DRAFT

REPORT TO THE ADVISORY BOARD ON RADIATION AND WORKER HEALTH

National Institute for Occupational Safety and Health

BLIND DOSE RECONSTRUCTION OF CASE #[REDACTED] FROM HANFORD AND THE GRAND JUNCTION OPERATIONS OFFICE

Contract No. 200-2009-28555
SCA-TR-BDR2014-[REDACTED]

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BLIND DOSE RECONSTRUCTION OF CASE #[REDACTED] FROM HANFORD AND THE GRAND JUNCTION OPERATIONS OFFICE	Page 2 of 80
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TABLE OF CONTENTS

LIST OF TABLES

EXECUTIVE SUMMARY

Under Contract No. 200-2009-28555, SC&A has been tasked by the Advisory Board on Radiation and Worker Health (Advisory Board) to perform eight blind dose reconstructions (DRs). This report presents the methodologies and results of our DR for the blind case selected by the Advisory Board representing an energy employee (EE) who worked at the Hanford Site and Grand Junction Operation Office.

To perform this blind DR, SC&A was provided with all of the Department of Energy (DOE) dosimetry records; the Department of Labor (DOL) correspondence, forms, and medical records; and the Computer-Assisted Telephone Interview (CATI) Report that were made available to the National Institute for Occupational Safety and Health (NIOSH) for constructing doses in behalf of Case #[redacted]. SC&A used two independent approaches to reconstruct occupational doses associated with this case. Both approaches used the available dosimetry records and current technical guidance documents published by NIOSH and the Oak Ridge Associated Universities Team (ORAUT). The first approach, which is referred to as DR–Method A, used the spreadsheets and other tools developed by NIOSH to calculate the doses, whereas the second approach, referred to as DR–Method B, manually calculated the doses [with the assistance of the internal dosimetry computer program Integrated Modules for Bioassay Analysis (IMBA)].

This Executive Summary provides an overview of the case and a comparison of the results of the two independent DR methods. Section I of this report provides a detailed discussion of the approach used to reconstruct external/internal occupational radiation doses using DR–Method A, and Section II describes the reconstruction of doses using DR–Method B.

RELEVANT BACKGROUND INFORMATION

According to the DOL records, this case represents an EE who worked at the Hanford Site from [redacted] through [redacted] and the Grand Junction Operations Office (GJOO) from [redacted] through [redacted].

The EE was diagnosed with nine primary skin cancer BCCs (basal cell carcinomas), as shown in Table ES-1.

Table ES-1. Cancers and Diagnosis Dates

#	Description	Diagnosis Date	ICD-9 Code
1	BCC, [redacted]	[redacted]	[redacted]
2	BCC, [redacted]	[redacted]	[redacted]
3	BCC, [redacted]	[redacted]	[redacted]
4	BCC, [redacted]	[redacted]	[redacted]
5	BCC, [redacted]	[redacted]	[redacted]
6	BCC, [redacted]	[redacted]	[redacted]
7	BCC, [redacted]	[redacted]	[redacted]
8	BCC, [redacted]	[redacted]	[redacted]
9	BCC, [redacted]	[redacted]	[redacted]

According to the DOE records and the CATI Report, the EE worked in the [redacted] Department and had a variety of job titles such as [redacted], [redacted], and [redacted] at both Hanford and GJOO. The EE was monitored for external photon and electron exposure during the employment period at Hanford; however, there were no external monitoring records provided for the EE's employment at GJOO. In addition, there were no recorded bioassay data from either facility.

PRESENTATION OF RESULTS

The results of both independent DR methods are shown in Table ES-2. DR–Method A calculated external and internal doses using the EE's Hanford dosimetry records, as well as modeled doses associated with the EE's employment period at GJOO. This method derived total skin doses ranging from 1.843 rem to 2.168 rem. The Method A skin doses varied depending on cancer location and date of diagnosis.

DR–Method B derived a total skin dose of 0.811 rem to the skin of the [redacted], 0.833 rem to the skin of the [redacted], and 1.309 rem to the skin of the [redacted]. Method B explicitly evaluated external dose from photon, beta, and occupational medical x-ray exams based on dosimetry records from the EE's employment at the Hanford Site. Internal dose to the skin was assessed based on environmental internal exposure, which resulted in doses less than 1 mrem and were not included in the probability of causation (POC) calculation. Since Method B determined that the EE was not monitored or likely exposed to radioactive material at GJOO, no radiation dose was assigned during this employment period.

Both DR methods calculated a POC using NIOSH's Interactive RadioEpidemiological Program (IREP, v.5.7). Method A calculated a POC value of 43.18%, and Method B derived a POC value of 38.59 %, as described in Sections I and II.

Table ES-2. Derived Dose Estimates

	DR – Method A (Numbers represent cancers listed in Table ES-1)							DR – Method B		
	#1 Dose (rem)	**#2 Dose (rem)**	**#3 Dose (rem)**	**#4 Dose (rem)**	**#5 Dose (rem)**	**#6, 8, & 9 Dose (rem)**	**#7 Dose (rem)**	**Skin Cancer of [redacted] (rem)**	**Skin Cancer of [redacted] (rem)**	**Skin Cancer on [redacted] (rem)**
External Dose (Occupational):*										
▪ Recorded Photon Dose										
30–250 keV Photons, Hanford	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.680	0.680	0.680
>250 keV Photons, Hanford	0.510	0.510	0.510	0.510	0.510	0.510	0.510	–	–	–
30–250 keV Photons, GJOO	0.370	0.370	0.370	0.370	0.370	0.370	0.370	–	–	–
▪ Missed Photon Dose										
30–250 keV Photons, Hanford	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.090	0.090	0.090
30–250 keV Photons, GJOO CW	–	–	–	–	–	–	–	–	–	–
▪ Recorded Shallow Dose										
e^- >15 keV, Hanford	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.009
e^- >15 keV, GJOO (e-/p)	0.556	0.556	0.556	0.556	0.556	0.556	0.556	–	–	
▪ Occupational Medical Dose										
Hanford	0.008	0.008	0.008	0.032	0.008	0.008	0.324	0.031	0.053	0.530
GJOO	–	–	–	–	–	–	–	–	–	–
Internal Dose (Occupational): Th, U, & Ra GJOO (CW Admin. Intakes)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	–	–	–
Tritium, Hanford CW	0.079	0.079	0.079	0.079	0.079	0.079	0.079	–	–	–
e- >15 keV, Hanford CW	0.005	0.005	0.005	0.005	0.005	0.005	0.005	–	–	–
Pu, Hanford CW	0.043	0.045	0.047	0.047	0.049	0.051	0.051	–	–	–
U, Hanford CW	0.009	0.009	0.010	0.010	0.010	0.010	0.010	–	–	–
FAP, Hanford ORAUT-OTIB-0054	0.001	0.001	0.001	0.001	0.001	0.001	0.001	–	–	–
Total	**1.843**	**1.845**	**1.848**	**1.872**	**1.850**	**1.852**	**2.168**	**0.811**	**0.833**	**1.309**

SECTION I: DR–METHOD A

I.1 DOSE RECONSTRUCTION OVERVIEW

This report presents the results of an independent blind dose reconstruction (DR) performed by S. Cohen & Associates (SC&A) for an energy employee (EE) who worked at Hanford from [**redacted**] through [**redacted**] and the Grand Junction Operations Office (GJOO) from [**redacted**] through [**redacted**].

The EE was diagnosed with nine skin basal cell carcinomas (BCCs) on the [**redacted**] between 2006 and 2010. All cancers were primary cancers, as shown in Table I-1.

Table I-1. Cancers and Diagnosis Dates

#	Description	Diagnosis Date	ICD-9 Code
1	BCC, [**redacted**]	[**redacted**]	[**redacted**]
2	BCC, [**redacted**]	[**redacted**]	[**redacted**]
3	BCC, [**redacted**]	[**redacted**]	[**redacted**]
4	BCC, [**redacted**]	[**redacted**]	[**redacted**]
5	BCC, [**redacted**]	[**redacted**]	[**redacted**]
6	BCC, [**redacted**]	[**redacted**]	[**redacted**]
7	BCC, [**redacted**]	[**redacted**]	[**redacted**]
8	BCC, [**redacted**]	[**redacted**]	[**redacted**]
9	BCC, [**redacted**]	[**redacted**]	[**redacted**]

According to the Computer-Assisted Telephone Interview (CATI) Report, the EE was a [**redacted**] in the [**redacted**] Department at both facilities. The EE was monitored for external photon and electron exposure during the employment period at Hanford, but not at GJOO; the EE had no recorded bioassay data from either facility.

I.2 SC&A BLIND DOSE RECONSTRUCTION APPROACH

SC&A reviewed all of the Department of Energy (DOE) records provided on behalf of this employee and the NIOSH procedures relevant to this case, which included the Technical Basis Document (TBD) for Hanford (issued as six separate documents numbered ORAUT-TKBS-0006-1 through ORAUT-TKBS-0006-6), GJOO documents as listed in various sections of this report, ORAUT-OTIB-0017 concerning shallow doses, and ORAUT-OTIB-0006 and ORAUT-PROC-0061 for occupational x-ray doses. Using the guidance provided in these documents, along with the EE's dosimetry records, SC&A manually calculated reasonable, claimant-favorable annual organ doses for each of the cancers, as shown in Table I-2. Appendices I.A-1 through I.A-9 provide a list of SC&A's annual organ doses and also includes IREP input parameters for each year, such as energy range, distribution type, and uncertainty.

Table I-2. Summary of SC&A-Derived External/Internal Dose Estimates

	#1 IREP entry #	#1 Dose (rem)	#2 IREP entry #	#2 Dose (rem)	#3 IREP entry #	#3 Dose (rem)
External Dose (Occupational):*						
▪ Recorded Photon Dose						
30–250 keV Photons, Hanford	1–8	0.170	1–8	0.170	1–8	0.170
>250 keV Photons, Hanford	9–16	0.510	9–16	0.510	9–16	0.510
30–250 keV Photons, GJOO	30–39	0.370	30–39	0.370	30–39	0.370
▪ Missed Photon Dose						
30–250 keV Photons, Hanford	18–24	0.080	18–24	0.080	18–24	0.080
30–250 keV Photons, GJOO CW						
▪ Recorded Shallow Dose						
e^- >15 keV, Hanford	17	0.010	17	0.010	17	0.010
e^- >15 keV, GJOO (e-/p)	40–49	0.556	40–49	0.556	40–49	0.556
▪ Occupational Medical Dose						
Hanford	25–29	0.008	25–29	0.008	25–29	0.008
GJOO	NA	–	NA	–	NA	–
▪ Occupational Environmental Dose:	NA	–	NA	–	NA	–
Internal Dose (Occupational):						
Th, U, & Ra GJOO (CW Admin. Intakes)	50–69	0.002	50–70	0.002	50–71	0.002
Tritium, Hanford CW	70–92	0.079	71–93	0.079	72–94	0.079
e- >15 keV, Hanford CW	93–125	0.005	94–127	0.005	95–129	0.005
Pu, Hanford CW	126–183	0.043	128–187	0.045	130–191	0.047
U, Hanford CW	184–248	0.009	188–254	0.009	192–260	0.010
FAP, Hanford ORAUT-OTIB-0054	249–281	0.001	255–288	0.001	261–295	0.001
Total		**1.843**		**1.845**		**1.848**

Table I-2. Summary of SC&A-Derived External/Internal Dose Estimates (continued)

	#4 IREP entry	#4 Dose (rem)	#5 IREP entry	#5 Dose (rem)	#6, 8, & 9 IREP entry	#6, 8, & 9 Dose (rem)	#7 IREP entry	#7 Dose (rem)
External Dose (Occupational):*								
▪ Recorded Photon Dose								
30–250 keV Photons, Hanford	1–8	0.170	1–8	0.170	1–8	0.170	1–8	0.170
>250 keV Photons, Hanford	9–16	0.510	9–16	0.510	9–16	0.510	9–16	0.510
30–250 keV Photons, GJOO	30–39	0.370	30–39	0.370	30–39	0.370	30–39	0.370
▪ Missed Photon Dose								
30–250 keV Photons, Hanford	18–24	0.080	18–24	0.080	18–24	0.080	18–24	0.080
30–250 keV Photons, GJOO								
▪ Recorded Shallow Dose								
e^- >15 keV, Hanford	17	0.010	17	0.010	17	0.010	17	0.010
e^- >15 keV, GJOO (e-/p)	40–49	0.556	40–49	0.556	40–49	0.556	40–49	0.556
▪ Occupational Medical Dose								
Hanford	25–29	0.032	25–29	0.008	25–29	0.008	25–29	0.324
GJOO	NA	–	NA	–	NA	–	NA	–
▪ Occupational Envir. Dose:	NA	–	NA	–	NA	–	NA	–
Internal Dose (Occupational):								
Th, U, & Ra GJOO (CW Admin. Intakes)	50–71	0.002	50–72	0.002	50–73	0.002	50–73	0.002
Tritium, Hanford CW	72–94	0.079	73–95	0.079	74–96	0.079	74–96	0.079
e- >15 keV, Hanford CW	95–129	0.005	96–131	0.005	97–133	0.005	97–133	0.005
Pu, Hanford CW	130–164	0.047	132–195	0.049	134–199	0.051	134–199	0.051
U, Hanford CW	165–260	0.010	196–266	0.010	200–272	0.010	200–272	0.010
FAP, Hanford ORAUT-OTIB-0054	261–295	0.001	267–302	0.001	273–309	0.001	273–309	0.001
Total		**1.872**		**1.850**		**1.852**		**2.168**

*This table is limited to doses reconstructed based on external exposures "at a distance," as measured by film badges, and does not include skin exposures that may have resulted from direct skin contamination.

SC&A determined the POC for this case using these annual doses as input into the IREP program. Since the EE was diagnosed with nine primary cancers, these doses were entered nine times into the IREP program, one for each cancer. The total external and internal doses shown in Table I-2 produced a POC of 43.18%.

I.3 EXTERNAL DOSES

To perform this DR, SC&A analyzed the DOE files containing the details of the individual badge cycles, and also the summary reports, and compared them to the [redacted] *HAN QC.xls* file supplied to SC&A by NIOSH for this case. The summary reports, the individual badge cycle data, and NIOSH's external dosimetry data file agreed with each other.

In the sections that follow, a description is provided regarding the reconstruction of external recorded photon and electron doses, and missed doses.

I.3.1 Recorded Photon and Electron Doses

The organ dose conversion factor (DCF) of 1.00 was applied to the skin and all electron doses are assumed to be associated with the >15 keV energy range, in accordance with ORAUT-OTIB-0017. Because of their location, no clothing attenuation was used for the cancer sites. SC&A used 100% AP exposure geometry for recorded and missed dose for this case as per the *Hanford Site – Occupational External Dose* (ORAUT-TKBS-0006-6, page 39).

Hanford Recorded Photon Dose

The DOE records show that this EE was monitored on a yearly dosimeter exchange basis for the entire Hanford employment period during [redacted]–[redacted], and that the EE received a small amount of positive recorded photon and electron dose. SC&A used the guidance described in ORAUT-TKBS-0006-6 and ORAUT-OTIB-0017 to derive the organ doses from this exposure. SC&A's Method A assumed 25% 30–250 keV photon and 75% >250 keV photons as per ORAUT-TKBS-0006-6, Table 6-7, page 34.

Example of [redacted] *recorded photon dose calculations* – SC&A calculated the [redacted] photon dose to the skin as follows:

> Records show that for [redacted], the EE received a deep dose (D) of 0.290 rem, of which 0.290 rem was ≥LOD/2 value of 0.010 rem (ORAUT-TKBS-0006-6, Table 6-13, page 42).

$$\begin{aligned}\text{Skin Dose (30–250 keV)} &= \text{D} \times \text{DCF} \times \text{Energy Fraction} \\ &= 0.290 \times 1.0 \times 0.25 \\ &= 0.073 \text{ rem}\end{aligned}$$

DR–Method A's calculated [redacted] 30–250 keV dose of 0.073 rem is listed in entry #2 of the IREP Input tables, as shown in each of the Appendices I.A-1 through I.A-9. A total 30–250 keV photon skin dose of 0.170 rem was assigned to each cancer site.

Similar calculations were performed using 75% >250 keV photons. A total >250 keV photon skin dose of 0.510 rem was assigned to each cancer site.

The recorded photon doses were entered into IREP as a constant distribution with no uncertainty because a claimant-favorable DCF of 1.00 was used, as per ORAUT-OTIB-0017. The total

recorded photon dose assignments for the nine cancer sites are summarized in Table I-2 above, and detailed in Appendices I.A-1 through I.A-9.

GJOO Assigned Photon Dose

There were no records of external dosimetry for the EE's employment period at the GJOO. Additionally, there is no TBD listed on the NIOSH website for the GJOO; therefore, the 95th percentile coworker doses from the REMS database recommended in the document *DR Drafts GJOO_10-23-2013_5.0.docx* (NIOSH 2013) located in the DR Tool folder on the H-drive was used for this case. This database covers the EE's GJOO employment period [redacted]–[redacted] and lists annual doses for Operator, Supervisor, and Administrative personnel. The Administrative dose was used in this case, because of the EE's job description as [redacted]. Photon dose was applied as 100% 30–250 keV, as per page 14 of DR Drafts GJOO_10-23-013_5.0.docx.

Example of [redacted] *assigned photon dose calculations* – SC&A calculated the [redacted] photon dose to the skin as follows:

The database lists an annual deep dose (D) of 0.040 rem, and the EE was employed 7 months in [redacted]:

$$\begin{aligned}\text{Skin Dose (30–250 keV)} &= \text{D} \times \text{DCF} \times \text{Energy fraction} \times \text{Time fraction} \\ &= 0.040 \times 1.0 \times 1.0 \times 7/12 \\ &= 0.023 \text{ rem}\end{aligned}$$

DR–Method A calculated a 30–250 keV dose for [redacted] of 0.023 rem, which is listed in entry #30 of the IREP Input tables, as shown in each of the Appendices I.A-1 through I.A-9.

The assigned photon dose was entered into IREP as a constant distribution with no uncertainty. The total recorded photon dose assignments for the nine cancer sites are summarized in Table I-2 above and detailed in Appendices I.A-1 through I.A-9.

Hanford Recorded Electron Skin Dose

Electron dose was assigned to the skin because of the locations of the cancer sites. The electron dose was the difference between the *Shallow* recorded dose and the *Deep* recorded dose.

Example of [redacted] *recorded electron dose calculations* – SC&A calculated the [redacted] electron dose to the skin as follows:

Records show that for [redacted], the EE received a deep dose (D) of 0.000 rem, and a shallow dose of 0.010 rem, of which 0.010 rem was $\geq$LOD/2. The electron dose to the skin was assumed to be 100% e^- >15 keV. A skin DCF of 1.0 was applied.

$$\begin{aligned}\text{Electron Skin Dose (>15 keV)} &= (\text{Shallow} - \text{Deep}) \times \text{DCF} \\ &= (0.010 \text{ rem} - 0.000 \text{ rem}) \times 1.0 \\ &= 0.010 \text{ rem}\end{aligned}$$

SC&A's Method A-calculated [redacted] >15 keV electron skin dose of 0.010 rem is listed in entry #17 of the IREP Input tables, as shown in each of the Appendices I.A-1 through I.A-9.

The recorded electron dose was entered into IREP as a constant distribution with no uncertainty. The total recorded electron dose assignments for the nine skin cancer sites are summarized in Table I-2 above, and detailed in Appendices I.A-1 through I.A-9.

GJOO Assigned Electron Skin Dose

There was no recorded electron dose at GJOO for this EE. Therefore, the recommendation in DR Drafts GJOO_10-23-2013_5.0.docx (page 16) was used to derive the electron dose by using a post-1985 beta/photon value of 1.5.

Example of [redacted] *assigned electron dose calculations* – SC&A calculated the [redacted] electron dose to the skin as follows:

The database lists an annual deep dose (D) of 0.040 rem, and the EE was employed 7 months in [redacted].

$$\begin{aligned}\text{Electron Skin Dose (>15 keV)} &= D \times DCF \times B/p \times \text{Time fraction} \\ &= 0.040 \times 1.0 \times 1.5 \times 7/12 \\ &= 0.035 \text{ rem}\end{aligned}$$

DR–Method A calculated a >15 keV electron skin dose of 0.035 rem for 1987, which is listed in entry #40 of the IREP Input tables, as shown in each of the Appendices I.A-1 through I.A-9.

The assigned electron doses were entered into IREP as a constant distribution with no uncertainty. The total recorded electron dose assignments for the nine skin cancer sites are summarized in Table I-2 above, and detailed in Appendices I.A-1 through I.A-9.

I.3.2 Missed Photon and Electron Doses

Hanford Missed Photon Dose

Because the EE was in administration and appeared to have a yearly badge exchange cycle, Method A used the recorded number of zeros in the EE's DOE data to determine the missed photon doses (i.e., no additional zeros were added to cover potentially unrecorded badge cycles). DR–Method A arrived at a total of 8 zeros, or <LOD/2, values for photons.

An example of missed photon dose calculations to the skin is cited below for the year [redacted].

Method A found 1 zero for [redacted]; i.e., 1 reading was recorded that was less than the LOD/2. The limit of detection (LOD) for the time period was 0.020 rem, making the LOD/2 equal to 0.010 rem (ORAUT-TKBS-0006-6, Table 6-13, page 42).

$$\begin{aligned}\text{Missed Skin Photon Dose (30–250 keV)} &= (\#\text{ zeros} \times \text{LOD}/2) \times DCF \\ &= (1 \times 0.010 \text{ rem}) \times 1.0 \\ &= 0.010 \text{ rem}\end{aligned}$$

The calculated 30–250 keV missed photon dose of 0.010 rem is cited in entry #18 of the IREP Input tables, as shown in each of the Appendices I.A-1 through I.A-9.

The missed photon doses were entered into IREP as a lognormal distribution with an uncertainty of 1.520. The total missed photon dose assignments are summarized in Table I-2 above, and detailed in Appendices I.A-1 through I.A-9.

Hanford Missed Electron Dose
In reviewing the dosimetry records, DR–Method A did not find any instances where the shallow dose minus the deep dose resulted in missed electron (>15 keV) dose.

GJOO Missed Photon Dose
Missed photon dose was not assigned for the period the EE worked at the GJOO because missed dose was incorporated into the assigned doses, as per page 14 of DR Drafts GJOO_10-23-2013_5.0.docx.

I.3.3 Neutron Dose

Hanford Neutron Dose
The EE's records did not show monitoring for neutron exposure, and the low photon recorded doses would indicate that exposure to neutrons was not likely. Additionally, the EE's position in administration would not indicate significant exposure to neutrons, nor would significant neutron exposure occur while working during the reactor shutdown periods. Therefore, neutron dose was not assigned in this case.

GJOO Neutron Dose
The EE was not monitored for neutrons at GJOO, and considering the EE's position in administration, the EE likely would not have been significantly exposed to neutrons. The document DR Drafts GJOO_10-23-2013_5.0.docx states on page 17 that unmonitored neutron doses should not be assigned after [redacted]; therefore, neutron dose was not assigned in this case.

I.3.4 Occupational Medical

Hanford X-ray Doses
The DOE records show that the EE received a total of six PA x-ray exams during the period of [redacted]–[redacted]. ORAUT-TKBS-0006-3, ORAUT-OTIB-0006, ORAUT-OTIB-0079, and ORAUT-PROC-0061 were consulted for the appropriate projections and doses. Dr–Method A used the projections for the various skin cancer locations and their associated doses as recommended in Table 3-8, pages 19 and 20, and Table 3-9, page 23, of ORAUT-TKBS-0006-3. These projections and doses are summarized in Table I-3.

Table I-3. Medical X-ray Parameters and Dose per Exam

#	Description	Diagnosis Date	Projection	Dose per Exam (rem)
1	BCC, [redacted]	[redacted]	[redacted]	1.28E-3
2	BCC, [redacted]	[redacted]	[redacted]	1.28E-3
3	BCC, [redacted]	[redacted]	[redacted]	1.28E-3
4	BCC, [redacted]	[redacted]	[redacted]	5.4E-3
5	BCC, [redacted]	[redacted]	[redacted]	1.28E-3
6	BCC, [redacted]	[redacted]	[redacted]	1.28E-3
7	BCC, [redacted]	[redacted]	[redacted]	5.4E-2
8	BCC, [redacted]	[redacted]	[redacted]	1.28E-3
9	BCC, [redacted]	[redacted]	[redacted]	1.28E-3

The annual occupational medical dose values were entered into IREP in entries #25–#29 as a normal distribution with 30% uncertainty and a photon energy range of 30–250 keV, as shown in Appendices I.A-1 through I.A-9.

GJOO X-ray Doses

There were no x-ray exam records in the EE's files for the GJOO facility; the EE stated in the CATI Report that annual x-ray exams were not required as part of the employment at GJOO. A document (ORAUT undated) was located, which indicates on page 2 that during the EE's employment period of [redacted]–[redacted], all occupational medical x-ray exams were performed offsite. Therefore, according to ORAUT-OTIB-0079, occupational medical x-ray doses would not be assigned in this case.

I.3.5 Onsite Ambient Dose

Hanford

SC&A found that the EE was monitored for all periods during the Hanford employment; therefore, according to ORAUT-PROC-0060, Attachment A, page 14, no external ambient dose should be assigned in this case.

GJOO

SC&A found that the GJOO site is not specifically addressed in ORAUT-PROC-0060. Because the EE was assigned unmonitored dose derived from coworker data, which would include missed dose, external environmental dose was not assigned in this case.

I.4 INTERNAL DOSES

There were no bioassay records in the DOE files for this EE.

I.4.1 Hanford Internal Doses

Coworker Intakes and Resulting Dose Assignments

The EE did not participate in the bioassay program at Hanford; however, the EE stated in the CATI that the EE worked in the reactor area during reactor shutdowns. Therefore, SC&A's DR–

Method A assigned coworker intakes at the 50th percentile value from the tables in ORAUT-TKBS-0006-5. Table I-4 summarizes these intakes and their source:

Table I-4. Hanford Coworker Intake Parameters during [Redact]–[Redact]

Radionuclide	Solu. Type	Table	TBD-5 Page	*Intake (pCi/day)
H-3 as HTO	F	5-31	64	3.2E5 / 7.6E3 / 1.1E3 / 6.1E2
I-131	F	5-31	63	3.4E3
Cs-137	F	C-31	141	28.38 / 10.13
Zn-65	S	C-29	140	12.58 / 7.411 / 2555**
Na-24	F	C-19	135	250.8
Pu-239, 240	M	C-9	131	1.003 / 0.1336
Pu-239, 240	S	C-10	131	12.21 / 2.654
Uranium	F	C-24	138	9.654 / 1.166 / 0.446
Uranium	M	C-25	138	38.9 / 4.02 / 1.75
Uranium	S	C-26	138	605 / 76.1 / 42.6

*Intake values varied as a function of time period.
**Represents a potential acute intake on October 1, 1976.

These intake values were entered into the chronic annual dose workbook (CADW) to determine the resulting doses. The solubility type that produced the greater dose was used to assign dose in the IREP Input tables; Type S plutonium was adjusted to Type SS, as per ORAUT-OTIB-0049 (when using coworker data from urinalyses for systemic organs, i.e., skin), and Type S uranium was used. Radionuclides that produced doses <0.001 rem were not assigned. The doses were entered into the IREP Input tables as e^- <15 keV for tritium, e^- >15 keV for I-131 plus Cs-137, and alpha radiation for plutonium and uranium, as summarized in Table I-2 of this report.

Fisson and Activation Products

The ORAUT-OTIB-0054 workbook, Version 1.60, was used to assign fission and activation products (FAP) intakes during the period [redacted]–[redacted] for this case. A default decay time of 180 days was used because knowledge of the actual decay time was not available. The only radionuclide that produced a total dose ≥0.001 rem was Ru-106. The total dose of 0.001 rem was assigned to each of the cancer sites in the IREP Input tables, as summarized in Table I-2 of this report.

I.4.2 GJOO Internal Doses

Because the EE did not participate in the bioassay program at GJOO, the intake values from the document DR Drafts GJOO_10-23-2013_5.0.docx were used in the CADW. SC&A used the recommended intake values from page 21 of that document for uranium, radium, and thorium for an administrative position, since the EE's job function was a [redacted]. The greater of the intakes from the different categories were used (i.e., Natural U ore, or Tailings). These 95th percentile intake values (the only values provided by this document) for the period [redacted]–[redacted] were entered into the CADW program as chronic intakes to determine the resulting doses; the greater dose from the different solubility types was assigned in this case. A total of 0.002 rem alpha dose was assigned to each cancer site starting in entry #50 of the IREP Input tables, as shown in Appendices I.A-1 through I.A-9.

I.4.3 Environmental Internal Dose

Hanford
SC&A used the default Hanford environmental values in the CADW program to derive the potential environmental internal dose to the skin for the period **[**redacted**]**–**[**redacted**]**. All doses were <0.001 rem; therefore, Hanford environmental internal dose was not assigned in this case because the use of coworker dose resulted in a greater, claimant-favorable dose.

GJOO
Because the EE was assigned claimant-favorable GJOO inhalation and ingestion intakes at the 95th percentile values, which would include environmental intakes, no environmental internal intakes/doses were assigned.

I.5 CATI REPORT AND RADIOLOGICAL INCIDENTS

SC&A reviewed the EE's DOE records and CATI Report to determine if the EE was involved in any radiological incidents. SC&A did not find any documentation of radiological incidents that would impact the external or internal radiation doses assigned in this case, and no radiation incidents were reported in the CATI.

I.6 SUMMARY CONCLUSIONS

This DR used best-estimate methods to obtain reasonable external and internal dose assignments. The total POC for the nine multiple primary cancers was calculated using the NIOSH-Interactive RadioEpidemiological Program (v.5.7) and determined to be 43.18%.

I.7 REFERENCES

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APPENDIX I.A-1: IREP INPUT – BCC [REDACTED] ([REDACTED])

EXPOSURE INFORMATION							
Number of exposures							
281							
Exposure #	Exposure Year	Exposure Rate	Radiation Type	Dose Distribution Type	Parameter 1	Parameter 2	Parameter 3
1	[redact]	acute	photons E=30–250keV	Constant	0.020	0.000	0.000
2	[redact]	acute	photons E=30–250keV	Constant	0.073	0.000	0.000
3	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
4	[redact]	acute	photons E=30–250keV	Constant	0.050	0.000	0.000
5	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
6	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
7	[redact]	acute	photons E=30–250keV	Constant	0.013	0.000	0.000
8	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
9	[redact]	acute	photons E>250keV	Constant	0.060	0.000	0.000
10	[redact]	acute	photons E>250keV	Constant	0.218	0.000	0.000
11	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
12	[redact]	acute	photons E>250keV	Constant	0.150	0.000	0.000
13	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
14	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
15	[redact]	acute	photons E>250keV	Constant	0.038	0.000	0.000
16	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
17	[redact]	acute	electrons E>15keV	Constant	0.010	0.000	0.000
18	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
19	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
20	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
21	[redact]	acute	photons E=30–250keV	Lognormal	0.020	1.520	0.000
22	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
23	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
24	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
25	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
26	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
27	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
28	[redact]	acute	photons E=30–250keV	Normal	0.003	0.001	0.000
29	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
30	[redact]	acute	photons E=30–250keV	Constant	0.023	0.000	0.000
31	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
32	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
33	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
34	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
35	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
36	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
37	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
38	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
39	[redact]	acute	photons E=30–250keV	Constant	0.027	0.000	0.000

Appendix I.A-1: IREP Input – BCC [Redacted] ([Redacted]) (continued)

40	[redact]	acute	electrons E>15keV	Constant	0.035	0.000	0.000
41	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
42	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
43	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
44	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
45	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
46	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
47	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
48	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
49	[redact]	acute	electrons E>15keV	Constant	0.041	0.000	0.000
50	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
51	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
52	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
53	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
54	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
55	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
56	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
57	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
58	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
59	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
60	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
61	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
62	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
63	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
64	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
65	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
66	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
67	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
68	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
69	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
70	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
71	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
72	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
73	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
74	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
75	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
76	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
77	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
78	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
79	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
80	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
81	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
82	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
83	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
84	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000

Appendix I.A-1: IREP Input – BCC [Redacted] ([Redacted]) (continued)

85	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
86	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
87	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
88	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
89	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
90	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
91	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
92	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
93	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
94	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
95	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
96	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
97	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
98	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
99	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
100	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
101	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
102	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
103	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
104	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
105	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
106	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
107	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
108	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
109	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
110	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
111	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
112	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
113	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
114	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
115	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
116	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
117	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
118	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
119	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
120	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
121	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
122	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
123	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
124	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
125	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
126	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
127	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
128	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
129	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000

Appendix I.A-1: IREP Input – BCC [Redacted] ([Redacted]) (continued)

130	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
131	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
132	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
133	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
134	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
135	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
136	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
137	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
138	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
139	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
140	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
141	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
142	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
143	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
144	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
145	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
146	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
147	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
148	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
149	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
150	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
151	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
152	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
153	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
154	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
155	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
156	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
157	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
158	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
159	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
160	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
161	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
162	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
163	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
164	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
165	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
166	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
167	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
168	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
169	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
170	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
171	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
172	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
173	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
174	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000

Appendix I.A-1: IREP Input – BCC [Redacted] ([Redacted]) (continued)

175	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
176	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
177	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
178	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
179	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
180	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
181	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
182	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
183	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
184	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
185	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
186	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
187	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
188	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
189	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
190	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
191	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
192	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
193	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
194	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
195	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
196	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
197	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
198	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
199	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
200	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
201	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
202	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
203	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
204	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
205	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
206	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
207	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
208	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
209	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
210	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
211	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
212	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
213	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
214	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
215	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
216	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
217	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
218	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
219	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000

Appendix I.A-1: IREP Input – BCC [Redacted] ([Redacted]) (continued)

220	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
221	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
222	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
223	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
224	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
225	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
226	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
227	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
228	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
229	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
230	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
231	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
232	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
233	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
234	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
235	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
236	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
237	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
238	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
239	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
240	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
241	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
242	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
243	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
244	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
245	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
246	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
247	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
248	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
249	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
250	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
251	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
252	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
253	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
254	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
255	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
256	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
257	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
258	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
259	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
260	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
261	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
262	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
263	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
264	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

Appendix I.A-1: IREP Input – BCC [Redacted] ([Redacted]) (continued)

265	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
266	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
267	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
268	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
269	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
270	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
271	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
272	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
273	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
274	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
275	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
276	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
277	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
278	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
279	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
280	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
281	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

APPENDIX I.A-2: IREP INPUT – BCC [REDACTED] ([REDACTED])

EXPOSURE INFORMATION							
Number of exposures							
288							
Exposure #	Exposure Year	Exposure Rate	Radiation Type	Dose Distribution Type	Parameter 1	Parameter 2	Parameter 3
1	[redact]	acute	photons E=30–250keV	Constant	0.020	0.000	0.000
2	[redact]	acute	photons E=30–250keV	Constant	0.073	0.000	0.000
3	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
4	[redact]	acute	photons E=30–250keV	Constant	0.050	0.000	0.000
5	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
6	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
7	[redact]	acute	photons E=30–250keV	Constant	0.013	0.000	0.000
8	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
9	[redact]	acute	photons E>250keV	Constant	0.060	0.000	0.000
10	[redact]	acute	photons E>250keV	Constant	0.218	0.000	0.000
11	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
12	[redact]	acute	photons E>250keV	Constant	0.150	0.000	0.000
13	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
14	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
15	[redact]	acute	photons E>250keV	Constant	0.038	0.000	0.000
16	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
17	[redact]	acute	electrons E>15keV	Constant	0.010	0.000	0.000
18	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
19	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
20	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
21	[redact]	acute	photons E=30–250keV	Lognormal	0.020	1.520	0.000
22	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
23	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
24	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
25	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
26	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
27	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
28	[redact]	acute	photons E=30–250keV	Normal	0.003	0.001	0.000
29	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
30	[redact]	acute	photons E=30–250keV	Constant	0.023	0.000	0.000
31	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
32	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
33	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
34	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
35	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
36	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
37	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
38	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
39	[redact]	acute	photons E=30–250keV	Constant	0.027	0.000	0.000

Appendix I.A-2: IREP Input – BCC [Redacted] ([Redacted]) (continued)

40	[redact]	acute	electrons E>15keV	Constant	0.035	0.000	0.000
41	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
42	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
43	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
44	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
45	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
46	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
47	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
48	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
49	[redact]	acute	electrons E>15keV	Constant	0.041	0.000	0.000
50	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
51	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
52	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
53	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
54	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
55	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
56	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
57	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
58	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
59	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
60	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
61	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
62	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
63	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
64	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
65	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
66	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
67	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
68	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
69	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
70	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
71	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
72	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
73	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
74	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
75	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
76	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
77	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
78	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
79	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
80	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
81	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
82	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
83	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
84	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000

Appendix I.A-2: IREP Input – BCC [Redacted] ([Redacted]) (continued)

85	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
86	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
87	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
88	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
89	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
90	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
91	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
92	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
93	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
94	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
95	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
96	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
97	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
98	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
99	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
100	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
101	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
102	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
103	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
104	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
105	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
106	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
107	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
108	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
109	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
110	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
111	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
112	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
113	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
114	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
115	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
116	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
117	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
118	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
119	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
120	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
121	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
122	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
123	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
124	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
125	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
126	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
127	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
128	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
129	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000

Appendix I.A-2: IREP Input – BCC [Redacted] ([Redacted]) (continued)

130	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
131	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
132	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
133	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
134	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
135	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
136	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
137	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
138	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
139	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
140	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
141	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
142	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
143	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
144	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
145	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
146	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
147	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
148	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
149	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
150	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
151	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
152	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
153	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
154	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
155	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
156	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
157	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
158	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
159	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
160	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
161	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
162	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
163	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
164	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
165	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
166	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
167	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
168	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
169	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
170	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
171	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
172	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
173	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
174	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000

Appendix I.A-2: IREP Input – BCC [Redacted] ([Redacted]) (continued)

175	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
176	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
177	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
178	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
179	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
180	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
181	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
182	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
183	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
184	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
185	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
186	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
187	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
188	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
189	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
190	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
191	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
192	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
193	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
194	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
195	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
196	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
197	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
198	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
199	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
200	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
201	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
202	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
203	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
204	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
205	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
206	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
207	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
208	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
209	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
210	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
211	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
212	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
213	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
214	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
215	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
216	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
217	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
218	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
219	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000

Appendix I.A-2: IREP Input – BCC [Redacted] ([Redacted]) (continued)

220	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
221	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
222	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
223	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
224	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
225	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
226	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
227	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
228	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
229	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
230	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
231	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
232	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
233	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
234	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
235	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
236	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
237	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
238	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
239	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
240	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
241	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
242	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
243	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
244	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
245	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
246	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
247	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
248	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
249	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
250	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
251	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
252	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
253	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
254	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
255	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
256	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
257	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
258	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
259	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
260	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
261	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
262	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
263	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
264	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

Appendix I.A-2: IREP Input – BCC [Redacted] ([Redacted]) (continued)

265	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
266	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
267	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
268	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
269	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
270	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
271	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
272	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
273	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
274	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
275	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
276	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
277	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
278	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
279	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
280	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
281	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
282	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
283	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
284	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
285	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
286	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
287	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
288	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

APPENDIX I.A-3: IREP INPUT – BCC [REDACTED] ([REDACTED])

EXPOSURE INFORMATION							
Number of exposures							
295							
Exposure #	Exposure Year	Exposure Rate	Radiation Type	Dose Distribution Type	Parameter 1	Parameter 2	Parameter 3
1	[redact]	acute	photons E=30–250keV	Constant	0.020	0.000	0.000
2	[redact]	acute	photons E=30–250keV	Constant	0.073	0.000	0.000
3	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
4	[redact]	acute	photons E=30–250keV	Constant	0.050	0.000	0.000
5	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
6	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
7	[redact]	acute	photons E=30–250keV	Constant	0.013	0.000	0.000
8	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
9	[redact]	acute	photons E>250keV	Constant	0.060	0.000	0.000
10	[redact]	acute	photons E>250keV	Constant	0.218	0.000	0.000
11	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
12	[redact]	acute	photons E>250keV	Constant	0.150	0.000	0.000
13	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
14	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
15	[redact]	acute	photons E>250keV	Constant	0.038	0.000	0.000
16	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
17	[redact]	acute	electrons E>15keV	Constant	0.010	0.000	0.000
18	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
19	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
20	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
21	[redact]	acute	photons E=30–250keV	Lognormal	0.020	1.520	0.000
22	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
23	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
24	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
25	[redact]	acute	photons E=30–250keV	Normal	0.00128	0.000	0.000
26	[redact]	acute	photons E=30–250keV	Normal	0.00128	0.000	0.000
27	[redact]	acute	photons E=30–250keV	Normal	0.00128	0.000	0.000
28	[redact]	acute	photons E=30–250keV	Normal	0.00256	0.001	0.000
29	[redact]	acute	photons E=30–250keV	Normal	0.00128	0.000	0.000
30	[redact]	acute	photons E=30–250keV	Constant	0.023	0.000	0.000
31	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
32	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
33	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
34	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
35	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
36	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
37	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
38	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
39	[redact]	acute	photons E=30–250keV	Constant	0.027	0.000	0.000

AppendiX I.A-3: IREP Input – BCC [Redacted] ([Redacted]) (continued)

40	[redact]	acute	electrons E>15keV	Constant	0.035	0.000	0.000
41	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
42	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
43	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
44	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
45	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
46	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
47	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
48	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
49	[redact]	acute	electrons E>15keV	Constant	0.041	0.000	0.000
50	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
51	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
52	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
53	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
54	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
55	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
56	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
57	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
58	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
59	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
60	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
61	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
62	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
63	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
64	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
65	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
66	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
67	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
68	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
69	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
70	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
71	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
72	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
73	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
74	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
75	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
76	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
77	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
78	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
79	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
80	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
81	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
82	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
83	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
84	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000

AppendiX I.A-3: IREP Input – BCC [Redacted] ([Redacted]) (continued)

85	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
86	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
87	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
88	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
89	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
90	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
91	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
92	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
93	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
94	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
95	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
96	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
97	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
98	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
99	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
100	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
101	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
102	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
103	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
104	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
105	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
106	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
107	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
108	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
109	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
110	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
111	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
112	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
113	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
114	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
115	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
116	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
117	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
118	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
119	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
120	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
121	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
122	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
123	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
124	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
125	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
126	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
127	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
128	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
129	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000

AppendiX I.A-3: IREP Input – BCC [Redacted] ([Redacted]) (continued)

130	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
131	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
132	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
133	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
134	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
135	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
136	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
137	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
138	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
139	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
140	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
141	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
142	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
143	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
144	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
145	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
146	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
147	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
148	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
149	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
150	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
151	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
152	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
153	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
154	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
155	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
156	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
157	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
158	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
159	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
160	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
161	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
162	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
163	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
164	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
165	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
166	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
167	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
168	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
169	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
170	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
171	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
172	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
173	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
174	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000

AppendiX I.A-3: IREP Input – BCC [Redacted] ([Redacted]) (continued)

175	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
176	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
177	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
178	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
179	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
180	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
181	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
182	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
183	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
184	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
185	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
186	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
187	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
188	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
189	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
190	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
191	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
192	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
193	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
194	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
195	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
196	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
197	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
198	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
199	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
200	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
201	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
202	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
203	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
204	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
205	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
206	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
207	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
208	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
209	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
210	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
211	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
212	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
213	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
214	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
215	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
216	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
217	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
218	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
219	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000

AppendiX I.A-3: IREP Input – BCC [Redacted] ([Redacted]) (continued)

220	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
221	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
222	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
223	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
224	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
225	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
226	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
227	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
228	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
229	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
230	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
231	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
232	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
233	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
234	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
235	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
236	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
237	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
238	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
239	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
240	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
241	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
242	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
243	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
244	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
245	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
246	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
247	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
248	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
249	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
250	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
251	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
252	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
253	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
254	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
255	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
256	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
257	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
258	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
259	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
260	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
261	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
262	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
263	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
264	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

AppendiX I.A-3: IREP Input – BCC [Redacted] ([Redacted]) (continued)

265	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
266	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
267	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
268	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
269	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
270	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
271	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
272	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
273	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
274	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
275	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
276	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
277	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
278	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
279	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
280	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
281	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
282	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
283	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
284	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
285	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
286	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
287	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
288	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
289	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
290	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
291	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
292	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
293	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
294	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
295	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

APPENDIX I.A-4: IREP INPUT – BCC [REDACTED] ([REDACTED])

EXPOSURE INFORMATION							
Number of exposures							
295							
Exposure #	Exposure Year	Exposure Rate	Radiation Type	Dose Distribution Type	Parameter 1	Parameter 2	Parameter 3
1	[redact]	acute	photons E=30–250keV	Constant	0.020	0.000	0.000
2	[redact]	acute	photons E=30–250keV	Constant	0.073	0.000	0.000
3	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
4	[redact]	acute	photons E=30–250keV	Constant	0.050	0.000	0.000
5	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
6	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
7	[redact]	acute	photons E=30–250keV	Constant	0.013	0.000	0.000
8	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
9	[redact]	acute	photons E>250keV	Constant	0.060	0.000	0.000
10	[redact]	acute	photons E>250keV	Constant	0.218	0.000	0.000
11	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
12	[redact]	acute	photons E>250keV	Constant	0.150	0.000	0.000
13	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
14	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
15	[redact]	acute	photons E>250keV	Constant	0.038	0.000	0.000
16	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
17	[redact]	acute	electrons E>15keV	Constant	0.010	0.000	0.000
18	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
19	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
20	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
21	[redact]	acute	photons E=30–250keV	Lognormal	0.020	1.520	0.000
22	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
23	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
24	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
25	[redact]	acute	photons E=30–250keV	Normal	0.00540	0.002	0.000
26	[redact]	acute	photons E=30–250keV	Normal	0.00540	0.002	0.000
27	[redact]	acute	photons E=30–250keV	Normal	0.00540	0.002	0.000
28	[redact]	acute	photons E=30–250keV	Normal	0.01080	0.003	0.000
29	[redact]	acute	photons E=30–250keV	Normal	0.00540	0.002	0.000
30	[redact]	acute	photons E=30–250keV	Constant	0.023	0.000	0.000
31	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
32	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
33	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
34	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
35	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
36	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
37	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
38	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
39	[redact]	acute	photons E=30–250keV	Constant	0.027	0.000	0.000

Appendix I.A-4: IREP Input – BCC [Redacted] ([Redacted]) (continued)

40	[redact]	acute	electrons E>15keV	Constant	0.035	0.000	0.000
41	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
42	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
43	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
44	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
45	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
46	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
47	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
48	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
49	[redact]	acute	electrons E>15keV	Constant	0.041	0.000	0.000
50	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
51	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
52	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
53	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
54	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
55	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
56	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
57	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
58	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
59	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
60	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
61	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
62	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
63	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
64	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
65	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
66	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
67	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
68	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
69	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
70	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
71	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
72	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
73	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
74	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
75	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
76	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
77	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
78	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
79	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
80	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
81	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
82	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
83	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
84	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000

Appendix I.A-4: IREP Input – BCC [Redacted] ([Redacted]) (continued)

85	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
86	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
87	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
88	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
89	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
90	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
91	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
92	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
93	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
94	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
95	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
96	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
97	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
98	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
99	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
100	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
101	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
102	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
103	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
104	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
105	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
106	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
107	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
108	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
109	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
110	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
111	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
112	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
113	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
114	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
115	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
116	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
117	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
118	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
119	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
120	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
121	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
122	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
123	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
124	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
125	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
126	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
127	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
128	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
129	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000

Appendix I.A-4: IREP Input – BCC [Redacted] ([Redacted]) (continued)

130	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
131	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
132	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
133	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
134	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
135	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
136	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
137	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
138	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
139	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
140	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
141	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
142	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
143	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
144	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
145	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
146	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
147	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
148	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
149	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
150	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
151	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
152	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
153	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
154	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
155	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
156	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
157	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
158	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
159	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
160	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
161	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
162	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
163	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
164	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
165	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
166	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
167	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
168	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
169	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
170	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
171	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
172	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
173	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
174	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000

Appendix I.A-4: IREP Input – BCC [Redacted] ([Redacted]) (continued)

175	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
176	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
177	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
178	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
179	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
180	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
181	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
182	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
183	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
184	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
185	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
186	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
187	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
188	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
189	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
190	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
191	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
192	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
193	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
194	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
195	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
196	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
197	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
198	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
199	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
200	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
201	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
202	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
203	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
204	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
205	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
206	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
207	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
208	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
209	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
210	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
211	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
212	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
213	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
214	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
215	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
216	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
217	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
218	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
219	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000

Appendix I.A-4: IREP Input – BCC [Redacted] ([Redacted]) (continued)

220	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
221	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
222	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
223	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
224	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
225	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
226	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
227	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
228	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
229	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
230	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
231	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
232	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
233	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
234	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
235	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
236	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
237	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
238	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
239	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
240	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
241	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
242	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
243	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
244	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
245	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
246	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
247	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
248	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
249	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
250	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
251	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
252	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
253	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
254	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
255	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
256	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
257	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
258	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
259	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
260	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
261	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
262	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
263	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
264	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

Appendix I.A-4: IREP Input – BCC [Redacted] ([Redacted]) (continued)

265	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
266	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
267	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
268	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
269	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
270	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
271	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
272	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
273	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
274	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
275	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
276	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
277	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
278	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
279	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
280	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
281	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
282	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
283	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
284	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
285	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
286	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
287	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
288	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
289	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
290	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
291	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
292	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
293	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
294	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
295	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

APPENDIX I.A-5: IREP INPUT – BCC [REDACTED] ([REDACTED])

EXPOSURE INFORMATION							
Number of exposures							
302							
Exposure #	Exposure Year	Exposure Rate	Radiation Type	Dose Distribution Type	Parameter 1	Parameter 2	Parameter 3
1	[redact]	acute	photons E=30–250keV	Constant	0.020	0.000	0.000
2	[redact]	acute	photons E=30–250keV	Constant	0.073	0.000	0.000
3	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
4	[redact]	acute	photons E=30–250keV	Constant	0.050	0.000	0.000
5	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
6	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
7	[redact]	acute	photons E=30–250keV	Constant	0.013	0.000	0.000
8	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
9	[redact]	acute	photons E>250keV	Constant	0.060	0.000	0.000
10	[redact]	acute	photons E>250keV	Constant	0.218	0.000	0.000
11	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
12	[redact]	acute	photons E>250keV	Constant	0.150	0.000	0.000
13	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
14	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
15	[redact]	acute	photons E>250keV	Constant	0.038	0.000	0.000
16	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
17	[redact]	acute	electrons E>15keV	Constant	0.010	0.000	0.000
18	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
19	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
20	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
21	[redact]	acute	photons E=30–250keV	Lognormal	0.020	1.520	0.000
22	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
23	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
24	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
25	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
26	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
27	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
28	[redact]	acute	photons E=30–250keV	Normal	0.003	0.001	0.000
29	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
30	[redact]	acute	photons E=30–250keV	Constant	0.023	0.000	0.000
31	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
32	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
33	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
34	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
35	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
36	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
37	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
38	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
39	[redact]	acute	photons E=30–250keV	Constant	0.027	0.000	0.000
40	[redact]	acute	electrons E>15keV	Constant	0.035	0.000	0.000
41	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
42	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
43	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
44	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
45	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
46	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
47	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
48	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
49	[redact]	acute	electrons E>15keV	Constant	0.041	0.000	0.000
50	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
51	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
52	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
53	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
54	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
55	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
56	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
57	[redact]	chronic	alpha	Constant	0.000	0.000	0.000

Appendix I.A-5: IREP Input – BCC [Redacted] ([Redacted]) (continued)

58	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
59	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
60	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
61	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
62	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
63	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
64	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
65	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
66	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
67	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
68	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
69	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
70	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
71	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
72	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
73	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
74	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
75	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
76	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
77	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
78	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
79	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
80	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
81	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
82	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
83	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
84	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
85	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
86	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
87	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
88	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
89	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
90	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
91	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
92	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
93	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
94	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
95	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
96	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
97	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
98	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
99	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
100	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
101	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
102	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
103	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
104	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
105	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
106	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
107	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
108	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
109	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
110	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
111	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
112	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
113	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
114	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
115	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
116	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
117	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
118	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
119	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
120	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000

Appendix I.A-5: IREP Input – BCC [Redacted] ([Redacted]) (continued)

121	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
122	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
123	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
124	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
125	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
126	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
127	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
128	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
129	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
130	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
131	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
132	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
133	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
134	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
135	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
136	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
137	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
138	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
139	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
140	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
141	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
142	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
143	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
144	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
145	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
146	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
147	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
148	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
149	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
150	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
151	[redact]	chronic	alpha	Lognormal	0.001	3.180	0.000
152	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
153	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
154	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
155	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
156	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
157	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
158	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
159	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
160	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
161	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
162	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
163	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
164	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
165	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
166	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
167	[redact]	chronic	alpha	Lognormal	0.002	3.180	0.000
168	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
169	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
170	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
171	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
172	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
173	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
174	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
175	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
176	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
177	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
178	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
179	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
180	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
181	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
182	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
183	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000

Appendix I.A-5: IREP Input – BCC [Redacted] ([Redacted]) (continued)

184	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
185	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
186	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
187	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
188	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
189	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
190	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
191	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
192	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
193	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
194	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
195	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
196	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
197	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
198	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
199	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
200	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
201	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
202	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
203	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
204	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
205	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
206	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
207	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
208	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
209	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
210	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
211	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
212	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
213	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
214	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
215	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
216	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
217	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
218	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
219	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
220	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
221	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
222	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
223	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
224	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
225	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
226	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
227	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
228	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
229	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
230	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
231	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
232	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
233	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
234	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
235	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
236	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
237	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
238	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
239	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
240	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
241	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
242	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
243	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
244	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
245	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
246	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000

Appendix I.A-5: IREP Input – BCC [Redacted] ([Redacted]) (continued)

247	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
248	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
249	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
250	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
251	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
252	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
253	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
254	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
255	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
256	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
257	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
258	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
259	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
260	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
261	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
262	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
263	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
264	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
265	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
266	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
267	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
268	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
269	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
270	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
271	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
272	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
273	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
274	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
275	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
276	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
277	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
278	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
279	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
280	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
281	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
282	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
283	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
284	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
285	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
286	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
287	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
288	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
289	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
290	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
291	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
292	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
293	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
294	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
295	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
296	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
297	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
298	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
299	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
300	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
301	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
302	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

APPENDICES I.A-6, I.A-8, AND I.A-9: IREP INPUT – BCC [REDACTED] ([REDACTED])

EXPOSURE INFORMATION							
Number of exposures							
309							
Exposure #	Exposure Year	Exposure Rate	Radiation Type	Dose Distribution Type	Parameter 1	Parameter 2	Parameter 3
1	[redact]	acute	photons E=30–250keV	Constant	0.020	0.000	0.000
2	[redact]	acute	photons E=30–250keV	Constant	0.073	0.000	0.000
3	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
4	[redact]	acute	photons E=30–250keV	Constant	0.050	0.000	0.000
5	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
6	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
7	[redact]	acute	photons E=30–250keV	Constant	0.013	0.000	0.000
8	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
9	[redact]	acute	photons E>250keV	Constant	0.060	0.000	0.000
10	[redact]	acute	photons E>250keV	Constant	0.218	0.000	0.000
11	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
12	[redact]	acute	photons E>250keV	Constant	0.150	0.000	0.000
13	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
14	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
15	[redact]	acute	photons E>250keV	Constant	0.038	0.000	0.000
16	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
17	[redact]	acute	electrons E>15keV	Constant	0.010	0.000	0.000
18	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
19	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
20	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
21	[redact]	acute	photons E=30–250keV	Lognormal	0.020	1.520	0.000
22	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
23	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
24	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
25	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
26	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
27	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
28	[redact]	acute	photons E=30–250keV	Normal	0.003	0.001	0.000
29	[redact]	acute	photons E=30–250keV	Normal	0.001	0.000	0.000
30	[redact]	acute	photons E=30–250keV	Constant	0.023	0.000	0.000
31	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
32	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
33	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
34	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
35	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
36	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
37	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
38	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
39	[redact]	acute	photons E=30–250keV	Constant	0.027	0.000	0.000

Appendices I.A-6, I.A-8, and I.A-9: IREP Input – BCC [Redacted] ([Redacted]) (continued)

40	[redact]	acute	electrons E>15keV	Constant	0.035	0.000	0.000
41	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
42	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
43	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
44	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
45	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
46	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
47	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
48	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
49	[redact]	acute	electrons E>15keV	Constant	0.041	0.000	0.000
50	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
51	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
52	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
53	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
54	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
55	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
56	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
57	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
58	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
59	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
60	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
61	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
62	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
63	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
64	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
65	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
66	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
67	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
68	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
69	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
70	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
71	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
72	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
73	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
74	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
75	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
76	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
77	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
78	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
79	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
80	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
81	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
82	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
83	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000

Appendices I.A-6, I.A-8, and I.A-9: IREP Input – BCC [Redacted] ([Redacted]) (continued)

84	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
85	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
86	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
87	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
88	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
89	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
90	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
91	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
92	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
93	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
94	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
95	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
96	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
97	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
98	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
99	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
100	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
101	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
102	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
103	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
104	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
105	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
106	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
107	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
108	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
109	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
110	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
111	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
112	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
113	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
114	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
115	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
116	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
117	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
118	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
119	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
120	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
121	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
122	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
123	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
124	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
125	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
126	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
127	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000

Appendices I.A-6, I.A-8, and I.A-9: IREP Input – BCC [Redacted] ([Redacted]) (continued)

128	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
129	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
130	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
131	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
132	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
133	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
134	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
135	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
136	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
137	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
138	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
139	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
140	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
141	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
142	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
143	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
144	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
145	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
146	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
147	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
148	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
149	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
150	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
151	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
152	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
153	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
154	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
155	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
156	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
157	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
158	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
159	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
160	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
161	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
162	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
163	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
164	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
165	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
166	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
167	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
168	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
169	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
170	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
171	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000

Appendices I.A-6, I.A-8, and I.A-9: IREP Input – BCC [Redacted] ([Redacted]) (continued)

172	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
173	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
174	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
175	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
176	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
177	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
178	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
179	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
180	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
181	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
182	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
183	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
184	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
185	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
186	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
187	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
188	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
189	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
190	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
191	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
192	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
193	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
194	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
195	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
196	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
197	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
198	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
199	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
200	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
201	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
202	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
203	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
204	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
205	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
206	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
207	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
208	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
209	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
210	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
211	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
212	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
213	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
214	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
215	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000

Appendices I.A-6, I.A-8, and I.A-9: IREP Input – BCC [Redacted] ([Redacted]) (continued)

216	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
217	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
218	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
219	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
220	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
221	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
222	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
223	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
224	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
225	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
226	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
227	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
228	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
229	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
230	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
231	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
232	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
233	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
234	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
235	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
236	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
237	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
238	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
239	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
240	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
241	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
242	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
243	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
244	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
245	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
246	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
247	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
248	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
249	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
250	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
251	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
252	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
253	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
254	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
255	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
256	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
257	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
258	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
259	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000

Appendices I.A-6, I.A-8, and I.A-9: IREP Input – [Redacted] ([Redacted]) (continued)

260	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
261	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
262	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
263	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
264	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
265	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
266	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
267	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
268	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
269	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
270	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
271	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
272	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
273	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
274	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
275	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
276	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
277	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
278	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
279	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
280	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
281	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
282	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
283	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
284	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
285	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
286	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
287	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
288	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
289	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
290	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
291	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
292	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
293	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
294	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
295	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
296	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
297	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
298	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
299	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
300	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
301	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
302	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
303	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

Appendices I.A-6, I.A-8, and I.A-9: IREP Input – [Redacted] ([Redacted]) (continued)

304	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
305	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
306	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
307	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
308	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
309	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

APPENDIX I.A-7: IREP INPUT – BCC [REDACTED] ([REDACTED])

EXPOSURE INFORMATION							
Number of exposures							
309							
Exposure #	Exposure Year	Exposure Rate	Radiation Type	Dose Distribution Type	Parameter 1	Parameter 2	Parameter 3
1	[redact]	acute	photons E=30–250keV	Constant	0.020	0.000	0.000
2	[redact]	acute	photons E=30–250keV	Constant	0.073	0.000	0.000
3	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
4	[redact]	acute	photons E=30–250keV	Constant	0.050	0.000	0.000
5	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
6	[redact]	acute	photons E=30–250keV	Constant	0.003	0.000	0.000
7	[redact]	acute	photons E=30–250keV	Constant	0.013	0.000	0.000
8	[redact]	acute	photons E=30–250keV	Constant	0.005	0.000	0.000
9	[redact]	acute	photons E>250keV	Constant	0.060	0.000	0.000
10	[redact]	acute	photons E>250keV	Constant	0.218	0.000	0.000
11	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
12	[redact]	acute	photons E>250keV	Constant	0.150	0.000	0.000
13	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
14	[redact]	acute	photons E>250keV	Constant	0.008	0.000	0.000
15	[redact]	acute	photons E>250keV	Constant	0.038	0.000	0.000
16	[redact]	acute	photons E>250keV	Constant	0.015	0.000	0.000
17	[redact]	acute	electrons E>15keV	Constant	0.010	0.000	0.000
18	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
19	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
20	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
21	[redact]	acute	photons E=30–250keV	Lognormal	0.020	1.520	0.000
22	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
23	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
24	[redact]	acute	photons E=30–250keV	Lognormal	0.010	1.520	0.000
25	[redact]	acute	photons E=30–250keV	Normal	0.054	0.016	0.000
26	[redact]	acute	photons E=30–250keV	Normal	0.054	0.016	0.000
27	[redact]	acute	photons E=30–250keV	Normal	0.054	0.016	0.000
28	[redact]	acute	photons E=30–250keV	Normal	0.108	0.032	0.000
29	[redact]	acute	photons E=30–250keV	Normal	0.054	0.016	0.000
30	[redact]	acute	photons E=30–250keV	Constant	0.023	0.000	0.000
31	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
32	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
33	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
34	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
35	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
36	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
37	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000
38	[redact]	acute	photons E=30–250keV	Constant	0.040	0.000	0.000

Appendix I.A-7: IREP Input – BCC [Redacted] ([Redacted]) (continued)

39	[redact]	acute	photons E=30–250keV	Constant	0.027	0.000	0.000
40	[redact]	acute	electrons E>15keV	Constant	0.035	0.000	0.000
41	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
42	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
43	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
44	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
45	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
46	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
47	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
48	[redact]	acute	electrons E>15keV	Constant	0.060	0.000	0.000
49	[redact]	acute	electrons E>15keV	Constant	0.041	0.000	0.000
50	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
51	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
52	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
53	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
54	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
55	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
56	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
57	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
58	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
59	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
60	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
61	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
62	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
63	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
64	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
65	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
66	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
67	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
68	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
69	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
70	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
71	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
72	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
73	[redact]	chronic	alpha	Constant	0.000	0.000	0.000
74	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
75	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
76	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
77	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
78	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
79	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
80	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
81	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
82	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000

Appendix I.A-7: IREP Input – BCC [Redacted] ([Redacted]) (continued)

83	[redact]	chronic	electrons E<15keV	Lognormal	0.008	4.000	0.000
84	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
85	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
86	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
87	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
88	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
89	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
90	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
91	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
92	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
93	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
94	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
95	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
96	[redact]	chronic	electrons E<15keV	Lognormal	0.000	4.000	0.000
97	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
98	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
99	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
100	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
101	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
102	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
103	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
104	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
105	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
106	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
107	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
108	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
109	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
110	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
111	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
112	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
113	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
114	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
115	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
116	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
117	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
118	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
119	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
120	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
121	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
122	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
123	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
124	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
125	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
126	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000

Appendix I.A-7: IREP Input – BCC [Redacted] ([Redacted]) (continued)

127	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
128	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
129	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
130	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
131	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
132	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
133	[redact]	chronic	electrons E>15keV	Lognormal	0.000	3.000	0.000
134	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
135	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
136	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
137	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
138	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
139	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
140	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
141	[redact]	chronic	alpha	Lognormal	0.000	3.180	0.000
142	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
143	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
144	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
145	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
146	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
147	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
148	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
149	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
150	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
151	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
152	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
153	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
154	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
155	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
156	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
157	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
158	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
159	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
160	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
161	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
162	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
163	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
164	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
165	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
166	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
167	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
168	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
169	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000
170	[redact]	chronic	alpha	Lognormal	4.000	3.180	0.000

Appendix I.A-7: IREP Input – BCC [Redacted] ([Redacted]) (continued)

171	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
172	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
173	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
174	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
175	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
176	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
177	[redact]	chronic	alpha	Lognormal	0.000	7.710	0.000
178	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
179	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
180	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
181	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
182	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
183	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
184	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
185	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
186	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
187	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
188	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
189	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
190	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
191	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
192	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
193	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
194	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
195	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
196	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
197	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
198	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
199	[redact]	chronic	alpha	Lognormal	4.000	7.710	0.000
200	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
201	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
202	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
203	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
204	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
205	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
206	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
207	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
208	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
209	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
210	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
211	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
212	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
213	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
214	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000

Appendix I.A-7: IREP Input – BCC [Redacted] ([Redacted]) (continued)

215	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
216	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
217	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
218	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
219	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
220	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
221	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
222	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
223	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
224	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
225	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
226	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
227	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
228	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
229	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
230	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
231	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
232	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
233	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
234	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
235	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
236	[redact]	chronic	alpha	Lognormal	0.000	3.000	0.000
237	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
238	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
239	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
240	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
241	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
242	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
243	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
244	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
245	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
246	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
247	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
248	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
249	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
250	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
251	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
252	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
253	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
254	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
255	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
256	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
257	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
258	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000

Appendix I.A-7: IREP Input – BCC [Redacted] ([Redacted]) (continued)

259	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
260	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
261	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
262	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
263	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
264	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
265	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
266	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
267	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
268	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
269	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
270	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
271	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
272	[redact]	chronic	alpha	Lognormal	0.000	4.820	0.000
273	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
274	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
275	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
276	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
277	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
278	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
279	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
280	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
281	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
282	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
283	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
284	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
285	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
286	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
287	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
288	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
289	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
290	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
291	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
292	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
293	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
294	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
295	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
296	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
297	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
298	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
299	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
300	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
301	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
302	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

Appendix I.A-7: IREP Input – BCC [Redacted] ([Redacted]) (continued)

303	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
304	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
305	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
306	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
307	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
308	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000
309	[redact]	chronic	electrons E>15keV	Constant	0.000	0.000	0.000

SECTION II: DR–METHOD B

II.1 DOSE RECONSTRUCTION OVERVIEW

Section II of this report presents a blind DR using SC&A's Method B for an EE that worked for Hanford and GJOO. The EE contracted nine basal cell carcinomas on the [redacted], redacted], and [redacted]. This worker was monitored only at the Hanford Site under an external monitoring program, which included recorded photon and beta exposures. The EE was not monitored for internal exposure. There is no indication that the EE was exposed to any radioactive materials at GJOO, and there are no dosimetry records for GJOO in the comprehensive employment records. Therefore, radiation dose was not assigned for the GJOO employment period for DR–Method B.

Our investigation evaluated recorded dose to penetrating and non-penetrating radiation based on thermoluminescent dosimeter (TLD) data, missed dose to penetrating radiation, and occupational medical dose. Appendix II.A-1 lists the assigned doses for all of the skin cancers located on the exposed skin of the [redacted]. Appendix II.A-2 lists the assigned doses for the skin on the [redacted]. Appendix II.A-3 lists the assigned doses for the skin cancer of the [redacted], which is covered by clothing. The shallow dose calculation, which is discussed below, takes into consideration attenuation of the beta radiation from clothing. The following table summarizes SC&A's estimate of the EE's skin dose.

Table II-1. Assigned Doses for Case #[redacted]

Radiation Type	Appx II.A-1 Exposure No.	Skin Doses on [redacted] (rem)	Appx II.A-2 Exposure No.	Skin Dose for the [redacted] (rem)	Appx II.A-3 Exposure No.	Skin Dose for the [redacted] (rem)
Recorded photon	2–9	0.68	2–9	0.68	2–9	0.68
Recorded shallow	1	0.01	1	0.01	1	0.009
Missed photon	10–15	0.09	10–15	0.09	10–15	0.09
Occupational medical	16–25	0.031	16–25	0.053	16–25	0.53
Total		**0.811**		**0.833**		**1.309**

Using the external dosimetry data provided by the DOE for work at the Hanford Site, DR–Method B calculated a total dose of 0.811 rem for each of the cancers located on exposed skin of the [redacted]; for the exposed skin on the [redacted], a total of 0.833 rem was calculated; and for the cancer located on the [redacted], a total dose of 1.309 rem was calculated. Based on these results, a POC of 38.59% was derived.case

II.1.1 Dose Reconstruction Approach

To perform this blind DR, SC&A was provided with all of the Department of Energy (DOE) dosimetry records, the CATI report, and the Department of Labor (DOL) correspondence, forms, and medical records that were made available to NIOSH for constructing doses in behalf of this case. Using these data, DR–Method B manually calculated the doses using basic health physics DR practices that did not employ DR workbooks and other tools developed by NIOSH and its

contractors, but did take advantage of the vast body of guidance documents compiled and developed by NIOSH for performing DRs.

The approach used by SC&A to perform this blind DR began with developing an understanding of the work history of this EE and the types of activities that were ongoing in different buildings and time periods at Hanford. This was accomplished by reviewing the worker's records and also reviewing the site profile and other documents in the Site Research Database (SRDB) that would help us understand the types of activities and exposures this worker might have experienced each year of employment at Hanford. Once we were able to develop an understanding of this worker's occupational/radiological exposure history, we compiled all the information available that would help us reconstruct the worker's exposure each year of employment at Hanford. The IREP input was then used to derive the POC for this worker.

II.1.2 Relevant Case Information

According to the DOL records, this case represents an EE born in [redacted], who worked at Hanford as an [redacted] from [redacted], to [redacted]. The EE was diagnosed with nine BCCs. Table II-2 lists the cancers and the dates of diagnosis.

Table II-2. Cancer Types for Case #[redacted]

Cancer type	Date of diagnosis
BCC [redacted]	[redacted]
BCC [redacted]	[redacted]
BCC [redacted]	[redacted]
BCC [redacted]	[redacted]
BCC [redacted]	[redacted]
BCC [redacted]	[redacted]
BCC [redacted]	[redacted]
BCC [redacted]	[redacted]
BCC [redacted]	[redacted]

The EE states the following in the DOL records regarding the EE's job responsibilities:

> *Complete* [redacted] *at all nine nuclear reactor sites. Complete* [redacted], [unidentifiable word] [redacted]. *Complete* [redacted], *later became* [redacted] *function.*
>
> *Completing all* [redacted] *assigned to company. This completion involved* [redacted] *right at the nine plant locations, not all areas were identified as high radiation zones.*

II.1.3 Relevant CATI Information

The CATI Report was conducted with the EE, who confirmed being monitored for external radiation, but was not part of the internal monitoring program. The EE provided the following information about work duties in the CATI Report.

In [redacted]*, did all* [redacted] *and controlled all* [redacted] *assigned to them. Once a year, conducted* [redacted]*. Managed* [redacted] *assigned to them and managed all* [redacted] *areas.*

During summer reactor shutdowns, [the EE] *worked during the day at* [the EE's] *regular job and then worked swing shift as an* [redacted] *in the reactor area. These shutdowns lasted two weeks.*

During reactor shutdown, for about two weeks, worked in the evening in the reactor area as an [redacted]*. Wore two pairs of coveralls, booties, mask, cap and anything else required for the area. Was given a pocket dosimeter during this time.*

There is no mention of radiological incidents in the CATI Report or the DOE records.

II.1.4 Completeness and Reliability of External Dosimetry Records

The administrative record for this worker indicates that the EE was monitored for external exposures under what appears to be an annual exchange schedule for the entire employment at Hanford. Table II-3 presents the external dosimetry data provided by DOE for this worker.

Table II-3. External Dosimetry Results for Case #[redacted]

Year	Dose (mrem)	
	Shallow	Deep
[redacted]	290	290
[redacted]	0	0
[redacted]	20	20
[redacted]	200	200
[redacted]	10	10
[redacted]	10	10
[redacted]	0	0
[redacted]	10	0
[redacted]	0	0
[redacted]	0	0
[redacted]	50	50
[redacted]	0	0
[redacted]	20	20

II.2 EXTERNAL DOSES

SC&A's Method B performed a reconstruction of the external doses using the TLD dosimetry data and the documented occupational x-ray information provided in the DOE records. SC&A thoroughly reviewed the dosimetry records for Case #[redacted] and found that this EE was monitored for external photon and beta exposures throughout employment. These records, along with the *Hanford External Dose Technical Basis Document* (ORAUT-TKBS-0006-6) and the *External Dose Guidelines* (OCAS-IG-001), were used to reconstruct the external doses for this case. The DR includes an assessment of recorded and missed photon dose, recorded shallow

dose, occupational medical dose, and environmental internal dose. Table II-4 is a summary of the assigned doses and Appendices II.A-1, II.A-2, and II.A-3 present the IREP input values used to determine the POC. Appendix II.A-1 lists the assigned doses for all of the skin cancers located on the exposed skin of the [redacted]. Appendix II.A-2 lists the assigned doses for the skin on the [redacted]. Appendix II.A-3 lists the assigned doses for the skin cancer of the [redacted], which is covered by clothing. The shallow dose calculation, which is discussed below, takes into consideration attenuation of the beta radiation from clothing.

Table II-4. Assigned External Doses for Case #[redacted]

Radiation Type	Appx II.A-1 Exposure No.	Skin Doses on [redacted] (rem)	Appx II.A-2 Exposure No.	Skin Dose for the [redacted] (rem)	Appx II.A-3 Exposure No.	Skin Dose for the [redacted] (rem)
Recorded photon	2–9	0.68	2–9	0.68	2–9	0.68
Recorded shallow	1	0.01	1	0.01	1	0.009
Missed photon	10–15	0.09	10–15	0.09	10–15	0.09
Occupational medical	16–25	0.031	16–25	0.053	16–25	0.53
Total		**0.810**		**0.832**		**1.31**

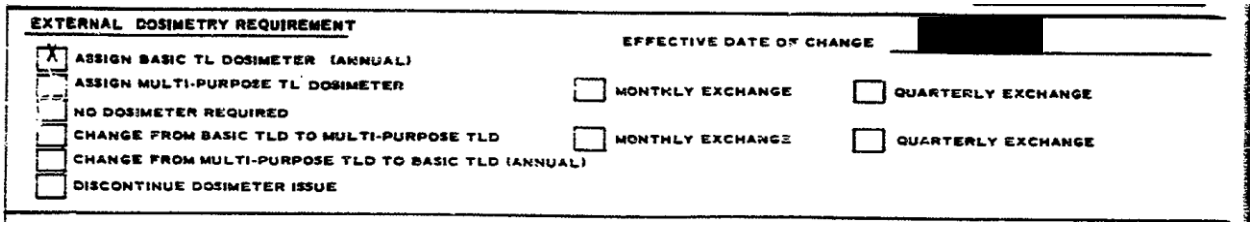
DR–Method B used the guidance in ORAUT-OTIB-0017 for the assignment of doses to the skin. The dose conversion factor (DCF) of 1.0 was assumed for the skin. Since the EE worked throughout the Hanford site, it was decided to assign 100% 30–250 keV photons for deep dose and 100% >15 keV electrons for shallow dose. Table II-5 lists the external dose parameters used to calculate doses.

Table II-5. External DR Parameters for Case #[redacted]

	Photons	Electrons
Energy range	100% 30–250 keV	100% >15 keV
DCF	1	1
ICRP CF	NA	NA

II.2.1 Recorded Photon Dose

The EE was monitored on an annual basis for external exposure to photons with TLD dosimeters. Figure II-1 is a portion of this EE's Radiation Protection Records from [redacted]. It clearly shows that the EE was on an annual exchange schedule, which indicates that the radiation protection staff at Hanford at the time believed that this individual had a lower risk of radiation exposure as compared to other monitored workers. The EE was monitored on an annual basis with a basic TLD, as shown in Figure II-1.


EXTERNAL DOSIMETRY REQUIREMENT

EFFECTIVE DATE OF CHANGE [redacted]

[X] ASSIGN BASIC TL DOSIMETER (ANNUAL)

[ ] ASSIGN MULTI-PURPOSE TL DOSIMETER — [ ] MONTHLY EXCHANGE [ ] QUARTERLY EXCHANGE

[ ] NO DOSIMETER REQUIRED

[ ] CHANGE FROM BASIC TLD TO MULTI-PURPOSE TLD — [ ] MONTHLY EXCHANGE [ ] QUARTERLY EXCHANGE

[ ] CHANGE FROM MULTI-PURPOSE TLD TO BASIC TLD (ANNUAL)

[ ] DISCONTINUE DOSIMETER ISSUE

Figure II-1. Radiation Protection Record for Case #[Redacted] from December [Redacted]

Page 26 of ORAUT-TKBS-0006-6 states:

> *A "Basic" TLD with limited capability for beta and photon (X- and gamma ray) radiation was used from January 1, 1971, through about 1988. This dosimeter, which had one chip, was assigned to personnel with little or no potential to receive dose.*

The EE did have some positive readings above the limit of detection (LOD). The recorded photon doses were calculated using the energy fractions and DCFs listed in Table II-5. An example of SC&A's calculations is given below for the year [redacted].

For [redacted], the EE had a photon reading of 0.080 rem.

> Calculated recorded 30–250 keV photon dose to the skin = 0.080 * 1.0 = 0.080 rem.

DR–Method B calculated a total of 0.680 rem recorded photon dose to the skin, as cited in entries #2–#9 of Appendix II.A-1and Appendix II.A-2. These values are entered as the mean of a normal distribution with a standard deviation of 30%.

II.2.2 Recorded Shallow Dose

The shallow doses listed in the Hanford dosimetry records represent the dose captured in the open window and, therefore, include both penetrating and non-penetrating doses. The dose from electron exposure is determined by subtracting the deep dose from the listed shallow dose. Eight of the nine skin cancers are located on exposed skin of the [redacted] and [redacted]. However, one of the skin cancers is located on the [redacted], which would be covered by clothing. Since beta radiation is attenuated by clothing, skin that is covered would receive a smaller shallow dose. Guidance on pages 6 and 7 of ORAUT-OTIB-0017 describes the method to attenuate shallow dose to skin covered by clothing and lab coats, as cited below.

> *All measured and missed non-penetrating doses that are considered electrons should be corrected to account for attenuation by clothing or personal protection equipment (PPE), if applicable. No attenuation should generally be assumed if the skin cancer was diagnosed in an area not normally covered by clothing, such as the face. Information on beta attenuation factors for uranium can be found in the DOE Standard "Guide of Good Practices for Occupational Radiological Protection in Uranium Facilities," DOE-STD-1136-2000 (which is based on the*

DOE Health Physics Manual of Good Practices for Uranium Facilities, EGG-2530). Examples from this document of transmission factors for uranium through various types of protective clothing include:

- *Lab coat (65% Dacron/35% cotton) – 0.91*
- *Two pairs of coveralls plus paper liner – 0.80*
- *Two pairs of gloves plus liner – 0.60*
- *Face shield – 0.41*

For likely non-compensable cases, an acceptable claimant-favorable approach is to assume 100% transmission (i.e., ignore attenuation). For likely compensable cases, an acceptable minimizing approach is to assume a transmission of 0.6 (unless there is evidence a face shield was used and the skin cancer was on the face, in which case 0.41 would be appropriate). For cases in which a best estimate is applied and the specific type of protective clothing is unknown, a factor of 0.855 for uranium is appropriate (equal to the average of the 0.80 and 0.91 factors listed above). Note that the transmission factors listed are claimant favorable for areas where undergarments (such as a shirt) are worn, because the factors are relevant only to the protective clothing material itself.

For Case #[**redacted**], the best-estimate attenuation factor of 0.855 was applied to the recorded shallow dose. The EE had only one positive shallow dose reading of 0.010 rem in 1982. The [**redacted**] shallow doses were calculated as shown below:

Calculated recorded shallow dose to the **exposed** skin = 0.010 * 1 = 0.010 rem
Calculated recorded shallow dose to the **covered** skin = 0.010 * 1 * 0.855 = 0.00855 rem

These values are entered into the IREP input tables as the mean of a normal distribution with a standard deviation of 30%.

II.2.3 Neutron Dose

As was previously mentioned, the EE was only monitored for beta and photon exposure and had little to no potential for exposure to neutron radiation. Given the EE's job duties and the fact that the EE was monitored annually with a Basic TLD, DR–Method B did not assign neutron dose for this case.

II.2.4 Missed Photon Dose

DR–Method B assigned missed dose to the skin by multiplying the number of zero readings and readings below the LOD/2 value by one-half the non-penetrating LOD. A detailed review of the external dosimetry data was performed, which assessed each annual recorded value. The missed photon dose was than determined using guidance in Attachment C of ORAUT-OTIB-0017, as cited below.

For any badge cycle with a zero result in either the OW or S reading, or both, assign a single missed dose as explained in Items 7–9 below.

If only the OW reading was reported as zero, the missed dose assigned should be the appropriate OW LOD for that era (divided by 2, treated as lognormal) and considered electrons (corrected for attenuation, if applicable) or low-energy photons (multiplied by 0.6 in the film badge era, if applicable) consistent with the approach taken in Step 2.

If only the S reading was reported as zero, the missed dose assigned should be the appropriate S LOD for that era (divided by 2, treated as lognormal) and considered 30–250 keV photons.

If both the OW and S readings were reported as zero, the missed dose assigned should be the appropriate OW LOD for that era (divided by 2, treated as lognormal) and considered 30–250 keV photons.

During the film-badge era, for a person potentially exposed to neutrons, assign unmonitored neutron dose based on neutron-gamma ratios per the TBD (using an organ DCF of 1).

During the TLD era, for a person potentially exposed to neutrons, if a zero neutron result was recorded, assign missed dose per the TBD (using an organ DCF of 1).

Attachment C of ORAUT-OTIB-0017 lists the LOD for non-penetrating dose as 30 mrem. Since DOE records show that the EE had zero readings for both shallow and deep dose in the years [redacted], [redacted]–[redacted], and [redacted], the missed dose for those years was assigned as 30–250 keV photons. An example of SC&A's missed photon dose calculation is given for the year 1976:

Calculated missed photon dose to the skin = # of zero readings * ½ LOD * DCF
= 1 * 0.015 * 1.0 = 0.015 rem

DR–Method B calculated a total missed photon dose to the skin of 0.09 rem, as cited in entries #10–#15 of Appendix II.A-1 and Appendix II.A-2. As per the guidance in OCAS-IG-001, these values were entered into the IREP input tables as the geometric mean of a lognormal distribution with a geometric standard deviation of 1.52.

II.2.5 Missed Shallow Dose

According to the procedures in ORAUT-OTIB-0017, it is not necessary to assign any missed shallow dose for this case.

II.2.6 Occupational Medical Dose

The EE had documented PA chest x-ray exams for the years [redacted], [redacted], [redacted], [redacted], and [redacted]. Table 3-3 of ORAUT-TKBS-0006-3 states that, from 1956 through 1980, all employees at Hanford received annual conventional x-ray exams. From 1981 through 1990, all employees less than 45 years of age were given x-ray exams every 5 years and 1 exam at the termination of employment. Using this information, SC&A's Method B assumed that the EE received an x-ray exam every year between [redacted] and [redacted], plus the documented exam in [redacted]. We also assumed the EE received an x-ray exam in [redacted] (5 years after the last in [redacted]) and 1 exam at termination in [redacted]. The occupational medical doses were assigned to the skin using the dose values in Tables 3-10 and 3-11 of ORAUT-TKBS-0006-3. This guidance takes into consideration the location of the skin cancers relative to the x-ray beam. A total dose of 0.031 rem was calculated for each skin cancer on the [redacted], as cited in entries #16–#25 of Appendix II.A-1. A total dose of 0.053 rem was calculated for the skin cancer on the [redacted], as cited in entries #16–#25 of Appendix II.A-2. For the skin cancer on the [redacted], a total dose of 0.53 rem was calculated, as cited in entries #16–#25 of Appendix II.A-3. These values were entered into the IREP input table as the mean of a normal distribution with 30% standard deviation.

II.3 INTERNAL DOSE

The EE was not monitored for internal exposure, and there was no indication that the EE had any potential for internal exposure. Therefore, DR–Method B assessed environmental internal dose, since the EE did work onsite and could have been exposed to the ambient airborne radionuclides from onsite releases to the air. DR–Method B assigned internal dose based on radionuclide intakes cited in Table A-12 of ORAUT-TKBS-0006-4, reproduced herein as Table II-6. The intakes are zero from 1972 through 1983. DR–Method B chose the default absorption types listed in Table 4-3 of ORAUT-TKBS-0006-4. The annual intakes were divided by 365 days to convert them to units of Bq/day for the IMBA program. The IMBA program was used to calculate the annual doses from the radionuclide intakes listed in Table II-7.

Table II-6. Environmental Intakes at Hanford based on Environmental Air Monitoring (Bq/year)

Year	Ce/Pr-144	Cs/Ba-137	Pu-239	Ru/Rh-103	Ru/Rh-106	Sr/Y-90	I-131
Absorption Type	Type M	Type F	Type M	Type F	Type F	Type F	Type F
1983	0	1.47E-02	3.13E-04	0	0	1.52E-03	0
1984	5.05E-02	2.02E-02	3.74E-03	2.53E-04	1.01E-01	1.16E-02	0
1985	5.05E-02	5.05E-03	5.05E-03	2.63E-01	3.03E-01	4.29E-03	1.02E-01
1986	0	4.40E-03	1.52E-03	1.01E-02	2.02E-01	1.06E-04	1.02E-01
1987	0	2.02E-05	2.02E-04	1.01E-04	1.01E-02	1.01E-04	1.02E-04

Table II-7. Internal Intakes at Hanford based on Environmental Air Monitoring (Bq/day)

Year	Ce/Pr-144	Cs/Ba-137	Pu-239	Ru/Rh-103	Ru/Rh-106	Sr/Y-90	I-131
Absorption Type	Type M	Type F	Type M	Type F	Type F	Type F	Type F
1983	0.00E+00	4.03E-05	8.58E-07	0.00E+00	0.00E+00	4.16E-06	0.00E+00
1984	1.38E-04	5.53E-05	1.02E-05	6.93E-07	2.77E-04	3.18E-05	0.00E+00
1985	1.38E-04	1.38E-05	1.38E-05	7.21E-04	8.30E-04	1.18E-05	2.79E-04
1986	0.00E+00	1.21E-05	4.16E-06	2.77E-05	5.53E-04	2.90E-07	2.79E-04
1987	0.00E+00	5.53E-08	5.53E-07	2.77E-07	2.77E-05	2.77E-07	2.79E-07

All of the calculated annual doses to the skin were extremely small and well below 1 mrem per year, and therefore were not included in the calculation of POC.

II.4 CALCULATION OF POC

The IREP input values cited in Appendix II.A-1, Appendix II.A-2, and Appendix II.A-3 were imported into the IREP program. Since there are multiple primary cancer sites for this case, the multiple cancer site portion of the IREP program was used to determine the total POC for this DR. Table II-8 presents the calculated POC for each skin cancer site.

Table II-8. Calculated POC for Skin Cancers for Case #[redacted]

Cancer type	Date of diagnosis	POC
BCC [redacted]	[redacted]	4.99%
BCC [redacted]	[redacted]	4.99%
BCC [redacted]	[redacted]	5.15%
BCC [redacted]	[redacted]	4.99%
BCC [redacted]	[redacted]	4.99%
BCC [redacted]	[redacted]	4.99%
BCC [redacted]	[redacted]	7.36%
BCC [redacted]	[redacted]	4.99%
BCC [redacted]	[redacted]	4.99%

A hand calculation for the POC from multiple cancers is as follows:

$$(1 - POC_1) * (1 - POC_2) * (1 - POC_3) * (1 - POC_4) * (1 - POC_5) * (1 - POC_6) * (1 - POC_7) * (1 - POC_8) * (1 - POC_9) = 1 - POC_{total}$$

Therefore, for this case,

$$(1 - POC_{total}) = 0.614$$
$$1 - 0.614 = 0.3859$$
$$POC_{total} = 38.59\%$$

The POC is determined to be 38.59%, which would not make this claim eligible for compensation.

II.5 REFERENCES

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ORAUT-OTIB-0017. 2005. *Technical Information Bulletin: Interpretation of Dosimetry Data for Assignment of Shallow Dose*, Rev. 01, Oak Ridge Associated Universities Team, Cincinnati, Ohio. October 11, 2005.

ORAUT-TKBS-0006-3. 2010. *Technical Basis Document for the Hanford Site – Occupational Medical Dose,* Rev. 02, Oak Ridge Associated Universities Team, Cincinnati, Ohio. January 7, 2010.

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ORAUT-TKBS-0006-6. 2010. *Technical Basis Document for the Hanford Site – Occupational External Dose*, Rev. 04. Oak Ridge Associated Universities Team, Cincinnati, Ohio. January 7, 2010.

U.S. Department of Energy (DOE). 2000. *Guide of Good Practices for Occupational Radiological Protection in Uranium Facilities*, DOE-STD-1136-2000. August 2000.

APPENDIX II.A-1: IREP INPUT – SCCS ON [REDACTED]

Exposure entry	Exposure year	Radiation Type	Exposure rate	Distribution	Parameter 1	Parameter 2
1	[redacted]	>15 keV electrons	acute	normal	0.01	0.003
2	[redacted]	30–250 keV photons	acute	normal	0.08	0.024
3	[redacted]	30–250 keV photons	acute	normal	0.29	0.087
4	[redacted]	30–250 keV photons	acute	normal	0.02	0.006
5	[redacted]	30–250 keV photons	acute	normal	0.2	0.06
6	[redacted]	30–250 keV photons	acute	normal	0.01	0.003
7	[redacted]	30–250 keV photons	acute	normal	0.01	0.003
8	[redacted]	30–250 keV photons	acute	normal	0.05	0.015
9	[redacted]	30–250 keV photons	acute	normal	0.02	0.006
10	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
11	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
12	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
13	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
14	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
15	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
16	[redacted]	30–250 keV photons	acute	normal	1.30E-03	0.000
17	[redacted]	30–250 keV photons	acute	normal	1.30E-03	0.000
18	[redacted]	30–250 keV photons	acute	normal	1.30E-03	0.000
19	[redacted]	30–250 keV photons	acute	normal	1.30E-03	0.000
20	[redacted]	30–250 keV photons	acute	normal	1.30E-03	0.000
21	[redacted]	30–250 keV photons	acute	normal	1.30E-03	0.000
22	[redacted]	30–250 keV photons	acute	normal	1.30E-03	0.000
23	[redacted]	30–250 keV photons	acute	normal	1.30E-03	0.000
24	[redacted]	30–250 keV photons	acute	normal	1.01E-02	0.003
25	[redacted]	30–250 keV photons	acute	normal	1.01E-02	0.003

APPENDIX II.A-2: IREP INPUT – SCC ON [REDACTED]

Exposure entry	Exposure year	Radiation Type	Exposure rate	Distribution	Parameter 1	Parameter 2
1	[redacted]	<15 keV electrons	acute	normal	0.01	0.003
2	[redacted]	30–250 keV photons	acute	normal	0.08	0.024
3	[redacted]	30–250 keV photons	acute	normal	0.29	0.087
4	[redacted]	30–250 keV photons	acute	normal	0.02	0.006
5	[redacted]	30–250 keV photons	acute	normal	0.2	0.06
6	[redacted]	30–250 keV photons	acute	normal	0.01	0.003
7	[redacted]	30–250 keV photons	acute	normal	0.01	0.003
8	[redacted]	30–250 keV photons	acute	normal	0.05	0.015
9	[redacted]	30–250 keV photons	acute	normal	0.02	0.006
10	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
11	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
12	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
13	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
14	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
15	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
16	[redacted]	30–250 keV photons	acute	normal	5.40E-03	0.002
17	[redacted]	30–250 keV photons	acute	normal	5.40E-03	0.002
18	[redacted]	30–250 keV photons	acute	normal	5.40E-03	0.002
19	[redacted]	30–250 keV photons	acute	normal	5.40E-03	0.002
20	[redacted]	30–250 keV photons	acute	normal	5.40E-03	0.002
21	[redacted]	30–250 keV photons	acute	normal	5.40E-03	0.002
22	[redacted]	30–250 keV photons	acute	normal	5.40E-03	0.002
23	[redacted]	30–250 keV photons	acute	normal	5.40E-03	0.002
24	[redacted]	30–250 keV photons	acute	normal	4.70E-03	0.001
25	[redacted]	30–250 keV photons	acute	normal	4.70E-03	0.001

APPENDIX II.A-3: IREP INPUT – SCC ON [REDACTED]

Exposure entry	Exposure year	Radiation Type	Exposure rate	Distribution	Parameter 1	Parameter 2
1	[redacted]	<15 keV electrons	acute	normal	0.01	0.003
2	[redacted]	30–250 keV photons	acute	normal	0.08	0.024
3	[redacted]	30–250 keV photons	acute	normal	0.29	0.087
4	[redacted]	30–250 keV photons	acute	normal	0.02	0.006
5	[redacted]	30–250 keV photons	acute	normal	0.2	0.06
6	[redacted]	30–250 keV photons	acute	normal	0.01	0.003
7	[redacted]	30–250 keV photons	acute	normal	0.01	0.003
8	[redacted]	30–250 keV photons	acute	normal	0.05	0.015
9	[redacted]	30–250 keV photons	acute	normal	0.02	0.006
10	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
11	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
12	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
13	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
14	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
15	[redacted]	30–250 keV photons	acute	lognormal	0.015	1.52
16	[redacted]	30–250 keV photons	acute	normal	5.40E-02	0.016
17	[redacted]	30–250 keV photons	acute	normal	5.40E-02	0.016
18	[redacted]	30–250 keV photons	acute	normal	5.40E-02	0.016
19	[redacted]	30–250 keV photons	acute	normal	5.40E-02	0.016
20	[redacted]	30–250 keV photons	acute	normal	5.40E-02	0.016
21	[redacted]	30–250 keV photons	acute	normal	5.40E-02	0.016
22	[redacted]	30–250 keV photons	acute	normal	5.40E-02	0.016
23	[redacted]	30–250 keV photons	acute	normal	5.40E-02	0.016
24	[redacted]	30–250 keV photons	acute	normal	4.70E-02	0.014
25	[redacted]	30–250 keV photons	acute	normal	4.70E-02	0.014