

**Area Monitoring Dosimeter Program for the Pacific  
Northwest National Laboratory: Results for CY 1998**

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## Summary

In January 1993, Pacific Northwest National Laboratory (PNNL) established an area monitoring dosimeter program in accordance with Article 514 of the Department of Energy (DOE) Radiological Control Manual (RCM). The purpose of the program was to minimize the number of areas requiring issuance of personnel dosimeters and to demonstrate that doses outside Radiological Buffer Areas are negligible. In accordance with 10 CFR Part 835.402 (a) (1)-(4) and Article 511.1 of the RCM, personnel dosimetry shall be provided to 1) radiological workers who are likely to receive at least 100 mrem annually and 2) declared pregnant workers, minors, and members of the public who are likely to receive at least 50 mrem annually. Program results for calendar years 1993-1997 confirmed that personnel dosimetry was not needed for individuals located in areas monitored by the program.

A total of 97 area thermoluminescent dosimeters (TLDs) were placed in PNNL facilities during calendar year 1998. The TLDs were exchanged and analyzed quarterly. All routine area monitoring TLD results were less than 50 mrem annually after correcting for worker occupancy. The results support the conclusion that personnel dosimeters are not necessary for staff, declared pregnant workers, minors, or members of the public in these monitored areas.



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## 1.0 Introduction

The Department of Energy (DOE) Radiological Control Manual (RCM)(DOE 1994), first issued in 1992, establishes practices for radiological control activities at DOE facilities. Article 514 of the RCM discusses the establishment and maintenance of a comprehensive area dosimeter monitoring program to minimize the number of areas requiring issuance of personnel dosimeters and to demonstrate that doses outside of Radiological Buffer Areas are negligible. This program will also help demonstrate compliance with 10 CFR Part 835.401(a)(3), 401(a)(6), 402(a)(3), 401(a)(4), and 1003(b). As discussed in Article 514, area monitoring dosimeters

- shall be used to record and document radiation levels in routinely occupied areas adjacent to areas where radiation or operations with radiation exist (not applicable when the radiation arises solely from low-energy beta sources such as  $^{14}\text{C}$  or  $^3\text{H}$ )
- should be used in Radiologically Controlled Areas to supplement existing monitoring programs and to provide data in the event of an emergency
- should be used to support dosimetry investigations where personnel express concern about their work environment and exposure to ionizing radiation.

In January 1993, Pacific Northwest National Laboratory (PNNL)<sup>(1)</sup> established an area monitoring thermoluminescent dosimeter (TLD) program in accordance with Article 514 of the RCM. The program was conducted as outlined by Bivins<sup>(1)</sup> during calendar years (CY) 1993 and 1994. The program is now implemented according to RCP-5.1.04, "Area Monitoring TLD Program," issued in PNL-MA-266, *PNL Radiological Control Implementing Procedures*. Program results for CY 1993/1994, CY 1995, CY 1996, and CY 1997 are found in Bivins and Stoetzel (1996a), Bivins and Stoetzel (1996b), Bivins and Stoetzel (1997), and Bivins and Stoetzel (1998), respectively. Data from the program were also used to support the PNNL As Low As Reasonably Achievable (ALARA) program.

The materials and methods used in collecting area monitoring TLD data and program results for CY 1998 are presented in this report. Neutron dose readings from the area TLDs were included in Section 3.0 of this report. An evaluation of the accuracy of neutron dose data was included in this section. Although neutron dose data was available for previous years, it was not included in previous annual reports.

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<sup>(1)</sup>The Pacific Northwest National Laboratory is operated for the U.S. Department of Energy by Battelle under Contract DE-AC06-76RLO 1830. Battelle also owns and operates private facilities near the Hanford Site.

<sup>(2)</sup>Bivins, S.R. February 24, 1993. Letter Report to D.P. Higby entitled "Area Monitoring Dosimeter." Pacific Northwest National Laboratory, Richland, Washington.

## 2.0 Materials and Methods

This section provides information on the type of TLDs used in the program, how they were located in the field, and frequency of exchange. Derivation of the investigation level, which triggers an evaluation into the potential cause of a reading, is also provided.

### 2.1 Description of Area TLDs

The Hanford Standard Dosimeter and the Hanford Combination Neutron Dosimeter were used as dosimeters for this program during CY 1998. The Hanford Standard Dosimeter was positioned at all but one location (3745 vault). The 3745 vault was used for storage of neutron sources; therefore, a Hanford Combination Neutron Dosimeter was positioned near the vault.

A brief description of each type of dosimeter is presented below. Appendix A provides a description of TLD processing, calibration, and the dose algorithm used in determining doses. A more detailed description of each dosimeter and processing system can be found in PNL-MA-568, *Hanford External Dosimetry Project Manual* (October 1996 issue).

#### 2.1.1 Hanford Standard Dosimeter

This dosimeter has also been accredited by the DOE Laboratory Accreditation Program (DOELAP) and is known commercially as a Harshaw 8825 dosimeter. The dosimeter contains TLD-700 chips in positions one, two, and three and a TLD-600 chip in position four. The TLD-600 chip is neutron-sensitive. The chips have thicknesses of 0.38 mm (100 mg/cm<sup>2</sup>) in positions one, two, and four, and 0.15 mm (40 mg/cm<sup>2</sup>) in position three. The TLD holder is constructed of black plastic with the following filtration:

1. position one - 242 mg/cm<sup>2</sup> ABS plastic and 91 mg/cm<sup>2</sup> copper
2. position two - 1000 mg/cm<sup>2</sup> acrylonitrilebutadienestyrene (ABS) plastic and Teflon.®
3. position three - 8 mg/cm<sup>2</sup> Teflon® and 9 mg/cm<sup>2</sup> mylar
4. position four - 240 mg/cm<sup>2</sup> ABS plastic and 463 mg/cm<sup>2</sup> tin.

These dosimeters were read for shallow dose, deep dose, neutron dose, and eye dose. Only deep dose and neutron dose readings are discussed in this report.

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### 2.1.2 Hanford Combination Neutron Dosimeter

This dosimeter consists of three components – 1) a beta-photon TLD, 2) an albedo neutron TLD, and 3) two CR-39 track-etch dosimeter foils. The albedo neutron TLD is currently used to assess neutron dose rather than the CR-39 track-etch dosimeter foils. The beta-photon TLD is the Harshaw 8825 dosimeter. The albedo neutron TLD is the Harshaw 8816 dosimeter, which contains three TLD-600 phosphors and one TLD-700 phosphor. This albedo TLD has the following filter configurations:

- TLD-700 #1 (tin filters on the front and back)
- TLD-600 #2 (cadmium filter on front and tin filter on the back)
- TLD-600 #3 (tin filter on front and cadmium filter on back)
- TLD-600 #4 (tin filters on front and back)

These dosimeters were read for shallow dose, deep dose, neutron dose, and eye dose. Only deep dose and neutron dose readings are discussed in this report.

## 2.2 Placement of Area TLDs

Area TLDs were placed in the following PNNL facilities (DOE-owned, DOE-leased, and Battelle private):

- all 300 Area PNNL facilities where staff worked at least eight hours per month
- all PNNL facilities where staff conducted radiological work (i.e., had a current Radiological Work Permit)
- all PNNL facilities that were located within 15 m (~50 ft) of another facility (including those of other Hanford Site contractors) containing a radiological area (indoors or outdoors).

TLDs positioned as discussed above are referred to as “routine” area TLDs in this report. Area TLDs were also positioned in facilities as approved by the Radiological Control organization for special situations such as ALARA evaluations. In this report, these are referred to as “special” area TLDs.

A list of routine and special area TLD locations is included as Appendix B. The number of area TLDs in each facility was determined according to the following criteria:

- at least one area TLD per facility
- one additional area TLD for every 25 staff members for facilities that require area TLDs but do not contain a Radiologically Controlled Area or a radiological area
- one additional area TLD for every 15 staff members for facilities that require area TLDs and contain a Radiologically Controlled Area or a radiological area

Additional area TLDs were positioned as determined by the Radiological Control organization.

Each Hanford Standard Dosimeter used as an area TLD was positioned facing the potential source of exposure. If the potential source of exposure was from within the facility, then the area TLD was placed on the wall opposite the potential source. If the potential source of exposure was located outside the facility, then the area TLD was placed on the inside surface of the exterior wall facing the potential source. The TLDs were placed 1 to 2 m (3 to 6 ft) from the floor, depending on whether staff in the area would be standing or seated.

Each Hanford Combination Neutron Dosimeter used as an area TLD was placed on the front-face of a 5-gallon carboy filled with water. The neutron portion of the dosimeter was at least 7.5 cm (3 inches) from any edge of the carboy. The physical size and weight of the 5-gallon carboy limits the locations for positioning this dosimeter.

Each area TLD was identified with an attached bar code label containing a facility ID (e.g., 337 LOC.5) and a TLD identification number beginning with the letter "A" to denote an area TLD followed by a four-digit number (e.g., A3014).

### **2.3 Frequency of Area TLD Exchange**

All area TLDs were scheduled to be exchanged and analyzed quarterly. The area monitoring TLD procedure allows for a facility manager to request a special exchange for any TLD in his/her facility. The Safety & Health Manager may also request a special exchange for area TLDs in any facility. Any area TLD changed out was immediately replaced with another area TLD unless the area TLD location was being discontinued.

### **2.4 Data Review**

Any area TLD results greater than or equal to 40 mrem in a quarter was investigated. This action level was established to ensure that an individual would not likely receive greater than 50 mrem annually (the trigger level for requiring personnel dosimetry for declared pregnant workers, minors, and members of the public). The investigation level of 40 mrem per quarter was derived by dividing the 50 mrem annual limit

by four and adjusting for worker occupancy. The area TLDs were exposed for approximately 8760 h annually; individual occupancy was assumed to be 2000 h (8 h/d, 5 d/wk, and 50 wk/yr). Therefore, the occupancy-corrected quarterly limit is as follows:

$$\text{Quarterly limit} = (50 \text{ mrem}/4)(8760 \text{ h}/2000 \text{ h}) = 55 \text{ mrem}$$

The 55-mrem calculated quarterly limit was reduced to 40 mrem to allow for such factors as processing time, processing errors, the potential for individuals to be present more than 2000 h annually, and the potential for maximum exposure rates occurring during occupancy hours.

## **2.5 Quality Assurance and Quality Control**

The Hanford External Dosimetry Project (HEDP) performed the measurements of the area TLDs. The HEDP laboratory is DOELAP accredited. Quality assurance and quality control programs are conducted in accordance with Section 5 of PNL-MA-568 and Section 3 of PNL-MA-842, *Hanford External Dosimetry Project Technical Basis Manual* (September 1998 issue).

### 3.0 Results and Discussion

Table 3.1 summarizes area monitoring TLD results for CY 1998. Quarterly area monitoring TLD results are grouped into dose ranges (i.e.,  $\leq 10$  mrem;  $>10$  mrem but  $<40$  mrem;  $<40$  mrem). In three locations, quarterly area monitoring TLD results for routine locations exceeded the quarterly investigation level of 40 mrem; however, none of these locations had potential personnel exposures of 50 mrem after considering worker occupancy. The results support the conclusion that personnel dosimeters are not necessary for staff in the areas monitored by the area TLDs.

**Table 3.1.** Summary of Area Monitoring TLD Results, CY 1998

<b>Routine Area TLDs</b>	<b>Quantity</b>
• Number of Area TLD Locations	97
• Total Number of Area TLDs Analyzed <sup>(a)</sup>	361
• Area TLD Results by Dose Range	
$\leq 10$ mrem	332
$>10$ mrem but $<40$ mrem	19
$\geq 40$ mrem <sup>(b)</sup>	10
<b>Special Area TLDs</b>	
• Number of Area TLD Locations	0
• Total Number of Area TLDs Analyzed	0
• Area TLD Results by Dose Range	
10 mrem	0
$>10$ mrem but $<40$ mrem	0
40 mrem <sup>(b)</sup>	0
(a) The total does not equal 388 (four times the number of TLD locations) because locations were started and terminated at various times throughout the year, and several samples were lost.	
(b) The quarterly investigation level was 40 mrem.	

Individual area monitoring TLD results for each quarter as well as annual totals are presented in Appendix C. The results in Appendix C are not corrected for worker occupancy. Assuming workers to be present 2000 h/yr, results should be multiplied by 0.23 to correct for worker occupancy.

#### 3.1 Routine Area TLD Results

Quarterly area monitoring TLD results for facilities located outside the 300 Area (622R, 747A, 747A Trl, 2400 Stevens, EMSL, ESB, HS-1, LSL-II, PSL, RTL, and Sigma V) were  $\leq 10$  mrem. The four

locations with quarterly results greater than or equal to the 40 mrem "investigation level" were located in the 300 Area. Reviews were conducted on these locations and results are summarized below.

- TLD ID# A3048 (3720 Loc. 2) was located on the bulletin board in the lunchroom of the 3720 Building. The total measured deep dose was 30 mrem for CY 1993, 120 mrem for CY 1994, 180 mrem for CY 1995, 146 mrem for CY 1996, and 486 mrem for CY 1997. Total measured deep dose for CY 1998 was 478 mrem; about the same as CY 1997. As documented in past annual reports, the cause of the elevated readings was radioactive material stored in a shielded glovebox in a laboratory across the hall from the lunchroom. Based on the elevated readings, the cognizant Radiological Control Technician (RCT) Supervisor added the lunchroom to the daily routines for the facility and directed researchers to notify the Radiological Control organization before moving any materials within the shielded glovebox. Daily routines using a microrem meter showed contact reading on the wall, where the area TLD was located, to range from 50 to 100  $\mu\text{mrem/h}$ . Readings dropped off to approximately 30  $\mu\text{mrem/h}$  several feet from the wall. General background readings in the lunchroom were about 10-15  $\mu\text{mrem/h}$ ; therefore, there was no exposure concern to staff in the lunchroom. The projected dose to staff in the lunchroom is less than the 50 mrem annual dose requiring personnel dosimetry for a declared pregnant worker, a minor, or a member of the public.

Most of the radioactive material in the shielded glovebox was shipped to another facility during April 1999. Microrem readings on contact with the wall near the area TLD location were reduced by a factor of 4 (i.e., 12-25  $\mu\text{mrem/h}$ ). The first quarter of CY 1999 should be the last quarter with readings exceeding the 40 mrem investigation level.

- TLD ID# A3062 (325 Loc. 2) was located in Room 5 of the mezzanine of 325 Building on the north wall about chest height. The total measured deep dose for CY 1993-CY 1996 ranged from 20-58 mrem. Total measured deep dose increased to 108 mrem for CY 1997 and to 340 mrem for CY 1998. The upward trend in dose for the past two years is due to increased waste handling and storage activities in the basement of 325. Waste is frequently stored along the south wall of the basement just below Room 5. Differences in readings between the CY 1998 quarters are likely due to the movement of waste in and out of the basement. Routine surveys are taken in the mezzanine annually. The last survey conducted during October 1998 showed  $\mu\text{mrem}$  readings ranging from 5 to 28  $\mu\text{mrem/h}$ , which were below the 50  $\mu\text{mrem/h}$  level requiring posting as a Radiological Buffer Area. Based on the area TLD results for CY 1998, an individual spending 2000 hours/y in Room 5 near the north wall could have received 78 mrem. Occupancy by a member of the public, minor, or pregnant worker is not likely to exceed 0.5, which would be equivalent to < 40 mrem annually and would not require dosimetry.
- TLD ID# A3175 (325 Loc. 5) was located in the lunchroom area of the east equipment room located on the second floor of the 325 Building. This location was initiated the second quarter of CY 1997. The second quarter "deep dose" result for CY 1998 was 42 mrem. Deep dose results for the other quarters were less than the 40 mrem investigation level (33, 38, and 11 mrem). The total annual deep dose was 124 mrem.

The neutron-sensitive TLD-600 chip of the area dosimeters showed positive readings (i.e., ranged from 20 - 36 mrem per quarter) since placed at this location the second quarter of CY 1997. This was the only area TLD location that showed positive neutron dose results on a Hanford Standard Dosimeter for CY 1998. The likely source of the neutron dose was from Room 503 located beneath the east equipment room. Room 503 contains a fissile materials storage area. The neutron dose results for the area dosimeters are based on a calibration on phantom to unmoderated neutrons from bare  $^{252}\text{Cf}$ . The neutrons reaching this area TLD location will be moderated by intervening shielding and building material; therefore, a calibration was performed with the dosimeter in air to a  $^{252}\text{Cf}$  source moderated by a 30-cm-diameter sphere of  $\text{D}_2\text{O}$ . This calibration showed that the reported neutron dose results in Appendix C should be divided by a factor of 2.66 to obtain a more accurate neutron dose result. With the application of this correction factor the corrected annual neutron dose would be ~45 mrem.

Area TLD results for CY 1997 were comparable to the CY 1998 results; there was no noticeable upward trend of results. Summing the deep dose and neutron doses for CY 1998 and conservatively assuming an individual to be exposed for 2000 hours, the maximum annual dose to an individual would be ~40 mrem. This dose is below the 50 mrem annual dose, which requires personnel dosimetry for a declared pregnant worker, a minor, or a member of the public.

- TLD ID# A3185 (3745 Loc. 2) was located at the entrance to the radioactive material storage vault in the 3745 Building. This area TLD was a Hanford Combination Neutron Dosimeter and was placed in the field starting the third quarter of CY 1998. The TLD was located on the floor in front of the vault. Results for the third quarter of CY 1998 showed a deep dose of 49 mrem and a neutron dose of 97 mrem. Results for the fourth quarter decreased to 13 mrem deep dose and 28 mrem neutron dose. A Hanford Standard Dosimeter, area TLD (TLD ID# A3158), located about 10 feet from A3185 showed zero dose for CY 1997 and CY 1998. TLD ID# A3050 is located in the Counting Laboratory (north end of 3745 Building). This is the only routinely occupied area in 3745 Building and has had 0 mrem area TLD readings since it was initiated in CY 1993. Therefore, doses to a member of the public, minor, or pregnant worker would be less than 50 mrem annually.

All area TLDs will be removed from 3745 Building as it is no longer an occupied facility. The Counting Laboratory was moved to 326 Building during the first quarter of 1999.

## 3.2 Special Area TLD Results

No special area TLDs were positioned in the field during CY 1998.

## 4.0 Conclusions

The area monitoring TLD program for CY 1998 was a useful tool in determining exposure trends in work areas located outside radiological areas. All routine area monitoring TLD results were less than 50 mrem annually after correcting for worker occupancy. The results support the conclusion that personnel dosimeters are not required for staff in these monitored areas.

## 5.0 References

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## **Appendix A**

### **Area TLD - Processing, Calibration, and Dose Assessment**

## Appendix A

### Area TLD - Processing, Calibration, and Dose Assessment

#### A.1 Processing

Harshaw 8800 series automated reader systems were used to process the area TLDs (i.e., Hanford Standard Dosimeter and Hanford Combination Neutron Dosimeter). Automated processing steps included the following:

- Pre-issue reader annealings, in which each dosimeter card is processed through the automated reader systems to remove any remaining residual signal from past occupational exposure or environmental background radiation. Each dosimeter card is annealed at 80° C for 16 h before being issued.
- Reader processing, in which the reader heats all chips simultaneously at a rate of 25° C/s until a maximum temperature of 300° C is obtained.
- Glow-curve recording, in which the glow curve is recorded for all dosimeters and stored for a period of approximately 2 yr.

#### A.2 Calibration

Area TLDs were calibrated using sources that were traceable to the National Institute of Standards and Technology (NIST). The primary calibration was the deep dose from an on-phantom <sup>137</sup>Cs exposure.

#### A.3 Dose Assessment

The contribution to the area TLD from naturally occurring environmental radiation was determined using the following equation:

$$E_i = G_i (FD - BD)$$

where:  $E_i$  = estimated environmental background for chip  $i$  (<sup>60</sup>Co mR-equivalent)

$G_i$  = background growth rate (mR/d)

FD = field cycle days (days between previous and current processing date)

BD = blank days (mean days between previous and current processing for blank cards).

The adjusted chip readings are calculated using the following equation:

$$D_i = \frac{X_i B_i E_i}{(RRF_i * F_i)}$$

- where:  $D_i$  = adjusted chip reading for chip i ( $^{137}\text{C}$  rem-equivalent)  
 $X_i$  = calibrated chip reading for chip i ( $^{60}\text{Co}$  mR-equivalent)  
 $B_i$  = mean calibrated chip i reading from blank cards ( $^{60}\text{Co}$  mR-equivalent)  
 $E_i$  = estimated environmental background for chip i ( $^{60}\text{Co}$  mR-equivalent)  
 $RRF_i$  =  $^{137}\text{Cs}$  relative response factor (RRF) for chip i (mR/rem)  
 $F_i$  = fade factor for chip i.

Area TLD readings were provided for shallow dose, deep dose, neutron dose, and eye dose. Only deep dose and neutron results were included for discussion in this report.

#### **A.4 Dose Algorithm**

Dose algorithms for the Hanford Standard Dosimeter and Hanford Combination Neutron Dosimeter can be found in Section 8 of PNL-MA-568.

#### **A.5 Quality Control Program**

Quality assurance and quality control programs are conducted in accordance with Section 5 of PNL-MA-568 and Section 3 of PNL-MA-842.

## **Appendix B**

### **Locations of Area Monitoring TLDs**

## Appendix B

### Locations of Area Monitoring TLDs

BLDG	TLD ID #	Location ID #	Description of Location
		Routine TLDs	
305-B	A3001	LOC. 1	South wall of Rm 2 near vending machine
306-W	A3034	LOC. 1	Main entrance on first bulletin board
306-W	A3035	LOC. 2	Second floor lunchroom
306-W	A3036	LOC. 3	First floor - Rm 131
318	A3039	LOC. 1	Front lobby
318	A3040	LOC. 2	Main corridor of second floor across from Rm 202
318	A3041	LOC. 3	Main corridor outside instrument receiving
318	A3022	TRL. 4	Bulletin board on the north wall (main entrance)
320	A3042	LOC. 1	Lobby
320	A3043	LOC. 2	Basement on bulletin board outside of Rm 5 on east wall
325	A3061	LOC. 1	Main lobby near north door
325	A3062	LOC. 2	Mezzanine, Rm 5, north wall (chest height)
325	A3063	LOC. 3	Second floor - outside of Rm 944
325	A3174	LOC. 4	Lunchroom (second floor)
325	A3175	LOC. 5	East equipment rm (second floor, lunch area)
325	A3176	LOC. 6	Copy rm (second floor)
326	A3064	LOC. 1	First floor - bulletin board in copy area (Rm 15)
326	A3065	LOC. 2	First floor - in front of exit door to basement
326	A3066	LOC. 3	First floor - in corridor across from Rm 48-B
326	A3067	LOC. 4	Second floor - lunchroom bulletin board
326	A3068	LOC. 5	Second floor - corridor near Rm 40-C
326	A3157	LOC. 6	Basement - Rm 14A bulletin board
326	A3178	LOC. 7	Rm 37B (second floor, east wall)
329	A3071	LOC. 1	Lunchroom
329	A3072	LOC. 2	Rm 115 - east wall
329	A3074	LOC. 4	North-south hallway (Rm 2)
329	A3075	LOC. 5	North-south hallway (Rm 6-C)
329	A3173	LOC. 8	Rm 129 (above sink)

BLDG	TLD ID #	Location ID #	Description of Location
331	A3044	LOC. 1	First floor - mail room
331	A3045	LOC. 2	Second floor hallway on bulletin board outside of Rm 22
331	A3046	LOC. 3	Third floor - Rm 45
336-1	A3073	LOC.1	Bulletin board in Rm 5 on east wall at entrance to Rm 6
337	A3080	LOC. 1	First floor south - west wall of Rm 1114
337	A3081	LOC. 2	First floor north - east wall of Rm 1225
337	A3082	LOC. 3	Second floor south - west wall of Rm 2112
337	A3083	LOC. 4	Second floor north - north wall of Rm 2213
337	A3084	LOC. 5	Third floor south - Rm 3124
337	A3085	LOC. 6	Third floor north - Mt. Rainier Rm
337	A3155	LOC. 7	Duplicating rm - north wall
338	A3177	LOC. 1	Conference rm
350	A3004	LOC. 1	Bulletin board in Rm 137
350	A3005	LOC. 2	Bulletin board between Rm 158 and Rm 175
622-R	A3086	LOC. 1	Rm 110 by red phone
622-R	A3087	LOC. 2	Exit sign in front of men's room
747-A	A3088	LOC. 1	Bulletin board on west wall by scale
747-A	A3089	TRL.1, LOC. 1	Bulletin board by south door
2400	A3113	LOC. 1	Secretary's desk located in main entrance
2400	A3114	LOC. 2	Bulletin board in entry way to Rm 1414
2400	A3115	LOC. 3	High-bay bulletin board in entry to Lab 1445
2400	A3116	LOC. 4	Second floor on bulletin board outside of Rm 2428
3718-A	A3006	LOC. 1	Bulletin board outside of main office
3718-B	A3007	LOC. 1	Above phone on north wall
3718-G	A3119	LOC. 1	North wall of warehouse office
3720	A3047	LOC. 1	North and south corridor across from Rm 221
3720	A3048	LOC. 2	Bulletin board in lunchroom (Rm 401), north wall
3730	A3049	LOC. 1	Desk area near computers
3745	A3050	LOC. 1	Counting Laboratory - south wall
3745	A3158	LOC. 2	On wall about 10 ft from vault
3745	A3185	LOC. 2	In front of vault at floor level
3760	A3009	LOC. 1	Lobby
3760	A3010	LOC. 2	Second floor Rm 215 (SE cubicle)
3760	A3011	LOC. 3	Second floor - copy room
EMSL	A3093	LOC. 1	Accelerator Room (north wall)

BLDG	TLD ID #	Location ID #	Description of Location
EMSL	A3094	LOC. 2	Accelerator Rm (east wall)
EMSL	A3095	LOC. 3	Accelerator Rm (south wall enclosure)
EMSL	A3096	LOC. 4	Accelerator Rm (south wall)
EMSL	A3097	LOC. 5	Accelerator Rm (west wall)
EMSL	A3098	LOC. 6	Accelerator Rm (control console)
ESB	A3091	LOC. 1	Inside of Rm 14
ESB	A3092	LOC. 2	Entry way to Rm 31
HS-1	A3179	LOC. 1	Rm 88 - west wall
HS-1	A3180	LOC. 2	Rm 88 - west wall near floor
HS-1	A3181	LOC. 3	Rm 88 - north wall
HS-1	A3182	LOC. 4	Rm 94 - east wall
LSL-II	A3167	LOC. 1	Lunchroom
LSL-II	A3168	LOC. 2	Corridor outside of Lab 1404
LSL-II	A3169	LOC. 3	Lab 1508
LSL-II	A3170	LOC. 4	Lab 1419
LSL-II	A3171	LOC. 5	Office 1224
LSL-II	A3172	LOC. 6	Lab 1336
PSL	A3099	LOC. 1	Lab 1611
PSL	A3100	LOC. 2	Bulletin board in Lab 1504
PSL	A3101	LOC. 3	East entrance on secretary's desk
PSL	A3102	LOC. 4	Bulletin board in Lab 1304
PSL	A3103	LOC. 5	Corridor outside of Lab 315
RTL	A3105	LOC. 1	Lab 428
RTL	A3106	LOC. 2	Lab 328
RTL	A3107	LOC. 3	Lab 218
RTL	A3108	LOC. 4	Outside Room 127 Secretary office
RTL	A3109	LOC. 5	Canteen above fire extinguisher
RTL	A3110	LOC. 6	Bulletin board in Rm 21-A
Sigma V	A3186	LOC. 1	Rm 1519 - west wall
Sigma V	A3187	LOC. 2	Rm 1519 - south wall
Sigma V	A3188	LOC. 3	Rm 1519 - north wall
Sigma V	A3189	LOC. 4	Rm 1227 - north wall
Sigma V	A3190	LOC. 5	Rm 1523 - west wall
Sigma V	A3191	LOC. 6	Rm 1519 - ceiling

## **Appendix C**

### **Area Monitoring TLD Results for CY 1998**



## Appendix C

### Area Monitoring TLD Results for CY 1998<sup>(a)</sup>

TLD Location	TLD ID#	Deep Dose (mrem)				Deep Dose (mrem) Annual
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
305B LOC.1	A3001	0	0	0	0	0
306W LOC.1	A3034	0	0	0	0	0
306W LOC.2	A3035	6	7	9	8	30
306W LOC.3	A3036	0	6	0	6	12
318 LOC.1	A3039	0	0	0	0	0
318 LOC.2	A3040	0	0	0	0	0
318 LOC.3	A3041	0	0	0	0	0
318 TRL.4	A3022	0	0	0	0	0
320 LOC.1	A3042	0	0	0	0	0
320 LOC.2	A3043	0	0	0	0	0
325 LOC.1	A3061	0	0	0	0	0
325 LOC.2	A3062	88	90	116	46	340
325 LOC.3	A3063	26	21	23	28	98
325, LOC.4	A3174	0	0	0	0	0
325, LOC.5	A3175	33	42	38	11	124
325, LOC.5	A3175	30(e)	32(e)	31(e)	20(e)	113(e)
325, LOC.6	A3176	19	19	16	15	69
326 LOC.1	A3064	0	0	0	0	0
326 LOC.2	A3065	0	0	0	0	0
326 LOC.3	A3066	0	0	0	0	0

TLD Location	TLD ID#	Deep Dose (mrem)	Deep Dose (mrem)	Deep Dose (mrem)	Deep Dose (mrem)	Deep Dose (mrem)
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
326 LOC.4	A3067	0	0	0	0	0
326 LOC.5	A3068	0	0	0	0	0
326, LOC. 6	A3157	0	0	0	0	0
326, LOC.7	A3178	24	22	17	37	100
329 LOC.1	A3071	0	0	0	0	0
329 LOC.2	A3072	0	0	0	0	0
329 LOC.4	A3074	0	0	0	0	0
329 LOC.5	A3075	0	0	0	0	0
329, LOC. 8	A3173	23	14	6	6	49
331 LOC.1	A3044	0	0	0	0	0
331 LOC.2	A3045	(b)	0	0	0	0
331 LOC.3	A3046	0	0	0	0	0
336-1, LOC.1	A3073	0	0	0	0	0
337 LOC.1	A3080	0	0	0	0	0
337 LOC.2	A3081	(b)	0	0	0	0
337 LOC.3	A3082	0	0	0	5	5
337 LOC.4	A3083	0	0	0	0	0
337 LOC.5	A3084	0	0	0	0	0
337 LOC.6	A3085	0	0	0	6	6
337, LOC. 7	A3155	7	6	6	8	27
338, LOC.1	A3177	(b)	0	0	0	0
350 LOC.1	A3004	0	0	0	0	0
350 LOC.2	A3005	0	0	0	0	0
622R LOC.1	A3086	7	8	7	6	28
622R LOC.2	A3087	0	0	0	0	0
747A LOC.1	A3088	0	0	0	0	0

TLD Location	TLD ID#	Deep Dose (mrem)			Deep Dose (mrem)	
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
747A Th LOC.1	A3089	0	0	0	0	0
2400 LOC.1	A3113	0	0	0	0	0
2400 LOC.2	A3114	0	0	0	0	0
2400 LOC.3	A3115	0	0	0	0	0
2400 LOC.4	A3116	0	0	0	0	0
3718A LOC.1	A3006	0	0	0	0	0
3718B LOC.1	A3007	5	0	0	5	10
3718G	A3119	31	(d)	(d)	(d)	31
3720 LOC.1	A3047	6	0	0	0	6
3720 LOC.2	A3048	106	128	97	147	478
3730 LOC.1	A3049	0	0	0	0	0
3745 LOC.1	A3050	0	0	0	0	0
3745 LOC.2	A3158	0	0	0	0	0
3745 LOC.2	A3185	(c)	(c)	49	13	62
3745 LOC.2	A3185	(c)	(c)	97 (f)	28 (f)	125 (f)
3760 LOC.1	A3009	0	0	0	0	0
3760 LOC.2	A3010	0	0	0	0	0
3760 LOC.3	A3011	0	0	0	0	0
EMSL LOC.1	A3093	7	5	0	5	17
EMSL LOC.2	A3094	9	7	6	9	31
EMSL LOC.3	A3095	10	6	6	7	29
EMSL LOC.4	A3096	7	5	0	6	18
EMSL LOC.5	A3097	5	0	0	7	12
EMSL LOC.6	A3098	0	0	0	0	0
ESB LOC.1	A3091	0	0	0	(b)	0
ESB LOC.2	A3092	0	0	0	0	0
HS-1, LOC.1	A3179	0	0	0	0	0

TLD Location	TLD ID#	Deep Dose (mrem)	Deep Dose (mrem)	Deep Dose (mrem)	Deep Dose (mrem)	Deep Dose (mrem)
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
HS-1, LOC.2	A3180	0	0	0	0	0
HS-1, LOC.3	A3181	0	0	0	0	0
HS-1, LOC.4	A3182	0	0	0	0	0
LSL-II LOC.1	A3167	0	0	0	5	5
LSL-II LOC.2	A3168	0	0	0	0	0
LSL-II LOC.3	A3169	6	0	0	5	11
LSL-II LOC.4	A3170	0	0	0	5	5
LSL-II LOC.5	A3171	6	0	0	6	12
LSL-II LOC.6	A3172	5	0	0	5	10
PSL LOC.1	A3099	0	0	0	0	0
PSL LOC.2	A3100	0	0	0	0	0
PSL LOC.3	A3101	0	0	0	0	0
PSL LOC.4	A3102	0	0	0	0	0
PSL LOC.5	A3103	0	0	0	0	0
RTL LOC.1	A3105	7	0	0	6	13
RTL LOC.2	A3106	7	6	0	6	19
RTL LOC.3	A3107	7	6	0	6	19
RTL LOC.4	A3108	0	0	0	0	0
RTL LOC.5	A3109	0	0	0	0	0
RTL LOC.6	A3110	0	0	0	0	0
Sigma V, LOC.1	A3186	(c)	(c)	(c)	0	0
Sigma V, LOC.2	A3187	(c)	(c)	(c)	0	0
Sigma V, LOC.3	A3188	(c)	(c)	(c)	0	0
Sigma V, LOC.4	A3189	(c)	(c)	(c)	0	0
Sigma V, LOC.5	A3190	(c)	(c)	(c)	0	0
Sigma V, LOC.6	A3191	(c)	(c)	(c)	0	0

TLD Location	TLD ID#	Deep Dose (mrem)	Deep Dose (mrem)	Deep Dose (mrem)	Deep Dose (mrem)	Deep Dose (mrem)
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
(a) - Multiply area TLD result by 0.23 to obtain dose estimates corrected for worker occupancy. (b) - Area TLD lost. (c) - Sample location not initiated yet. (d) - Sample location discontinued (e) - Neutron dose from Hanford Standard Dosimeter (f) - Neutron dose from Hanford Combination Neutron Dosimeter						

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