Modeled Atmospheric Radon Concentrations from Uranium Mines

J. G. Droppo

April 1985

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SUMMARY

Because elevated radon concentrations have been reported in the exhaust air vents from operating underground uranium mines, the U.S. Environmental Protection Agency (EPA) under the Clean Air Act is assessing the health impact of air emissions of radon from various sources. The radon emissions from these uranium mines may impact local workers and residents. Pacific Northwest Laboratory (PNL) under an Interagency Agreement with EPA is using a computer modeling approach to study these increases of radon concentrations in the air downwind from the mines.

To help EPA assess potential contribution of mine emissions to measured radon concentrations, the long-term average ground level radon concentrations resulting from mine emissions alone were computed. Using the EPA Industrial Source Complex (ISC) Gaussian dispersion model, impacted areas were defined for four concentration levels: 0.1, 0.2, 0.5, and 1.0 pCi/L.

Radon concentrations were determined for multiple mine operations in an intensive mining area, for a model mine, and for 14 case study mines. The multiple mine computations are made for emissions from over 100 vents located in the Ambrosia Lake Region of New Mexico. As for the individual mines, the range of radon concentrations was computed based on both plume rise and no plume rise.

A modeling approach was chosen that best represents actual conditions and maximizes the confidence in the predicted radon concentrations. Although current modeling techniques for transport and dispersion of contaminants are not always reliable in predicting short-term concentrations, these models do give reasonably good estimates of long-term average concentrations, which are of concern in this study. Where possible, the model inputs were based on actual emission measurements and mine locations. Local meteorological conditions were used when available. The model dispersion parameters originated from studies made at sites quite similar to the mining areas. Concentrations of main interest are at relatively close distances where these model parameters have their largest data base, and the straight-line assumption of the model is appropriate.

Radon concentration contour maps are also presented for these mines. Results for the 14 case study mines were plotted on maps containing population data for the selected mine areas. These maps cover a range of plume rise assumptions.

The radon concentrations were mainly a function of emission rates and plume rise. A wide variation of measured mine emission rates produced a corresponding range in computed radon concentrations. The importance of plume rise was also evident in the results. Differences also occurred as a result of variations in local dispersion climatology, number of vents, vent patterns, vent size, and exhaust flow. Multiple mine modeling indicated that the radon concentrations were increased as a result of overlapping mine emissions.

The vertical or horizontal orientation of the vents are important in the calculation of concentrations near the vents. The plume rise for vertical vents results in low ground level concentrations near the vents. No plume rise for horizontal vents results in high ground level radon concentrations near the vents. The importance of the release orientation becomes progressively less at greater distances from the mine vents. At distances on the order of 10 km, the predicted radon concentrations for horizontal and vertical vent releases have equivalent magnitudes.

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INTRODUCTION

Uranium mining and milling operations result in the release of radon from numerous sources of various types and strengths. The U.S. Environmental Protection Agency (EPA) under the Clean Air Act, is assessing the health impact of air emissions of radon from underground uranium mines. In this case, the radon emissions may impact workers and residents in the mine vicinity. To aid in this assessment, the EPA needs to know how mine releases can affect the radon concentrations at populated locations. To obtain this type of information, Pacific Northwest Laboratory used the radon emissions, release characteristics and local meteorological conditions for a number of mines to model incremental radon concentrations.

Long-term, average, incremental radon concentrations were computed based on the best available information on release rates, plume rise parameters, number and locations of vents, and local dispersion climatology. Calculations are made for a model mine, individual mines, and multiple mines.

Our approach was to start with a general case and then consider specific cases for comparison. A model underground uranium mine was used to provide definition of the order of magnitude of typical impacts. Then computations were made for specific mines using the best mine-specific information available for each mine. These case study results are expressed as predicted incremental radon concentration contours plotted on maps with local population data from a previous study (Bruno et al. 1984). Finally, the effect of possible overlap of radon releases from nearby mines was studied by calculating cumulative radon concentrations for multiple mines in a region with many mines.

The dispersion model, modeling assumptions, data sources, computational procedures, and results are documented in this report. The methodology is described in the first section. Then the next two sections give single mine and multiple mine modeling results. The final section discusses these results.

METHODOLOGY

A dispersion model is used to estimate the airborne radon concentrations expected to result from mine radon emissions. Concentrations are expected to be greatest over the first several kilometers surrounding the mine. Assuming the terrain and meteorology are relatively uniform over these distances, a straight line Gaussian model is appropriate. The EPA's interest in long-term average concentrations is best met by using a climatological dispersion model. Multiple vent locations dictate that the model be able to handle sources at different locations. The model should also be able to handle various horizontal and vertical release configurations.

A model meeting the above criteria was selected for use from EPA's User's Network for Applied Modeling of Air Pollution (UNAMAP) series of atmospheric dispersion models. The use of a UNAMAP model ensures availability of the model to anyone to make additional computations or related studies. In addition, the user's guide for the selected model provides detailed model documentation.

The model used is the Industrial Source Complex Long-Term dispersion model (ISCLT) (EPA 1979). Volume I of the user's guide gives detailed technical information on formulations used in the ISCLT with user's instructions and Volume II contains sample runs and program code listings.

ISCLT is a climatological dispersion model. The input requirements for this study are as follows:

- Meteorological Data--Joint frequency tables of wind speed, wind direction, and atmospheric stability were obtained at the nearest site representative of conditions at the uranium mine or mines being studied. Appendix A contains the tables used in the computations. Mixing height inputs for each mine were obtained from a report by Holzworth (1972).
- Source Data--The emission rates and characteristics for each mine vent were defined based on a combination of information from a number

of sources. These included letters from mine operators, a report by Jackson et al. (1980), and other public sources. Appendices B and C list all these information sources.

- Receptor Definition--Computations were made for two sets of receptors or grids. A square grid was used for generating the concentration isopleth maps. A grid spacing of 0.5 km was used for single mine computations and 1.0 km for the multiple mines. A polar grid, centered on the mine shaft, was used to determine detailed downwind concentration profiles. Sixteen direction sectors and selected arc distances were used.
- Dispersion Parameters--ISCLT allows selection of rural, urban or custom dispersion coefficients. In all computations reported here, dispersion parameters for rural conditions were used.
- Plume Rise--ISCLT has plume rise formulations for both heat and momentum generated plume rise. Required inputs are the exhaust temperature, vertical exit velocity, release height, and exit size. Fans force the air out of the exhaust vents. Plume rise is computed for vertically oriented vents based on their exit velocity and size. Horizontally oriented vents do not have any initial vertical velocities, and are assumed not to have any plume rise. The exit temperature is assumed to be close to ambient temperature. Default parameters are used for defining the atmospheric vertical structure.

Although detailed information was not available on the actual release heights of the vents, these are releases that occur relatively close to the ground. Typical release heights may vary from near-surface to 4 m. Fixed release heights of 1 m for vertical vents and 3 m for vents without any plume rise (horizontal vents) were assumed. Because the release heights are relatively low, the plume rise is quite important in increasing the effective plume height.

The extent that plume rise may reduce computed ground level radon concentrations is uncertain because of the lack of mine plume rise data. The range of effects are considered by computing radon concentrations for both no

plume rise (horizontal vents) and plume rise (vertical vents). Although the near-surface vent releases are different than release configurations studied in plume rise from high industrial stacks, the plume rise formulations used in ISCLT should provide reasonable estimates of potential plume rise for mine vents.

The relatively low height of vent releases makes it uncertain that the computed plume rise will be realized in all cases. Near-release influences such as buildings, walls, hills, and vegetation can easily change local flow characteristics such that downwash of the plume occurs. Even when downwash does not occur, the increased local dispersion will tend to decrease plume rise. Insufficient mine vent information was available to utilize ISCLT's plume downwash options.

A ground level release with no plume rise represents the computation case with the highest computed downwind radon concentrations. A release with plume rise represents the case with the lowest radon concentrations. The radon concentrations computed with these two cases will span the range of conditions for various local influences on vent releases.

The procedure for making radon concentration contour plots was as follows. ISCLT was used to compute the incremental radon concentrations for a grid, as described before, covering the area of interest. Then a linear interpolation plotting program was used to draw 0.1, 0.2, 0.5, and 1.0 pCi/L concentration contours using the same scale as the mine maps with the population data. The contour plots were then superimposed on the population mine map.

INDIVIDUAL MINE IMPACT

The incremental airborne radon concentrations were computed both for a model mine and actual individual mines. This section describes assumptions, inputs, and results of these computations.

MODEL UNDERGROUND URANIUM MINE

Typical incremental radon concentrations in the air around a model underground uranium mine were computed. The wide variation in release parameters and rates for individual mines made the definition of a model mine very difficult. Parameters were defined using a combination of representative and typical values.

A release configuration of five vents was used as in a previous EPA study (EPA 1984). Figure 1 shows the relative location of vents.

A generic radon release rate of 11 kCi/yr (EPA 1984) was used for the mine. This was equally divided among the five vents for a 2.2 kCi/yr release for each vent. The emission rate of 11 kCi/yr was an average rate for eight mines chosen by EPA where emission rates had been measured. These mines had produced uranium ore for at least 10 years at that time and been included in the population study around underground uranium mines (Bruno et al. 1984).

The exit velocity and exit diameter were based on the average values available from six of fourteen case study mines. These six mines had specific emission information available. A physical release height of 1 m was assumed for each model mine vent. The Ambrosia Lake meteorological data from the Phillips mine site were used for the model mine (Appendix A, Table A-7). Model mine release characteristics are listed in Appendix B along with tables of computed radon concentrations.

The radon concentration patterns computed for the model mine are given in Figures 2 and 3 for the cases of no plume rise and plume rise, respectively. Table 1 contains computed radon concentrations for the model mine at selected distances from the mine shaft. The maximum is the highest value that occurred in any of the sixteen direction sectors. The average value of all sectors at

FIGURE 1. Model Reference Underground Mine

FIGURE 2. Computed Incremental Radon Concentrations, pCi/L, Around the Model Underground Mine Assuming No Plume Rise

FIGURE 3. Computed Incremental Radon Concentrations, pCi/L, Around the Model Underground Mine With Plume Rise

TABLE 1. Estimates of Radon Concentrations in Air at Selected Distances from the Model Underground Uranium Mine

Distance from Mine Shaft (m)	Computed with no Plume Rise		Computed with Plume Rise	
	Maximum Sector	Average All Sectors	Maximum Sector	Average All Sectors
500	12.1	5.6	0.39	0.22
1,000	4.5	2.0	0.38	0.20
2,000	0.95	0.48	0.23	0.14
3,000	0.50	0.26	0.19	0.11
5,000	0.23	0.13	0.12	0.07
7,000	0.14	0.09	0.08	0.05
10,000	0.08	0.04	0.06	0.03

each distance are given for definition of the impact. Values are given for both plume rise and no plume rise. Distances are measured from the model mine shaft. In all cases the maximum is about a factor of two higher than the average.

The mine shaft is used as a central point to define downwind distances. The five vent releases for the model mine occur within about one square kilometer area around the mine shaft. As a result, the concentrations computed for the first several kilometers can be expected to partly reflect the distribution of the five vents.

CASE STUDY MINES

EPA selected the case study or specific mines from mines where actual radon measurements were made (Jackson 1980) and also were included in population studies around mines (EPA 1983). Mines were selected based primarily on the existence of population in the mine vicinity and whether the locations provided a cross section of different mine sites.

Table 2 contains a summary of the case study mine characteristics. Of the 14 mines selected, measured radon emissions were available for six mines. The values given for the emissions are based on the sum of average values for the vents at each mine. The average values of release parameters for the model mine were used for the mines lacking site-specific data. Local meteorological

TABLE 2. Summary of Case Study Mines

Mine Number	Number of Modeled Vents	Total Radon Emission (kCi/yr)	Type of Emission Data ^(a)	Source of Meteorology ^(b)
1	1	11	Generic	Regional
2	11	2	Measured	Local
3	8	11	Generic	Local
4	6	11	Generic	Local
5	5	11	Generic	Regional
6	1	11	Generic	Local
7	7	25	Measured	Regional
8	5	11	Generic	Regional
9	2	11	Generic	Regional
10	4	8	Measured	Regional
11	13	9	Measured	Local
12	4	5	Measured	Local
13	5	11	Generic	Local
14	2	0.5	Measured	Regional

(a) Generic = average generic values were used for exit velocity and diameter because specific information was not available. Measured = measured values of exit velocity and diameter for each vent were used.

(b) Regional = meteorological surface observations from station in the region of the site; Local = meteorological data in the immediate area of the mine.

data were used for 7 of 14 mines. The information in this table provides a framework for understanding the case study results presented later. Appendix C contains additional details concerning sources and characteristics of model inputs and output radon concentration tables for two mines.

The case study mine computations are made to assess the effects of various influences on radon concentrations. Generic input values were used where data were not available to allow comparisons based on the available site-specific data.

Even for the mines where emission measurements were made, these data apply only to the period or year when the measurements were made. They may, or may not, represent current or long-term operations. However, radon concentrations computed using these measured emission values will provide general guidance for the range of values possible from operating mines.

Figures 4 to 14 contain radon contour plots for 11 of the case study mines. These are based on measured and generic radon emission rates as listed in Table 2. These plots are based on computed plume rise at all vents. The six horizontal vents at mines 11 and 12 were assumed to be oriented vertically without changing the exit sizes and velocities. As expected the higher radon concentrations occur around the location of vents which were generally in the immediate area of the shafts. All computed concentrations were less than 0.1 pCi/L at case study mine 11, mine 12, and mine 14, and thus no contour plots are given for these mines.

Figures 15 and 16 contain contour plots based on actual vent configurations (horizontal or vertical) for the two mines that are known to have horizontal vents. Mine 11 is modeled with three horizontal and ten vertical vents. Mine 12 has two horizontal and two vertical vents. These horizontal vents are modeled as an area release with no plume rise. These computations are based on measured radon emission rates (Table 2). Although no information was found to indicate any of the other case study mines have horizontal vents, some may have these types of vents.

Figures 17 to 22 contain radon contour plots for the six mines with measured emission data (Table 2) computed for no-plume-rise releases. These plots are also based on measured radon emission rates to provide a means for evaluating the plume rise results given in preceding figures.

Average downwind radon concentrations were computed for the six mines with measured release characteristics. Instead of the measured emission rates used in Table 2, the model mine release rate of 11 kCi/yr was used for each mine. Measured vent exit sizes and velocities were used assuming only vertical releases. The six horizontal vents at mines 11 and 12 were assumed to be

FIGURE 4. Estimated Incremental Radon Concentration Contours, pCi/L, allowing for Plume Rise at Case Study Mine 1

FIGURE 5. Estimated Incremental Radon Concentration Contours, pCi/L, Allowing for Plume Rise at Case Study Mine 2

FIGURE 7. Estimated Incremental Radon Concentration Contours, pCi/L, allowing for Plume Rise at Case Study Mine 4

FIGURE 8. Estimated Incremental Radon Concentration Contours, pCi/L, Allowing for Plume Rise at Case Study Mine 5

FIGURE 9. Estimated Incremental Radon Concentration Contours, pCi/L, Allowing for Plume Rise at Case Study Mine 6

FIGURE 10. Estimated Incremental Radon Concentration Contours, pCi/L, Allowing for Plume Rise at Case Study Mine 7

FIGURE 11. Estimated Incremental Radon Concentration Contours Allowing for Plume Rise at Case Study Mine 8

FIGURE 12. Estimated Incremental Radon Concentration Contours, pCi/L, Allowing for Plume Rise at Case Study Mine 9

FIGURE 13. Estimated Incremental Radon Concentration Contours, pCi/L, Allowing for Plume Rise at Case Study Mine 10

FIGURE 14. Estimated Incremental Radon Concentration Contours, pCi/L, Allowing for Plume Rise at Case Study Mine 13

FIGURE 15. Estimated Incremental Radon Concentration Contours, pCi/L, Allowing for Actual Vent Configurations, pCi/L, at Case Study Mine 11

FIGURE 16. Estimated Incremental Radon Concentration Contours, pCi/L, Allowing for Actual Vent Configurations at Case Study Mine 12

FIGURE 17. Estimated Incremental Radon Concentration Contours, pCi/L, Based on a No Plume Rise Assumption at Case Study Mine 2

FIGURE 18. Estimated Incremental Radon Concentration Contours, pCi/L, Based on a No Plume Rise Assumption at Case Study Mine 7

FIGURE 19. Estimated Incremental Radon Concentration Contours, pCi/L, Based on a No Plume Rise Assumption at Case Study Mine 10

FIGURE 20. Estimated Incremental Radon Concentration Contours, pCi/L, Based on a No Plume Rise Assumption at Case Study Mine 11

FIGURE 21. Estimated Incremental Radon Concentration Contours, pCi/L, Based on a No Plume Rise Assumption at Case Study Mine 12

FIGURE 22. Estimated Incremental Radon Concentration Contours, pCi/L, Based on a No Plume Rise Assumption at Case Study Mine 14

oriented vertically without changing the exit sizes and velocities. As with the case study computations done previously, the best available meteorological data were used for each mine.

The average concentrations were computed as a function of distance in two ways. First, the average concentration values at each distance were computed for each of the six mines. Overall average concentrations as a function of distance were then computed by averaging the six sets of mine values. This result is the 'mine average' curve in Figure 23. Second, the 'vent average' curve is based on giving equal weight to each of the vents. This average of the concentrations from the 41 vents has slightly lower values than the mine average. These curves provide an estimate of the dependence of radon concentration as function of downwind distance based on these mines and their local characteristics. Based on this figure, the screening formula developed by EPA in 1983 (EPA 1983) appears to give a reasonable prediction of the average variation of concentration with distance.

FIGURE 23. Average Incremental Radon Concentrations, pCi/L, Downwind of the Six Mines with Measured Release Characteristics Based on a Generic Release of 11,000 Ci/yr for Each Mine

MULTIPLE MINE COMPUTATION

In practice, several mines often occur in the same region. The radon concentrations computed in the preceding sections for individual mines may overlap to produce greater values. The question of cumulative mine impacts was addressed by modeling the combined concentrations in a region with intensive uranium mining.

Ambrosia Lake was the intensive mining area selected for a multiple mine computation. A total of over 100 mine vents are used by the underground uranium mines in this region. Case study mines 11 and 12 are located in this area.

Vent locations for mines at Ambrosia Lake identified by Droppo and Glissmeyer (1981) are given in Figure 24. Emission rates for these vents are given in Table 3 based on earlier measurement programs. These reported emission rates are maximum values from two sets of measurements.

Ground level releases with no plume rise for multiple mines at Ambrosia Lake were computed previously using a different climatological dispersion model (Droppo and Glissmeyer 1981). These were rerun using ISCLT with the same input parameters as the earlier study. The results were equivalent. Predicted contours were the same both in shape and location. This closeness of results is to be expected because the same dispersion relationships and coefficients are used in the two models. Although a different meteorological data set is used in the computations reported in this study, the magnitudes and contour shapes for the no-plume-rise case are quite close to those reported in 1981.

The horizontal and vertical configurations of the vents were known for the two case study mines located in this region. For these two mines, 5 of the 17 vents were horizontal. It is reasonable to expect that other vents in the area may be horizontal. The lack of specific vent orientation information was addressed by considering the extremes of all vertical vents with plume rise or all vents without any plume rise (horizontal). Then an intermediate case with plume rise for five horizontal vents at the two case study mines, 11 and 12, was run to see how significantly horizontal vents influence the computed radon patterns.

FIGURE 24. Detailed Map of Selected Multiple Mine Area Showing Vent Locations (Droppo and Glissmeyer 1981)

TABLE 3. Source Terms for Multiple Mine Computation
(Droppo and Glissmeyer 1981)

Emission Rate Rank	Vent Num- ber Fig. 24	Radon Emission Rate (Ci/yr)	Emission Rate Rank	Vent Num- ber Fig. 24	Radon Emission Rate (Ci/yr)	Emission Rate Rank	Vent Num- ber Fig. 24	Radon Emission Rate (Ci/yr)
1	94	8310	41	13	810	81	61	280
2	99	5670	42	38	810	82	100	270
3	110	5310	43	89	790	83	34	250
4	82	5170	44	5	770	84	71	240
5	105	4900	45	92	760	85	18	220
6	87	4570	46	59	750	86	112	220
7	95	4540	47	48	720	87	12	210
8	25	3990	48	115	720	88	55	210
9	54	3180	49	11	660	89	74	210
10	52	2770	50	16	660	90	102	210
11	51	2510	51	24	650	91	26	200
12	53	2490	52	45	650	92	47	200
13	58	2330	53	65	643	93	69	200
14	27	2160	54	63	620	94	37	190
15	79	2100	55	101	620	95	67	180
16	49	2050	56	17	600	96	19	170
17	2	1950	57	96	580	97	70	170
18	29	1840	58	107	580	98	33	160
19	40	1730	59	98	570	99	109	160
20	9	1720	60	35	530	100	20	150
21	88	1690	61	81	530	101	66	140
22	44	1680	62	60	500	102	68	130
23	97	1560	63	77	500	103	23	100
24	15	1500	64	116	500	104	90	99
25	8	1410	65	117	500	105	57	96
26	113	1400	66	80	460	106	85	88
27	43	1320	67	50	450	107	78	87
28	21	1290	68	7	430	108	39	72
29	56	1260	69	91	420	119	31	54
30	1	1250	70	103	410	110	75	52
31	4	1230	71	46	380	111	76	47
32	108	1230	72	22	350	112	83	40
33	30	1210	73	36	350	113	72	37
34	86	1180	74	14	340	114	93	10
35	62	1160	75	73	340			
36	28	1070	76	6	330			
37	42	1060	77	114	330			
38	106	940	78	64	319			
39	111	890	79	32	300			
40	104	880	80	10	290			

The radon concentrations from multiple uranium mines in the Ambrosia Lake region modeled for ground level release without plume rise are given in Figure 25, and those concentrations for all vertical vents with plume rise in Figure 26. The ground level release computation assumed a release height of 1 m and no plume rise. The computations with plume rise used the actual release characteristics for 17 vents (mine 11 and mine 12). For all other vents, the generic model mine vent characteristics are used.

The combination of mines with actual vent configuration (mines 11 and 12) and mines with plume rise is shown in Figure 27. This involves 5 horizontal vents modeled as area sources. Comparison with Figure 26 shows the influence of the known horizontal vents at case study mines 11 and 12. Similar increases in concentration are to be expected for any additional horizontal vents that may exist in this region. Figure 25 provides an upper limit for what these computed concentrations could approach.

FIGURE 25. Estimated Incremental Radon Concentration Contours, pCi/L, Based on Multiple Mine Emissions Using a No Plume Rise Assumption

FIGURE 26. Estimated Incremental Radon Concentration Contours, pCi/L, Based on Multiple Mine Emissions Allowing for Plume Rise and All Vertical Vent Configurations

FIGURE 27. Estimated Incremental Radon Concentration Contours, pCi/L, Based on Multiple Mine Emissions Allowing for Plume Rise at All Vents Except Five Horizontal Vents at Case Study Mines 11 and 12

DISCUSSION

The radon concentrations computed for the model mine and specific mines provide a basis of evaluating the importance of various parameters. Vent size and exit velocity, vent orientation, release height and local meteorology are a few of the major influences on the plume transport and dispersion processes.

Comparing the model mine contour plots with and without plume rise (Figures 2 and 3) shows that the no-plume-rise case has much larger predicted areas within each of the radon contour concentrations. The shape of contours are also different for these two cases. The plume rise case has contours offset to one side of the vents compared to a more circular pattern centered on the vents for the no-plume-rise case. The origin of this shift in patterns for the plume rise case appears to be the result of greater local high wind speeds from the west (Table A-7). Because little or no plume rise is expected at higher wind speeds, the high winds from the west result in greater concentrations to the east of the mining area. These model mine results clearly illustrate the importance of local meteorological conditions in determining patterns of incremental radon concentrations.

A wide variation of the area inside the radon concentration contours occurred between the case study mines (Figures 4 to 16). A major factor for the variation in the six mines with specific emission data was the range of the measured values. The relative locations of the contour areas between mines reflected differences in local winds.

Plume rise is shown to be an important factor in determining the estimated changes in long-term, average, surface level radon concentrations. At individual mines, the areas enclosed by the computed radon contours are considerably smaller for vents modeled with plume rise compared to vents with no plume rise.

A similar trend for vents with and without plume rise occurred with the multiple mine results. Much larger areas were enclosed by the computed contours for multiple mines than for any of the single mines. The plume rise

mainly reduced the very high concentrations near the mine. Farther downwind, the predicted radon concentrations became the same order of magnitude.

As a result of the importance of plume rise, the orientation of the vent exhaust is critical. A vertical vent has an initial upward velocity, which is the main source of energy for plume rise. A horizontal vent has no initial vertical velocity, and is modeled as an area surface release with no plume rise. The individual and multiple mine computations with horizontal vent releases clearly show the importance of vent orientation in estimated radon concentrations in the immediate vicinity of the mine.

These results indicate that no single computation will be representative of all mines. Depending on local conditions and influences, the impact may be anywhere between maximum radon concentrations for a release with no plume rise and minimum levels for a release with plume rise. In addition the impact will change depending on the radon emission rate.

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APPENDIX A
METEOROLOGICAL SUMMARIES

TABLE A-1a. Cedar City Meteorological Data (Source 1 in Table C-1)

* FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY *

SEASON 1

STABILITY CATEGORY 1

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPH)	WIND SPEED CATEGORY 2 (2.5000MPH)	WIND SPEED CATEGORY 3 (4.3000MPH)	WIND SPEED CATEGORY 4 (6.8000MPH)	WIND SPEED CATEGORY 5 (9.5000MPH)	WIND SPEED CATEGORY 6 (12.5000MPH)
0.000	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00002000	0.00017002	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00002000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000

A.1

TABLE A-1b.

SEASON 1

STABILITY CATEGORY 2

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1	WIND SPEED CATEGORY 2	WIND SPEED CATEGORY 3	WIND SPEED CATEGORY 4	WIND SPEED CATEGORY 5	WIND SPEED CATEGORY 6
	(0.7500MPS)	(2.5000MPS)	(4.3000MPS)	(6.8000MPS)	(9.5000MPS)	(12.5000MPS)
0.000	0.00029004	0.00017002	0.00017002	0.00000000	0.00000000	0.00000000
22.500	0.00029004	0.00051007	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00029004	0.00000000	0.00017002	0.00000000	0.00000000	0.00000000
67.500	0.00029004	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00029004	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00029004	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00029004	0.00017002	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00029004	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00029004	0.00017002	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00029004	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00029004	0.00017002	0.00017002	0.00000000	0.00000000	0.00000000
247.500	0.00029004	0.00034005	0.00034005	0.00000000	0.00000000	0.00000000
270.000	0.00029004	0.00034005	0.00034005	0.00000000	0.00000000	0.00000000
292.500	0.00029004	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00029004	0.00017002	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00029004	0.00000000	0.00017002	0.00000000	0.00000000	0.00000000

TABLE A-1c.

SEASON 1

STABILITY CATEGORY 3

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00176025	0.00222031	0.00410058	0.00103014	0.00017002	0.00000000
22.500	0.00176025	0.00085012	0.00171024	0.00017002	0.00000000	0.00000000
45.000	0.00176025	0.00120017	0.00051007	0.00000000	0.00000000	0.00000000
67.500	0.00176025	0.00068010	0.00017002	0.00000000	0.00000000	0.00000000
90.000	0.00176025	0.00068010	0.00034005	0.00000000	0.00000000	0.00000000
112.500	0.00176025	0.00017002	0.00017002	0.00017002	0.00017002	0.00000000
135.000	0.00176025	0.00068010	0.00034005	0.00000000	0.00000000	0.00000000
157.500	0.00176025	0.00051007	0.00051007	0.00034005	0.00000000	0.00000000
180.000	0.00176025	0.00171024	0.00188026	0.00154022	0.00137019	0.00017002
202.500	0.00176025	0.00222031	0.00427060	0.00427060	0.00205029	0.00017002
225.000	0.00176025	0.00137019	0.00376053	0.00342048	0.00120017	0.00017002
247.500	0.00176025	0.00205029	0.00154022	0.00085012	0.00017002	0.00000000
270.000	0.00176025	0.00103014	0.00222031	0.00120017	0.00000000	0.00000000
292.500	0.00176025	0.00085012	0.00103014	0.00034005	0.00000000	0.00000000
315.000	0.00176025	0.00137019	0.00205029	0.00051007	0.00000000	0.00000000
337.500	0.00176025	0.00171024	0.00256036	0.00051007	0.00000000	0.00000000

A.3

TABLE A-1d.

SEASON 1

STABILITY CATEGORY 4

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00292041	0.00598084	0.01471207	0.01881264	0.00188026	0.00085012
22.500	0.00292041	0.00667094	0.00855120	0.01505211	0.00239034	0.00034005
45.000	0.00309043	0.00376053	0.00308043	0.00256036	0.00000000	0.00000000
67.500	0.00292041	0.00154022	0.00103014	0.00051007	0.00000000	0.00000000
90.000	0.00292041	0.00171024	0.00188026	0.00154022	0.00017002	0.00000000
112.500	0.00292041	0.00222031	0.00188026	0.00120017	0.00017002	0.00000000
135.000	0.00292041	0.00274039	0.00513072	0.00194022	0.00017002	0.00017002
157.500	0.00309043	0.00393055	0.00547077	0.00103014	0.00068010	0.00000000
180.000	0.00309043	0.00650091	0.01197168	0.02274320	0.00992139	0.00513072
202.500	0.00292041	0.00410058	0.01676236	0.03967557	0.01522214	0.00496070
225.000	0.00292041	0.00427060	0.01129159	0.02394336	0.01009142	0.00068010
247.500	0.00292041	0.00308043	0.00462065	0.00547077	0.00085012	0.00000000
270.000	0.00292041	0.00393055	0.00393055	0.00445063	0.00120017	0.00034005
292.500	0.00292041	0.00239034	0.00205029	0.00120017	0.00017002	0.00000000
315.000	0.00292041	0.00325046	0.00239034	0.00137019	0.00034005	0.00000000
337.500	0.00292041	0.00274039	0.00547077	0.00376053	0.00034005	0.00000000

A.4

TABLE A-1e.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 5

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00446063	0.00633089	0.00872122	0.00103014	0.00017002	0.00000000
22.500	0.00446063	0.00547077	0.00547077	0.00034005	0.00017002	0.00000000
45.000	0.00446063	0.00376053	0.00393055	0.00000000	0.00000000	0.00000000
67.500	0.00446063	0.00188026	0.00120017	0.00000000	0.00000000	0.00000000
90.000	0.00446063	0.00239034	0.00256036	0.00017002	0.00000000	0.00000000
112.500	0.00446063	0.00359050	0.00821115	0.00000000	0.00000000	0.00000000
135.000	0.00463065	0.00769108	0.02137300	0.00000000	0.00017002	0.00000000
157.500	0.00446063	0.00598084	0.02103295	0.00034005	0.00000000	0.00000000
180.000	0.00446063	0.01146161	0.02069291	0.00171024	0.00017002	0.00000000
202.500	0.00446063	0.00547077	0.01590223	0.00239034	0.00034005	0.00000000
225.000	0.00446063	0.00479067	0.00547077	0.00137019	0.00017002	0.00000000
247.500	0.00446063	0.00325046	0.00222031	0.00017002	0.00000000	0.00000000
270.000	0.00446063	0.00342048	0.00085012	0.00017002	0.00000000	0.00000000
292.500	0.00446063	0.00103014	0.00017002	0.00000000	0.00000000	0.00000000
315.000	0.00446063	0.00222031	0.00034005	0.00000000	0.00000000	0.00000000
337.500	0.00446063	0.00120017	0.00120017	0.00000000	0.00000000	0.00000000

A.5

TABLE A-1f.

SEASON 1

STABILITY CATEGORY 6

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00791111	0.00256036	0.00034005	0.00000000	0.00000000	0.00000000
22.500	0.00791111	0.00342048	0.00000000	0.00017002	0.00000000	0.00000000
45.000	0.00774109	0.00564079	0.00051007	0.00000000	0.00000000	0.00000000
67.500	0.00774109	0.00427060	0.00017002	0.00000000	0.00000000	0.00000000
90.000	0.00774109	0.00684096	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00791111	0.00547077	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00774109	0.01573221	0.00120017	0.00000000	0.00000000	0.00000000
157.500	0.00791111	0.01300183	0.00051007	0.00000000	0.00000000	0.00000000
180.000	0.00808114	0.01556219	0.00051007	0.00017002	0.00000000	0.00000000
202.500	0.00774109	0.00752106	0.00034005	0.00017002	0.00000000	0.00000000
225.000	0.00774109	0.00376053	0.00034005	0.00017002	0.00000000	0.00000000
247.500	0.00774109	0.00222031	0.00017002	0.00000000	0.00000000	0.00000000
270.000	0.00774109	0.00137019	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00774109	0.00103014	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00774109	0.00085012	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00774109	0.00103014	0.00000000	0.00000000	0.00000000	0.00000000

A.6

TABLE A-2a. Grand Junction/Uravan Meteorological Data (Source 2 in Table C-1)

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 1

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00009103	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00036413	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00018207	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00027310	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00154756	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00518849	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00782886	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00127447	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00081930	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00009103	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00018207	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00009103	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00045517	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00045517	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00091033	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00036413	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-2b.

SEASON 1

STABILITY CATEGORY 2

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1	WIND SPEED CATEGORY 2	WIND SPEED CATEGORY 3	WIND SPEED CATEGORY 4	WIND SPEED CATEGORY 5	WIND SPEED CATEGORY 6
	(0.7500MPS)	(2.5000MPS)	(4.3000MPS)	(6.8000MPS)	(9.5000MPS)	(12.5000MPS)
0.000	0.00036413	0.00045517	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00127447	0.00063723	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00063723	0.00018207	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00091033	0.00009103	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00591716	0.00063723	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.01948111	0.00191170	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.02958580	0.00846609	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00473373	0.00200273	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00318616	0.00072827	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00036413	0.00018207	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00072827	0.00027310	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00027310	0.00009103	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00172963	0.00063723	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00182066	0.00136550	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00327720	0.00527993	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00118343	0.00227583	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-2c.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 3

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00227583	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00309513	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00109240	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00045517	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.00327720	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.09649523	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.04269459	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.01010469	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00373236	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00100137	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00127447	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.00054620	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00300410	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00682749	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.02667274	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.01165225	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-2d.

SEASON 1

STABILITY CATEGORY 4

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00227583	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00364133	0.00172963	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00127447	0.00063723	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00054620	0.00009103	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.00373236	0.00254893	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.01110605	0.01274465	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.04943104	0.04533455	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.01165225	0.00291306	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00427856	0.00118343	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00118343	0.00009103	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00145653	0.00054620	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.00063723	0.00054620	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00345926	0.00883022	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00791989	0.00819299	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.03086027	0.04433318	0.00172963	0.00000000	0.00000000
337.500	0.00000000	0.01347292	0.01766045	0.00063723	0.00000000	0.00000000

A.10

TABLE A-2e.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 5

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1	WIND SPEED CATEGORY 2	WIND SPEED CATEGORY 3	WIND SPEED CATEGORY 4	WIND SPEED CATEGORY 5	WIND SPEED CATEGORY 6
	(0.7500MPS)	(2.5000MPS)	(4.3000MPS)	(6.8000MPS)	(9.5000MPS)	(12.5000MPS)
0.000	0.00054620	0.00063723	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00182066	0.00081930	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00091033	0.00027310	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00127447	0.00009103	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00828402	0.00091033	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.02703687	0.00263996	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.04114702	0.01174329	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00655439	0.00282203	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00436960	0.00100137	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00054620	0.00027310	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00100137	0.00036413	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00036413	0.00018207	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00236686	0.00081930	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00254893	0.00191170	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00455166	0.00737369	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00172963	0.00318616	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-2f.

SEASON 1

STABILITY CATEGORY 6

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00100137	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00409650	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00200273	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00309513	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.01756941	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.05862540	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.08921257	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.01447428	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00928539	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00100137	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00200273	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00100137	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00518889	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00518889	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.01037779	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00409650	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-3a. Grand Junction/Urban/Lisban Meteorological Data (Source 3 in Table C-1)

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 1

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1	WIND SPEED CATEGORY 2	WIND SPEED CATEGORY 3	WIND SPEED CATEGORY 4	WIND SPEED CATEGORY 5	WIND SPEED CATEGORY 6
	(0.7500MPS)	(2.5000MPS)	(4.3000MPS)	(6.8000MPS)	(9.5000MPS)	(12.5000MPS)
0.000	0.00000000	0.00008052	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00042944	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00026840	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00161039	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.00190563	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.00727360	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.00222771	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.00152987	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00037576	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00080520	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00024156	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.00158355	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00059048	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00104675	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00024156	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.00059048	0.00000000	0.00000000	0.00000000	0.00000000

A.13

TABLE A-3b.

SEASON 1

STABILITY CATEGORY 2

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1	WIND SPEED CATEGORY 2	WIND SPEED CATEGORY 3	WIND SPEED CATEGORY 4	WIND SPEED CATEGORY 5	WIND SPEED CATEGORY 6
	(0.7500MPS)	(2.5000MPS)	(4.3000MPS)	(6.8000MPS)	(9.5000MPS)	(12.5000MPS)
0.000	0.00000000	0.00034892	0.00045628	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00147619	0.00072468	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00093940	0.00026840	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00536797	0.00053680	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.00730044	0.00077836	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.02734982	0.00268399	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.00845456	0.00241559	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.00571689	0.00241559	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00150303	0.00034892	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00316710	0.00158355	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00099308	0.00037576	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.00477750	0.00158355	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00225455	0.00083204	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00418702	0.00314026	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00083204	0.00134199	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.00193247	0.00373074	0.00000000	0.00000000	0.00000000

A.14

TABLE A-3c.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 3

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1	WIND SPEED CATEGORY 2	WIND SPEED CATEGORY 3	WIND SPEED CATEGORY 4	WIND SPEED CATEGORY 5	WIND SPEED CATEGORY 6
	(0.7500MPS)	(2.5000MPS)	(4.3000MPS)	(6.8000MPS)	(9.5000MPS)	(12.5000MPS)
A.15 0.000	0.00000000	0.00000000	0.00222771	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00000000	0.00356970	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00000000	0.00161039	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00000000	0.00268399	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.00000000	0.00402598	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.00000000	0.13546079	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.00000000	0.01218530	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.00000000	0.01218530	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00000000	0.00174459	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00000000	0.00872296	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00000000	0.00171775	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.00000000	0.00955499	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00000000	0.00391862	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00000000	0.01572816	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00000000	0.00681733	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.00000000	0.01910998	0.00000000	0.00000000	0.00000000

TABLE A-3d.

SEASON 1

STABILITY CATEGORY 4

DIRECTION (DEGREE)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00000000	0.00222771	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00000000	0.00418702	0.00198515	0.00000000	0.00000000
45.000	0.00000000	0.00000000	0.00187879	0.00093940	0.00000000	0.00000000
67.500	0.00000000	0.00000000	0.00322078	0.00053680	0.00000000	0.00000000
90.000	0.00000000	0.00000000	0.00458962	0.00314026	0.00000000	0.00000000
112.500	0.00000000	0.00000000	0.01559396	0.01790219	0.00000000	0.00000000
135.000	0.00000000	0.00000000	0.01411777	0.01293681	0.00000000	0.00000000
157.500	0.00000000	0.00000000	0.01403725	0.00351602	0.00000000	0.00000000
180.000	0.00000000	0.00000000	0.00201299	0.00056364	0.00000000	0.00000000
202.500	0.00000000	0.00000000	0.01033335	0.00080520	0.00000000	0.00000000
225.000	0.00000000	0.00000000	0.00195931	0.00072468	0.00000000	0.00000000
247.500	0.00000000	0.00000000	0.01113854	0.00955499	0.00000000	0.00000000
270.000	0.00000000	0.00000000	0.00450910	0.01151430	0.00000000	0.00000000
292.500	0.00000000	0.00000000	0.01825111	0.01889526	0.00000000	0.00000000
315.000	0.00000000	0.00000000	0.00789092	0.01132642	0.00042944	0.00000000
337.500	0.00000000	0.00000000	0.02211605	0.02898706	0.00104675	0.00000000

A.15

TABLE A-3e.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON I

STABILITY CATEGORY 5

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00053680	0.00061732	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00209351	0.00093940	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00134199	0.00040260	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00751516	0.00053680	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.01019915	0.00112727	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.03795157	0.00370390	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.01175586	0.00335498	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.00789092	0.00340866	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00206667	0.00048312	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00475066	0.00238875	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00134199	0.00048312	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.00636105	0.00319394	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00308658	0.00107359	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00587793	0.00440174	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00115411	0.00187879	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.00284503	0.00523377	0.00000000	0.00000000	0.00000000

A.17

TABLE A-3f.

SEASON 1

STABILITY CATEGORY 6

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00099308	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00472382	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00295239	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.01827795	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.02163293	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.08231787	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.02547103	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.01744591	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00437490	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00872296	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00271083	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.01752643	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00676365	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.01197058	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00265715	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.00670997	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-4a. Casper Meteorological Data (Source 4 in Table C-1)

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 1

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00000000	0.00000000	0.00000000	0.00017003	0.00000000
247.500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000

A.19

TABLE A-4b.

SEASON 1

STABILITY CATEGORY 2

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00017003	0.00017003	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00034006	0.00051009	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00051009	0.00017003	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00017003	0.00068012	0.00000000	0.00000000	0.00000000
90.000	0.00017003	0.00068012	0.00034006	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.00017003	0.00017003	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.00051009	0.00034006	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.00034006	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00017003	0.00051009	0.00034006	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00034006	0.00017003	0.00000000	0.00017003	0.00000000
225.000	0.00000000	0.00085015	0.00017003	0.00000000	0.00000000	0.00000000
247.500	0.00034006	0.00017003	0.00085015	0.00000000	0.00000000	0.00000000
270.000	0.00034006	0.00120022	0.00017003	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00034006	0.00051009	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00051009	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00017003	0.00051009	0.00017003	0.00000000	0.00000000	0.00000000

A.20

TABLE A-4c.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 3

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1	WIND SPEED CATEGORY 2	WIND SPEED CATEGORY 3	WIND SPEED CATEGORY 4	WIND SPEED CATEGORY 5	WIND SPEED CATEGORY 6
	(0.7500MPH)	(2.5000MPH)	(4.3000MPH)	(6.8000MPH)	(9.5000MPH)	(12.5000MPH)
0.000	0.00073013	0.00137025	0.00188034	0.00017003	0.00017003	0.00000000
22.500	0.00004001	0.00120022	0.00171031	0.00120022	0.00000000	0.00000000
45.000	0.00021004	0.00205037	0.00103019	0.00000000	0.00000000	0.00000000
67.500	0.00021004	0.00103019	0.00085015	0.00000000	0.00000000	0.00000000
90.000	0.00021004	0.00188034	0.00291053	0.00051009	0.00000000	0.00000000
112.500	0.00021004	0.00205037	0.00308056	0.00034006	0.00000000	0.00000000
135.000	0.00021004	0.00137025	0.00085015	0.00051009	0.00000000	0.00017003
157.500	0.00038007	0.00085015	0.00120022	0.00017003	0.00000000	0.00000000
180.000	0.00021004	0.00085015	0.00205037	0.00068012	0.00000000	0.00000000
202.500	0.00004001	0.00188034	0.00325059	0.00188034	0.00051009	0.00000000
225.000	0.00021004	0.00051009	0.00633114	0.00342062	0.00120022	0.00034006
247.500	0.00056010	0.00103019	0.00616111	0.00171031	0.00017003	0.00000000
270.000	0.00004001	0.00120022	0.00564102	0.00171031	0.00017003	0.00000000
292.500	0.00056010	0.00222040	0.00222040	0.00034006	0.00000000	0.00000000
315.000	0.00004001	0.00137025	0.00274049	0.00034006	0.00017003	0.00000000
337.500	0.00021004	0.00085015	0.00239043	0.00000000	0.00000000	0.00017003

TABLE A-4d.

SEASON 1

STABILITY CATEGORY 4

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00127023	0.00547099	0.01180213	0.00992179	0.00308056	0.00051009
22.500	0.00059011	0.00718130	0.01163210	0.01727311	0.00393071	0.00051009
45.000	0.00059011	0.00513093	0.01077194	0.00923166	0.00068012	0.00000000
67.500	0.00059011	0.00667120	0.01026185	0.00616111	0.00068012	0.00000000
90.000	0.00076014	0.00462083	0.01317238	0.01043188	0.00154028	0.00000000
112.500	0.00059011	0.00359065	0.00462083	0.00188034	0.00034006	0.00000000
135.000	0.00025005	0.00256046	0.00103019	0.00188034	0.00017003	0.00000000
157.500	0.00059011	0.00103019	0.00154028	0.00034006	0.00000000	0.00000000
180.000	0.00059011	0.00239043	0.00342062	0.00291053	0.00068012	0.00017003
202.500	0.00025005	0.00154028	0.00616111	0.02992540	0.02103379	0.00752136
225.000	0.00007001	0.00274049	0.01556281	0.10090820	0.06294135	0.03283592
247.500	0.00042008	0.00496089	0.01932348	0.03676663	0.01009182	0.00701126
270.000	0.00042008	0.00530096	0.00940170	0.01966355	0.00462083	0.00274049
292.500	0.00042008	0.00410074	0.00325059	0.00872157	0.00291053	0.00120022
315.000	0.00110020	0.00325059	0.00513093	0.00342062	0.00120022	0.00017003
337.500	0.00007001	0.00308056	0.00462083	0.00274049	0.00051009	0.00017003

TABLE A-4e.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 5

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00055010	0.00650117	0.00530096	0.00017003	0.00000000	0.00000000
22.500	0.00055010	0.00445080	0.00256046	0.00017003	0.00000000	0.00000000
45.000	0.00020004	0.00616111	0.00291053	0.00000000	0.00000000	0.00000000
67.500	0.00020004	0.00308956	0.00239043	0.00000000	0.00000000	0.00000000
90.000	0.00072013	0.00393071	0.00393071	0.00000000	0.00000000	0.00000000
112.500	0.00037007	0.00171031	0.00085015	0.00017003	0.00000000	0.00000000
135.000	0.00055010	0.00205037	0.00085015	0.00000000	0.00000000	0.00000000
157.500	0.00055010	0.00085015	0.00051009	0.00000000	0.00000000	0.00000000
180.000	0.00089016	0.00274049	0.00188034	0.00000000	0.00000000	0.00000000
202.500	0.00020004	0.00137025	0.00479086	0.00137025	0.00000000	0.00000000
225.000	0.00055010	0.00684123	0.02223401	0.00256046	0.00034006	0.00000000
247.500	0.00055010	0.00769139	0.04138746	0.00154028	0.00017003	0.00000000
270.000	0.00089016	0.00889160	0.01180213	0.00000000	0.00000000	0.00000000
292.500	0.00072013	0.00445080	0.00393071	0.00000000	0.00000000	0.00000000
315.000	0.00020004	0.00547099	0.00393071	0.00000000	0.00000000	0.00000000
337.500	0.00037007	0.00308056	0.00205037	0.00000000	0.00000000	0.00000000

TABLE A-4f.

SEASON 1

STABILITY CATEGORY 6

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00063011	0.00547099	0.00034006	0.00000000	0.00000000	0.00000000
22.500	0.00080014	0.00427077	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00029005	0.00205037	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00080014	0.00205037	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00046008	0.00085015	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00029005	0.00120022	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00063011	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00097017	0.00034006	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00046008	0.00120022	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00063011	0.00103019	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00063011	0.00359065	0.00051009	0.00000000	0.00000000	0.00000000
247.500	0.00183033	0.00923166	0.00137025	0.00000000	0.00000000	0.00000000
270.000	0.00097017	0.01077194	0.00034006	0.00000000	0.00000000	0.00000000
292.500	0.00131024	0.00581105	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00080014	0.00445080	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00131024	0.00410074	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-5a. La Polvadera Valley Meteorological Data (Source 5 in Table C-1)

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 1

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00041771	0.00083542	0.00041771	0.00041771	0.00000000	0.00000000
22.500	0.00000000	0.00125313	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00125313	0.00125313	0.00041771	0.00000000	0.00000000	0.00000000
67.500	0.00083542	0.00125313	0.00083542	0.00000000	0.00000000	0.00000000
90.000	0.00250626	0.00459482	0.00083542	0.00000000	0.00000000	0.00000000
112.500	0.00208855	0.00208855	0.00083542	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.00000000	0.00000000	0.00083542	0.00000000	0.00000000
157.500	0.00041771	0.00000000	0.00000000	0.00041771	0.00000000	0.00000000
180.000	0.00041771	0.00041771	0.00041771	0.00000000	0.00000000	0.00000000
202.500	0.00041771	0.00000000	0.00041771	0.00041771	0.00000000	0.00000000
225.000	0.00041771	0.00125313	0.00000000	0.00000000	0.00041771	0.00000000
247.500	0.00083542	0.00000000	0.00083542	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00000000	0.00041771	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00000000	0.00041771	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00000000	0.00083542	0.00041771	0.00000000	0.00041771
337.500	0.00000000	0.00083542	0.00000000	0.00041771	0.00000000	0.00000000

TABLE A-5b.

SEASON 1

STABILITY CATEGORY 2

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00167084	0.00250626	0.00167084	0.00000000	0.00000000	0.00000000
22.500	0.00083542	0.00250626	0.00167084	0.00000000	0.00000000	0.00000000
45.000	0.00041771	0.00250626	0.00167084	0.00000000	0.00000000	0.00000000
67.500	0.00041771	0.00208855	0.00167084	0.00000000	0.00000000	0.00000000
90.000	0.00292398	0.00292398	0.00334169	0.00083542	0.00000000	0.00000000
112.500	0.00083542	0.00125313	0.00208855	0.00334169	0.00041771	0.00000000
135.000	0.00083542	0.00125313	0.00334169	0.00334169	0.00041771	0.00000000
157.500	0.00041771	0.00125313	0.00250626	0.00208855	0.00000000	0.00000000
180.000	0.00041771	0.00208855	0.00584795	0.00417711	0.00125313	0.00083542
202.500	0.00125313	0.00083542	0.00501253	0.00125313	0.00000000	0.00000000
225.000	0.00125313	0.00083542	0.00167084	0.00334169	0.00041771	0.00000000
247.500	0.00083542	0.00167084	0.00250626	0.00083542	0.00041771	0.00125313
270.000	0.00125313	0.00125313	0.00125313	0.00125313	0.00000000	0.00041771
292.500	0.00125313	0.00167084	0.00125313	0.00125313	0.00000000	0.00125313
315.000	0.00125313	0.00375940	0.00250626	0.00041771	0.00083542	0.00041771
337.500	0.00000000	0.00167084	0.00125313	0.00041771	0.00000000	0.00000000

TABLE A-5c.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 3

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00167084	0.00292398	0.00167084	0.00041771	0.00000000	0.00000000
22.500	0.00083542	0.00167084	0.00000000	0.00083542	0.00000000	0.00000000
45.000	0.00125313	0.00250626	0.00083542	0.00000000	0.00000000	0.00000000
67.500	0.00083542	0.00292398	0.00083542	0.00000000	0.00041771	0.00000000
90.000	0.00334169	0.00208855	0.00292398	0.00125313	0.00000000	0.00000000
112.500	0.00083542	0.00041771	0.00041771	0.00292398	0.00000000	0.00000000
135.000	0.00000000	0.00125313	0.00167084	0.00083542	0.00000000	0.00000000
157.500	0.00083542	0.00208855	0.00208855	0.00083542	0.00041771	0.00000000
180.000	0.00125313	0.00375940	0.00751879	0.00334169	0.00041771	0.00000000
202.500	0.00041771	0.00208855	0.00459482	0.00417711	0.00167084	0.00000000
225.000	0.00041771	0.00584795	0.00501253	0.00459482	0.00292398	0.00041771
247.500	0.00208855	0.00292398	0.00417711	0.00501253	0.00167084	0.00292398
270.000	0.00334169	0.00167084	0.00167084	0.00041771	0.00000000	0.00000000
292.500	0.00041771	0.00083542	0.00041771	0.00167084	0.00167084	0.00000000
315.000	0.00125313	0.00208855	0.00292398	0.00292398	0.00083542	0.00000000
337.500	0.00083542	0.00125313	0.00334169	0.00000000	0.00000000	0.00041771

TABLE A-5d.

SEASON 1

STABILITY CATEGORY 4

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00668337	0.00877193	0.00584795	0.00125313	0.00000000	0.00000000
22.500	0.00250626	0.00668337	0.00375940	0.00083542	0.00083542	0.00000000
45.000	0.00250626	0.00375940	0.00208855	0.00000000	0.00041771	0.00000000
67.500	0.00292398	0.00584795	0.00292398	0.00000000	0.00041771	0.00000000
90.000	0.00835422	0.00710108	0.00208855	0.00083542	0.00000000	0.00000000
112.500	0.00292398	0.00292398	0.00292398	0.00083542	0.00041771	0.00041771
135.000	0.00208855	0.00167084	0.00417711	0.00208855	0.00041771	0.00000000
157.500	0.00334169	0.00125313	0.00375940	0.00208855	0.00041771	0.00000000
180.000	0.00501253	0.00960735	0.01378446	0.00835422	0.00083542	0.00000000
202.500	0.00543024	0.00960735	0.01879699	0.01211361	0.00208855	0.00000000
225.000	0.01044277	0.02255639	0.01503759	0.01378446	0.00375940	0.00125313
247.500	0.01461988	0.01567301	0.00918964	0.00710108	0.00125313	0.00334169
270.000	0.01169590	0.00626566	0.00793651	0.00375940	0.00000000	0.00000000
292.500	0.00459482	0.00375940	0.00459482	0.00167084	0.00083542	0.00000000
315.000	0.00250626	0.00292398	0.00626566	0.00125313	0.00125313	0.00041771
337.500	0.00334169	0.00292398	0.00793651	0.00167084	0.00083542	0.00000000

TABLE A-5e.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 5

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00125313	0.00250626	0.00125313	0.00041771	0.00000000	0.00000000
22.500	0.00000000	0.00125313	0.00041771	0.00000000	0.00000000	0.00000000
45.000	0.00167084	0.00167084	0.00041771	0.00041771	0.00000000	0.00000000
67.500	0.00041771	0.00208855	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00334169	0.00125313	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00083542	0.00250626	0.00083542	0.00000000	0.00000000	0.00000000
135.000	0.00083542	0.00167084	0.00041771	0.00041771	0.00000000	0.00000000
157.500	0.00208855	0.00083542	0.00167084	0.00000000	0.00000000	0.00000000
180.000	0.00250626	0.00125313	0.00208855	0.00208855	0.00000000	0.00041771
202.500	0.00417711	0.00626566	0.01002506	0.00167084	0.00041771	0.00000000
225.000	0.00334169	0.01712614	0.00751879	0.00041771	0.00041771	0.00000000
247.500	0.00626566	0.01044277	0.00334169	0.00041771	0.00041771	0.00000000
270.000	0.00584795	0.00208855	0.00041771	0.00041771	0.00000000	0.00000000
292.500	0.00208855	0.00083542	0.00000000	0.00083542	0.00000000	0.00000000
315.000	0.00125313	0.00041771	0.00041771	0.00000000	0.00000000	0.00000000
337.500	0.00083542	0.00041771	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-5f.

SEASON 1

STABILITY CATEGORY 6

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00250626	0.00000000	0.00041771	0.00000000	0.00000000	0.00000000
22.500	0.00041771	0.00083542	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00250626	0.00167084	0.00083542	0.00000000	0.00000000	0.00000000
67.500	0.00083542	0.00083542	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00208855	0.00125313	0.00041771	0.00041771	0.00000000	0.00000000
112.500	0.00125313	0.00125313	0.00041771	0.00000000	0.00000000	0.00000000
135.000	0.00041771	0.00000000	0.00000000	0.00000000	0.00041771	0.00000000
157.500	0.00250626	0.00250626	0.00125313	0.00000000	0.00000000	0.00000000
180.000	0.00334169	0.00167084	0.00125313	0.00041771	0.00041771	0.00000000
202.500	0.00375940	0.00710108	0.01378446	0.00041771	0.00000000	0.00000000
225.000	0.00335422	0.03174602	0.00626566	0.00083542	0.00041771	0.00041771
247.500	0.01503759	0.03091060	0.00167084	0.00041771	0.00000000	0.00041771
270.000	0.01712614	0.01169590	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00626566	0.00417711	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00083542	0.00083542	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00125313	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000

A.30

TABLE A.6a. Gallup Meteorological Data (Source 6 in Table C.1)

SEASON 1

STABILITY CATEGORY 1

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00067810	0.00041106	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00056508	0.00034205	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00067810	0.00041106	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00022603	0.00013702	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00067810	0.00041106	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00097314	0.00047907	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00045206	0.00027404	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00022603	0.00013702	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00074711	0.00034205	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00045206	0.00027404	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00079211	0.00047907	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00226232	0.00137020	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00135719	0.00082212	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00101815	0.00061609	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00045206	0.00027404	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00045206	0.00034205	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A.6b. (Contd).

SEASON 1

STABILITY CATEGORY 2

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00467767	0.00212330	0.00082212	0.00000000	0.00000000	0.00000000
22.500	0.00172025	0.00075311	0.00054808	0.00000000	0.00000000	0.00000000
45.000	0.00378354	0.00157523	0.00075311	0.00000000	0.00000000	0.00000000
67.500	0.00240834	0.00109616	0.00075311	0.00000000	0.00000000	0.00000000
90.000	0.00240834	0.00109616	0.00075311	0.00000000	0.00000000	0.00000000
112.500	0.00082612	0.00041106	0.00027404	0.00000000	0.00000000	0.00000000
135.000	0.00158223	0.00068510	0.00041106	0.00000000	0.00000000	0.00000000
157.500	0.00172025	0.00075311	0.00034205	0.00000000	0.00000000	0.00000000
180.000	0.00247735	0.00123318	0.00095914	0.00000000	0.00000000	0.00000000
202.500	0.00240734	0.00089013	0.00102715	0.00000000	0.00000000	0.00000000
225.000	0.00302743	0.00150722	0.00198628	0.00000000	0.00000000	0.00000000
247.500	0.00598486	0.00267138	0.00246635	0.00000000	0.00000000	0.00000000
270.000	0.00646692	0.00301443	0.00226032	0.00000000	0.00000000	0.00000000
292.500	0.00295842	0.00137020	0.00123318	0.00000000	0.00000000	0.00000000
315.000	0.00399057	0.00178125	0.00082212	0.00000000	0.00000000	0.00000000
337.500	0.00192628	0.00075311	0.00082212	0.00000000	0.00000000	0.00000000

TABLE A.6c. (Contd)

SEASON 1

STABILITY CATEGORY 3

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00098914	0.00239734	0.00246635	0.00020503	0.00000000	0.00000000
22.500	0.00097314	0.00212330	0.00150722	0.00020503	0.00000000	0.00000000
45.000	0.00130019	0.00315145	0.00164423	0.00027404	0.00006801	0.00000000
67.500	0.00132919	0.00321946	0.00376754	0.00020503	0.00006801	0.00000000
90.000	0.00059408	0.00143821	0.00205529	0.00020503	0.00000000	0.00000000
112.500	0.00022603	0.00054808	0.00054808	0.00006801	0.00000000	0.00000000
135.000	0.00017002	0.00041106	0.00075311	0.00013702	0.00006801	0.00000000
157.500	0.00022603	0.00054808	0.00089013	0.00006801	0.00000000	0.00000000
180.000	0.00070710	0.00171224	0.00274039	0.00075311	0.00027404	0.00000000
202.500	0.00084812	0.00205529	0.00383655	0.00171224	0.00034205	0.00027404
225.000	0.00148221	0.00335648	0.00657594	0.00411059	0.00184926	0.00075311
247.500	0.00223332	0.00541177	0.00972739	0.00452165	0.00246635	0.00041106
270.000	0.00213230	0.00493270	0.00602786	0.00315145	0.00054808	0.00006801
292.500	0.00110316	0.00267138	0.00328847	0.00109616	0.00020503	0.00000000
315.000	0.00053708	0.00130119	0.00130119	0.00047907	0.00006801	0.00000000
337.500	0.00042406	0.00102715	0.00095914	0.00006801	0.00006801	0.00000000

TABLE A.6d. (Contd)

SEASON 1

STABILITY CATEGORY 4

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00114316	0.00205529	0.00417860	0.00342549	0.00020503	0.00013702
22.500	0.00082112	0.00130119	0.00349350	0.00260337	0.00020503	0.00006801
45.000	0.00114316	0.00205529	0.00335648	0.00239734	0.00006801	0.00000000
67.500	0.00118117	0.00212330	0.00589084	0.00335648	0.00047907	0.00006801
90.000	0.00091413	0.00164423	0.00465867	0.00294542	0.00068510	0.00006801
112.500	0.00053308	0.00095914	0.00143821	0.00082212	0.00006801	0.00006801
135.000	0.00038185	0.00068510	0.00150722	0.00137020	0.00027404	0.00006801
157.500	0.00083812	0.00150722	0.00328847	0.00308244	0.00075311	0.00020503
180.000	0.00171525	0.00308244	0.01013845	0.00705601	0.00102715	0.00034205
202.500	0.00163223	0.00274039	0.01287884	0.01096057	0.00280840	0.00068510
225.000	0.00224032	0.00383655	0.02013988	0.02938820	0.00863123	0.00328847
247.500	0.00228633	0.00411059	0.01815359	0.03247064	0.01294685	0.00445264
270.000	0.00141020	0.00253436	0.00965938	0.01548121	0.00445264	0.00116417
292.500	0.00076211	0.00137020	0.00342549	0.00623389	0.00164423	0.00020503
315.000	0.00038185	0.00068510	0.00246635	0.00363052	0.00054808	0.00013702
337.500	0.00041906	0.00075311	0.00150722	0.00123318	0.00034205	0.00000000

TABLE A.6e. (Contd)

SEASON 1

STABILITY CATEGORY 5

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00102715	0.00308244	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00191827	0.00239734	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00184926	0.00205529	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00157523	0.00205529	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.00212330	0.00178125	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.00157523	0.00089013	0.00000000	0.00000000	0.00000000
135.000	0.00000000	0.00232933	0.00075311	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.00191827	0.00171224	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00424761	0.00780912	0.00000000	0.00000000	0.00000000
202.500	0.00000000	0.00301443	0.00774111	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00342549	0.00993342	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.00404158	0.00767210	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00191827	0.00356251	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00082212	0.00205529	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00068510	0.00109616	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.00013702	0.00095914	0.00000000	0.00000000	0.00000000

TABLE A.6f. (Contd)

SEASON 1

STABILITY CATEGORY 6

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.01354394	0.00356251	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.01387198	0.00356251	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.02741592	0.00712402	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.02090499	0.00541177	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.02958123	0.00726104	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.01739549	0.00431562	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.01427004	0.00349350	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.01777954	0.00458966	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.03213159	0.00767210	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.01706644	0.00431562	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.02227518	0.00568581	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.02838906	0.00746707	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.01583226	0.00390456	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00468767	0.00123318	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00338548	0.00089013	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00390656	0.00102715	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-7a. Phillips Site Meteorological Data (Source 7 in Table C-1)

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 1

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
A.37 0.000	0.00039108	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00039108	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00058663	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00097771	0.00039108	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00078217	0.00078217	0.00000000	0.00000000	0.00000000	0.00000000
225.000	0.00078217	0.00097771	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00234650	0.00078217	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00039108	0.00136879	0.00000000	0.00000000	0.00000000	0.00000000
292.500	0.00078217	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00019554	0.00117325	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00058663	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-7b.

SEASON 1

STABILITY CATEGORY 2

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00039108	0.00097771	0.00000000	0.00000000	0.00000000	0.00000000
22.500	0.00058663	0.00058663	0.00019554	0.00000000	0.00000000	0.00000000
45.000	0.00039108	0.00039108	0.00019554	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00058663	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00058663	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00175988	0.00039108	0.00019554	0.00000000	0.00000000	0.00000000
180.000	0.00234650	0.00195542	0.00000000	0.00000000	0.00000000	0.00000000
202.500	0.00136879	0.00215096	0.00039108	0.00000000	0.00000000	0.00000000
225.000	0.00078217	0.00078217	0.00039108	0.00019554	0.00000000	0.00000000
247.500	0.00097771	0.00175988	0.00019554	0.00000000	0.00000000	0.00000000
270.000	0.00097771	0.00117325	0.00019554	0.00000000	0.00000000	0.00000000
292.500	0.00117325	0.00097771	0.00000000	0.00000000	0.00000000	0.00000000
315.000	0.00078217	0.00254204	0.00000000	0.00000000	0.00000000	0.00000000
337.500	0.00078217	0.00156433	0.00000000	0.00000000	0.00000000	0.00000000

A.38

TABLE A-7c.

* FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY *

SEASON 1

STABILITY CATEGORY 3

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00019554	0.00215096	0.00117325	0.00000000	0.00000000	0.00000000
22.500	0.00058663	0.00039108	0.00019554	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00097771	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00019554	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00019554	0.00019554	0.00000000	0.00000000	0.00000000	0.00000000
112.500	0.00078217	0.00078217	0.00000000	0.00000000	0.00000000	0.00000000
135.000	0.00117325	0.00039108	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00234650	0.00234650	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00449746	0.00391083	0.00078217	0.00000000	0.00000000	0.00000000
202.500	0.00195542	0.00332421	0.00293313	0.00000000	0.00000000	0.00000000
225.000	0.00195542	0.00175988	0.00078217	0.00019554	0.00000000	0.00000000
247.500	0.00136879	0.00195542	0.00312867	0.00058663	0.00000000	0.00000000
270.000	0.00332421	0.00371529	0.00234650	0.00078217	0.00000000	0.00000000
292.500	0.00156433	0.00410638	0.00039108	0.00000000	0.00000000	0.00000000
315.000	0.00195542	0.00215096	0.00215096	0.00000000	0.00000000	0.00000000
337.500	0.00039108	0.00215096	0.00195542	0.00019554	0.00000000	0.00000000

TABLE A-7d.

SEASON 1

STABILITY CATEGORY 4

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00879938	0.00664842	0.00195542	0.00039108	0.00000000	0.00000000
22.500	0.00488854	0.00117325	0.00058663	0.00019554	0.00000000	0.00000000
45.000	0.00547517	0.00117325	0.00058663	0.00000000	0.00000000	0.00000000
67.500	0.00449746	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
90.000	0.00684396	0.00019554	0.00019554	0.00000000	0.00000000	0.00000000
112.500	0.00469300	0.00136879	0.00039108	0.00019554	0.00000000	0.00000000
135.000	0.00684396	0.00293313	0.00156433	0.00000000	0.00000000	0.00000000
157.500	0.00469300	0.00273758	0.00117325	0.00019554	0.00000000	0.00000000
180.000	0.00547517	0.00625734	0.00488854	0.00175988	0.00000000	0.00000000
202.500	0.00410638	0.00567071	0.00645288	0.00097771	0.00019554	0.00000000
225.000	0.00449746	0.00234650	0.00567071	0.00371529	0.00117325	0.00000000
247.500	0.00312867	0.00351975	0.00547517	0.00645288	0.00058663	0.00000000
270.000	0.00410638	0.00449746	0.00762613	0.00743058	0.00097771	0.00000000
292.500	0.00273758	0.00469300	0.00527963	0.00332421	0.00039108	0.00000000
315.000	0.00586625	0.00371529	0.00547517	0.00215096	0.00000000	0.00000000
337.500	0.01036371	0.00684396	0.00547517	0.00097771	0.00019554	0.00000000

A.40

TABLE A-7e.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 5

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.01055925	0.01055925	0.00332421	0.00097771	0.00000000	0.00000000
22.500	0.01857646	0.00606179	0.00097771	0.00019554	0.00000000	0.00000000
45.000	0.01251467	0.00234650	0.00078217	0.00019554	0.00000000	0.00000000
67.500	0.01114588	0.00117325	0.00058663	0.00078217	0.00000000	0.00000000
90.000	0.01564334	0.00254204	0.00058663	0.00000000	0.00000000	0.00000000
112.500	0.00840829	0.00449746	0.00234650	0.00058663	0.00000000	0.00000000
135.000	0.00821275	0.00586625	0.00136879	0.00019554	0.00019554	0.00000000
157.500	0.00762613	0.00391083	0.00136879	0.00039108	0.00019554	0.00000000
180.000	0.00762613	0.00645288	0.00508408	0.00273758	0.00019554	0.00000000
202.500	0.00371529	0.00782167	0.00743058	0.00449746	0.00078217	0.00000000
225.000	0.00508408	0.00449746	0.00488854	0.00293313	0.00039108	0.00000000
247.500	0.00449746	0.00508408	0.00527963	0.00723504	0.00175988	0.00000000
270.000	0.00762613	0.00919046	0.01075479	0.01134142	0.00332421	0.00000000
292.500	0.00547517	0.00469300	0.00527963	0.00430192	0.00215096	0.00019554
315.000	0.01368792	0.00645288	0.00488854	0.00567071	0.00117325	0.00000000
337.500	0.01916309	0.01603442	0.00684396	0.00215096	0.00019554	0.00000000

A.41

TABLE A-7f.

SEASON 1

STABILITY CATEGORY 6

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.7500MPS)	WIND SPEED CATEGORY 2 (2.5000MPS)	WIND SPEED CATEGORY 3 (4.3000MPS)	WIND SPEED CATEGORY 4 (6.8000MPS)	WIND SPEED CATEGORY 5 (9.5000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00703950	0.01407900	0.00136879	0.00000000	0.00000000	0.00000000
22.500	0.02170513	0.02072742	0.00195542	0.00000000	0.00000000	0.00000000
45.000	0.01271021	0.00332421	0.00078217	0.00000000	0.00019554	0.00000000
67.500	0.00371529	0.00117325	0.00039108	0.00039108	0.00000000	0.00000000
90.000	0.00762613	0.00097771	0.00039108	0.00039108	0.00000000	0.00000000
112.500	0.00312867	0.00312867	0.00156433	0.00097771	0.00000000	0.00000000
135.000	0.00430192	0.00410638	0.00136879	0.00039108	0.00000000	0.00000000
157.500	0.00293313	0.00117325	0.00136879	0.00097771	0.00019554	0.00000000
180.000	0.00293313	0.00821275	0.00586625	0.00136879	0.00019554	0.00000000
202.500	0.00215096	0.00625734	0.00625734	0.00136879	0.00000000	0.00000000
225.000	0.00234650	0.00351975	0.00391083	0.00117325	0.00019554	0.00000000
247.500	0.00254204	0.00449746	0.00527963	0.00273758	0.00000000	0.00000000
270.000	0.00606179	0.00938600	0.01173250	0.00527963	0.00117325	0.00000000
292.500	0.00195542	0.00488854	0.00606179	0.00215096	0.00019554	0.00000000
315.000	0.00312867	0.00684396	0.00430192	0.00332421	0.00097771	0.00019554
337.500	0.01016817	0.01192804	0.00762613	0.00175988	0.00058663	0.00019554

A.42

TABLE A-8a. Nose Rock Meteorological Data (Source 8 in Table C-1)

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 1

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1	WIND SPEED CATEGORY 2	WIND SPEED CATEGORY 3	WIND SPEED CATEGORY 4	WIND SPEED CATEGORY 5	WIND SPEED CATEGORY 6
	(0.5000MPS)	(1.5000MPS)	(5.0000MPS)	(8.0000MPS)	(10.0000MPS)	(12.5000MPS)
A.43 0.000	0.00000000	0.00015480	0.00030960	0.00000000	0.00000000	0.00000000
22.500	0.00000000	0.00000000	0.00015480	0.00000000	0.00000000	0.00000000
45.000	0.00000000	0.00000000	0.00030960	0.00000000	0.00000000	0.00000000
67.500	0.00000000	0.00015480	0.00015480	0.00000000	0.00000000	0.00000000
90.000	0.00000000	0.00000000	0.00061920	0.00000000	0.00000000	0.00000000
112.500	0.00000000	0.00000000	0.00030960	0.00000000	0.00000000	0.00000000
135.000	0.00015480	0.00015480	0.00000000	0.00000000	0.00000000	0.00000000
157.500	0.00000000	0.00015480	0.00000000	0.00000000	0.00000000	0.00000000
180.000	0.00000000	0.00015480	0.00015480	0.00000000	0.00000000	0.00000000
202.500	0.00015480	0.00000000	0.00015480	0.00000000	0.00000000	0.00000000
225.000	0.00000000	0.00015480	0.00000000	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.00015480	0.00000000	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00015480	0.00015480	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00015480	0.00046440	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00015480	0.00015480	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.00015480	0.00000000	0.00000000	0.00000000	0.00000000

TABLE A-8b.

SEASON 1

STABILITY CATEGORY 2

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.5000MPS)	WIND SPEED CATEGORY 2 (1.5000MPS)	WIND SPEED CATEGORY 3 (5.0000MPS)	WIND SPEED CATEGORY 4 (8.0000MPS)	WIND SPEED CATEGORY 5 (10.0000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00092879	0.00154799	0.00108359	0.00077399	0.00000000	0.00000000
22.500	0.00077399	0.00185759	0.00123839	0.00000000	0.00000000	0.00000000
45.000	0.00061920	0.00077399	0.00000000	0.00000000	0.00000000	0.00000000
67.500	0.00123839	0.00201238	0.00123839	0.00046440	0.00000000	0.00000000
90.000	0.00154799	0.00402477	0.00294118	0.00092879	0.00000000	0.00000000
112.500	0.00092879	0.00263158	0.00092879	0.00061920	0.00000000	0.00000000
135.000	0.00108359	0.00433437	0.00061920	0.00077399	0.00000000	0.00000000
157.500	0.00185759	0.00154799	0.00123839	0.00108359	0.00000000	0.00000000
180.000	0.00232198	0.00386997	0.00092879	0.00092879	0.00000000	0.00000000
202.500	0.00061920	0.00185759	0.00077399	0.00108359	0.00000000	0.00000000
225.000	0.00108359	0.00123839	0.00015480	0.00015480	0.00000000	0.00000000
247.500	0.00108359	0.00108359	0.00092879	0.00108359	0.00000000	0.00000000
270.000	0.00108359	0.00247678	0.00263158	0.00185759	0.00000000	0.00000000
292.500	0.00046440	0.00139319	0.00294118	0.00170279	0.00000000	0.00000000
315.000	0.00061920	0.00170279	0.00185759	0.00216718	0.00000000	0.00000000
337.500	0.00123839	0.00154799	0.00154799	0.00077399	0.00000000	0.00000000

TABLE A-8c.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 3

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.5000MPS)	WIND SPEED CATEGORY 2 (1.5000MPS)	WIND SPEED CATEGORY 3 (5.0000MPS)	WIND SPEED CATEGORY 4 (8.0000MPS)	WIND SPEED CATEGORY 5 (10.0000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00077399	0.00123839	0.00108359	0.00000000	0.00000000
22.500	0.00000000	0.00030960	0.00077399	0.00108359	0.00000000	0.00000000
45.000	0.00015480	0.00046440	0.00030960	0.00077399	0.00000000	0.00000000
67.500	0.00000000	0.00015480	0.00030960	0.00092879	0.00030960	0.00000000
90.000	0.00015480	0.00201238	0.00216718	0.00278638	0.00108359	0.00000000
112.500	0.00046440	0.00356037	0.00495356	0.00448916	0.00061920	0.00092879
135.000	0.00030960	0.00340557	0.00619195	0.00603715	0.00139319	0.00015480
157.500	0.00000000	0.00247678	0.00448916	0.00386997	0.00123839	0.00170279
180.000	0.00030960	0.00123839	0.00448916	0.00185759	0.00170279	0.00123839
202.500	0.00015480	0.00046440	0.00092879	0.00247678	0.00201238	0.00170279
225.000	0.00015480	0.00000000	0.00077399	0.00309598	0.00201238	0.00139319
247.500	0.00000000	0.00030960	0.00077399	0.00340557	0.00154799	0.00201238
270.000	0.00000000	0.00108359	0.00185759	0.00448916	0.00495356	0.00046440
292.500	0.00000000	0.00030960	0.00201238	0.00603715	0.00356037	0.00046440
315.000	0.00030960	0.00154799	0.00123839	0.00433437	0.00232198	0.00046440
337.500	0.00000000	0.00108359	0.00154799	0.00232198	0.00092879	0.00000000

TABLE A-8d.

SEASON 1

STABILITY CATEGORY 4

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.5000MPS)	WIND SPEED CATEGORY 2 (1.5000MPS)	WIND SPEED CATEGORY 3 (5.0000MPS)	WIND SPEED CATEGORY 4 (8.0000MPS)	WIND SPEED CATEGORY 5 (10.0000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00030960	0.00139319	0.00077399	0.00046440	0.00046440
22.500	0.00000000	0.00015480	0.00061920	0.00046440	0.00046440	0.00000000
45.000	0.00000000	0.00061920	0.00015480	0.00046440	0.00046440	0.00030960
67.500	0.00015480	0.00030960	0.00015480	0.00108359	0.00030960	0.00061920
90.000	0.00015480	0.00123839	0.00123839	0.00294118	0.00495356	0.00325077
112.500	0.00000000	0.00015480	0.00139319	0.00712074	0.01609907	0.01563468
135.000	0.00015480	0.00170279	0.00123839	0.00681115	0.01346749	0.01687307
157.500	0.00015480	0.00077399	0.00170279	0.00433437	0.00990712	0.01377709
180.000	0.00030960	0.00201238	0.00201238	0.00619195	0.01114551	0.01253870
202.500	0.00015480	0.00030960	0.00123839	0.00526316	0.01702787	0.01873065
225.000	0.00000000	0.00077399	0.00139319	0.00557276	0.02105264	0.03204335
247.500	0.00015480	0.00108359	0.00154799	0.00433437	0.01578948	0.03467493
270.000	0.00030960	0.00123839	0.00108359	0.00464396	0.01547988	0.01996904
292.500	0.00030960	0.00030960	0.00077399	0.00170279	0.01424149	0.02198143
315.000	0.00015480	0.00092879	0.00077399	0.00278638	0.00866873	0.00727554
337.500	0.00000000	0.00046440	0.00092879	0.00294118	0.00541796	0.00263158

TABLE A-8e.

- FREQUENCY OF OCCURRENCE OF WIND SPEED, DIRECTION AND STABILITY -

SEASON 1

STABILITY CATEGORY 5

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.5000MPS)	WIND SPEED CATEGORY 2 (1.5000MPS)	WIND SPEED CATEGORY 3 (5.0000MPS)	WIND SPEED CATEGORY 4 (8.0000MPS)	WIND SPEED CATEGORY 5 (10.0000MPS)	WIND SPEED CATEGORY 6 (12.5000MPS)
0.000	0.00000000	0.00030960	0.00108359	0.00092879	0.00046440	0.00000000
22.500	0.00000000	0.00030960	0.00092879	0.00092879	0.00000000	0.00000000
45.000	0.00000000	0.00030960	0.00030960	0.00046440	0.00000000	0.00000000
67.500	0.00000000	0.00015480	0.00061920	0.00015480	0.00000000	0.00000000
90.000	0.00000000	0.00046440	0.00278638	0.00201238	0.00000000	0.00000000
112.500	0.00000000	0.00185759	0.00294118	0.00975232	0.00000000	0.00000000
135.000	0.00000000	0.00092879	0.00433437	0.02662539	0.00000000	0.00000000
157.500	0.00000000	0.00154799	0.00340557	0.02260062	0.00000000	0.00000000
180.000	0.00000000	0.00201238	0.00356037	0.01625387	0.00000000	0.00000000
202.500	0.00000000	0.00154799	0.00185759	0.01238390	0.00000000	0.00000000
225.000	0.00000000	0.00077399	0.00278638	0.00000000	0.00000000	0.00000000
247.500	0.00000000	0.00046440	0.00170279	0.00000000	0.00000000	0.00000000
270.000	0.00000000	0.00092879	0.00154799	0.00000000	0.00000000	0.00000000
292.500	0.00000000	0.00015480	0.00108359	0.00000000	0.00000000	0.00000000
315.000	0.00000000	0.00061920	0.00046440	0.00000000	0.00000000	0.00000000
337.500	0.00000000	0.00046440	0.00154799	0.00000000	0.00000000	0.00000000

A.47

TABLE A-8f.

SEASON 1

STABILITY CATEGORY 6

DIRECTION (DEGREES)	WIND SPEED CATEGORY 1 (0.5000MPH)	WIND SPEED CATEGORY 2 (1.5000MPH)	WIND SPEED CATEGORY 3 (5.0000MPH)	WIND SPEED CATEGORY 4 (8.0000MPH)	WIND SPEED CATEGORY 5 (10.0000MPH)	WIND SPEED CATEGORY 6 (12.5000MPH)
0.000	0.00061920	0.00092879	0.00123839	0.00000000	0.00000000	0.00000000
22.500	0.00046440	0.00123839	0.00092879	0.00000000	0.00000000	0.00000000
45.000	0.00046440	0.00046440	0.00061920	0.00000000	0.00000000	0.00000000
67.500	0.00077399	0.00046440	0.00092879	0.00000000	0.00000000	0.00000000
90.000	0.00077399	0.00386997	0.00464396	0.00000000	0.00000000	0.00000000
112.500	0.00046440	0.00433437	0.00944273	0.00000000	0.00000000	0.00000000
135.000	0.00108359	0.00743034	0.01687307	0.00000000	0.00000000	0.00000000
157.500	0.00294118	0.01207431	0.01981425	0.00000000	0.00000000	0.00000000
180.000	0.00309598	0.01486068	0.01687307	0.00000000	0.00000000	0.00000000
202.500	0.00278636	0.00402477	0.01021672	0.00000000	0.00000000	0.00000000
225.000	0.00046440	0.00309598	0.00959753	0.00000000	0.00000000	0.00000000
247.500	0.00077399	0.00309598	0.00603715	0.00000000	0.00000000	0.00000000
270.000	0.00061920	0.00247678	0.00417957	0.00000000	0.00000000	0.00000000
292.500	0.00046440	0.00232198	0.00216718	0.00000000	0.00000000	0.00000000
315.000	0.00030960	0.00185759	0.00139319	0.00000000	0.00000000	0.00000000
337.500	0.00046440	0.00170279	0.00232198	0.00000000	0.00000000	0.00000000

APPENDIX B

MODEL MINE

APPENDIX B

MODEL MINE

Generic inputs are based on the same model mine as given in the October 1984 Background Information Document For Final Rules (EPA 1984). Ambrosia Lake meteorological data from the Phillips site were used. Plume rise is based on average exit size and velocity from the 6 of the 14 case study mines with specific emission data (Jackson et al, 1980). The total model mine release of 11 kCi/yr is equally divided among the five model mine vents.

An average mine exit velocity of 16.2 m/s and vent diameter of 1.51 m were used based on information available for the case study mines. An exit temperature of 286.83 degrees Kelvin was assumed. The same value was assumed for ambient temperature.

Tables B.1 and B.2 contain concentration output tables for the model mine without plume rise and with plume rise, respectively. These tables were generated using the ISCLT code for a polar grid of receptors.

EPA. 1984. Radionuclides - Background Information Document For Final Rules, EPA 520/1-84-022-2, U.S. Environmental Protection Agency, Washington, D.C.

Jackson, et al. 1980. An Investigation of Radon-222 Emissions From Underground Uranium Mines, PNL-3262, Pacific Northwest Laboratory, Richland, Washington.

TABLE B.1. Model Mine Computed Radon Concentrations Without Plume Rise

** ANNUAL GROUND LEVEL CONCENTRATION (PICO CURIES / LITER - GRID SYSTEM RECEPTORS - - X AXIS (RANGE , METERS) -						) FROM ALL SOURCES COMBINED **			
	200.000	500.000	1000.000	2000.000	3000.000	4000.000	5000.000	7000.000	8000.000
AXIS (AZIMUTH BEARING, DEGREES)	- CONCENTRATION -								
337.500	8.106940	1.384239	1.193307	0.293482	0.149298	0.094470	0.066836	0.039912	0.032615
315.000	6.632443	6.687230	1.053584	0.318893	0.171078	0.111453	0.080316	0.049003	0.040333
292.500	6.085063	3.430773	1.039049	0.322906	0.164429	0.103891	0.073455	0.043796	0.035773
270.000	6.093984	2.981897	1.007273	0.363644	0.212052	0.142590	0.104551	0.064935	0.053731
247.500	5.835514	3.092342	1.111706	0.386796	0.189438	0.116747	0.081222	0.047490	0.038540
225.000	11.869246	3.777282	1.962185	0.521431	0.283471	0.184681	0.132905	0.080905	0.066603
202.500	3.015293	7.579865	4.315895	0.953392	0.495064	0.320797	0.231079	0.141284	0.116569
180.000	3.424650	6.049090	4.476326	0.837864	0.379105	0.228130	0.156983	0.090978	0.073698
157.500	13.740145	5.833694	3.126462	0.834825	0.440671	0.292387	0.201320	0.121356	0.099483
135.000	10.854540	7.060907	4.411537	0.600332	0.286087	0.176014	0.122648	0.072078	0.055595
112.500	10.951127	6.649044	2.746896	0.453414	0.203467	0.120983	0.082450	0.047145	0.038006
90.000	10.651436	5.992166	1.390828	0.471555	0.260770	0.171313	0.123934	0.075891	0.062561
67.500	9.684406	12.129735	1.241393	0.334656	0.170340	0.106544	0.074789	0.044229	0.036053
45.000	7.894514	7.034993	1.094075	0.293936	0.150909	0.095511	0.067508	0.040219	0.032844
22.500	7.317917	4.090584	1.113168	0.328329	0.168360	0.106651	0.075442	0.045028	0.036807
0.000	7.287961	6.327664	1.173295	0.366635	0.195192	0.126461	0.090776	0.055165	0.045356
- GRID SYSTEM RECEPTORS - - X AXIS (RANGE , METERS) -									
	9000.000	10000.000	15000.000	20000.000	30000.000	50000.000			
Y AXIS (AZIMUTH BEARING, DEGREES)	- CONCENTRATION -								
337.500	0.027314	0.023325	0.012840	0.008510	0.004870	0.002472			
315.000	0.033966	0.029137	0.016248	0.010840	0.006220	0.003160			
292.500	0.029947	0.025562	0.014045	0.009293	0.005298	0.002677			
270.000	0.045435	0.039096	0.022007	0.014747	0.008513	0.004348			
247.500	0.032099	0.027282	0.014797	0.009714	0.005498	0.002760			
225.000	0.050130	0.044171	0.026888	0.018035	0.010405	0.005331			
202.500	0.098473	0.084684	0.047580	0.032109	0.018646	0.009628			
180.000	0.061349	0.052131	0.028244	0.018611	0.010541	0.005308			
157.500	0.083567	0.071520	0.039616	0.026369	0.015115	0.007683			
135.000	0.049287	0.041609	0.022682	0.014944	0.008500	0.004291			
112.500	0.031506	0.026676	0.014311	0.009378	0.005302	0.002670			
90.000	0.052777	0.045323	0.025366	0.017030	0.009958	0.005067			
67.500	0.030145	0.025704	0.014092	0.009346	0.005344	0.002718			
45.000	0.027493	0.023463	0.012489	0.008540	0.004875	0.002470			
22.500	0.030440	0.026344	0.014514	0.009648	0.005527	0.002813			
0.000	0.036175	0.032733	0.018244	0.012204	0.007046	0.003611			

TABLE B.2. Model Mine Computed Radon Concentrations With Plume Rise

**	ANNUAL GROUND LEVEL CONCENTRATION (PICO CURIES / LITER					) FROM ALL SOURCES COMBINED				**	
	- GRID SYSTEM RECEPTORS -										
	- X AXIS (RANGE , METERS) -										
	200,000	500,000	1000,000	2000,000	3000,000	4000,000	5000,000	7000,000	8000,000		
Y AXIS (AZIMUTH BEARING, DEGREES)	- CONCENTRATION -										
337,500	0.226867	0.130881	0.133513	0.091629	0.067367	0.051307	0.040546	0.027600	0.023495		
315,000	0.171911	0.106700	0.103467	0.090232	0.072776	0.058002	0.047132	0.033108	0.028458		
292,500	0.150176	0.090937	0.083900	0.065416	0.068402	0.053684	0.043055	0.029695	0.025358		
270,000	0.143610	0.080410	0.077067	0.066042	0.078287	0.066395	0.055956	0.040980	0.035669		
247,500	0.146902	0.080633	0.076830	0.079010	0.067077	0.053799	0.043557	0.030293	0.025913		
225,000	0.156984	0.094114	0.085329	0.098163	0.091284	0.077572	0.065375	0.047921	0.041740		
202,500	0.171523	0.142589	0.118822	0.166624	0.160454	0.137142	0.115743	0.084973	0.074088		
180,000	0.187600	0.224479	0.231287	0.191138	0.147036	0.112912	0.089239	0.060507	0.051398		
157,500	0.248370	0.288694	0.273520	0.234230	0.187487	0.148016	0.119181	0.082694	0.070783		
135,000	0.296100	0.275335	0.357653	0.191568	0.135090	0.100510	0.078122	0.052003	0.043933		
112,500	0.338240	0.330650	0.383598	0.180376	0.109223	0.075346	0.056064	0.035538	0.029582		
90,000	0.300711	0.387250	0.299373	0.196419	0.139953	0.105105	0.082578	0.055927	0.047580		
67,500	0.265775	0.375351	0.298232	0.143916	0.093286	0.066737	0.050869	0.033226	0.027937		
45,000	0.268226	0.321093	0.252209	0.123962	0.080855	0.058487	0.044967	0.029702	0.025061		
22,500	0.232972	0.346377	0.246158	0.144399	0.095792	0.069052	0.052813	0.034594	0.029109		
0,000	0.267996	0.320452	0.219195	0.144496	0.103149	0.077455	0.066744	0.041000	0.034832		
	- GRID SYSTEM RECEPTORS -										
	- X AXIS (RANGE , METERS) -										
	9000,000	10000,000	15000,000	20000,000	30000,000	50000,000					
Y AXIS (AZIMUTH BEARING, DEGREES)	- CONCENTRATION -										
337,500	0.020318	0.017805	0.010599	0.007291	0.004333	0.002268					
315,000	0.024796	0.021861	0.013245	0.009184	0.005484	0.002877					
292,500	0.021975	0.019286	0.011515	0.007920	0.004696	0.002449					
270,000	0.031183	0.027885	0.017299	0.012125	0.007333	0.003888					
247,500	0.022479	0.019740	0.011797	0.008100	0.004795	0.002495					
225,000	0.036758	0.032692	0.020368	0.014355	0.008733	0.004671					
202,500	0.065315	0.058147	0.036345	0.025730	0.015732	0.008466					
180,000	0.044363	0.038309	0.022948	0.015733	0.009281	0.004828					
157,500	0.061473	0.054050	0.032474	0.022437	0.013366	0.007009					
135,000	0.037759	0.032912	0.019253	0.013116	0.007709	0.003995					
112,500	0.025139	0.021717	0.012377	0.008345	0.004856	0.002502					
90,000	0.031145	0.036058	0.021499	0.014864	0.008880	0.004683					
67,500	0.023933	0.020315	0.012124	0.008270	0.004871	0.002537					
45,000	0.021526	0.018759	0.010997	0.007504	0.004420	0.002297					
22,500	0.024948	0.021705	0.012646	0.008626	0.005079	0.002642					
0,000	0.030179	0.026331	0.015631	0.010773	0.006413	0.003369					

APPENDIX C

CASE STUDY MINES

APPENDIX C

CASE STUDY MINES

Table C.1 summarizes the sources of information for the required characteristics of the 14 modeled mines. Detailed footnotes give additional data as well as the sources of specific mine information used in the modeling. The data sources include reports with mine emission studies, mine safety maps, and information provided by the mining companies. A portion of these data were provided in response to a written request from EPA to the mine owners. Specific release information on vents are not given because some of the information was considered proprietary by mine operators who granted permission to use the mine emissions in this analysis.

As examples of modeling outputs, Tables C.2 and C.3 contain the listings of radon concentrations computed for case study mines 11 and 12 based on the actual combinations of vertical and horizontal vents for these mines. These tables correspond to Figures 15 and 16 in the main text. Tables C.4 and C.5 contain listings for the same two mines based on assuming all vertical vents. Since all concentrations were under 0.1 pCi/L, no contour plots were made for these latter runs.

TABLE C.1. Summary of Information Used in Modeling Radon Concentration at Selected Mines

Case Study Mine Number	Specific Emission data (a)	Mine			
		Met. (b)	Emissions (c)	Vent. Char. (d)	Vent. Loc. (e)
1 (f)	No	1	g	gg	a
2 (g)	Yes	2	m	aa	a
3 (h)	No	3	g	ga	a
4 (i)	No	3	g	gg	a
5 (j)	No	4	g	gg	g
6 (k)	No	5	g	aa	a
7 (l)	Yes	6	m	aa	a
8 (m)	No	6	m	aa	a
9 (n)	No	6	g	ga	g
10 (o)	Yes	6	m	aa	a
11 (p)	Yes	7	m	aa	a
12 (q)	Yes	7	m	aa	a
13 (r)	No	8	g	gg	a
14 (s)	Yes	6	m	aa	a

(a) Yes = mine specific emission data used. No = generic emission values used (mine total of 11 kCi/yr). Permission was obtained by EPA to use mine-specific emission studies reported in Jackson et al. 1979, Radon-222 Emissions in Ventilation Air From Underground Uranium Mines. NUREG/CR-0627, PNL-2888 Rev., Pacific Northwest Laboratory, Richland, Washington, and Jackson et al. 1980 An Investigation of Radon-222 Emissions from Underground Mines. NUREG/CR-1273, PNL-3262, Pacific Northwest Laboratory, Richland, Washington. Not all the listed mines were included in these studies.

(b) Meteorological data used in dispersion computations were taken from the nearest representative location with data. Typical sources were from the case study mine, or other nearby mines or mills. National weather summaries were used in cases where other closer meteorological data were not identified. The numbers in the table refer to the following data sources.

1 = Cedar City, Utah meteorological input tables were based from two years of surface observations (1975 - 1976) using data tapes obtained from the U.S. Department of Commerce.

- 2 = Grand Junction stability class data and Uravan wind direction/speed data were used. These data were in "A Review of Available Meteorological Data Representative of the Uravan Uranium Mill Site Vicinity" prepared for Union Carbide Corporation, Metals Division, Grand Junction, Colorado.
 - 3 = Grand Junction stability class data and Uravan wind speed data and Lisbon wind direction data were used. These data were in "A Review of Available Meteorological Data Representative of the Uravan Uranium Mill Site Vicinity" prepared for Union Carbide Corporation, Metals Division, Grand Junction, Colorado, May 7, 1980 and meteorological data supplied Rio Algom Corporation - Lisbon Mine in a letter to M. O. Orgill, PNL dated 8-1-1983 from S. L. Wasiter, U.S. Nuclear Regulatory Commission, Region IV, Denver, Colorado.
 - 4 = Casper, Wyo. meteorological input tables were based from two year of surface observations (1975 - 1976) using data tapes obtained from the U.S. Department of Commerce.
 - 5 = La Polvadera Valley data obtained in Mt. Taylor Uranium Mill Project, New Mexico, Volume 4 Radiation Safety Program and Appendicies, Gulf Mineral Resources Co., Denver, Colorado, no date.
 - 6 = Gallup NM summaries for 1/76 to 12/80 obtained from the U.S. Department of Commerce is given in Uranium Mill License Renewal Application, Environmental Report, Church Rock Mill, License No. NM-UNC-ML, state of New Mexico, Environmental Improvement Division, Dec. 1981.
 - 7 = NMEID Phillips Site, data in attachment 9 of letter dated 8/18/83 to Mr. R. J. Guimond, USEPA from W. J. Shelly, Kerr-McGee Corporation.
 - 8 = Nose Rock meteorological data were obtained in "Nose Rock Project, Volume 3, Attachments to Uranium Mill License Application", Phillips Uranium Corporation, no date. These data are a combination of onsite wind measurements cloud cover information at Albuquerque, NM for the period 8/22/76 to 8/8/77.
- (c) Radon emission rate from the mine; m = measured data in PNL study, g = generic total mine release of 11 Ci/yr equally divided between vents.
 - (d) Vent release characteristics for total exhaust flow and exit diameter respectively; a = actual, g = generic.
 - (e) Vent locations relative to main shaft were based on; a = actual location, g = generic spacing.

(f) Mine 1 (Hack Canyon):

Number of vents based on information supplied by W. O. Hatchell, Staff Geologist, State of New Mexico, Energy and Mineral Department in letter dated 7-21-83. Pages were supplied from the document Uranium Resources and Technology, A Review of the New Mexico Uranium Industry, 1980, New Mexico Energy and Mineral Department, Santa Fe, New Mexico.

(g) Mine 2 (Deremo-Synder):

Measured vent and emission data (see footnote (a)). Vent locations were defined using a map supplied as an enclosure in a letter dated 8-17-83 to Mr. R. J. Guimond, USEPA from R. G. Beverly, Union Carbide Corporation.

(h) Mine 3 (LaSal):

Vent locations and diameters were taken from map labeled "Deer Creek Group, La Sal and Snowball Areas, Union Carbide Corporation, Metals Division, Uravan, Colorado" dated 3-22-83. The division between mines was uncertain on this map. The two vents with Snowball written near them and in the vicinity of the Snowball Portal were not included in the La Sal vents; all the remaining vents labeled on this map were used in the modeling of radon concentrations for La Sal. Generic flow rates and actual exit diameters used.

(i) Mine 4 (Hecla):

Vent locations were taken from map labeled "Reclamation Map, U.C.C.- Hecla Joint Venture, Union Carbide Corporation, Metals Division, Uravan" dated 13-13-78.

(j) Mine 5 (Sheep Mountain):

Generic vents and emissions were used.

(k) Mine 6 (Mt. Taylor):

Flow rates were based on information supplied by W.O. Hatchell, Staff Geologist, State of New Mexico, Energy and Mineral Department in letter dated 7-21-83. Pages were supplied from the document Uranium Resources and Technology, A Review of the New Mexico Uranium Industry, 1980, New Mexico Energy and Mineral Department, Santa Fe, New Mexico. Size of shaft was taken from maps labeled "Ventilation and Escape Plan, Gulf Mineral Resources Co., Mt. Taylor Mine Project, San Mateo, New Mexico.

(l) Mine 7 (Old Church Rock):

A vent location map was not obtained for this mine. The emissions from the seven vents measured in the PNL study were modeled in a generic pattern based on the spacing of the vents at other mines in this immediate area.

(m) Mine 8 (Church Rock NE):

Number of vents and total flow are from information supplied by W. O. Hatchell, Staff Geologist, State of New Mexico, Energy and Mineral Department in letter dated 7-21-83. Pages were supplied from the document Uranium Resources and Technology, A Review of the New Mexico Uranium Industry, 1980, New Mexico Energy and Mineral Department, Santa Fe, New Mexico.

(n) Mine 9 (Church Rock East):

Church Rock East was part of CR #1 when PNL measured emissions. The East shaft was under construction, and one vent from the East mine was operating as part of Church Rock #1. This vent is one of two exhaust vents shown for the East Shaft in a Ventilation Map for Kerr-McGee Corporation Church Rock Operations, dated 9-1-78. Vent locations were taken from "Ventilation Map, Kerr-McGee Corporation, Church Rock Uranium Operations" dated 8-1-78. Generic emission rates were used to model this mine.

(o) Mine 10 (Church Rock 1):

Measured vent and emission data (see footnote (a)). Vent locations were taken from "Ventilation Map, Kerr-McGee Corporation, Church Rock Uranium Operations" dated 8-1-78. Modeled as operating when measurements were made (see footnote (n)).

(p) Mine 11 (Kerr McGee Sec. 30 East, NM):

Measured vent and emission data (see footnote (a)).

(q) Mine 12 (Kerr McGee Sec. 30 West, NM)

Measured vent and emission data (see footnote (a)).

(r) Mine 13 (Nose Rock):

Nose rock has two mines (#1 & #2) located about 3/4 mile apart: #1 was modeled.

(s) Mine 14 (Mariano Lake):

Measured vent and emission data (see footnote (a)). Vent locations were defined using a map supplied as an enclosure in a letter dated 8-12-83 to Mr. R. J. Guimond, USEPA from S. A. Zagnoli, Gulf Mineral Resources Co.

TABLE C.2. Radon Concentration Listings for Case Study Mine 11 Based on Actual Vent Orientation

** ANNUAL GROUND LEVEL CONCENTRATION (PICO CURIES PER LITER) FROM ALL SOURCES COMBINED **									
Y AXIS (AZIMUTH BEARING, DEGREES)	- GRID SYSTEM RECEPTORS - - X AXIS (RANGE , METERS) - - CONCENTRATION -								
	200.000	500.000	1000.000	2000.000	3000.000	4000.000	5000.000	7000.000	8000.000

337.500	1.870961	0.433468	0.338289	0.105484	0.057997	0.039411	0.029449	0.019132	0.016162
315.000	1.264944	1.028570	0.249430	0.093995	0.057202	0.040991	0.031806	0.021795	0.018722
272.500	1.005350	0.629947	0.265614	0.091883	0.055351	0.039200	0.030124	0.020109	0.017118
270.000	0.837621	0.474777	0.194153	0.087283	0.060004	0.046009	0.037228	0.026603	0.023150
247.500	0.744569	0.462768	0.206826	0.072297	0.048195	0.035821	0.028179	0.019383	0.016649
225.000	0.707468	0.460233	0.263638	0.115942	0.076637	0.057311	0.045450	0.031793	0.027516
202.500	0.811165	0.510650	0.305579	0.166354	0.114122	0.089274	0.073108	0.053165	0.046590
190.000	0.923956	0.664911	0.323885	0.149472	0.101053	0.073660	0.057353	0.038972	0.033344
157.500	1.252414	0.715014	0.302072	0.166851	0.116439	0.089592	0.072334	0.051302	0.044504
135.000	1.613156	0.707715	0.420421	0.163880	0.095335	0.066896	0.051152	0.034110	0.029027
112.500	2.114837	1.201396	0.414239	0.133090	0.074519	0.050192	0.037242	0.023914	0.020075
90.000	2.739959	2.569021	0.356436	0.155427	0.097047	0.070142	0.054509	0.037212	0.031893
67.500	2.991840	7.218555	0.651119	0.137269	0.070875	0.047980	0.035832	0.022946	0.019273
45.000	2.320549	0.306828	0.500684	0.121574	0.066485	0.042311	0.031255	0.020219	0.017046
22.500	1.775768	2.521598	0.533386	0.304089	0.078017	0.049658	0.036618	0.023658	0.019939
0.000	2.012772	2.192571	0.406545	0.159833	0.080395	0.054456	0.041301	0.027456	0.023357

Y AXIS (AZIMUTH BEARING, DEGREES)	- GRID SYSTEM RECEPTORS - - X AXIS (RANGE , METERS) - - CONCENTRATION -								
	9000.000	10000.000	15000.000	20000.000	30000.000	50000.000			

337.500	0.013935	0.012204	0.007350	0.005135	0.003123	0.001680			
315.000	0.016351	0.014466	0.008978	0.006363	0.003921	0.002130			
272.500	0.014841	0.013055	0.007956	0.005585	0.003408	0.001835			
270.000	0.020422	0.015222	0.011602	0.008330	0.005207	0.002863			
247.500	0.014531	0.012852	0.007944	0.005606	0.003437	0.001855			
225.000	0.024180	0.021518	0.013626	0.009791	0.006132	0.003391			
202.500	0.041332	0.037061	0.023986	0.017428	0.011023	0.006147			
190.000	0.029000	0.025569	0.015645	0.010994	0.006698	0.003601			
157.500	0.039130	0.034805	0.021870	0.015569	0.009614	0.005224			
135.000	0.025148	0.022103	0.013395	0.009356	0.005667	0.003026			
112.500	0.017198	0.014975	0.008806	0.006056	0.003607	0.001902			
90.000	0.027789	0.024536	0.015085	0.010642	0.006517	0.003526			
67.500	0.016540	0.014429	0.008566	0.005936	0.003571	0.001902			
45.000	0.014672	0.012430	0.007674	0.005337	0.003222	0.001720			
22.500	0.017155	0.014995	0.008945	0.006210	0.003740	0.001993			
0.000	0.020246	0.017807	0.010843	0.007619	0.004651	0.002509			

TABLE C.3. Radon Concentration Listings for Case Study Mine 12 Based on Actual Vent Orientation

** ANNUAL GROUND LEVEL CONCENTRATION (PICO CURIES PER LITER - GRID SYSTEM RECEPTORS - - X AXIS (RANGE , METERS) -						) FROM ALL SOURCES COMBINED				**
Y AXIS (AZIMUTH BEARING, DEGREES)	200,000	500,000	1000,000	2000,000	3000,000	4000,000	5000,000	7000,000	8000,000	
	CONCENTRATION									
337,500	1.455446	0.522092	0.194995	0.069292	0.037877	0.024861	0.018045	0.011171	0.009263	
315,000	1.329022	0.512454	0.209185	0.079628	0.044829	0.029947	0.021976	0.013794	0.011495	
292,500	1.218692	0.445555	0.179087	0.067399	0.037865	0.025285	0.018572	0.011688	0.009750	
270,000	1.502931	0.533024	0.267708	0.104070	0.058935	0.039446	0.029004	0.018272	0.015256	
247,500	2.086039	0.700878	0.238991	0.079804	0.042539	0.027565	0.019906	0.012294	0.010201	
225,000	2.415821	0.672187	0.309223	0.121518	0.068789	0.046106	0.033911	0.021357	0.017852	
202,500	2.792563	1.383826	0.601318	0.226050	0.125882	0.083931	0.061586	0.038736	0.032397	
180,000	5.489498	2.781344	0.702060	0.194300	0.095524	0.059735	0.042190	0.025374	0.020840	
157,500	18.302099	3.406094	0.786637	0.238152	0.123451	0.079733	0.057394	0.035329	0.029240	
135,000	6.749863	4.099204	0.710311	0.166187	0.089517	0.050010	0.035256	0.021219	0.017452	
112,500	0.001521	2.890929	0.403328	0.099687	0.049430	0.031131	0.022094	0.013368	0.011004	
90,000	12.160922	2.329483	0.572503	0.163146	0.084047	0.054008	0.038812	0.023832	0.019725	
67,500	5.413344	1.303370	0.310480	0.099135	0.045589	0.029411	0.021087	0.012901	0.010660	
45,000	3.318848	1.041130	0.274980	0.082625	0.042773	0.027394	0.019676	0.011946	0.009854	
22,500	2.200561	0.873112	0.259372	0.090903	0.047729	0.030807	0.022154	0.013574	0.011221	
0,000	1.577725	0.581069	0.245876	0.093758	0.052705	0.035184	0.025816	0.016193	0.013487	

- GRID SYSTEM RECEPTORS - - X AXIS (RANGE , METERS) -						
Y AXIS (AZIMUTH BEARING, DEGREES)	9000,000	10000,000	15000,000	20000,000	30000,000	50000,000
	CONCENTRATION					
337,500	0.007957	0.006785	0.003902	0.002660	0.001577	0.000830
315,000	0.009790	0.008484	0.004930	0.003384	0.002016	0.001066
292,500	0.009310	0.007208	0.004199	0.002883	0.001718	0.000907
270,000	0.013017	0.011303	0.006617	0.004563	0.002736	0.001455
247,500	0.008663	0.007492	0.004333	0.002963	0.001760	0.000927
225,000	0.015247	0.013248	0.007771	0.005390	0.003247	0.001740
202,500	0.027687	0.024068	0.014135	0.009825	0.005928	0.003183
180,000	0.017616	0.015148	0.008598	0.005838	0.003436	0.001799
157,500	0.024443	0.021461	0.012354	0.008439	0.005001	0.002632
135,000	0.014720	0.012655	0.007183	0.004861	0.002856	0.001490
112,500	0.009283	0.007978	0.004512	0.003047	0.001782	0.000926
90,000	0.016719	0.014429	0.008269	0.005643	0.003340	0.001758
67,500	0.009021	0.007775	0.004437	0.003016	0.001777	0.000931
45,000	0.008325	0.007164	0.004072	0.002759	0.001621	0.000847
22,500	0.009495	0.008182	0.004665	0.003168	0.001863	0.000975
0,000	0.011480	0.009941	0.005756	0.003943	0.002343	0.001236

TABLE C.4. Radon Concentration Listings for Case Study Mine 11 With All Vertical Vents

** ANNUAL GROUND LEVEL CONCENTRATION (PICO CURIES PER LITER										) FROM ALL SOURCES COMBINED **									
- GRID SYSTEM RECEPTORS -																			
- X AXIS (RANGE , METERS) -																			
200,000 500,000 1000,000 2000,000 3000,000 4000,000 5000,000 7000,000 8000,000																			
Y AXIS (AZIMUTH BEARING, DEGREES)										- CONCENTRATION -									

337,500	0.001546	0.001677	0.002164	0.002581	0.002742	0.002761	0.002676	0.002437	0.002307										
315,000	0.001074	0.000967	0.001115	0.001756	0.002286	0.002551	0.002626	0.002565	0.002480										
292,500	0.000493	0.000619	0.000828	0.001564	0.002048	0.002309	0.002387	0.002344	0.002269										
270,000	0.000701	0.000431	0.000486	0.000943	0.001372	0.001817	0.002102	0.002409	0.002446										
247,500	0.000536	0.000272	0.000451	0.000844	0.000932	0.001305	0.001546	0.001773	0.001801										
225,000	0.000476	0.000193	0.000470	0.000840	0.001256	0.001697	0.002012	0.002364	0.002433										
202,500	0.000516	0.000198	0.000596	0.001270	0.002302	0.003339	0.004058	0.004802	0.004922										
180,000	0.000638	0.000214	0.001278	0.002925	0.003912	0.004910	0.004723	0.004648	0.004495										
157,500	0.000848	0.000787	0.002765	0.005628	0.006473	0.007528	0.007668	0.007337	0.007045										
135,000	0.001180	0.001696	0.005695	0.006340	0.006406	0.006247	0.005968	0.005330	0.005011										
112,500	0.001521	0.002408	0.006117	0.008025	0.007181	0.006341	0.005609	0.004512	0.004086										
90,000	0.001736	0.003363	0.007895	0.010191	0.010047	0.009385	0.008595	0.007203	0.006607										
67,500	0.001799	0.003579	0.006466	0.007024	0.006497	0.005834	0.005207	0.004228	0.003841										
45,000	0.001811	0.003769	0.005695	0.005654	0.005202	0.004702	0.004226	0.003477	0.003175										
22,500	0.001801	0.003341	0.005691	0.005681	0.006434	0.005968	0.005426	0.004481	0.004083										
0,000	0.001633	0.002576	0.004230	0.005350	0.005633	0.005535	0.005258	0.004812	0.004293										

- GRID SYSTEM RECEPTORS -																			
- X AXIS (RANGE , METERS) -																			
4000,000 10000,000 15000,000 20000,000 30000,000 50000,000																			
Y AXIS (AZIMUTH BEARING, DEGREES)										- CONCENTRATION -									

337,500	0.002182	0.002063	0.001587	0.001299	0.000893	0.000546													
315,000	0.002386	0.002287	0.001837	0.001478	0.001379	0.000674													
292,500	0.002184	0.002094	0.001673	0.001355	0.000963	0.000593													
270,000	0.002451	0.002429	0.002139	0.001819	0.001357	0.000869													
247,500	0.001797	0.001772	0.001521	0.001273	0.000927	0.000581													
225,000	0.002458	0.002455	0.002234	0.001928	0.001469	0.000961													
202,500	0.004948	0.004917	0.004394	0.003739	0.002803	0.001807													
180,000	0.004312	0.004124	0.003270	0.002632	0.001863	0.001144													
157,500	0.004727	0.004610	0.003920	0.004018	0.002820	0.001718													
135,000	0.004707	0.004425	0.003315	0.002594	0.001770	0.001051													
112,500	0.003726	0.003417	0.002376	0.001789	0.001176	0.000678													
90,000	0.004084	0.003628	0.004036	0.003691	0.002079	0.001226													
67,500	0.003511	0.003227	0.002269	0.001721	0.001145	0.000669													
45,000	0.002916	0.002691	0.001922	0.001474	0.000996	0.000590													
22,500	0.003739	0.003340	0.002817	0.001831	0.001217	0.000709													
0,000	0.004001	0.003736	0.002753	0.002142	0.001463	0.000873													

TABLE C.5. Radon Concentration Listings for Case Study Mine 12 With All Vertical Vents

**	ANNUAL GROUND LEVEL CONCENTRATION (PICO CURIES PER LITER					) FROM ALL SOURCES COMBINED					**
- GRID SYSTEM RECEPTORS -											
- X AXIS (RANGE , METERS) -											
	200,000	500,000	1000,000	2000,000	3000,000	4000,000	5000,000	7000,000	8000,000		
Y AXIS (AZIMUTH BEARING, DEGREES)	- CONCENTRATION -										
337,500	0.043076	0.043130	0.037671	0.029296	0.023705	0.019354	0.016275	0.012238	0.010435		
315,000	0.027171	0.025841	0.032411	0.026976	0.022006	0.019532	0.017259	0.013723	0.012355		
292,500	0.024963	0.024327	0.033063	0.023075	0.021676	0.018011	0.016323	0.012696	0.011350		
270,000	0.031524	0.027786	0.036313	0.021768	0.022246	0.021260	0.019531	0.016252	0.014452		
247,500	0.034774	0.031196	0.046292	0.018470	0.018697	0.017206	0.015359	0.012209	0.010987		
225,000	0.037954	0.039022	0.047210	0.030320	0.028691	0.025994	0.023191	0.018410	0.017084		
202,500	0.041345	0.046763	0.042776	0.045233	0.042183	0.040834	0.038060	0.032306	0.029710		
180,000	0.042059	0.052779	0.046020	0.048487	0.048084	0.040523	0.034542	0.026269	0.023311		
157,500	0.042173	0.052651	0.045286	0.056908	0.053991	0.048986	0.043671	0.034866	0.031406		
135,000	0.048340	0.052319	0.061793	0.052033	0.042099	0.035661	0.030562	0.023298	0.020679		
112,500	0.048573	0.061014	0.072608	0.056591	0.040594	0.031134	0.025027	0.017669	0.015292		
90,000	0.049010	0.068388	0.072628	0.060415	0.050069	0.041967	0.035649	0.026904	0.023796		
67,500	0.052224	0.074420	0.064993	0.045003	0.033990	0.027061	0.022244	0.016134	0.014058		
45,000	0.059214	0.065924	0.055148	0.038909	0.029119	0.023144	0.019089	0.013959	0.012233		
22,500	0.064266	0.056320	0.051105	0.043017	0.034223	0.027765	0.023088	0.016910	0.014797		
0,000	0.062192	0.047687	0.048216	0.040497	0.033917	0.028702	0.024580	0.018746	0.016638		
- GRID SYSTEM RECEPTORS -											
- X AXIS (RANGE , METERS) -											
	9000,000	10000,000	15000,000	20000,000	30000,000	50000,000					
Y AXIS (AZIMUTH BEARING, DEGREES)	- CONCENTRATION -										
337,500	0.009696	0.008753	0.005768	0.004242	0.002710	0.001518					
315,000	0.011201	0.010218	0.006974	0.005189	0.003366	0.001908					
292,500	0.010230	0.009286	0.006236	0.004596	0.002949	0.001654					
270,000	0.013627	0.012554	0.008838	0.006677	0.004444	0.002532					
247,500	0.009959	0.009074	0.006167	0.004588	0.002940	0.001659					
225,000	0.015613	0.014352	0.010090	0.007636	0.005065	0.002940					
202,500	0.027173	0.025349	0.018124	0.013513	0.009208	0.005367					
180,000	0.020878	0.018660	0.012473	0.009119	0.005804	0.003239					
157,500	0.026455	0.025439	0.017606	0.013029	0.008389	0.004721					
135,000	0.018519	0.016719	0.010946	0.007989	0.005039	0.002782					
112,500	0.013422	0.011922	0.007456	0.005290	0.003255	0.001764					
90,000	0.021753	0.019153	0.012561	0.009149	0.005800	0.003230					
67,500	0.012457	0.011133	0.007114	0.005109	0.003190	0.001752					
45,000	0.010851	0.009725	0.006277	0.004537	0.002893	0.001575					
22,500	0.013101	0.011719	0.007496	0.005386	0.003362	0.001845					
0,000	0.014785	0.013463	0.008885	0.006498	0.004133	0.002305					

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