421f5d
ag04p	7 408	06-02-2011 03:31:17	e0d8e6cb
ag04p.out	123 954	07-02-2011 00:11:58	9a9dbe1b
ag05p	7 408	06-02-2011 03:31:17	5ff47d04
ag05p.out	123 859	07-02-2011 00:11:58	9e6606f2
ah00p	7 400	06-02-2011 03:31:17	d1a0631a
ah00p.out	123 362	07-02-2011 00:11:58	aabf060d
ah01p	7 403	06-02-2011 03:31:17	2dcedbed
ah01p.out	123 859	07-02-2011 00:11:59	43eadac6
ah02p	7 404	06-02-2011 03:31:17	da2e38a1
ah02p.out	123 859	07-02-2011 00:11:59	4314d145
ah03p	7 405	06-02-2011 03:31:17	75d18bac
ah03p.out	123 859	07-02-2011 00:11:59	114d1b04
ah04p	7 408	06-02-2011 03:31:17	e1b0bec5
ah04p.out	123 859	07-02-2011 00:11:59	3f2de75c
ah05p	7 408	06-02-2011 03:31:17	c7d58203
ah05p.out	123 859	07-02-2011 00:11:59	d72a904e
ai00p	7 399	06-02-2011 03:31:17	611af37f
ai00p.out	123 859	07-02-2011 00:12:00	f33e2987
ai01p	7 403	06-02-2011 03:31:17	27bfab0c
ai01p.out	123 859	07-02-2011 00:12:00	56572218
ai02p	7 405	06-02-2011 03:31:17	37624b4d
ai02p.out	123 954	07-02-2011 00:12:00	0bddaa30
ai03p	7 405	06-02-2011 03:31:17	722217e1
ai03p.out	123 859	07-02-2011 00:12:00	7723d157
ai04p	7 408	06-02-2011 03:31:18	86c35790
ai04p.out	123 574	07-02-2011 00:12:00	ea3d4e4d
ai05p	7 408	06-02-2011 03:31:18	76bbcd09
ai05p.out	123 859	07-02-2011 00:12:00	2e3f2bf3
aj00p	7 398	06-02-2011 03:31:18	f8b595f5
aj00p.out	123 859	07-02-2011 00:12:01	d789581d
aj01p	7 403	06-02-2011 03:31:18	0b9b6e15
aj01p.out	123 552	07-02-2011 00:12:01	6dd87259
aj02p	7 405	06-02-2011 03:31:18	981d9ff4
aj02p.out	123 859	07-02-2011 00:12:01	4ae2d970
aj03p	7 405	06-02-2011 03:31:18	df90b1a4
aj03p.out	123 859	07-02-2011 00:12:01	035c6e52
aj04p	7 408	06-02-2011 03:31:18	5cba7f7b
aj04p.out	123 764	07-02-2011 00:12:01	2267172e
aj05p	7 408	06-02-2011 03:31:18	5490b06b
aj05p.out	123 859	07-02-2011 00:12:02	1a31baaa
ak00p	7 396	06-02-2011 03:31:18	e85a9747
ak00p.out	124 159	07-02-2011 00:12:02	763b30ba
ak01p	7 399	06-02-2011 03:31:18	55b3bdfa
ak01p.out	123 969	07-02-2011 00:12:02	eb8f84c5
ak02p	7 401	06-02-2011 03:31:18	764c73b6
ak02p.out	123 662	07-02-2011 00:12:02	ca80dbaf

ak03p	7 401	06-02-2011 03:31:18	b29e850f
ak03p.out	124 634	07-02-2011 00:12:02	11b78364
ak04p	7 404	06-02-2011 03:31:18	e53fdfe3
ak04p.out	123 969	07-02-2011 00:12:02	3d49d297
ak05p	7 404	06-02-2011 03:31:18	410370ab
ak05p.out	123 969	07-02-2011 00:12:04	02de03b9
al00p	7 396	06-02-2011 03:31:18	fd1767dd
al00p.out	124 127	07-02-2011 00:12:05	c0cf6ecc
al01p	7 399	06-02-2011 03:31:18	55a58a47
al01p.out	124 032	07-02-2011 00:12:05	ec76a80e
al02p	7 401	06-02-2011 03:31:18	d04fe4cf
al02p.out	123 321	07-02-2011 00:12:06	411414a2
al03p	7 401	06-02-2011 03:31:18	5c6ac023
al03p.out	124 127	07-02-2011 00:12:06	265f6b3e
al04p	7 404	06-02-2011 03:31:18	d4727c5e
al04p.out	124 032	07-02-2011 00:12:06	e00199be
al05p	7 404	06-02-2011 03:31:18	558f823c
al05p.out	124 697	07-02-2011 00:12:06	4cfafa9d
am00p	7 396	06-02-2011 03:31:18	66e2fc7e
am00p.out	124 127	07-02-2011 00:12:06	c6526cf0
am01p	7 399	06-02-2011 03:31:18	a6a052b4
am01p.out	124 032	07-02-2011 00:12:07	7e9ab7e8
am02p	7 401	06-02-2011 03:31:18	6ebc075c
am02p.out	124 032	07-02-2011 00:12:07	f167d8a7
am03p	7 401	06-02-2011 03:31:18	4fcca3d1
am03p.out	124 032	07-02-2011 00:12:07	5bb5122d
am04p	7 404	06-02-2011 03:31:18	55699a6d
am04p.out	124 032	07-02-2011 00:12:07	68bd229d
am05p	7 404	06-02-2011 03:31:18	e2806d66
am05p.out	124 032	07-02-2011 00:12:07	65dabcbc
an00p	7 396	06-02-2011 03:31:18	235275be
an00p.out	124 127	07-02-2011 00:12:07	6a6f411a
an01p	7 399	06-02-2011 03:31:18	23ed1f22
an01p.out	124 222	07-02-2011 00:12:08	d83be811
an02p	7 400	06-02-2011 03:31:18	ef33add5
an02p.out	124 032	07-02-2011 00:12:08	f4c0ef4c
an03p	7 401	06-02-2011 03:31:18	3147494d
an03p.out	124 032	07-02-2011 00:12:08	f2ff36ab
an04p	7 404	06-02-2011 03:31:18	41cc0391
an04p.out	123 725	07-02-2011 00:12:08	eb20c650
an05p	7 404	06-02-2011 03:31:18	fb1fcf87
an05p.out	124 697	07-02-2011 00:12:08	7d84d9a2
ao00p	7 396	06-02-2011 03:31:18	5c0a93f9
ao00p.out	124 127	07-02-2011 00:12:09	850aa2b5
ao01p	7 399	06-02-2011 03:31:18	dac39e63
ao01p.out	124 127	07-02-2011 00:12:09	1a9d3567
ao02p	7 401	06-02-2011 03:31:18	8ce64582
ao02p.out	124 032	07-02-2011 00:12:09	393d9ee0
ao03p	7 401	06-02-2011 03:31:18	f3693529
ao03p.out	124 032	07-02-2011 00:12:09	7dc3f6f6
ao04p	7 403	06-02-2011 03:31:18	0bbea0eb
ao04p.out	124 032	07-02-2011 00:12:09	1e4a2440
ao05p	7 404	06-02-2011 03:31:18	d1f90294
ao05p.out	124 127	07-02-2011 00:12:10	b0a4fbca