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Scientific Notebook # 194

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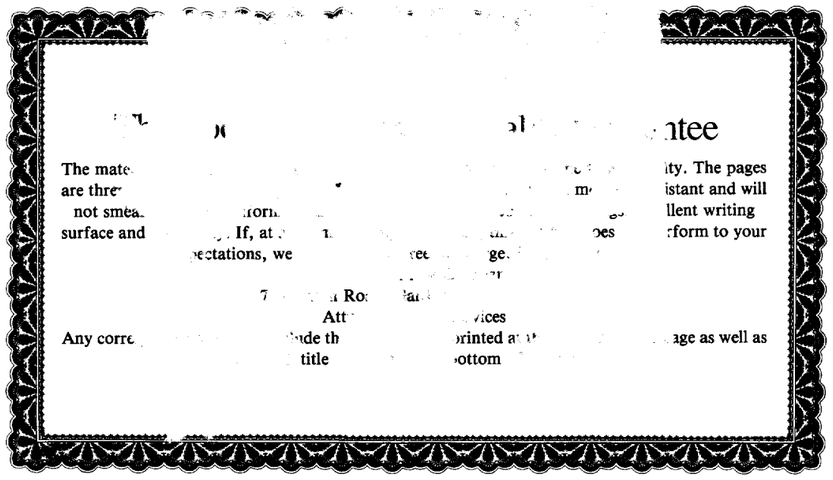

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3/26/00

Title of Activity: Documentation of TPA4.0beta Tests for SCR No. PA-SCR-301, Attachment 3 (GENII Related Modifications).

Participants: Patrick LaPlante, Roland Benke

Author/Primary Participant: Patrick LaPlante

Overall Objective: Test implementation of TPA 4.0 modifications related to providing flexibility in defining exposure pathways by incorporation of the GENII code into TPA 4.0 (we call the TPA version of GENII v1.485 as GENTPA 1.0). The test assignment is provided in the file tasks40.wpd which is included in the attached zip disk. Tests conducted for attachment #3 are limited to the adult receptor because tests related to age-dependent receptors are covered under the 'stochastic biosphere and receptor group' series of tests noted on the task assignment table in tasks40.wpd. file. 3 test plans with results are discussed in in this notebook. Each plan and results is discussed in following pages sequentially.

Work Plans: Each work plan will be presented with results, discussion, and summary/conclusions.

3/26/00 Work Plan (contd)

ATTACHMENT 3: Description of Acceptance Tests for GENII-Related Modifications to TPA 3.3
SCR No. PA-SCR-301

TPA Test Plan and Results Summary

Test name: GENTPA Setup Test

Anticipated start date: 3/9/00

Anticipated completion date: 3/10/00

Amount of your time available to perform this test: 2 hours

Percent of testing time to be spent in process level testing and system level testing: This test is primarily a process level test, however, execution of GENTPA occur by executing TPA.

Output files to be checked:

ggenii.out

Input files to be checked for proper data transfer to program:

ggamen.dat
grmdlib.dat
ggrdf.dat
gdefault.def/inp
gftrans.def/inp
gnewdf.dat
ggenii.def/inp
tpa.inp

Disposition of documentation (storage medium, physical location, and access method):

-TPA input and output files used for the test will be archived on zip disks and referenced in the scientific notebook (#194)

-data file comparisons will be documented on marked printouts that will be included in the scientific notebook (#194)

Functional test descriptions:

-Hand calculations: none

-Process-level tests:

Note: Tests involving parameters and data that are radionuclide or element specific should include checking values for the following radionuclides and elements that have been shown in TPA sensitivity analyses to be important to dose: ^{245}Cm, ^{241}Am, ^{237}Np, ^{239}Pu, ^{234}U, ^{230}Th, ^{129}I, ^{99}Tc, ^{14}C, ^{79}Se, and ^{36}Cl.

3/26/00 Work Plan (contd)

Setup Test #1: Confirm data input to files is correct by spot checking all values in ggamen.dat, grmdlib.dat, ggrdf.dat, gdefault.def, gftrans.def, and gnewdf.dat. Correct values for these files are available from GENII-S data files used for TPA 3.3 DCFs. Also, confirm all adult parameter values in ggenii.def and tpa.inp are same as those listed in appendix B of CNWRA 97-009.

Setup Test #2: Test the routines that create the input file for GENTPA (ggenii.def/inp) and write to GENTPA data files to ensure correct transfer of information
- are parameters in tpa.inp being correctly written to ggenii.inp?
- are fixed parameters in ggenii.def transferred correctly to ggenii.inp?
- does GENTPA input echo in ggenii.out confirm parameters transferred correctly?
- check gdefault.inp and tpa.inp after TPA run to confirm values from tpa.inp have been passed correctly to gdefault.inp
- check gftrans.inp after TPA run to ensure values are same as gftrans.def

-System-level tests:

TPA runs used to execute GENTPA for aforementioned tests will be done for the total system. This will provide some assurance that GENTPA setup and input parameter and data transfers are operating as intended when TPA is executed.

Reasonableness Test Description: None for this test (emphasis is on checking data transfer)

Final checklist (completed during testing):

3/26/00

Setup Test #1: (Files located on Zip Disk #1 \GENTPA SetupTest\Test1)

a) confirm that all parameter and data files contain the correct information?
b) ggamen.dat, grmdlib.dat contain the same data used for DCF calculations for TPA 3.3 (consistent with gamen.dat, and grmdlib.dat from GENII-S except ^{108}Ag added)
c) ggrdf.dat contains external dose coefficients from Federal Guidance 12 (ground surface and air submersion exposure values have been correctly entered into column1 and 3 in ggrdf.dat)
d) gdefault.def contains the same data used for DCF calculations for TPA 3.3 (consistent with the default.ip3 file used for GENII-S runs for TPA 3.3)
e) gftrans.def contains the same food transfer factors use for TPA 3.3 DCFs (documented in CNWRA 97-009 and provided in ftrans.ip3)
f) gnewdf.dat contains internal dose coefficients for adult receptor consistent with values used for TPA 3.3 DCFs (reported in Federal Guidance 11)
g) ggenii.def contains fixed input parameter values for GENTPA consistent with values used for TPA 3.3 DCFs (documented in CNWRA 97-009, Appendix B)
h) tpa.inp contains the same values used for TPA 3.3 DCF calculations (consistent with values reported in CNWRA 97-009, Appendix B)

Setup Test #2: (Files located on Zip Disk #1 \GENTPA SetupTest\Test2) 3/26/00

a) confirm that all parameters and data transfers are operating as intended
b) parameters in tpa.inp being correctly written to ggenii.inp
c) fixed parameters in ggenii.def transferred correctly to ggenii.inp
d) the GENTPA input echo in ggenii.out confirms parameters transferred correctly
e) gdefault.inp contains the parameter values from tpa.inp after TPA was run

3/26/00 Work Plan (contd)

f) gftrans.inp contains the correct parameter values from gftrans.def after TPA run

Did the modification substantially change results?

-not applicable to this set of tests that are focussed on confirming data and input operations (see Verification Tests for DCF Calculations plan and results described below).

Was TPA4.0beta output compared to TPA 3.3 output?

-not in this round of tests (see Verification Tests for DCF Calculations plan and results described below).

Which radionuclides were monitored to determine reasonableness of results in terms of dose?

- input data for all radionuclides checked

Test Results for GENTPA Setup Test

Setup Test #1 Results:

a) confirm that all parameter and data files contain the correct information

PASSED

b) ggamen.dat, grmdlib.dat contain the same data used for DCF calculations for TPA 3.3 (consistent with gamen.dat, and grmdlib.dat from GENII-S except ^{108}Ag added)

PASSED

c) ggrdf.dat contains external dose coefficients from Federal Guidance 12 (ground surface and air submersion exposure values have been correctly entered into column1 and 3 in ggrdf.dat)

PASSED

d) gdefault.def contains the same data used for DCF calculations for TPA 3.3 (consistent with the default.ip3 file used for GENII-S runs for TPA 3.3)

PASSED

e) gftrans.def contains the same food transfer factors use for TPA 3.3 DCFs (documented in CNWRA 97-009 and provided in ftrans.ip3)

PASSED

f) gnewdf.dat contains internal dose coefficients for adult receptor consistent with values used for TPA 3.3 DCFs (reported in Federal Guidance 11)

3/26/00 Work Plan (contd)

PASSED (the inhalation dose coefficient for Ag-108m was corrected)

g) ggenii.def contains fixed input parameter values for GENTPA consistent with values used for TPA 3.3 DCFs (documented in CNWRA 97-009, Appendix B)

PASSED

h) tpa.inp contains the same values used for TPA 3.3 DCF calculations (consistent with values reported in CNWRA 97-009, Appendix B)

PASSED (constant soil Kd values for Cl and Se were changed from 0 and 150 to 0.25 and 55 to be consistent with source data for GENTPA tests. These soil Kds were subsequently formally changed to correct values specified in Appendix A of the user manual.

Setup Test #2 Results:

a) confirm that all parameters and data transfers are operating as intended

PASSED

b) parameters in tpa.inp being correctly written to ggenii.inp

PASSED

c) fixed parameters in ggenii.def transferred correctly to ggenii.inp

PASSED

d) the GENTPA input echo in ggenii.out confirms parameters transferred correctly

PASSED

e) gdefault.inp contains the parameter values from tpa.inp after TPA was run

PASSED

f) gftrans.inp contains the correct parameter values from gftrans.def after TPA run

PASSED

Results of GENTPA Setup Test: Test #1
(all files referenced in this section on zip Dsk #1 \GENTPAsetupTest\Test1)
The following files were compared by visual inspection for consistency
Printouts of files are provided on pages 10–17

Test 1d → default.ip3 vs gdefault.def (no discrepancies)
~~gdefault~~ 3/26/00

Test 1g → ggenii.def vs CNWRA 97-009 Appx B (two minor inconsistencies noted 1) production values for crops in ggenii.def do not match consumption - this prod parameter only affect population dose (we do individual dose) so irrelevant, 2) poultry holdup is 20 days instead of 1 - this is also of low significance since the short duration will not sig impact long lived radionuclides).

Test 1h → tpa.inp vs CNWRA 97-009, Appx B (no discrepancies, except Cl Kd and Se Kd for soil were changed from 0 and 150 to 0.25 and 55 to reflect source data).

3/26/00 note that since tpa.inp will be updated with Appx A values from TPA 4 user manual the Kds will be corrected then

~~The following files were compared by spreadsheet~~ 3/26/00 3/26/00

Test 1f → gnewdf.dat vs Fed Guidance Rept #11 (1 discrepancy - Ag108m value for inhalation is incorrect - should be 7.66E-8 Sv/Bq)
(Adult FG11) (EPA, 1988)

3/26/00
Results of GENTPA Setup Test: Test #1 (cont'd).

The following files were compared by spreadsheet.

Test 1e → ftrans.ip3 vs gftrans.def (no discrepancies) see FTRANS.X/S

Test 1b → gamen.dat vs ggamen.dat (no discrepancies) see GAMEN.X/S

Test 1c → ggrdf.dat vs Federal Guidance 12 (EPA, 1993) (12 small rounding error identified at 3rd decimal place - considered to be too minor to change.
(Air submersion and soil surface values only)

Test 1b → ~~g~~rmdlib.dat vs grmdlib.dat (no discrepancies) see RMDLIB.X/S

Results of GENTPA Setup Test: Test #2
Call files referenced in this section are on zip disk #1
\GENTPAsetupTest\Test2)
3/26/00 following execution of TPA4.0

The following files were compared by visual inspection for consistency
Printouts of files are provided on pages

Test 2b → tpa.inp vs ggenii.inp (no discrepancies)

Test 2c → ggenii.def vs ggenii.inp (no discrepancies)

Test 2d → ggenii.out vs ggenii.inp (no discrepancies - but suggest adding space between total prod and human consumption holdup for readability).

3/26/00

Results of GENTPA Setup Test: Test #2 (cont)

Test 2e → gdefault.inp vs tpa.inp (1 discrepancy - breathing rates are not included in tpa.inp - thus TPA4.0 code was modified to include these parameters).
(Cronic Breathing Rate
3/24/00 Soil Density
~~Soil Ingestion~~
Interception fraction / Fmgate
Depth of surface soil)

Test 2f → gftrans.def vs gftrans.inp (no discrepancies) (see GFTRANS.xls)

Discussion and Conclusions for GENTPA setup Tests 1 and 2

Test #1 found only minor (insignificant) discrepancies except the Ag 108m inhalation dose coefficient in gnewdf.dat that needed to be changed to be consistent with Fed Guidance #11 report (EPA, 1988) value. This correction was made and submitted to A. Janetzke on 3/24/00. Test #2 found no discrepancies except the need to include breathing rates in tpa.inp. This change was made to TPA4.0 Beta and confirmed to work as intended. Therefore, all tests have PASSED

3/26/00

~~Work Plan for GENTPA Execution Tests~~ 3/26/00

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Printouts for GENTPA setup Test 1d

GENII data

G:/rbenke/default.ip3

GENII Default Parameter Values for Current YM Biosphere (16-Jul-97 PAL)

INVENTORY PARAMETERS----------		
0.037, 3.7E4, 3.7E7, 3.7E10, 1.0	NVU	Source input conversion
1.0, 0.15, 224.0	SVU	Soil source conversion
ENVIRONMENTAL PARAMETERS----------		
0.008	ABSHUM	Absolute humidity (kg/m3)
2	PRCNTI	Air dispersion conserv. flag
0.001	DPVRES	Deposition vel./resuspension
4.4E-10	LEAFRS	Leaf resuspension factor
2.0,2.0,3.0,0.8,0.8,0.8,1.0,0.8,1.0,1.5	BIOMAS	BIOMA2 Biomass (kg/m2)
0.4	DEPFR2	Interception frac./irrigate
15.0	SURCM	Depth of surface soil (cm)
225.0	SLDN	Surface soil density (kg/m2)
1.5E3	SSLDN	Soil density (kg/m3)
True	HARVST	Harvest removal considered?
50.0	SOLING	Soil ingested (mg/da)
14.0	WTIM	Weathering time (da)
1.0, 0.1, 0.1, 0.1	TRANS	Translocation, plants
0.1, 0.1, 0.1, 0.1, 1.0, 1.0	TRANSA	Translocation, animal food
33.0, 0.08, 73.0, 0.11, 33.0, 73.0	CONSUM	Animal Consumption (kg/da)
60.0, 0.3, 100., 0.3	DWATER	Animal drinking water (L/da)
0.0, 0.8, 1.0, 0.8	FRACUT	Acute fresh forage by season
0.2, 0.3, 0.5, 1.0	SHORWI	Shore width factors
0.02	INGWAT	Swim water ingested (L/hr)
25295.0	TCWS	H2O/sed. transfer (L/m2/yr)
0.4, 5.0, 4.0	YELDBT	BIOT: Veg. prod. (kg/m2/yr)
9.41E-4, 2*7.48E-4	TOTEXC	BIOT: Excavation (m2/m3-yr)
1.0, 0.81, 0.19, 0.02, 0.008, 0.002,	EXCAV	BIOT: Frac. soil brought to surface from within the waste by animal excavation
1.0, 0.9, 0.096, 0.006, 0.0005, 0.0005,		
1.0, 0.9, 0.096, 0.006, 0.0005, 0.0005		
270.0	RINH	Chronic breathing (cm3/sec)
330.0	RINHA	Acute breathing (cm3/sec)
10	NDIST	Number of distances
805.0, 2414.0, 4023.0, 5632.0, 7241.0,		
12068.0, 24135.0, 40255.0, 56315.0,		
72405.0	X	JF/chi/Q/pop grid dist. (m)
0.2,0.25,0.18,0.91,3*0.22,0.91,2*0.22	DRYFAC,	DRYFA2 dry/wet ratio

METABOLIC PARAMETERS----------		
0.5, 50.0, 500.0		XDIV
0.5, 0.5, 0.95, 0.05, 0.8, 0.0, 0.0, 0.2, 0.0,		ADJ
0.1, 0.9, 0.5, 0.5, 0.15, 0.4, 0.4, 0.05, 0.0,		
0.01, 0.99, 0.01, 0.99, 0.05, 0.4, 0.4, 0.135, 0.015		
DOSE PARAMETERS----------		
0.25, 0.15, 0.12, 0.12, 0.03, 0.03, 5*0.06	WT	Weighting factors
2.0	SI2I	Semi-infinite/inf

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Printouts for GENTPA setup Test 1d (contd)

gdefault.def

GENII Default Parameter Values for Current YM Biosphere (16-Jul-97 PAL)

INVENTORY PARAMETERS----------		
0.037, 3.7E4, 3.7E7, 3.7E10, 1.0	NVU	Source input conversion
1.0, 0.15, 224.0	SVU	Soil source conversion
ENVIRONMENTAL PARAMETERS----------		
0.008	ABSHUM	Absolute humidity (kg/m3)
2	PRCNTI	Air dispersion conserv. flag
0.001	DPVRES	Deposition vel./resuspension
4.4E-10	LEAFRS	Leaf resuspension factor
2.0,2.0,3.0,0.8,0.8,0.8,1.0,0.8,1.0,1.5	BIOMAS	BIOMA2 Biomass (kg/m2)
0.4	DEPFR2	Interception frac./irrigate
15.0	SURCM	Depth of surface soil (cm)
225.0	SLDN	Surface soil density (kg/m2)
1.5E3	SSLDN	Soil density (kg/m3)
True	HARVST	Harvest removal considered?
50.0	SOLING	Soil ingested (mg/da)
14.0	WTIM	Weathering time (da)
1.0, 0.1, 0.1, 0.1	TRANS	Translocation, plants
0.1, 0.1, 0.1, 0.1, 1.0, 1.0	TRANSA	Translocation, animal food
33.0, 0.08, 73.0, 0.11, 33.0, 73.0	CONSUM	Animal Consumption (kg/da)
60.0, 0.3, 100., 0.3	DWATER	Animal drinking water (L/da)
0.0, 0.8, 1.0, 0.8	FRACUT	Acute fresh forage by season
0.2, 0.3, 0.5, 1.0	SHORWI	Shore width factors
0.02	INGWAT	Swim water ingested (L/hr)
25295.0	TCWS	H2O/sed. transfer (L/m2/yr)
0.4, 5.0, 4.0	YELDBT	BIOT: Veg. prod. (kg/m2/yr)
9.41E-4, 2*7.48E-4	TOTEXC	BIOT: Excavation (m2/m3-yr)
1.0, 0.81, 0.19, 0.02, 0.008, 0.002,	EXCAV	BIOT: Frac. soil brought to surface from within the waste by animal excavation
1.0, 0.9, 0.096, 0.006, 0.0005, 0.0005,		
1.0, 0.9, 0.096, 0.006, 0.0005, 0.0005		
270.0	RINH	Chronic breathing (cm3/sec)
330.0	RINHA	Acute breathing (cm3/sec)
10	NDIST	Number of distances
805.0, 2414.0, 4023.0, 5632.0, 7241.0,		
12068.0, 24135.0, 40255.0, 56315.0,		
72405.0	X	JF/chi/Q/pop grid dist. (m)
0.2,0.25,0.18,0.91,3*0.22,0.91,2*0.22	DRYFAC,	DRYFA2 dry/wet ratio

METABOLIC PARAMETERS----------		
0.5, 50.0, 500.0		XDIV
0.5, 0.5, 0.95, 0.05, 0.8, 0.0, 0.0, 0.2, 0.0,		ADJ
0.1, 0.9, 0.5, 0.5, 0.15, 0.4, 0.4, 0.05, 0.0,		
0.01, 0.99, 0.01, 0.99, 0.05, 0.4, 0.4, 0.135, 0.015		
DOSE PARAMETERS----------		
0.25, 0.15, 0.12, 0.12, 0.03, 0.03, 5*0.06	WT	Weighting factors
2.0	SI2I	Semi-infinite/inf

home/rbeuke/ggenii.def

```
######################### Program GENII Input File ############  8 Jul 88 ####
Title: tpa4.0 input using genii w/ 93 update and CNWRA 97-009 data files
       \GENII\tpa.in                          Created on 02-10-2000 at 17:35
OPTIONS========================= Default ====================================
T    Near-field scenario?      (Far-field)    NEAR-FIELD: narrowly-focused
F    Population dose?          (Individual)                release, single site
F    Acute release?              (Chronic)    FAR-FIELD:  wide-scale release,
     Maximum Individual data set used                     multiple sites
                                Complete                                Complete
TRANSPORT OPTIONS============ Section   EXPOSURE PATHWAY OPTIONS===== Section
F  Air Transport                   1     F  Finite plume, external        5
F  Surface Water Transport         2     T  Infinite plume, external      5
F  Biotic Transport (near-field)  3,4    T  Ground, external              5
F  Waste Form Degradation (near)  3,4    F  Recreation, external          5
                                         T  Inhalation uptake             5,6
REPORT OPTIONS=======================    T  Drinking water ingestion      7,8
T  Report AEDE only                      F  Aquatic foods ingestion       7,8
T  Report by radionuclide                T  Terrestrial foods ingestion   7,9
T  Report by exposure pathway            T  Animal product ingestion      7,10
F  Debug report on screen                T  Inadvertent soil ingestion

INVENTORY ###############################################################################

 3    Inventory input activity units: (1-pCi  2-uCi  3-mCi  4-Ci  5-Bq)
 0    Surface soil source units (1- m2  2- m3  3- kg)
      Equilibrium question goes here

      --------|----Release Terms------|---------Basic Concentrations---------|
      Use when|  transport selected    |  near-field scenario, optionally      |
      --------|------------------------|---------------------------------------|
      Release |        Surface Buried  |        Surface Deep    Ground  Surface|
      Radio-  |Air     Water   Waste   |Air     Soil    Soil    Water   Water  |
      nuclide |/yr     /yr     /m3     |/m3     /unit   /m3     /L      /L     |
      --------|------- ------- -------|------- ------- ------- ------- -------|
   ✓  C 14                                                      1.0E+00
   ✓  CL36                                                      1.0E+00
   ✓  NI59                                                      1.0E+00
   ✓  NI63                                                      1.0E+00
   ✓  SE79                                                      1.0E+00
   ✓  SR90                                                      1.0E+00
   ✓  ZR93                                                      1.0E+00
   ✓  NB94                                                      1.0E+00
   ✓  MO93                                                      1.0E+00
   ✓  TC99                                                      1.0E+00
   ✓  PD107                                                     1.0E+00
   ✓  AG108M                                                    1.0E+00
   ✓  SN121M                                                    1.0E+00
   ✓  SN126                                                     1.0E+00
   ✓  I 129                                                     1.0E+00
   ✓  CS135                                                     1.0E+00
   ✓  CS137                                                     1.0E+00
   ✓  SM151                                                     1.0E+00
   ✓  PB210                                                     1.0E+00
   ✓  RA226                                                     1.0E+00
   ✓  AC227                                                     1.0E+00
   ✓  TH229                                                     1.0E+00
   ✓  TH230                                                     1.0E+00
```

several changes/comments

gsenii.def

```
   ✓  PA231                                                     1.0E+00
   ✓  U 232                                                     1.0E+00
   ✓  U 233                                                     1.0E+00
   ✓  U 234                                                     1.0E+00
   ✓  U 235                                                     1.0E+00
   ✓  U 236                                                     1.0E+00
   ✓  U 238                                                     1.0E+00
   ✓  NP237                                                     1.0E+00
   ✓  PU238  → not in Appendix E                                1.0E+00
   ✓  PU239                                                     1.0E+00
   ✓  PU240                                                     1.0E+00
   ✓  PU241  → not in Appendix E                                1.0E+00
   ✓  PU242                                                     1.0E+00
   ✓  AM241                                                     1.0E+00
   ✓  AM242M                                                    1.0E+00
   ✓  AM243                                                     1.0E+00
   ✓  CM243                                                     1.0E+00
   ✓  CM244                                                     1.0E+00
   ✓  CM245                                                     1.0E+00
   ✓  CM246                                                     1.0E+00

      --------|----Derived Concentrations-----|
      Use when|   measured values are known   |
      --------|-------------------------------|
      Release |Terres. Animal  Drink   Aquatic|
      Radio-  |Plant   Product Water   Food   |
      nuclide |/kg     /kg     /L      /kg    |
      --------|------- ------- ------- -------|

TIME ####################################################################################

   ✓  1    Intake ends after (yr)
   ✓  50   Dose calc. ends after (yr)
   ✓  0    Release ends after (yr)
   ✓  0    No. of years of air deposition prior to the intake period
   ✓  0    No. of years of irrigation water deposition prior to the intake period
           }
FAR-FIELD SCENARIOS (IF POPULATION DOSE) ################################################

   ✓  0        Definition option: 1-Use population grid in file POP.IN
   ✓  0                           2-Use total entered on this line

NEAR-FIELD SCENARIOS ####################################################################

            Prior to the beginning of the intake period: (yr)
   ✓  0       When was the inventory disposed?  (Package degradation starts)
   ✓  0       When was LOIC?  (Biotic transport starts)
   ✓  1.0   Fraction of roots in upper soil (top 15 cm)
   ✓  0     Fraction of roots in deep soil
      0.0   Manual redistribution: deep soil/surface soil dilution factor
      0     Source area for external dose modification factor (m2)
TRANSPORT ###############################################################################
            ====AIR TRANSPORT=========================================SECTION 1=====
                    0-Calculate PM                ✓ 0      Release type (0-3)
      1     Option: 1-Use chi/Q or PM value       ✓ F      Stack release (T/F)
                    2-Select MI dist & dir        ✓ 0      Stack height (m)
                    3-Specify MI dist & dir       ✓ 0      Stack flow (m3/sec)
```

check ✓ 3/29/00 cmat

gsen11.def

```
 0   Chi/Q or PM value                          0   Stack radius (m)
 0   MI sector index (1=S)                      0   Effluent temp. (C)
 0   MI distance from release point (m)         0   Building x-section (m2)
 T   Use jf data, (T/F) else chi/Q grid         0   Building height (m)

 ====SURFACE WATER TRANSPORT=========================SECTION 2=====
 0   Mixing ratio model: 0-use value, 1-river, 2-lake
 0   Mixing ratio, dimensionless
 0   Average river flow rate for: MIXFLG=0 (m3/s), MIXFLG=1,2 (m/s),
 0   Transit time to irrigation withdrawl location (hr)
     If mixing ratio model > 0:
 0     Rate of effluent discharge to receiving water body (m3/s)
 0     Longshore distance from release point to usage location (m)
 0     Offshore distance to the water intake (m)
 0     Average water depth in surface water body (m)
 0     Average river width (m), MIXFLG=1 only
 0     Depth of effluent discharge point to surface water (m), lake only

 ====WASTE FORM AVAILABILITY=========================SECTION 3=====
 0   Waste form/package half life, (yr)
 0   Waste thickness, (m)
 0   Depth of soil overburden, m

 ====BIOTIC TRANSPORT OF BURIED SOURCE===============SECTION 4=====
 F   Consider during inventory decay/buildup period (T/F)?
 F   Consider during intake period (T/F)?    | 1-Arid non agricultural
 0   Pre-Intake site condition..............| 2-Humid non agricultural
                                            | 3-Agricultural

 EXPOSURE ########################################################################

 ====EXTERNAL EXPOSURE===============================SECTION 5=====
 3384.0  Exposure time:                    |   Residential irrigation:
 1800.0    Plume (hr)                     |T      Consider: (T/F)
 0         Soil contamination (hr)        |1      Source: 1-ground water
 0         Swimming (hr)                  |               2-surface water
 0         Boating (hr)                   |58.0   Application rate (in/yr)
 0         Shoreline activities (hr)      |9.0    Duration (mo/yr)
 0       Shoreline type: (1-river, 2-lake, 3-ocean, 4-tidal basin)
 0       Transit time for release to reach aquatic recreation (hr)
 0       Average fraction of time submersed in acute cloud (hr/person hr)

 ====INHALATION======================================SECTION 6=====
 4200.0  Hours of exposure to contamination per year
 1.      0-No resus-  1-Use Mass Loading          2-Use Anspaugh model
 .0001     pension      Mass loading factor (g/m3)   Top soil available (cm)

 ====INGESTION POPULATION============================SECTION 7=====
 0       Atmospheric production definition (select option):
 2         0-Use food-weighted chi/Q, (food-sec/m3), enter value on this line
           1-Use population-weighted chi/Q
           2-Use uniform production
           3-Use chi/Q and production grids (PRODUCTION will be overridden)
 0       Population ingesting aquatic foods, 0 defaults to total (person)
 0       Population ingesting drinking water, 0 defaults to total (person)
 F       Consider dose from food exported out of region (default=F)
```


gsen11.def

Note below: S* or Source: 0-none, 1-ground water, 2-surface water
3-Derived concentration entered above

```
==== AQUATIC FOODS / DRINKING WATER INGESTION=========SECTION 8====

 F   Salt water? (default is fresh)

 USE          TRAN-   PROD-      -CONSUMPTION-  |
 ?   FOOD     SIT     UCTION     HOLDUP   RATE  |
 T/F TYPE     hr      kg/yr      da       kg/yr |      DRINKING WATER
 --- ------ ------ ---------- ------ ------ |-------------------------
 F   FISH     0.00   0.0E+00     0.00    0.0  | 1      Source (see above)
 F   MOLLUS   0.00   0.0E+00     0.00    0.0  | F      Treatment? T/F
 F   CRUSTA   0.00   0.0E+00     0.00    0.0  | 0.0    Holdup/transit(da)
 F   PLANTS   0.00   0.0E+00     0.00    0.0  | 30.0   Consumption (L/yr)

 ====TERRESTRIAL FOOD INGESTION=====================SECTION 9=====

 USE          GROW   --IRRIGATION--              PROD-     --CONSUMPTION--
 ?   FOOD     TIME   S RATE   TIME    YIELD      UCTION    HOLDUP    RATE
 T/F TYPE     da     * in/yr  mo/yr   kg/m2      kg/yr     da        kg/yr
 --- ------ ------ - ------ ------ ------     ---------- --------  ------
 T   LEAF V  80.00  1  60.0   3.0    2.0       0.0E+00     1.0       6.0
 T   ROOT V  85.00  1  60.0   5.0    4.0       0.0E+00    14.0      26.0
 T   FRUIT   80.00  1  60.0   2.5    3.0       0.0E+00    14.0      23.0
 T   GRAIN   75.00  1  60.0   5.0    0.54      0.0E+00    14.0      34.0
                                                          set to consumption rate

 ====ANIMAL PRODUCTION CONSUMPTION==================SECTION 10====

 USE          ---HUMAN---- TOTAL    DRINK     ------------STORED FEED-------------
 ?   FOOD     CONSUMPTION  PROD-    WATER     DIET  GROW  -IRRIGATION--        STOR-
 T/F TYPE     RATE  HOLDUP UCTION   CONTAM    FRAC- TIME  S RATE  TIME  YIELD AGE
              kg/yr  da    kg/yr    FRACT.    TION  da    * in/yr mo/yr kg/m3 da
 --- ------ ------ ------ ------ ------- ---- ---- - ------ ----- ----- ----
 T   BEEF    29.5   20.0   29.50   1.00   0.00  30.0 1 60.0   5.50  1.23  20.0
 T   POULTR   0.0   20.0    0.00   1.00   1.00  75.0 1 60.0   5.00  0.54  14.0
 T   MILK    100.0   1.0  100.00   1.00   0.00  30.0 1 60.0   5.50  1.23  20.0
 T   EGG       3.0   1.0    3.00   1.00   1.00  75.0 1 60.0   5.00  0.54  14.0
                                              ------------FRESH FORAGE-----------
     BEEF                                     0.56  46.0 1 60.0   5.50  1.23  1.0
     MILK                                     0.56  46.0 1 60.0   5.50  1.23  1.0

 ########################################################################
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16
3/27/00

(Home on Vulcan H:) /home/rbenke/tpg40/gnewdf.dat

Compare against FGR 11 (adult only; the highest values are used)

Intake-to-Dose Conversion Factors for Inhalation and Ingestion from ICRP72 and Federal Guidance 11 (Sv/Bq) PAL 1/24/00, (MAS 1-26-00 Ag108m added), (MAS 1-27-00 new FGR11 values for Bi210, Pb212, Bi212), (PAL 1-27-00 Np238 added)

Nuclide	Infant ing	Infant inh	Toddler ing	Toddler inh	Pre-teen ing	Pre-teen inh	Teen ing	Teen inh	Adult72 ing	Adult72 inh	AdultFG11 ing	AdultFG11 inh
start_data												
C 14	1.40E-09	1.90E-08	1.30E-09	1.40E-08	8.00E-10	7.40E-09	5.70E-10	6.40E-09	5.80E-10	5.80E-09	5.64E-10	5.64E-10
CL36	9.80E-09	3.10E-08	4.75E-09	2.05E-08	1.90E-09	1.00E-08	1.20E-09	8.80E-09	9.30E-10	7.30E-09	8.18E-10	5.93E-09
NI59	6.40E-10	1.70E-09	2.65E-10	1.23E-09	1.10E-10	5.90E-10	7.30E-11	4.60E-10	6.30E-11	4.40E-10	5.67E-11	7.31E-10
NI63	1.60E-09	4.80E-09	6.50E-10	3.50E-09	2.80E-10	1.70E-09	1.80E-10	1.30E-09	1.50E-10	1.30E-09	1.56E-10	1.70E-09
SE79	4.10E-08	2.30E-08	2.35E-08	1.65E-08	1.40E-08	8.70E-09	4.10E-09	7.60E-09	2.90E-09	6.80E-09	2.35E-09	2.66E-09
SR90	2.30E-07	4.20E-07	6.00E-08	3.35E-07	6.00E-08	1.80E-07	8.00E-08	1.60E-07	2.80E-08	1.60E-07	3.85E-08	3.51E-07
Y 90	3.10E-08	1.30E-08	1.50E-08	6.50E-09	5.90E-09	2.70E-09	3.30E-09	1.80E-09	2.70E-09	1.50E-09	2.91E-09	2.28E-09
MO93	7.90E-09	6.00E-09	5.95E-09	4.90E-09	4.00E-09	2.80E-09	3.40E-09	2.40E-09	3.10E-09	2.30E-09	3.64E-10	7.68E-09
ZR93	1.20E-09	7.00E-09	6.35E-10	5.45E-09	5.80E-10	3.30E-09	8.60E-10	3.30E-09	1.10E-09	3.30E-09	4.48E-10	8.67E-08
NB93M	1.50E-09	7.40E-09	6.85E-10	5.20E-09	2.70E-10	2.50E-09	1.50E-10	1.90E-09	1.20E-10	1.80E-09	1.41E-10	7.90E-09
NB94	1.50E-08	1.20E-07	7.50E-09	1.02E-07	3.40E-09	5.80E-08	2.10E-09	5.20E-08	1.70E-09	4.90E-08	1.93E-09	1.12E-07
TC99	1.00E-08	4.10E-08	3.55E-09	3.05E-08	1.30E-09	1.70E-08	8.20E-10	1.50E-08	6.40E-10	1.30E-08	3.95E-10	2.25E-09
PD107	4.40E-10	2.20E-09	2.10E-10	1.65E-09	8.10E-11	7.80E-10	4.60E-11	6.20E-10	3.70E-11	5.90E-10	4.04E-11	3.45E-09
AG108M	2.10E-08	8.90E-08	8.75E-09	7.45E-08	4.30E-09	4.40E-08	2.80E-09	3.90E-08	2.30E-09	3.70E-08	2.06E-09	~~2.17E-08~~ 7.66E-08
SN121M	4.60E-09	1.90E-08	2.05E-09	1.21E-08	8.20E-10	6.40E-09	4.70E-10	5.50E-09	3.80E-10	4.50E-09	4.19E-10	3.11E-09
SN121	2.60E-09	1.50E-09	1.27E-09	8.00E-10	5.00E-10	3.60E-10	2.80E-10	2.90E-10	2.30E-10	2.30E-10	2.44E-10	1.38E-10
SN126	5.00E-08	1.20E-07	2.30E-08	8.10E-08	9.80E-09	4.10E-08	5.90E-09	3.30E-08	4.70E-09	2.80E-08	5.27E-09	2.69E-08
SB126M	3.90E-10	1.80E-10	1.60E-10	1.80E-10	6.60E-11	3.70E-11	4.50E-11	2.40E-11	3.60E-11	2.00E-11	2.54E-11	9.17E-12
SB126	2.80E-08	1.90E-08	1.10E-08	1.20E-08	4.90E-09	5.00E-09	3.10E-09	4.00E-09	2.40E-09	3.20E-09	2.89E-09	3.17E-09
I 129	1.80E-07	7.20E-08	1.95E-07	7.35E-08	1.90E-07	6.70E-08	1.40E-07	4.60E-08	1.10E-07	3.60E-08	7.46E-08	4.69E-08
CS135	4.10E-09	2.70E-08	2.00E-09	2.00E-08	1.70E-09	1.10E-08	2.00E-09	9.50E-09	2.00E-09	8.60E-09	1.91E-09	1.23E-09
CS137	2.10E-08	1.10E-07	1.08E-08	8.50E-08	1.00E-08	4.80E-08	1.30E-08	4.20E-08	1.30E-08	3.90E-08	1.35E-08	8.63E-09
SM151	1.50E-09	1.10E-08	4.85E-10	8.35E-09	2.00E-10	4.50E-09	1.20E-10	4.00E-09	9.80E-11	4.00E-09	1.05E-10	8.10E-09
TH230	4.10E-06	2.10E-04	3.60E-07	1.70E-04	2.40E-07	1.10E-04	2.20E-07	9.90E-05	2.10E-07	1.00E-04	1.48E-07	8.80E-05
RA226	4.70E-06	3.40E-05	7.90E-07	2.40E-05	8.00E-07	1.20E-05	1.50E-06	1.00E-05	2.80E-07	9.50E-06	3.58E-07	2.32E-06
RN222	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PB210	8.40E-06	1.80E-05	2.90E-06	1.45E-05	1.90E-06	7.20E-06	1.90E-06	5.90E-06	6.90E-07	5.60E-06	1.45E-06	3.67E-06
BI210	1.50E-08	3.90E-07	7.30E-09	2.40E-07	2.90E-09	1.30E-07	1.60E-09	1.10E-07	1.30E-09	9.30E-08	1.73E-09	5.29E-08
PO210	2.60E-05	1.80E-05	6.60E-06	1.10E-05	2.60E-06	5.90E-06	1.60E-06	5.10E-06	1.20E-06	4.30E-06	5.14E-07	2.54E-06
U 232	2.50E-06	1.00E-04	7.00E-07	8.15E-05	5.70E-07	4.30E-05	6.40E-07	3.80E-05	3.30E-07	3.70E-05	3.54E-07	1.78E-04
TH232	4.60E-06	2.30E-04	4.00E-07	1.90E-04	2.90E-07	1.30E-04	2.50E-07	1.20E-04	2.30E-07	1.10E-04	7.38E-07	4.43E-04
RA228	3.00E-05	4.90E-05	4.60E-06	4.00E-05	3.90E-06	2.00E-05	5.30E-06	1.60E-05	6.90E-07	1.60E-05	3.88E-07	1.29E-06
AC228	7.40E-09	1.80E-07	2.10E-09	1.30E-07	8.70E-10	5.70E-08	5.30E-10	2.90E-08	4.30E-10	2.50E-08	5.85E-10	8.33E-08
TH228	3.70E-06	1.60E-04	3.00E-07	1.10E-04	1.50E-07	5.50E-05	9.40E-08	4.70E-05	7.20E-08	4.00E-05	1.07E-07	9.23E-05
RA224	2.70E-06	1.20E-05	5.10E-07	7.60E-06	2.60E-07	4.40E-06	2.00E-07	4.20E-06	6.50E-08	3.40E-06	9.89E-08	8.53E-07
PB212	1.50E-07	1.80E-05	4.80E-08	1.10E-05	2.00E-08	5.90E-06	1.30E-08	5.10E-06	6.00E-09	4.30E-06	1.23E-08	4.56E-08
BI212	3.20E-09	1.60E-07	1.30E-09	8.50E-08	5.00E-10	4.40E-08	3.30E-10	3.80E-08	2.60E-10	3.10E-08	2.87E-10	5.83E-09
U 234	3.70E-07	3.30E-05	1.09E-07	2.40E-05	7.40E-08	1.20E-05	7.40E-08	1.00E-05	4.90E-08	9.40E-06	7.66E-08	3.58E-05
U 236	3.50E-07	3.10E-05	1.07E-07	2.25E-05	7.00E-08	1.10E-05	7.00E-08	9.50E-06	4.70E-08	8.70E-06	7.26E-08	3.39E-05
U 235	3.50E-07	3.00E-05	1.08E-07	2.15E-05	7.10E-08	1.10E-05	7.00E-08	9.20E-06	4.70E-08	8.50E-06	7.19E-08	3.32E-05
TH231	3.90E-09	2.40E-09	1.80E-09	1.20E-09	7.40E-10	5.20E-10	4.20E-10	4.10E-10	3.40E-10	3.30E-10	3.65E-10	2.37E-10
PA231	1.30E-05	2.20E-04	1.20E-06	2.10E-04	9.20E-07	1.50E-04	8.00E-07	1.50E-04	7.10E-07	1.40E-04	2.86E-06	3.47E-04
AC227	3.30E-05	1.70E-03	2.65E-06	1.30E-03	1.50E-06	7.20E-04	1.20E-06	5.60E-04	1.10E-06	5.50E-04	3.80E-06	1.81E-03
TH227	3.00E-07	3.90E-05	5.30E-08	2.40E-05	2.30E-08	1.40E-05	1.50E-08	1.30E-05	8.80E-09	1.00E-05	1.03E-08	4.37E-06
FR223	2.60E-08	1.10E-08	1.30E-08	5.20E-09	5.00E-09	1.90E-09	2.90E-09	1.00E-09	2.40E-09	8.90E-10	2.33E-09	1.68E-09
RA223	5.30E-06	3.20E-05	8.40E-07	2.00E-05	4.50E-07	1.10E-05	3.70E-07	1.10E-05	1.00E-07	8.70E-06	1.78E-07	2.12E-06

Ag, Inhalation DCF (Sv/Bq)
108m Ag 7.66 E-08
110m Ag 2.17 E-08

3/10/00

3/27/00

NP237	2.00E-06	9.80E-05	1.75E-07	7.65E-05	1.10E-07	5.00E-05	1.10E-07	4.70E-05	1.10E-07	5.00E-05	1.20E-06	1.46E-04
PA233	9.70E-09	1.70E-08	4.70E-09	1.00E-08	1.90E-09	5.50E-09	1.10E-09	4.90E-09	8.70E-10	3.90E-09	9.81E-10	2.58E-09
U 233	3.80E-07	3.40E-05	1.16E-07	2.45E-05	7.80E-08	1.20E-05	7.80E-08	1.10E-05	5.10E-08	9.60E-06	7.81E-08	3.66E-05
TH229	1.10E-05	5.40E-04	8.90E-07	4.35E-04	6.20E-07	2.90E-04	5.30E-07	2.40E-04	4.90E-07	2.40E-04	9.54E-07	5.80E-04
RA225	7.10E-06	2.80E-05	9.00E-07	1.80E-05	5.00E-07	1.00E-05	4.40E-07	9.80E-06	9.90E-08	7.70E-06	1.04E-07	2.10E-06
AC225	4.60E-07	3.10E-05	1.40E-07	1.90E-05	5.40E-08	1.10E-05	3.00E-08	1.10E-05	2.40E-08	8.50E-06	3.00E-08	2.92E-06
U 238	3.40E-07	2.90E-05	1.00E-07	2.05E-05	6.80E-08	1.00E-05	6.70E-08	8.70E-06	4.50E-08	8.00E-06	6.88E-08	3.20E-05
TH234	4.00E-08	4.10E-08	1.90E-08	4.00E-08	7.40E-09	1.10E-08	4.20E-09	9.10E-09	3.40E-09	7.70E-09	3.69E-09	9.47E-09
PA234	5.00E-09	2.90E-09	2.40E-09	1.60E-09	1.00E-09	7.10E-10	6.40E-09	5.00E-10	5.10E-10	4.00E-10	5.84E-10	2.20E-10
AM242M	3.10E-06	1.60E-04	2.65E-07	1.30E-04	2.00E-07	9.40E-05	1.90E-07	8.80E-05	1.90E-07	9.20E-05	9.50E-07	1.15E-04
AM242	5.00E-09	8.00E-08	1.60E-09	5.00E-08	6.40E-10	2.70E-08	3.70E-10	2.40E-08	3.00E-10	2.00E-08	3.81E-10	1.58E-08
CM242	5.90E-07	2.40E-05	5.80E-08	1.60E-05	2.40E-08	8.20E-06	1.50E-08	7.30E-06	1.20E-08	5.90E-06	3.10E-08	4.67E-06
PU242	4.00E-06	2.00E-04	3.60E-07	1.65E-04	2.60E-07	1.20E-04	2.30E-07	1.10E-04	2.40E-07	1.10E-04	9.08E-07	1.11E-04
NP238	9.50E-09	9.90E-09	4.70E-09	6.40E-09	1.90E-09	3.70E-09	1.10E-09	3.30E-09	9.10E-10	3.50E-09	1.08E-09	1.00E-08
PU238	4.00E-06	2.00E-04	3.55E-07	1.65E-04	2.40E-07	1.10E-04	2.20E-07	1.00E-04	2.30E-07	1.10E-04	8.65E-07	1.06E-04
CM244	2.90E-06	1.50E-04	2.40E-07	1.07E-04	1.40E-07	6.10E-05	1.20E-07	5.30E-05	1.20E-07	5.70E-05	5.45E-07	6.70E-05
PU244	4.00E-06	2.00E-04	3.60E-07	1.60E-04	2.60E-07	1.20E-04	2.30E-07	1.10E-04	2.40E-07	1.10E-04	8.97E-07	1.09E-04
U 240	1.30E-08	4.90E-09	3.20E-09	2.40E-09	2.40E-09	1.10E-09	1.40E-09	7.00E-10	1.10E-09	5.80E-10	1.20E-09	6.13E-10
PU240	4.20E-06	2.10E-04	3.80E-07	1.80E-04	2.70E-07	1.20E-04	2.40E-07	1.10E-04	2.50E-07	1.20E-04	9.56E-07	1.16E-04
CM245	3.70E-06	1.90E-04	3.25E-07	1.50E-04	2.30E-07	1.00E-04	2.10E-07	9.40E-05	2.10E-07	9.90E-05	1.01E-06	1.23E-04
PU241	5.60E-08	2.80E-06	5.60E-09	2.75E-06	5.10E-09	2.40E-06	4.80E-09	2.20E-06	4.80E-09	2.30E-06	1.85E-08	2.23E-06
AM241	3.70E-06	1.80E-04	3.20E-07	1.50E-04	2.20E-07	1.00E-04	2.00E-07	9.20E-05	2.00E-07	9.60E-05	9.84E-07	1.20E-04
CM246	3.70E-06	1.90E-04	3.25E-07	1.50E-04	2.20E-07	1.00E-04	2.10E-07	9.40E-05	2.10E-07	9.80E-05	1.00E-06	1.22E-04
CM243	3.20E-06	1.60E-04	2.75E-07	1.23E-04	1.60E-07	7.30E-05	1.40E-07	6.50E-05	1.50E-07	6.90E-05	6.79E-07	8.30E-05
PU243	1.00E-09	6.00E-10	4.60E-10	3.00E-10	1.80E-10	1.40E-10	1.10E-10	9.20E-11	8.50E-11	8.60E-11	9.02E-11	4.44E-11
AM243	3.60E-06	1.80E-04	3.20E-07	1.45E-04	2.20E-07	1.00E-04	2.00E-07	9.10E-05	2.00E-07	9.60E-05	9.79E-07	1.19E-04
NP239	8.90E-09	5.60E-09	4.30E-09	3.10E-09	1.70E-09	1.60E-09	1.00E-09	1.30E-09	8.00E-10	1.00E-09	8.82E-10	6.78E-10
PU239	4.20E-06	2.10E-04	3.75E-07	1.75E-04	2.70E-07	1.20E-04	2.40E-07	1.10E-04	2.50E-07	1.20E-04	9.56E-07	1.16E-04

ggenii.def

```
######################### Program GENII Input File ############  8 Jul 88 ####
Title: tpa4.0 input using genii w/ 93 update and CNWRA 97-009 data files
       \GENII\tpa.in                                Created on 02-10-2000 at 17:35
OPTIONS========================= Default ========================================
T    Near-field scenario?       (Far-field)     NEAR-FIELD: narrowly-focused
F    Population dose?           (Individual)                 release, single site
F    Acute release?               (Chronic)     FAR-FIELD:  wide-scale release,
     Maximum Individual data set used                       multiple sites
                                        Complete                          Complete
TRANSPORT OPTIONS============ Section   EXPOSURE PATHWAY OPTIONS===== Section
F  Air Transport                  1      F  Finite plume, external        5
F  Surface Water Transport        2      T  Infinite plume, external      5
F  Biotic Transport (near-field)  3,4    T  Ground, external              5
F  Waste Form Degradation (near)  3,4    F  Recreation, external          5
                                         T  Inhalation uptake             5,6
REPORT OPTIONS=======================    T  Drinking water ingestion      7,8
T  Report AEDE only                      F  Aquatic foods ingestion       7,8
T  Report by radionuclide                T  Terrestrial foods ingestion   7,9
T  Report by exposure pathway            T  Animal product ingestion      7,10
F  Debug report on screen                T  Inadvertent soil ingestion

INVENTORY ##############################################################################
3  Inventory input activity units: (1-pCi  2-uCi  3-mCi  4-Ci  5-Bq)
0  Surface soil source units (1- m2  2- m3  3- kg)
   Equilibrium question goes here

--------|----Release Terms------|----------Basic Concentrations---------|
Use when|  transport selected   |  near-field scenario, optionally      |
--------|-----------------------|---------------------------------------|
Release |        Surface Buried |        Surface Deep     Ground  Surface|
Radio-  |Air     Water   Waste  |Air     Soil    Soil     Water   Water |
nuclide |/yr     /yr     /m3   |/m3     /unit   /m3      /L      /L    |
--------|------- ------- -------|------- ------- ------- ------- -------|
C 14                                                    1.0E+00
CL36                                                    1.0E+00
NI59                                                    1.0E+00
NI63                                                    1.0E+00
SE79                                                    1.0E+00
SR90                                                    1.0E+00
ZR93                                                    1.0E+00
NB94                                                    1.0E+00
MO93                                                    1.0E+00
TC99                                                    1.0E+00
PD107                                                   1.0E+00
AG108M                                                  1.0E+00
SN121M                                                  1.0E+00
SN126                                                   1.0E+00
I 129                                                   1.0E+00
CS135                                                   1.0E+00
CS137                                                   1.0E+00
SM151                                                   1.0E+00
PB210                                                   1.0E+00
RA226                                                   1.0E+00
AC227                                                   1.0E+00
TH229                                                   1.0E+00
TH230                                                   1.0E+00
```

RRB 3/12/00 ✓

ggenii.inp

```
######################### Program GENII Input File ############  8 Jul 88 ####
Title: tpa4.0 input using genii w/ 93 update and CNWRA 97-009 data files
       \GENII\tpa.in                                Created on 02-10-2000 at 17:35
OPTIONS========================= Default ========================================
T    Near-field scenario?       (Far-field)     NEAR-FIELD: narrowly-focused
F    Population dose?           (Individual)                 release, single site
F    Acute release?               (Chronic)     FAR-FIELD:  wide-scale release,
     Maximum Individual data set used                       multiple sites
                                        Complete                          Complete
TRANSPORT OPTIONS============ Section   EXPOSURE PATHWAY OPTIONS===== Section
F  Air Transport                  1      F  Finite plume, external        5
F  Surface Water Transport        2      T  Infinite plume, external      5
F  Biotic Transport (near-field)  3,4    T  Ground, external              5
F  Waste Form Degradation (near)  3,4    F  Recreation, external          5
                                         T  Inhalation uptake             5,6
REPORT OPTIONS=======================    T  Drinking water ingestion      7,8
T  Report AEDE only                      F  Aquatic foods ingestion       7,8
T  Report by radionuclide                T  Terrestrial foods ingestion   7,9
T  Report by exposure pathway            T  Animal product ingestion      7,10
F  Debug report on screen                T  Inadvertent soil ingestion

INVENTORY ##############################################################################
3  Inventory input activity units: (1-pCi  2-uCi  3-mCi  4-Ci  5-Bq)
0  Surface soil source units (1- m2  2- m3  3- kg)
   Equilibrium question goes here

--------|----Release Terms------|----------Basic Concentrations---------|
Use when|  transport selected   |  near-field scenario, optionally      |
--------|-----------------------|---------------------------------------|
Release |        Surface Buried |        Surface Deep     Ground  Surface|
Radio-  |Air     Water   Waste  |Air     Soil    Soil     Water   Water |
nuclide |/yr     /yr     /m3   |/m3     /unit   /m3      /L      /L    |
--------|------- ------- -------|------- ------- ------- ------- -------|
C 14                                                    1.0E+00
CL36                                                    1.0E+00
NI59                                                    1.0E+00
NI63                                                    1.0E+00
SE79                                                    1.0E+00
SR90                                                    1.0E+00
ZR93                                                    1.0E+00
NB94                                                    1.0E+00
MO93                                                    1.0E+00
TC99                                                    1.0E+00
PD107                                                   1.0E+00
AG108M                                                  1.0E+00
SN121M                                                  1.0E+00
SN126                                                   1.0E+00
I 129                                                   1.0E+00
CS135                                                   1.0E+00
CS137                                                   1.0E+00
SM151                                                   1.0E+00
PB210                                                   1.0E+00
RA226                                                   1.0E+00
AC227                                                   1.0E+00
TH229                                                   1.0E+00
TH230                                                   1.0E+00
```

RRB 3/13/00 ✓

ggenii.out

Default value changed from	1.0E-09	to	4.4E-10	for parameter	LEAFRS
Default value changed from	2.5E-01	to	4.0E-01	for parameter	DEPFR2
Default value changed from	2.2E+02	to	2.2E+02	for parameter	SHDN
Default value changed from	1.5E+03	to	5.0E+01	for parameter	SOLING
Default value changed from	6.8E+01	to	3.3E+01	for parameter	CONSUM(n)
Default value changed from	1.2E-01	to	8.0E-02	for parameter	CONSUM(n)
Default value changed from	5.5E+01	to	7.3E+01	for parameter	CONSUM(n)
Default value changed from	1.2E-01	to	1.1E-01	for parameter	CONSUM(n)
Default value changed from	6.8E+01	to	3.3E+01	for parameter	CONSUM(n)
Default value changed from	5.5E+01	to	7.3E+01	for parameter	CONSUM(n)
Default value changed from	5.0E+01	to	6.0E+01	for parameter	DWATER(n)
Default value changed from	6.0E+01	to	1.0E+02	for parameter	DWATER(n)
Default value changed from	8.0E+02	to	2.0E-01	for DRYFAC	1
Default value changed from	5.6E+03	to	9.1E-01	for DRYFAC	4
Default value changed from	7.2E+03	to	2.2E-01	for DRYFA2	1
Default value changed from	1.2E+04	to	2.2E-01	for DRYFA2	2
Default value changed from	2.4E+04	to	2.2E-01	for DRYFA2	3
Default value changed from	4.0E+04	to	9.1E-01	for DRYFA2	4
Default value changed from	5.6E+04	to	2.2E-01	for DRYFA2	5
Default value changed from	7.2E+04	to	2.2E-01	for DRYFA2	6

GENTPA Dose Calculation Program
(Version 1.0 11-Feb-00)

Case title: tpa4.0 input using genii w/ 93 update and CNWRA 97-009 data files
Executed on: 13-Mar-00 at 13:20:33 Page 0

See last page

BRB 3/13/00

ggenii.out 3/27/00

GENTPA Dose Calculation Program
(Version 1.0 11-Feb-00)

Case title: tpa4.0 input using genii w/ 93 update and CNWRA 97-009 data files
Executed on: 13-Mar-00 at 13:20:33 Page A. 1

This is a near field (narrowly-focused, single site) scenario.
Release is chronic
Individual dose

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
- Infinite plume, external
- Ground, external
- Inhalation uptake
- Drinking water ingestion
- Terrestrial foods ingestion
- Animal product ingestion
- Inadvertent soil ingestion

THE FOLLOWING TIMES ARE USED:
- Intake ends after (yr): 1.0
- Dose calculations ends after (yr): 50.0

========== FILENAMES AND TITLES OF FILES/LIBRARIES USED ==========

Input file name: \GENII\tpa.in
GENII Default Parameter Values for Current YM Biosphere (16-Jul-97 P
Radionuclide Master Library (11/28/90 RAP)(1-26-00 MAS Ag108m adde
IAEA Food Transfer Factors - (SJM 19-MAR-95)(PAL 15-Jul-97)(UPDATED
Bioaccumulation Factor Library - (30-Aug-88) RAP
FGR 12 External DCFs(per-Sv/yr per Bq/n) (SJM/PAL) for 43 TSPA Nucli
Worst-Case Solubilities, Yearly Dose Increments (25-Mar-96 PDR)

==========

1 Surface soil input unit: (1-m2, 2-m3, 3-kg)

Release Radio-nuclide	Air mCi/L	Basic Concentrations: Surface Soil mCi/m2	Deep Soil mCi/m3	Ground Water mCi/L	Surface Water mCi/L
C 14	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
CL36	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
NI59	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
NI63	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
SE79	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
SR90	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
ZR93	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
NB94	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
MO93	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
TC99	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
PD107	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
AG108M	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
SN121M	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00

gsen11.def

PA231	1.0E+00
U 232	1.0E+00
U 233	1.0E+00
U 234	1.0E+00
U 235	1.0E+00
U 236	1.0E+00
U 238	1.0E+00
NP237	1.0E+00
PU238	1.0E+00
PU239	1.0E+00
PU240	1.0E+00
PU241	1.0E+00
PU242	1.0E+00
AM241	1.0E+00
AM242M	1.0E+00
AM243	1.0E+00
CM243	1.0E+00
CM244	1.0E+00
CM245	1.0E+00
CM246	1.0E+00

Use when	Derived Concentrations - measured values are known			
Release Radio-nuclide	Terres. Plant /kg	Animal Product /kg	Drink Water /L	Aquatic Food /kg

```
TIME ###############################################################################

1     Intake ends after (yr)
50    Dose calc. ends after (yr)
0     Release ends after (yr)
0     No. of years of air deposition prior to the intake period
0     No. of years of irrigation water deposition prior to the intake period

FAR-FIELD SCENARIOS (IF POPULATION DOSE) ###########################################

0          Definition option: 1-Use population grid in file POP.IN
0                             2-Use total entered on this line

NEAR-FIELD SCENARIOS ###############################################################

           Prior to the beginning of the intake period: (yr)
0            When was the inventory disposed?  (Package degradation starts)
0            When was LOIC?  (Biotic transport starts)
1.0        Fraction of roots in upper soil (top 15 cm)
0          Fraction of roots in deep soil
0.0        Manual redistribution: deep soil/surface soil dilution factor
0          Source area for external dose modification factor (m2)
TRANSPORT ##########################################################################
           ====AIR TRANSPORT=================================SECTION 1=====
                  0-Calculate PM            |0        Release type (0-3)
1          Option: 1-Use chi/Q or PM value   |F        Stack release (T/F)
                  2-Select MI dist & dir    |0        Stack height (m)
                  3-Specify MI dist & dir   |0        Stack flow (m3/sec)
```

3/27/00

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PA231	1.0E+00
U 232	1.0E+00
U 233	1.0E+00
U 234	1.0E+00
U 235	1.0E+00
U 236	1.0E+00
U 238	1.0E+00
NP237	1.0E+00
PU238	1.0E+00
PU239	1.0E+00
PU240	1.0E+00
PU241	1.0E+00
PU242	1.0E+00
AM241	1.0E+00
AM242M	1.0E+00
AM243	1.0E+00
CM243	1.0E+00
CM244	1.0E+00
CM245	1.0E+00
CM246	1.0E+00

Use when	Derived Concentrations - measured values are known			
Release Radio-nuclide	Terres. Plant /kg	Animal Product /kg	Drink Water /L	Aquatic Food /kg

```
TIME ###############################################################################

1     Intake ends after (yr)
50    Dose calc. ends after (yr)
0     Release ends after (yr)
0     No. of years of air deposition prior to the intake period
0     No. of years of irrigation water deposition prior to the intake period

FAR-FIELD SCENARIOS (IF POPULATION DOSE) ###########################################

0          Definition option: 1-Use population grid in file POP.IN
0                             2-Use total entered on this line

NEAR-FIELD SCENARIOS ###############################################################

           Prior to the beginning of the intake period: (yr)
0            When was the inventory disposed?  (Package degradation starts)
0            When was LOIC?  (Biotic transport starts)
1.0        Fraction of roots in upper soil (top 15 cm)
0          Fraction of roots in deep soil
0.0        Manual redistribution: deep soil/surface soil dilution factor
0          Source area for external dose modification factor (m2)
TRANSPORT ##########################################################################
           ====AIR TRANSPORT=================================SECTION 1=====
                  0-Calculate PM            |0        Release type (0-3)
1          Option: 1-Use chi/Q or PM value   |F        Stack release (T/F)
                  2-Select MI dist & dir    |0        Stack height (m)
                  3-Specify MI dist & dir   |0        Stack flow (m3/sec)
```

gsen11.out

SN126	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
I 129	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
CS135	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
CS137	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
SM151	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
PB210	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
RA226	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
AC227	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
TH229	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
TH230	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
PA231	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
U 232	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
U 233	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
U 234	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
U 235	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
U 236	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
U 238	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
NP237	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
PU238	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
PU239	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
PU240	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
PU241	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
PU242	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
AM241	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
AM242M	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
AM243	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
CM243	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
CM244	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
CM245	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00
CM246	0.0E+00	0.0E+00	0.0E+00	1.0E+00	0.0E+00

========== NEAR-FIELD PARAMETERS ==========

0.0	Inventory disposed n years prior to beginning of intake period
0	LOIC occurred n years prior to beginning of intake period
1.0E+00	Fraction of roots in upper soil (top 15 cm)
0.0E+00	Fraction of roots in deep soil
0.0E+00	Manual redistribution: deep soil/surface soil dilution factor

========== EXTERNAL EXPOSURE ==========

3.4E+03	Hours of exposure to plume
1.8E+03	Hours of exposure to ground contamination
1	Residential irrigation source 1-ground water, 2-surface water
4.1E+01	Residential irrigation application rate (in/yr)
1.2E+01	Residential irrigation duration (mo/yr)

========== INHALATION ==========

4.2E+03	Hours of inhalation exposure per year
1	Resuspension model: 1-Mass Loading, 2-Anspaugh
1.0E-04	Mass loading factor (g/m3)

========== DRINKING WATER SOURCE/IRRIGATION ==========

7.3E+02	Drinking water consumption rate (l/yr)
1	Drinking water source: 1-ground, 2-surface, 3-system
F	Drinking water treatment: T/F
0.0	Drinking water transit/holdup time (d)

========== TERRESTRIAL FOOD INGESTION ==========

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FOOD TYPE	GROW TIME d	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD-UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	80.0	1	43.0	6.0	2.0	0.00E+00	1.0 6.0E+00
Oth. Veg	85.0	1	43.0	6.0	4.0	0.00E+00	14.0 2.6E+01
Fruit	80.0	1	43.0	6.0	3.0	0.00E+00	14.0 2.3E+01
Cereals	75.0	1	43.0	5.0	0.5	0.00E+00	14.0 3.4E+01

========== ANIMAL FOOD INGESTION ==========

FOOD TYPE	---HUMAN---- CONSUMPTION RATE kg/yr	HOLDUP d	TOTAL PROD-UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC-TION	STORED FEED- GROW TIME d	-IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m3	STOR-AGE d
Meat	3.0E+01	20.0	3.0E+01	1.00	0.0	30.00	1	60.0	5.5	1.23 20.0
Poultry	0.0E+00	20.0	0.0E+00	1.00	1.0	75.00	1	43.0	5.0	0.54 14.0
Cow Milk	1.0E+02	1.0	1.0E+02	1.00	0.0	30.00	1	60.0	5.5	1.23 20.0
Eggs	3.0E+00	1.0	3.0E+00	1.00	1.0	75.00	1	43.0	5.0	0.54 14.0
						FRESH FORAGE				
Meat					0.56	46.0	1	43.0	7.0	1.23 1.0
Cow Milk					0.56	46.0	1	43.0	7.0	1.23 1.0

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

qgen11.def

```
0          Chi/Q or PM value                          |0   Stack radius (m)
0          MI sector index (1=S)                      |0   Effluent temp. (C)
0          MI distance from release point (m)         |0   Building x-section (m2)
T          Use jf data, (T/F) else chi/Q grid         |0   Building height (m)

                ====SURFACE WATER TRANSPORT=========================SECTION 2=====
0          Mixing ratio model: 0-use value, 1-river, 2-lake
0          Mixing ratio, dimensionless
0          Average river flow rate for: MIXFLG=0 (m3/s), MIXFLG=1,2 (m/s),
0          Transit time to irrigation withdrawl location (hr)
           If mixing ratio model > 0:
0            Rate of effluent discharge to receiving water body (m3/s)
0            Longshore distance from release point to usage location (m)
0            Offshore distance to the water intake (m)
0            Average water depth in surface water body (m)
0            Average river width (m), MIXFLG=1 only
0            Depth of effluent discharge point to surface water (m), lake only

                ====WASTE FORM AVAILABILITY=========================SECTION 3=====
0          Waste form/package half life, (yr)
0          Waste thickness, (m)
0          Depth of soil overburden, m

                ====BIOTIC TRANSPORT OF BURIED SOURCE===============SECTION 4=====
T          Consider during inventory decay/buildup period (T/F)?
T          Consider during intake period (T/F)?   | 1-Arid non agricultural
0          Pre-Intake site condition.....         | 2-Humid non agricultural
                                                  | 3-Agricultural

EXPOSURE ##########################################################################

                ====EXTERNAL EXPOSURE===============================SECTION 5=====
                Exposure time:                    |  Residential irrigation:
3384.0            Plume (hr)                      | T      Consider: (T/F)
1800.0            Soil contamination (hr)         | 1      Source: 1-ground water
0                 Swimming (hr)                   |                2-surface water
0                 Boating (hr)                    | 58.0   Application rate (in/yr)
0                 Shoreline activities (hr)       | 9.0    Duration (mo/yr)
0          Shoreline type: (1-river, 2-lake, 3-ocean, 4-tidal basin)
0          Transit time for release to reach aquatic recreation (hr)
0          Average fraction of time submersed in acute cloud (hr/person hr)

                ====INHALATION=====================================SECTION 6=====
4200.0     Hours of exposure to contamination per year
1          0-No resus-  1-Use Mass Loading          2-Use Anspaugh model
.0001        pension      Mass loading factor (g/m3)   Top soil available (cm)

                ====INGESTION POPULATION===========================SECTION 7=====
0          Atmospheric production definition (select option):
2            0-Use food-weighted chi/Q, (food-sec/m3), enter value on this line
             1-Use population-weighted chi/Q
             2-Use uniform production
             3-Use chi/Q and production grids (PRODUCTION will be overridden)
0          Population ingesting aquatic foods, 0 defaults to total (person)
0          Population ingesting drinking water, 0 defaults to total (person)
F          Consider dose from food exported out of region (default=F)
```

3/27/00

qgen11.inp

```
0          Chi/Q or PM value                          |0   Stack radius (m)
0          MI sector index (1=S)                      |0   Effluent temp. (C)
0          MI distance from release point (m)         |0   Building x-section (m2)
T          Use jf data, (T/F) else chi/Q grid         |0   Building height (m)

                ====SURFACE WATER TRANSPORT=========================SECTION 2=====
0          Mixing ratio model: 0-use value, 1-river, 2-lake
0          Mixing ratio, dimensionless
0          Average river flow rate for: MIXFLG=0 (m3/s), MIXFLG=1,2 (m/s),
0          Transit time to irrigation withdrawl location (hr)
           If mixing ratio model > 0:
0            Rate of effluent discharge to receiving water body (m3/s)
0            Longshore distance from release point to usage location (m)
0            Offshore distance to the water intake (m)
0            Average water depth in surface water body (m)
0            Average river width (m), MIXFLG=1 only
0            Depth of effluent discharge point to surface water (m), lake only

                ====WASTE FORM AVAILABILITY=========================SECTION 3=====
0          Waste form/package half life, (yr)
0          Waste thickness, (m)
0          Depth of soil overburden, m

                ====BIOTIC TRANSPORT OF BURIED SOURCE===============SECTION 4=====
T          Consider during inventory decay/buildup period (T/F)?
T          Consider during intake period (T/F)?   | 1-Arid non agricultural
0          Pre-Intake site condition.....         | 2-Humid non agricultural
                                                  | 3-Agricultural

EXPOSURE ##########################################################################

                ====EXTERNAL EXPOSURE===============================SECTION 5=====
                Exposure time:                    |  Residential irrigation:
3384.0            Plume (hr)                      | T      Consider: (T/F)
1800.0            Soil contamination (hr)         | 1      Source: 1-ground water
0                 Swimming (hr)                   |                2-surface water
0                 Boating (hr)                    | 41.0   Application rate (in/yr)
0                 Shoreline activities (hr)       | 12.0   Duration (mo/yr)
0          Shoreline type: (1-river, 2-lake, 3-ocean, 4-tidal basin)
0          Transit time for release to reach aquatic recreation (hr)
0          Average fraction of time submersed in acute cloud (hr/person hr)

                ====INHALATION=====================================SECTION 6=====
4200.0     Hours of exposure to contamination per year
1          0-No resus-  1-Use Mass Loading          2-Use Anspaugh model
0.000100     pension      Mass loading factor (g/m3)   Top soil available (cm)

                ====INGESTION POPULATION===========================SECTION 7=====
0          Atmospheric production definition (select option):
2            0-Use food-weighted chi/Q, (food-sec/m3), enter value on this line
             1-Use population-weighted chi/Q
             2-Use uniform production
             3-Use chi/Q and production grids (PRODUCTION will be overridden)
0          Population ingesting aquatic foods, 0 defaults to total (person)
0          Population ingesting drinking water, 0 defaults to total (person)
F          Consider dose from food exported out of region (default=F)
```

gsen11.def

Note below: S* or Source: 0-none, 1-ground water, 2-surface water
3-Derived concentration entered above

AQUATIC FOODS / DRINKING WATER INGESTION ---- SECTION 8

Salt water? (default is fresh)

F

USE ? T/F	FOOD TYPE	TRANSIT hr	PRODUCTION kg/yr	CONSUMPTION HOLDUP da	CONSUMPTION RATE kg/yr	DRINKING WATER
F	FISH	0.00	0.0E+00	0.00	0.0	1 Source (see above)
F	MOLLUS	0.00	0.0E+00	0.00	0.0	F Treatment? T/F
F	CRUSTA	0.00	0.0E+00	0.00	0.0	0.0 Holdup/transit(da)
F	PLANTS	0.00	0.0E+00	0.00	0.0	730.0 Consumption (L/yr)

====TERRESTRIAL FOOD INGESTION==========SECTION 9=====

USE ? T/F	FOOD TYPE	GROW TIME da	IRRIGATION S *	IRRIGATION RATE in/yr	IRRIGATION TIME mo/yr	YIELD kg/m2	PRODUCTION kg/yr	CONSUMPTION HOLDUP da	CONSUMPTION RATE kg/yr
T	LEAF V	80.00	1	60.0	3.0	2.0	0.0E+00	1.0	6.0
T	ROOT V	85.00	1	60.0	5.0	4.0	0.0E+00	14.0	26.0
T	FRUIT	80.00	1	60.0	2.5	3.0	0.0E+00	14.0	23.0
T	GRAIN	75.00	1	60.0	5.0	0.54	0.0E+00	14.0	34.0

====ANIMAL PRODUCTION CONSUMPTION==========SECTION 10====

USE ? T/F	FOOD TYPE	HUMAN CONSUMPTION RATE kg/yr	HUMAN HOLDUP da	TOTAL PRODUCTION kg/yr	DRINK WATER CONTAM FRACT.	STORED FEED DIET FRACTION	STORED FEED GROW TIME da	STORED FEED IRRIGATION S *	STORED FEED IRRIGATION RATE in/yr	STORED FEED IRRIGATION TIME mo/yr	STORED FEED YIELD kg/m3	STORED FEED STORAGE da
T	BEEF	29.5	20.0	29.50	1.00	0.00	30.0	1	60.0	5.50	1.23	20.0
T	POULTR	0.0	20.0	0.00	1.00	1.00	75.0	1	60.0	5.00	0.54	14.0
T	MILK	100.0	1.0	100.00	1.00	0.00	30.0	1	60.0	5.50	1.23	20.0
T	EGG	3.0	1.0	3.00	1.00	1.00	75.0	1	60.0	5.00	0.54	14.0
						FRESH FORAGE						
	BEEF					0.56	46.0	1	60.0	5.50	1.23	1.0
	MILK					0.56	46.0	1	60.0	5.50	1.23	1.0

##########

gsen11.inp

Note below: S* or Source: 0-none, 1-ground water, 2-surface water
3-Derived concentration entered above

AQUATIC FOODS / DRINKING WATER INGESTION ---- SECTION 8

F Salt water? (default is fresh)

USE ? T/F	FOOD TYPE	TRANSIT hr	PRODUCTION kg/yr	CONSUMPTION HOLDUP da	CONSUMPTION RATE kg/yr	DRINKING WATER
F	FISH	0.00	0.0E+00	0.00	0.0	1 Source (see above)
F	MOLLUS	0.00	0.0E+00	0.00	0.0	F Treatment? T/F
F	CRUSTA	0.00	0.0E+00	0.00	0.0	0.0 Holdup/transit(da)
F	PLANTS	0.00	0.0E+00	0.00	0.0	730.0 Consumption (L/yr)

====TERRESTRIAL FOOD INGESTION==========SECTION 9=====

USE ? T/F	FOOD TYPE	GROW TIME da	IRRIGATION S *	IRRIGATION RATE in/yr	IRRIGATION TIME mo/yr	YIELD kg/m2	PRODUCTION kg/yr	CONSUMPTION HOLDUP da	CONSUMPTION RATE kg/yr
T	LEAF V	80.00	1	43.0	6.0	2.0	0.0E+00	1.0	6.0
T	ROOT V	85.00	1	43.0	6.0	4.0	0.0E+00	14.0	26.0
T	FRUIT	80.00	1	43.0	6.0	3.0	0.0E+00	14.0	23.0
T	GRAIN	75.00	1	43.0	5.0	0.54	0.0E+00	14.0	34.0

CB=63

====ANIMAL PRODUCTION CONSUMPTION==========SECTION 10====

USE ? T/F	FOOD TYPE	HUMAN CONSUMPTION RATE kg/yr	HUMAN HOLDUP da	TOTAL PRODUCTION kg/yr	DRINK WATER CONTAM FRACT.	STORED FEED DIET FRACTION	STORED FEED GROW TIME da	STORED FEED IRRIGATION S *	STORED FEED IRRIGATION RATE in/yr	STORED FEED IRRIGATION TIME mo/yr	STORED FEED YIELD kg/m3	STORED FEED STORAGE da
T	BEEF	29.5	20.0	29.50	1.00	0.00	30.0	1	60.0	5.50	1.23	20.0
T	POULTR	0.0	20.0	0.00	1.00	1.00	75.0	1	43.0	5.00	0.54	14.0
T	MILK	100.0	1.0	100.00	1.00	0.00	30.0	1	60.0	5.50	1.23	20.0
T	EGG	3.0	1.0	3.00	1.00	1.00	75.0	1	43.0	5.00	0.54	14.0
						FRESH FORAGE						
	BEEF					0.56	46.0	1	43.0	7.00	1.23	1.0
	MILK					0.56	46.0	1	43.0	7.00	1.23	1.0

CB=60.0 (CB=5.5)

##########

Leafy Vegetable Irrigation Rate PB [in/yr] = 43.0 (+ CROP)
" " " " " " = 43.0 + GRAIN
Other " " " " " "

Leafy " " " CB [in/yr] = 60.0 (+ CROP)
" " " " CB = 60.0 + GRAIN
Other " " " "

3/12/00 Printout for GENTPA Setup Test 2e

gdefault.inp

GENII Default Parameter Values for Current YM Biosphere (16-Jul-97 PAL)

INVENTORY PARAMETERS		
0.037, 3.7E4, 3.7E7, 3.7E10, 1.0	NVU	Source input conversion
1.0, 0.15, 224.0	SVU	Soil source conversion
ENVIRONMENTAL PARAMETERS		
0.008	ABSHUM	Absolute humidity (kg/m3)
2	PRCNTI	Air dispersion conserv. flag
0.001	DPVRES	Deposition vel./resuspension
4.4E-10	LEAFRS	Leaf resuspension factor
2.0,2.0,3.0,0.8,0.8,0.8,1.0,0.8,1.0,1.5	BIOMAS	BIOMA2 Biomass (kg/m2)
4.00000E-01	DEPFR2	Interception frac./irrigate
1.50000E+01	SURCM	Depth of surface soil (cm)
225.0	SLDN	Surface soil density (kg/m2)
1.5E3	SSLDN	Soil density (kg/m3)
True	HARVST	Harvest removal considered?
50.0	SOLING	Soil ingested (mg/da)
14.0	WTIM	Weathering time (da)
1.0, 0.1, 0.1, 0.1	TRANS	Translocation, plants
0.1, 0.1, 0.1, 0.1, 1.0, 1.0	TRANSA	Translocation, animal food
33.0, 0.08, 73.0, 0.11, 33.0, 73.0	CONSUM	Animal Consumption (kg/da)
50.0, 0.3, 100., 0.3	DWATER	Animal drinking water (L/da)
0.0, 0.8, 1.0, 0.8	FRACUT	Acute fresh forage by season
0.2, 0.3, 0.5, 1.0	SHORWI	Shore width factors
0.02	INGWAT	Swim water ingested (L/hr)
25295.0	TCWS	H2O/sed. transfer (L/m2/yr)
0.4, 5.0, 4.0	YELDBT	BIOT: Veg. prod. (kg/m2/yr)
9.41E-4, 2*7.48E-4	TOTEXC	BIOT: Excavation (m2/m3-yr)
1.0, 0.81, 0.19, 0.02, 0.008, 0.002,	EXCAV	BIOT: Frac. soil brought to
1.0, 0.9, 0.096, 0.006, 0.0005, 0.0005,		surface from within the
1.0, 0.9, 0.096, 0.006, 0.0005, 0.0005		waste by animal excavation
270.0	RINH	Chronic breathing (cm3/sec)
330.0	RINHA	Acute breathing (cm3/sec)
10	NDIST	Number of distances
805.0, 2414.0, 4023.0, 5632.0, 7241.0,		
12068.0, 24135.0, 40255.0, 56315.0,		
72405.0	X	JF/chi/Q/pop grid dist. (m)
0.2,0.25,0.18,0.91,3*0.22,0.91,2*0.22	DRYFAC,	DRYFA2 dry/wet ratio
METABOLIC PARAMETERS		
0.5, 50.0, 500.0		XDIV
0.5, 0.5, 0.95, 0.05, 0.8, 0.0, 0.0, 0.2, 0.0,		ADJ
0.1, 0.9, 0.5, 0.5, 0.15, 0.4, 0.4, 0.05, 0.0,		
0.01, 0.99, 0.01, 0.99, 0.05, 0.4, 0.4, 0.135, 0.015		
DOSE PARAMETERS		
0.25, 0.15, 0.12, 0.12, 0.03, 0.03, 5*0.06	WT	Weighting factors
2.0	SI2I	Semi-infinite/inf

Chronic Breathing Rate added to tpa.inp 3/27/00
not in tpa.inp ← Mike planned to add this

RPP 3/13/00

3/27/00

Work Plan for GENTPA Execution Testing

Test Plan for SCR #301

Test name: GENTPA Execution Test

Anticipated start date: 3/9/00

Anticipated completion date: 3/10/00

Amount of your time available to perform this test: 4 hours

Percent of testing time to be spent in process level testing and system level testing: This test is primarily a process level test, however, execution of GENTPA occurs by executing TPA.

Output files to be checked:

env.out (from GENII)
genv.out
ggenii.out
genv.cum
ggenii.cum
dcf.cum

Input files to be checked for proper data transfer to program: The GENTPA execution test (of intake calculations) requires that the following data files in TPA and GENII v1.485 need to be synchronized prior to running the test (this will be done by copying the verified TPA data data files from the GENTPA setup test to the GENII code directory):

ggamen.dat (TPA) should have the same data as gamen.dat (GENII)
grmdlib.dat (TPA) should have the same data as rmdlib.dat (GENII)
ggrdf.dat (TPA) should have the same data as grdf.dat (GENII)
gdefault.def (TPA) should have the same data as default.dat (GENII)
gftrans.def (TPA) should have the same data as gftrans.dat (GENII)
ggenii.def (TPA) should have the same data as genii.inp (GENII)
tpa.inp (TPA) should have the same data as genii.inp (GENII)

Disposition of documentation (storage medium, physical location, and access method):

-TPA and GENII input and output files used for the test will be archived on zip disks and referenced in the scientific notebook (#194)

Functional test descriptions:

-Hand calculations: the reasonableness test of the drinking water intakes (discussed below).

-Process-level tests:

Execution Test #1: Test that GENTPA provides intake results in genv.out that are consistent with

intakes calculated from GENII v1.485 using the same set of input parameters
- run GENII v1.485 with same parameter set as GENTPA and compare output in env.out and genv.out. Must ensure data files such as ggrdf.dat, ggenii.def, gdefault.def, gftrans.def for TPA are used for input data in GENII runs (e.g. grdf.dat, genii.dat, default.dat) to ensure consistency.

Execution Test #2: Confirm GENTPA uses the correct data files for running envin.exe and env.exe (check the data file echo in ggenii.out after a TPA run has been completed to see if it lists the correct versions of data files (i.e., ggrdf.dat, ggamen.dat, grmdlib.dat, gdefault.inp, gftrans.inp, gbioac1.dat)

Execution Test #3: Check that the *.cum files contain the same values for all TPA realizations when fixed values are used in GENTPA and a stochastic TPA code run is executed

-System-level tests: TPA runs used to execute GENTPA for aforementioned tests will be done for the total system. This will provide some assurance that GENTPA setup and input parameter and data transfers are operating as intended when TPA is executed.

Reasonableness Test Description: If GENTPA calculates intakes that are the same as the GENII code, then they are expected to be reasonable. Drinking water intakes will be checked to ensure they are the product of groundwater concentration and consumption rate.

Final checklist (completed during testing):

Execution Test #1:
-GENTPA provides intake results in genv.out that are consistent with intakes calculated from GENII v1.485 using the same set of input parameters

Execution Test #2:
-the ggenii.out file indicates that GENTPA uses the correct data files for running envin.exe and env.exe to generate intakes for the TPA code?

Execution Test #3:
3/27/00 these not checked due to time constraints
-the files genv.cum, ~~ggenii.cum~~, ~~def.cum~~ contain the same values for all TPA realizations when fixed values are used in GENTPA and a stochastic TPA code run is executed

Did the modification substantially change results?

Test results indicate the code modification will allow reproduction of DCF calculations consistent with prior DCF calculations in TPA 3.2 and 3.3 if the same data are used. One exception is that the modification has implemented the leaching factor calculation (leaching factor in gftrans.inp) in a manner that does not allow calculation of leaching factors based on pluvial conditions. Previous DCF calculations for TPA 3.2 and 3.3 used leach factors in pluvial DCF calculations that were based on pluvial conditions (wetter). Thus, pluvial DCFs calculated in TPA 4.0 are slightly higher than the same for prior TPA versions, however, the difference is not considered to be significant in relation to the uncertainty of the PA calculations. The difference is in the conservative direction (elevating dose). Also, the subset of Kds that is provided in tpa.inp allows

for user input to modify the calculation of leach factors, however, the remaining leach factors cannot be modified by the user unless calculated by hand and input to the gftrans.def file. Because the subset of the Kd's provided in tpa.inp are variable and the leach factors are calculated during tpa execution, this variation propagated to the leach factors calculated by TPA4.0 can lead to DCF variations from the constant DCF's used in TPA 3.2 and 3.3. However, this variation is not expected to be significant when compared with the total variation provided by other GENTPA sampled parameters and important sampled parameters from other modules.

Was TPA4.0beta output compared to TPA 3.3 output?

No. This test compared intermediate outputs from TPA4.0beta (radionuclide intakes) with similar intakes calculated with the GENII v1.485 code (code similar to the code used for TPA 3.3 DCF calculations).

Which radionuclides were monitored to determine reasonableness of results in terms of dose?

All radionuclides in the code were checked during the tests

Test Results for GENTPA Execution Test

Execution Test #1:
-GENTPA provides intake results in genv.out that are consistent with intakes calculated from GENII v1.485 using the same set of input parameters

PASSED

Execution Test #2:
-the ggenii.out file indicates that GENTPA uses the correct data files for running envin.exe and env.exe to generate intakes for the TPA code?

PASSED

Execution Test #3:
3/27/00 these not checked due to time constraints.
-the files genv.cum, ~~ggenii.cum~~, ~~def.cum~~ contain the same values for all TPA realizations when fixed values are used in GENTPA and a stochastic TPA code run is executed

PASSED

3/27/00

Results of GENTPA Execution Test #1

- files referenced ~~in~~ for this test are on zip disk #1 in the directory labeled \GENTPA Execution Test\Test 1\ (all following refs refer to this path)

- GENII v 1.485 runs (input and output files) are contained in the \Genii subdirectory on zip #1. The Genii subdirectory has 2 subdirectories (pluvial and current) which contain GENII input and output files for each biosphere. The ...\current\Fin directory contains the final Genii run that was done to synchronize the leaching factors between GENII and GENTPA and resolve remaining discrepancies in intakes. (TPA40beta)

- GENTPA run files and results are in the ...\GENTPA subdirectory
  - Excel processing of GENTPA output plus the output files themselves are in ...\GENTPA
  - ~~GENTPA~~ TPA4.0betaF was used for the comparison of intakes between TPA and GENII. A series of TPA runs were conducted starting with TPA40beta and genv.cum results were compared with Genii env.out intakes in the Excel file ...\GENTPA\genvcomp.tpavsgenii.xls. Each time discrepancies in intakes were noted, investigated further, and remedied until resolved. All discrepancies identified were subsequently linked to input data discrepancies. The final TPA run showing agreement w/ GENII intakes is archived in ...\GENTPA\gen2ex4\.

  - Data discrepancies causing discrepancies in intake comparison include the following
    - leach factors in ggrdf.~~inp~~dat are calculated from TPA input parameters that can be matched to parameters used for TPA 3.3 PCF leach factors for current biosphere - but TPA4.0 will not calculate pluvial leach factors - thus, TPA4.0 uses current biosphere based leach factors for both current and pluvial PCF cases. Thus, comparisons of intakes shows discrepancies for pluvial ~~PCF~~ intakes

Results of GENTPA Execution Test #1
- GENTPA (TPA40beta) files (cont'd)
  - discrepancies (cont'd)
    - leach factors (cont'd)
      that can be remedied by changing the leach factor parameter to pluvial (can't do both pluvial/current at once). This is the intended approach so it is not considered a problem (programmed to be efficient).

    - because only a subset of kd's is provided in tpa.inp - there are other radionuclides ~~that are not~~ who's leach factors are not affected by TPA input - these can be modified by directly inputting leach factors into GFTRANS.def.

    - 2 kds (Cl and Se) in the original tpa.inp file were incorrect values. Changing these to match TPA 3.2 PCF kd values resolved some discrepancies.

    - Some decimal place normality from the TPA 3.2/3.3 PCF leach factor calculations and TPA 4.0beta (carries more significant digits) accounted for differences in intakes of a few percent.

Discussion/conclusion for GENTPA Execution Test #1

The last column in the file ...\GENTPA\genvcomp.tpavsgenii.xls shows that intakes calculated for all radionuclides and pathways are the same when GENTPA and GENII v1485 are run with the same data and parameter inputs. A few specific soil related pathway intakes for radionuclids such as Se79, Y90, Mo93, Nb93, Pd107 and Sn121m showed minor discrepancies in intakes (less than 3%). This level of diff is acceptable so no further analysis was done, however, because these radionuclides are all daughters and daughter product leach factors were not checked for consistency - if is expected to be due to leach factor input differences and not coding. Therefore the TPA4.0betaF code PASSED Execution Test #1.

3/27/00 MG

3/27/00 MG GENTPA

Results for Execution Test #2

the file checked is on zip disk #1 \GENTPA Execution Test \ Test 2
(ggenii.out)

GENTPA Dose Calculation Program
(Version 1.0 11-Feb-00)

Case title: tpa4.0 input using genii w/ 93 update and CNWRA 97-009 data files
Executed on: 20-Mar-00 at 10:40:15 Page 0

GENTPA Dose Calculation Program
(Version 1.0 11-Feb-00)

Case title: tpa4.0 input using genii w/ 93 update and CNWRA 97-009 data files
Executed on: 20-Mar-00 at 10:40:15 Page A. 1

This is a near field (narrowly-focused, single site) scenario.
Release is chronic
Individual dose

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
Infinite plume, external
Ground, external
Inhalation uptake
Drinking water ingestion
Terrestrial foods ingestion
Animal product ingestion
Inadvertent soil ingestion

THE FOLLOWING TIMES ARE USED:
Intake ends after (yr): 1.0
Dose calculations ends after (yr): 50.0

========== FILENAMES AND TITLES OF FILES/LIBRARIES USED ==========

Input file name: \GENII\tpa.in
✓GENII Default Parameter Values for Current YM Biosphere (16-Jul-97 P
✓Radionuclide Master Library (11/28/90 RAP)(1-26-00 MAS Ag108m adde
✓IAEA Food Transfer Factors - (SJM 19-MAR-95)(PAL 15-Jul-97)(UPDATED
✓Bioaccumulation Factor Library - (30-Aug-88) RAP
✓FGR 12 External DCFs(per-Sv/yr per Bq/n) (SJM/PAL) for 43 TSPA Nucli
Worst-Case Solubilities, Yearly Dose Increments (25-Mar-96 PDR)

P 3/27/00 cut off remaining section

==========

Discussion / Conclusion for GENTPA Execution Test #2
ggenii.out correctly echoed the proper input data files following TPA4.0 Beta execution. Test #2 is PASSED

3/27/00 MG

Results for GENTPA Execution Test #3
(files for this test are on attached zip disk \GENTPA Execution Test \ Test 3)

A 10 realization run of TPA40BetaF was executed with fixed constant GENTPA parameter and variable parameter for different residuals. This test checks if stochastic operation of TPA will interfere with the append function for GENTPA. The genvi.cum file was checked to compare output intakes for 10 realizations to ensure they are all the same. Comparison is an excel spreadsheet (genvi.cum.tpa4F.fin.... 10real.intakecomp.xls), the genvi.cum file was renamed to genvi.cum.tpa4F.fin.10real.txt. Comparison showed all intakes were same for each realization, as expected, thus TPA40BetaF PASSED the test.

Discussion / Conclusion →

3/27/00 MG

Test Plan for SCR #301

Test name: Verification Tests for DCF Calculations

Anticipated start date: 3/10/00

Anticipated completion date: 3/13/00

Amount of your time available to perform this test: 8 hours

Percent of testing time to be spent in process level testing and system level testing: 50/50

Output files to be checked:

genv.out
gw_cb_ad.dat
gw_cb_ci.dat
rgwnr.tpa
rgwna.tpa
rgwsr.tpa

Input files to be checked for proper data transfer to program:

The TPA results from the GENTPA execution test will be used, therefore the input data will already have been confirmed from that test.

The system level tests involving the TPA 3.3 mean data set will utilize the same data files for GENTPA that were checked (and confirmed to have the appropriate TPA 3.3 data) in the GENTPA setup test. Other system level tests involve either the TPA 4.0beta tpa.inp files that was checked in the GENTPA setup test, versions of that file that contain known modifications necessary for the test, or data files that have been previously checked (e.g., mean value tpa.inp files from TPA 3.2.3 and 3.3).

Disposition of documentation (storage medium, physical location, and access method):

-TPA input and output files, and excel spreadsheet files for DCF calculations used for the tests will be archived on floppy or zip disks and referenced in the scientific notebook (#194)

Functional test descriptions:

-Hand calculations:

The DCF calculation test (discussed under 'process level tests' below) will involve using a spreadsheet program to calculate the DCFs for comparison with TPA generated DCFs

-Process-level tests:

DCF Verification Test #1: Confirm TPA DCF calculations by hand (spreadsheet) using intakes (genv.out) and dose coefficients (ggrdf.dat for external dose and gnewdf.dat for internal) from TPA intermediate and data files. Confirm daughter product DCFs are summed correctly prior to writing DCF tables gw_cb_ad.dat, gw_cb_ci.dat.

DCF Verification Test #2: Run a mean value tpa.inp file for TPA4.0beta and compare DCF outputs (gw_cb_ad.dat) with the same from a mean value TPA3.2.3 run. Given the prior testing has shown the TPA4.0beta can reproduce intakes (and thereby DCFs) calculated with models used for TPA 3.2.3 DCFs when comparable data are used as inputs, this test should identify any differences in DCFs due to data changes from TPA3.2.3 to 4.0beta.

-System-level tests:

DCF Verification System Test #1: Run a single realization of TPA 4.0 with TPA 3.3 mean value parameters and data file inputs and compare radionuclide specific dose curves over 10,000 and 100,000 yrs (from rgwnr.tpa) with TPA 3.3 results using the same data. Consider the following radionuclides for comparison of results: ^{245}Cm, ^{241}Am, ^{237}Np, ^{239}Pu, ^{234}U, ^{230}Th, ^{129}I, ^{99}Tc, ^{14}C, ^{79}Se, and ^{36}Cl (radionuclides important to dose from TPA 3.2 sensitivity analyses). Both sets of runs (TPA 3.3 and 4.0) should use the mean value data set from TPA 3.3 and the 4.0 runs should additionally use DCAGW parameter values consistent with those confirmed in the GENTPA setup testing to be the same used for DCFs in TPA 3.3. Dose coefficients from TPA 3.3 DCF calculations in GENII-S will be added to gnewdf.dat to ensure consistency in the TPA4.0 DCF calculations. This comparison could provide insight into any changes that have occurred to results due to 4.0 code changes in DCF calculations (note that module changes unrelated to DCAGW in 4.0 may change overall results in 4.0 when compared with 3.3, however, the test is still expected to be informative because there is general interest in identifying system changes and large deviations from past results can be indications of areas that need more focussed testing).

DCF Verification System Test #2: Run TPA 4.0 stochastically (100 realizations) using the most current tpa.inp with TPA 4.0 user manual (Appendix A) variable parameters for GENTPA and compare results with a TPA 3.2.3 base case run (3.2.3 used constant DCF tables). This is a general system test that may provide insight to potential problems with DCF calculations when executed stochastically along with the rest of the modules. (Note that module changes unrelated to DCAGW in 4.0 may change overall results in 4.0 when compared with 3.2.3, however, the test is still expected to be informative because there is general interest in identifying system changes and large deviations from past results can be indications of areas that need more focussed testing). An additional run of TPA4.0beta stochastically for 100 realizations with the constant GENTPA parameter set will allow presentation of differences in expected dose results (from TPA4.0beta) from the introduction of GENTPA parameter ranges and stochastic DCF calculations.

Reasonableness Test Description: If conclusions from the process level testing indicate that TPA 4.0 results based on TPA 3.3 parameters and data are similar to TPA 3.3 results, then the DCAGW calculations are considered reasonable. If differences noted the results of system tests are attributable to parameter or model changes in other modules, then GENTPA can still be considered to be producing reasonable results (DCFs).

Final checklist (completed during testing):

DCF Verification Test #1:
-confirm spreadsheet DCF calculations using intakes (genv.out) and dose coefficients (ggrdf.dat for external dose and gnewdf.dat for internal) from TPA are the same as DCFs calculated by DCAGW (in gw_cb_ad.dat, gw_cb_ci.dat) from the same information.

-confirm daughter product DCFs are summed correctly prior to writing DCF tables gw_cb_ad.dat, gw_cb_ci.dat

DCF Verification Test #2: code 3/27/00
-verify that ~~model~~ changes related to DCF calculations are not contributing to significant changes to DCF results in TPA4.0beta. Verify that data changes relevant to DCF calculations in TPA4.0beta explain any significant differences in DCF results when TPA4.0 beta and TPA 3.2.3 DCFs are compared.

DCF Verification System Test #1:
-deterministic system level testing using TPA 3.3 data in TPA 4.0 runs confirmed DCF calculations in DCAGW are producing similar results to TPA 3.3 when the same input parameters and data are used in the calculations

DCF Verification System Test #2:
-stochastic system level testing comparing TPA 3.2.3 and TPA 4.0beta 100 realization runs confirm the GENTPA modifications to DCAGW TPA 4.0 (coding and data modifications) are producing similar results to TPA 3.2.3 or different results that can be explained by intentional changes. The tests added confidence that stochastic calculations in TPA 4.0 are not adversely affecting implementation of DCF calculations in DCAGW.

Did the modification substantially change results?

No. The tested calculation of DCFs (from the intakes) was shown to be implemented in a manner that does not change the results from prior TPA 3.2 DCF calculation methods. The system level tests show expected dose results can increase by about an order of magnitude in the early (first 5000 yr) period when the expected dose is more unstable and subject to influence by sampled extremes (when variable biosphere parameters are introduced). The effect of such extremes is expected to diminish when a larger number of realizations is run causing greater convergence of results to the expected value. Beyond the 5000 yr period, the use of variable biosphere parameters does not significantly change the magnitude of the expected dose.

System level results showed significant differences between TPA 4.0beta and 3.3 and 3.2.3 regarding the time of radionuclide release/transport and the quantity/type of contaminants reaching the biosphere. These aspects of the code are not related to DCAGW modifications associated with SCR #301 and are being investigated under the relevant SCRs for release and transport models.

Was TPA4.0beta output compared to TPA 3.3 output?

Yes. See the answer to the previous question. For comparison purposes, the DCFs used for 3.2.3 were the

same as 3.3, therefore both can be used as a point of comparison with TPA 4.0beta.

Which radionuclides were monitored to determine reasonableness of results in terms of dose?

All radionuclide-specific tests emphasized those radionuclides that were found to be important in TPA 3.2 sensitivity analyses (Mohanty et al., 1999). These include: ^{245}Cm, ^{241}Am, ^{237}Np, ^{239}Pu, ^{234}U, ^{230}Th, ^{129}I, ^{99}Tc, ^{14}C, ^{79}Se, and ^{36}Cl. For 10,000 yr system level tests, the only radionuclides that break through the SZ are ^{129}I, ^{99}Tc, and ^{36}Cl. The DCF calculation test also considered additional radionuclides (those with daughter chains) to confirm products were being summed in DCFs correctly.

Results of Verification Tests for DCF Calculations

DCF Verification Test #1:
-confirm spreadsheet DCF calculations using intakes (genv.out) and dose coefficients (ggrdf.dat for external dose and gnewdf.dat for internal) from TPA are the same as DCFs calculated by DCAGW (in gw_cb_ad.dat, gw_cb_ci.dat) from the same information.

PASSED

-confirm daughter product DCFs are summed correctly prior to writing DCF tables gw_cb_ad.dat, gw_cb_ci.dat

PASSED

DCF Verification Test #2:
-verify that model changes related to DCF calculations are not contributing to significant changes to DCF results in TPA4.0beta. Verify that data changes relevant to DCF calculations in TPA4.0beta explain any significant differences in DCF results when TPA4.0 beta and TPA 3.2.3 DCFs are compared.

PASSED

DCF Verification System Test #1:
-deterministic system level testing using TPA 3.3 data in TPA 4.0 runs confirmed DCF calculations in DCAGW are producing similar results to TPA 3.3 when the same input parameters and data are used in the calculations

PASSED (see **Did the modification substantially change results?** above)

DCF Verification System Test #2:
-stochastic system level testing comparing TPA 3.2.3 and TPA 4.0beta 100 realization runs confirm the GENTPA modifications to DCAGW TPA 4.0 (coding and data modifications) are either producing similar results to TPA 3.2.3 or different results that can be explained by intentional changes. The tests added confidence that stochastic calculations in TPA 4.0 are not adversely affecting implementation of DCF calculations in DCAGW.

PASSED (see **Did the modification substantially change results?** above). The test results are interpreted in light of the other test results that coding modifications to DCAGW do not explain differences in results between TPA4.0beta and TPA 3.2.3 or 3.3. The data modifications to GENTPA parameters in TPA4.0 are shown to contribute to changes in results, however, the changes are the result of intended parameter and data changes (i.e., improvements).

3/27/00

Work Plan for Verification Tests for DCF Calculations (cont'd)

3/28/00

References:

Mohanty, S., R. Codell, R. Rice, J. Weldy, Y. Lu, R.M. Byrne, T.J. McCartin, M.S. Jarzemba, and G.W. Wittmeyer. *System-Level Repository Sensitivity Analysis Using TPA Version 3.2 Code.* CNWRA 99-002. San Antonio, TX: Center for Nuclear Waste Regulatory Analyses. 1999.

U.S. Environmental Protection Agency. 1988. *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion.* Federal Guidance Report No. 11.Washington DC: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency. 1993. *External Exposure to Radionuclides in Air, Water, and Soil: Exposure-to-Dose Coefficients for General Application, Based on the 1987 Federal Radiation Protection Guidance.* Federal Guidance Report No. 12. Washington DC: U.S. Environmental Protection Agency.

Results for DCF Verification test #1
(Files are located on attached zip disk \DCFVerificationTest\Test1\)

DCF comparisons (TPA4.0beta vs Hand calculations) are done for 11 radionuclides important to TPA calculations (C14, Cl36, Se79, Tc99, I-129, Th230, U234, Pu239, Np237, Am241, and Cm245) and are contained in DCF_calcs.xls file. Hand calculations of DCF's from intakes provided by TPA4.0beta match DCF's calculated by TPA4.0beta. Summation of daughter products is provided in the file DCF_chains.xls. The file shows hand calculation summing daughter products to DCF match DCF's calculated by TPA4.0beta.

Discussion/conclusions:
DCF verification Test #1 confirms that TPA4.0beta is correctly utilizing the intakes output from GENTPA and the GENTPA data files to calculate DCF's. The test results also confirm that the summation of daughter product contributions to DCF is implemented correctly. Thus, TPA4.0beta PASSED DCF Verification Test #1.

3/28/00

Note: internal dose coefficient comparison is in file Fgl1gen2.xls on zip disk \DCF Verification System Test\Test1\Tpa40beta-run\

3/28/00

Results for DCF Verification test #2
(Files are located on attached zip disk \DCFVerificationTest\Test2\)

The test involved 2 TPA code runs: 1) a mean value (tpa.inp) run of TPA4.0beta4, 1 realization, for 10,000 yr compliance period and 2) a mean value run of TPA3.2.3, 1 realization, for 10,000 yr compliance period. DCF's in gw_cb_ad.dat from each run were compared on an Excel spreadsheet file (dcfcomp.results.xls). A number of differences are noted in this file, therefore, a printout is attached to page 44 of this notebook. The ~~calculations~~ direct comparison spreadsheet is file comp.gwcbad.dat.mean.xls (results from this comparison are summarized in dcfcomp.results.xls). Discrepancies between TPA 4.0 and 3.2.3 DCF's were thought to be due to dose coefficient differences since 3.2.3 DCF's were calculated with GENII-S codes (uses hard wired internal dose coefficients that differ from coefficients used in TPA 4.0. Thus, a comparison of external dose coefficients was done in grdfcomp.calc.xls (TPA 3.2.3 vs TPA4.0K grdfi.dat and ggrdfi.dat, respectively). Similarly, a comparison of Genii-S internal dose coefficients (used for TPA 3.2.3 DCF's) and internal dose coefficients for Federal Guidance Report number 11 (ie, values used in TPA 4.0 gnewdfi.dat) was also conducted (file is Fgl1gen2.xls). The results of the dose coefficient comparison indicate most DCF differences are attributable to changes in external or internal dose coefficients in the TPA 4.0 version. Much of this is due to the change to Federal Guidance Report #11 internal dose coefficients. Another reason for ~~external~~ DCF differences was that V3.2.3 DCF's were based on updated parent dose coef, however, daughter coef. were not updated. In version 4.0, daughter dose coef. were updated and this impacted the DCF for some radionuclides. A few DCF discrepancies could not be explained by known data inconsistencies. Nonetheless, these inconsistencies were 1) for insignificant pathways such as inhalation (small % of total GW dose) or 2) For radionuclides that are not important contributors to total dose during the compliance period. Therefore, the test is PASSED however, efforts will continue to reconcile the differences.

3/28/00 [illegible] Results for DCF Verification Test #2

TPA 4.0 Beta Testing: Comparison of gw_cb_ad DCFs from TPA3.2.3 and TPA 4.0k from mean value runs
PAL 3/24/00

files described p. 43

Ratios of TPA4k DCFs to TPA3.2.3 DCFs

nuclide	d dir exp	inh	ing ani	ing crop	ing dw	change	
U238	0.45	0.99	1.01	0.98	0.98	*	dir exp
Cm246	1.02	1.02	0.97	0.99	1.00		
Pu242	1.00	1.01	0.99	1.01	1.02		
Am242m	0.96	1.04	1.01	0.99	0.99		
Pu238	2.44	0.96	1.00	1.00	1.00	*	dir exp
U234	1.01	1.01	0.99	1.01	0.99		
Th230	1.01	1.00	1.00	0.99	1.00		
Ra226	0.0043	1.05	1.39	1.40	1.40	*	all
Pb210	0.95	0.98	1.00	0.99	1.01		
Cm243	0.99	1.00	1.00	1.00	1.02		
Am243	1.01	0.99	1.01	0.99	1.02		
Pu239	0.99	0.97	1.00	1.00	0.99		
U235	1.01	1.00	1.01	1.02	1.02		
Pa231	1.01	0.99	1.02	1.02	1.00		
Ac227	0.57	1.00	1.22	1.05	1.03	*	dir exp, ing ani
Cm245	1.02	1.03	0.98	1.00	1.01		
Pu241	0.34	0.98	1.00	1.00	0.99	*	dir exp
Am241	1.00	1.00	1.01	1.00	1.02		
Np237	1.01	0.87	0.87	0.85	0.85	*	all ing
U233	1.00	1.01	1.02	0.99	1.00		
Th229	0.36	1.00	1.62	1.03	0.99	*	dir exp, ing ani
Cm244	0.99	1.01	1.00	1.01	0.98		
Pu240	1.00	0.97	1.00	1.00	0.99		
U236	0.99	0.99	0.98	0.99	0.98		
U232	0.25	1.01	1.00	0.98	1.00	*	dir exp
Sm151	0.98	1.00	1.00	1.01	1.01		
Cs137	0.0005	1.08	1.06	1.05	1.04		all
Cs135	0.98	1.03	1.04	1.02	1.03		
I129	1.08	1.23	1.11	1.10	1.12	*	all
Sn126	1.02	1.00	1.02	1.00	1.01		
Sn121m	1.02	0.99	1.01	0.99	1.03		
Ag108m	1.00	1.74	0.77	0.76	0.70		all ing,inh
Pd107	#DIV/0!	1.01	0.99	1.01	0.99		
Tc99	1.04	0.99	0.65	0.67	0.67	*	all ing
Mo93	1.03	1.01	1.12	1.13	1.12		all ing
Nb94	1.01	1.02	0.98	0.98	0.98		
Zr93	0.96	1.02	1.03	1.00	1.01		
Sr90	19.78	6.26	1.16	1.21	1.20	*	all
Se79	0.99	0.98	1.08	1.04	1.04	*	all ing
Ni63	#DIV/0!	2.05	1.00	1.01	1.00	*	dir, inh
Ni59	#DIV/0!	2.09	1.03	1.02	1.02		dir, inh
Cl36	1.09	1.04	1.08	1.08	1.00		all except dw
C14	#DIV/0!	#DIV/0!	1.00	1.02	1.01		dir, inh

attributed to daughter ext dose coef. change

Pu238 DCFs estimated for v3.2.3 (not calculated in Genii-5)

dose coef. dec. in 4.0

Int dose coef inc 39% in v4.0

4% increase in dose coef in v4.0

daughter dose coef diff.

unexplained

Pu241 DCFs estimated in v3.2.3 (not calculated in Genii-5)

15% dec in dose coef.

internal dose coef. dec by 15%

daughter coef. diff

leach factors differ but could be other exp.

ext dose coef and daughter dose coef lower in 4.0

ext dose coef diff

5% inc in dose coef.

8% inc in coef

11% inc in dose coef.

15% inc in dose coef in v4.0

v3.2.3 DCFs estimated from Ag110m

v.40 uses Ag108m

35% dec in dose coef. in v4.0

10% inc in dose coef. in v4.0

Sr90 daughter Y90 had no dose coef. in v3.2.3

19% inc in dose coef.

4% inc in dose coef.

leach factor and dose coef.

3/28/00

Discussion / Conclusions For DCF Verification Test #2

The DCF comparison test and investigation into data discrepancies between TPA 3.2.3 DCF calculations and TPA 4.0 beta indicate that all significant discrepancies between the DCFs noted in the test are explained by data differences. Thus, the TPA 4.0 beta code is found to be operating as intended and capable of reproducing prior version DCFs if the same input data are used. Refinements and updates to data used for the TPA 4.0 beta calculations are changing DCF results to some degree, however, these refinements are improving the calculations and therefore are not considered a problem. The magnitude of changes are considered moderate in light of the precision and variability of overall total system PA calcs. As time permits additional investigations to reproduce DCFs will be conducted, however, the present information/results are sufficient to PASS the Verification test.

Results for DCF Verification System Tests #1 and #2

(Files are provided on attached zip disk \DCFVerificationSystemTest\Test1\ and ...\test2*

* see note page 46 5/26/00

This test involved comparing the results of 2 mean value runs (one using TPA 3.3 and the other using TPA4.0beta4 with input data consistent with the version 3.3 run. For the 4.0 run, a gnewdf.dat file was created containing 3.3 consistent internal dose coefficients (see fg11gen2.xls and df-all.tst). The 3.3 run significant files are provided in ...\Tpa33_run\ while the 4.0k files are in \tpa40beta_run\. both directories have subdirectories for 10,000 yr and 100,000 yr TPA runs. The 4.0k runs were modified in the following two ways.

- the xLocationOfFaultyEvent in RegionOfInterest[m] parameter was changed from constant to uniform [548000, 548001] to avoid sampling errors. (also done in 3.3) 548000 3/28/00
- the volcanismDisruptiveScenarioFlag was changed to zero to match the 3.3 run

3/28/00

Results for DCF Verification System Test #1, part 2 (cont'd)

3/28/00

Comparisons of dose (from rgwnr.tpa) from the 3.3 and 4.0 runs are in rgwnr_10k.xls and rgwnr_100k.xls for 10,000 yr and 100,000 yr, respectively. Selected plots are shown in the following pages. Results indicate the following:

+ see note pg 46 5/26/00 sg

- 10,000 yr dose is dominated by I-129 and Cl-36 for TPA 3.3 and I-129, Tc-99, and Cl-36 in TPA 4.0
- 10,000 yr results show TPA 4.0 onset is occurring much earlier in time than 3.3 onset.
- 10,000 yr results show 4.0 doses reaching peak faster than 3.3 results
- 10,000 yr results show 4.0 doses are of higher magnitude
- 100,000 yr results for I-129 and Tc-99 (4.0), show initial high peaks relative to 3.3 which converge after 40,000 yrs. sg 3/28/00

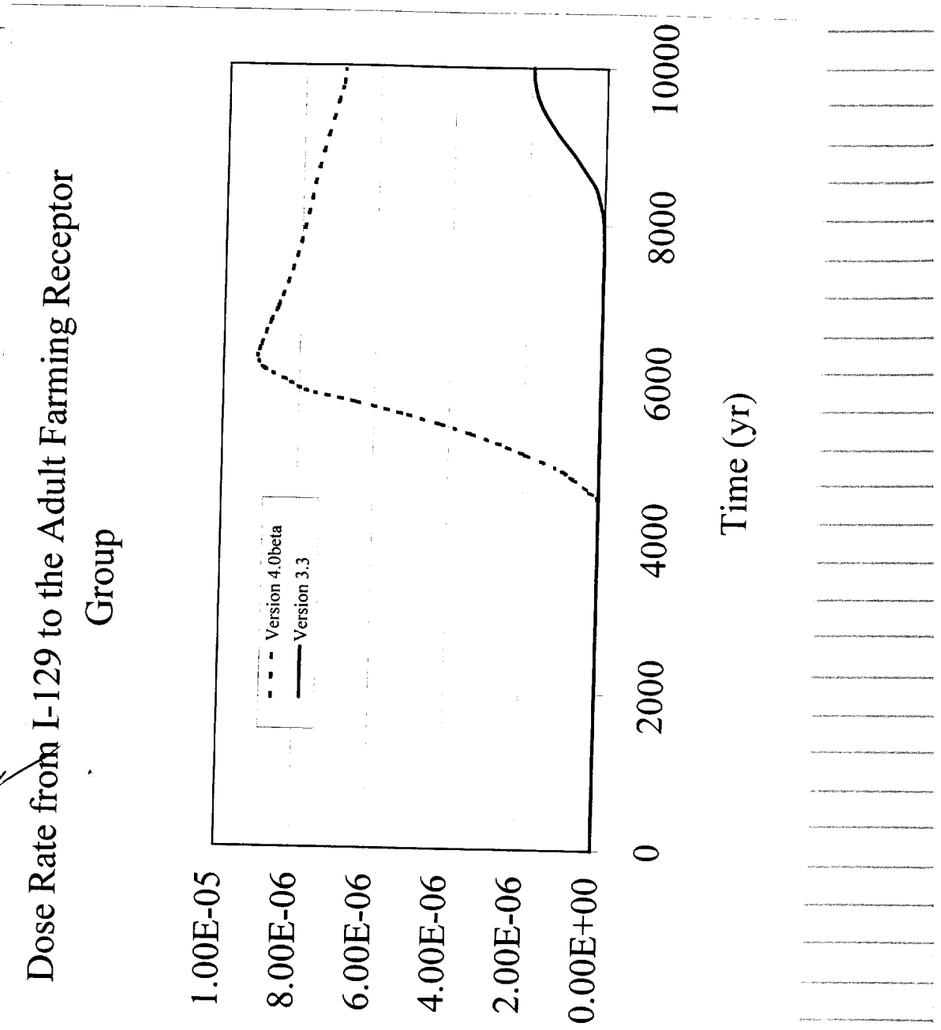
Note: rgwnr_10k.xls and rgwnr_100k.xls contained a minor error and have been replaced by files of the same name dated 4/3/00. These files are attached by Floppy disk to this notebook. sg 5/26/00 5/26/00 sg

The changes did not change conclusions 5/26/00 sg See Page 54 for disk

DCF Verification System Test #2 expands the testing to 100 realizations run with TPA 4.0beta K and the most up-to-date tpa.inp and a TPA 3.2.3 run with v 3.2.3 base case decks. While this test should measure the extent of both model and data changes for TPA 4.0beta, it also can provide additional insight into the Test 1 results. Results include:

- 10,000 yr results show earlier onset of dose (expected dose) for TPA 4.0 beta K vs TPA v 3.2.3 expected (approx 2K yr earlier)
- 10,000 yr results show TPA 4.0beta K expected dose is at least 1 order of magnitude higher than v 3.2.3 expected dose and during first 4000 year 2 to 4 orders of magnitude greater.

Results for DCF Verification System Test 1 File = rgwnr_10k.xls*



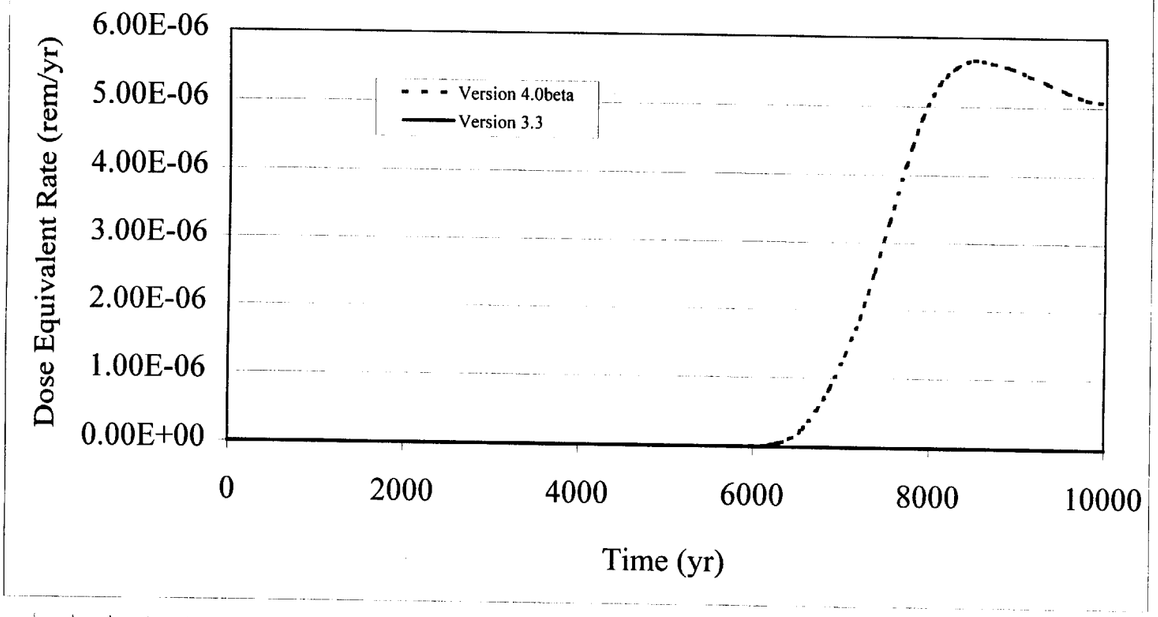
3/28/00

* see note

pa 46 5/26/00

Results for DCF Verification System Test 1 File = rsvnr_vOk.xls *

Dose Rate from Tc-99 to the Adult Farming Receptor Group



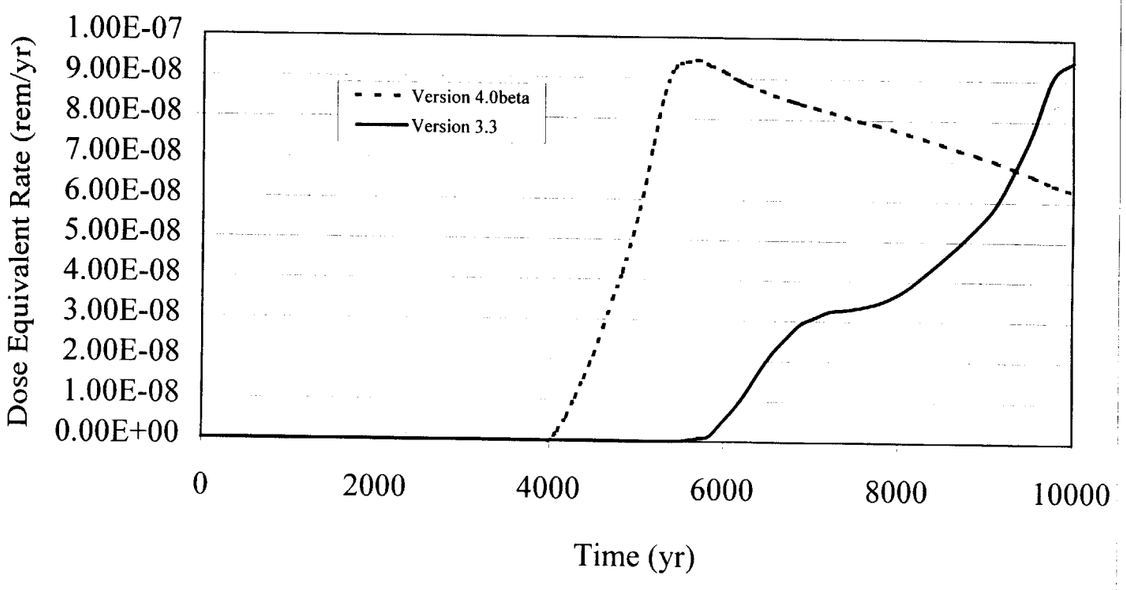
3/28/00

* see note

pa 46 5/26/00

Results for DCF Verification System Test 1 File = rsvnr_vOk.xls *

Dose Rate from Cl-36 to the Adult Farming Receptor Group



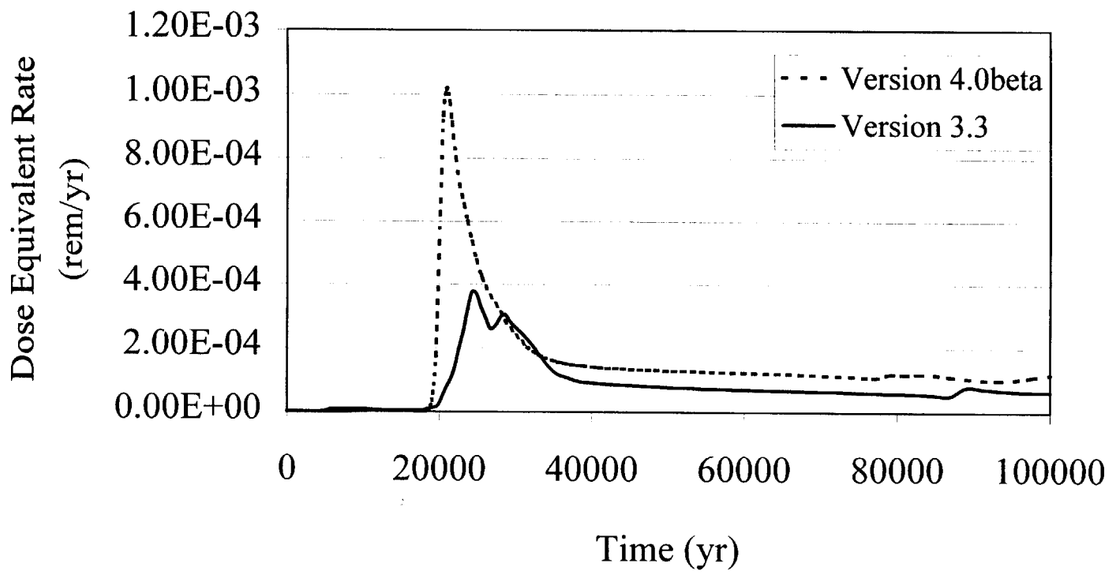
3/28/00

* See note pg 46 5/24/00

Results for DCF Verification System Test 1 File = rgwmc_dcf.xls *

3/28/00

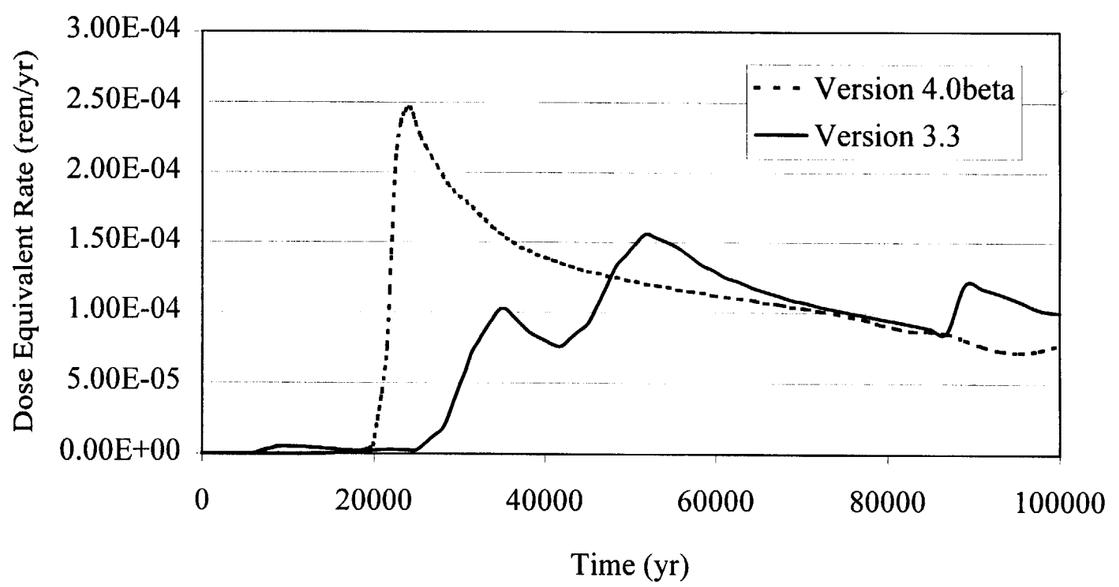
Dose Rate from I-129 to the Adult Farming Receptor Group



* See note pg 46 5/24/00

Results for DCF Verification System Test 1 File = rgwmc_dcf.xls *

Dose Rate from Tc-99 to the Adult Farming Receptor Group

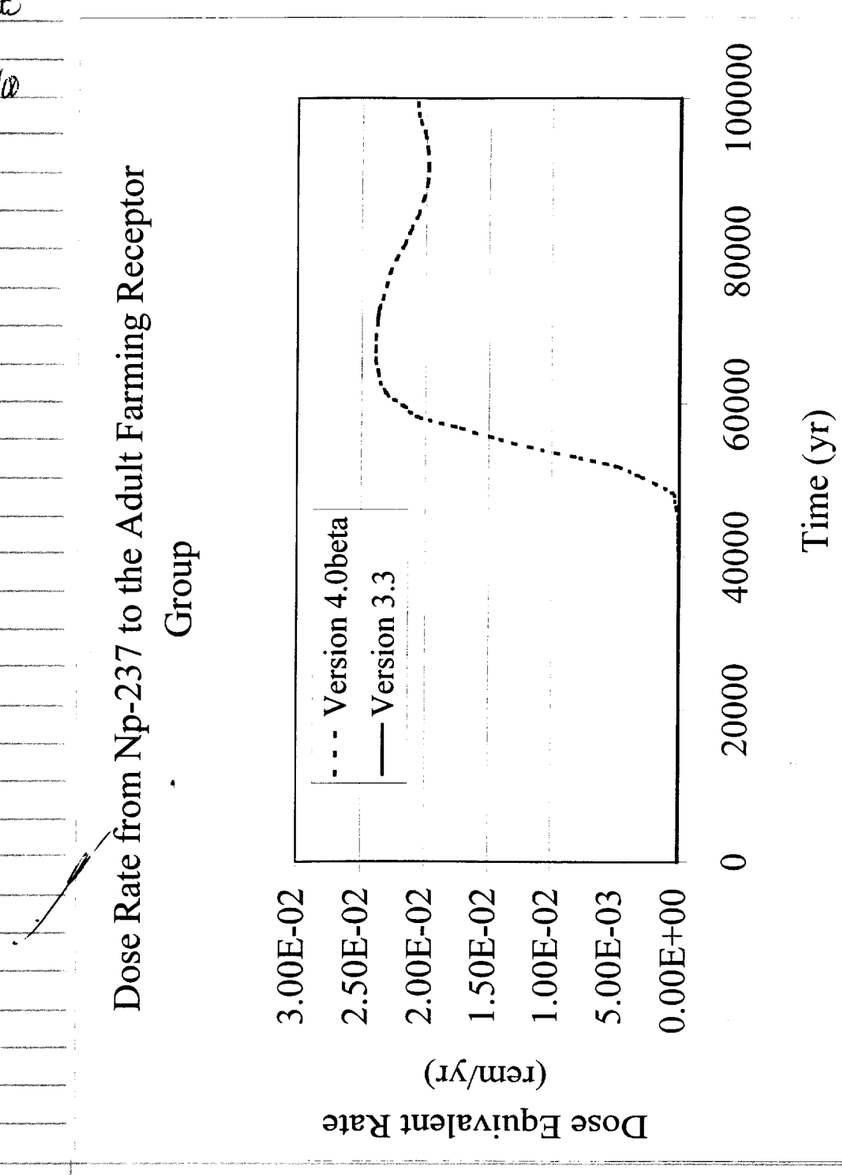


3/28/00

DCF
Results for Verification System Test 1 file = rgwnrm100k.xls*

3/28/00

*See note p. 46 5/26/00



DCF Verification System Test 1 and 2 Results (cont'd)

Test 2 results (cont'd)

- 10,000 yr results show early doses (< 4000 year) expected from TPA4K are more susceptible to bias from extreme realizations, whereas, in later years the greater number of realizations with doses causes convergence of expected dose with the realizations

- 10,000 yr results show wide variation in breakthrough or onset of dose (from early 250 yr to late at 9000 yr)

- 10,000 yr results show TPA4K expected dose is moderately ~~was~~ effected by the use of constant GENTPA parameter (as opposed to variable). When constant GENTPA parameters are used early (< 4000 years) results, expected dose, is shows 1 order of magnitude difference in the constant vs variable parameter expected doses. After ~~at~~ 4000 years the two curves converge - suggesting that an increase in realizations should diminish the impact of using variable parameters in GENTPA.

see page 55 for chart

100,000 year results show about an order of magnitude difference between TPA 3.2.3 expected dose and TPA4.0beta4 expected dose, beyond 20,000 years.

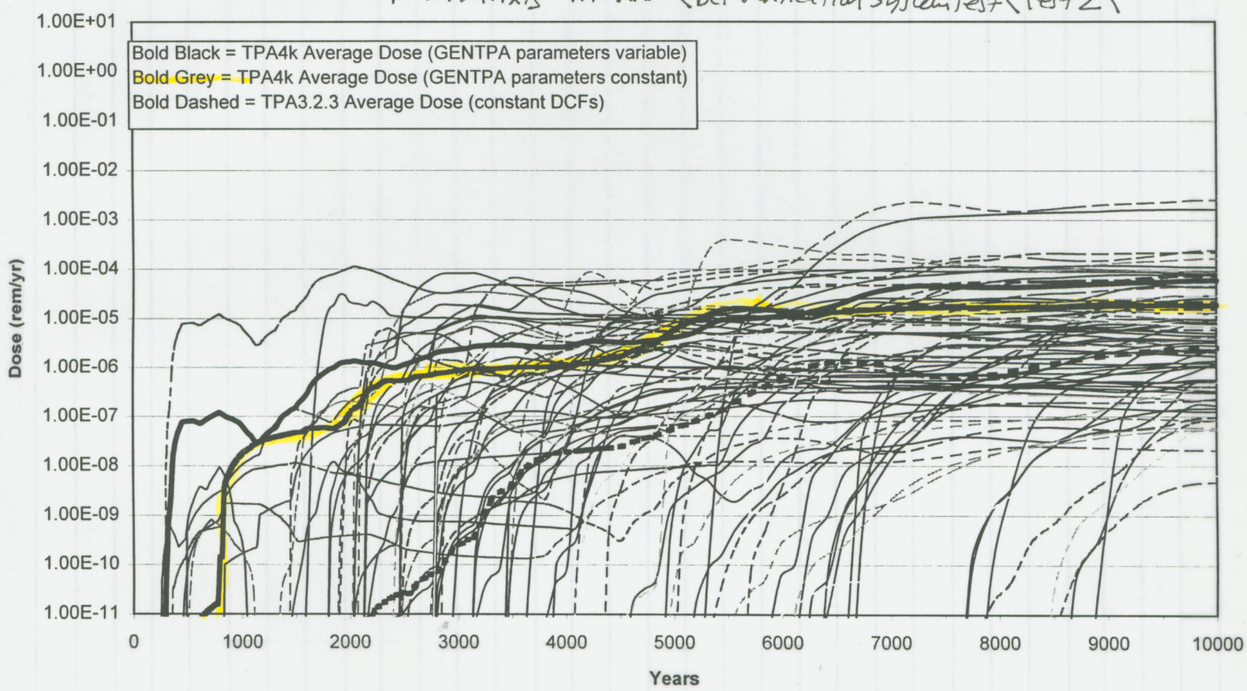
Discussion/Conclusions for DCF Verification System test 1 and 2.

Because the purpose of tests 1 and 2 are to identify potential differences in the TPA4.0beta DCF calculations when compared with earlier DCF calculations, additional analyses were conducted to attempt to isolate the cause for differences in results. First, the earlier onset of dose seen in both test 1 and 2 relates to early release and transport and is not controlled by DCF calculations. An analysis of early and late realizations to identify ~~the~~ potentially important parameter differences is provided in file sp.tpa4.10k.xls. This analysis shows differences in parameters associated with early vs late dose and high vs low dose are from TPA modules other than GENTPA.

3/26/10

TPA4k Dose Results Over 10,000 Years for 100 Realizations with Average Dose from TPA 4k and TPA3.2.3

File = DCFP1.rgwsr.tpa4k.10k.xls in ...\DCFVerification SystemTest\Test2\



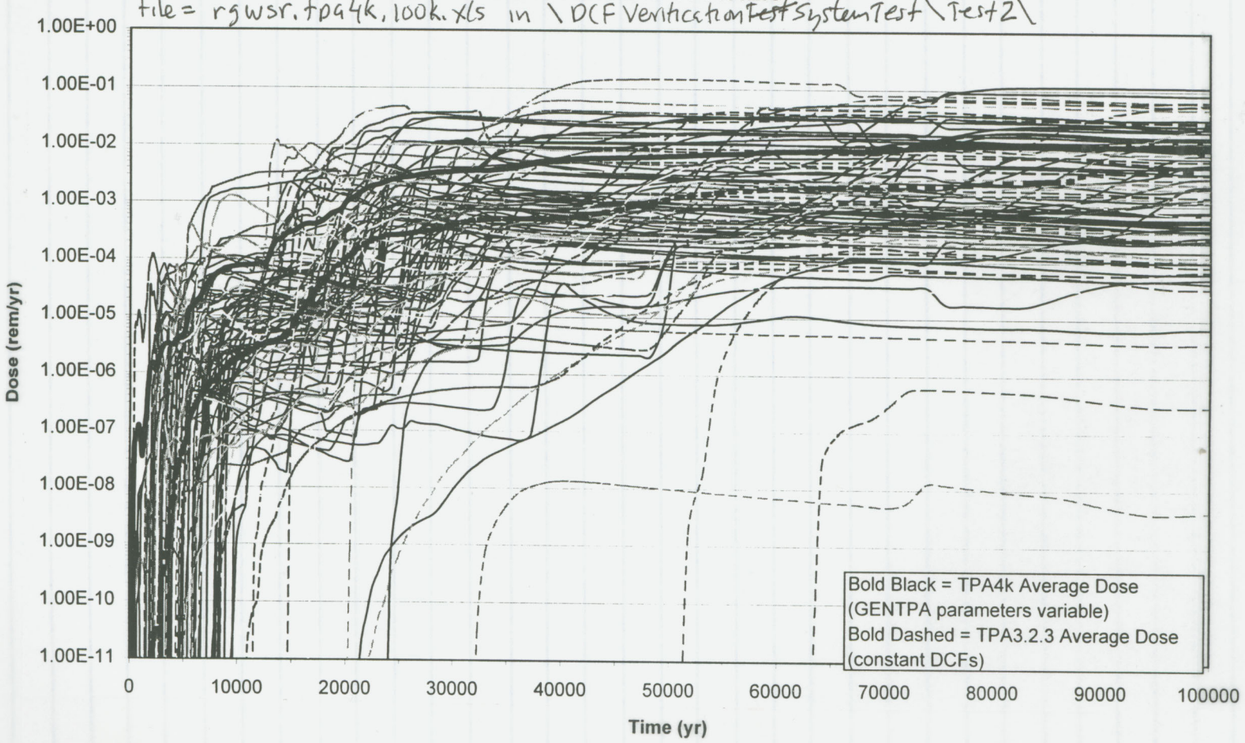
Results for DCF Verification System Test 2 AR 3/26/10

3/26/10

TPA4k Dose Results Over 100,000 Years for 100 Realizations with Average Dose from TPA4k and TPA3.2.3

~~3/29/10~~

File = rgwsr.tpa4k.100k.xls in \DCF VerificationTestSystemTest\Test2\



Results for DCF Verification System Test 2

3/28/00

Discussion / Conclusions for DCF Verification System Tests (and 2 earlier)

To gain further insight to the cause of differences in expected dose curves between TPA 4.0beta4 and TPA 3.2.3 the file nefii.dis was analyzed to determine differences in release and transport through the saturated zone. Files are from \DCF Verification Test\ test2\ DCFP_323_mean\ and ...\DCFP_mean, the analysis is in file \comp.nefii.dis.mean.xls. This analysis clearly shows faster transport of a greater amount of material through the sat zone. results include the following:

- Tc-99 is transported out (released) for 52 during 10,000 yr period in TPA4.0 but not in TPA 3.2.3
- Release of Tc-99 is greater than I-129 or Cl36 in TPA4.0beta4.
- Time to reach equilibrium in TPA4.0 beta4 S2 is about 3 timesteps vs 7 for TPA 3.2.3. (faster transport).

the conclusions from this testing is that the primary differences identified in tests 1 and 2 are the result of release and transport changes to TPA4.0 and not changes related to SCR-301. the tests provide confidence that the implementation of DCF calculations is operating as intended and no significant problems with DCF modifications are identified. thus, TPA4.0beta4 Verification System tests 1 and 2 have PASSED.

3/28/00

Note on Data files related to test 2 on Zip Disk (attached)
\DCF Verification System Test\ Test2\ ....

\DCFP_323_100K\ contains all tpa3.23 files for 100 kyr run
\DCFP_323_10K " " " " 10kyr run
\DCFP1\ contains TPA4.0beta4 files for 100 real 10K runs
\DCFP2\ " " " " " 100kyr run
\DCFP3\ " " " " " 10K run
w/ constant GENTPA parameters.

This scientific notebook is adequately prepared and contains sufficient detail that a technically qualified person could replicate the work.

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5/26/00

ADDITIONAL INFORMATION FOR SCIENTIFIC NOTEBOOK #: 194

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