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Accession #: D196071642

Document #: SD-WM-CN-016

Title/Desc:

XQS & UNIT DOSE CALCULATIONS FOR CWC INTERIM
SAFETY BASIS EFFORT

Pages: 124

APR 3 1996

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 156464

2. To: (Receiving Organization) SN&NE	3. From: (Originating Organization) Consequence Analysis 8M400	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Solid Waste SAR/8M300	6. Cog. Engr.: C.H. Huang	7. Purchase Order No.: N/A
8. Originator Remarks: The attached SD provides the information of X/Qs and unit dose calculations for Central Waste Complex Interim Safety Basis Effort.		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: CWC
11. Receiver Remarks:		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: 2/29/96

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-WM-CN-016	N/A	0	X/Qs and Unit Dose Calculations for Central Waste Complex Interim Safety Basis Effort	N/A	1/2	/	/

16. KEY

Approval Designator (F)		Reason for Transmittal (G)				Disposition (H) & (I)					
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)		1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)				1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged					
(G)	(H)	17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)						(G)	(H)		
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1		Cog. Eng. C.H. Huang	<i>C.H. Huang</i>	3/12/96	A3-34						
1		Cog. Mgr. D.S. Leach	<i>D.S. Leach</i>	3/18/96							
		QA									
		Safety									
		Env.									
1		Peer rev. D.A. Himes	<i>D.A. Himes</i>	3/14/96	A3-34						

18. C.H. Huang <i>C.H. Huang</i> Signature of EDT Originator	19. D.S. Leach <i>D.S. Leach</i> Authorized Representative Date for Receiving Organization	20. D.S. Leach <i>D.S. Leach</i> Cognizant Manager Date	21. DOE APPROVAL (if required) Ctrl. No. ☒ [W/A] Approved ☐ Approved w/comments ☐ Disapproved w/comments
 

XQs AND UNIT DOSE CALCULATIONS FOR CENTRAL WASTE COMPLEX INTERIM SAFETY BASIS EFFORT

C. H. HUANG

Westinghouse Hanford, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: 156464 UC: 630
Org Code: 8M400 Charge Code: A4G12
B&R Code: EW3130020 Total Pages: 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 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**X/Qs AND UNIT DOSE CALCULATIONS FOR CENTRAL WASTE COMPLEX
INTERIM SAFETY BASIS EFFORT**

C. H. HUANG
March 13, 1996

INTRODUCTION:

The objective for this problem is to calculate the ground-level release dispersion factors (X/Q) and unit doses for onsite facility and offsite receptors at the site boundary and at Highway 240 for plume meander, building wake effect, plume rise, and the combined effect. The release location is at Central Waste Complex Building P4 in the 200 West Area. The onsite facility is located at Building P7.

Acute ground level release 99.5 percentile dispersion factors (X/Q) were generated using the GXQ (B. Hey, 1994). The unit doses were calculated using the GENII code.

The dimensions of Building P4 are 15 m in W x 24 m in L x 6 m in H.

METHODOLOGIES AND ASSUMPTIONS

Bounding or worst case meteorology is considered to be a set meteorological conditions (i.e., wind speed, stability class) which results in a downwind concentration of airborne contaminants which is exceeded only a small fraction of time due to weather fluctuations. The NRC (1982) defines this fraction of exceedance as 0.5% for each sector or 5% for the overall site. That is, X/Q values are generated for weather conditions which result in downwind concentrations which are exceeded only 0.5% of the time in the maximum sector, or 5% of the time for the overall site. The greater of these two values is selected as bounding. Bounding or worst case X/Q values are used to assess the dose consequences in most accident scenarios. These bounding X/Q values represent minimum dispersing conditions, which results in maximum downwind concentrations, i.e., concentrations which are exceeded only a very small fraction of the time, as explained above. These X/Q's will therefore result in very conservative estimates of potential accident consequences.

The X/Q refers to the concentration of airborne contamination. It is the ratio of contaminant concentration at a specific receptor location to contaminant release rate. The receptor of concern is normally defined as a human having a standard breathing rate and metabolism. The product of X/Q and breathing rate is a unitless number representing the fraction of contaminant inhaled to contaminant released. Inhalation is the most likely pathway to human exposure.

The GENII code was used to calculate the unit doses.

BUILDING WAKE EFFECT AND PLUME MEANDER

The formulas used to calculate the horizontal diffusion and vertical diffusion coefficients at the source were taken from Equation 2.2 of NRC (1990) for considering the building wake effect:

$$\sigma_y (x=0) = W_b/4.3 = 15/4.3 = 3.5$$

$$\sigma_z (x=0) = H_b/2.15 = 6/2.15 = 2.8$$

where:

W_b = Building width (m)

H_b = Building height (m)

The above adjustment for the calculation of X/Q is made using the virtual distance method. These adjusted virtual distances are then used to calculate downwind diffusion coefficients and the concentrations.

The correction of plume meander used in the MACCS code (as requested by the customer) was used for adjusting the X/Q determination.

BUOYANT PLUME RISE

The release scenario is applied to a postulated ground level fire. The plume rise is also considered in the dose calculations. The buoyancy of the plume depends upon the heat generated or the combustion gas temperature.

The momentum rise of the plume is small in comparison to the buoyant component. The buoyant plume rise is a function of gas density and velocity. The velocity is a function of fire size and geometry. The momentum/buoyancy plume rise model used in GXQ is taken from equations 8.35, 8.36, and 8.57 of Randerson (1984) for plume rise in a crosswind. Assumptions made are that the effluent is a heated gas with a heat capacity and mean molecular weight close to that of air, and that initial effluent density and vertical velocity within the plume are constant.

FIRE SCENARIO ASSUMPTIONS

An initial vertical velocity of 1 m/s is assumed. This value is both conservative and consistent, assuming that the temperature of combustion gas is 1200 °F. The size of the fire is conservatively kept small at 3.0 meter diameter. The convective heat release rate for the diesel (modelled as kerosene) fire is 3.35×10^6 W based on a burn rate of 80.1 g/s for a burn area of 7.07 m² (see NRC, 1988; NUREG - 1320).

The duration of the fire is assumed to be half an hour. Wake effects and plume meander are also included in the X/Q calculations.

RECEPTOR DESCRIPTIONS

- Onsite: Ground level release dispersion factors (X/Q) were generated using the GXQ dosimetry code for the onsite nearest occupied facility for various cases with plume meander, building wake effect or plume rise for acute exposure at Building P7. Building P7 is located 498 m in the direction of east-southeast (ESE) from Central Waste Complex Building P4. These results are summarized in the Table 2 for various cases.
- Site Boundary: Receptor at the site boundary in the worst direction. Where the site is bounded by the Columbia River, the site boundary is taken to be at the nearer bank of the river. Atmosphere dispersion factors (X/Q) were generated for 16 sectors location around the site boundary; plume rise is also included in a fire accident for calculating the acute exposure. These results are summarized in the Table 3.
- Receptor at Highway 240: In addition, the receptor at Highway 240 were calculated. Atmosphere dispersion factors (X/Q) were generated for sectors location around the offsite receptor at Highway 240 with plume meander, building wake effect, plume rise, and the combined plume meander and building wake for acute exposure. These results are summarized in the Table 4.

The receptor locations and the source terms are specified by the customer (see Appendix A). The receptor locations at the onsite facility, the offsite boundary, and Highway 240 are given in Table 1.

CODE DOCUMENTATION

- o GXQ version 4.0 (11/19/94)
- o Joint Frequency Data: 200 Area, 10 m, Pasquill A-G (1983-1991 Average).
- o GENII version 1.485 (12/3/90)
- o GENII Default Parameter Values (28-Mar-90 RAP)
- o Radionuclide Master Library (7/23/93 PDR)
- o External Dose Factor Library (8-May-90-RAP)
- o Internal Dose Increments, PNL or Maximum Solubilities, (7/23/93 PDR)

GXQ output files are attached in Appendix B. GENII input and output files are attached in Appendix C.

Table 1. Receptors Locations in the Worst Sector for Onsite Facility, Offsite, and Highway 240.

Receptor	Distance
Onsite Facility (P7) (ESE)	498 m
Offsite (W)	11.7 Km
Highway 240 (W)*	4070 m

* West is the worst direction (see Case 4 GXQ run in Appendix B for the directions checked).

Table 2: Onsite Nearest Occupied Facility 99.5 Percentile Dispersion Factors (X/Q) at the Receptor of Building P7.

Specific X/Q	Building Wake*	Plume Meander	Plume Rise	X/Q(s/m ³)
1	Y	Y	Y	3.13E-05
2	Y	Y	N	1.36E-03
3	Y	N	N	1.47E-03
4	N	N	N	2.10E-03
5	N	Y	Y	3.13E-05
6	N	N	Y	9.77E-04
7	N	Y	N	1.68E-03
Y = Necessary to consider in the X/Q determination				
N = Not necessary to consider in the X/Q determination				

* Initial plume size for Case 1 (width = 3.0, height = 0.0).

Table 3: 99.5 Percentile X/Qs Values at Site Boundary Obtained from Acute Releases.

Specific X/Q	Building Wake	Plume Meander	Plume Rise	X/Q(s/m ³)
1	Y	Y	Y	3.74E-06
2	Y	Y	N	1.40E-05
3	Y	N	N	1.73E-05
4	N	N	N	1.76E-05
5	N	Y	Y	3.74E-06
6	N	N	Y	4.36E-06
7	N	Y	N	1.41E-05
Y = Necessary to consider in the X/Q determination N = Not necessary to consider in the X/Q determination				

Table 4: Receptor at Highway 240, 99.5 Percentile X/Qs Values Obtained from Acute Releases.

Specific X/Q	Building Wake	Plume Meander	Plume Rise	X/Q(s/m ³)
1	Y	Y	Y	5.37E-06
2	Y	Y	N	5.46E-05
3	Y	N	N	6.64E-05
4	N	N	N	6.98E-05
5	N	Y	Y	5.37E-06
6	N	N	Y	7.03E-06
7	N	Y	N	5.60E-05
Y = Necessary to consider in the X/Q determination N = Not necessary to consider in the X/Q determination				

SOURCE TERM

The source terms for the mixtures of isotopes were provided by the customer. The source terms for MFP, 12% nominal TRU, and 23.9% Pu-240 TRU for the mixtures of isotopes are shown in Tables 5, 6 and 7, respectively. For dose calculations, the source terms in the tables have been converted into specific activity for each isotope in unit of either Ci per Ci of a mixture or Ci per gram TRU.

Table 5. MFP Mixture and Percentage by Activity.

Isotope	Percentage by Activity	Ci per Ci of Mixture
Cs-137	24.8	0.248
Ba-137m	24.8	0.248
Sr-90	19.4	0.194
Y-90	19.4	0.194
Pu-239	0.41	0.0041
Pu-241	10.4	0.104
Am-241	0.79	0.0079
Total	100	1.00 Ci/Ci

Table 6. 12% Nominal TRU and Specific Activity for Each Isotope.

Isotope	Percentage by Weight	Specific Activity (Ci/g)	Activity per gram TRU (Ci) (Ci)
Pu-238	0.08	17.4	1.39E-02
Pu-239	83.95	0.0613	5.15E-02
Pu-240	12.97	0.227	2.94E-02
Pu-241	1.10	103	1.13E+00
Pu-242	0.03	0.00394	1.18E-06
Am-241	1.75	3.43	6.00E-02
Total	99.9		1.29+00 (Ci/g)

Table 7. 23.9% Pu-240 TRU and Specific Activity for Each Isotope.

Isotope	Percentage by Weight	Specific Activity (Ci/g)	Activity per gram TRU (Ci) (Ci)
Pu-238	0.09	17.4	1.57E-02
Pu-239	70.60	0.0613	4.33E-02
Pu-240	23.86	0.227	5.42E-02
Pu-241	1.60	103	1.65E+00
Pu-242	1.30	0.00394	5.12E-06
Am-241	2.55	3.43	8.75E-02
Total	100.		1.85+00 (Ci/g)

UNIT DOSE CALCULATIONS

The GENII code was used to calculate doses for each mixture of isotopes. The unit X/Q and the source terms as shown in Tables 5, 6, and 7 were used as input data into the GENII code for dose calculations. Two cases for each mixture are considered: One is soluble Pu (nitrates, etc.) and the other insoluble (oxides) mixture. The calculated unit doses are shown in Table 8 for three mixtures (MFP, 12% nominal TRU and 23.9 % Pu-240). The doses in the tables are expressed either in unit of rem/Ci or rem/g.

Table 8. Doses Per Unit X/Q for Soluble and Insoluble Mixtures.

Mixture	Soluble Pu (Nitrates)	Insoluble (Oxides)
MFP	2.0E+03 (rem/Ci)	1.8E+03 (rem/Ci)
TRU (12% Nominal)	2.5E+04 (rem/g)	2.0E+04 (rem/g)
TRU (23.9% Pu-240)	3.3E+04 (rem/g)	2.7E+04 (rem/g)

REFERENCES

- Hey, B. E., 1994, *GXQ Program Users' Guide*, WHC-SD-GN-SWD-30002, Westinghouse Hanford Company, Richland, Washington.
- Napier, B. A., et al., 1988, GENII - The Hanford Environmental Radiation Dosimetry Software System, PNL-6584, Pacific Northwest Laboratory, Richland, Washington.
- NRC, 1988, Nuclear Fuel Cycle Facility Accident Analysis Handbook. NUREG - 1320. Nuclear Regulatory Commission, Washington, D.C.
- NRC, 1990, MELCOR Accident Consequence Code System (MACCS), Model Description, NUREG.CR-4691, SAND86-1562, Vol. 2, U.S. Nuclear Regulatory Commission, Washington, D.C.
- Randerson, D., ed., 1984, Atmospheric Science and Power Production, DOE/TIC-27601 (DE84005177), Technical Information Center, Office of Scientific and Technical Information Center, U.S. Department of Energy, Washington, D.C.
- U.S. Nuclear Regulatory Commission, November 1982, *Atmospheric Dispersion Models For Potential Accident Consequence Assessments At Nuclear Power Plants*, Regulatory Guide 1.145, Revision 1, Office Of Nuclear Regulatory Research.

APPENDIX A

RECEPTOR LOCATION AND SOURCE TERM PROVIDED BY THE CUSTOMER

Solid Waste Safety Analysis
176-1941 A2-26
January 10, 1996

GENII CALCULATIONS FOR THE CENTRAL WASTE COMPLEX INTERIM SAFETY BASIS EFFORT

J.C. Van Keuren

A3-34

cc: J.P. Estrellado, Jr.
K.D. Gibson

T3-01
T3-01

It is requested that X/Q and unit dose consequence determinations be made for the Central Waste Complex, which now includes the buildings proposed for the W-112 project. It is preferred that the MACCS code be used for the X/Q determination, eliminating the need for the analyst to evaluate time distributions associated with the scenario.

The onsite dose receptor is considered to reside at the Plutonium Finishing Plant. The exact distance is expected to be extracted from site drawings. The location of the Long Term Drum Storage Buildings for project W-112 are assumed as being in a general location not affecting the onsite receptor distance. The plume direction is assumed to be in a east-south-east direction.

Other receptor locations need to be considered (i.e., Highway-240 and 11.7 km in a west direction).

The effort will need X/Q for scenarios with and without plume meander. Furthermore, there is a need for X/Qs with and without building wake considerations. The building wake considerations will be developed from dimensions that reflect those for the 2402 buildings and will be supplied to you. Finally analyses demonstrate the need for plume rise determination for the scenarios using burning diesel.

Therefore, the effort will require seven potential X/Qs for the different receptors as shown in the following matrix:

Specific X/Q	Building Wake	Plume Meander	Plume Rise	X/Q
1	Y	Y	Y	
2	Y	Y	N	
3	Y	N	N	
4	N	N	N	
5	N	Y	Y	
6	N	N	Y	
7	N	Y	N	
<p>Y = Necessary to consider in the X/Q determination</p> <p>N = Not necessary to consider in the X/Q determination</p>				

Unit doses consequence based on Plutonium-Equivalent Curie (PE-Ci) quantities are necessary for different isotopic mixtures used in the safety analyses. Calculations are to be based upon inhalation. The following isotopic distributions are noted for the storage facilities.

Isotopic Distribution		
Specific Mixtures		Percentage by weight
MFP	Cs-137	24.80
	Ba-137m	24.80
	Sr-90	19.40
	Y-90	19.40
	Pu-239	0.41
	Pu-241	10.40
	Am-241	0.79
TRU (12% nominal)	Pu-238	0.08
	Pu-239	83.95
	Pu-240	12.97
	Pu-241	1.10
	Pu-242	0.03
	Am-241	1.75
TRU (23.9% Pu-240)	Pu-238	0.09
	Pu-239	70.60
	Pu-240	23.86
	Pu-241	1.60
	Pu-242	1.30
	Am-241	2.55

APPENDIX B

X/Q OUTPUT FILES

GXQ Version 4.0
December 19, 1994

General Purpose Atmospheric Dispersion Code
Produced by Westinghouse Hanford Company

Users Guide documented in WHC-SD-GN-SWD-30002 Rev. 1.

Validation documented in WHC-SD-GN-SWD-30003 Rev. 1.

Code Custodian is: Brit E. Hey
Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352
(509) 376-2921

Run Date = 03/13/96
Run Time = 13:40:58.77

INPUT ECHO:

CWC Solid Waste Storage P4 to P7 XQs, case 1.

c GXQ Version 4.0 Input File

c mode
1

c

c MODE CHOICE:

c mode = 1 then X/Q based on Hanford site specific meteorology
c mode = 2 then X/Q based on atmospheric stability class and wind speed
c mode = 3 then X/Q plot file is created

c

c LOGICAL CHOICES:

c ifox inorm icdf ichk isite ipop

c	T	F	F	F	F	F
---	---	---	---	---	---	---

c ifox = t then joint frequency used to compute frequency to exceed X/Q
c = f then joint frequency used to compute annual average X/Q
c inorm = t then joint frequency data is normalized (as in GENII)
c = f then joint frequency data is un-normalized
c icdf = t then cumulative distribution file created (CDF.OUT)
c = f then no cumulative distribution file created
c ichk = t then X/Q parameter print option turned on
c = f then no parameter print
c isite = t then X/Q based on joint frequency data for all 16 sectors
c = f then X/Q based on joint frequency data of individual sectors
c ipop = t then X/Q is population weighted
c = f then no population weighting

c

c X/Q AND WIND SPEED ADJUSTMENT MODELS:

c ipuff idep isrc iwind
0 0 0 1

c DIFFUSION COEFFICIENT ADJUSTMENT MODELS:

c iwake ipm iflow ientr
2 2 0 0

c EFFECTIVE RELEASE HEIGHT ADJUSTMENT MODELS:

c (irise igrnd) iwash igrav
1 1 0 0

c ipuff = 1 then X/Q calculated using puff model
c = 0 then X/Q calculated using default continuous plume model
c idep = 1 then plume depletion model turned on (Chamberlain model)
c isrc = 1 then X/Q multiplied by scalar
c = 2 then X/Q adjusted by wind speed function
c iwind = 1 then wind speed corrected for plume height
c iwake = 1 then NRC RG 1.145 building wake model turned on
c = 2 then MACCS virtual distance building wake model turned on
c ipm = 1 then NRC RG 1.145 plume meander model turned on
c = 2 then 5th Power Law plume meander model turned on
c = 3 then sector average model turned on
c iflow = 1 then sigmas adjusted for volume flow rate
c ientr = 1 then method of Pasquill used to account for entrainment
c irise = 1 then MACCS buoyant plume rise model turned on
c = 2 then ISC2 momentum/buoyancy plume rise model turned on
c igrnd = 1 then Mills buoyant plume rise modification for ground effects

```

c iwash = 1 then stack downwash model turned on
c igrav = 1 then gravitational settling model turned on
c      = 0 unless specified otherwise, 0 turns model off
c
c PARAMETER INPUT:
c
c      release      reference      mixing      frequency
c      height      anemometer     height     to
c      hs(m)       ha(m)          hm(m)      exceed
c
c      0.00000E+00  1.00000E+01  1.00000E+03  5.00000E-01
c
c      initial      initial      release      deposition      gravitational
c      width        plume        duration     velocity        settling
c      Wb(m)         Hb(m)        trd(hr)      vd(m/s)         velocity
c
c      3.00000E+00  0.00000E+00  5.00000E-01  1.00000E-03  1.00000E-03
c
c      ambient      initial      initial      release      convective
c      temperature  plume        plume        diameter   heat release
c      Tamb(C)      TO(C)        flow rate    d(m)        rate(1)
c
c      2.00000E+01  1.20000E+03  7.07000E+00  3.00000E+00  3.35000E+06
c
c (1) If zero then buoyant flux based on plume/ambient temperature difference.
c
c      X/Q          Wind
c      scaling      Speed
c      factor       Exponent
c      c(?)         a(?)
c
c      1.00000E+00  7.80000E-01
c
c RECEPTOR DEPENDENT DATA (no line limit)
c FOR MODE make RECEPTOR DEPENDENT DATA
c 1 (site specific) sector distance receptor-height
c 2 (by class & wind speed) class windspeed distance offset receptor-height
c 3 (create plot file) class windspeed xmax imax ymax jmax xqmin power
c
c RECEPTOR PARAMETER DESCRIPTION
c sector = 0, 1, 2... (all, S, SSW, etc.)
c distance = receptor distance (m)
c receptor height = height of receptor (m)
c class = 1, 2, 3, 4, 5, 6, 7 (P-G stability class A, B, C, D, E, F, G)
c windspeed = anemometer wind speed (m/s)
c offset = offset from plume centerline (m)
c xmax = maximum distance to plot or calculate to (m)
c imax = distance intervals
c ymax = maximum offset to plot (m)
c jmax = offset intervals
c xqmin = minimum scaled X/Q to calculate
c power = exponent in power function step size
c
MODE:
Site specific X/Q calculated.

LOGICAL CHOICES:
Joint frequency used to calculate X/Q based on frequency of exceedance.
No normalization of joint frequency.
X/Q calculated for single sector.

MODELS SELECTED:
MACCS Virtual source building wake model selected.
5th power law plume meander model selected.
MACCS buoyancy plume rise model based on convective heat.
Mills buoyant rise modification for pool fire selected.
Default Gaussian plume model selected.
Wind velocity corrected for average plume height.

WARNING/ERROR MESSAGES:
WARNING #10 - X/Q may be underestimated for plume rise scenario without
accounting for entrainment.

JOINT FREQUENCY DATA:

```

WHC-SD-WM-CN-016, Rev. 0

200 AREA (HMS) - 10 M - Pasquill A - G (1983 - 1991 Average)
Created 8/26/92 KR

CWC Solid Waste Storage P4 to P7 XQs, case 1.

SECTOR	DISTANCE (m)	RECEPT HEIGHT (m)	SECT. FREQ. (%)	POPULATION	TOTAL POPULATION SCALED X/Q (s/m3)	AVERAGE INDIVIDUAL SCALED X/Q (s/m3)	ATM. STAB. CLASS	WIND SPEED (m/s)
ESE	498	0	18.80	1	3.13E-05	3.13E-05	D	9.80
W	11700	0	4.80	1	3.74E-06	3.74E-06	F	0.89
W	4070	0	4.80	1	5.37E-06	5.37E-06	F	2.65

GXQ Version 4.0
December 19, 1994

General Purpose Atmospheric Dispersion Code
Produced by Westinghouse Hanford Company

Users Guide documented in WHC-SD-GN-SWD-30002 Rev. 1.
Validation documented in WHC-SD-GN-SWD-30003 Rev. 1.
Code Custodian is: Brit E. Hey

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352
(509) 376-2921

Run Date = 03/10/96
Run Time = 11:38:27.76

```

INPUT ECHO:
CWC Solid Waste Storage P4 to P7 XQs, case 2 with wake effect & plume meander
c GXQ Version 4.0 Input File
c mode
  1
c
c MODE CHOICE:
c mode = 1 then X/Q based on Hanford site specific meteorology
c mode = 2 then X/Q based on atmospheric stability class and wind speed
c mode = 3 then X/Q plot file is created
c
c LOGICAL CHOICES:
c ifox inorm icdf ichk isite ipop
  T     F     F     F     F     F
c ifox = t then joint frequency used to compute frequency to exceed X/Q
c       = f then joint frequency used to compute annual average X/Q
c inorm = t then joint frequency data is normalized (as in GENII)
c       = f then joint frequency data is un-normalized
c icdf  = t then cumulative distribution file created (CDF.OUT)
c       = f then no cumulative distribution file created
c ichk  = t then X/Q parameter print option turned on
c       = f then no parameter print
c isite = t then X/Q based on joint frequency data for all 16 sectors
c       = f then X/Q based on joint frequency data of individual sectors
c ipop  = t then X/Q is population weighted
c       = f then no population weighting
c
c X/Q AND WIND SPEED ADJUSTMENT MODELS:
c ipuff idep isrc iwind
  0     0     0     0
c DIFFUSION COEFFICIENT ADJUSTMENT MODELS:
c iwake ipm iflow ientr
  2     2     0     0
c EFFECTIVE RELEASE HEIGHT ADJUSTMENT MODELS:
c (irise igrnd) iwash igrav
  0     0     0     0
c ipuff = 1 then X/Q calculated using puff model
c       = 0 then X/Q calculated using default continuous plume model
c idep  = 1 then plume depletion model turned on (Chamberlain model)
c isrc  = 1 then X/Q multiplied by scalar
c       = 2 then X/Q adjusted by wind speed function
c iwind = 1 then wind speed corrected for plume height
c iwake = 1 then NRC RG 1.145 building wake model turned on
c       = 2 then MACCS virtual distance building wake model turned on
c ipm   = 1 then NRC RG 1.145 plume meander model turned on
c       = 2 then 5th Power Law plume meander model turned on
c       = 3 then sector average model turned on

```

```

c iflow = 1 then sigmas adjusted for volume flow rate
c ientr = 1 then method of Pasquill used to account for entrainment
c irise = 1 then MACCS buoyant plume rise model turned on
c      = 2 then ISC2 momentum/buoyancy plume rise model turned on
c igrnd = 1 then Mills buoyant plume rise modification for ground effects
c iwash = 1 then stack downwash model turned on
c igrav = 1 then gravitational settling model turned on
c      = 0 unless specified otherwise, 0 turns model off
c
c PARAMETER INPUT:
c
c      release      reference      mixing      frequency
c      height      anemometer      height      to
c      hs(m)        ha(m)          hm(m)       exceed
c
c      0.00000E+00  1.00000E+01  1.00000E+03  5.00000E-01
c
c      initial      initial      release      deposition      gravitational
c      plume        plume        duration     velocity        settling
c      width        height      trd(hr)       velocity        velocity
c      wb(m)        Hb(m)          (m/s)         (m/s)          (m/s)
c
c      1.50000E+01  6.00000E+00  5.00000E-01  1.00000E-03  1.00000E-03
c
c      ambient      initial      initial      release      convective
c      temperature  plume        plume        diameter    heat release
c      Tamb(C)      T0(C)         flow rate    d(m)         rate(1)
c                  V0(m3/s)
c
c      2.00000E+01  2.00000E+01  1.00000E+00  1.00000E+00  0.00000E+00
c
c (1) If zero then buoyant flux based on plume/ambient temperature difference.
c
c      X/Q          Wind
c      scaling      Speed
c      factor       Exponent
c      c(?)         a(?)
c
c      1.00000E+00  7.80000E-01
c
c RECEPTOR DEPENDENT DATA (no line limit)
c FOR MODE make RECEPTOR DEPENDENT DATA
c 1 (site specific) sector distance receptor-height
c 2 (by class & wind speed) class windspeed distance offset receptor-height
c 3 (create plot file) class windspeed xmax ymax jmax xqmin power
c
c RECEPTOR PARAMETER DESCRIPTION
c sector = 0, 1, 2... (all, S, SSW, etc.)
c distance = receptor distance (m)
c receptor height = height of receptor (m)
c class = 1, 2, 3, 4, 5, 6, 7 (P-G stability class A, B, C, D, E, F, G)
c windspeed = anemometer wind speed (m/s)
c offset = offset from plume centerline (m)
c xmax = maximum distance to plot or calculate to (m)
c imax = distance intervals
c ymax = maximum offset to plot (m)
c jmax = offset intervals
c xqmin = minimum scaled X/Q to calculate
c power = exponent in power function step size
c
MODELS:
Site specific X/Q calculated.

LOGICAL CHOICES:
Joint frequency used to calculate X/Q based on frequency of exceedance.
No normalization of joint frequency.
X/Q calculated for single sector.

MODELS SELECTED:
MACCS Virtual source building wake model selected.
5th power law plume meander model selected.
Default Gaussian plume model selected.

WARNING/ERROR MESSAGES:

JOINT FREQUENCY DATA:

```


200 AREA (HMS) - 10 M - Pasquill A - G (1983 - 1991 Average)
Created 8/26/92 KR

CWC Solid Waste Storage P4 to P7 XQs, case 2 with wake effect & plume meander

SECTOR	DISTANCE (m)	RECEPT HEIGHT (m)	SECT. FREQ. (%)	POPULATION	TOTAL POPULATION SCALED X/Q (s/m3)	AVERAGE INDIVIDUAL SCALED X/Q (s/m3)	ATM. STAB. CLASS	WIND SPEED (m/s)
ESE	498	0	18.80	1	1.36E-03	1.36E-03	F	0.89
W	11700	0	4.80	1	1.40E-05	1.40E-05	G	2.65
W	4070	0	4.80	1	5.46E-05	5.46E-05	G	2.65

GXQ Version 4.0
December 19, 1994

General Purpose Atmospheric Dispersion Code
Produced by Westinghouse Hanford Company

Users Guide documented in WHC-SD-GN-SWD-30002 Rev. 1.
Validation documented in WHC-SD-GN-SWD-30003 Rev. 1.
Code Custodian is: Brit E. Hey

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352
(509) 376-2921

Run Date = 03/10/96
Run Time = 11:39:46.91

INPUT ECHO:

CWC Solid Waste Storage P4 to P7 XQs, case 3.

c GXQ Version 4.0 Input File

c mode
1

c

c MODE CHOICE:

c mode = 1 then X/Q based on Hanford site specific meteorology
c mode = 2 then X/Q based on atmospheric stability class and wind speed
c mode = 3 then X/Q plot file is created

c

c LOGICAL CHOICES:

c ifox inorm icdf ichk isite ipop

T F F F F F

c ifox = t then joint frequency used to compute frequency to exceed X/Q

c = f then joint frequency used to compute annual average X/Q

c inorm = t then joint frequency data is normalized (as in GENII)

c = f then joint frequency data is un-normalized

c icdf = t then cumulative distribution file created (CDF.OUT)

c = f then no cumulative distribution file created

c ichk = t then X/Q parameter print option turned on

c = f then no parameter print

c isite = t then X/Q based on joint frequency data for all 16 sectors

c = f then X/Q based on joint frequency data of individual sectors

c ipop = t then X/Q is population weighted

c = f then no population weighting

c

c X/Q AND WIND SPEED ADJUSTMENT MODELS:

c ipuff idep isrc iwind

0 0 0 0

c DIFFUSION COEFFICIENT ADJUSTMENT MODELS:

c iwake ipm iflow ientr

2 0 0 0

c EFFECTIVE RELEASE HEIGHT ADJUSTMENT MODELS:

c (irise igrnd) iwash igrav

0 0 0 0

c ipuff = 1 then X/Q calculated using puff model

c = 0 then X/Q calculated using default continuous plume model

c idep = 1 then plume depletion model turned on (Chamberlain model)

c isrc = 1 then X/Q multiplied by scalar

c = 2 then X/Q adjusted by wind speed function

c iwind = 1 then wind speed corrected for plume height

c iwake = 1 then NRC RG 1.145 building wake model turned on

```

c      = 2 then MACCS virtual distance building wake model turned on
c ipm  = 1 then NRC RG 1.145 plume meander model turned on
c      = 2 then 5th Power Law plume meander model turned on
c      = 3 then sector average model turned on
c iflow = 1 then sigmas adjusted for volume flow rate
c ientr = 1 then method of Pasquill used to account for entrainment
c irise  = 1 then MACCS buoyant plume rise model turned on
c      = 2 then ISC2 momentum/buoyancy plume rise model turned on
c igrnd  = 1 then Mills buoyant plume rise modification for ground effects
c iwash  = 1 then stack downwash model turned on
c igrav  = 1 then gravitational settling model turned on
c      = 0 unless specified otherwise, 0 turns model off
c
c PARAMETER INPUT:
c
c      release      reference      mixing      frequency
c      height      height      height      to
c      hs(m)        ha(m)        hm(m)        exceed
c
c      0.00000E+00  1.00000E+01  1.00000E+03  5.00000E-01
c
c      initial      initial      release      deposition      gravitational
c      plume        plume        duration     velocity        settling
c      width        height      trd(hr)      vd(m/s)         velocity
c      Wb(m)        Hb(m)
c
c      1.50000E+01  6.00000E+00  5.00000E-01  1.00000E-03  1.00000E-03
c
c      ambient      initial      initial      release      convective
c      temperature  temperature  plume        diameter     heat release
c      Tamb(C)      T0(C)        flow rate    d(m)         rate(1)
c
c      2.00000E+01  2.00000E+01  1.00000E+00  1.00000E+00  0.00000E+00
c
c      (1) If zero then buoyant flux based on plume/ambient temperature difference.
c
c      X/Q          Wind
c      scaling      Speed
c      factor       Exponent
c      c(?)         a(?)
c
c      1.00000E+00  7.80000E-01
c
c RECEPTOR DEPENDENT DATA (no line limit)
c FOR MODE make RECEPTOR DEPENDENT DATA
c 1 (site specific) sector distance receptor-height
c 2 (by class & wind speed) class windspeed distance offset receptor-height
c 3 (create plot file) class windspeed xmax imax ymax jmax xqmin power
c
c RECEPTOR PARAMETER DESCRIPTION
c sector = 0, 1, 2... (all, S, SSW, etc.)
c distance = receptor distance (m)
c receptor height = height of receptor (m)
c class = 1, 2, 3, 4, 5, 6, 7 (P-Q stability class A, B, C, D, E, F, G)
c windspeed = anemometer wind speed (m/s)
c offset = offset from plume centerline (m)
c xmax = maximum distance to plot or calculate to (m)
c imax = distance intervals
c ymax = maximum offset to plot (m)
c jmax = offset intervals
c xqmin = minimum scaled X/Q to calculate
c power = exponent in power function step size

```

MODE:
Site specific X/Q calculated.

LOGICAL CHOICES:
Joint frequency used to calculate X/Q based on frequency of exceedance.
No normalization of joint frequency.
X/Q calculated for single sector.

MODELS SELECTED:
MACCS Virtual source building wake model selected.
Default Gaussian plume model selected.

WARNING/ERROR MESSAGES:

JOINT FREQUENCY DATA:
200 AREA (HMS) - 10 M - Pasquill A - G (1983 - 1991 Average)
Created 8/26/92 KR

CWC Solid Waste Storage P4 to P7 XQs, case 3.

SECTOR	DISTANCE (m)	RECEPT HEIGHT (m)	SECT. FREQ. (%)	POPULATION	TOTAL POPULATION SCALED X/Q (s/m3)	AVERAGE INDIVIDUAL SCALED X/Q (s/m3)	ATM. STAB. CLASS	WIND SPEED (m/s)
ESE	498	0	18.80	1	1.47E-03	1.47E-03	F	0.89
W	11700	0	4.80	1	1.73E-05	1.73E-05	G	2.65
W	4070	0	4.80	1	6.64E-05	6.64E-05	G	2.65

GXQ Version 4.0
December 19, 1994

General Purpose Atmospheric Dispersion Code
Produced by Westinghouse Hanford Company

Users Guide documented in WHC-SD-GN-SWD-30002 Rev. 1.
Validation documented in WHC-SD-GN-SWD-30003 Rev. 1.
Code Custodian is: Brit E. Hey

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352
(509) 376-2921

Run Date = 03/10/96
Run Time = 09:58:47.97

```

INPUT ECHO:
CWC Solid Waste Storage P4 to P7 XQs, case 4. no effect
c GXQ Version 4.0 Input File
c mode
  1
c
c MODE CHOICE:
c mode = 1 then X/Q based on Hanford site specific meteorology
c mode = 2 then X/Q based on atmospheric stability class and wind speed
c mode = 3 then X/Q plot file is created
c
c LOGICAL CHOICES:
c ifox inorm icdf ichk isite ipop
  T   F   F   F   F   F
c ifox = t then joint frequency used to compute frequency to exceed X/Q
c      = f then joint frequency used to compute annual average X/Q
c inorm = t then joint frequency data is normalized (as in GENII)
c      = f then joint frequency data is un-normalized
c icdf  = t then cumulative distribution file created (CDF.OUT)
c      = f then no cumulative distribution file created
c ichk  = t then X/Q parameter print option turned on
c      = f then no parameter print
c isite = t then X/Q based on joint frequency data for all 16 sectors
c      = f then X/Q based on joint frequency data of individual sectors
c ipop  = t then X/Q is population weighted
c      = f then no population weighting
c
c X/Q AND WIND SPEED ADJUSTMENT MODELS:
c ipuff idep isrc iwind
  0   0   0   0
c DIFFUSION COEFFICIENT ADJUSTMENT MODELS:
c iwake ipm iflow ientr
  0   0   0   0
c EFFECTIVE RELEASE HEIGHT ADJUSTMENT MODELS:
c (irise igrnd)iwash igrav
  0   0   0   0
c ipuff = 1 then X/Q calculated using puff model
c      = 0 then X/Q calculated using default continuous plume model
c idep  = 1 then plume depletion model turned on (Chamberlain model)
c isrc  = 1 then X/Q multiplied by scalar
c      = 2 then X/Q adjusted by wind speed function
c iwind = 1 then wind speed corrected for plume height
c iwake = 1 then NRC RG 1.145 building wake model turned on
c      = 2 then MACCS virtual distance building wake model turned on

```

```

c ipm = 1 then NRC RG 1.145 plume meander model turned on
c   = 2 then 5th Power Law plume meander model turned on
c   = 3 then sector average model turned on
c iflow = 1 then sigmas adjusted for volume flow rate
c ientr = 1 then method of Pasquill used to account for entrainment
c irise = 1 then MACCS buoyant plume rise model turned on
c   = 2 then ISC2 momentum/buoyancy plume rise model turned on
c igrnd = 1 then Mills buoyant plume rise modification for ground effects
c iwash = 1 then stack downwash model turned on
c igrav = 1 then gravitational settling model turned on
c   = 0 unless specified otherwise, 0 turns model off
c
c PARAMETER INPUT:
c
c   release      reference      mixing      frequency
c   height      anemometer     height     to
c   hs(m)       ha(m)          hm(m)      exceed
c                                     Cx(%)
c
c   0.00000E+00  1.00000E+01  1.00000E+03  5.00000E-01
c
c   initial      initial      release      deposition      gravitational
c   plume        plume        duration     velocity        settling
c   width        height      trd(hr)      velocity        velocity
c   Wb(m)        Hb(m)                          vd(m/s)         vg(m/s)
c
c   3.50000E+00  2.80000E+00  5.00000E-01  1.00000E-03  1.00000E-03
c
c   ambient      initial      initial      release      convective
c   temperature  plume        plume        diameter    heat release
c   Tamb(C)      T0(C)        flow rate   d(m)         rate(1)
c                                     V0(m3/s)
c                                     qh(w)
c
c   2.00000E+01  2.00000E+01  1.00000E+00  1.00000E+00  0.00000E+00
c
c (1) If zero then buoyant flux based on plume/ambient temperature difference.
c
c X/Q          Wind
c scaling      Speed
c factor       Exponent
c c(?)         a(?)
c
c 1.00000E+00  7.80000E-01
c
c RECEPTOR DEPENDENT DATA (no line limit)
c FOR MODE make RECEPTOR DEPENDENT DATA
c 1 (site specific) sector distance receptor-height
c 2 (by class & wind speed) class windspeed distance offset receptor-height
c 3 (create plot file) class windspeed xmax imax ymax jmax xqmin power
c
c RECEPTOR PARAMETER DESCRIPTION
c sector = 0, 1, 2... (all, S, SSW, etc.)
c distance = receptor distance (m)
c receptor height = height of receptor (m)
c class = 1, 2, 3, 4, 5, 6, 7 (P-G stability class A, B, C, D, E, F, G)
c windspeed = anemometer wind speed (m/s)
c offset = offset from plume centerline (m)
c xmax = maximum distance to plot or calculate to (m)
c imax = distance intervals
c ymax = maximum offset to plot (m)
c jmax = offset intervals
c xqmin = minimum scaled X/Q to calculate
c power = exponent in power function step size

```

MODE:
Site specific X/Q calculated.

LOGICAL CHOICES:
Joint frequency used to calculate X/Q based on frequency of exceedance.
No normalization of joint frequency.
X/Q calculated for single sector.

MODELS SELECTED:
Default Gaussian plume model selected.

WARNING/ERROR MESSAGES:

JOINT FREQUENCY DATA:

200 AREA (HMS) - 10 M - Pasquill A - G (1983 - 1991 Average)

Created 8/26/92 KR

CWC Solid Waste Storage P4 to P7 XQs, case 4. no effect

SECTOR	DISTANCE (m)	RECEPT HEIGHT (m)	SECT. FREQ. (%)	POPULATION	TOTAL POPULATION	AVERAGE INDIVIDUAL	ATM. STAB. CLASS	WIND SPEED (m/s)
					SCALED X/Q (s/m3)	SCALED X/Q (s/m3)		
ESE	498	0	18.80	1	2.10E-03	2.10E-03	F	0.89
W	11700	0	4.80	1	1.76E-05	1.76E-05	G	2.65
S	5550	0	6.30	1	2.50E-05	2.50E-05	E	0.89
SSW	4810	0	4.53	1	2.21E-05	2.21E-05	F	2.65
SW	4160	0	2.93	1	2.90E-05	2.90E-05	F	2.65
WSW	4160	0	2.72	1	2.91E-05	2.91E-05	F	2.65
W	4070	0	4.80	1	6.98E-05	6.98E-05	G	2.65
WNW	6660	0	3.98	1	2.05E-05	2.05E-05	G	4.70
NW	8140	0	4.72	1	2.89E-05	2.89E-05	G	2.65

GXQ Version 4.0
December 19, 1994

General Purpose Atmospheric Dispersion Code
Produced by Westinghouse Hanford Company

Users Guide documented in WHC-SD-GN-SWD-30002 Rev. 1.
Validation documented in WHC-SD-GN-SWD-30003 Rev. 1.
Code Custodian is: Brit E. Hey

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352
(509) 376-2921

Run Date = 03/13/96
Run Time = 13:48:01.48

INPUT ECHO:

CWC Solid Waste Storage P4 to P7 XQs, case 5.

c GXQ Version 4.0 Input File

c mode
1

c

c MODE CHOICE:

c mode = 1 then X/Q based on Hanford site specific meteorology
c mode = 2 then X/Q based on atmospheric stability class and wind speed
c mode = 3 then X/Q plot file is created

c

c LOGICAL CHOICES:

c ifox inorm icdf ichk isite ipop
T F F F F F

c ifox = t then joint frequency used to compute frequency to exceed X/Q
c = f then joint frequency used to compute annual average X/Q
c inorm = t then joint frequency data is normalized (as in GENII)
c = f then joint frequency data is un-normalized
c icdf = t then cumulative distribution file created (CDF.OUT)
c = f then no cumulative distribution file created
c ichk = t then X/Q parameter print option turned on
c = f then no parameter print
c isite = t then X/Q based on joint frequency data for all 16 sectors
c = f then X/Q based on joint frequency data of individual sectors
c ipop = t then X/Q is population weighted
c = f then no population weighting

c

c X/Q AND WIND SPEED ADJUSTMENT MODELS:

c ipuff idep isrc iwind
0 0 0 1

c DIFFUSION COEFFICIENT ADJUSTMENT MODELS:

c iwake ipm iflow ientr
0 2 0 0

c EFFECTIVE RELEASE HEIGHT ADJUSTMENT MODELS:

c (irise igrnd) iwash igrav
1 1 0 0

c ipuff = 1 then X/Q calculated using puff model
c = 0 then X/Q calculated using default continuous plume model
c idep = 1 then plume depletion model turned on (Chamberlain model)
c isrc = 1 then X/Q multiplied by scalar
c = 2 then X/Q adjusted by wind speed function
c iwind = 1 then wind speed corrected for plume height
c iwake = 1 then NRC RG 1.145 building wake model turned on
c = 2 then MACCS virtual distance building wake model turned on
c ipm = 1 then NRC RG 1.145 plume meander model turned on
c = 2 then 5th Power Law plume meander model turned on
c = 3 then sector average model turned on
c iflow = 1 then sigmas adjusted for volume flow rate


```

c ientr = 1 then method of Pasquill used to account for entrainment
c irise = 1 then MACCS buoyant plume rise model turned on
c      = 2 then ISC2 momentum/buoyancy plume rise model turned on
c igrnd = 1 then Mills buoyant plume rise modification for ground effects
c iwash = 1 then stack downwash model turned on
c igrav = 1 then gravitational settling model turned on
c      = 0 unless specified otherwise, 0 turns model off
c
c PARAMETER INPUT:
c
c   release      reference      mixing      frequency
c   height      anemometer      height      to
c   hs(m)       ha(m)           hm(m)       exceed
c
c   0.00000E+00  1.00000E+01    1.00000E+03  5.00000E-01
c
c   initial      initial      release      deposition      gravitational
c   plume        plume        duration     velocity        settling
c   width        height      trd(hr)       vd(m/s)         velocity
c   wb(m)        Hb(m)
c
c   3.00000E+00  0.00000E+00    5.00000E-01  1.00000E-03    1.00000E-03
c
c   ambient      initial      initial      release      convective
c   temperature  plume        plume        flow rate    heat release
c   Tamb(C)      T0(C)         V0(m3/s)     diameter     rate(1)
c
c   2.00000E+01  1.20000E+03    7.07000E+00  3.00000E+00    3.35000E+06
c
c (1) If zero then buoyant flux based on plume/ambient temperature difference.
c
c   X/Q          Wind
c   scaling      Speed
c   factor        Exponent
c   c(?)         a(?)
c
c   1.00000E+00  7.80000E-01
c
c RECEPTOR DEPENDENT DATA (no line limit)
c FOR MODE      make      RECEPTOR DEPENDENT DATA
c 1 (site specific)      sector distance receptor-height
c 2 (by class & wind speed) class windspeed distance offset receptor-height
c 3 (create plot file)    class windspeed xmax imax ymax jmax xqmin power
c
c RECEPTOR PARAMETER DESCRIPTION
c sector = 0, 1, 2... (all, S, SSW, etc.)
c distance = receptor distance (m)
c receptor height = height of receptor (m)
c class = 1, 2, 3, 4, 5, 6, 7 (P-G stability class A, B, C, D, E, F, G)
c windspeed = anemometer wind speed (m/s)
c offset = offset from plume centerline (m)
c xmax = maximum distance to plot or calculate to (m)
c imax = distance intervals
c ymax = maximum offset to plot (m)
c jmax = offset intervals
c xqmin = minimum scaled X/Q to calculate
c power = exponent in power function step size
c
MODE:
Site specific X/Q calculated.

LOGICAL CHOICES:
Joint frequency used to calculate X/Q based on frequency of exceedance.
No normalization of joint frequency.
X/Q calculated for single sector.

MODELS SELECTED:
5th power law plume meander model selected.
MACCS buoyancy plume rise model based on convective heat.
Mills buoyant rise modification for pool fire selected.
Default Gaussian plume model selected.
Wind velocity corrected for average plume height.

WARNING/ERROR MESSAGES:
WARNING #10 - X/Q may be underestimated for plume rise scenario without

```

accounting for entrainment.

JOINT FREQUENCY DATA:

200 AREA (HMS) - 10 M - Pasquill A - G (1983 - 1991 Average)

Created 8/26/92 KR

CWC Solid Waste Storage P4 to P7 XQs, case 5.

SECTOR	DISTANCE (m)	RECEPT HEIGHT (m)	SECT. FREQ. (%)	POPULATION	TOTAL POPULATION SCALED X/Q (s/m3)	AVERAGE INDIVIDUAL SCALED X/Q (s/m3)	ATM. STAB. CLASS	WIND SPEED (m/s)
ESE	498	0	18.80	1	3.13E-05	3.13E-05	D	9.80
W	11700	0	4.80	1	3.74E-06	3.74E-06	F	0.89
W	4070	0	4.80	1	5.37E-06	5.37E-06	F	2.65

GXQ Version 4.0
December 19, 1994

General Purpose Atmospheric Dispersion Code
Produced by Westinghouse Hanford Company

Users Guide documented in WHC-SD-GN-SWD-30002 Rev. 1.
Validation documented in WHC-SD-GN-SWD-30003 Rev. 1.
Code Custodian is: Brit E. Hey
Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352
(509) 376-2921

Run Date = 03/13/96
Run Time = 13:53:38.55

INPUT ECHO:

CWC Solid Waste Storage P4 to P7 XQs, case 6.

c GXQ Version 4.0 Input File

c mode
1

c

c MODE CHOICE:

c mode = 1 then X/Q based on Hanford site specific meteorology
c mode = 2 then X/Q based on atmospheric stability class and wind speed
c mode = 3 then X/Q plot file is created

c

c LOGICAL CHOICES:

c ifox inorm icdf ichk isite ipop

T F F F F F
c ifox = t then joint frequency used to compute frequency to exceed X/Q
c = f then joint frequency used to compute annual average X/Q
c inorm = t then joint frequency data is normalized (as in GENIII)
c = f then joint frequency data is un-normalized
c icdf = t then cumulative distribution file created (CDF.OUT)
c = f then no cumulative distribution file created
c ichk = t then X/Q parameter print option turned on
c = f then no parameter print
c isite = t then X/Q based on joint frequency data for all 16 sectors
c = f then X/Q based on joint frequency data of individual sectors
c ipop = t then X/Q is population weighted
c = f then no population weighting

c X/Q AND WIND SPEED ADJUSTMENT MODELS:

c ipuff idep isrc iwind
0 0 0 1

c DIFFUSION COEFFICIENT ADJUSTMENT MODELS:

c iwake ipm iflow ientr
0 0 0 0

c EFFECTIVE RELEASE HEIGHT ADJUSTMENT MODELS:

c (irise igrnd) iwash igrav

1 1 0 0
c ipuff = 1 then X/Q calculated using puff model
c = 0 then X/Q calculated using default continuous plume model
c idep = 1 then plume depletion model turned on (Chamberlain model)
c isrc = 1 then X/Q multiplied by scalar
c = 2 then X/Q adjusted by wind speed function
c iwind = 1 then wind speed corrected for plume height
c iwake = 1 then NRC RG 1.145 building wake model turned on
c = 2 then MACCS virtual distance building wake model turned on
c ipm = 1 then NRC RG 1.145 plume meander model turned on
c = 2 then 5th Power Law plume meander model turned on
c = 3 then sector average model turned on
c iflow = 1 then sigmas adjusted for volume flow rate
c ientr = 1 then method of Pasquill used to account for entrainment
c irise = 1 then MACCS buoyant plume rise model turned on
c = 2 then ISC2 momentum/buoyancy plume rise model turned on

```

c igrnd = 1 then Mills buoyant plume rise modification for ground effects
c iwash = 1 then stack downwash model turned on
c igrav = 1 then gravitational settling model turned on
c      = 0 unless specified otherwise, 0 turns model off
c
c PARAMETER INPUT:
c      reference      mixing      frequency
c      release      anemometer      to
c      height      height      height      exceed
c      hs(m)      ha(m)      hm(m)      Cx(%)
c
c      0.00000E+00      1.00000E+01      1.00000E+03      5.00000E-01
c
c      initial      initial      release      deposition      gravitational
c      plume      plume      duration      velocity      settling
c      width      height      trd(hr)      velocity      velocity
c      Wb(m)      Hb(m)      trd(hr)      vd(m/s)      vg(m/s)
c
c      1.50000E+01      6.00000E+00      5.00000E-01      1.00000E-03      1.00000E-03
c
c      ambient      initial      initial      release      convective
c      temperature      plume      plume      diameter      heat release
c      Tamb(C)      T0(C)      V0(m3/s)      d(m)      rate(1)
c
c      2.00000E+01      1.20000E+03      7.07000E+00      3.00000E+00      3.35000E+06
c
c (1) If zero then buoyant flux based on plume/ambient temperature difference.
c
c      X/Q      Wind
c      scaling      Speed
c      factor      Exponent
c      c(?)      a(?)
c
c      1.00000E+00      7.80000E-01
c
c RECEPTOR DEPENDENT DATA (no line limit)
c FOR MODE make RECEPTOR DEPENDENT DATA
c 1 (site specific) sector distance receptor-height
c 2 (by class & wind speed) class windspeed distance offset receptor-height
c 3 (create plot file) class windspeed xmax ymax xmin power
c
c RECEPTOR PARAMETER DESCRIPTION
c sector = 0, 1, 2... (all, S, SSW, etc.)
c distance = receptor distance (m)
c receptor height = height of receptor (m)
c class = 1, 2, 3, 4, 5, 6, 7 (P-G stability class A, B, C, D, E, F, G)
c windspeed = anemometer wind speed (m/s)
c offset = offset from plume centerline (m)
c xmax = maximum distance to plot or calculate to (m)
c imax = distance intervals
c ymax = maximum offset to plot (m)
c jmax = offset intervals
c xmin = minimum scaled X/Q to calculate
c power = exponent in power function step size
c
MODE:
Site specific X/Q calculated.

LOGICAL CHOICES:
Joint frequency used to calculate X/Q based on frequency of exceedance.
No normalization of joint frequency.
X/Q calculated for single sector.

MODELS SELECTED:
MACCS buoyancy plume rise model based on convective heat.
Mills buoyant rise modification for pool fire selected.
Default Gaussian plume model selected.
Wind velocity corrected for average plume height.

WARNING/ERROR MESSAGES:
WARNING #10 - X/Q may be underestimated for plume rise scenario without
accounting for entrainment.

JOINT FREQUENCY DATA:
200 AREA (HMS) - 10 M - Pasquill A - G (1983 - 1991 Average)

```

Created 8/26/92 KR

CMC Solid Waste Storage P4 to P7 XGs, case 6.

SECTOR	DISTANCE (m)	RECEPT HEIGHT (m)	SECT. FREQ. (%)	POPULATION	TOTAL POPULATION	AVERAGE INDIVIDUAL	ATM. STAB. CLASS	WIND SPEED (m/s)
					SCALED X/Q (s/m3)	SCALED X/Q (s/m3)		
ESE	498	0	18.80	1	9.77E-04	9.77E-04	G	4.70
W	11700	0	4.80	1	4.36E-06	4.36E-06	F	4.70
W	4070	0	4.80	1	7.03E-06	7.03E-06	F	2.65

GXQ Version 4.0
December 19, 1994

General Purpose Atmospheric Dispersion Code
Produced by Westinghouse Hanford Company

Users Guide documented in WHC-SD-GN-SWD-30002 Rev. 1.

Validation documented in WHC-SD-GN-SWD-30003 Rev. 1.

Code Custodian is: Brit E. Hey

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352
(509) 376-2921

Run Date = 03/10/96

Run Time = 11:43:51.16

INPUT ECHO:

CMC Solid Waste Storage P4 to P7 XQs, case 7. with plume meander

c GXQ Version 4.0 Input File

c mode

1

c

c MODE CHOICE:

c mode = 1 then X/Q based on Hanford site specific meteorology

c mode = 2 then X/Q based on atmospheric stability class and wind speed

c mode = 3 then X/Q plot file is created

c

c LOGICAL CHOICES:

c ifox inorm icdf ichk isite ipop

T F F F F F

c ifox = t then joint frequency used to compute frequency to exceed X/Q

c = f then joint frequency used to compute annual average X/Q

c inorm = t then joint frequency data is normalized (as in GENII)

c = f then joint frequency data is un-normalized

c icdf = t then cumulative distribution file created (CDF.OUT)

c = f then no cumulative distribution file created

c ichk = t then X/Q parameter print option turned on

c = f then no parameter print

c isite = t then X/Q based on joint frequency data for all 16 sectors

c = f then X/Q based on joint frequency data of individual sectors

c ipop = t then X/Q is population weighted

c = f then no population weighting

c

c X/Q AND WIND SPEED ADJUSTMENT MODELS:

c ipuff idep isrc iwind

0 0 0 0

c DIFFUSION COEFFICIENT ADJUSTMENT MODELS:

c iwake ipm iflow ientr

0 2 0 0

c EFFECTIVE RELEASE HEIGHT ADJUSTMENT MODELS:

c (irise igrnd)iwash igrav

0 0 0 0

c ipuff = 1 then X/Q calculated using puff model

c = 0 then X/Q calculated using default continuous plume model

c idep = 1 then plume depletion model turned on (Chamberlain model)

c isrc = 1 then X/Q multiplied by scalar

c = 2 then X/Q adjusted by wind speed function

c iwind = 1 then wind speed corrected for plume height

c iwake = 1 then NRC RG 1.145 building wake model turned on

c = 2 then MACCS virtual distance building wake model turned on

c ipm = 1 then NRC RG 1.145 plume meander model turned on

c = 2 then 5th Power Law plume meander model turned on

c = 3 then sector average model turned on

c iflow = 1 then sigmas adjusted for volume flow rate

c ientr = 1 then method of Pasquill used to account for entrainment

```

c  irise = 1 then MACCS buoyant plume rise model turned on
c      = 2 then ISC2 momentum/buoyancy plume rise model turned on
c  igrnd = 1 then Mills buoyant plume rise modification for ground effects
c  iwash = 1 then stack downwash model turned on
c  igrav = 1 then gravitational settling model turned on
c      = 0 unless specified otherwise, 0 turns model off
c
c  PARAMETER INPUT:
c
c  release      reference      mixing      frequency
c  height      anemometer     height     to
c  hs(m)       ha(m)          hm(m)      exceed
c                                     cx(%)
c
c  0.00000E+00  1.00000E+01  1.00000E+03  5.00000E-01
c
c  initial      initial      release      deposition      gravitational
c  plume        plume        duration     velocity        settling
c  width        height       trd(hr)      velocity        velocity
c  Wb(m)        Hb(m)        trd(hr)      vd(m/s)         vg(m/s)
c
c  3.50000E+00  2.80000E+00  5.00000E-01  1.00000E-03  1.00000E-03
c
c  ambient      initial      initial      release      convective
c  temperature  plume        plume        diameter    heat release
c  Tamb(C)      TO(C)        flow rate    d(m)         rate(1)
c                                     V0(m3/s)     qh(w)
c
c  2.00000E+01  2.00000E+01  1.00000E+00  1.00000E+00  0.00000E+00
c
c  (1) If zero then buoyant flux based on plume/ambient temperature difference.
c
c  X/Q          Wind
c  scaling      Speed
c  factor       Exponent
c  c(?)         a(?)
c
c  1.00000E+00  7.80000E-01
c
c  RECEPTOR DEPENDENT DATA (no line limit)
c  FOR MODE     make      RECEPTOR DEPENDENT DATA
c  1 (site specific) sector distance receptor-height
c  2 (by class & wind speed) class windspeed distance offset receptor-height
c  3 (create plot file) class windspeed xmax imax ymax jmax xqmin power
c
c  RECEPTOR PARAMETER DESCRIPTION
c  sector = 0, 1, 2... (all, S, SSW, etc.)
c  distance = receptor distance (m)
c  receptor height = height of receptor (m)
c  class = 1, 2, 3, 4, 5, 6, 7 (P-G stability class A, B, C, D, E, F, G)
c  windspeed = anemometer wind speed (m/s)
c  offset = offset from plume centerline (m)
c  xmax = maximum distance to plot or calculate to (m)
c  imax = distance intervals
c  ymax = maximum offset to plot (m)
c  jmax = offset intervals
c  xqmin = minimum scaled X/Q to calculate
c  power = exponent in power function step size
c
MODE:
Site specific X/Q calculated.

LOGICAL CHOICES:
Joint frequency used to calculate X/Q based on frequency of exceedance.
No normalization of joint frequency.
X/Q calculated for single sector.

MODELS SELECTED:
5th power law plume meander model selected.
Default Gaussian plume model selected.

WARNING/ERROR MESSAGES:

JOINT FREQUENCY DATA:
200 AREA (HMS) - 10 N - Pasquill A - G (1983 - 1991 Average)
Created 8/26/92 KR

```

WHC-SD-WM-CN-016, Rev. 0

CWC Solid Waste Storage P4 to P7 XQs, case 7. with plume meander

SECTOR	DISTANCE (m)	RECEPT HEIGHT (m)	SECT. FREQ. (%)	POPULATION	TOTAL POPULATION SCALED X/Q (s/m3)	AVERAGE INDIVIDUAL SCALED X/Q (s/m3)	ATM. STAB. CLASS	WIND SPEED (m/s)
ESE	498	0	18.80	1	1.68E-03	1.68E-03	F	0.89
W	11700	0	4.80	1	1.41E-05	1.41E-05	G	2.65
W	4070	0	4.80	1	5.60E-05	5.60E-05	G	2.65

APPENDIX C

GENII INPUT AND OUTPUT FILES

Program GENII Input File ##### 8 Jul 88 ###
 Title: CWC - MFP-percent by activity-soluble Pu.

\GENII\cwc_mfp.in

OPTIONS----- Default -----
 F Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
 F Population dose? (Individual) release, single site
 T Acute release? (Chronic) FAR-FIELD: wide-scale release,
 Maximum Individual data set used multiple sites
 Complete

TRANSPORT OPTIONS----- Section EXPOSURE PATHWAY OPTIONS----- Section
 T 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 F Ground, external 5
 F Waste Form Degradation (near) 3,4 F Recreation, external 5
 T Inhalation uptake 5,6

REPORT OPTIONS-----
 T Report AEDE only F Drinking water ingestion 7,8
 T Report by radionuclide F Aquatic foods ingestion 7,8
 T Report by exposure pathway F Terrestrial foods ingestion 7,9
 F Debug report on screen F Animal product ingestion 7,10
 F Inadvertent soil ingestion

INVENTORY #####

- 4 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

Use when	---Release Terms--- transport selected			-----Basic Concentrations----- near-field scenario, optionally				
	Air /yr	Surface Water /yr	Buried Waste /m3	Air /m3	Surface Soil /unit	Deep Soil /m3	Ground Water /L	Surface Water /L
CS137	2.5E-1							
SR90	1.9E-1							
Y 90	1.9E-1							
PU239	4.1E-3							
PU241	1.0E-1							
AM241	7.9E-3							

Use when	---Derived Concentrations--- measured values are known			
	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)
0       Fraction of roots in upper soil (top 15 cm)
0       Fraction of roots in deep soil
0       Manual redistribution: deep soil/surface soil dilution factor
0       Source area for external dose modification factor (m2)

TRANSPORT #####
-----AIR TRANSPORT-----SECTION 1-----
0       0-Calculates PM                               0       Release type (0-3)
1       Option: 1-Use chi/Q or PM value                F       Stack release (T/F)
0       2-Select MI dist & dir                          0       Stack height (m)
0       3-Specify MI dist & dir                          0       Stack flow (m3/sec)
1       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 withdrawal location (hr)
0       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=====

```

0 Exposure time: Residential irrigation:
0 Plume (hr) T Consider: (T/F)
0 Soil contamination (hr) 0 Source: 1-ground water
0 Swimming (hr) 0 2-surface water
0 Boating (hr) 0 Application rate (in/yr)
0 Shoreline activities (hr) 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)
1.0 Average fraction of time submersed in acute cloud (hr/person hr)

```

=====INHALATION=====SECTION 6=====

```

8766.0 Hours of exposure to contamination per year
0 0-No resus- 1-Use Mass Loading 2-Use Anspaugh model
0 pension Mass loading factor (g/m3) Top soil available (cm)

```

=====INGESTION POPULATION=====SECTION 7=====

```

0 Atmospheric production definition (select option):
0 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)

```

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	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER	
F	FISH	0.00	0.0E+00	0.00	0.0	0	Source(see above)
F	MOLLUS	0.00	0.0E+00	0.00	0.0	T	Treatment? T/F
F	CRUSTA	0.00	0.0E+00	0.00	0.0	0	Hldup/transit(da)
F	PLANTS	0.00	0.0E+00	0.00	0.0	0	Consumption(L/yr)

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

USE T/F	FOOD TYPE	GROW TIME da	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
F	LEAF V	0.00	0	0.0	0.0	0.0E+00	0.0	0.0
F	ROOT V	0.00	0	0.0	0.0	0.0E+00	0.0	0.0
F	FRUIT	0.00	0	0.0	0.0	0.0E+00	0.0	0.0
F	GRAIN	0.00	0	0.0	0.0	0.0E+00	0.0	0.0

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

USE ?	FOOD T/F TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	-----STORED FEED-----						STOR- YIELD AGE kg/m3 da
		CONSUMPTION RATE kg/yr	HOLDUP da			DIET FRAC- TION	GROW TIME da	-IRRIGATION-- S RATE * in/yr	TIME mo/yr			
F	BEEF	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	POULTR	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	MILK	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	EGG	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
	BEEF					0.00	0.0	0	0.0	0.00	0.00	0.0
	MILK					0.00	0.0	0	0.0	0.00	0.00	0.0

#####

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-soluble Pu.

Executed on: 02/28/96 at 09:51:59

Page A.

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This is a far-field (wide-scale release, multiple site) scenario.
Release is acute
Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
Infinite plume, external
Inhalation uptake

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\cwcmfp.in

GENII Default Parameter Values (28-Mar-90 RAP)

Radionuclide Library - Times<100 years (23-July-93 PDR)

External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R

Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

Release Radio- nuclide	----Release Terms-----		
	Air	Surface Water	Buried Source
	Ci/yr	Ci/yr	Ci/m3
CS137	2.5E-01	0.0E+00	0.0E+00
SR90	1.9E-01	0.0E+00	0.0E+00
Y 90	1.9E-01	0.0E+00	0.0E+00
PU239	4.1E-03	0.0E+00	0.0E+00

PU241 1.0E-01 0.0E+00 0.0E+00
AM241 7.9E-03 0.0E+00 0.0E+00

===== AIR TRANSPORT =====
=====

1.0E+00 Input E/Q value (s/m3)

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

1.0E+00 Fraction of time spent in cloud

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

Resuspension not considered

=====

Input prepared by: _____ Date: _____

Input checked by: _____ Date: _____

=====

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-soluble Pu.

Executed on: 02/28/96 at 09:52:11

Page C.

1

Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Organ	Committed Dose Equivalent	Weighting Factors	Weighted Dose Equivalent
Gonads	5.3E+02	2.5E-01	1.3E+02
Breast	2.6E+00	1.5E-01	3.9E-01
R Marrow	3.0E+03	1.2E-01	3.6E+02
Lung	2.7E+02	1.2E-01	3.2E+01
Thyroid	2.6E+00	3.0E-02	7.7E-02
Bone Sur	3.8E+04	3.0E-02	1.1E+03
Liver	6.5E+03	6.0E-02	3.9E+02
LL Int.	7.0E+00	6.0E-02	4.2E-01
UL Int.	4.4E+00	6.0E-02	2.6E-01
S Int.	3.2E+00	6.0E-02	1.9E-01
Stomach	2.9E+00	6.0E-02	1.7E-01
Internal Effective Dose Equivalent			2.0E+03
External Dose			2.9E-02
Annual Effective Dose Equivalent			2.0E+03

Controlling Organ: Bone Sur
 Controlling Pathway: Inh
 Controlling Radionuclide: AM241

Total Inhalation EDE: 2.0E+03

Total Ingestion EDE: 0.0E+00

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-soluble Pu.

Executed on: 02/28/96 at 09:52:11

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 Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Dose Commitment Year

1 2 3 ...

Internal : |

Intake : |

Year: 3 | 0.0E+00 ...

| +

2 | 0.0E+00 0.0E+00 ...

| + +

1 | 8.3E+01 + 5.5E+01 + 5.4E+01 + ... = 2.0E+03

Internal

Effective

Dose

Equivalent

|| || ||

Internal

Cumulative

Annual 8.3E+01 + 5.5E+01 + 5.4E+01 + ... = 2.0E+03

Internal

Dose

Dose

+ + + +

External

Annual 2.9E-02 0.0E+00 0.0E+00 ... 2.9E-02

Dose

11 11 11 11

Annual

Cumulative

Dose

8.3E+01 + 5.5E+01 + 5.4E+01 + ... = 2.0E+03

Dose

Maximum

8.3E+01

Annual

Dose Occurred

In Year 1

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-soluble Pu.

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 Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Committed Dose Equivalent by Exposure Pathway

Pathway	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
Testes							
Inhale	2.7E+02	2.9E+00	3.2E+00	4.4E+00	7.0E+00	3.8E+04	3.0E+03
5.3E+02							
Total	2.7E+02	2.9E+00	3.2E+00	4.4E+00	7.0E+00	3.8E+04	3.0E+03
5.3E+02							

Pathway	Ovaries	Muscle	Thyroid	Liver
Inhale	5.2E+02	2.6E+00	2.6E+00	6.5E+03
Total	5.2E+02	2.6E+00	2.6E+00	6.5E+03

External Dose by Exposure Pathway

Pathway	
Plume	2.9E-02
Total	2.9E-02

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-soluble Pu.

Executed on: 02/28/96 at 09:52:11

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Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Committed Dose Equivalent by Radionuclide

Radionuclide	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
Testes							
-----	-----	-----	-----	-----	-----	-----	-----
SR 90	3.5E-01	9.6E-02	1.0E-01	2.3E-01	7.2E-01	1.5E+02	6.8E+01
8.9E-02							
Y 90	2.3E+00	1.0E-01	2.6E-01	1.2E+00	3.0E+00	3.7E-03	3.7E-03
1.3E-04							
CS 137	2.7E+00	2.7E+00	2.8E+00	2.8E+00	2.8E+00	2.5E+00	2.6E+00
2.7E+00							
PU 241	9.0E-01	4.6E-03	5.3E-03	1.2E-02	2.0E-02	5.1E+03	4.0E+02
7.8E+01							
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00							
AM 241	1.7E+02	3.4E-02	4.2E-02	1.3E-01	3.1E-01	2.1E+04	1.6E+03
3.0E+02							
PU 239	8.8E+01	7.8E-03	1.2E-02	5.0E-02	1.5E-01	1.1E+04	8.7E+02
1.6E+02							
-----	-----	-----	-----	-----	-----	-----	-----
Total	2.7E+02	2.9E+00	3.2E+00	4.4E+00	7.0E+00	3.8E+04	3.0E+03
5.3E+02							

Radionuclide	Ovaries	Muscle	Thyroid	Liver
-----	-----	-----	-----	-----
SR 90	8.9E-02	8.6E-02	8.9E-02	0.0E+00
Y 90	1.2E-04	1.2E-04	1.2E-04	3.7E-03
CS 137	2.5E+00	2.4E+00	2.4E+00	0.0E+00
PU 241	7.6E+01	4.9E-03	2.1E-03	8.0E+02
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AM 241	2.9E+02	2.9E-02	1.6E-02	3.8E+03
PU 239	1.5E+02	4.8E-03	4.7E-03	2.0E+03

-----	-----	-----	-----	-----
Total	5.2E+02	2.6E+00	2.6E+00	6.5E+03

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-soluble Pu.

Executed on: 02/28/96 at 09:52:11

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Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
SR 90	1.3E+01	0.0E+00	7.8E-06	1.3E+01	1.3E+01
Y 90	5.5E-01	0.0E+00	2.8E-04	5.5E-01	5.5E-01
CS 137	2.5E+00	0.0E+00	2.9E-02	2.5E+00	2.5E+00
PU 241	2.7E+02	0.0E+00	7.7E-12	2.7E+02	2.7E+02
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AM 241	1.2E+03	0.0E+00	1.7E-05	1.2E+03	1.2E+03
PU 239	6.1E+02	0.0E+00	8.8E-08	6.1E+02	6.1E+02

Program GENII Input File ##### 8 Jul 88 ###
 Title: CWC - MFP-percent by activity-insoluble Pu.
 \GENII\cwcmpfb.in

OPTIONS===== Default =====
 F Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
 F Population dose? (Individual) release, single site
 T Acute release? (Chronic) FAR-FIELD: wide-scale release,
 Maximum Individual data set used multiple sites

TRANSPORT OPTIONS===== Complete EXPOSURE PATHWAY OPTIONS===== Complete
 T 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 F Ground, external 5
 F Waste Form Degradation (near) 3,4 F Recreation, external 5
 T Inhalation uptake 5,6

REPORT OPTIONS=====
 T Report AEDE only F Drinking water ingestion 7,8
 T Report by radionuclide F Aquatic foods ingestion 7,8
 T Report by exposure pathway F Terrestrial foods ingestion 7,9
 F Debug report on screen F Animal product ingestion 7,10
 F Inadvertent soil ingestion

INVENTORY #####

- 4 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

Use when	---Release Terms--- transport selected			-----Basic Concentrations----- near-field scenario, optionally				
	Air /yr	Surface Water /yr	Buried Waste /m3	Air /m3	Surface Soil /unit	Deep Soil /m3	Ground Water /L	Surface Water /L
CS137	2.5E-1							
SR90	1.9E-1							
Y 90	1.9E-1							
PU239	4.1E-3							
PU241	1.0E-1							
AM241	7.9E-3							

Use when	-----Derived Concentrations----- measured values are known			
	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)
0 Fraction of roots in upper soil (top 15 cm)
0 Fraction of roots in deep soil
0 Manual redistribution: deep soil/surface soil dilution factor
0 Source area for external dose modification factor (m2)

TRANSPORT #####

====AIR TRANSPORT=====SECTION 1=====

0	0-Calculates PM	0	Release type (0-3)
1	Option: 1-Use chi/Q or PM value	F	Stack release (T/F)
0	2-Select MI dist & dir	0	Stack height (m)
0	3-Specify MI dist & dir	0	Stack flow (m3/sec)
1	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 withdrawal location (hr)
0 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:
 0 Plume (hr) T Consider: (T/F)
 0 Soil contamination (hr) 0 Source: 1-ground water
 0 Swimming (hr) 2-surface water
 0 Boating (hr) 0 Application rate (in/yr)
 0 Shoreline activities (hr) 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)
 1.0 Average fraction of time submersed in acute cloud (hr/person hr)

====INHALATION=====SECTION 6=====

8766.0 Hours of exposure to contamination per year
 0 0-No resus- 1-Use Mass Loading 2-Use Anspaugh model
 0 pension Mass loading factor (g/m3) Top soil available (cm)

====INGESTION POPULATION=====SECTION 7=====

0 Atmospheric production definition (select option):
 0 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)

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 ? FOOD T/F TYPE	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER
F FISH	0.00	0.0E+00	0.00	0.0	0 Source(see above)
F MOLLUS	0.00	0.0E+00	0.00	0.0	T Treatment? T/F
F CRUSTA	0.00	0.0E+00	0.00	0.0	0 Hldup/transit(da)
F PLANTS	0.00	0.0E+00	0.00	0.0	0 Consumpton(L/yr)

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

USE ? FOOD T/F TYPE	GROW TIME da	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
F LEAF V	0.00	0	0.0	0.0	0.0E+00	0.0	0.0
F ROOT V	0.00	0	0.0	0.0	0.0E+00	0.0	0.0
F FRUIT	0.00	0	0.0	0.0	0.0E+00	0.0	0.0
F GRAIN	0.00	0	0.0	0.0	0.0E+00	0.0	0.0

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

USE ?	FOOD T/F TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET		GROW		--STORED FEED--		STOR- AGE da
		CONSUMPTION RATE kg/yr	HOLDUP da			FRACTION	TIME da	S *	IRRIGATION RATE in/yr	TIME mo/yr	YIELD kg/m3	
F	BEEF	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	POULTR	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	MILK	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	EGG	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
	BEEF					0.00	0.0	0	0.0	0.00	0.00	0.0
	MILK					0.00	0.0	0	0.0	0.00	0.00	0.0

#####

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-insoluble Pu.

Executed on: 02/28/96 at 09:58:12

Page A.

1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is acute
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Infinite plume, external
 Inhalation uptake

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\cwcmbpb.in

GENII Default Parameter Values (28-Mar-90 RAP)

Radionuclide Library - Times<100 years (23-July-93 PDR)

External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R

PNL Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

=====

-----Release Terms-----			
Release	Surface Buried		
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3
CS137	2.5E-01	0.0E+00	0.0E+00
SR90	1.9E-01	0.0E+00	0.0E+00
Y 90	1.9E-01	0.0E+00	0.0E+00
PU239	4.1E-03	0.0E+00	0.0E+00
PU241	1.0E-01	0.0E+00	0.0E+00
AM241	7.9E-03	0.0E+00	0.0E+00

===== AIR TRANSPORT

=====

1.0E+00 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE

=====

1.0E+00 Fraction of time spent in cloud

===== INHALATION

=====

 Resuspension not considered

=====

=

Input prepared by: _____

Date: _____

Input checked by: _____

Date: _____

=====

=

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-insoluble Pu.

Executed on: 02/28/96 at 09:58:24

Page C.

1

Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Organ	Committed Dose Equivalent	Weighting Factors	Weighted Dose Equivalent
Gonads	3.9E+02	2.5E-01	9.7E+01
Breast	2.6E+00	1.5E-01	3.9E-01
R Marrow	2.2E+03	1.2E-01	2.7E+02
Lung	2.2E+03	1.2E-01	2.6E+02
Thyroid	2.6E+00	3.0E-02	7.7E-02
Bone Sur	2.8E+04	3.0E-02	8.3E+02
Liver	4.9E+03	6.0E-02	2.9E+02
LL Int.	7.0E+00	6.0E-02	4.2E-01
UL Int.	4.4E+00	6.0E-02	2.6E-01
S Int.	3.2E+00	6.0E-02	1.9E-01
Stomach	2.9E+00	6.0E-02	1.7E-01
Internal Effective Dose Equivalent			1.8E+03
External Dose			2.9E-02
Annual Effective Dose Equivalent			1.8E+03

Controlling Organ:	Bone Sur
Controlling Pathway:	Inh
Controlling Radionuclide:	AM241

Total Inhalation EDE:	1.8E+03
Total Ingestion EDE:	0.0E+00

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-insoluble Pu.

Executed on: 02/28/96 at 09:58:24

Page C.

2

 Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Dose Commitment Year

1 2 3 ...

Internal : |

Intake : |

Year: 3 | 0.0E+00 ...

| +

2 | 0.0E+00 0.0E+00 ...

| + +

1 | 9.9E+01 + 6.7E+01 + 6.0E+01 + ... = 1.8E+03

Internal

Effective

Dose

Equivalent

|| || ||

Internal

Cumulative

Annual 9.9E+01 + 6.7E+01 + 6.0E+01 + ... = 1.8E+03

Internal

Dose

Dose

+ + + +

External

Annual 2.9E-02 0.0E+00 0.0E+00 ... 2.9E-02

Dose

11 11 11 11

Annual

Cumulative

Dose 9.9E+01 + 6.7E+01 + 6.0E+01 + ... = 1.8E+03

Dose

Maximum

9.9E+01

Annual

Dose Occurred

In Year 1

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-insoluble Pu.

Executed on: 02/28/96 at 09:58:24

Page C.

3

Acute release	
Uptake/exposure period:	1.0
Dose commitment period:	50.0
Dose units:	Rem

Committed Dose Equivalent by Exposure Pathway

Pathway	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
Testes							
<hr/>							
Inhale	2.2E+03	2.9E+00	3.2E+00	4.4E+00	7.0E+00	2.8E+04	2.2E+03
3.9E+02							
<hr/>							
Total	2.2E+03	2.9E+00	3.2E+00	4.4E+00	7.0E+00	2.8E+04	2.2E+03
3.9E+02							
<hr/>							
Pathway	Ovaries	Muscle	Thyroid	Liver			
<hr/>							
Inhale	3.8E+02	2.6E+00	2.6E+00	4.9E+03			
<hr/>							
Total	3.8E+02	2.6E+00	2.6E+00	4.9E+03			

External Dose by Exposure Pathway

Pathway	
<hr/>	
Plume	2.9E-02
<hr/>	
Total	2.9E-02

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-insoluble Pu.

Executed on: 02/28/96 at 09:58:24

Page C.

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Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by Radionuclide

Radionuclide	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
Testes							
-----	-----	-----	-----	-----	-----	-----	-----
SR 90	3.5E-01	9.6E-02	1.0E-01	2.3E-01	7.2E-01	1.5E+02	6.8E+01
8.9E-02							
Y 90	2.3E+00	1.0E-01	2.6E-01	1.2E+00	3.0E+00	3.7E-03	3.7E-03
1.3E-04							
CS 137	2.7E+00	2.7E+00	2.8E+00	2.8E+00	2.8E+00	2.5E+00	2.6E+00
2.7E+00							
PU 241	3.8E+02	3.7E-03	3.4E-03	9.9E-03	2.2E-02	2.2E+03	1.7E+02
3.2E+01							
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00							
AM 241	1.7E+02	3.4E-02	4.2E-02	1.3E-01	3.1E-01	2.1E+04	1.6E+03
3.0E+02							
PU 239	1.6E+03	5.7E-03	1.1E-02	5.2E-02	1.6E-01	4.4E+03	3.4E+02
5.9E+01							
-----	-----	-----	-----	-----	-----	-----	-----
Total	2.2E+03	2.9E+00	3.2E+00	4.4E+00	7.0E+00	2.8E+04	2.2E+03
3.9E+02							

Radionuclide	Ovaries	Muscle	Thyroid	Liver
-----	-----	-----	-----	-----
SR 90	8.9E-02	8.6E-02	8.9E-02	0.0E+00
Y 90	1.2E-04	1.2E-04	1.2E-04	3.7E-03
CS 137	2.5E+00	2.4E+00	2.4E+00	0.0E+00
PU 241	3.1E+01	3.4E-03	1.5E-03	3.7E+02
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AM 241	2.9E+02	2.9E-02	1.6E-02	3.8E+03

PU 239	5.9E+01	2.1E-03	2.0E-03	7.8E+02
-----	-----	-----	-----	-----
Total	3.8E+02	2.6E+00	2.6E+00	4.9E+03

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - MFP-percent by activity-insoluble Pu.

Executed on: 02/28/96 at 09:58:24

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Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
SR 90	1.3E+01	0.0E+00	7.8E-06	1.3E+01	1.3E+01
Y 90	5.5E-01	0.0E+00	2.8E-04	5.5E-01	5.5E-01
CS 137	2.5E+00	0.0E+00	2.9E-02	2.5E+00	2.5E+00
PU 241	1.6E+02	0.0E+00	7.7E-12	1.6E+02	1.6E+02
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AM 241	1.2E+03	0.0E+00	1.7E-05	1.2E+03	1.2E+03
PU 239	4.3E+02	0.0E+00	8.8E-08	4.3E+02	4.3E+02

Program GENII Input File ##### 8 Jul 88 ###
 Title: CWC - 12 percent nominal Pu-percent by weight-soluble Pu.

\GENII\cwcpu.in

OPTIONS----- Default -----
 F Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
 F Population dose? (Individual) release, single site
 T Acute release? (Chronic) FAR-FIELD: wide-scale release,
 Maximum Individual data set used multiple sites
 Complete Complete
 TRANSPORT OPTIONS----- Section EXPOSURE PATHWAY OPTIONS----- Section
 T 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 F Ground, external 5
 F Waste Form Degradation (near) 3,4 F Recreation, external 5
 T Inhalation uptake 5,6
 REPORT OPTIONS-----
 T Report AEDE only F Drinking water ingestion 7,8
 T Report by radionuclide F Aquatic foods ingestion 7,8
 T Report by exposure pathway F Terrestrial foods ingestion 7,9
 F Debug report on screen F Animal product ingestion 7,10
 F Inadvertent soil ingestion

INVENTORY #####

- 4 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--- transport selected			---Basic Concentrations--- near-field scenario, optionally				
Release Radio- nuclide	Air /yr	Surface Water /yr	Buried Waste /m3	Air /m3	Surface Soil /unit	Deep Soil /m3	Ground Water /L	Surface Water /L
PU238	1.4E-2							
PU239	5.2E-2							
PU240	2.9E-2							
PU241	1.1E+0							
PU242	1.2E-6							
AM241	6.0E-2							

Use when	---Derived Concentrations--- measured values are known			
	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)
0 Fraction of roots in upper soil (top 15 cm)
0 Fraction of roots in deep soil
0 Manual redistribution: deep soil/surface soil dilution factor
0 Source area for external dose modification factor (m2)

TRANSPORT #####

====AIR TRANSPORT=====SECTION 1=====

0	Option: 1-Use chi/Q or PM value	0	Release type (0-3)
1	2-Select MI dist & dir	F	Stack release (T/F)
	3-Specify MI dist & dir	0	Stack height (m)
1	Chi/Q or PM value	0	Stack flow (m3/sec)
0	MI sector index (1=S)	0	Stack radius (m)
0	MI distance from release point (m)	0	Effluent temp. (C)
T	Use jf data, (T/F) else chi/Q grid	0	Building x-section (m2)
			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 withdrawal 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)?
0 Pre-Intake site condition.....
1-Arid non agricultural
2-Humid non agricultural
3-Agricultural

EXPOSURE #####

=====EXTERNAL EXPOSURE=====SECTION 5=====

```

0      Exposure time:
0      Plume (hr)
0      Soil contamination (hr)
0      Swimming (hr)
0      Boating (hr)
0      Shoreline activities (hr)
0      Shoreline type: (1-river, 2-lake, 3-ocean, 4-tidal basin)
0      Transit time for release to reach aquatic recreation (hr)
1.0    Average fraction of time submersed in acute cloud (hr/person hr)

```

=====INHALATION=====SECTION 6=====

```

8766.0 Hours of exposure to contamination per year
0      0-No resus- 1-Use Mass Loading 2-Use Anspaugh model
0      pension    Mass loading factor (g/m3) Top soil available (cm)

```

=====INGESTION POPULATION=====SECTION 7=====

```

0      Atmospheric production definition (select option):
0      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)

```

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 ?	FOOD T/F	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER	
F	FISH	0.00	0.0E+00	0.00	0.0	0	Source(see above)
F	MOLLUS	0.00	0.0E+00	0.00	0.0	T	Treatment? T/F
F	CRUSTA	0.00	0.0E+00	0.00	0.0	0	Hldup/transit(da)
F	PLANTS	0.00	0.0E+00	0.00	0.0	0	Consumption(L/yr)

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

USE ?	FOOD T/F	GROW TIME da	--IRRIGATION-- S RATE * in/yr			YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
F	LEAF V	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F	ROOT V	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F	FRUIT	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F	GRAIN	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0

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

USE ? T/F	FOOD TYPE	---HUMAN---		TOTAL PROD- UCTION	DRINK WATER CONTAM FRACT.	DIET		GROW		STOR- FEED		STOR-	
		CONSUMPTION RATE	HOLDUP da			FRAC-	TIME	S	RATE	TIME	YIELD	AGE	
		kg/yr		kg/yr		TION	da	*	in/yr	mo/yr	kg/m3	da	
F	BEEF	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0	
F	POULTR	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0	
F	MILK	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0	
F	EGG	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0	
	BEEF					0.00	0.0	0	0.0	0.00	0.00	0.0	
	MILK					0.00	0.0	0	0.0	0.00	0.00	0.0	

#####

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:14:12

Page A.

1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is acute
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Infinite plume, external
 Inhalation uptake

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\cwcpu.in

GENII Default Parameter Values (28-Mar-90 RAP)

Radionuclide Library - Times<100 years (23-July-93 PDR)

External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R)

Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

=====

-----Release Terms-----			
Release	Surface		Buried
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3

PU238	1.4E-02	0.0E+00	0.0E+00
PU239	5.2E-02	0.0E+00	0.0E+00
PU240	2.9E-02	0.0E+00	0.0E+00
PU241	1.1E+00	0.0E+00	0.0E+00

PU242 1.2E-06 0.0E+00 0.0E+00
 AM241 6.0E-02 0.0E+00 0.0E+00

===== AIR TRANSPORT

=====

1.0E+00 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE

=====

1.0E+00 Fraction of time spent in cloud

===== INHALATION

=====

Resuspension not considered

=====

Input prepared by: _____

Date: _____

Input checked by: _____

Date: _____

=====

=====

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:14:29

Page C.

1

Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Organ	Committed Dose Equivalent	Weighting Factors	Weighted Dose Equivalent
Gonads	6.5E+03	2.5E-01	1.6E+03
Breast	3.8E-01	1.5E-01	5.8E-02
R Marrow	3.6E+04	1.2E-01	4.3E+03
Lung	3.3E+03	1.2E-01	4.0E+02
Thyroid	2.5E-01	3.0E-02	7.6E-03
Bone Sur	4.6E+05	3.0E-02	1.4E+04
Liver	8.1E+04	6.0E-02	4.8E+03
LL Int.	5.8E+00	6.0E-02	3.5E-01
UL Int.	2.2E+00	6.0E-02	1.3E-01
S Int.	6.6E-01	6.0E-02	4.0E-02
Stomach	4.8E-01	6.0E-02	2.9E-02
Internal Effective Dose Equivalent			2.5E+04
External Dose			1.3E-04
Annual Effective Dose Equivalent			2.5E+04

Controlling Organ:	Bone Sur
Controlling Pathway:	Inh
Controlling Radionuclide:	AM241

Total Inhalation EDE:	2.5E+04
Total Ingestion EDE:	0.0E+00

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:14:29

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2

 Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Dose Commitment Year

1 2 3 ...

Internal : |

Intake : |

Year: 3 | 0.0E+00 ...

| +

2 | 0.0E+00 0.0E+00 ...

| + +

1 | 9.9E+02 + 6.8E+02 + 6.7E+02 + ... = 2.5E+04

Internal

Effective

Dose

Equivalent

|| || ||

Internal

Cumulative

Annual 9.9E+02 + 6.8E+02 + 6.7E+02 + ... = 2.5E+04

Internal

Dose

Dose

+ + + +

External

Annual	1.3E-04	0.0E+00	0.0E+00	...	1.3E-04
Dose					

Annual		Cumulative
Dose	9.9E+02 + 6.8E+02 + 6.7E+02 + ... = 2.5E+04	Dose

Maximum
9.9E+02 Annual
Dose Occurred
In Year 1

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:14:29

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3

 Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by Exposure Pathway

Pathway	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
Testes							
-----	-----	-----	-----	-----	-----	-----	-----
Inhale	3.3E+03	4.8E-01	6.6E-01	2.2E+00	5.8E+00	4.6E+05	3.6E+04
6.5E+03							
-----	-----	-----	-----	-----	-----	-----	-----
Total	3.3E+03	4.8E-01	6.6E-01	2.2E+00	5.8E+00	4.6E+05	3.6E+04
6.5E+03							

Pathway	Ovaries	Muscle	Thyroid	Liver
-----	-----	-----	-----	-----
Inhale	6.4E+03	3.8E-01	2.5E-01	8.1E+04
-----	-----	-----	-----	-----
Total	6.4E+03	3.8E-01	2.5E-01	8.1E+04

External Dose by Exposure Pathway

Pathway	
-----	-----
Plume	1.3E-04
-----	-----
Total	1.3E-04

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:14:29

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Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by Radionuclide

Radionuclide Testes	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R	Marro
-----	-----	-----	-----	-----	-----	-----	-----	-----
PU 240	6.0E+02	5.3E-02	8.5E-02	3.4E-01	9.9E-01	7.7E+04	6.0E+03	
1.1E+03								
PU 238	3.1E+02	2.7E-02	4.4E-02	1.9E-01	5.1E-01	3.3E+04	2.6E+03	
4.5E+02								
PU 242	2.5E-02	2.2E-06	3.4E-06	1.4E-05	4.0E-05	2.9E+00	2.4E-01	
4.1E-02								
PU 241	9.9E+00	5.1E-02	5.7E-02	1.3E-01	2.1E-01	5.6E+04	4.4E+03	
8.5E+02								
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	
0.0E+00								
AM 241	1.3E+03	2.6E-01	3.3E-01	9.6E-01	2.4E+00	1.6E+05	1.3E+04	
2.3E+03								
PU 239	1.1E+03	9.4E-02	1.5E-01	6.1E-01	1.8E+00	1.4E+05	1.1E+04	
1.9E+03								
-----	-----	-----	-----	-----	-----	-----	-----	-----
Total	3.3E+03	4.8E-01	6.6E-01	2.2E+00	5.8E+00	4.6E+05	3.6E+04	
6.5E+03								

Radionuclide	Ovaries	Muscle	Thyroid	Liver
-----	-----	-----	-----	-----
PU 240	1.1E+03	3.4E-02	3.2E-02	1.3E+04
PU 238	4.4E+02	1.7E-02	1.7E-02	6.0E+03
PU 242	4.2E-02	1.5E-06	1.3E-06	5.3E-01
PU 241	8.3E+02	5.3E-02	2.3E-02	8.7E+03
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AM 241	2.2E+03	2.2E-01	1.3E-01	2.9E+04
PU 239	1.9E+03	5.8E-02	5.7E-02	2.4E+04

-----	-----	-----	-----	-----
Total	6.4E+03	3.8E-01	2.5E-01	8.1E+04

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:14:29

Page C.

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Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
PU 240	4.2E+03	0.0E+00	8.9E-07	4.2E+03	4.2E+03
PU 238	1.8E+03	0.0E+00	4.4E-07	1.8E+03	1.8E+03
PU 242	1.6E-01	0.0E+00	0.0E+00	1.6E-01	1.6E-01
PU 241	2.9E+03	0.0E+00	8.4E-11	2.9E+03	2.9E+03
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AM 241	8.9E+03	0.0E+00	1.3E-04	8.9E+03	8.9E+03
PU 239	7.4E+03	0.0E+00	1.1E-06	7.4E+03	7.4E+03

Program GENII Input File ##### 8 Jul 88 ####
 Title: CWC - 12 percent nominal Pu-percent by weight-insoluble Pu.
 \GENII\cwcpub.in

OPTIONS===== Default =====
 F Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
 F Population dose? (Individual) release, single site
 T Acute release? (Chronic) FAR-FIELD: wide-scale release,
 Maximum Individual data set used multiple sites

TRANSPORT OPTIONS===== Section EXPOSURE PATHWAY OPTIONS===== Section
 T 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 F Ground, external 5
 F Waste Form Degradation (near) 3,4 F Recreation, external 5
 T Inhalation uptake 5,6
 F Drinking water ingestion 7,8
 F Aquatic foods ingestion 7,8
 F Terrestrial foods ingestion 7,9
 F Animal product ingestion 7,10
 F Inadvertent soil ingestion

REPORT OPTIONS=====
 T Report AEDE only
 T Report by radionuclide
 T Report by exposure pathway
 F Debug report on screen

INVENTORY #####

4 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

Use when		Release Terms transport selected			Basic Concentrations near-field scenario, optionally				
Release Radio- nuclide	Air /yr	Surface Water /yr	Buried Waste /m3	Air /m3	Surface Soil /unit	Deep Soil /m3	Ground Water /L	Surface Water /L	
PU238	1.4E-2								
PU239	5.2E-2								
PU240	2.9E-2								
PU241	1.1E+0								
PU242	1.2E-6								
AM241	6.0E-2								

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)
0 Fraction of roots in upper soil (top 15 cm)
0 Fraction of roots in deep soil
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)
0 2-Select MI dist & dir 0 Stack height (m)
0 3-Specify MI dist & dir 0 Stack flow (m3/sec)
1 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 withdrawal location (hr)
0 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:
0 Plume (hr) T Residential irrigation:
0 Soil contamination (hr) 0 Consider: (T/F)
0 Swimming (hr) 0 Source: 1-ground water
0 Boating (hr) 0 2-surface water
0 Shoreline activities (hr) 0 Application rate (in/yr)
0 Shoreline type: (1-river, 2-lake, 3-ocean, 4-tidal basin) Duration (mo/yr)
0 Transit time for release to reach aquatic recreation (hr)
1.0 Average fraction of time submersed in acute cloud (hr/person hr)

```

```

=====INHALATION=====SECTION 6=====
8766.0 Hours of exposure to contamination per year
0 0-No resus- 1-Use Mass Loading 2-Use Anspaugh model
0 pension Mass loading factor (g/m3) Top soil available (cm)

```

```

=====INGESTION POPULATION=====SECTION 7=====
0 Atmospheric production definition (select option):
0 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)

```

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 ? FOOD T/F TYPE	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER	
F FISH	0.00	0.0E+00	0.00	0.0	0	Source (see above)
F MOLLUS	0.00	0.0E+00	0.00	0.0	T	Treatment? T/F
F CRUSTA	0.00	0.0E+00	0.00	0.0	0	Hidup/transit(da)
F PLANTS	0.00	0.0E+00	0.00	0.0	0	Consumpton(L/yr)

```

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

```

USE ? FOOD T/F TYPE	GROW TIME da	--IRRIGATION-- S RATE * in/yr		TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
F LEAF V	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F ROOT V	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F FRUIT	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F GRAIN	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0

```

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

```

USE ? T/F	FOOD TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC- TION	GROW TIME da	-----STORED FEED-----			STOR-	
		CONSUMPTION RATE kg/yr	HOLDUP da					-IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m3	AGE da	
F	BEEF	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	POULTR	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	MILK	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	EGG	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
	BEEF					0.00	0.0	0	0.0	0.00	0.00	0.0
	MILK					0.00	0.0	0	0.0	0.00	0.00	0.0

#####

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-insoluble Pu.

Executed on: 02/28/96 at 10:20:34

Page A.

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 This is a far-field (wide-scale release, multiple site) scenario.
 Release is acute
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Infinite plume, external
 Inhalation uptake

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\cwcpub.in

GENII Default Parameter Values (28-Mar-90 RAP)

Radionuclide Library - Times<100 years (23-July-93 PDR)

External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R

PNL Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

=====

-----Release Terms-----			
Release	Surface		Buried
Radio-	Air	Water	Source
nuclide	Ci/yr	Ci/yr	Ci/m3
PU238	1.4E-02	0.0E+00	0.0E+00
PU239	5.2E-02	0.0E+00	0.0E+00
PU240	2.9E-02	0.0E+00	0.0E+00
PU241	1.1E+00	0.0E+00	0.0E+00

PU242 1.2E-06 0.0E+00 0.0E+00
 AM241 6.0E-02 0.0E+00 0.0E+00

===== AIR TRANSPORT

=====

1.0E+00 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE

=====

1.0E+00 Fraction of time spent in cloud

===== INHALATION

=====

Resuspension not considered

=====

=

Input prepared by: _____

Date: _____

Input checked by: _____

Date: _____

=====

=

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-insoluble Pu.

Executed on: 02/28/96 at 10:20:50

Page C.

1

Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Organ	Committed Dose Equivalent	Weighting Factors	Weighted Dose Equivalent
Gonads	3.9E+03	2.5E-01	9.8E+02
Breast	3.1E-01	1.5E-01	4.6E-02
R Marrow	2.2E+04	1.2E-01	2.6E+03
Lung	4.1E+04	1.2E-01	5.0E+03
Thyroid	1.9E-01	3.0E-02	5.6E-03
Bone Sur	2.8E+05	3.0E-02	8.5E+03
Liver	5.0E+04	6.0E-02	3.0E+03
LL Int.	6.3E+00	6.0E-02	3.8E-01
UL Int.	2.2E+00	6.0E-02	1.3E-01
S Int.	6.1E-01	6.0E-02	3.6E-02
Stomach	4.3E-01	6.0E-02	2.6E-02
Internal Effective Dose Equivalent			2.0E+04
External Dose			1.3E-04
Annual Effective Dose Equivalent			2.0E+04

Controlling Organ: Bone Sur
Controlling Pathway: Inh
Controlling Radionuclide: AM241

Total Inhalation EDE:	2.0E+04
Total Ingestion EDE:	0.0E+00

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-insoluble Pu.

Executed on: 02/28/96 at 10:20:50

Page C.

2

Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Dose Commitment Year

1 2 3 ...

Internal : |

Intake : |

Year: 3 | 0.0E+00 ...

| +

2 | 0.0E+00 0.0E+00 ...

| + +

1 | 1.3E+03 + 9.5E+02 + 7.9E+02 + ... = 2.0E+04

Internal

Effective

Dose

Equivalent

|| || ||

Internal

Cumulative

Annual 1.3E+03 + 9.5E+02 + 7.9E+02 + ... = 2.0E+04

Internal

Dose

Dose

+ + + +

External

Annual 1.3E-04 0.0E+00 0.0E+00 ... 1.3E-04

Dose

||

||

||

||

Annual

Cumulative

Dose

1.3E+03 + 9.5E+02 + 7.9E+02 + ... = 2.0E+04

Dose

Maximum

1.3E+03

Annual

Dose Occurred

In Year 1

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-insoluble Pu.

Executed on: 02/28/96 at 10:20:50

Page C.

3

 Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Committed Dose Equivalent by Exposure Pathway

Pathway	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
Testes							
Inhale	4.1E+04	4.3E-01	6.1E-01	2.2E+00	6.3E+00	2.8E+05	2.2E+04
3.9E+03							
Total	4.1E+04	4.3E-01	6.1E-01	2.2E+00	6.3E+00	2.8E+05	2.2E+04
3.9E+03							

Pathway	Ovaries	Muscle	Thyroid	Liver
Inhale	3.9E+03	3.1E-01	1.9E-01	5.0E+04
Total	3.9E+03	3.1E-01	1.9E-01	5.0E+04

External Dose by Exposure Pathway

Pathway	
Plume	1.3E-04
Total	1.3E-04

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-insoluble Pu.

Executed on: 02/28/96 at 10:20:50

Page C.

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Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by Radionuclide

Radionuclide Testes	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
-----	-----	-----	-----	-----	-----	-----	-----
PU 240	1.1E+04	3.9E-02	7.5E-02	3.6E-01	1.1E+00	3.0E+04	2.3E+03
4.0E+02							
PU 238	5.4E+03	1.9E-02	3.7E-02	1.9E-01	5.6E-01	1.2E+04	1.0E+03
1.7E+02							
PU 242	4.6E-01	1.6E-06	3.0E-06	1.5E-05	4.4E-05	1.1E+00	9.4E-02
1.6E-02							
PU 241	4.2E+03	4.0E-02	3.7E-02	1.1E-01	2.4E-01	2.4E+04	1.9E+03
3.5E+02							
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00							
AM 241	1.3E+03	2.6E-01	3.3E-01	9.6E-01	2.4E+00	1.6E+05	1.3E+04
2.3E+03							
PU 239	1.9E+04	6.9E-02	1.3E-01	6.3E-01	1.9E+00	5.3E+04	4.1E+03
7.2E+02							
-----	-----	-----	-----	-----	-----	-----	-----
Total	4.1E+04	4.3E-01	6.1E-01	2.2E+00	6.3E+00	2.8E+05	2.2E+04
3.9E+03							

Radionuclide	Ovaries	Muscle	Thyroid	Liver
-----	-----	-----	-----	-----
PU 240	4.0E+02	1.6E-02	1.3E-02	5.3E+03
PU 238	1.7E+02	7.7E-03	6.6E-03	2.3E+03
PU 242	1.6E-02	6.7E-07	5.6E-07	2.1E-01
PU 241	3.4E+02	3.7E-02	1.6E-02	4.0E+03
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00

AM 241	2.2E+03	2.2E-01	1.3E-01	2.9E+04
PU 239	7.2E+02	2.5E-02	2.4E-02	9.5E+03
-----	-----	-----	-----	-----
Total	3.9E+03	3.1E-01	1.9E-01	5.0E+04

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 12 percent nominal Pu-percent by weight-insoluble Pu.

Executed on: 02/28/96 at 10:20:50

Page C.

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Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
PU 240	2.9E+03	0.0E+00	8.9E-07	2.9E+03	2.9E+03
PU 238	1.3E+03	0.0E+00	4.4E-07	1.3E+03	1.3E+03
PU 242	1.2E-01	0.0E+00	0.0E+00	1.2E-01	1.2E-01
PU 241	1.8E+03	0.0E+00	8.4E-11	1.8E+03	1.8E+03
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AM 241	8.9E+03	0.0E+00	1.3E-04	8.9E+03	8.9E+03
PU 239	5.2E+03	0.0E+00	1.1E-06	5.2E+03	5.2E+03

Program GENII Input File ##### 8 Jul 88

Title: CWC - 23.9 percent nominal Pu-percent by weight-soluble Pu.

\GENII\cwcpu2.in

OPTIONS===== Default =====

F Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
F Population dose? (Individual) release, single site
T Acute release? (Chronic) FAR-FIELD: wide-scale release,
Maximum Individual data set used multiple sites

Complete

TRANSPORT OPTIONS===== Section EXPOSURE PATHWAY OPTIONS===== Section

T 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 F Ground, external 5
F Waste Form Degradation (near) 3,4 F Recreation, external 5
T Inhalation uptake 5,6

REPORT OPTIONS=====

T Report AEDE only F Drinking water ingestion 7,8
T Report by radionuclide F Aquatic foods ingestion 7,8
T Report by exposure pathway F Terrestrial foods ingestion 7,9
F Debug report on screen F Animal product ingestion 7,10
F Inadvertent soil ingestion

INVENTORY #####

4 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

Use when	Release Terms			Basic Concentrations				
	transport selected			near-field scenario, optionally				
Release	Surface		Buried	Surface	Deep	Ground	Surface	
Radio-	Water		Waste	Soil	Soil	Water	Water	
nuclide	/yr		/m3	/unit	/m3	/L	/L	
PU238	1.6E-2							
PU239	4.3E-2							
PU240	5.4E-2							
PU241	1.7E+0							
PU242	5.1E-6							
AM241	8.8E-2							

Use when	Derived Concentrations			
	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

0 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)
 0 Fraction of roots in upper soil (top 15 cm)
 0 Fraction of roots in deep soil
 0 Manual redistribution: deep soil/surface soil dilution factor
 0 Source area for external dose modification factor (m2)

TRANSPORT

====AIR TRANSPORT=====SECTION 1=====

0	0-Calculatate PM	0	Release type (0-3)
1	Option: 1-Use chi/Q or PM value	0	Stack release (T/F)
	2-Select MI dist & dir	0	Stack height (m)
	3-Specify MI dist & dir	0	Stack flow (m3/sec)
1	Chi/Q or PM value	0	Stack radius (m)
0	MI sector index (1=5)	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 withdrawal location (hr)
 0 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=====

```

0 Exposure time: | Residential irrigation:
0 Plume (hr) | T Consider: (T/F)
0 Soil contamination (hr) | 0 Source: 1-ground water
0 Swimming (hr) | 2-surface water
0 Boating (hr) | 0 Application rate (in/yr)
0 Shoreline activities (hr) | 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)
1.0 Average fraction of time submersed in acute cloud (hr/person hr)

```

=====INHALATION=====SECTION 6=====

```

8766.0 Hours of exposure to contamination per year
0 0-No resus- 1-Use Mass Loading 2-Use Anspaugh model
0 pension Mass loading factor (g/m3) Top soil available (cm)

```

=====INGESTION POPULATION=====SECTION 7=====

```

0 Atmospheric production definition (select option):
0 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)

```

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 ?	FOOD T/F TYPE	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER	
F	FISH	0.00	0.0E+00	0.00	0.0	0	Source(see above)
F	MOLLUS	0.00	0.0E+00	0.00	0.0	T	Treatment? T/F
F	CRUSTA	0.00	0.0E+00	0.00	0.0	0	Hldup/transit(da)
F	PLANTS	0.00	0.0E+00	0.00	0.0	0	Consumption(L/yr)

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

USE ?	FOOD T/F TYPE	GROW TIME da	--IRRIGATION-- S RATE * in/yr		TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
F	LEAF V	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F	ROOT V	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F	FRUIT	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F	GRAIN	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0

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

USE ? T/F	FOOD TYPE	---HUMAN---		TOTAL PROD- UCTIION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC- TION	GROW TIME da	-----STORED FEED-----				STOR-	
		CONSUMPTION RATE kg/yr	HOLDUP da					-IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m3	AGE da		
F	BEEF	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.00	0.0
F	POULTR	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.00	0.0
F	MILK	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.00	0.0
F	EGG	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.00	0.0
	BEEF					0.00	0.0	0	0.0	0.00	0.00	0.00	0.0
	MILK					0.00	0.0	0	0.0	0.00	0.00	0.00	0.0

#####

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:26:38

Page A.

1

This is a far-field (wide-scale release, multiple site) scenario.
Release is acute
Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
Infinite plume, external
Inhalation uptake

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\cwcpu2.in

GENII Default Parameter Values (28-Mar-90 RAP)

Radionuclide Library - Times<100 years (23-July-93 PDR)

External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R

Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

=====

-----Release Terms-----			
Release	Air		Surface Buried
Radio-	Water		Source
nuclide	Ci/yr	Ci/yr	Ci/m3
PU238	1.6E-02	0.0E+00	0.0E+00
PU239	4.3E-02	0.0E+00	0.0E+00

PU240	5.4E-02	0.0E+00	0.0E+00
PU241	1.7E+00	0.0E+00	0.0E+00
PU242	5.1E-06	0.0E+00	0.0E+00
AM241	8.8E-02	0.0E+00	0.0E+00

===== AIR TRANSPORT

=====

1.0E+00 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE

=====

1.0E+00 Fraction of time spent in cloud

===== INHALATION

=====

Resuspension not considered

=====

Input prepared by: _____

Date: _____

Input checked by: _____

Date: _____

=====

=

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:26:55

Page C.

1

Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Organ	Committed Dose Equivalent	Weighting Factors	Weighted Dose Equivalent
Gonads	8.7E+03	2.5E-01	2.2E+03
Breast	5.4E-01	1.5E-01	8.0E-02
R Marrow	4.8E+04	1.2E-01	5.8E+03
Lung	4.3E+03	1.2E-01	5.2E+02
Thyroid	3.4E-01	3.0E-02	1.0E-02
Bone Sur	6.2E+05	3.0E-02	1.8E+04
Liver	1.1E+05	6.0E-02	6.4E+03
LL Int.	7.7E+00	6.0E-02	4.6E-01
UL Int.	3.0E+00	6.0E-02	1.8E-01
S Int.	9.0E-01	6.0E-02	5.4E-02
Stomach	6.6E-01	6.0E-02	4.0E-02
Internal Effective Dose Equivalent			3.3E+04
External Dose			2.0E-04
Annual Effective Dose Equivalent			3.3E+04

Controlling Organ: Bone Sur
Controlling Pathway: Inh

Controlling Radionuclide:	AM241

Total Inhalation EDE:	3.3E+04
Total Ingestion EDE:	0.0E+00

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:26:55
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Page C.

 Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Dose Commitment Year

1 2 3 ...

Internal : |

Intake : |

Year: 3 | 0.0E+00 ...

| +

2 | 0.0E+00 0.0E+00 ...

| + +

1 | 1.3E+03 + 8.9E+02 + 8.7E+02 + ... = 3.3E+04

Internal

Effective

Dose

Equivalent

|| || ||

Internal

Cumulative

Annual 1.3E+03 + 8.9E+02 + 8.7E+02 + ... = 3.3E+04

Internal

Dose

Dose

+ + + +

External

Annual 2.0E-04 0.0E+00 0.0E+00 ... 2.0E-04

Dose

11 11 11 11

Annual

Cumulative

Dose

1.3E+03 + 8.9E+02 + 8.7E+02 + ... = 3.3E+04

Dose

Maximum

1.3E+03

Annual

Dose Occurred

In Year 1

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:26:55

Page C.

3

Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by Exposure Pathway

Pathway	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
Testes							
-----	-----	-----	-----	-----	-----	-----	-----
Inhale	4.3E+03	6.6E-01	9.0E-01	3.0E+00	7.7E+00	6.2E+05	4.8E+04
8.7E+03							
-----	-----	-----	-----	-----	-----	-----	-----
Total	4.3E+03	6.6E-01	9.0E-01	3.0E+00	7.7E+00	6.2E+05	4.8E+04
8.7E+03							

Pathway	Ovaries	Muscle	Thyroid	Liver
-----	-----	-----	-----	-----
Inhale	8.6E+03	5.4E-01	3.4E-01	1.1E+05
-----	-----	-----	-----	-----
Total	8.6E+03	5.4E-01	3.4E-01	1.1E+05

External Dose by Exposure Pathway

Pathway	
-----	-----
Plume	2.0E-04
-----	-----
Total	2.0E-04

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:26:55

Page C.

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Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by Radionuclide

Radionuclide Testes	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
-----	-----	-----	-----	-----	-----	-----	-----
PU 240	1.1E+03	1.0E-01	1.6E-01	6.5E-01	1.9E+00	1.4E+05	1.1E+04
2.0E+03							
PU 238	3.6E+02	3.1E-02	5.1E-02	2.2E-01	5.9E-01	3.8E+04	3.0E+03
5.2E+02							
PU 242	1.1E-01	9.4E-06	1.4E-05	5.8E-05	1.7E-04	1.2E+01	1.0E+00
1.8E-01							
PU 241	1.5E+01	7.9E-02	8.9E-02	2.0E-01	3.3E-01	8.7E+04	6.9E+03
1.3E+03							
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00							
AM 241	1.9E+03	3.8E-01	4.7E-01	1.4E+00	3.4E+00	2.4E+05	1.8E+04
3.3E+03							
PU 239	8.8E+02	7.8E-02	1.2E-01	5.0E-01	1.5E+00	1.1E+05	8.7E+03
1.6E+03							
-----	-----	-----	-----	-----	-----	-----	-----
Total	4.3E+03	6.6E-01	9.0E-01	3.0E+00	7.7E+00	6.2E+05	4.8E+04
8.7E+03							

Radionuclide	Ovaries	Muscle	Thyroid	Liver
-----	-----	-----	-----	-----
PU 240	2.0E+03	6.4E-02	6.1E-02	2.5E+04
PU 238	5.1E+02	2.0E-02	1.9E-02	6.9E+03
PU 242	1.8E-01	6.2E-06	5.6E-06	2.2E+00
PU 241	1.3E+03	8.3E-02	3.5E-02	1.4E+04
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00

AM 241	3.2E+03	3.2E-01	1.8E-01	4.2E+04
PU 239	1.5E+03	4.8E-02	4.7E-02	2.0E+04
-----	-----	-----	-----	-----
Total	8.6E+03	5.4E-01	3.4E-01	1.1E+05

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-soluble Pu.

Executed on: 02/28/96 at 10:26:55

Page C.

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 Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
PU 240	7.8E+03	0.0E+00	1.6E-06	7.8E+03	7.8E+03
PU 238	2.1E+03	0.0E+00	5.1E-07	2.1E+03	2.1E+03
PU 242	6.9E-01	0.0E+00	0.0E+00	6.9E-01	6.9E-01
PU 241	4.6E+03	0.0E+00	1.3E-10	4.6E+03	4.6E+03
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AM 241	1.3E+04	0.0E+00	1.9E-04	1.3E+04	1.3E+04
PU 239	6.1E+03	0.0E+00	9.4E-07	6.1E+03	6.1E+03

Program GENII Input File ##### 8 Jul 88 ####
 Title: CWC - 23.9 percent nominal Pu-percent by weight-insoluble Pu.

\GENII\cwcpcu2b.in

OPTIONS===== Default =====
 F Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
 F Population dose? (Individual) release, single site
 T Acute release? (Chronic) FAR-FIELD: wide-scale release,
 Maximum Individual data set used multiple sites

Complete
 TRANSPORT OPTIONS===== Section EXPOSURE PATHWAY OPTIONS===== Section
 T 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 F Ground, external 5
 F Waste Form Degradation (near) 3,4 F Recreation, external 5
 T Inhalation uptake 5,6
 F Drinking water ingestion 7,8
 F Aquatic foods ingestion 7,8
 F Terrestrial foods ingestion 7,9
 F Animal product ingestion 7,10
 F Inadvertent soil ingestion

REPORT OPTIONS=====
 T Report AEDE only
 T Report by radionuclide
 T Report by exposure pathway
 F Debug report on screen

INVENTORY #####

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

Use when	Release Terms			Basic Concentrations				
	transport selected			near-field scenario, optionally				
Release Radio- nuclide	Air /yr	Surface Water /yr	Buried Waste /m3	Air /m3	Surface Soil /unit	Deep Soil /m3	Ground Water /L	Surface Water /L
PU238	1.6E-2							
PU239	4.3E-2							
PU240	5.4E-2							
PU241	1.7E+0							
PU242	5.1E-6							
AM241	8.8E-2							

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)
 0 Fraction of roots in upper soil (top 15 cm)
 0 Fraction of roots in deep soil
 0 Manual redistribution: deep soil/surface soil dilution factor
 0 Source area for external dose modification factor (m2)

TRANSPORT

====AIR TRANSPORT=====SECTION 1=====

0	0-Calculat PM	0	Release type (0-3)
1	Option: 1-Use chi/Q or PM value	0	Stack release (T/F)
	2-Select MI dist & dir	0	Stack height (m)
	3-Specify MI dist & dir	0	Stack flow (m3/sec)
1	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 withdrawal location (hr)
 0 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:
 0 Plume (hr) T Consider: (T/F)
 0 Soil contamination (hr) 0 Source: 1-ground water
 0 Swimming (hr) 2-surface water
 0 Boating (hr) 0 Application rate (in/yr)
 0 Shoreline activities (hr) 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)
 1.0 Average fraction of time submersed in acute cloud (hr/person hr)

=====INHALATION=====SECTION 6=====

8766.0 Hours of exposure to contamination per year
 0 0-No resus- 1-Use Mass Loading 2-Use Anspaugh model
 0 pension Mass loading factor (g/m3) Top soil available (cm)

=====INGESTION POPULATION=====SECTION 7=====

Atmospheric production definition (select option):
 0 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)

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 ?	FOOD T/F TYPE	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER	
F	FISH	0.00	0.0E+00	0.00	0.0	0	Source(see above)
F	MOLLUS	0.00	0.0E+00	0.00	0.0	T	Treatment? T/F
F	CRUSTA	0.00	0.0E+00	0.00	0.0	0	Hldup/transit(da)
F	PLANTS	0.00	0.0E+00	0.00	0.0	0	Consumption(L/yr)

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

USE ?	FOOD T/F TYPE	GROW TIME da	--IRRIGATION-- S RATE * in/yr		TIME mo/yr	YIELD kg/m2	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
F	LEAF V	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F	ROOT V	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F	FRUIT	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0
F	GRAIN	0.00	0	0.0	0.0	0.0	0.0E+00	0.0	0.0

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

USE ?	FOOD T/F TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	-----STORED FEED-----						
		CONSUMPTION RATE kg/yr	HOLDUP da			DIET FRAC- TION	GROW TIME da	-IRRIGATION- S * in/yr	RATE mo/yr	TIME	YIELD kg/m3	STOR- AGE da
F	BEEF	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	POULTR	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	MILK	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
F	EGG	0.0	0.0	0.00	0.00	0.00	0.0	0	0.0	0.00	0.00	0.0
	BEEF					0.00	0.0	0	0.0	0.00	0.00	0.0
	MILK					0.00	0.0	0	0.0	0.00	0.00	0.0

#####

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-insoluble Pu

Executed on: 02/28/96 at 10:31:36

Page A.

1

 This is a far-field (wide-scale release, multiple site) scenario.
 Release is acute
 Individual dose

THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
 Air

THE FOLLOWING EXPOSURE PATHS ARE CONSIDERED:
 Infinite plume, external
 Inhalation uptake

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\cwcpu2b.in

GENII Default Parameter Values (28-Mar-90 RAP)

Radionuclide Library - Times<100 years (23-July-93 PDR)

External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R

PNL Solubilities, Yearly Dose Increments (23-Jul-93 PDR)

=====

Release Radio- nuclide	-----Release Terms-----		
	Air	Surface	Buried
	Ci/yr	Water	Source
	Ci/yr	Ci/yr	Ci/m3
PU238	1.6E-02	0.0E+00	0.0E+00
PU239	4.3E-02	0.0E+00	0.0E+00

PU240	5.4E-02	0.0E+00	0.0E+00
PU241	1.7E+00	0.0E+00	0.0E+00
PU242	5.1E-06	0.0E+00	0.0E+00
AM241	8.8E-02	0.0E+00	0.0E+00

===== AIR TRANSPORT

=====

1.0E+00 Input E/Q value (s/m3)

===== EXTERNAL EXPOSURE

=====

1.0E+00 Fraction of time spent in cloud

===== INHALATION

=====

Resuspension not considered

=====

Input prepared by: _____

Date: _____

Input checked by: _____

Date: _____

=====

=====

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-insoluble Pu

Executed on: 02/28/96 at 10:31:53

Page C.

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 Acute release
 Uptake/exposure period: 1.0
 Dose commitment period: 50.0
 Dose units: Rem

Organ	Committed Dose Equivalent	Weighting Factors	Weighted Dose Equivalent
Gonads	5.4E+03	2.5E-01	1.3E+03
Breast	4.4E-01	1.5E-01	6.6E-02
R Marrow	3.0E+04	1.2E-01	3.6E+03
Lung	5.1E+04	1.2E-01	6.1E+03
Thyroid	2.6E-01	3.0E-02	7.8E-03
Bone Sur	3.9E+05	3.0E-02	1.2E+04
Liver	6.9E+04	6.0E-02	4.1E+03
LL Int.	8.2E+00	6.0E-02	4.9E-01
UL Int.	3.0E+00	6.0E-02	1.8E-01
S Int.	8.2E-01	6.0E-02	4.9E-02
Stomach	5.9E-01	6.0E-02	3.5E-02
Internal Effective Dose Equivalent			2.7E+04
External Dose			2.0E-04
Annual Effective Dose Equivalent			2.7E+04

 Controlling Organ: Bone Sur
 Controlling Pathway: Inh
 Controlling Radionuclide: AM241

Total Inhalation EDE:	2.7E+04
Total Ingestion EDE:	0.0E+00

 GENII Dose Calculation Program
 (Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-insoluble Pu

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 Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Dose Commitment Year

1 2 3 ...

Internal : |

Intake : |

Year: 3 | 0.0E+00 ...

| +

2 | 0.0E+00 0.0E+00 ...

| + +

1 | 1.7E+03 + 1.2E+03 + 1.0E+03 + ... = 2.7E+04

Internal

Effective

Dose

Equivalent

|| || ||

Internal

Cumulative

Annual 1.7E+03 + 1.2E+03 + 1.0E+03 + ... = 2.7E+04

Internal

Dose

Dose

+ + + +

External

Annual	2.0E-04	0.0E+00	0.0E+00	...	2.0E-04
--------	---------	---------	---------	-----	---------

Dose

||

Annual	Cumulative
--------	------------

Dose 1.7E+03 + 1.2E+03 + 1.0E+03 + ... = 2.7E+04 Dose

Maximum

1.7E+03 Annual

Dose Occurred

In Year 1

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-insoluble Pu

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Acute release

Uptake/exposure period:

1.0

Dose commitment period:

50.0

Dose units:

Rem

Committed Dose Equivalent by Exposure Pathway

Pathway	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
Testes							
Inhale	5.1E+04	5.9E-01	8.2E-01	3.0E+00	8.2E+00	3.9E+05	3.0E+04
5.4E+03							
Total	5.1E+04	5.9E-01	8.2E-01	3.0E+00	8.2E+00	3.9E+05	3.0E+04
5.4E+03							

Pathway	Ovaries	Muscle	Thyroid	Liver
Inhale	5.3E+03	4.4E-01	2.6E-01	6.9E+04
Total	5.3E+03	4.4E-01	2.6E-01	6.9E+04

External Dose by Exposure Pathway

Pathway	
Plume	2.0E-04
Total	2.0E-04

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-insoluble Pu

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Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Committed Dose Equivalent by Radionuclide

Radionuclide	Lung	Stomach	S Int.	UL Int.	LL Int.	Bone Su	R Marro
Testes							
-----	-----	-----	-----	-----	-----	-----	-----
PU 240	2.1E+04	7.3E-02	1.4E-01	6.7E-01	2.1E+00	5.6E+04	4.3E+03
7.6E+02							
PU 238	6.2E+03	2.2E-02	4.3E-02	2.2E-01	6.5E-01	1.4E+04	1.2E+03
1.9E+02							
PU 242	1.9E+00	6.9E-06	1.3E-05	6.2E-05	1.9E-04	4.8E+00	4.0E-01
6.7E-02							
PU 241	6.5E+03	6.2E-02	5.8E-02	1.7E-01	3.7E-01	3.7E+04	2.9E+03
5.4E+02							
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.0E+00							
AM 241	1.9E+03	3.8E-01	4.7E-01	1.4E+00	3.4E+00	2.4E+05	1.8E+04
3.3E+03							
PU 239	1.6E+04	5.7E-02	1.1E-01	5.2E-01	1.6E+00	4.4E+04	3.4E+03
5.9E+02							
-----	-----	-----	-----	-----	-----	-----	-----
Total	5.1E+04	5.9E-01	8.2E-01	3.0E+00	8.2E+00	3.9E+05	3.0E+04
5.4E+03							

Radionuclide	Ovaries	Muscle	Thyroid	Liver
-----	-----	-----	-----	-----
PU 240	7.6E+02	2.9E-02	2.5E-02	1.0E+04
PU 238	1.9E+02	8.8E-03	7.6E-03	2.7E+03
PU 242	6.8E-02	2.8E-06	2.4E-06	9.0E-01
PU 241	5.3E+02	5.8E-02	2.5E-02	6.2E+03
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00

AM 241	3.2E+03	3.2E-01	1.8E-01	4.2E+04
PU 239	5.9E+02	2.1E-02	2.0E-02	7.8E+03
-----	-----	-----	-----	-----
Total	5.3E+03	4.4E-01	2.6E-01	6.9E+04

GENII Dose Calculation Program
(Version 1.485 3-Dec-90)

Case title: CWC - 23.9 percent nominal Pu-percent by weight-insoluble Pu

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Acute release
Uptake/exposure period: 1.0
Dose commitment period: 50.0
Dose units: Rem

Radio-nuclide	Inhalation Effective Dose Equivalent	Ingestion Effective Dose Equivalent	External Dose	Internal Effective Dose Equivalent	Annual Effective Dose Equivalent
PU 240	5.5E+03	0.0E+00	1.6E-06	5.5E+03	5.5E+03
PU 238	1.5E+03	0.0E+00	5.1E-07	1.5E+03	1.5E+03
PU 242	5.0E-01	0.0E+00	0.0E+00	5.0E-01	5.0E-01
PU 241	2.8E+03	0.0E+00	1.3E-10	2.8E+03	2.8E+03
U 237	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
AM 241	1.3E+04	0.0E+00	1.9E-04	1.3E+04	1.3E+04
PU 239	4.3E+03	0.0E+00	9.4E-07	4.3E+03	4.3E+03

CHECKLIST FOR PEER REVIEW

Document Reviewed: C. H. Huang, "X/Qs AND UNIT DOSE CALCULATIONS FOR CENTRAL WASTE COMPLEX INTERIM SAFETY BASIS EFFORT,"
March 13, 1996.

Scope of Review: Entire Document

Yes No NA

☐	☐	☒	*	Previous reviews complete and cover analysis, up to scope of this review, with no gaps.
☒	☐	☐		Problem completely defined.
☒	☐	☒		Accident scenarios developed in a clear and logical manner.
☒	☐	☐		Necessary assumptions explicitly stated and supported.
☒	☐	☐		Computer codes and data files documented.
☒	☐	☐		Data used in calculations explicitly stated in document.
☒	☐	☐		Data checked for consistency with original source information as applicable.
☐	☐	☒		Mathematical derivations checked including dimensional consistency of results.
☒	☐	☐		Models appropriate and used within range of validity or use outside range of established validity justified.
☒	☐	☐		Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations.
☒	☐	☐		Software input correct and consistent with document reviewed.
☒	☐	☐		Software output consistent with input and with results reported in document reviewed.
☐	☐	☒		Limits/criteria/guidelines applied to analysis results are appropriate and referenced. Limits/criteria/guidelines checked against references.
☐	☐	☒		Safety margins consistent with good engineering practices.
☒	☐	☐		Conclusions consistent with analytical results and applicable limits.
☒	☐	☐		Results and conclusions address all points required in the problem statement.
☐	☐	☒		Format consistent with appropriate NRC Regulatory Guide or other standards
☐	☒	☐	*	Review calculations, comments, and/or notes are attached.
☒	☐	☐		Document approved.

DA. Himes
Reviewer (Printed Name and Signature)

3/14/96
Date

HEDOP REVIEW CHECKLIST
for
Radiological and Nonradiological Release Calculations

Document Reviewed: C. H. Huang, "X/QS AND UNIT DOSE CALCULATIONS FOR CENTRAL WASTE COMPLEX INTERIM SAFETY BASIS EFFORT,"
March 13, 1996

Submitted by: C. H. HUANG
Date Submitted: March 12, 1996

Scope of Review: Entire Document

YES NO* N/A

☒	☐	☐	1. A detailed technical review and approval of the environmental transport and dose calculation portion of the analysis has been performed and documented.
☐	☐	☒	2. Detailed technical review(s) and approval(s) of scenario and release determinations have been performed and documented.
☒	☐	☐	3. HEDOP-approved code(s) were used.
☒	☐	☐	4. Receptor locations were selected according to HEDOP recommendations.
☒	☐	☐	5. All applicable environmental pathways and code options were included and are appropriate for the calculations.
☒	☐	☐	6. Hanford site data were used.
☒	☐	☒	7. Model adjustments external to the computer program were justified and performed correctly.
☒	☐	☐	8. The analysis is consistent with HEDOP recommendations.
☐	☐	☒	9. Supporting notes, calculations, comments, comment resolutions, or other information is attached. (Use the "Page 1 of X" page numbering format and sign and date each added page.)
☒	☐		10. Approval is granted on behalf of the Hanford Environmental Dose Overview Panel.

* All "NO" responses must be explained and use of nonstandard methods justified.

D.A. Himes 3/14/96
HEDOP-Approved Reviewer (Printed Name and Signature) Date

COMMENTS (add additional signed and dated pages if necessary):

DISTRIBUTION SHEET

To	From	Page 1 of 1
D.J. Schmitt	C.H. Huang	Date 3/12/96
Project Title/Work Order		EDT No. 156464
X/Qs AND UNIT DOSE CALCULATIONS FOR CENTRAL WASTE COMPLEX INTERIM SAFETY BASIS EFFORT		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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D.J. Schmitt	T3-01	X			
D.A. Himes	A3-34	X			
J.C. Van Keuren	A3-34	X			

C.H. Huang

A3-34 X