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AN EVALUATION OF METEOROLOGIC DATA DIFFERENCES BETWEEN THE PANTEX PLANT AND AMARILLO, TEXAS

S. F. Snyder

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SUMMARY

Meteorologic data from the Pantex Plant and from the nearby National Weather Service (NWS) station at the Amarillo, Texas, International Airport were evaluated to determine if the NWS data adequately represented meteorologic conditions at the Pantex Plant. Annual site environmental dose calculations for the Pantex Plant have previously used the NWS data; information from this data comparison helped determine if future environmental dose calculations should use site-specific Pantex meteorologic data.

The meteorologic data evaluated were wind speed, wind direction, and atmospheric stability class. Nine hundred hours of wind speed and wind direction data were randomly selected and evaluated for 1988, 1990, and 1991. Evaluations of specific hourly wind speed measurements showed significant differences between the two locations; however, overall average wind speed differences were not statistically significant. The average annual wind speed at Amarillo was approximately 0.4 m/s higher than at Pantex for all three years, ranging between 5 and 6 m/s at both locations. The median wind direction difference was 0 to 10°, with 63% of all hourly data comparisons being 10° or less. Because the resolution of the NWS Amarillo data was 10°, no more precise statements about wind direction differences could be made.

Atmospheric stability class data were compared for years 1990 and 1991 and found to be very similar. Stability class designations were identical and one class different in 63% and 30%, respectively, of the paired hourly data. An unexpected finding was the preponderance of Class D stability, which occurred approximately 62% of the time in both data sets.

The overall effect of meteorological differences between the two locations was evaluated by performing environmental dose assessments using the GENII dose assessment computer code. Acute and chronic releases of ^{3}H and ^{239}Pu were evaluated. Results using the NWS Amarillo meteorologic data were approximately one-half of those generated using Pantex meteorologic data. The two-fold difference in dose results is within the uncertainty expected from current dose assessment codes; therefore, the two meteorologic databases can

be used interchangeably and prior dose calculation results using the NWS Amarillo data are acceptable.

There are some reasons, however, for favoring the use of the Pantex meteorologic data. The Pantex data are site-specific, collected continuously using an automated data collection system, and compiled automatically, providing greater confidence in meteorologic data. The Pantex data are recorded every 15 minutes at two elevations, whereas the NWS data are collected hourly at one elevation. In cases of data loss or unavailability of historical data the NWS Amarillo data set provides an acceptable substitute. If Pantex meteorologic data are to be used for environmental dose calculations, however, a quality assurance program must be established. Significant periods of data loss occurred in 1988 and 1989.

ACKNOWLEDGMENTS

In recognition of his time spent compiling the Pantex meteorologic data, much appreciation goes to W.A. Laseter of the Pantex Environmental Protection Department (EPD). M. J. Manning's contributions in the early stages of this work are also gratefully acknowledged, as are the helpful comments contributed by D. A. McGrath, D. W. Griffis, and others in the Pantex EPD.

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INTRODUCTION

All U.S. Department of Energy (DOE) sites with nuclear facilities estimate the dose to members of the public from assumed or actual atmospheric releases of radioactive materials. These evaluations require the use of meteorologic data, typically wind speed, wind direction, and stability class. This report evaluates the similarities and differences in the wind speed, wind direction, and stability class recorded at the DOE Pantex Plant and at the Amarillo, Texas, International Airport. Amarillo, Texas, is the site of the National Weather Service (NWS) meteorologic tower that is nearest to the Pantex Plant. Amarillo data are used in current Pantex dose assessments. The Amarillo airport is located approximately 10 miles west of Pantex, across the relatively flat plain of the Llano Estacado.

The use of accurate meteorologic information in a dose assessment permits the best possible evaluation of an individual's actual or potential exposure to (or, alternatively, an environmental media concentration of) a contaminant. The conclusions drawn from the data evaluation will, therefore, reveal the consequences of using Amarillo meteorologic data for dose assessments performed for hypothetical or actual releases at the Pantex Plant.

Although there are no established criteria that endorse the substitution of one meteorologic data set for another, the two data sets can be compared, and their similarities and differences identified. The DOE has issued guidance stating that in order for offsite meteorologic data to be acceptable for DOE site applications, "the data should* be representative of conditions at the DOE facility and provide statistically valid data consistent with onsite monitoring requirements"[(a)] (DOE 1991). This study aims to answer the question of whether meteorological data recorded offsite at the Amarillo tower are representative of conditions at Pantex. This question is resolved by determining whether the Amarillo data set is statistically valid and appropriate for onsite monitoring requirements.

(a) "Should*" is used in this regulatory guide to indicate high-priority elements of an environmental surveillance program.

The publicly available meteorologic data collected at the Amarillo International Airport are collected by NWS. The meteorologic data collected at Pantex are currently used primarily for Emergency Management Department (EMD) purposes. The EMD is most interested in the real-time data; the software that compiles the 15-min meteorologic measurements at Pantex for use by the EMD is part of the Atmospheric Release Advisory Capability (ARAC) system (Baskett 1992). The Environmental Protection Department is more interested in summaries of hourly meteorologic data collected over a weekly, monthly, or annual time period.

Wind speed, wind direction, and stability class data sets from Pantex and Amarillo were compared in this study. For the wind speed and wind direction evaluation, a random sample of data from each of the three years evaluated (1988, 1990, and 1991) was selected for evaluation. The stability class provides an indication of the amount of atmospheric turbulence, which indicates the degree of dispersion of airborne releases. The evaluation of stability class was limited to the years 1990 and 1991. Four months of data were missing from the 1989 Pantex Plant data set; therefore, that particular year was not evaluated at all in this study. The stability class evaluation did not include the year 1988 because of ARAC software errors that caused incorrect calculation of the stability class for most of that year.[a]

After the evaluation of each raw data set, the meteorologic data from each location was formatted for use by the GENII computer code. The GENII dose assessment code (Napier et al. 1988) was used to evaluate a hypothetical unit release of tritium and plutonium-239. The dose assessment results play out the differences caused by the use of each location's meteorologic data in an assessment of the consequences of a Pantex Plant release. The final discussion of the results of the data evaluations and dose assessments will also discuss logistical considerations.

(a) Personal communication, April 15, 1992, Ronald Baskett, ARAC, Lawrence National Laboratory, Livermore, California.

METHODS

Hourly wind speed, wind direction, and stability class measurements were obtained from the Environmental Protection Department staff at Pantex (Pantex data) and the National Weather Service (Amarillo data) (NOAA 1991) for the evaluations discussed below.

WIND SPEED AND WIND DIRECTION

The wind speed and wind direction data were evaluated for the years 1988, 1990, and 1991. Pantex winds were measured 10 m above the ground, and Amarillo winds were measured 7 m above the ground. This small difference in elevation was assumed not to affect the comparability of the two data sets.

In addition to differences in wind measurement height, the procedure for collecting wind data differed at the two sites. The Pantex station is fully automatic, recording the 15-minute average of readings taken approximately every 8 seconds. This study used the top-of-the-hour Pantex measurement, which averaged the data measured over the 15 minutes prior to the hour. Amarillo data are collected hourly by an individual observing a digital instrument read-out over a 1-minute period within 10 minutes of the top of the hour. These two sets of wind data represent measurements taken within the last 15 minutes of the hour at each location.

Unit conversions were required for several of the data sets. First, Amarillo wind speed data were converted from knots to m/s for analysis. Pantex wind speed was recorded in m/s. Second, Amarillo wind direction was recorded in tens-of-degrees units (e.g., 180° equals 18 tens-of-degrees). The Pantex data, recorded in integer degrees, was converted to tens-of-degrees units as indicated in Table 1.

The wind data were sorted into annual files that paired the hourly wind measurements at both locations. Prior to pairing the data, the Pantex time stamp, which indicated Greenwich Mean Time, was adjusted to Central Standard Time. The Amarillo data was time-stamped in Central Standard Time.

TABLE 1. Conversion from Degrees to Tens-of-Degrees for Wind Direction Data

Pantex: Measured Wind Direction (degrees from)	Pantex: Tens-of-Degrees Wind Direction
0 to 4 degrees	0
5 to 14 degrees	1
15 to 24 degrees	2
25 to 34 degrees	3
.	.
.	.
.	.
345 to 354 degrees	35
355 to 360 degrees	36

Data recoverability is the percentage of paired data (Amarillo tower and Pantex tower data) *actually* recovered out of the total quantity of paired data that are theoretically available for a given year. For example, the total number of possible annual hourly readings (non-leap years) is 8760 (365 x 24 hours/day). If only 8340 paired hourly readings were available (recovered) for this year because of equipment failure, etc., at either of the two towers, the data recoverability would be 8340/8760 = 0.95 x 100% = 95%. Data recoverability for the three years used in the wind data evaluations is shown in Table 2. The lower recoverability of 1990 was primarily the result of missing Pantex data in May of that year.

A random sample of 900 hours of wind speed and wind direction data was taken for each year evaluated, using a short QBASIC (IBM 1991) program (see Appendix A). The 900 hours sampled represent approximately 10% of the paired total of all data for any one year.

TABLE 2. The Annual Data Recoverability of the Paired Pantex and Amarillo Hourly Wind Data

Year	Data Recoverability (%)
1988	97
1990	90
1991	97

STABILITY CLASS

The Pasquill stability classes were evaluated for only the years 1990 and 1991. The hourly stability class data for the entire year were evaluated. Stability classes are designated alphabetically from A to F and indicate a category of atmospheric dispersion from the greatest (A) to the least (F) amounts of dispersion. Class A stability indicates considerable turbulence (plumes spread more in a vertical than a horizontal direction), and class F stability indicates very stable conditions (the horizontal spread of the plume is very large in comparison to the vertical spread) (Baskett 1992). Class D stability, neutral (similar dispersion in a vertical and horizontal direction), is the typical daytime condition in most locations.

Stability class designations at the two sites are determined by algorithms using several meteorologic data inputs. The NWS (Amarillo data) stability class designation is based on D.B. Turner's method (1964), which considered cloud cover, wind speed, time of day (day or night), insolation (incoming radiation), and solar altitude. The ARAC system software (Pantex data) determines the stability class in a slightly different manner. Pantex wind data are used to calculate sigma-theta (σ_θ), which describes the standard deviation of the horizontal wind direction over the 15-min measurement interval. The sigma-theta, time of day (day or night), and wind speed are used to determine the stability class. The ARAC system software stability class algorithm includes correction factors for surface roughness in the vicinity of the tower and the instrumentation measurement height.

The evaluation of the stability class presented here is limited. The annual frequency of each stability class at each location, and the magnitude of the difference in paired stability class data, were evaluated. Little statistical analysis was performed on the stability class data because of the multiparametric algorithms used to define the stability class.

DOSE ASSESSMENT

The Pantex Environmental Protection Department (EPD) uses meteorologic data to perform dose assessments. Dose assessments were done using identical release and exposure scenarios to evaluate the consequences of using each location's meteorologic data sets. A hypothetical unit release of tritium and plutonium-239 was assumed to occur at the Pantex Plant. Both chronic and acute releases were considered. The dose assessment results will reveal the ultimate similarity of the Amarillo and Pantex data sets as they are used in EPD applications.

Dose assessment codes use the wind speed, wind direction, and stability class data in the form of a formatted data file that displays the annual frequency at which the atmospheric conditions are described by a given wind direction, wind speed, and stability class. The GENII dose assessment code requires a formatted data file known as a joint frequency distribution (JFD) file. JFD files for 1990 and 1991 were compiled for Pantex and Amarillo (Appendix B).

The Amarillo JFD file was created by reformatting the Amarillo STAR (STability ARray) files provided by the NWS. STAR files are used in some environmental transport codes to profile the annual meteorology. The Pantex JFD file was then created from the hourly Pantex measurements. The Pantex JFD contains the same wind speed classifications used by the NWS in the Amarillo STAR files.

The dose assessments considered a ground-level airborne release that exposed an individual via the following pathways: inhalation; outdoor recreation; ingestion of contaminated food crops and animal products; inadvertent ingestion of soil; and external exposure from ground-deposited and airborne radionuclides. Doses to the maximum individual (MI), as opposed to

the average individual, were calculated. Exposure parameters for the MI are intended to reflect the maximum credible exposure to an individual from all chosen pathways.

The location of the MI for the chronic dose assessments was determined by using a population file in GENII that placed one individual at 0.5, 1.5, 2.5, and 3.5 miles from the release point in all 16 compass directions (i.e., N, NNE, NE, etc.). For the acute dose assessments, the MI location was that identified by a previous evaluation of a 1990 Pantex release, 1900 meters ESE of the release (MHSMP 1991).

RESULTS AND DISCUSSION

This section gives a thorough review of the wind data analyses, followed by a brief discussion of the stability class evaluation. Finally, the dose assessment results are compared.

WIND DATA

Results of the wind data analyses are displayed in several figures and tables. Figures 1 through 3 (wind direction) and Figures 8 through 10 (wind speed) display 900 random hours of paired data for the years 1988, 1990, and 1991. Each point in these figures indicates the wind direction or wind speed recorded at the same hour of the year at both the Amarillo and the Pantex locations. If the wind data at both locations were identical, all data points in each figure would fall on the X = Y cartesian coordinates of each graph, indicated by the solid 45° line in each figure and at the arrowed points in Figures 1, 2, and 3.

Wind Direction

The 900 randomly selected wind direction data points from 1988, 1990, and 1991 are plotted in Figures 1, 2, and 3, respectively. The wind direction indicated is the direction from which the wind blew. A number of the data points represent several occurrences of identical paired data.

The wind direction data for the two sites appear to be similar; wind direction data points occur in a general X = Y pattern along the 45° line in each figure. Wind direction values near 0° or near 360° are both in the northerly direction, as indicated by the arrows in each figure. Wind direction is recorded on a polar coordinate system as degrees from true north, with degrees increasing in a clock-wise direction. Therefore, values in the 0,360 and 360,0 regions of the wind direction plots represent similar wind directions at each location.

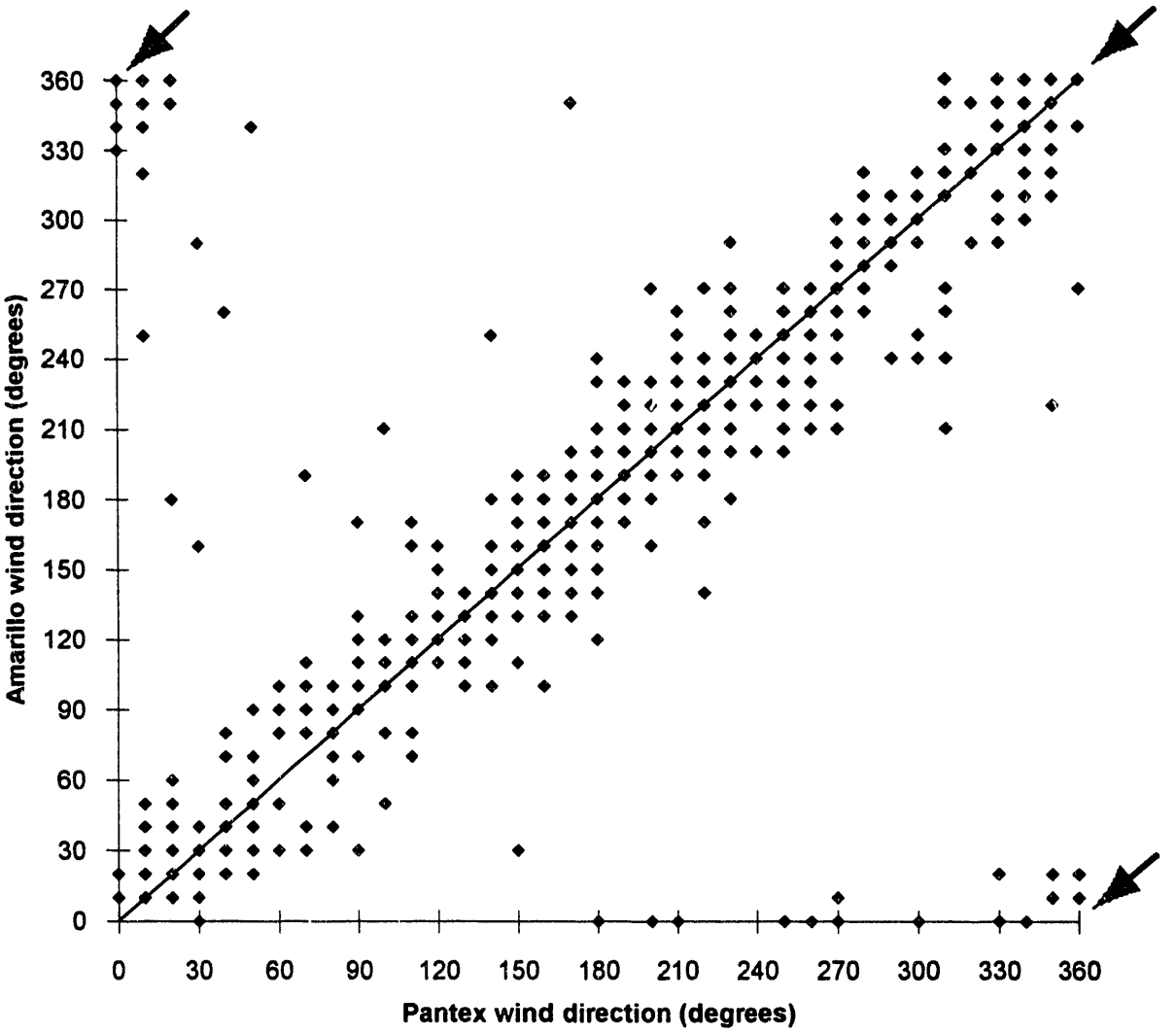

FIGURE 1. 1988 Wind Direction Data Recorded at Pantex and Amarillo (900 Random Hours) – The ♦ symbols indicate a measurement recorded at the same hour at each location. A symbol may represent more than one data point. The solid line and arrows indicate where points would fall if the measurements at each location were the same.

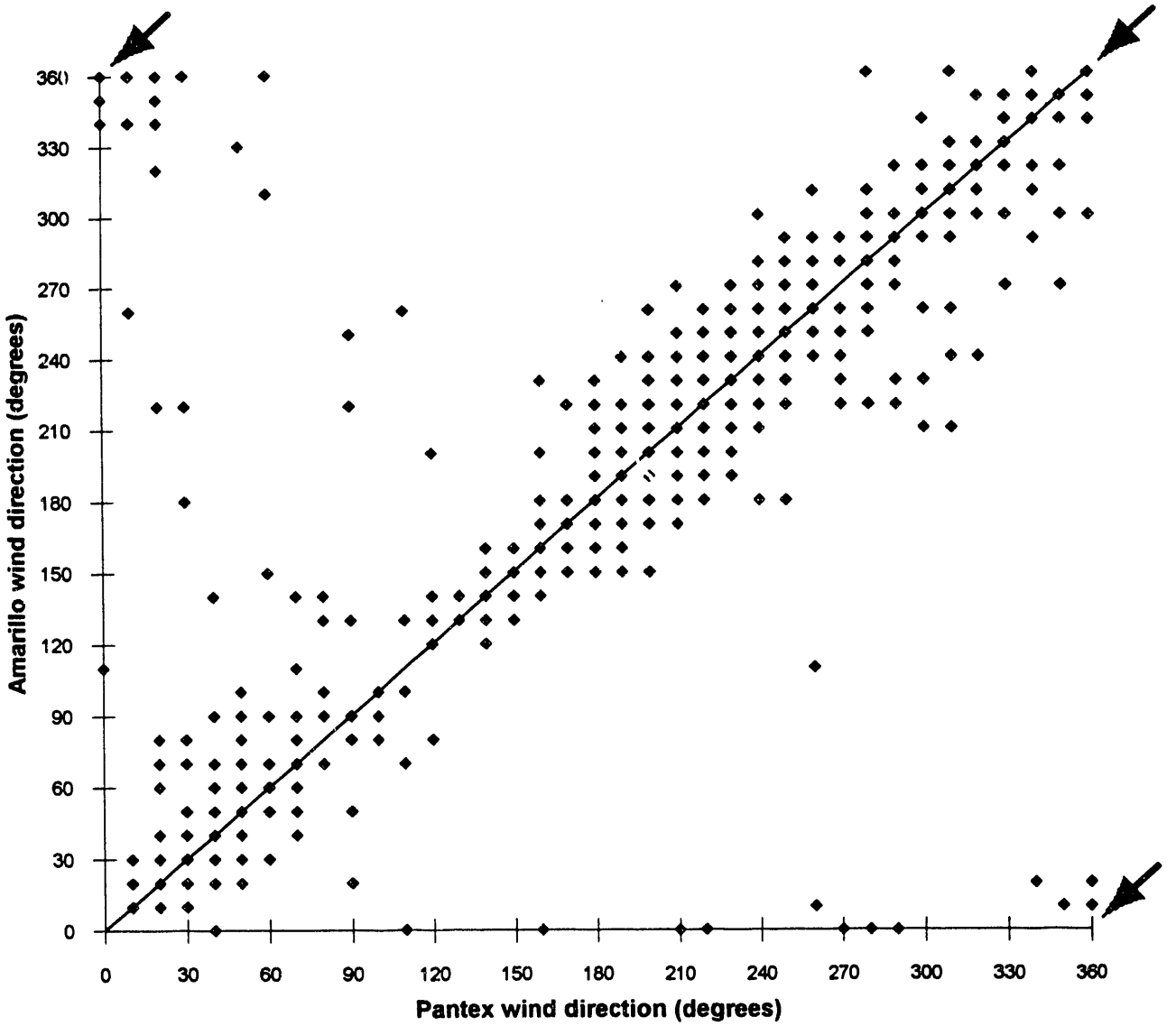

FIGURE 2. 1990 Wind Direction Data Recorded at Pantex and Amarillo (900 Random Hours) – The ♦ symbols indicate a measurement recorded at the same hour at each location. A symbol may represent more than one data point. The solid line and arrows indicate where points would fall if the measurements at each location were the same.

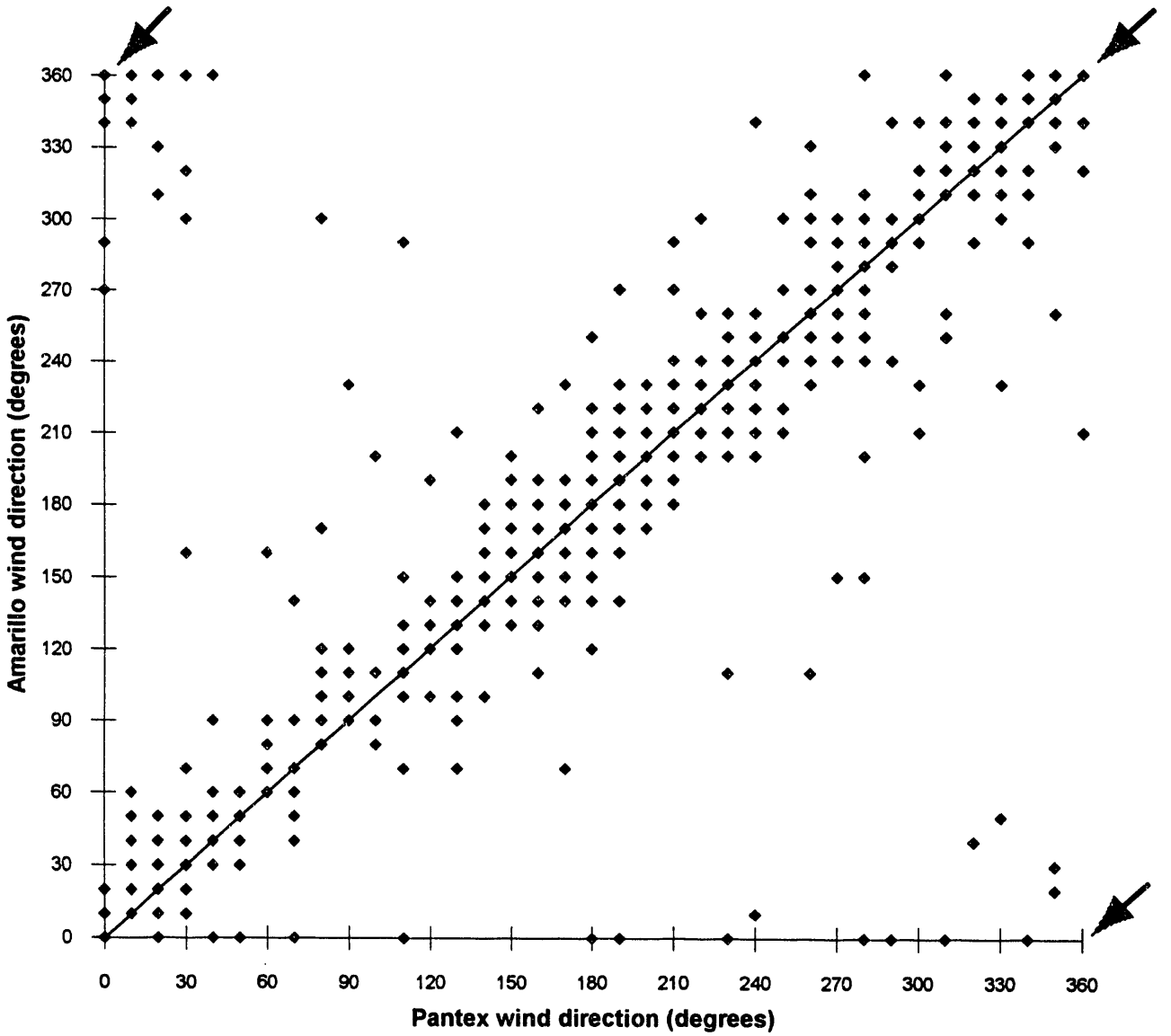

FIGURE 3. 1991 Wind Direction Data Recorded at Pantex and Amarillo (900 Random Hours) – The ♦ symbols indicate a measurement recorded at the same hour at each location. A symbol may represent more than one data point. The solid line and arrows indicate where points would fall if the measurements at each location were the same.

An analysis of the absolute value of the wind direction differences was conducted, and results are shown in Figures 4, 5, and 6. Tabulated values are shown in Table 3. The x-axis values are no higher than 180 because no two points in a polar coordinate system are more than 180° apart. The wind direction at each location differed by 20° or less for approximately 63% of

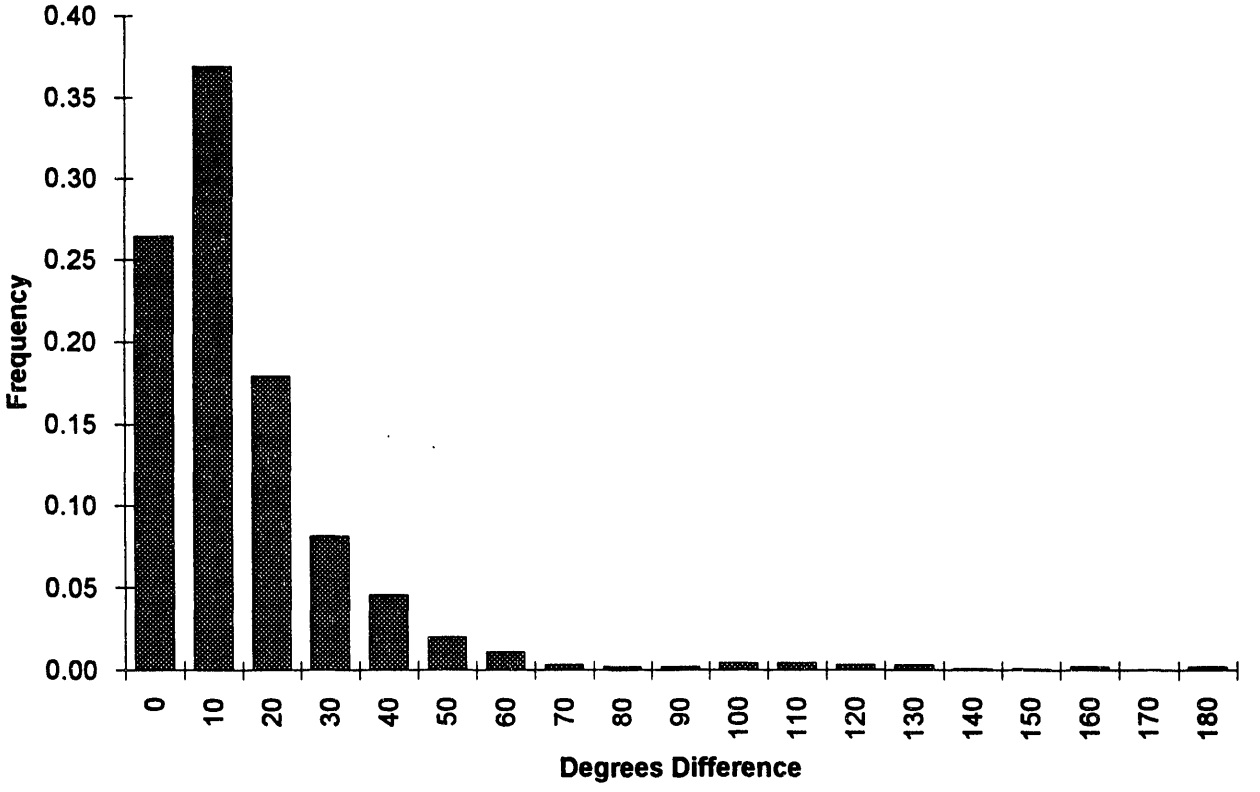

FIGURE 4. 1988 Frequency Distribution (Fraction) of Wind Direction Difference Between Pantex and Amarillo (900 Random Hours)

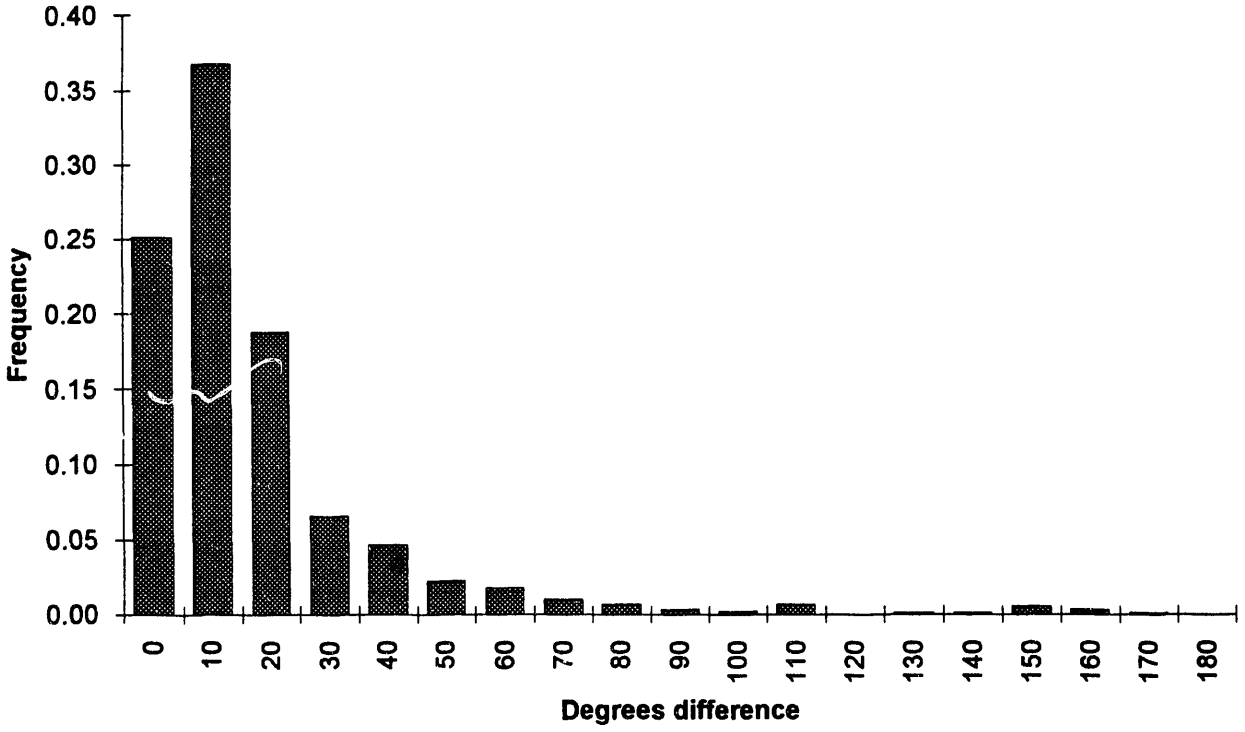

FIGURE 5. 1990 Frequency Distribution (Fraction) of Wind Direction Difference Between Pantex and Amarillo (900 Random Hours)

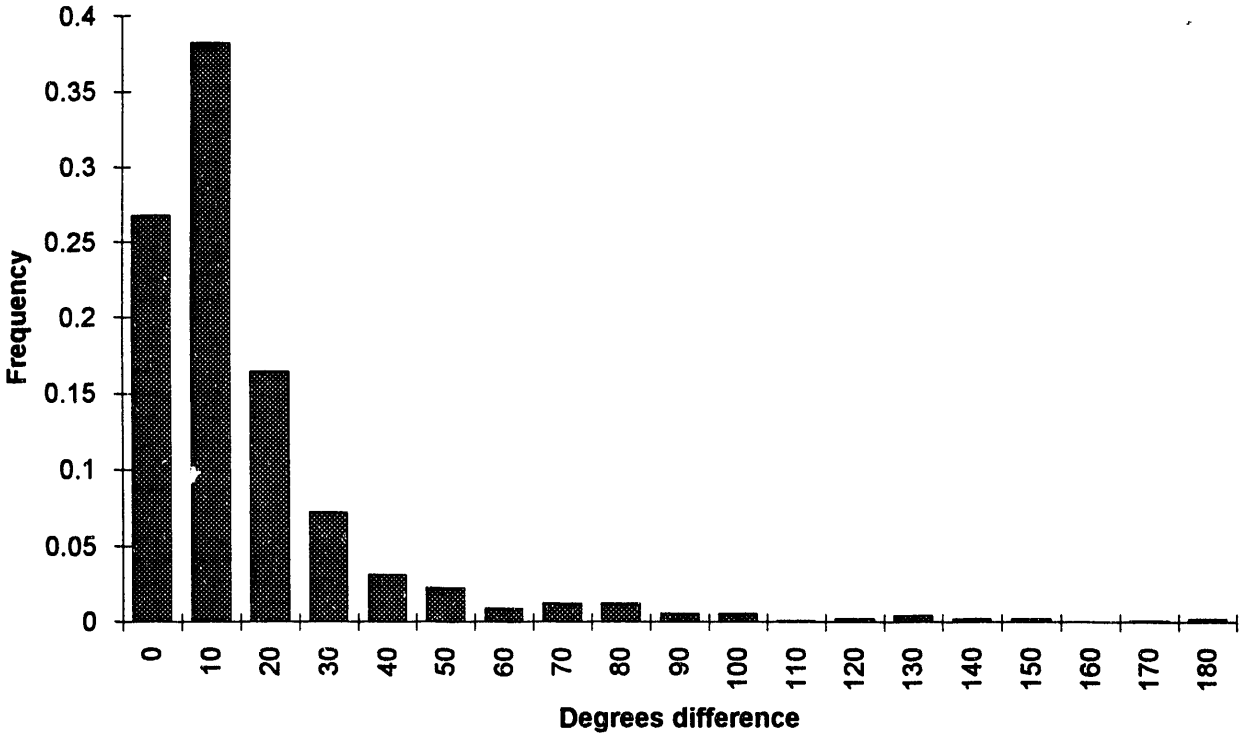

FIGURE 6. 1991 Frequency Distribution (Fraction) of Wind Direction Difference Between Pantex and Amarillo (900 Random Hours)

TABLE 3. Fractional Distribution of Annual Wind Direction Difference Data

Degrees of Difference	1988	1990	1991
0	0.26	0.25	0.27
10	0.37	0.37	0.38
20	0.18	0.19	0.16
30	0.08	0.07	0.07
40	0.05	0.05	0.03
50	0.02	0.02	0.02
60	0.01	0.02	0.01
70	0.00	0.01	0.01
80	0.00	0.01	0.01
90	0.00	0.00	0.01
100	0.00	0.00	0.01
110	0.00	0.01	0.00
120	0.00	0.00	0.00
130	0.00	0.00	0.00
140	0.00	0.00	0.00
150	0.00	0.01	0.00
160	0.00	0.00	0.00
170	0.00	0.00	0.00
180	0.00	0.00	0.00

the sample observations. At the other extreme, approximately 2.5% of the wind direction readings at each location differed by more than 90°.

The JDF and STAR files used by environmental transport and dose assessment codes place wind directions in one of sixteen compass directions (i.e., N, NNE, NE,...NNW). The centers of the compass directions are 22.5° apart. The JFD and STAR files indicate the annual frequency at which winds blow in a certain compass direction. The median wind direction difference between the paired Pantex and Amarillo data is on the order of 10°. Table 3 indicates that 63% of the wind direction differences are less than 10°; i.e., less than 14° because of the tens-of-degrees units resolution of the wind direction measurements (see the section "Wind Speed and Wind Direction"). The median wind direction difference cannot be stated more precisely than 0° to 10° because the direction data evaluated were limited by the tens-of-degrees units of the Amarillo direction data.

Figure 7 shows the 1988 paired wind direction measurements in relation to how they would be approximately parsed in the construction of an

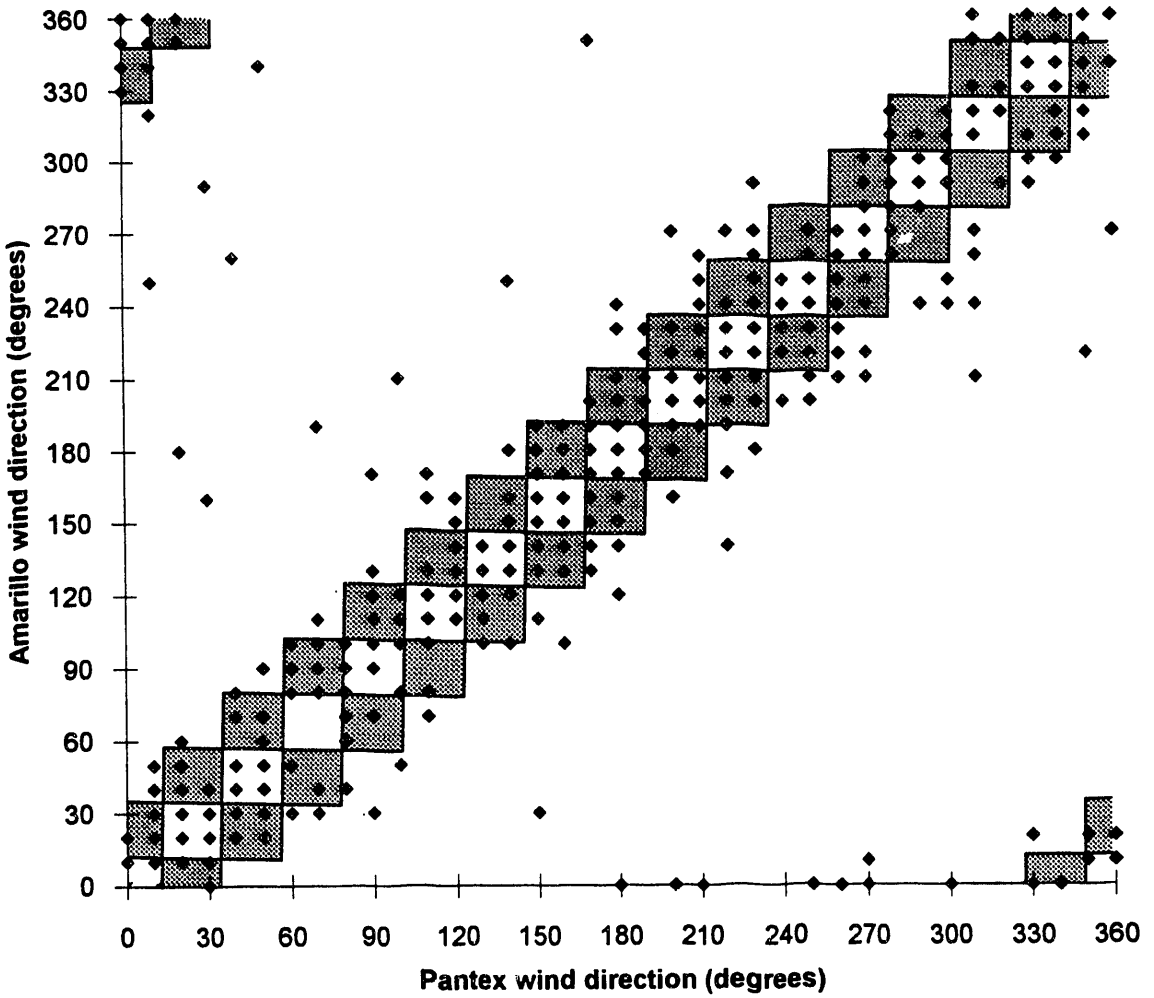

FIGURE 7. 1988 Wind Direction Data Recorded at Pantex and Amarillo, Overlaid with Compass Direction Indications – Points in clear boxes (along the X=Y direction and in the corners indicate that the wind direction was measured in the same direction sector at both locations when a 16-sector compass was used (e.g., N, NNE, NE, ENE, etc.). Points in the shaded boxes indicate that the measurement in one location was one compass direction off the reading of the other location.

environmental transport meteorologic data file. Points located in the clear boxes of Figure 7 indicate that the same wind direction (i.e., the same compass direction) would be reported for each location during the construction of the environmental transport data file. However, points located in the

shaded boxes of Figure 7 would be located in direction "A" (e.g., SW) in one location's meteorologic data file and in direction "B" (e.g., SSW), one compass direction adjacent to "A," in the other location's meteorologic data file. The results of the 1990 and 1991 paired wind direction data are similar, showing few points outside the boxed areas.

An evaluation of the 900 paired wind direction measurements for 1988 showed that 48% of the time the wind directions were located in the same 16-sector compass direction box. An additional 38% more are off by one adjacent compass direction. In short, 86% of the paired wind directions for 1988 are within one compass direction of each other. The dose assessment results will help resolve whether there is a one-compass-direction offset of the maximum individual location.

If a wind direction difference at the two locations exists, it may have less profound consequences for chronic release assessments than for acute release assessments. Chronic release evaluations use wind direction data averaged over the entire year; therefore, wind direction differences may average out over the year. For example, +10° wind direction differences and -10° wind direction differences may average out to a 0° wind direction difference over the entire year. The discussion of the dose assessment results indicates that this "averaging out" does not occur.

Assessments of acutal releases require the most accurate wind direction measurements over a specific, short window of time. Therefore, it would be best to use the site-specific Pantex data for these acute assessments because of the possible misrepresentation of the acutal meteorological conditions that may result from using Amarillo meteorologic data. In contrast with these retrospective acute release assessments, dose assessment codes that evaluate prospective (hypothetical) acute release assessments use average meteorologic data. The use of average data decreases the probability of severely compromising the accuracy of the dose assessment results if Amarillo meteorologic data are used in place of Pantex data.

Wind Speed

The wind speed data are displayed in Figures 8, 9, and 10. The paired data parallel the X = Y line, the solid line in each figure, rather well. The dashed lines in each figure indicate a 2 m/s wind speed difference between the two locations. An average of 91% of the annual wind speed values differed by 2 m/s or less over the three years evaluated (92% for 1988, 90% for 1990, and 91% for 1991). The correlation coefficients were 0.87, 0.85, and 0.85 for 1988, 1990, and 1991, respectively.

The overall, annual average wind speed at Amarillo was higher than that of Pantex, but not statistically different, as indicated in Table 4. As discussed for wind direction, chronic release evaluations would be expected to produce approximately the same environmental transport results, if all other variables held constant, regardless of whether Pantex or Amarillo wind speed data were used.

In contrast with the similar annual average wind speeds, the time-specific wind speeds differed between the two locations. Paired t-tests (95% confidence interval) (Microsoft 1992) performed on each year's 900 randomly selected hours of wind speed data indicated a statistically significant difference in the wind speeds at any given time. The wind speed difference noted by the paired t-test could become apparent during dose assessments of acute releases. Using the generally higher wind speed data of Amarillo for acute release at Pantex would result in a greater dispersion of airborne releases, if all other variables remained the same. This would decrease dose estimates for nearby MIs and increase dose estimates for individuals farther away. The effect on the evaluation of population dose estimates is difficult to predict.

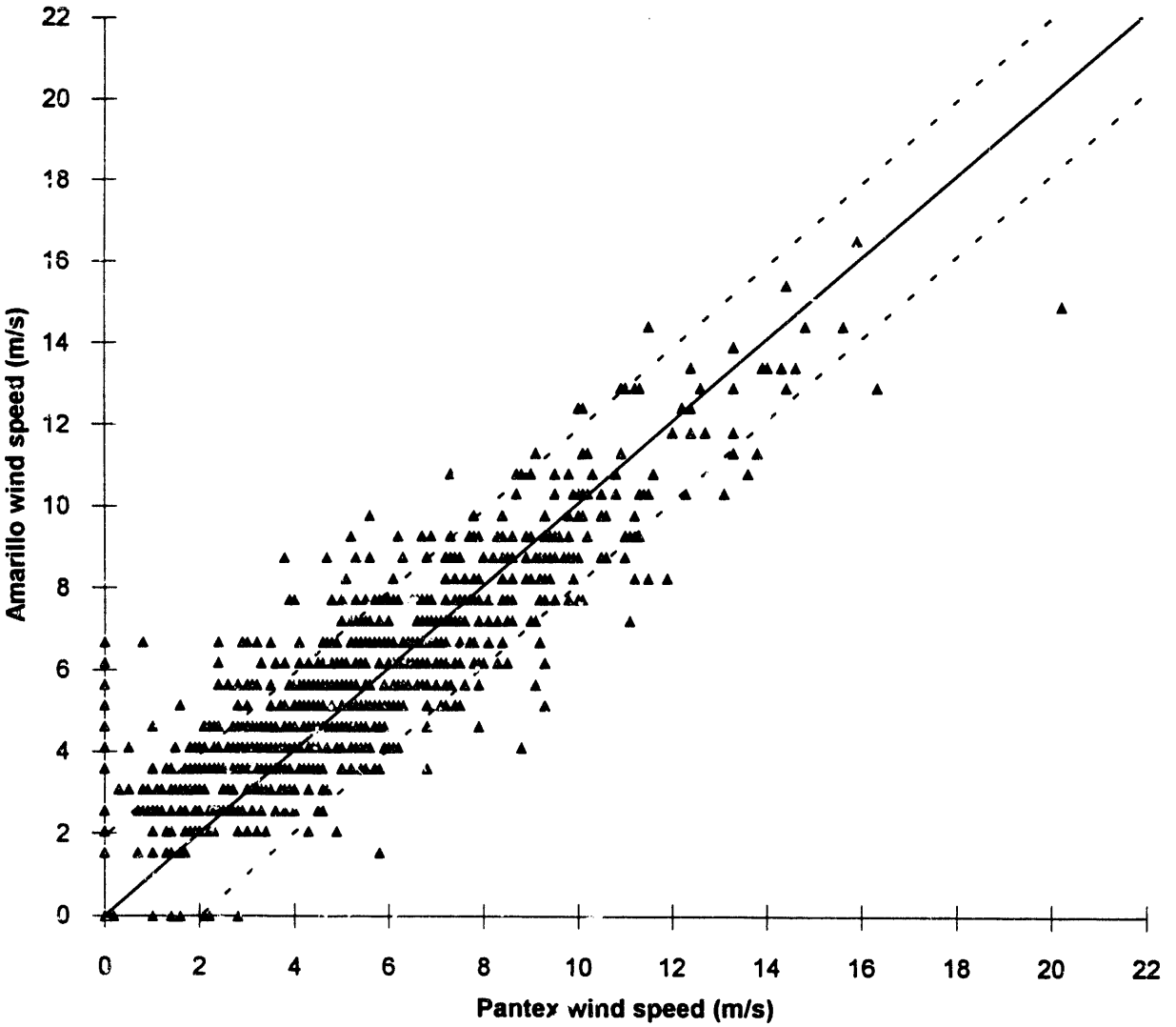

FIGURE 8. 1988 Wind Speed Data Recorded at Pantex and Amarillo (900 Random Hours) – The ▲ symbols indicate a measurement recorded at the same hour at each location. The solid line indicates where points would fall if the measurements at each location were the same. The dashed lines indicate the location of wind speed measurements that differ by 2 m/s.

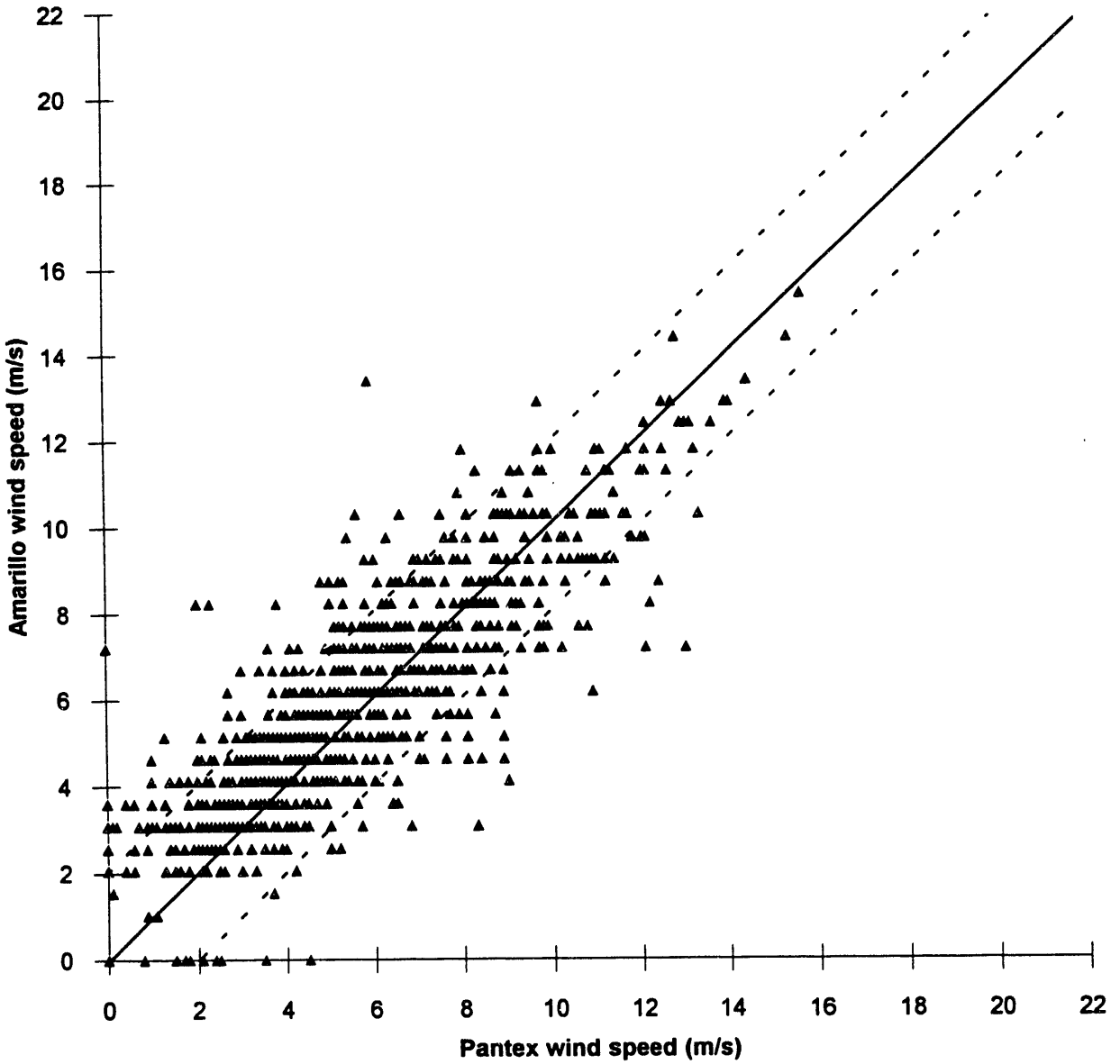

FIGURE 9. 1990 Wind Speed Data Recorded at Pantex and Amarillo (900 Random Hours) – The ▲ symbols indicate a measurement recorded at the same hour at each location. The solid line indicates where points would fall if the measurements at each location were the same. The dashed lines indicate the location of wind speed measurements that differ by 2 m/s.

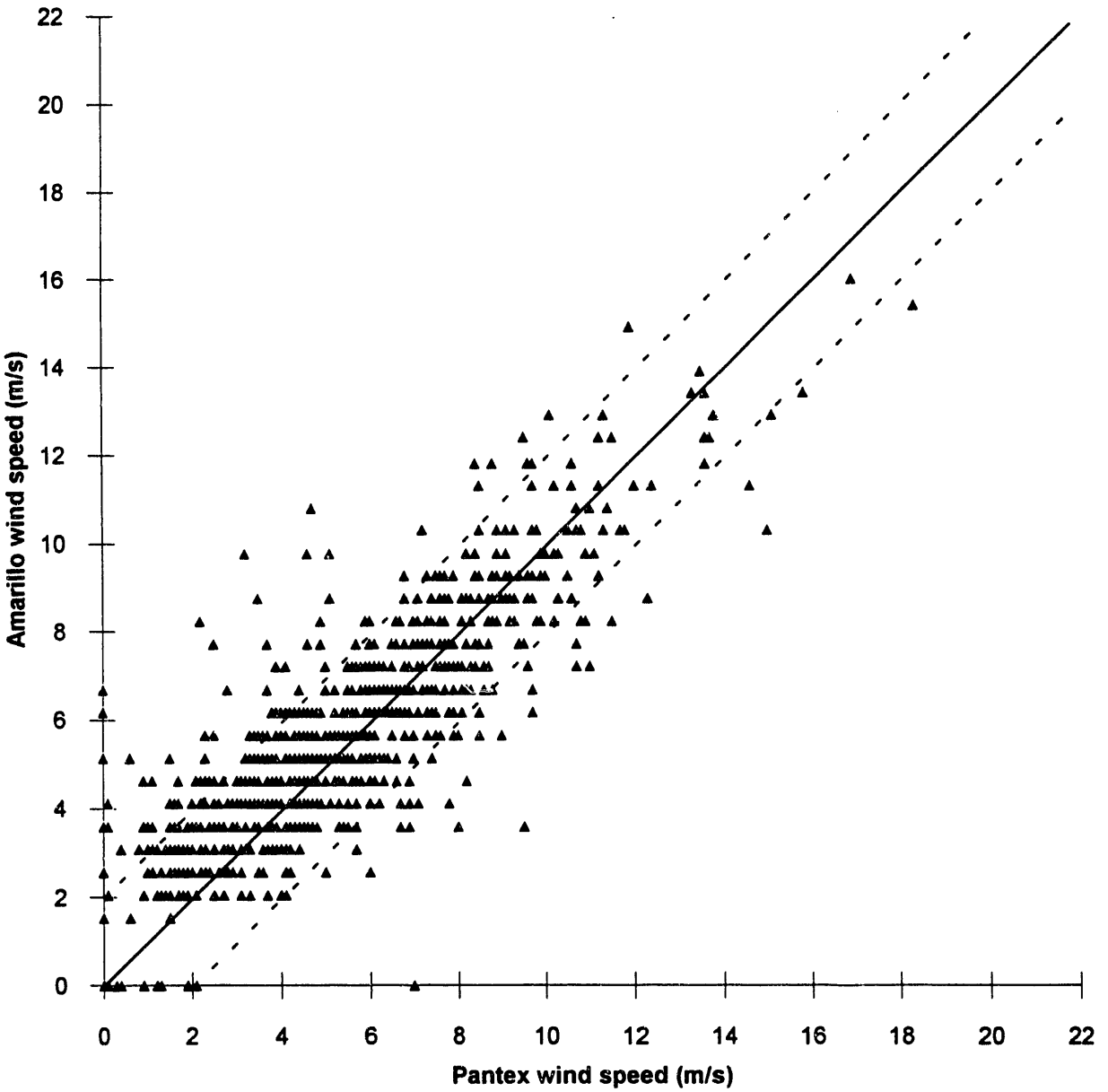

FIGURE 10. 1991 Wind Speed Data Recorded at Pantex and Amarillo (900 Random Hours) – The ▲ symbols indicate a measurement recorded at the same hour at each location. The solid line indicates where points would fall if the measurements at each location were the same. The dashed lines indicate the location of wind speed measurements that differ by 2 m/s.

TABLE 4. The Overall, Annual Average Wind Speed at Pantex and Amarillo

Year	Location	Average Wind Speed (m/s)
1988	Pantex	5.34 ± 3.03
	Amarillo	5.73 ± 2.66
1990	Pantex	5.70 ± 2.90
	Amarillo	6.03 ± 2.62
1991	Pantex	5.53 ± 2.89
	Amarillo	5.86 ± 2.52

To further evaluate the wind speeds at the two locations, the distributions of wind speeds were plotted. These are shown in Figures 11, 12, and 13. Each location indicates a triangular distribution of speeds. The Amarillo data are skewed toward higher wind speeds, and the Pantex data are skewed toward lower wind speeds. Despite the similarity of the overall average wind speeds, the individual Amarillo measurements are more skewed toward higher wind speed categories in comparison with those of Pantex.

The reason for the difference in the wind speed distribution at the two locations is not readily apparent. The lower measurement height of the Amarillo measurements (7 m compared to 10 m) would, in fact, favor an expectation for a greater fraction of lower wind speed readings. Potential explanations include 1) the difference in data measurement methods (see the Methods section), 2) the location of the Pantex meteorologic tower relative to site facilities, and 3) higher wind speeds at the Amarillo International Airport created by reduced ground roughness over the airport tarmac.

In regard to explanation 2 above, the wind, as measured at Pantex, blew most frequently from the SSW in 1990 and 1991. The Pantex meteorologic monitoring tower is located on the northeast corner of the site. The predominant winds would have passed in the direction of the Pantex Plant complex before being measured by the wind speed sensors. Pantex Plant buildings may have effected the greater frequency of lower wind speed measurements.

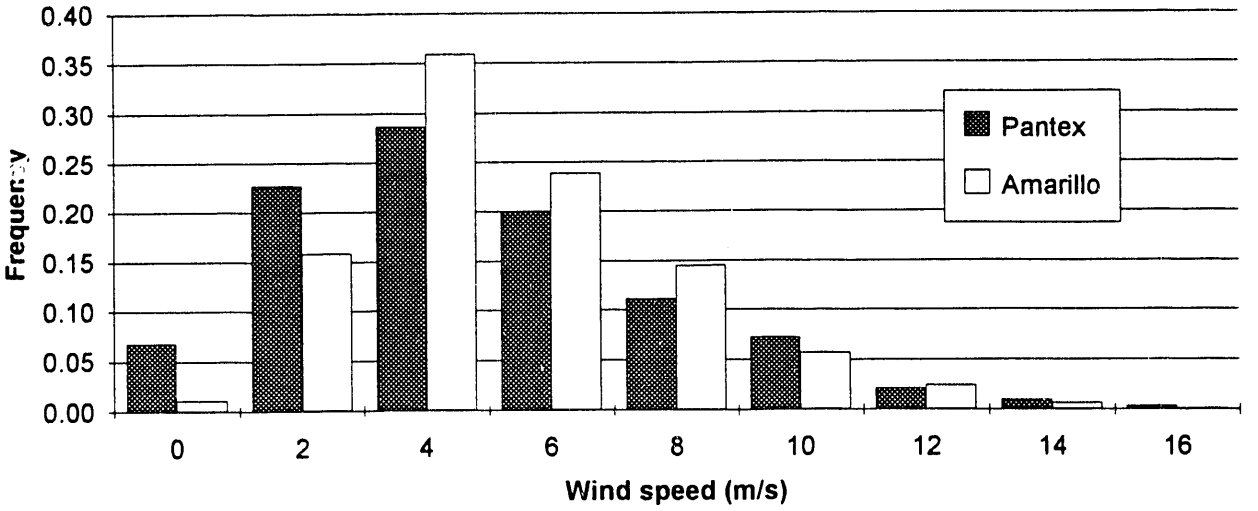

FIGURE 11. 1988 Frequency Distribution (Fraction) of Wind Speed Data at Pantex and Amarillo (900 Random Hours)

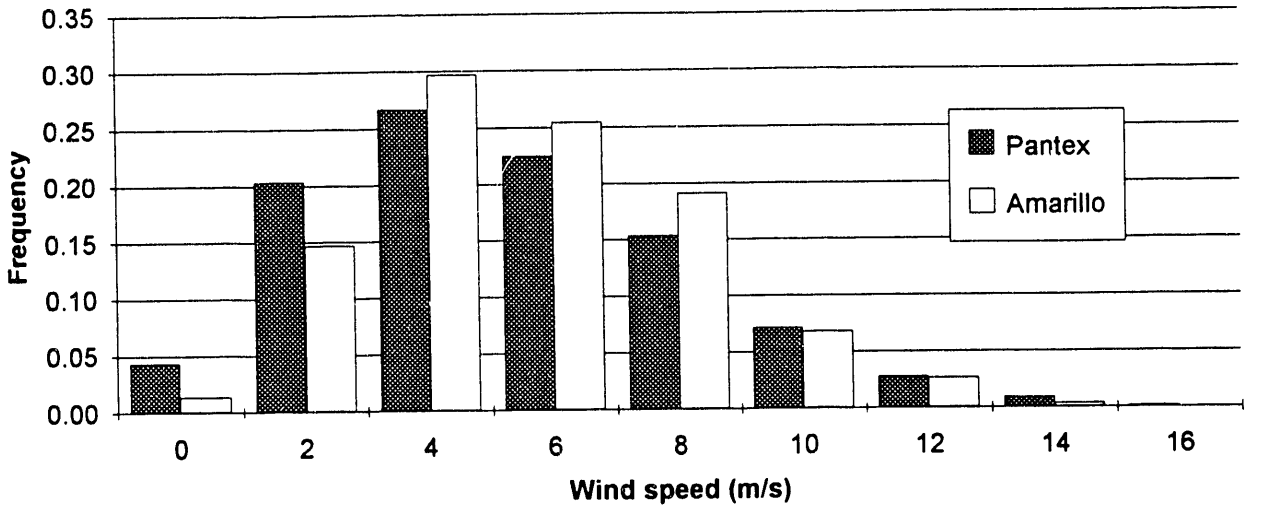

FIGURE 12. 1990 Frequency Distribution (Fraction) of Wind Speed Data at Pantex and Amarillo (900 Random Hours)

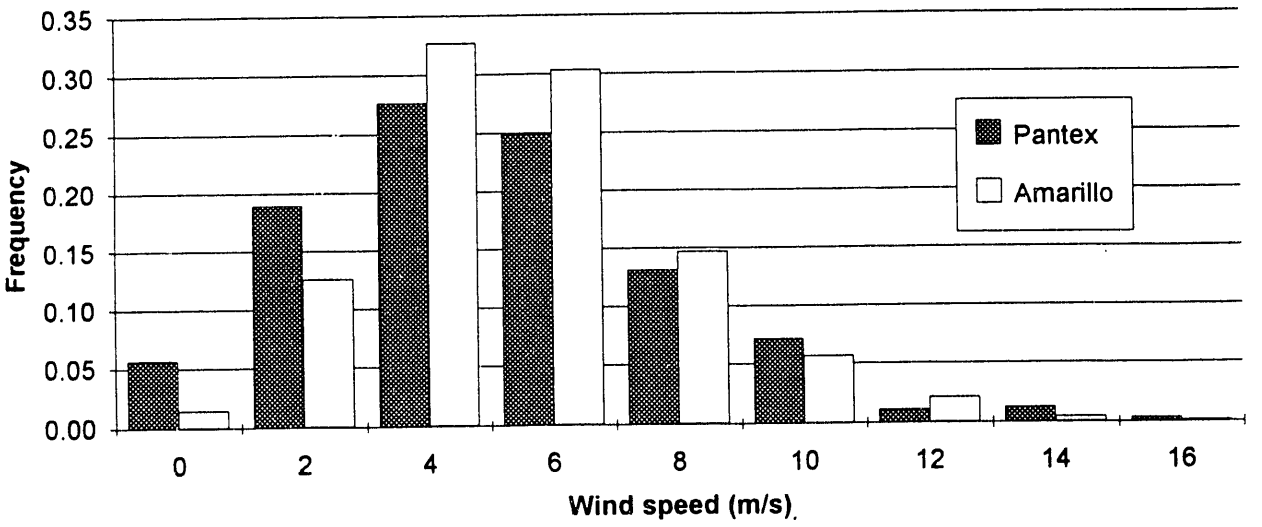

FIGURE 13. 1991 Frequency Distribution (Fraction) of Wind Speed Data at Pantex and Amarillo (900 Random Hours)

The distributions of the paired wind speed differences were also evaluated. The wind speed distributions (Figures 11 through 13) allude to the results expected from evaluation of the wind speed difference distributions. The Amarillo wind speed distributions are skewed towards a greater frequency of higher wind speeds. When the differences (i.e., Pantex wind speed minus Amarillo wind speed) are summarized, the average difference is found to be -0.35 (-0.395 for 1988, -0.337 for 1990, and -0.331 for 1991). The average minimum difference for each of the three years evaluated is -7, and the average maximum difference is 6.

STABILITY CLASS

Both the annual frequency with which a stability class was designated and the difference in the stability class designations of the 1990 and 1991 paired Pantex and Amarillo data were evaluated. Little statistical evaluation of the stability class designations was undertaken due to the multiparametric calculation of this variable. Also, the stability class is partially based on wind speed and wind direction, which were previously discussed in detail.

Figures 14 and 15 show the annual frequency for each stability class in 1990 and 1991, respectively. The lack of lower wind speeds recorded at

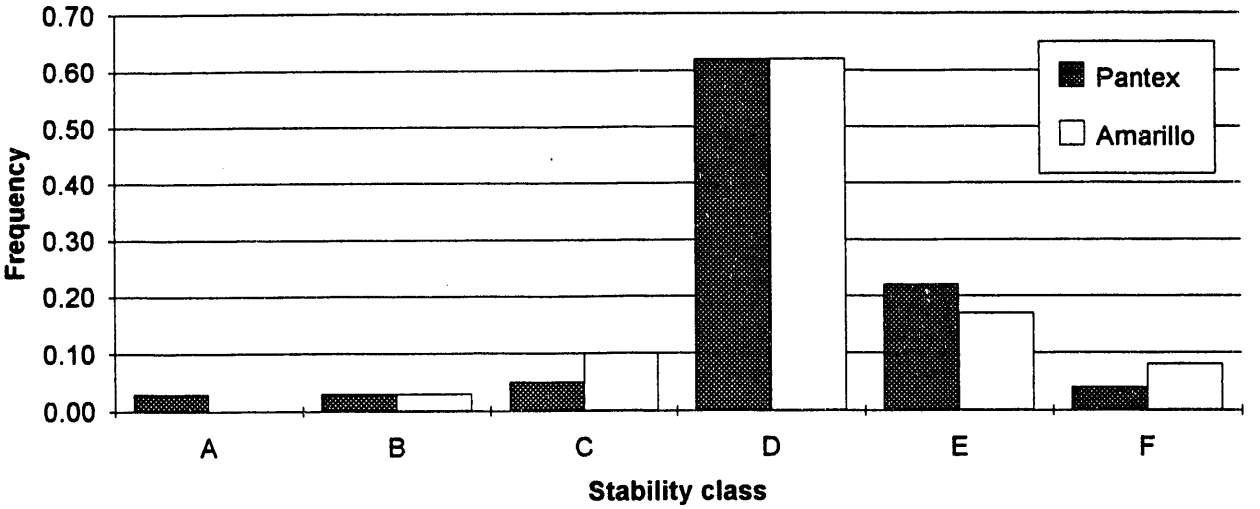

FIGURE 14. 1990 Frequency Distribution of Stability Class Designations at Pantex and Amarillo

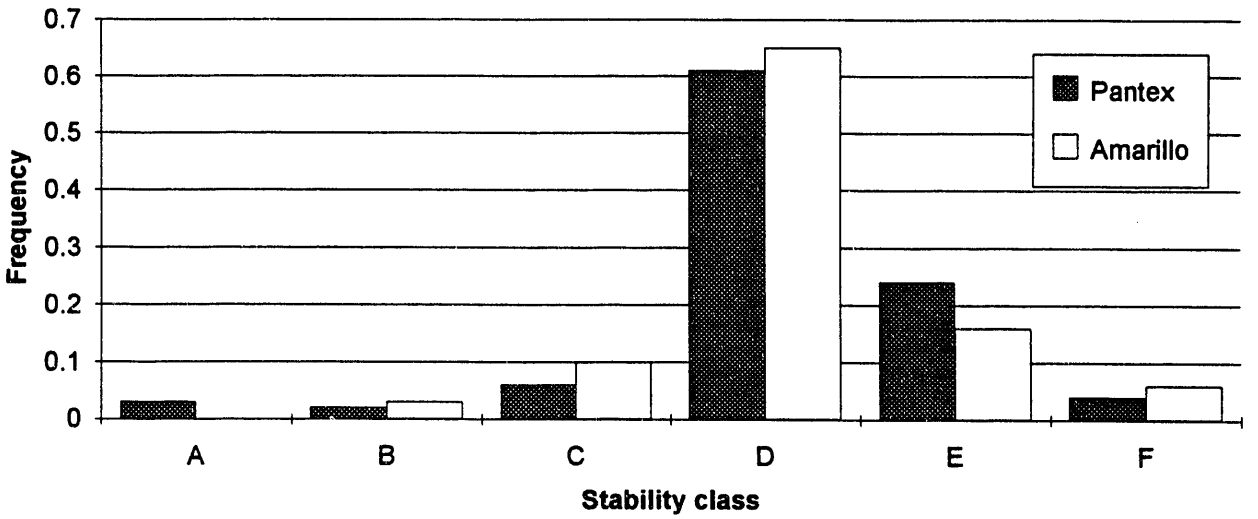

FIGURE 15. 1991 Frequency Distribution of Stability Class Designations at Pantex and Amarillo

Amarillo is reflected in the stability class designations by the greater frequency of A stabilities at Pantex in comparison to Amarillo. The A stability classes, indicating greater vertical dispersion, occur at a greater frequency with lower wind speeds.

Differences in the paired hourly stability class designations were also evaluated (see Table 5). The stability class designations are similar at the two locations. These designations were identical 63% of the time during 1990 and 1991. Approximately 30% of the time, the stability classes were one designation different.

The high frequency of the D stability classes in the Pantex-Amarillo region was unexpected. The D stability class is most frequently found in most locations, but the overwhelming frequency with which it was found in the Pantex and Amarillo databases was surprising. A cursory sample of JFD files from other locations around the nation indicated a 20% to 40% frequency of D stability designations, compared to the approximately 62% frequency found in the Pantex and Amarillo data sets. The stability class designation algorithm

TABLE 5. Stability Class Differences Between the Paired Amarillo and Pantex Hourly Data

Stability Class Difference[a]	1990	1991
None	63%	63%
One	30%	32%
Two	6%	4%
Three	1%	0%
Four	0%	0%
Five	0%	0%

(a) "None" means no difference in the paired stability classes; "1" means the stability class designations are adjacent alphabetic letters; "2" means the stability classes differ by 2; and so on.

used at Pantex (the first data set evaluated) was initially suspect because of problems identified in the 1988 data. However, because both the Amarillo and Pantex data independently indicated the same majority of D stabilities, no other conclusion can be drawn except that this is a real phenomenon.

DOSE ASSESSMENT

JFD files were compiled for each location for the years 1990 and 1991. These files serve to represent meteorologic profile for the year of interest. The GENII code was then used to evaluate hypothetical chronic and acute unit releases of tritium and plutonium-239. A total of eight GENII evaluations were performed for each year, data collection location, and release scenario type (acute or chronic). The pertinent pages of the GENII output files are provided in Appendix C.

The results of the chronic dose assessment, listed in Table 6, indicate the relative dose to the maximally exposed individual (MI). GENII was used to determine the location of the MI, based on the JFD file and the population file of uniformly distributed individuals.

The results of the dose assessment were suggested by the results of the wind speed and wind direction analyses. The differences noted in the wind speeds at the two locations were presumed to be compounded by the differences in the wind directions. The wind direction results indicated the possibility of a one-compass-direction difference in the location of the MI. The use of

TABLE 6. Results of the GENII Chronic Dose Assessments

Meteorologic Data Used	Year	Relative Maximally Exposed Individual Dose	Maximally Exposed Individual Direction
Pantex	1990	1	NNE
Amarillo	1990	0.46	N
Pantex	1991	1	NNE
Amarillo	1991	0.45	N

Amarillo meteorologic data to evaluate a chronic ground-level Pantex release produced an MI location north of the release. The use of Pantex meteorologic data, however, produced an MI location north-northwest of the release.

The results of the wind speed analysis indicated that modeling a chronic Pantex release based on Amarillo meteorologic data yields a more dispersed release. The wind speed distribution of Amarillo would tend to result in greater dispersion of a release, thereby producing lower dose estimates. This was reflected in the GENII dose assessment, in which results from the use of Amarillo meteorologic data were approximately half that obtained by the use of the Pantex meteorologic data.

At times, dose assessments are required to evaluate hypothetical acute releases. Although dose assessments for past acute releases are best evaluated by site-specific, time-specific meteorologic data, future acute releases are evaluated by the use of JFD (or similar) files. GENII was used to evaluate acute unit releases of tritium and plutonium-239. Season-specific relative effective dose commitments (Table 7) were evaluated. The acute release was assumed to occur during the season indicated in the table.

Both the acute and chronic release dose assessments resulted in greater doses when the Pantex meteorologic data were used. The difference in these dose estimates is about two-fold for both types of release considered.

TABLE 7. Relative Maximum Individual Dose from an Acute Airborne Release of Tritium and Plutonium-239, Using the Indicated Meteorologic Database

Year	Release During	Pantex	Amarillo
1990	Winter	1	0.64
	Spring	1	0.64
	Summer	1	0.64
	Autumn	1	0.65
1991	Winter	1	0.49
	Spring	1	0.49
	Summer	1	0.49
	Autumn	1	0.50

Dose assessments performed using the same meteorologic data with different dose assessment codes will result in dose estimate differences because of the varied model algorithms used in each code. The twofold difference in the results of the dose assessments generated from the alternate use of the Pantex or Amarillo meteorologic data is within the range of variability that would be expected from the use of different dose assessment codes. Therefore, the results of this evaluation indicate that the Amarillo data do not unacceptably misrepresent the MI doses resulting from airborne releases at Pantex. Use of the Pantex data produces more conservative dose estimates.

However, as a result of the overwhelming majority of D (neutral) stability classes, doses in this part of the country may be more accurately assessed by environmental transport and dose assessment codes. The atmosphere may be more predictable in this region, as indicated by the great quantity of D stabilities. This great neutrality may decrease the uncertainty in the atmospheric dispersion calculations, narrowing the expected uncertainty of the final dose estimate generated by a dose assessment. This presently unverified theory would render the Pantex dose estimates more accurate, thereby encouraging their use rather than the interchangeable use of either data set.

CONCLUSIONS AND RECOMMENDATIONS

The U.S. Department of Energy regulatory guide (DOE/EH-0173T) states that offsite meteorologic data measurements are acceptable for use if they are representative of DOE site conditions and are sufficiently accurate. A comparison of several meteorologic variables recorded at the Pantex Plant and Amarillo, Texas, was the focus of this evaluation. This evaluation identified the differences and similarities between the wind speed and wind direction measurements, and between the stability class designations, recorded at these two locations. Such meteorologic data are used in the evaluation of the dispersion of airborne releases for dose assessments.

The results of this data evaluation, and subsequent dose assessment, provide an indication of the consequences of substituting the Amarillo meteorologic data for Pantex data in the assessment of airborne releases of radionuclides from the Pantex Plant. The identified differences between the wind data were tested by the GENII environmental accumulation and dose assessment code. The dose assessments performed with GENII were for hypothetical chronic and acute unit releases of tritium and plutonium-239. The consequence of using alternate meteorologic data sets for the evaluation of actual acute releases is less certain because the consequences of these releases depend on atmospheric conditions at the time of the release. Actual site-specific data would be preferred for retrospective acute release assessments.

The wind data evaluation indicated that substituting Amarillo meteorologic data for Pantex data in a dose assessment may result in a one-compass-direction difference in the location of the maximally exposed individual. Also, wind speed differences between the two locations indicated that a potentially lower dose estimate may result from the use of Amarillo data. Both of these inferences were confirmed by the GENII dose assessments. Differences in wind speed and direction likely compounded to produce the differences in dose assessments.

The GENII assessments provided evidence that the use of Amarillo meteorologic information in the evaluation of chronic and acute Pantex

Plant airborne releases will result in lower cumulative dose estimates, which are, nevertheless, within the expected range of uncertainty. Dose assessment codes model the behavior of a release and an individual's exposure to that release. Dose assessment codes estimating an individual exposure to within an order of magnitude of the "correct" answer are acceptable by current standards. Therefore, the two-fold difference between the Amarillo and Pantex dose estimates is within an acceptable range. Use of the Amarillo data will provide acceptable dose estimates; however, the use of the Pantex data will generate more conservative values.

In some important respects, the Environmental Protection Department's use of the Pantex meteorologic data is preferable to the use of the Amarillo data, despite the findings that 1) the meteorologic conditions at Amarillo are similar to those at the Pantex Plant and 2) the dose estimates resulting from use of either data set are within an order of magnitude of each other. The small differences in wind speed and wind direction generate dose assessment results that are within the expected reliability of typical, current environmental transport and dose assessment model results. However, it is possible that the great preponderance of neutral atmospheric stability classes may increase the predictability of the dispersion of Pantex Plant releases. If this is the case, the higher dose estimates and MI location differences between the Pantex and Amarillo dose assessments would be more significant, and Pantex data would be most applicable.

Other considerations that support the use of the Pantex data are the resolution of the data, the logistics of data access, and the format of the available data. The continuous, automatic, electronic data collection at Pantex yields more confidence in the Pantex measurements. Pantex data are recorded every 15 min and at two elevations (10 m and 60 m above groundlevel), which provides greater resolution of meteorologic activity. The manual reading and recording of the Amarillo data potentially introduce human error and bias into the measurements. The 10-m measurement height of the Pantex records is more standard than the 7-m measurement height of the Amarillo data.

The logistics of using one data set over another is also an important consideration. The Amarillo, Texas, data are collected by the NWS. These

data can be accessed from two locations. More recent NWS readings can be obtained from the Southern Regional Climate Center (SRCC),[a] which operates under contract to the NWS. One drawback to accessing data from the SRCC is that some additional data manipulation may have to be performed to get all the parameters needed. Specifically, the stability class designations would have to be calculated. The second option is to access the Amarillo data from the National Climatic Data Center (NCDC) (NOAA 1991). These data are unavailable for one month after the end of the data collection period because of data processing procedures. In addition, once a data request is made to the NCDC, the minimum processing time, even for a rush order, is one week (and this assumes no ordering or backlogging problems, which were experienced during this study). Data from the NCDC do not require additional data manipulation.

Assuming the financial arrangements for acquiring NWS data do not create a time delay, the Pantex data and the SRCC Amarillo data are potentially available with the same time lag. The SRCC data could be obtained electronically via systems such as Internet. The Pantex data set, however, contains preprocessed data, whereas the Amarillo data are limited to raw meteorologic measurements.

If it is decided that the Pantex Environmental Protection Department will use the Pantex data, quality assurance measures must be initiated. Many months of 1989 data were not usable for this study because of data-recording problems. Developing and implementing a quality assurance plan would be the most appropriate approach. The plan should assure that instruments measure and record appropriate data, on a weekly basis at a minimum.

(a) J. Grymes, Southern Regional Climate Center, Department of Geography and Anthropology, Room 254 Howe-Russell, Louisiana State University, Baton Rouge, Louisiana, 70803, 504-388-6184, FAX 388-2912.

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APPENDIX A

QuickBASIC RANDOM DATA SELECTION

Appendix A. QuickBASIC random data selection

```
'RANSEL.BAS - THIS FILE WILL RANDOMLY SELECT 900 DATA LINES FROM
'THE ANNUAL WIND DATA FILE CONTAINING BOTH THE AMARILLO AND PANTEX DATA

DEFINT A-Z

TYPE MELDATATYPE
  DAT AS STRING * 35
  CRLF AS STRING * 2
END TYPE

DIM FILEDATA AS MELDATATYPE

OPEN "D:\PANAMREV\WINDXX.MLD" FOR RANDOM AS #1 LEN = LEN(FILEDATA)
OPEN "D:\PANAMREV\WRANDMXX.DAT" FOR OUTPUT AS #2 LEN = 36

RANDOMIZE TIMER
CLS

NHRS% = 1000              'NUMBER OF HOURS IN ANNUAL DATABASE

FOR I = 1 TO 900
  X% = INT((NHRS% - 1) + 1) * RND + 1
  GET #1, X%, FILEDATA
  L$ = FILEDATA.DAT
  PRINT X%; "  ="; L$; "="
WRITE #2, L$
NEXT

CLOSE
END
```

APPENDIX B

JOINT FREQUENCY DISTRIBUTION FILES

Appendix B. Joint Frequency Distribution Files

1990 Amarillo JFD File.....B.2

1991 Amarillo JFD File.....B.3

1990 Pantex JFD File.....B.4

1991 Pantex JFD File.....B.5

Amarillo,TX JFD data created from the NWS STAR file -- 1990
2 July 1992 -- SFS

6	6	1	1	7	
2.9	5.2	8.6	13.3	18.4	23.9

0.04	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.00	0.01
0.04	0.02	0.01	0.01	0.02	0.02	0.04	0.05	0.03	0.04	0.02	0.04	0.03	0.00	0.01	0.03
0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.01	0.01	0.00
0.02	0.03	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.02	0.00	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.07	0.03	0.06	0.07	0.09	0.02	0.06	0.04	0.13	0.13	0.17	0.12	0.12	0.10	0.09	0.06
0.06	0.01	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.03	0.02	0.02	0.00	0.02
0.11	0.03	0.05	0.08	0.16	0.06	0.11	0.06	0.15	0.08	0.15	0.07	0.09	0.01	0.10	0.00
0.09	0.06	0.03	0.08	0.07	0.03	0.06	0.02	0.15	0.15	0.13	0.10	0.17	0.23	0.15	0.08
0.25	0.14	0.14	0.18	0.16	0.10	0.22	0.09	0.10	0.11	0.09	0.08	0.08	0.14	0.19	0.22
0.16	0.09	0.11	0.07	0.21	0.08	0.10	0.07	0.26	0.24	0.13	0.10	0.10	0.16	0.11	0.19
0.35	0.15	0.15	0.16	0.19	0.16	0.22	0.22	0.79	0.70	0.86	0.54	0.48	0.53	0.37	0.29
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.10	0.08	0.03	0.10	0.13	0.06	0.01	0.02	0.14	0.05	0.14	0.05	0.08	0.07	0.05	0.02
0.37	0.32	0.23	0.22	0.25	0.08	0.14	0.17	0.54	0.56	0.57	0.37	0.22	0.27	0.38	0.25
0.96	0.73	0.70	0.45	0.74	0.38	0.69	0.86	1.63	0.97	0.78	0.43	0.38	0.33	0.57	0.45
0.49	0.23	0.26	0.30	0.61	0.27	0.55	0.89	2.79	2.02	2.11	1.05	0.54	0.62	0.86	0.39
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.23	0.15	0.09	0.08	0.08	0.02	0.05	0.08	0.62	0.45	0.38	0.22	0.23	0.05	0.11	0.10
2.43	2.26	1.60	1.06	0.78	0.64	0.98	1.78	7.45	4.83	3.89	1.96	1.16	0.82	0.83	0.83
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.05	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.23	0.29	0.17	0.01	0.05	0.02	0.01	0.01
1.62	0.67	0.46	0.14	0.09	0.15	0.30	0.51	3.09	1.33	1.69	0.84	0.37	0.09	0.11	0.38
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.07	0.00	0.01	0.01	0.00	0.00	0.00
0.39	0.25	0.06	0.03	0.05	0.07	0.13	0.14	0.61	0.48	0.41	0.27	0.25	0.02	0.05	0.07
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Amarillo,TX JFD data created from the NWS STAR file - 1991
5 July 1992 - SFS

6	6	1	1	7											
2.9	5.2	8.6	13.1	18.4	25.0										
0.01	0.00	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01
0.01	0.01	0.00	0.01	0.01	0.02	0.01	0.02	0.04	0.02	0.02	0.03	0.02	0.02	0.01	0.02
0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.01	0.02	0.00
0.01	0.01	0.01	0.05	0.01	0.01	0.02	0.03	0.02	0.01	0.02	0.02	0.03	0.00	0.01	0.02
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.11	0.02	0.06	0.08	0.03	0.03	0.05	0.05	0.08	0.12	0.10	0.05	0.10	0.09	0.09	0.07
0.02	0.00	0.01	0.00	0.02	0.02	0.01	0.01	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.01
0.13	0.07	0.03	0.09	0.07	0.08	0.02	0.07	0.17	0.06	0.07	0.07	0.15	0.09	0.05	0.09
0.13	0.06	0.05	0.06	0.08	0.06	0.05	0.06	0.06	0.06	0.09	0.07	0.10	0.16	0.18	0.10
0.35	0.22	0.17	0.14	0.27	0.19	0.23	0.18	0.23	0.15	0.19	0.10	0.13	0.08	0.25	0.17
0.29	0.16	0.13	0.08	0.08	0.13	0.13	0.07	0.31	0.30	0.11	0.13	0.15	0.21	0.15	0.22
0.51	0.14	0.25	0.17	0.18	0.15	0.21	0.15	0.31	0.39	0.40	0.25	0.43	0.51	0.40	0.37
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.06	0.03	0.06	0.03	0.02	0.06	0.06	0.09	0.24	0.11	0.08	0.10	0.06	0.08	0.05	0.03
0.42	0.27	0.21	0.16	0.33	0.19	0.19	0.21	0.49	0.45	0.53	0.30	0.37	0.38	0.32	0.38
1.52	0.67	0.70	0.48	0.62	0.56	0.87	1.29	2.28	1.34	1.12	0.59	0.41	0.31	0.65	0.48
0.71	0.32	0.38	0.35	0.50	0.37	0.78	0.83	2.56	1.96	1.87	0.78	0.43	0.48	0.83	0.51
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15	0.07	0.09	0.06	0.02	0.03	0.07	0.19	0.41	0.42	0.43	0.19	0.14	0.02	0.05	0.06
2.77	1.70	1.05	0.87	0.82	0.78	2.03	3.12	6.13	4.41	3.77	1.93	0.95	0.50	1.02	1.37
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.05	0.38	0.27	0.23	0.01	0.05	0.02	0.02	0.01
0.84	0.71	0.17	0.09	0.10	0.18	0.66	0.88	2.11	1.47	1.30	0.71	0.59	0.11	0.16	0.27
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.06	0.05	0.00	0.03	0.00	0.01	0.00
0.43	0.10	0.00	0.01	0.03	0.06	0.15	0.16	0.53	0.35	0.26	0.46	0.63	0.30	0.08	0.09
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PANTEX JFD for 1990 using NWS speed categories. GENII format. 7/92, SFS
Annual recovery :90% (7898 hours)

6	6	1	1	10.0

0.9	2.5	4.3	6.9	9.8	16.5	

0.08	0.05	0.10	0.09	0.06	0.06	0.08	0.05	0.03	0.10	0.06	0.13	0.03	0.10	0.06	0.05
0.00	0.03	0.03	0.01	0.00	0.00	0.00	0.03	0.01	0.00	0.03	0.04	0.00	0.03	0.00	0.01
0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.03	0.03	0.01	0.06	0.03
0.11	0.14	0.15	0.13	0.14	0.03	0.04	0.05	0.09	0.09	0.15	0.11	0.14	0.23	0.20	0.23
0.14	0.10	0.18	0.10	0.04	0.06	0.01	0.05	0.04	0.16	0.24	0.16	0.11	0.14	0.18	0.23
0.13	0.19	0.29	0.38	0.13	0.06	0.06	0.06	0.05	0.14	0.11	0.11	0.11	0.09	0.13	0.15
0.06	0.15	0.14	0.20	0.14	0.11	0.05	0.18	0.08	0.10	0.10	0.09	0.13	0.05	0.11	0.04
0.04	0.16	0.18	0.09	0.04	0.00	0.04	0.05	0.08	0.13	0.13	0.08	0.09	0.04	0.06	0.08
0.03	0.13	0.13	0.05	0.04	0.03	0.03	0.04	0.05	0.08	0.10	0.04	0.04	0.04	0.04	0.01
0.19	0.33	0.25	0.11	0.06	0.11	0.15	0.20	0.28	0.38	0.44	0.29	0.19	0.35	0.49	0.28
0.23	0.27	0.33	0.42	0.14	0.13	0.15	0.23	0.67	0.97	0.70	0.61	0.37	0.28	0.44	0.32
0.09	0.13	0.27	0.27	0.11	0.08	0.11	0.10	0.14	0.27	0.20	0.11	0.06	0.10	0.06	0.09
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.13	0.05	0.16	0.15	0.16	0.10	0.09	0.09	0.09	0.19	0.14	0.06	0.06	0.04	0.01	0.06
0.09	0.29	0.25	0.15	0.13	0.04	0.04	0.09	0.42	0.41	0.37	0.20	0.15	0.11	0.15	0.10
0.89	0.94	0.97	0.57	0.32	0.39	0.47	1.29	1.28	2.13	1.18	0.90	0.48	0.48	0.42	0.41
0.14	0.46	0.56	0.22	0.30	0.29	0.51	0.82	2.53	3.23	1.68	0.72	0.41	0.80	0.38	0.22
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.00	0.03	0.04	0.03	0.01	0.01	0.03	0.05	0.04	0.00	0.00	0.00	0.00	0.01	0.00
0.06	0.05	0.08	0.03	0.04	0.01	0.06	0.06	0.11	0.15	0.13	0.06	0.04	0.05	0.01	0.04
1.38	2.67	1.89	0.39	0.11	0.28	0.68	1.91	5.06	6.48	4.44	1.41	0.90	1.04	0.53	0.57
0.01	0.03	0.01	0.01	0.01	0.00	0.00	0.01	0.06	0.10	0.13	0.04	0.01	0.09	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.85	1.20	0.68	0.01	0.03	0.05	0.23	0.92	1.24	1.95	2.01	0.58	0.16	0.09	0.09	0.23
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.32	0.20	0.10	0.00	0.05	0.08	0.08	0.16	0.19	0.47	0.76	0.32	0.13	0.00	0.04	0.15
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PANTEX JFD for 1991 using NWS speed categories. GENII format. 7/92, SFS
Annual recovery :97% (8480 hours)

6	6	1	1	10.0											
0.9		2.5	4.3		6.9	9.8	16.5								
0.05	0.08	0.08	0.07	0.09	0.11	0.07	0.11	0.12	0.06	0.06	0.14	0.07	0.08	0.08	0.05
0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.00
0.01	0.00	0.02	0.00	0.01	0.02	0.00	0.01	0.05	0.01	0.00	0.00	0.00	0.02	0.04	0.01
0.13	0.11	0.13	0.17	0.09	0.02	0.07	0.09	0.15	0.09	0.07	0.09	0.09	0.15	0.14	0.20
0.19	0.20	0.15	0.13	0.07	0.12	0.12	0.14	0.28	0.19	0.21	0.14	0.12	0.18	0.18	0.19
0.21	0.17	0.05	0.15	0.05	0.08	0.15	0.07	0.12	0.20	0.19	0.13	0.15	0.12	0.20	0.21
0.05	0.07	0.09	0.11	0.11	0.11	0.05	0.13	0.08	0.12	0.12	0.08	0.18	0.17	0.08	0.09
0.09	0.04	0.08	0.08	0.07	0.04	0.02	0.06	0.06	0.06	0.14	0.05	0.08	0.11	0.09	0.09
0.05	0.04	0.05	0.09	0.06	0.04	0.05	0.04	0.06	0.05	0.13	0.07	0.06	0.06	0.04	0.04
0.32	0.22	0.22	0.22	0.15	0.18	0.07	0.29	0.25	0.31	0.24	0.33	0.12	0.21	0.32	0.27
0.31	0.35	0.26	0.54	0.22	0.31	0.42	0.29	0.50	0.84	0.54	0.29	0.37	0.24	0.46	0.52
0.07	0.04	0.14	0.14	0.08	0.12	0.08	0.13	0.24	0.19	0.17	0.12	0.07	0.07	0.06	0.12
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.06	0.00	0.02	0.06	0.04	0.05	0.07	0.08	0.09	0.12	0.07	0.04	0.06	0.06	0.09	0.01
0.21	0.27	0.24	0.18	0.12	0.14	0.25	0.32	0.41	0.53	0.31	0.21	0.13	0.20	0.11	0.18
1.08	0.75	0.63	0.26	0.32	0.37	0.65	1.06	1.56	1.34	1.31	0.60	0.42	0.41	0.38	0.52
0.52	0.74	0.65	0.32	0.24	0.52	0.92	1.31	2.65	2.56	1.67	0.35	0.45	0.41	0.40	0.52
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.05	0.08	0.01	0.04	0.05	0.02	0.02	0.09	0.17	0.27	0.14	0.04	0.02	0.04	0.01	0.04
1.83	2.23	1.13	0.45	0.21	0.51	2.28	4.22	3.93	4.94	3.15	1.20	0.64	0.70	0.59	1.01
0.02	0.00	0.02	0.02	0.01	0.00	0.04	0.08	0.04	0.12	0.07	0.04	0.00	0.02	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.59	1.10	0.20	0.02	0.06	0.13	0.79	1.46	1.37	2.09	1.52	0.57	0.22	0.11	0.15	0.42
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.24	0.25	0.01	0.01	0.01	0.01	0.12	0.45	0.18	0.55	0.39	0.51	0.54	0.38	0.12	0.19
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX C

GENII OUTPUT FILES

Appendix C. GENII Output Files

1990 Amarillo JFD File Chronic Release Scenario.....C.2

1991 Amarillo JFD File Chronic Release Scenario.....C.5

1990 Pantex JFD File Chronic Release Scenario.....C.8

1991 Pantex JFD File Chronic Release Scenario.....C.11

1990 Amarillo JFD File Acute Release Scenario.....C.14

1991 Amarillo JFD File Acute Release Scenario.....C.20

1990 Pantex JFD File Acute Release Scenario.....C.26

1991 Pantex JFD File Acute Release Scenario.....C.32

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

Case title:   H3 and Pu Chronic Release using the 1990 Amarillo JFD file

Executed on:  07/03/92 at 09:29:38                                Page A.  1
-----------------------------------------------------------------------------

          This is a far-field (wide-scale release, multiple site) scenario.
          Release is chronic
          Dose to exposed population of  1.600E+02

          THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
               Air

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

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


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

 Input file name: \GENII\aml90.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Master Library   (11/28/90 RAP)
 Food Transfer Factor Library - (RAP  29-Aug-88) (UPDATED LEACHING FA
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Internal Dose Increments, PNL Solubility Choices Rerun 12/3/90 PDR
 10 x 1 POPULATION FILE
 Amarillo,TX JFD data created from the NWS STAR file -- 1990

==========================================================================

          -------- ----Release Terms------
          Release          Surface Buried
          Radio-   Air     Water   Source
          nuclide   Ci/yr   Ci/yr   Ci/m3
          -------- ------- ------- -------
          H 3      1.0E+00 0.0E+00 0.0E+00
          PU239    1.0E+00 0.0E+00 0.0E+00

========== AIR TRANSPORT ===================================================
          Joint frequency data input.
          Ground level release.

========== EXTERNAL EXPOSURE ===============================================
 8.8E+03   Hours of exposure to plume
 4.4E+03   Hours of exposure to ground contamination
 0.0E+00   Hours of exposure from swimming
 0.0E+00   Hours of exposure from boating
 0.0E+00   Hours of exposure from shoreline activities
       1   Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin

========== INHALATION ======================================================
```

8.8E+03 Hours of inhalation exposure per year
1 Resuspension model: 1-Mass Loading, 2-Anspaugh
1.0E-04 Mass loading factor (g/m3)

========== INGESTION POPULATION ==========
1 Atmospheric production definition: 1 - Use population-weighted chi/Q
Food production in region assumed to equal consumption.

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

FOOD TYPE	GROW TIME d	--IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m2	PROD-UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5		1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0		5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0		5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8		180.0	8.0E+01

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

FOOD TYPE	---HUMAN---- CONSUMPTION RATE kg/yr	HOLDUP d	TOTAL PROD-UCTION kg/yr	DRINK WATER CONTAM FRACT.	----------STORED FEED---------- DIET FRAC-TION	GROW TIME d	-IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m3	STOR-AGE d
Meat	8.0E+01	15.0		0.00	0.3	90.00	0	0.0	0.0	0.80	180.0
Poultry	1.8E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0
Cow Milk	2.7E+02	1.0		0.00	0.3	45.00	0	0.0	0.0	2.00	100.0
Eggs	3.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0
					----------FRESH FORAGE----------						
Meat					0.75	45.0	0	0.0	0.0	2.00	100.0
Cow Milk					0.75	30.0	0	0.0	0.0	1.50	0.0

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

Case title: H3 and Pu Chronic Release using the 1990 Amarillo JFD file

Executed on: 07/03/92 at 09:29:50 Page B. 1

1.6E-05 Population-weighted chi/Q

Release period:	1.0
Uptake/exposure period:	1.0
Dose commitment period:	50.0
Dose units:	Person rem

	Dose Commitment Year 1	2	3	...			
Internal Intake Year: 3			0.0E+00	...			
			+				
2		0.0E+00	0.0E+00	...			Internal Effective Dose Equivalent
		+	+				
1	1.2E-01 +	8.8E-02 +	6.7E-02 +	...	=	1.3E+00	
	||	||	||				
Internal Annual Dose	1.2E-01 +	8.8E-02 +	6.7E-02 +	...	=	1.3E+00	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	8.4E-09	0.0E+00	0.0E+00	...		8.4E-09	
	||	||	||			||	
Annual Dose	1.2E-01 +	8.8E-02 +	6.7E-02 +	...	=	1.3E+00	Cumulative Dose
						1.2E-01	Maximum Annual Dose Occurred In Year 1

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

Case title:   H3 and Pu Chronic Release Using the 1991 Amarillo JFD file

Executed on:  07/05/92 at 19:07:10                                Page A.  1
-----------------------------------------------------------------------------

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

          THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
               Air

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

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

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

 Input file name: \GENII\aml91.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Master Library   (11/28/90 RAP)
 Food Transfer Factor Library - (RAP  29-Aug-88) (UPDATED LEACHING FA
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Internal Dose Increments, PNL Solubility Choices Rerun 12/3/90 PDR
 10 x 1 POPULATION FILE
 Amarillo,TX JFD data created from the NWS STAR file - 1991

=================== ==========================================================

          -------- ----Release Terms------
          Release          Surface Buried
          Radio-   Air     Water   Source
          nuclide   Ci/yr   Ci/yr   Ci/m3
          -------- ------- ------- -------
          H 3      1.0E+00 0.0E+00 0.0E+00
          PU239    1.0E+00 0.0E+00 0.0E+00

========== AIR TRANSPORT ==========================================================
          Joint frequency data input.
          MI distance, direction, and chi/Q will be selected by the program.
          Ground level release.

========== EXTERNAL EXPOSURE ======================================================
 8.8E+03   Hours of exposure to plume
 4.4E+03   Hours of exposure to ground contamination
 0.0E+00   Hours of exposure from swimming
 0.0E+00   Hours of exposure from boating
 0.0E+00   Hours of exposure from shoreline activities
       1   Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin

========== INHALATION =============================================================
```

8.8E+03 Hours of inhalation exposure per year
1 Resuspension model: 1-Mass Loading, 2-Anspaugh
1.0E-04 Mass loading factor (g/m3)

========== INGESTION POPULATION ==========
1 Atmospheric production definition: 1 - Use population-weighted chi/Q

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

FOOD TYPE	GROW TIME d	--IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m2	PROD-UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5		1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0		5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0		5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8		180.0	8.0E+01

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

FOOD TYPE	---HUMAN---- CONSUMPTION RATE kg/yr	HOLDUP d	TOTAL PROD-UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC-TION	STORED FEED GROW TIME d	-IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m3	STOR-AGE d
Meat	8.0E+01	15.0		0.00	0.3	90.00	0	0.0	0.0	0.80	180.0
Poultry	1.8E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0
Cow Milk	2.7E+02	1.0		0.00	0.3	45.00	0	0.0	0.0	2.00	100.0
Eggs	3.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0
					FRESH FORAGE						
Meat					0.75	45.0	0	0.0	0.0	2.00	100.0
Cow Milk					0.75	30.0	0	0.0	0.0	1.50	0.0

==========

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

Case title: H3 and Pu Chronic Release Using the 1991 Amarillo JFD file

Executed on: 07/05/92 at 19:07:22 Page B. 1

1.6E-06 Individual chi/Q

8.0E+02 Maximum individual distance (m)
9 Maximum individual sector index (1=S)

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

Case title: H3 and Pu Chronic Release Using the 1991 Amarillo JFD file

Executed on: 07/05/92 at 19:07:34 Page C. 2

Release period:	1.0
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	...			Internal Effective Dose Equivalent
		+	+				
1	1.3E-02 +	9.2E-03 +	7.0E-03 +	...	=	1.3E-01	
	||	||	||				
Internal Annual Dose	1.3E-02 +	9.2E-03 +	7.0E-03 +	...	=	1.3E-01	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	8.6E-10	0.0E+00	0.0E+00	...		8.6E-10	
	||	||	||			||	
Annual Dose	1.3E-02 +	9.2E-03 +	7.0E-03 +	...	=	1.3E-01	Cumulative Dose
						1.3E-02	Maximum Annual Dose Occurred In Year 1

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

Case title:   H3 and Pu Chronic Release Using the 1990 Pantex JFD file_NWS
               Wind Spds
Executed on:  07/05/92 at 18:23:10                                Page A.  1
-----------------------------------------------------------------------------

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

          THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
               Air

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

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

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

 Input file name: \GENII\ptx90jfd.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Master Library   (11/28/90 RAP)
 Food Transfer Factor Library - (RAP  29-Aug-88) (UPDATED LEACHING FA
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Internal Dose Increments, PNL Solubility Choices Rerun 12/3/90 PDR
 10 x 1 POPULATION FILE
 PANTEX JFD for 1990 using NWS speed categories. GENII format. 7/92, SFS

=============================================================================

          -------- ----Release Terms------
          Release          Surface Buried
          Radio-   Air     Water   Source
          nuclide   Ci/yr   Ci/yr   Ci/m3
          -------- ------- ------- -------
          H 3      1.0E+00 0.0E+00 0.0E+00
          PU239    1.0E+00 0.0E+00 0.0E+00

========== AIR TRANSPORT ======================================================
          Joint frequency data input.
          MI distance, direction, and chi/Q will be selected by the program.
          Ground level release.

========== EXTERNAL EXPOSURE ==================================================
 8.8E+03   Hours of exposure to plume
 4.4E+03   Hours of exposure to ground contamination
 0.0E+00   Hours of exposure from swimming
 0.0E+00   Hours of exposure from boating
 0.0E+00   Hours of exposure from shoreline activities
       1   Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin

========== INHALATION =========================================================
```

8.8E+03 Hours of inhalation exposure per year
1 Resuspension model: 1-Mass Loading, 2-Anspaugh
1.0E-04 Mass loading factor (g/m3)

========== INGESTION POPULATION ==========
1 Atmospheric production definition: 1 - Use population-weighted chi/Q

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

FOOD TYPE	GROW TIME d	--IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m2	PROD-UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5		1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0		5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0		5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8		180.0	8.0E+01

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

FOOD TYPE	---HUMAN---- CONSUMPTION RATE kg/yr	HOLDUP d	TOTAL PROD-UCTION kg/yr	DRINK WATER CONTAM FRACT.	----------STORED FEED---------- DIET FRAC-TION	GROW TIME d	-IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m3	STOR-AGE d
Meat	8.0E+01	15.0		0.00	0.3	90.00	0	0.0	0.0	0.80	180.0
Poultry	1.8E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0
Cow Milk	2.7E+02	1.0		0.00	0.3	45.00	0	0.0	0.0	2.00	100.0
Eggs	3.0E+01	1.0		0.00	1.0	90.00	0	0.0	0.0	0.80	180.0
					----------FRESH FORAGE----------						
Meat					0.75	45.0	0	0.0	0.0	2.00	100.0
Cow Milk					0.75	30.0	0	0.0	0.0	1.50	0.0

==========

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

Case title: H3 and Pu Chronic Release Using the 1990 Pantex JFD file_NWS Wind Spds
Executed on: 07/05/92 at 18:23:23 Page B. 1

4.3E-06 Individual chi/Q

8.0E+02 Maximum individual distance (m)
10 Maximum individual sector index (1=S)

Release period:	1.0
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	...			Internal Effective Dose Equivalent
		+	+				
1	3.5E-02 +	2.5E-02 +	1.9E-02 +	...	=	3.6E-01	
	||	||	||				
Internal Annual Dose	3.5E-02 +	2.5E-02 +	1.9E-02 +	...	=	3.6E-01	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	2.3E-09	0.0E+00	0.0E+00	...		2.3E-09	
	||	||	||			||	
Annual Dose	3.5E-02 +	2.5E-02 +	1.9E-02 +	...	=	3.6E-01	Cumulative Dose
						3.5E-02	Maximum Annual Dose Occurred In Year 1

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

 Case title:   H3 and Pu Chronic Release Using the 1991 Pantex JFD file_NWS
               Wind Spds
 Executed on:  07/05/92 at 18:23:40                                Page A.  1
-----------------------------------------------------------------------------

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

          THE FOLLOWING TRANSPORT MODES ARE CONSIDERED
               Air

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

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

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

 Input file name: \GENII\ptx91jfd.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Master Library   (11/28/90 RAP)
 Food Transfer Factor Library - (RAP  29-Aug-88) (UPDATED LEACHING FA
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Internal Dose Increments, PNL Solubility Choices Rerun 12/3/90 PDR
 10 x 1 POPULATION FILE
 PANTEX JFD for 1991 using NWS speed categories. GENII format. 7/92, SFS

=============================================================================

          -------- ----Release Terms------
          Release          Surface Buried
          Radio-   Air     Water   Source
          nuclide   Ci/yr   Ci/yr   Ci/m3
          -------- ------- ------- -------
          H 3      1.0E+00 0.0E+00 0.0E+00
          PU239    1.0E+00 0.0E+00 0.0E+00

========== AIR TRANSPORT ======================================================
          Joint frequency data input.
          MI distance, direction, and chi/Q will be selected by the program.
          Ground level release.

========== EXTERNAL EXPOSURE ==================================================
 8.8E+03   Hours of exposure to plume
 4.4E+03   Hours of exposure to ground contamination
 0.0E+00   Hours of exposure from swimming
 0.0E+00   Hours of exposure from boating
 0.0E+00   Hours of exposure from shoreline activities
       1   Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin

========== INHALATION =========================================================
```

```
 8.8E+03   Hours of inhalation exposure per year
       1   Resuspension model:  1-Mass Loading, 2-Anspaugh
 1.0E-04   Mass loading factor (g/m3)

========== INGESTION POPULATION ==============================================
       1   Atmospheric production definition: 1 - Use population-weighted chi/Q

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

                  GROW   --IRRIGATION--          PROD-    --CONSUMPTION--
            FOOD  TIME   S RATE   TIME    YIELD   UCTION   HOLDUP    RATE
            TYPE  d      * in/yr  mo/yr   kg/m2   kg/yr    d         kg/yr
            -------- -----  - -----  -----   -----   -------  ------    ------
            Leaf Veg  90.0  0   0.0    0.0     1.5                1.0  3.0E+01
            Oth. Veg  90.0  0   0.0    0.0     4.0                5.0  2.2E+02
            Fruit     90.0  0   0.0    0.0     2.0                5.0  3.3E+02
            Cereals   90.0  0   0.0    0.0     0.8              180.0  8.0E+01

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

            ---HUMAN---- TOTAL   DRINK   -------------STORED FEED--------------
            CONSUMPTION  PROD-   WATER   DIET  GROW  -IRRIGATION--      STOR-
FOOD        RATE  HOLDUP UCTION  CONTAM  FRAC- TIME  S RATE  TIME   YIELD AGE
TYPE        kg/yr    d   kg/yr  FRACT.  TION   d    * in/yr mo/yr  kg/m3 d
--------    ------ ----- ------ -------  ----  ----  - ----- -----  ----- -----

Meat       8.0E+01  15.0          0.00   0.3 90.00  0   0.0   0.0   0.80 180.0
Poultry    1.8E+01   1.0          0.00   1.0 90.00  0   0.0   0.0   0.80 180.0
Cow Milk   2.7E+02   1.0          0.00   0.3 45.00  0   0.0   0.0   2.00 100.0
Eggs       3.0E+01   1.0          0.00   1.0 90.00  0   0.0   0.0   0.80 180.0

                                         -------------FRESH FORAGE-------------
Meat                                     0.75  45.0  0   0.0   0.0   2.00 100.0
Cow Milk                                 0.75  30.0  0   0.0   0.0   1.50   0.0

==============================================================================

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

 Case title:   H3 and Pu Chronic Release Using the 1991 Pantex JFD file_NWS
                Wind Spds
 Executed on:  07/05/92 at 18:23:53                                Page B.  1
 ----------------------------------------------------------------------------
 3.8E-06   Individual chi/Q


 8.0E+02   Maximum individual distance (m)
      10   Maximum individual sector index (1=S)
```

Release period:	1.0
Uptake/exposure period:	1.0
Dose commitment period:	50.0
Dose units:	Rem

Internal Intake Year:	Dose Commitment Year 1	2	3	...			
3			0.0E+00	...			
			+				
2		0.0E+00	0.0E+00	...			Internal Effective Dose Equivalent
		+	+				
1	2.9E-02 +	2.1E-02 +	1.6E-02 +	...	=	3.0E-01	
	||	||	||				
Internal Annual Dose	2.9E-02 +	2.1E-02 +	1.6E-02 +	...	=	3.0E-01	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	2.0E-09	0.0E+00	0.0E+00	...		2.0E-09	
	||	||	||			||	
Annual Dose	2.9E-02 +	2.1E-02 +	1.6E-02 +	...	=	3.0E-01	Cumulative Dose
						2.9E-02	Maximum Annual Dose Occurred In Year 1

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

 Case title:   Acute H3 and Pu Release -- Amarillo 1990 jfd file

 Executed on:  07/09/92 at 16:54:56                                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
               Ground, external
               Recreation, external
               Inhalation uptake
               Terrestrial foods ingestion
               Animal product ingestion
               Inadvertent soil ingestion

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

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

 Input file name: \GENII\acaml90.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Master Library   (11/28/90 RAP)
 Food Transfer Factor Library - (RAP  29-Aug-88) (UPDATED LEACHING FA
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Internal Dose Increments, PNL Solubility Choices Rerun 12/3/90 PDR
 Amarillo,TX JFD data created from the NWS STAR file -- 1990

==============================================================================

          -------- ----Release Terms------
          Release          Surface Buried
          Radio-   Air     Water   Source
          nuclide   Ci/yr   Ci/yr   Ci/m3
          -------- ------- ------- -------
          H 3      1.0E+00 0.0E+00 0.0E+00
          PU239    1.0E+00 0.0E+00 0.0E+00

========== AIR TRANSPORT ======================================================
          Joint frequency data input.
1.9E+03   Maximum individual distance from release point (m)
1.4E+01   Maximum individual sector index (Wind Toward ESE)
          Ground level release.

========== EXTERNAL EXPOSURE ==================================================
 1.0E+00  Fraction of time spent in cloud
 4.4E+03  Hours of exposure to ground contamination
 0.0E+00  Hours of exposure from swimming
 0.0E+00  Hours of exposure from boating
 0.0E+00  Hours of exposure from shoreline activities
       1  Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin


========== INHALATION =========================================================
```

8.8E+03 Hours of exposure to resuspended contamination per year
1 Resuspension model: 1-Mass Loading, 2-Anspaugh
1.0E-04 Mass loading factor (g/m3)

========== INGESTION POPULATION ==========
1 Atmospheric production definition: 1 - Use population-weighted chi/Q

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

FOOD TYPE	GROW TIME d	--IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m2	PROD-UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5		1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0		5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0		5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8		180.0	8.0E+01

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

FOOD TYPE	---HUMAN---- CONSUMPTION RATE kg/yr	HOLDUP d	TOTAL PROD-UCTION kg/yr	DRINK WATER CONTAM FRACT.	----------STORED FEED---------- DIET FRAC-TION	GROW TIME d	-IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m3	STOR-AGE d
Meat	8.0E+01	15.0		0.00		90.00	0	0.0	0.0	0.80	
Poultry	1.8E+01	1.0		0.00		90.00	0	0.0	0.0	0.80	
Cow Milk	2.7E+02	1.0		0.00		45.00	0	0.0	0.0	2.00	
Eggs	3.0E+01	1.0		0.00		90.00	0	0.0	0.0	0.80	
					----------FRESH FORAGE----------						
Meat						45.00	0	0.0	0.0	2.00	
Cow Milk						30.00	0	0.0	0.0	1.50	

==========

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

Case title: Acute H3 and Pu Release -- Amarillo 1990 jfd file

Executed on: 07/09/92 at 16:54:56 Page A. 2

	Probability	E/Q (sec/m3)	DOQ (m2)	Travel Time (sec)	Population-Weighted E/Q (person-sec/m3)
Sector index:14					
Distance: 1900.0					
	0.0142	7.7E-05	7.7E-07	655.	
	0.0500	6.3E-05	6.3E-07	365.	
	0.1000	4.4E-05	4.4E-07	365.	
	0.2500	1.5E-05	1.5E-07	221.	
	0.5000	5.6E-06	5.6E-08	221.	

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

Case title: Acute H3 and Pu Release -- Amarillo 1990 jfd file

Executed on: 07/09/92 at 16:55:07 Page B. 1

6.3E-05 Individual E/Q

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	...			Internal Effective Dose Equivalent
		+	+				
1	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	
	||	||	||				
Internal Annual Dose	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	3.4E-08	0.0E+00	0.0E+00	...		3.4E-08	
	||	||	||			||	
Annual Dose	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Dose
						6.1E-01	Maximum Annual Dose Occurred In Year 1

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	...		Internal Effective Dose Equivalent
		+	+			
1	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	= 6.4E+00	
	||	||	||			
Internal Annual Dose	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	= 6.4E+00	Cumulative Internal Dose
	+	+	+		+	
External Annual Dose	3.4E-08	0.0E+00	0.0E+00	...	3.4E-08	
	||	||	||		||	
Annual Dose	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	= 6.4E+00	Cumulative Dose
					6.1E-01	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
		+	+				
1	6.2E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	
	||	||	||				
Internal Annual Dose	6.2E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	3.4E-08	0.0E+00	0.0E+00	...		3.4E-08	
	||	||	||			||	
Annual Dose	6.2E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Dose
						6.2E-01	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
			+	+				
	1	6.4E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.5E+00	
		||	||	||				
Internal Annual Dose		6.4E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.5E+00	Cumulative Internal Dose
		+	+	+			+	
External Annual Dose		3.4E-08	0.0E+00	0.0E+00	...		3.4E-08	
		||	||	||			||	
Annual Dose		6.4E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.5E+00	Cumulative Dose
							6.4E-01	Maximum Annual Dose Occurred In Year 1

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

 Case title:   Acute H3 and Pu Release -- Amarillo 1991 jfd file

 Executed on:  07/09/92 at 16:55:34                                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
               Ground, external
               Recreation, external
               Inhalation uptake
               Terrestrial foods ingestion
               Animal product ingestion
               Inadvertent soil ingestion

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

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

 Input file name: \GENII\acaml91.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Master Library   (11/28/90 RAP)
 Food Transfer Factor Library - (RAP  29-Aug-88) (UPDATED LEACHING FA
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Internal Dose Increments, PNL Solubility Choices Rerun 12/3/90 PDR
 Amarillo,TX JFD data created from the NWS STAR file - 1991

=============================================================================

          -------- ----Release Terms------
          Release          Surface Buried
          Radio-   Air     Water   Source
          nuclide   Ci/yr   Ci/yr   Ci/m3
          -------- ------- ------- -------
          H 3      1.0E+00 0.0E+00 0.0E+00
          PU239    1.0E+00 0.0E+00 0.0E+00

========== AIR TRANSPORT ======================================================
          Joint frequency data input.
1.9E+03   Maximum individual distance from release point (m)
1.4E+01   Maximum individual sector index (Wind Toward ESE)
          Ground level release.

========== EXTERNAL EXPOSURE ==================================================
 1.0E+00  Fraction of time spent in cloud
 4.4E+03  Hours of exposure to ground contamination
 0.0E+00  Hours of exposure from swimming
 0.0E+00  Hours of exposure from boating
 0.0E+00  Hours of exposure from shoreline activities
       1  Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin

========== INHALATION =========================================================
 8.8E+03  Hours of exposure to resuspended contamination per year
       1  Resuspension model:  1-Mass Loading, 2-Anspaugh
```

1.0E-04 Mass loading factor (g/m3)

========== INGESTION POPULATION ==========
1 Atmospheric production definition: 1 - Use population-weighted chi/Q

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

FOOD TYPE	GROW TIME d	S *	IRRIGATION RATE in/yr	IRRIGATION TIME mo/yr	YIELD kg/m2	PROD-UCTION kg/yr	CONSUMPTION HOLDUP d	CONSUMPTION RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5		1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0		5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0		5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8		180.0	8.0E+01

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

FOOD TYPE	HUMAN CONSUMPTION RATE kg/yr	HUMAN HOLDUP d	TOTAL PROD-UCTION kg/yr	DRINK WATER CONTAM FRACT.	STORED FEED DIET FRAC-TION	STORED FEED GROW TIME d	STORED FEED S *	STORED FEED IRRIGATION RATE in/yr	STORED FEED IRRIGATION TIME mo/yr	STORED FEED YIELD kg/m3	STORED FEED STOR-AGE d
Meat	8.0E+01	15.0		0.00		90.00	0	0.0	0.0	0.80	
Poultry	1.8E+01	1.0		0.00		90.00	0	0.0	0.0	0.80	
Cow Milk	2.7E+02	1.0		0.00		45.00	0	0.0	0.0	2.00	
Eggs	3.0E+01	1.0		0.00		90.00	0	0.0	0.0	0.80	
					FRESH FORAGE						
Meat						45.00	0	0.0	0.0	2.00	
Cow Milk						30.00	0	0.0	0.0	1.50	

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

Case title: Acute H3 and Pu Release -- Amarillo 1991 jfd file

Executed on: 07/09/92 at 16:55:34 Page A. 2

Sector index:14
Distance: 1900.0

Probability	E/Q (sec/m3)	DOQ (m2)	Travel Time (sec)	Population-Weighted E/Q (person-sec/m3)
0.0133	7.7E-05	7.7E-07	655.	
0.0500	6.3E-05	6.3E-07	365.	
0.1000	4.4E-05	4.4E-07	365.	
0.2500	1.6E-05	1.6E-07	221.	
0.5000	5.2E-06	5.2E-08	145.	

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

Case title: Acute H3 and Pu Release -- Amarillo 1991 jfd file

Executed on: 07/09/92 at 16:55:46 Page B. 1

6.3E-05 Individual E/Q

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	...			Internal Effective Dose Equivalent
			+	+				
	1	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	
		||	||	||				
Internal Annual Dose		6.1E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Internal Dose
		+	+	+			+	
External Annual Dose		3.3E-08	0.0E+00	0.0E+00	...		3.3E-08	
		||	||	||			||	
Annual Dose		6.1E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Dose
							6.1E-01	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
		+	+				
1	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	
	||	||	||				
Internal Annual Dose	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	3.3E-08	0.0E+00	0.0E+00	...		3.3E-08	
	||	||	||			||	
Annual Dose	6.1E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Dose
						6.1E-01	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
		+	+				
1	6.2E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	
	||	||	||				
Internal Annual Dose	6.2E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	3.3E-08	0.0E+00	0.0E+00	...		3.3E-08	
	||	||	||			||	
Annual Dose	6.2E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.4E+00	Cumulative Dose
						6.2E-01	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
		+	+				
1	6.4E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.5E+00	
	||	||	||				
Internal Annual Dose	6.4E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.5E+00	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	3.3E-08	0.0E+00	0.0E+00	...		3.3E-08	
	||	||	||			||	
Annual Dose	6.4E-01 +	4.4E-01 +	3.3E-01 +	...	=	6.5E+00	Cumulative Dose
						6.4E-01	Maximum Annual Dose Occurred In Year 1

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

Case title:   Acute H3 and Pu Release -- Pantex 1990 jfd file

Executed on:  07/09/92 at 16:53:40                                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
               Ground, external
               Recreation, external
               Inhalation uptake
               Terrestrial foods ingestion
               Animal product ingestion
               Inadvertent soil ingestion

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

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

 Input file name: \GENII\acptx90.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Master Library   (11/28/90 RAP)
 Food Transfer Factor Library - (RAP  29-Aug-88) (UPDATED LEACHING FA
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Internal Dose Increments, PNL Solubility Choices Rerun 12/3/90 PDR
 PANTEX JFD for 1990 using NWS speed categories. GENII format. 7/92, SFS

=============================================================================

          -------- ----Release Terms------
          Release          Surface Buried
          Radio-   Air     Water   Source
          nuclide   Ci/yr   Ci/yr   Ci/m3
          -------- ------- ------- -------
          H 3      1.0E+00 0.0E+00 0.0E+00
          PU239    1.0E+00 0.0E+00 0.0E+00

========== AIR TRANSPORT ======================================================
          Joint frequency data input.
1.9E+03   Maximum individual distance from release point (m)
1.4E+01   Maximum individual sector index (Wind Toward ESE)
          Ground level release.

========== EXTERNAL EXPOSURE ==================================================
 1.0E+00  Fraction of time spent in cloud
 4.4E+03  Hours of exposure to ground contamination
 0.0E+00  Hours of exposure from swimming
 0.0E+00  Hours of exposure from boating
 0.0E+00  Hours of exposure from shoreline activities
       1  Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin

========== INHALATION =========================================================
 8.8E+03  Hours of exposure to resuspended contamination per year
       1  Resuspension model:  1-Mass Loading, 2-Anspaugh
```

1.0E-04 Mass loading factor (g/m3)

========== INGESTION POPULATION ==========
1 Atmospheric production definition: 1 - Use population-weighted chi/Q

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

FOOD TYPE	GROW TIME d	S *	--IRRIGATION-- RATE in/yr	TIME mo/yr	YIELD kg/m2	PROD-UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5		1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0		5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0		5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8		180.0	8.0E+01

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

FOOD TYPE	---HUMAN---- CONSUMPTION RATE kg/yr	HOLDUP d	TOTAL PROD-UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC-TION	GROW TIME d	S *	-IRRIGATION-- RATE in/yr	TIME mo/yr	YIELD kg/m3	STOR-AGE d
					----------STORED FEED----------						
Meat	8.0E+01	15.0		0.00		90.00	0	0.0	0.0	0.80	
Poultry	1.8E+01	1.0		0.00		90.00	0	0.0	0.0	0.80	
Cow Milk	2.7E+02	1.0		0.00		45.00	0	0.0	0.0	2.00	
Eggs	3.0E+01	1.0		0.00		90.00	0	0.0	0.0	0.80	
					----------FRESH FORAGE----------						
Meat						45.00	0	0.0	0.0	2.00	
Cow Milk						30.00	0	0.0	0.0	1.50	

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

Case title: Acute H3 and Pu Release -- Pantex 1990 jfd file

Executed on: 07/09/92 at 16:53:40 Page A. 2

	Probability	E/Q (sec/m3)	DOQ (m2)	Travel Time (sec)	Population-Weighted E/Q (person-sec/m3)
Sector index:14					
Distance: 1900.0					
	0.0108	2.5E-04	2.5E-06	2111.	
	0.0500	1.0E-04	1.0E-06	760.	
	0.1000	6.0E-05	6.0E-07	760.	
	0.2500	2.9E-05	2.9E-07	442.	
	0.5000	1.4E-05	1.4E-07	275.	

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

Case title: Acute H3 and Pu Release -- Pantex 1990 jfd file

Executed on: 07/09/92 at 16:53:51 Page B. 1

1.0E-04 Individual E/Q

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	...			Internal Effective Dose Equivalent
		+	+				
1	9.9E-01 +	7.1E-01 +	5.4E-01 +	...	=	1.0E+01	
	||	||	||				
Internal Annual Dose	9.9E-01 +	7.1E-01 +	5.4E-01 +	...	=	1.0E+01	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	5.4E-08	0.0E+00	0.0E+00	...		5.4E-08	
	||	||	||			||	
Annual Dose	9.9E-01 +	7.1E-01 +	5.4E-01 +	...	=	1.0E+01	Cumulative Dose
						9.9E-01	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
		+	+				
1	9.9E-01 +	7.1E-01 +	5.4E-01 +	...	=	1.0E+01	
	||	||	||				
Internal Annual Dose	9.9E-01 +	7.1E-01 +	5.4E-01 +	...	=	1.0E+01	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	5.4E-08	0.0E+00	0.0E+00	...		5.4E-08	
	||	||	||			||	
Annual Dose	9.9E-01 +	7.1E-01 +	5.4E-01 +	...	=	1.0E+01	Cumulative Dose
						9.9E-01	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
			+	+				
	1	1.0E+00 +	7.1E-01 +	5.4E-01 +	...	=	1.0E+01	
		||	||	||				
Internal Annual Dose		1.0E+00 +	7.1E-01 +	5.4E-01 +	...	=	1.0E+01	Cumulative Internal Dose
		+	+	+			+	
External Annual Dose		5.4E-08	0.0E+00	0.0E+00	...		5.4E-08	
		||	||	||			||	
Annual Dose		1.0E+00 +	7.1E-01 +	5.4E-01 +	...	=	1.0E+01	Cumulative Dose
							1.0E+00	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
		+	+				
1	1.0E+00 +	7.2E-01 +	5.4E-01 +	...	=	1.0E+01	
	||	||	||				
Internal Annual Dose	1.0E+00 +	7.2E-01 +	5.4E-01 +	...	=	1.0E+01	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	5.4E-08	0.0E+00	0.0E+00	...		5.4E-08	
	||	||	||			||	
Annual Dose	1.0E+00 +	7.2E-01 +	5.4E-01 +	...	=	1.0E+01	Cumulative Dose
						1.0E+00	Maximum Annual Dose Occurred In Year 1

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

Case title:   Acute H3 and Pu Release -- Pantex 1991 jfd file

Executed on:  07/09/92 at 16:54:17                                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
               Ground, external
               Recreation, external
               Inhalation uptake
               Terrestrial foods ingestion
               Animal product ingestion
               Inadvertent soil ingestion

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

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

 Input file name: \GENII\acptx91.in
 GENII Default Parameter Values (28-Mar-90 RAP)
 Radionuclide Master Library   (11/28/90 RAP)
 Food Transfer Factor Library - (RAP  29-Aug-88) (UPDATED LEACHING FA
 External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 R
 Internal Dose Increments, PNL Solubility Choices Rerun 12/3/90 PDR
 PANTEX JFD for 1991 using NWS speed categories. GENII format. 7/92, SFS

=============================================================================

          -------- ----Release Terms------
          Release          Surface Buried
          Radio-   Air     Water   Source
          nuclide   Ci/yr   Ci/yr   Ci/m3
          -------- ------- ------- -------
          H 3      1.0E+00 0.0E+00 0.0E+00
          PU239    1.0E+00 0.0E+00 0.0E+00

========== AIR TRANSPORT ======================================================
          Joint frequency data input.
1.9E+03   Maximum individual distance from release point (m)
1.4E+01   Maximum individual sector index (Wind Toward ESE)
          Ground level release.

========== EXTERNAL EXPOSURE ==================================================
 1.0E+00  Fraction of time spent in cloud
 4.4E+03  Hours of exposure to ground contamination
 0.0E+00  Hours of exposure from swimming
 0.0E+00  Hours of exposure from boating
 0.0E+00  Hours of exposure from shoreline activities
       1  Shoreline type: 1-river, 2-lake, 3-ocean, 4-tidal basin

========== INHALATION =========================================================
 8.8E+03  Hours of exposure to resuspended contamination per year
       1  Resuspension model:  1-Mass Loading, 2-Anspaugh
```

1.0E-04 Mass loading fac[illegible] (g/m3)

========== INGESTION POPULATIO[illegible] ==========
1 Atmospheric production definition: 1 - Use population-weighted chi/Q

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

FOOD TYPE	GROW TIME d	--IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m2	PROD-UCTION kg/yr	--CONSUMPTION-- HOLDUP d	RATE kg/yr
Leaf Veg	90.0	0	0.0	0.0	1.5		1.0	3.0E+01
Oth. Veg	90.0	0	0.0	0.0	4.0		5.0	2.2E+02
Fruit	90.0	0	0.0	0.0	2.0		5.0	3.3E+02
Cereals	90.0	0	0.0	0.0	0.8		180.0	8.0E+01

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

FOOD TYPE	---HUMAN---- CONSUMPTION RATE kg/yr	HOLDUP d	TOTAL PROD-UCTION kg/yr	DRINK WATER CONTAM FRACT.	----------STORED FEED---------- DIET FRAC-TION	GROW TIME d	-IRRIGATION-- S *	RATE in/yr	TIME mo/yr	YIELD kg/m3	STOR-AGE d
Meat	8.0E+01	15.0		0.00		90.00	0	0.0	0.[illegible]	[illegible].80	
Poultry	1.8E+01	1.0		0.00		90.00	0	0.0	0	0.80	
Cow Milk	2.7E+02	1.0		0.00		45.00	0	0.0	0.0	2.00	
Eggs	3.0E+01	1.0		0.00		90.00	0	0.0	0.0	0.80	
					----------FRESH FORAGE----------						
Meat						45.00	0	0.0	0.0	2.00	
Cow Milk						30.00	0	0.0	0.0	1.50	

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

Case title: Acute H3 and Pu Release -- Pantex 1991 jfd file

Executed on: 07/09/92 at 16:54:17 Page A. 2

	Probability	E/Q (sec/m3)	DOQ (m2)	Travel Time (sec)	Population-Weighted E/Q (person-sec/m3)
Sector index:14					
Distance: 1900.0					
	0.0160	2.5E-04	2.5E-06	2111.	
	0.0500	1.3E-04	1.3E-06	2111.	
	0.1000	7.6E-05	7.6E-07	760.	
	0.2500	2.5E-05	2.5E-07	442.	
	0.5000	9.3E-06	9.3E-08	275.	

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

Case title: Acute H3 and Pu Release -- Pantex 1991 jfd file

Executed on: 07/09/92 at 16:54:29 Page B. 1

1.3E-04 Individual E/Q

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	...			Internal Effective Dose Equivalent
			+	+				
	1	1.3E+00 +	9.0E-01 +	6.8E-01 +	...	=	1.3E+01	
		||	||	||				
Internal Annual Dose		1.3E+00 +	9.0E-01 +	6.8E-01 +	...	=	1.3E+01	Cumulative Internal Dose
		+	+	+			+	
External Annual Dose		6.9E-08	0.0E+00	0.0E+00	...		6.9E-08	
		||	||	||			||	
Annual Dose		1.3E+00 +	9.0E-01 +	6.8E-01 +	...	=	1.3E+01	Cumulative Dose
							1.3E+00	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
		+	+				
1	1.3E+00 +	9.0E-01 +	6.8E-01 +	...	=	1.3E+01	
	||	||	||				
Internal Annual Dose	1.3E+00 +	9.0E-01 +	6.8E-01 +	...	=	1.3E+01	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	6.9E-08	0.0E+00	0.0E+00	...		6.9E-08	
	||	||	||			||	
Annual Dose	1.3E+00 +	9.0E-01 +	6.8E-01 +	...	=	1.3E+01	Cumulative Dose
						1.3E+00	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
		+	+				
1	1.3E+00 +	9.0E-01 +	6.8E-01 +	...	=	1.3E+01	
	||	||	||				
Internal Annual Dose	1.3E+00 +	9.0E-01 +	6.8E-01 +	...	=	1.3E+01	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	6.9E-08	0.0E+00	0.0E+00	...		6.9E-08	
	||	||	||			||	
Annual Dose	1.3E+00 +	9.0E-01 +	6.8E-01 +	...	=	1.3E+01	Cumulative Dose
						1.3E+00	Maximum Annual Dose Occurred In Year 1

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	...			Internal Effective Dose Equivalent
		+	+				
1	1.3E+00 +	9.1E-01 +	6.9E-01 +	...	=	1.3E+01	
	||	||	||				
Internal Annual Dose	1.3E+00 +	9.1E-01 +	6.9E-01 +	...	=	1.3E+01	Cumulative Internal Dose
	+	+	+			+	
External Annual Dose	6.9E-08	0.0E+00	0.0E+00	...		6.9E-08	
	||	||	||			||	
Annual Dose	1.3E+00 +	9.1E-01 +	6.9E-01 +	...	=	1.3E+01	Cumulative Dose
						1.3E+00	Maximum Annual Dose Occurred In Year 1

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