Duquesne Light

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March 22, 1984

United States Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Mr. George W. Knighton, Chief
Licensing Branch 3
Office of Nuclear Reactor Regulation

SUBJECT: Beaver Valley Power Station - Unit 2
Docket No. 50-412
Environmental Report - Accident Evaluation

Gentlemen:

Attached to this letter are eight (8) copies of our responses to the Accident Evaluation Branch questions (E450.1 and E450.2) forwarded to Duquesne Light Company in your letter dated December 2, 1983. These responses were originally scheduled for submittal to the NRC on February 24, 1984. A delay was requested by Duquesne Light Company in a telephone conversation on February 6, 1984, and approval from the NRC Project Manager and the Branch reviewer was received. This delay is documented in a letter to you dated February 24, 1984. Also attached are eight (8) copies of the revised Environment Report (ER), Section 7.1. It is our intention to include the responses and Section 7.1 in ER Amendment 5 scheduled for submittal to the NRC on March 30, 1984.

DUQUESNE LIGHT COMPANY

By E. J. Woolever
E. J. Woolever
Vice President

ETE/wjs
Attachments

cc: Mr. H. R. Denton, Director NRR (w/a)
Mr. D. Eisenhut, Director Division of Licensing (w/a)
Mr. G. Walton, NRC Resident Inspector (w/a)
Mr. M. Lacitra, Project Manager (w/a)

A001
1/1

SUBSCRIBED AND SWORN TO BEFORE ME THIS
22nd DAY OF March, 1984.

Anita Elaine Reiter
Notary Public

ANITA ELAINE REITER, NOTARY PUBLIC
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
MY COMMISSION EXPIRES OCTOBER 20, 1986

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF ALLEGHENY)

On this 22nd day of March, 1984, before me, a Notary Public in and for said Commonwealth and County, personally appeared E. J. Woolever, who being duly sworn, deposed and said that (1) he is Vice President of Duquesne Light, (2) he is duly authorized to execute and file the foregoing Submittal on behalf of said Company, and (3) the statements set forth in the Submittal are true and correct to the best of his knowledge.

Anita Elaine Reiter
Notary Public

ANITA ELAINE REITER, NOTARY PUBLIC
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
MY COMMISSION EXPIRES OCTOBER 20, 1986

NRC Letter: December 2, 1983

Question E450.1

While you have tried to follow the staff's approach to and the structure of presentation of the results of such analyses in several DES/FESs persuant to the Statement of Interim Policy (Federal Register, June 13, 1983),

a. Your use of the population data for the year 1980, instead of the data for the plant mid-life year, is consistent with the staff's practice. Please provide basis for your selection of this population data; and

b. Information regarding the following items are absent in ER-OL:

   i. Risk estimates to an individual of early fatality as a function of distance or as isopleths,

   ii. Probability distribution and risk estimates of thryoid cancer fatalities,

   iii. Estimated person-rem and cancer fatalities (excluding thyroid, and thyroid only) CCDFs and risks within the 50-mi region,

   iv. Estimated distributions of number of persons exposed above 25 rems to whole body, 300 rems to thyroid, and 200 rems to total bone marrow from early exposure, and

   v. Estimated economic cost of damage to the plant.

Either provide this information, or a justification why such information is unnecessary in support of your Environmental Report.

Response:

a. The results of the severe accident analysis for BVPS-2 provided in Section 7.1.3.2 has been revised. The analysis is now based upon the projected population distribution for the year 2010. Refer to Section 7.1, Amendment 5.

b. (i) CRAC2 calculations for the BVPS-2 plant and site indicate that the risk of fatality due to early exposure within the 10-mile emergency planning zone (EPZ) are quite limited. Only those people living within 1.5 miles of the plant are predicted to be at risk of early fatality with mean risk to the entire population of approximately 3.8×10^{-7} per reactor-year. The individual risk of early fatality ranges

from approximately 1.5 x 10^{-13} per reactor-year to 5.9 x 10^{-9} per reactor-year in the populated land elements. Approximately 40 percent of the 48 land elements within 1.5 miles are unpopulated. Because of the extremely low fatality risk and the limited area involved, the plotting of early fatality isopleths would not provide significant additional information.

b. (ii) The risk curve for thyroid cancer is provided on Figure 7.1-5, Amendment 5.

b. (iii) Generation of risk curves for the population within 50 miles of BVPS-2 requires an additional set of CRAC runs. The additional information gained by performing these analyses does not warrant the additional effort required.

However, without performing additional analyses, some estimates of risk within 50 miles are possible. Detailed output for latent cancer fatalities as a function of location due to early exposure was available in numerical form from the CRAC2 analyses. These results indicate that the ratio of latent cancer fatalities within 50 miles to that within 350 miles is approximately 0.65. The population within 50 miles of the plant, therefore, assumes about 65 percent of the total latent cancer fatality risk due to early exposure. Assuming that the latent cancer fatalities due to chronic exposure are spatially distributed approximately the same as the population, then the apportionment of this cancer fatality risk between the population within 50 miles and the total population can be estimated. The ratio of the populations is:

$$\frac{P\ (0\text{-}50\ mi)}{P\ (0\text{-}350\ mi)} = \frac{3{,}950{,}000}{94{,}971{,}000} = 0.04$$

The mean value for the latent cancer fatalities due to early exposure (for the total population) is 1.86 x 10^{-3} per reactor-year, while the mean value for latent cancer fatality due to chronic exposure is 1.85 x 10^{-2} per reactor-year. The estimated cancer risk (early and chronic) within 50 miles is $0.65(1.86\times10^{-3}) + 0.04(1.85\times10^{-2}) = 1.95\times10^{-3}$ per reactor-year.

The total cancer fatality risk mean value for the population within 350 miles is 2.0 x 10^{-2} per reactor year. Therefore, the cancer risk assumed by the population within 50 miles of the plant is approximately 10 percent of the total cancer risk. A similar relationship would hold for the distribution of population total body man-Rem between the population

within 50 miles of BVPS-2 and the total population within 350 miles.

b. (iv) The CCDF for population with bone marrow dose greater than 200 Rem is shown on Figure 7.1-6, Amendment 5. Producing risk curves for population with whole body dose above 25 Rem and population with thyroid dose above 300 Rem requires separate CRAC2 calculations with the present version of the code. The value of the information gained by performing these analyses does not warrant the additional effort required. The results for the population with bone marrow dose greater than 200 Rem can be used as an indication of the order of magnitude of the least number of people to receive 300 Rem thyroid dose or 25 Rem whole body dose.

b. (v) The economic cost of damages to the plant would be associated with decontamination, repair or replacement of the plant, and replacement power. Although no detailed methodology has been developed to estimate the contribution of an accident to the economic risk to the licensee for decontamination and restoration of the plant, experience in these areas is being gained as cleanup of Three Mile Island Unit 2 continues.

The economic penalty associated with an accident occuring during the first year of operation of BVPS-2 can be estimated at $1,600 million, in time-of-expenditure dollars, for decontamination and restoration (Comptroller General of the United States).

In addition, during each restoration year, the utility will need to purchase replacement power for the damaged unit. This cost is estimated to be approximately $575 million, in 1986 dollars, assuming the plant would be shut down for eight years and that the energy which would have been produced by BVPS-2 (assuming a 67-percent average capacity factor) would be replaced largely by coal-fired generation within the CAPCO grid. This cost is based, in part (1987-1991), on production cost savings data previously provided in response to NRC question E320.1 of the BVPS-2 Environmental Report, Amendment 3. These projected cost savings were subsequently estimated for the years 1992-1994 to provide 8 years of data for prediction of power replacement costs. The estimated CAPCO production cost savings for the years 1992, 1993, and 1994 were $80 million, $66 million, and $65 million, in 1986 dollars, respectively.

If the probability of sustaining a total loss of the plant is assumed equal to the sum of the probabilities of the occurence of core-melt accidents, there would be approximately 5.1 chances in 100,000 that a disabling accident would occur during each year of service life of BVPS-2. Multiplying the previously estimated cost of $2,175 million for an accident at BVPS-2 during the initial year of its operation by the 5.1×10^{-5} probability results in an economic risk of $111,000 applicable to BVPS-2 during that year. The economic risk in subsequent years is assumed to be the same with the effects of inflation on restoration and cleanup costs approximately offset by the effects of plant depreciation and reduced capacity.

Reference:

Comptroller General of the United States 1981. "Report to the Congress," EMD-81-106, Washington, DC, August 26, 1981.

NRC Letter: December 2, 1983

Question E450.2

As stated in Section 7A.2, the estimates of early fatalities in ER-OL were made with the assumption of supportive medical treatment. Please discuss this basis for this assumption, including the availability of such medical treatment to all persons requiring the treatment subsequent to acute radiological exposure resulting from severe accidents in the BVPS-2 reactor.

Response:

The CCDF for population having bone marrow doses in excess of 200 Rem indicates that the frequency of exceeding the capacity of supportive treatment facilities (2,500-5,000 beds, WASH-1400) is very small (about 7 out of one hundred million per year of reactor operation). This frequency is, in effect, an estimate of the probability of having underpredicted the number of early fatalities by using the supportive medical treatment dose response function. Inherent in the consequence analysis performed for BVPS-2 is the assumption of a 10-mile sheltering distance. Increasing the sheltering distance to 25 miles would further reduce the likelihood of exceeding the capacity of treatment facilities.

Reactors, U.S. Department of Energy (USDOE), formerly ERDA. The SAPS terminated operation in 1982 and is scheduled for decommissioning by the USDOE. The SAPS area is leased by DLC to the USDOE.

The low population zone (LPZ) surrounding BVPS-2 encompasses an area within an approximate 3.6-mile radius of the BVPS-2 reactor containment centerline. The distance for the LPZ is based on the requirements of 10 CFR 100. The 3.6-mile radius meets the requirement that the LPZ be an area in which sufficient protective measures can be taken to assure that the resident population does not receive a dose in excess of a specified level resulting from a postulated accident condition. No population centers with populations equal to or greater than 25,000 exist within the LPZ, or within an area of radius 1 1/3 times the LPZ radius, approximately 4.8 miles.

The population center nearest to BVPS-2, as defined by 10 CFR 100, is the township of McCandless, Pennsylvania, which supported approximately 26,250 people in 1980 at a density of 1,608 people per square mile. The township's closest corporate boundary to the station is approximately 17 miles east of BVPS-2. Existing population centers with over 25,000 people are presented in FSAR Table 2.1-24. Cities and towns projected to become population centers with over 25,000 people during the period 1980 to 2030 are listed in FSAR Table 2.1-25. The projected population distribution for 2010, based on 1980 census data, is found in FSAR Tables 2.1-7, 2.1-14, and 2.1-21.

The safety analysis of the BVPS-2 site has also included a review of potential external hazards generated by man (offsite activities that might cause an accident). This review encompassed nearby industrial, transportation, and military facilities that might create explosive, missile, toxic gas, or similar hazards. The risk to BVPS-2 from such hazards has been found to be negligible. A more detailed discussion of the compliance with siting criteria and the consideration of external hazards is given in FSAR Section 2.2. Also discussed in the FSAR are design provisions required for severe natural phenomena such as earthquakes, floods, and tornadoes.

7.1.2.3 Emergency Preparedness

An Emergency Preparedness Plan for BVPS is in place and is exercised on an annual basis. The plan applies to the operation of BVPS-1 during the construction of BVPS-2 and will be modified to address both units upon completion and operation of BVPS-2.

The BVPS Emergency Preparedness Plan provides guidance for coping with both onsite and offsite emergency situations. It ranges in scope from relatively minor unusual events and occurrences involving small releases of radioactive material to a major nuclear accident having significant offsite radiological consequences. This plan, together with the interrelated state and county emergency plans,

release category parameters used for the analysis are presented in Table 7.1-3.

Potential radiological consequences have been calculated for the nine release categories using the CRAC2 computer code. This code incorporates the models developed in the RSS. The analyses are site specific and employ environmental parameters associated with the BVPS-2 location. Meteorological data used in the analyses represent one full year of hourly averages of wind speed and direction, atmospheric lapse rate, and precipitation. Population data for the year 2010 is based on 1980 census data for the area within a 350-mile radius of the plant. Habitable land fraction out to 350 miles is also a site-specific input. In addition, the analyses require land use statistics as a function of state, including land value, farm product values, and growing season information for the area out to 350 miles. A diagram of the consequence analysis model is given on Figure 7.1-1.

In order to calculate consequences and their associated probabilities, weather data for 1 year are sampled. It would be prohibitively expensive to model the radioactivity release starting at each of the 8,760 possible hourly start times. Instead, a provision known as "bin sampling" is used. In this method, all of the hourly meteorological data are first classified into groups or bins (there are 29 bins defined in CRAC2) on the basis of similarity of weather sequences. Samples are selected from each bin. This ensures against exclusion or inappropriate weighting of some weather sequences.

Protective actions modeled which would reduce radiation doses include evacuation of nearby population, sheltering of non-evacuees, long-term relocation of people, and interdiction and decontamination of contaminated land. The evacuation plan used (refer to Appendix 7A) is site specific and includes two possible evacuation schemes. The evacuation parameters used in the model were extracted from a recent evacuation and mass notification study performed for BVPS (Alan M. Voorhees and Associates 1980).

7.1.3.2.1.6 Calculation of Risk Curves

This section describes the analytical techniques used to compile and assemble the results into risk diagrams. The assembly process is based on a matrix multiplication process. Matrices were constructed for the following separate analyses: initiating events, plant states, release categories, and consequences. Multiplication of the first three of these matrices provides the probability of occurrence associated with each release category, as shown in Table 7.1-2. These probabilities were then multiplied by the consequence matrix provided by the CRAC2 runs done on a conditional basis (release category probability equal to 1). This operation provides the additional probability associated with the weather conditions and

evacuation scenarios to yield the total probability and consequences that make up the risk curves.

7.1.3.2.2 Dose and Health Impacts of Atmospheric Releases

The results of the calculations for dose and health impacts are presented in the form of probability distributions functions, sometimes referred to as CCDFs (complementary cumulative distribution functions), or final risk curves. All of the release categories shown in Table 7.1-2 are included in each risk curve.

Figures 7.1-2 through 7.1-6 represent the probability distribution functions for the damage indices of early fatalities, total latent effects, population whole body man-Rem, thyroid cancer fatalities, and population with bone marrow dose over 200 Rem, respectively. Early fatalities refer to those deaths which might result within 1 year of a postulated accident. The total latent effects include fatalities from leukemia, cancers of the lung, gastrointestinal tract, breast, and bone, but do not include thyroid cancers. The population whole body man-Rem is the sum of the number of people exposed times the whole body dose received for each dose level.

The final risk curves represent the product of the analysis of initiating events, plant response, containment response, and site consequences for severe accident sequences at BVPS-2. Incorporated into each of these distributions is the probability of a plant state resulting in a release to the environment described by any of the nine release categories, for each year of reactor operation.

The left side of Figure 7.1-2 shows that there is approximately one chance in 10 million per reactor year that one or more fatalities might occur as a result of a severe accident at BVPS-2. This frequency of exceeding a given number of fatalities decreases as the damage index (number of fatalities) increases. Additionally, the risk curve shows that the probability of exceeding one early fatality and the probability of exceeding approximately 200 early fatalities are about the same.

Figure 7.1-3 shows the probability distribution for fatal cancers (excluding data groups "thyroid" and "whole body"). Calculation of these effects is based upon the dose response model presented in the BEIR report (National Academy of Sciences 1972) and is consistent with models developed in BEIR III (National Academy of Sciences 1980). There is typically a latent period after exposure of from 2 to 30 years before a cancer might be manifested. In addition, individuals are considered to be at risk of leukemia induction for 30 years after the latent period following exposure, while for all other cancers they are assumed to be at risk for the remainder of their lives. As a result, the predicted number of fatal cancers may be distributed over many years. The dose used in predicting the number of latent effects is a result of both acute and chronic exposure.

Figure 7.1-4 provides the probability distribution for total population whole body dose in man-Rem. Acute and chronic whole body doses to the population within 350 miles of the plant were used to generate this risk curve.

The thyroid cancer fatality risk distribution is presented in Figure 7.1-5. These results are based upon the assumption that 4% of the radiation induced thyroid nodules result in thyroid cancer fatality.

Figure 7.1-6 shows the probability distribution for the population exceeding a bone marrow dose of 200 Rem and provides an estimate of the number of people which might require supportive medical treatment.

As an indication of the spatial distribution of individual latent cancer fatality risk per year of reactor operation, contours of constant risk (isorisk curves) are plotted on a map of the site out to 10 miles (Figure 7.1-8).

7.1.3.2.3 Economic Impacts

Placing monetary values on the cost of human radiation exposure is at best a difficult and controversial task. However, it is possible to assess the economic impacts of avoidance of adverse health effects. Such a calculation has been performed for BVPS-2. The results are shown on Figure 7.1-7, which is the probability distribution function for total cost of offsite mitigating actions including decontamination efforts. Factors which contribute to these estimated costs include the following:

- Evacuation costs,
- Value of milk contaminated and condemned,
- Costs of decontamination of property where practical, and
- Indirect costs due to loss of property use and incomes derived therefrom.

The loss of land use and associated incomes derives from the possible need to interdict the land and property until it is free of contamination or can be economically decontaminated.

Several comments can be made concerning economic risks based upon Figure 7.1-7. The initial plateau portion of the curve indicates that the probability of total costs exceeding 1 million dollars and the probability of total costs exceeding 20 million dollars are the same. This is a direct result of calculating evacuation costs based upon evacuation of the entire 10-radial-mile area of the plant. The right side of the risk curve indicates that, although very unlikely (less than one chance in one hundred million), costs could exceed

several billion dollars (1980 dollars). These costs do not include the cost of decontamination and repair or replacement of the facility, nor the cost of replacement power.

7.1.3.2.4 Releases to Ground Water

7.1.3.2.4.1 Introduction

Releases of radioactivity to the ground-water system could occur following a postulated core meltdown with eventual penetration of the containment basemat. Core debris which exits the melt hole would then enter the water table, which is normally at an elevation of approximately 20 feet below the containment basemat, and radionuclides in the debris would be leached in the ground-water system. It is also possible for containment sump water, which could be rich in dissolved fission products, to be released through a breach in the containment.

An analysis of the potential consequences of such an event is presented by the USNRC staff in NUREG-0440, "Liquid Pathway Generic Study" or LPGS (USNRC 1978a). This generic report provides the basis for the comparative evaluation of BVPS-2.

The LPGS presents analyses for a four-loop Westinghouse pressurized water reactor (PWR) located at a number of land sites, one of which is on a river system which is very similar to the one at BVPS-2. The LPGS river site is on the Clinch River approximately 21 miles upstream of its juncture with the Tennessee River. The balance of this river system consists of the Tennessee River (567 miles), the Ohio River (46 miles) and the Mississippi River (954 miles). This system contains a number of dams and reservoirs, principally along the Tennessee River segment.

The BVPS-2 river system is similar, consisting of 946 miles of the Ohio River and the same 954 miles of the lower Mississippi River. Like the Tennessee, there are numerous dams along the Ohio. However, unlike the Tennessee, which is an important recreational resource, the Ohio is heavily industrialized.

In the LPGS, parameters for each generic site (including the Clinch River site) were chosen to be representative of the full spectrum of similar sites, in this case river sites. Parameters used for analysis in the LPGS, although typical, do not represent any actual plant site. In the LPGS it was concluded that individual and population doses for the liquid pathways would be small fractions of the airborne pathways dose which could result from a core meltdown accident.

Individual and population doses are reported in the LPGS for the principal liquid pathways: drinking water, aquatic food, and direct exposure from swimming and shoreline usage. Exposure resulting from

crop irrigation was also considered but was found to contribute insignificantly to dose (USNRC 1978a).

Doses to individuals and populations were calculated in the LPGS without taking credit for possible interdiction methods such as isolation of contaminated ground water, the temporary restriction of fishing, or the provision of alternate sources of drinking water (or additional purification equipment). Such interdiction methods would be highly successful in preventing exposure to radioactivity, and the liquid pathways consequences would therefore be economic and societal rather than radiological.

covered solely by such a measure. At best, it can be a contributing factor to a risk judgment, but not necessarily a decisive factor.

To accomplish these comparisons, the mean values for a damage index (for example, early fatalities) as calculated by CRAC2 for each release category were weighted by the corresponding release category frequency, and then summed. The resulting value is representative of the risk for the particular damage index per year of reactor operation. The results of these calculations are presented in Table 7.1-4 for early fatalities, latent cancer fatalities, population whole body man-Rem, thyroid cancer fatalities, population with bone marrow dose over 200 Rem, and the total cost with decontamination.

The mean risk of early fatality per year of BVPS-2 operation for all release categories is approximately 0.0002, for evacuation to 10 miles. The population at risk for early fatalities is within a 20-mile radius of the plant. The 2010 population within 20 miles of the plant, shown in FSAR Table 2.1-4, is 489,932. Accidental fatalities per year for a population of this size, based upon overall averages for the United States, are approximately 108 from motor vehicle accidents, 38 from falls, 15 from drowning, 14 from burns, and 6 from firearms (National Research Council 1980). The risk of early fatalities due to the operation of BVPS-2 is therefore very small in relation to other fatal risks to which the population is exposed.

For comparison with the population whole body dose mean value of 309 man-Rem, also shown in Table 7.1-4, the whole body dose to the population within 350 miles of BVPS-2 due to natural radiation from the environment can be calculated. In the northeastern United States, at the altitude of BVPS-2, the average annual dose to an individual due to natural radiation is approximately 103 mRem (National Academy of Sciences 1980). If the population at risk around BVPS-2 is considered to be those people within 350 miles, or a population of 94,971,369 as shown in FSAR Table 2.1-21, the population dose from natural radiation is 9,782,000 man-Rem. Based upon population whole body dose, the risk due to severe accidents resulting from operation of BVPS-2 is very small compared to the risk due to natural radiation.

The average number of latent cancer fatalities for the lifetime of the population within 350 miles of the reactor, due to one year of reactor operation, is approximately 2.1×10^{-2}. In comparison, assuming a representative United States population, the expected number of deaths per year due to cancer would be approximately 195,300 (U.S. Bureau of Census 1982). Although this is comparing a lifetime risk to a yearly risk, it is evident that the risk of cancer fatality due to severe accidents is very small in relation to existing cancer fatality risks.

TABLE 7.1-3

RELEASE CATEGORY PARAMETERS

Release Category	Time to Release* (hr)	Release Duration (hr)	Warning Time** (hr)	Sensible Heat Rate*** (cal/sec)
BV-1	2.5	1.0	1.0	1.0×10^6
BV-2	0.72	2.0	0.2	7.9×10^6
BV-3	6.0	2.0	0.5	9.8×10^6
BV-4	8.3	0.5	4.1	2.4×10^7
BV-5	4.3	0.5	4.1	2.3×10^7
BV-6	20.1	0.5	16.0	2.9×10^7
BV-7	4.5	0.5	4.0	1.0×10^6
BV-8	21.0	0.5	2.0	1.0×10^6
BV-9	95.0	10.0	80.0	0

NOTES:

*Time between reactor shutdown and release to atmosphere.
**Time from beginning of official warning to beginning of atmospheric release.
***Due to thermal heat content of the released gases.

TABLE 7.1-4

MEAN VALUES FOR DAMAGE INDICES

Release Category	Early Fatalities	Latent Cancer Fatalities	Population Whole Body Man-Rem	Total Cost with Decontamination (1980 Dollars)	Population with Bone Marrow Dose Over 200 Rem	Thyroid Cancer Fatalities
BV-1	2.89×10^{-7}	1.82×10^{-4}	2.87	92.9	5.8×10^{-6}	2.8×10^{-5}
BV-2	7.23×10^{-7}	5.88×10^{-5}	0.90	53.0	4.5×10^{-6}	1.1×10^{-5}
BV-3	9.55×10^{-6}	8.16×10^{-4}	12.7	734.0	3.6×10^{-5}	1.3×10^{-4}
BV-4	5.21×10^{-5}	2.83×10^{-3}	41.9	2,350.0	7.1×10^{-4}	2.6×10^{-4}
BV-5	7.48×10^{-6}	3.68×10^{-4}	5.5	307.0	9.2×10^{-5}	3.5×10^{-5}
BV-6	1.66×10^{-4}	1.62×10^{-2}	243.0	11,230.0	7.0×10^{-4}	1.2×10^{-3}
BV-7	0	8.69×10^{-5}	1.4	404.0	0	9.1×10^{-5}
BV-8	0	4.43×10^{-5}	0.7	432.0	0	2.8×10^{-5}
BV-9	0	4.6×10^{-6}	0.1	552.0	0	3.7×10^{-7}
TOTAL	2.36×10^{-4}	2.06×10^{-2}	309.4	16,410.0	1.5×10^{-3}	1.8×10^{-3}

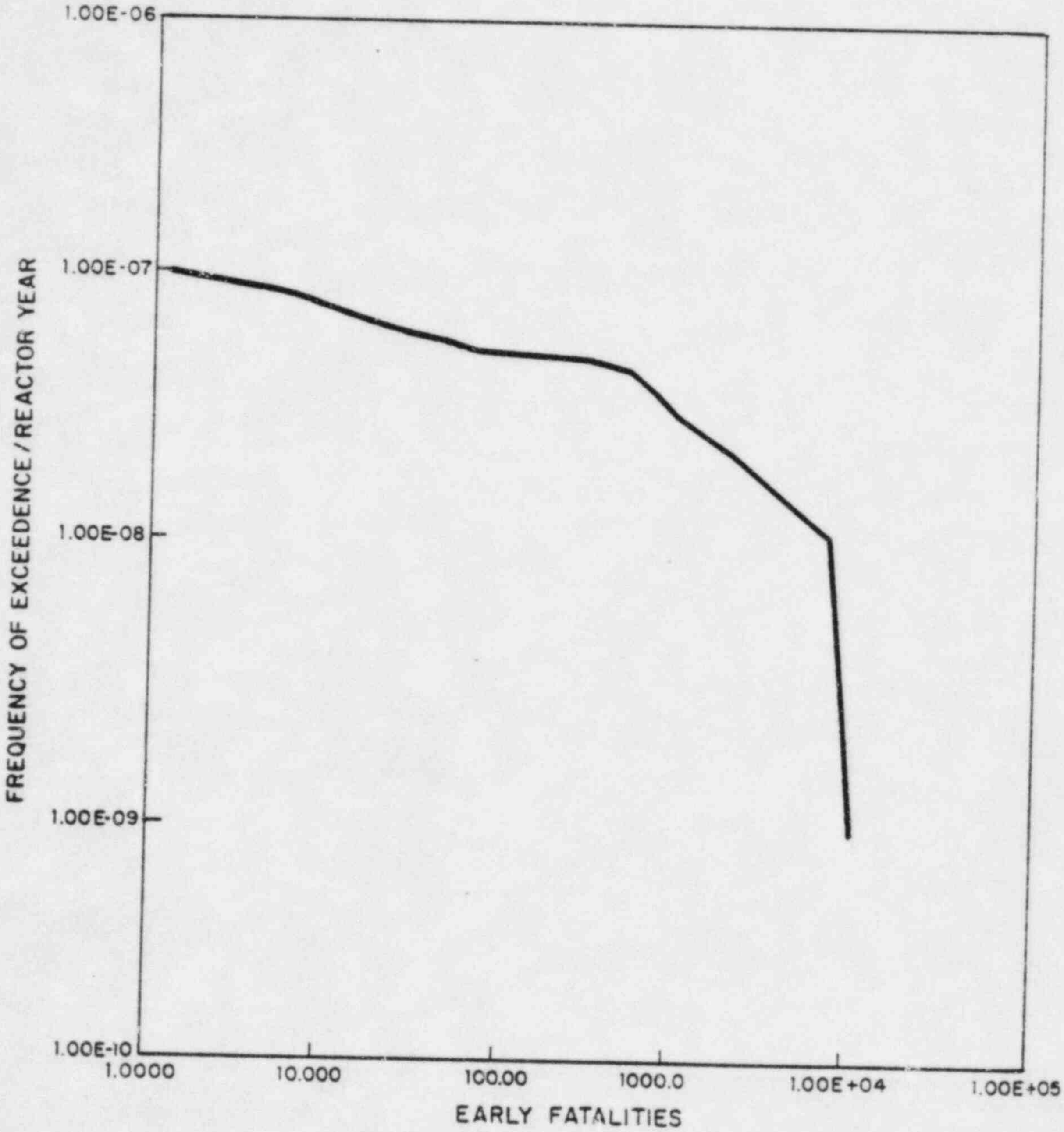

FIGURE 7.1-2
RISK CURVE FOR EARLY FATALITIES
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

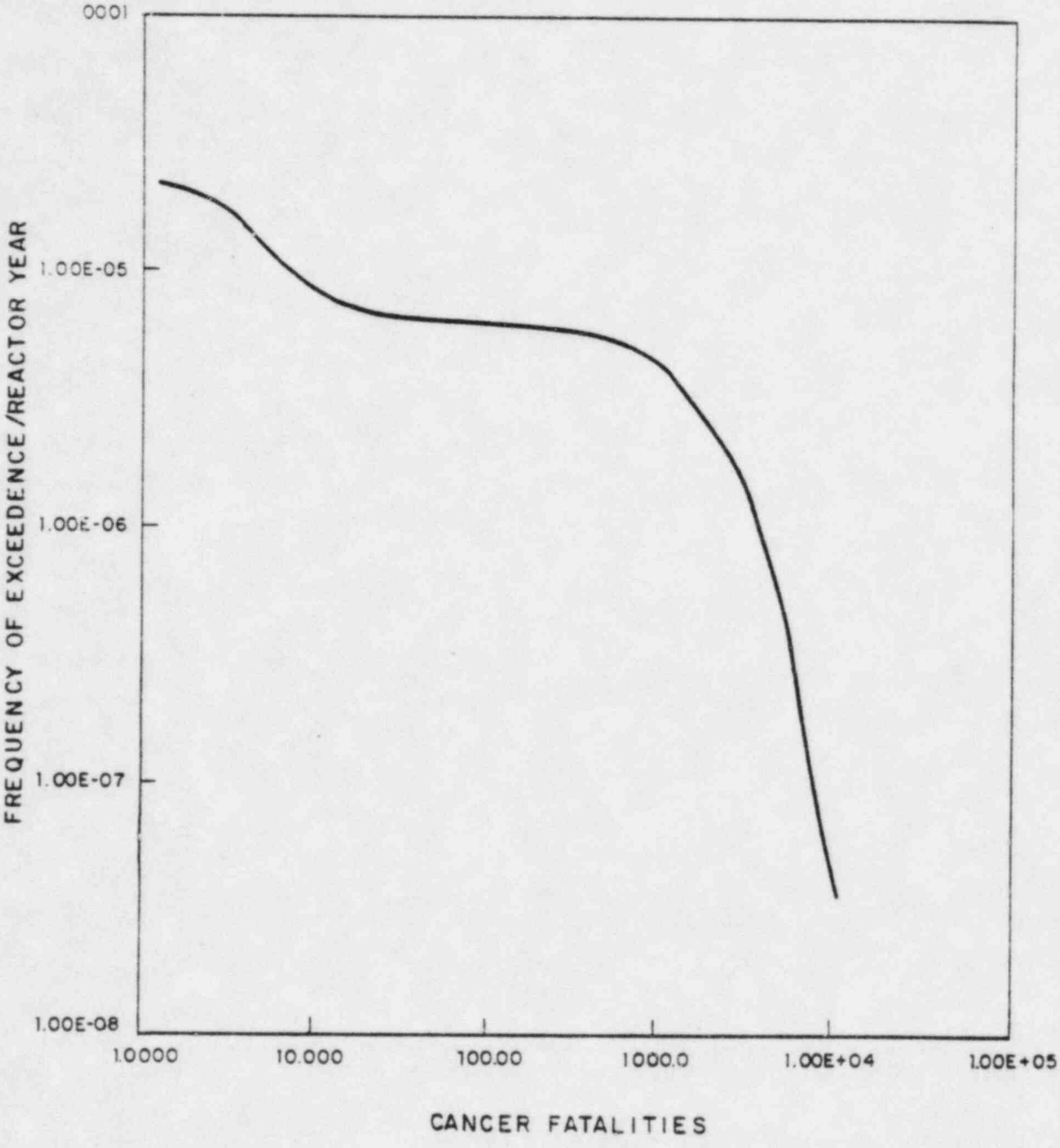

FIGURE 7.1-3
RISK CURVE FOR TOTAL LATENT CANCER FATALITIES
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

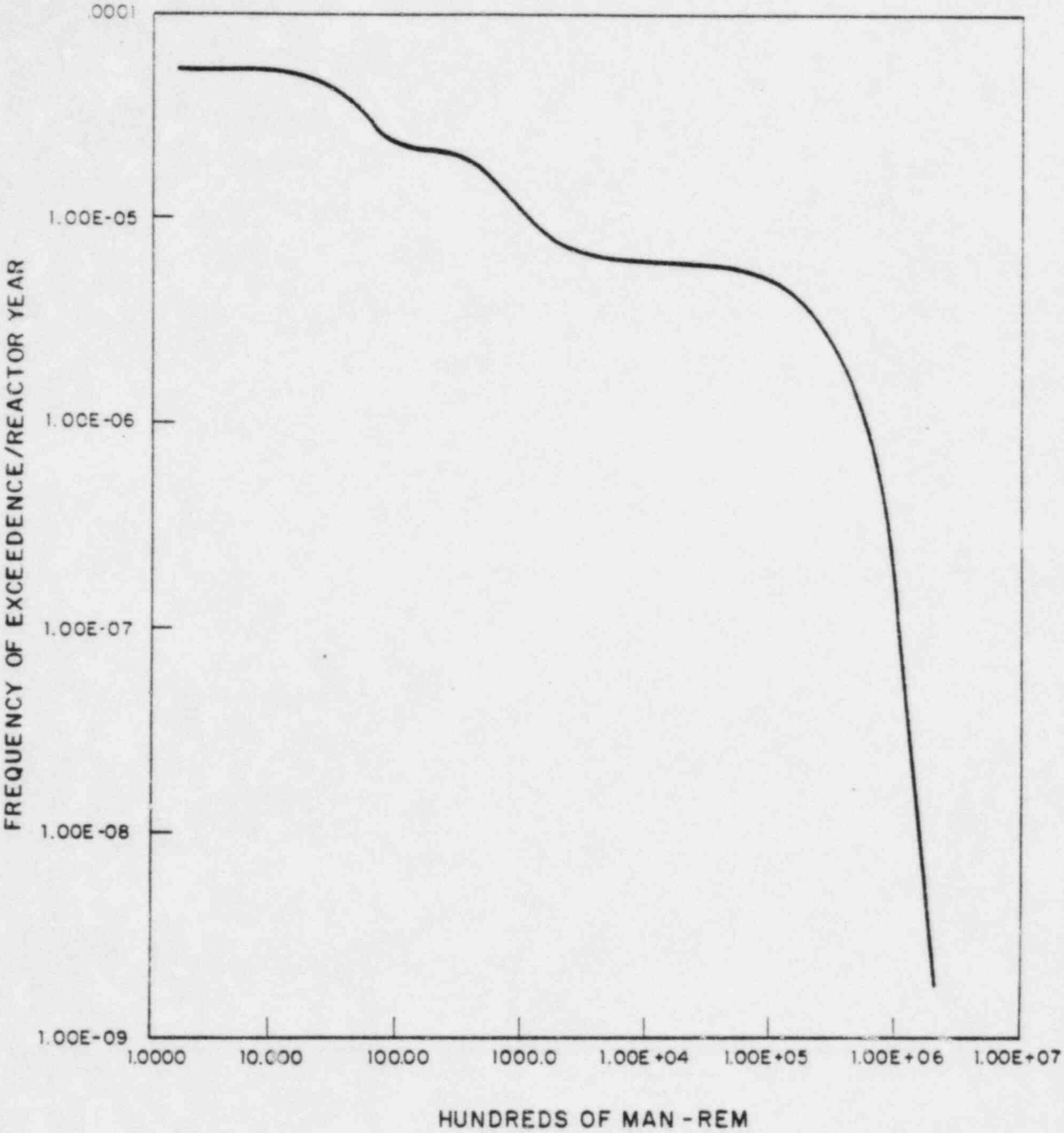

FIGURE 7.1-4
RISK CURVE FOR TOTAL
POPULATION WHOLE BODY MAN-REM
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

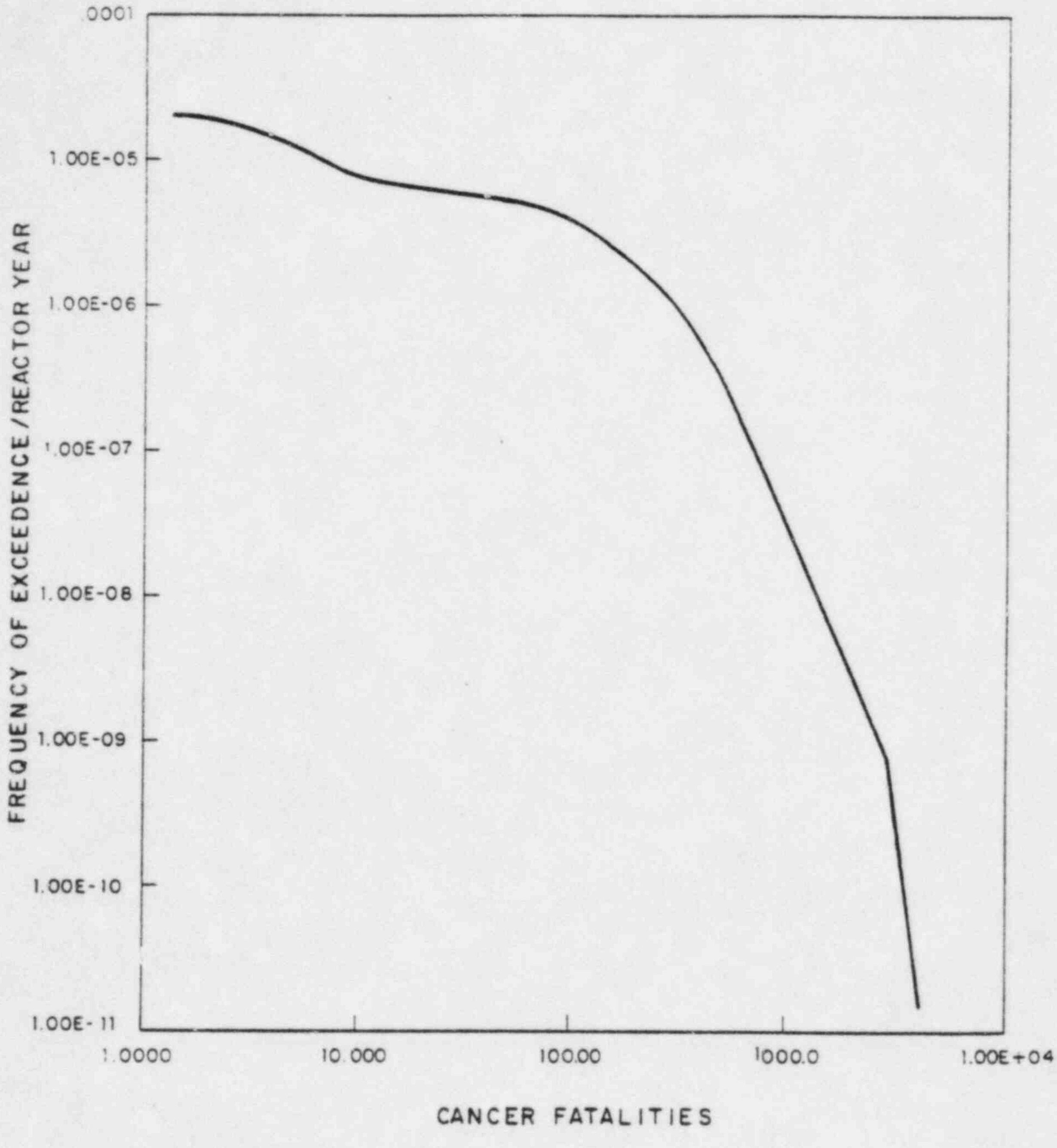

FIGURE 7.1-5
POINT ESTIMATE RISK CURVE FOR
THYROID CANCER FATALITIES
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

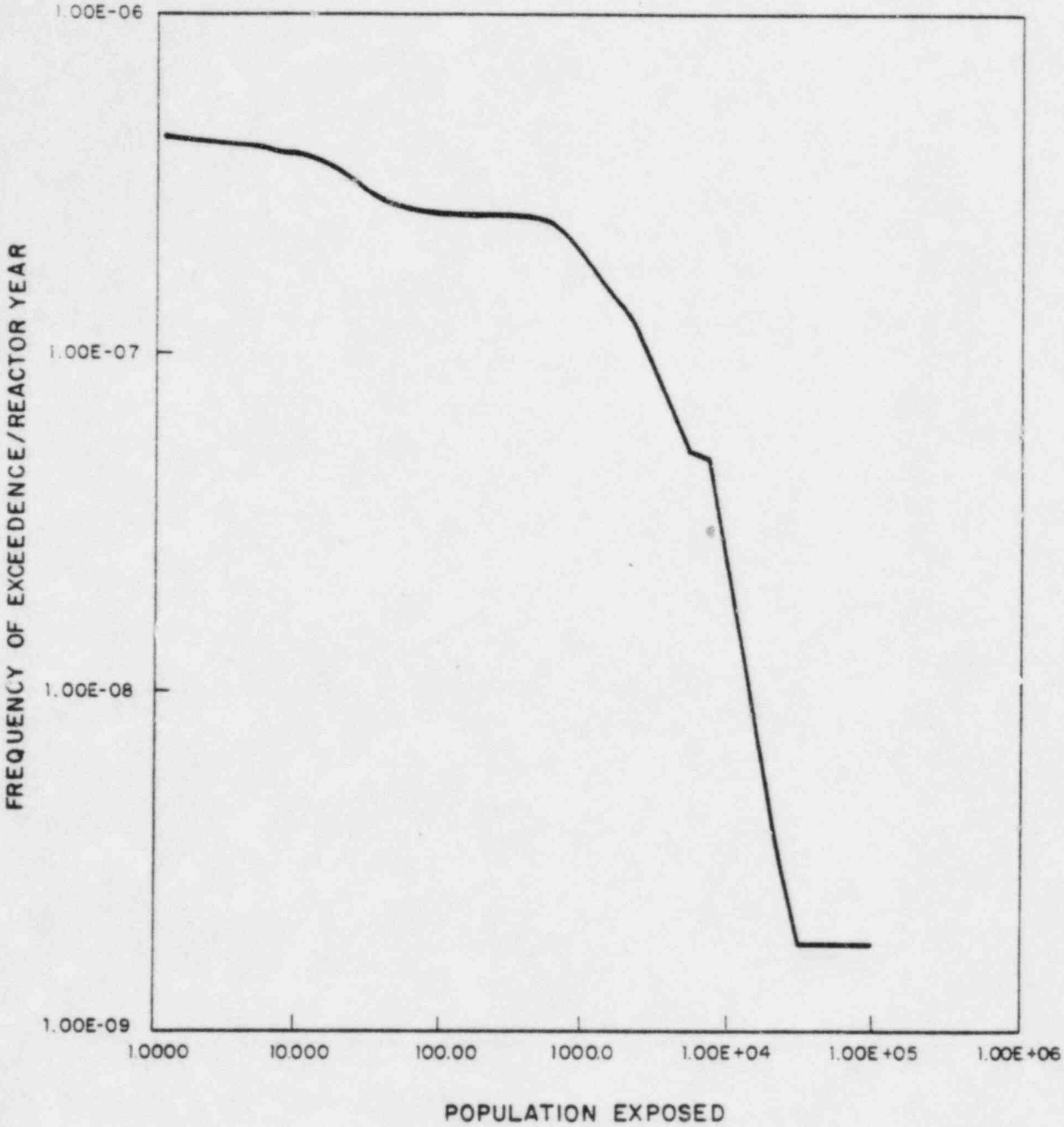

FIGURE 7.1-6
RISK CURVE FOR POPULATION WITH BONE MARROW DOSE >200 REM
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

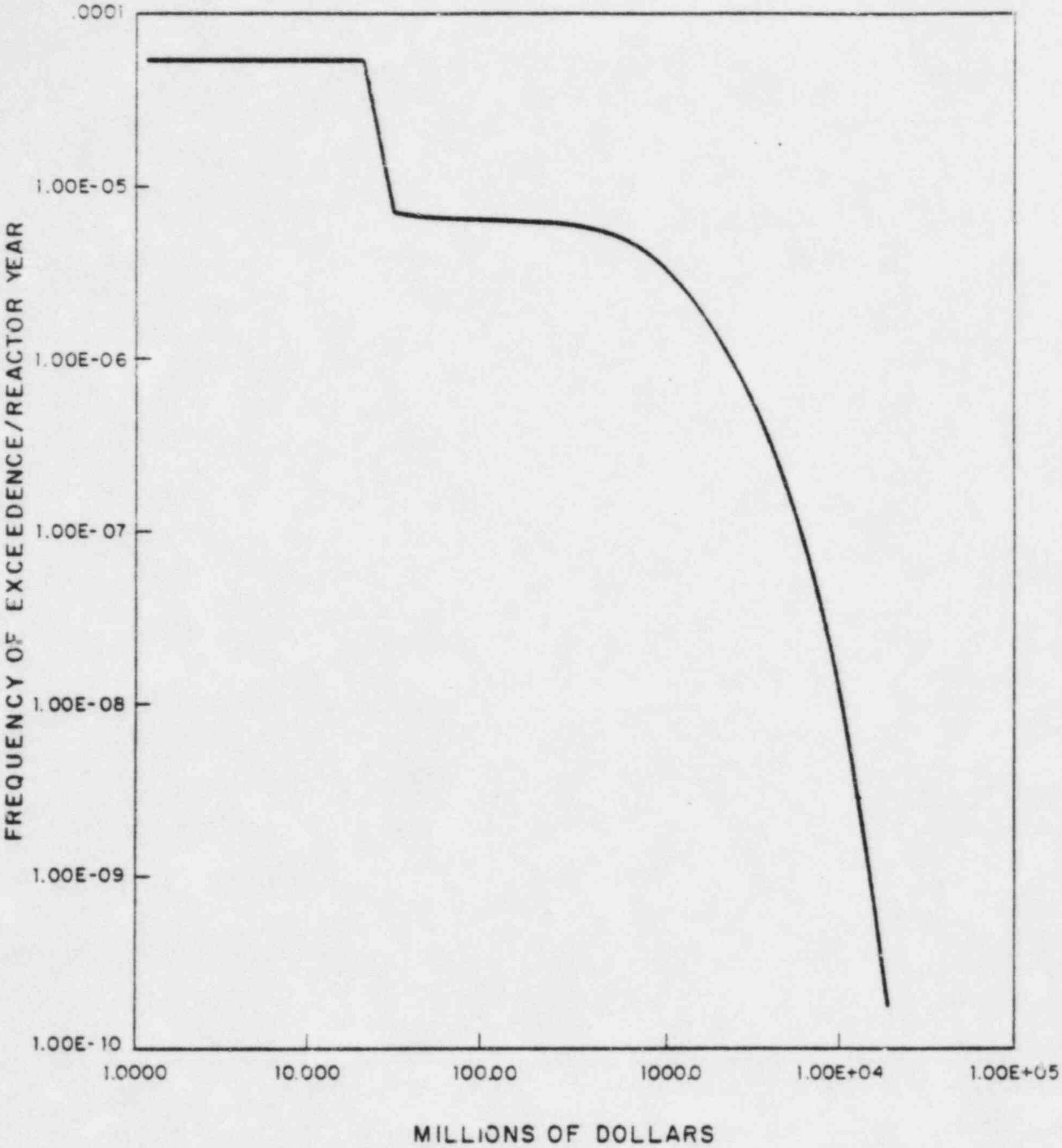

FIGURE 7.1-7
RISK CURVE FOR TOTAL COST WITH DECONTAMINATION
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

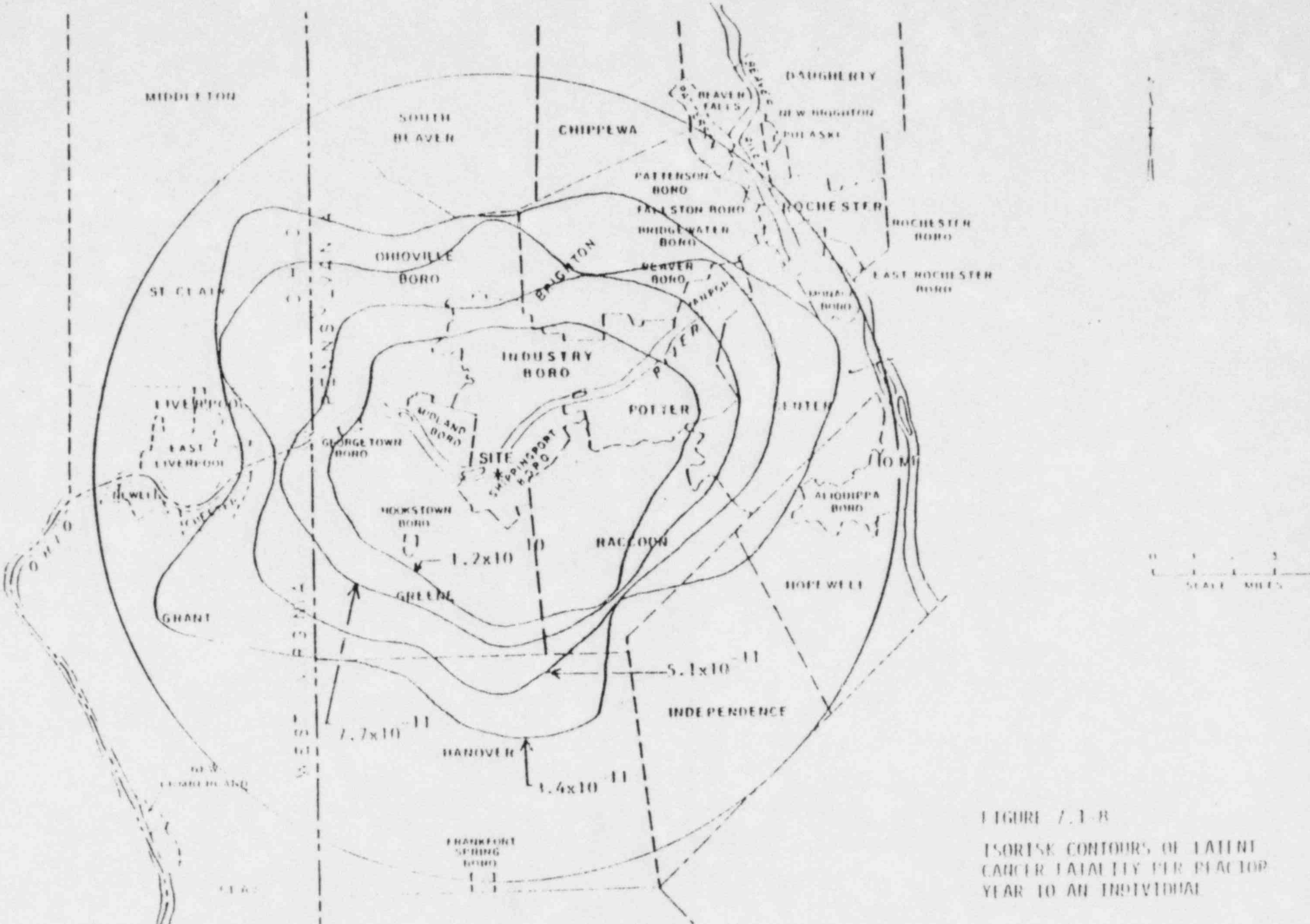

FIGURE 7.1-8

ISORISK CONTOURS OF LATENT CANCER FATALITY PER REACTOR YEAR TO AN INDIVIDUAL