DOE Oversight Bureau, New Mexico Environment Department

Direct Penetrating Radiation Monitoring at the Waste Isolation Pilot Plant

Conducted by the New Mexico Environment Department DOE Oversight Bureau for Calendar Year 2013 Q-1

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Final Report

9/29/2014

The purpose of this communication is to transmit direct penetrating radiation (DPR) dose levels collected at the Waste Isolation Pilot Plant during the first quarter of calendar year 2013. The data measurements were obtained using the E-PERM® electret ionization chamber system from Rad Elec Inc.

Introduction

The purpose of this communication is to transmit direct penetrating radiation (DPR) dose levels, recorded at New Mexico Environment Department (NMED) Department of Energy (DOE) Oversight Bureau monitoring sites, collected during the first quarter of calendar year 2013 (January to March, 2013). The Bureau maintains fourteen (14) sites located in the Exclusive Use Area at the Waste Isolation Pilot Plant (WIPP), and six (6) sites at other locations in the WIPP region (Table 1, Figure 2 and Figure 3).

Table 1. Location and operational details of direct penetrating radiation monitoring stations located inside the WIPP Exclusive Use Area and in the WIPP vicinity.

Location	Location Description	Operational History
DPR 01	Exclusive Use Area, Parking lot	Active
DPR 02	Exclusive Use Area, Railroad entrance	Active
DPR 03 to 11	Exclusive Use Area, Fence line	Active
DPR 12 to 14	Exclusive Use Area, Loading dock	Active
DPR 15	Carlsbad, NM - Canal St.	Discontinued CY2012 Q-2
DPR 16	Loving Weigh Station	Active
DPR 17	Malaga Volunteer Fire Department	Active
DPR 18	Hobbs Highway	Active
DPR 19	Southeast Control Tower	Active
DPR 20	Carlsbad, NM - Guadalupe St. (interior)	Active
DPR 21	Carlsbad, NM - Guadalupe St. (exterior)	Active



Figure 1. Location of DPR monitors maintained by the DOE Oversight Bureau at the WIPP.

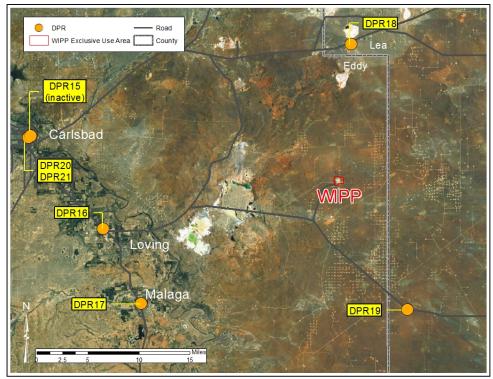


Figure 2. Location of DPR monitors maintained by the DOE Oversight Bureau in the area surrounding WIPP.

The quarterly dose rates have been normalized to reflect an actual quarter of 91.25 days.

<u>Results</u>

DPR results at the WIPP ranged from a minimum average quarterly dose of 20.0 mrad at the WIPP Railroad Track Entrance (DPR02), to a maximum average quarterly dose of 26.1 mrad at WIPP North-northeast Fence (DPR09). The largest measurement in the vicinity of WIPP was 30.6 mrad, measured at the Loving Weigh Station (DPR16). The highest average quarterly dose at any location was 63.2 mrad, measured at the NMED Carlsbad Guadalupe Street Office – Interior location. These results are double the usual amount.

Table 2 shows the individual results from each electret and the normalized average quarterly dose in mrad at each location.

Figure 3 shows the average dose calculations from monitors located in the WIPP Exclusive Use Area by quarter.

	king Lot Entrance D	PR01		Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
SFC 139	1/2/13 12:38	4/1/13 12:16 PM	40	23.6
SFC 145	1/2/13 12:38	4/1/13 12:16 PM	38	23.2
SFC 207	1/2/13 12:38	4/1/13 12:16 PM	42	25.8
		Average Quarter	ly Dose in mRad:	24.2
WIDD Pail	road Track Entrance	DRPR02		
			Valta va Drav	Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
SFC 057	1/2/13 12:55	4/1/13 1:46 PM	32	19.8
SFC 065	1/2/13 12:55	4/1/13 1:46 PM	33	20.3
SFC 082	1/2/13 12:55	4/1/13 1:46 PM	32	19.9
		Average Quarter	ly Dose in mRad:	20.0
WIPP Sou	thwest Corner Fence	DPR03		Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
SFK 330	1/2/13 12:44	4/1/13 2:17 PM	39	21.5
SFK 351	1/2/13 12:44	4/1/13 2:17 PM	40	22.3
SFK 458	1/2/13 12:44	4/1/13 2:17 PM	43	24.1
		Average Quarter	ly Dose in mRad:	22.6
VVIPP SOU	th Fonco Contor – NP	R04		
		R04 Finish Date and Time	Voltage Drop	Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
Electret ID SFK 487	Start Date and Time 1/2/13 12:48	Finish Date and Time 4/1/13 2:26 PM	37	Normalized 22.9
Electret ID SFK 487 SFK 527	Start Date and Time 1/2/13 12:48 1/2/13 12:48	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM	37 40	Normalized 22.9 23.1
Electret ID SFK 487	Start Date and Time 1/2/13 12:48	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM 4/1/13 2:26 PM	37 40 41	Normalized 22.9 23.1 23.9
Electret ID SFK 487 SFK 527 SFK 569	Start Date and Time 1/2/13 12:48 1/2/13 12:48 1/2/13 12:48	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM 4/1/13 2:26 PM Average Quarter	37 40	Normalized 22.9 23.1
Electret ID SFK 487 SFK 527 SFK 569	Start Date and Time 1/2/13 12:48 1/2/13 12:48	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM 4/1/13 2:26 PM	37 40 41	Normalized 22.9 23.1 23.9
Electret ID SFK 487 SFK 527 SFK 569	Start Date and Time 1/2/13 12:48 1/2/13 12:48 1/2/13 12:48	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM 4/1/13 2:26 PM Average Quarter	37 40 41	Normalized 22.9 23.1 23.9 23.3
Electret ID SFK 487 SFK 527 SFK 569 WIPP Nea	Start Date and Time 1/2/13 12:48 1/2/13 12:48 1/2/13 12:48 1/2/13 12:48	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM 4/1/13 2:26 PM Average Quarter DPR05	37 40 41 Iy Dose in mRad:	Normalized 22.9 23.1 23.9 23.3 Quarterly Dose
Electret ID SFK 487 SFK 527 SFK 569 WIPP Near Electret ID	Start Date and Time 1/2/13 12:48 1/2/13 12:48 1/2/13 12:48 r SE Corner of Fence Start Date and Time	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM 4/1/13 2:26 PM Average Quarter DPR05 Finish Date and Time	37 40 41 Iy Dose in mRad: Voltage Drop	Normalized 22.9 23.1 23.9 23.3 Quarterly Dose Normalized
Electret ID SFK 487 SFK 527 SFK 569 WIPP Neat Electret ID SFC 087	Start Date and Time 1/2/13 12:48 1/2/13 12:48 1/2/13 12:48 r SE Corner of Fence Start Date and Time 1/8/13 11:16	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM 4/1/13 2:26 PM Average Quarter DPR05 Finish Date and Time 4/1/13 1:53 PM	37 40 41 Iy Dose in mRad: Voltage Drop 36	Normalized 22.9 23.1 23.9 23.3 Quarterly Dose Normalized 23.6
Electret ID SFK 487 SFK 527 SFK 569 WIPP Near Electret ID SFC 087 SFC 114	Start Date and Time 1/2/13 12:48 1/2/13 12:48 1/2/13 12:48 r SE Corner of Fence Start Date and Time 1/8/13 11:16 1/8/13 11:16	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM 4/1/13 2:26 PM Average Quarter DPR05 Finish Date and Time 4/1/13 1:53 PM 4/1/13 1:53 PM 4/1/13 1:53 PM 4/1/13 1:53 PM	37 40 41 Iy Dose in mRad: Voltage Drop 36 35	Normalized 22.9 23.1 23.9 23.3 Quarterly Dose Normalized 23.6 23.2
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Electret ID SFK 487 SFK 527 SFK 569 WIPP Near Electret ID SFC 087 SFC 114 SFC 159 WIPP Far Electret ID SFK 477	Start Date and Time 1/2/13 12:48 1/2/13 12:48 1/2/13 12:48 1/2/13 12:48 r SE Corner of Fence Start Date and Time 1/8/13 11:16 1/8/13 11:16 1/8/13 11:16 1/8/13 11:16 1/8/13 11:16 1/8/13 11:16 1/8/13 11:21	Finish Date and Time 4/1/13 2:26 PM 4/1/13 2:26 PM 4/1/13 2:26 PM Average Quarter DPR05 Finish Date and Time 4/1/13 1:53 PM 4/1/13 1:53 PM 4/1/13 1:53 PM 4/1/13 1:53 PM Average Quarter DPR06 Finish Date and Time 4/1/13 2:32 PM 4/1/13 2:32 PM 4/1/13 2:32 PM 4/1/13 2:32 PM	37 40 41 Iy Dose in mRad: Voltage Drop 36 35 36 Iy Dose in mRad: Voltage Drop 38	Normalized 22.9 23.1 23.9 23.3 Quarterly Dose Normalized 23.6 23.2 23.9 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.9 23.6 23.9 23.6 23.9 23.9 23. 2 23.9 23. 2 23.9 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.6 23.8

Table 2. Direct Penetrating Radiation Quarterly Dose Rates for CY2013 Q-1

	Fence Mid DPR07	7		Oversterik - Dees
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Quarterly Dose Normalized
SFB 985	1/2/13 11:18 AM	4/5/13 10:45 AM	42	24.4
SFC 063	1/2/13 11:18 AM	4/5/13 10:45 AM	47	27.5
SFC 210	1/2/13 11:18 AM	4/5/13 10:45 AM	40	22.7
0.010	.,_,		ly Dose in mRad:	24.9
				27.5
WIPP NE (Corner of Fence DF	PR08		Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
SFK 431	1/7/13 10:55	4/4/13 3:04 PM	45	26.2
SFK 510	1/7/13 10:55	4/4/13 3:04 PM	45	26.0
SFK 533	1/7/13 10:55	4/4/13 3:04 PM	45	25.8
		Average Quarter	ly Dose in mRad:	26.0
WIPP Nort	h Fence NE DPR0	9		
Electret ID	Start Date and Time	Finish Date and Time	Valtaga Drop	Quarterly Dose Normalized
	1/7/13 11:02 AM	4/4/13 3:01 PM	Voltage Drop	27.0
SGJ 046 SGJ 055	1/7/13 11:02 AM	4/4/13 3:01 PM 4/4/13 3:01 PM	48 45	27.0
SGJ 055 SGJ 061	1/7/13 11:02 AM	4/4/13 3:01 PM	45 46	25.9
363.001	1/1/13 11.02 AIVI			
		Average Quarter	ly Dose in mRad:	26.1
WIPP Nort	h Fence Salt Pile	OPR10		Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
SFK 428	1/7/13 11:10 AM	4/4/13 2:58 PM	41	23.9
SFK 437	1/7/13 11:10 AM	4/4/13 2:58 PM	40	23.4
				23.4
SFK 438	1/7/13 11:10 AM	4/4/13 2:58 PM	39	23.4 22.4
SFK 438	1/7/13 11:10 AM			
		Average Quarter	39	22.4 23.3
WIPP NW	Corner of Fence D	Average Quarter PR11	39 Iy Dose in mRad:	22.4 23.3 Quarterly Dose
WIPP NW Electret ID	Corner of Fence D Start Date and Time	Average Quarter PR11 Finish Date and Time	39 Iy Dose in mRad: Voltage Drop	22.4 23.3 Quarterly Dose Normalized
WIPP NW Electret ID SGJ 042	Corner of Fence D Start Date and Time 1/8/13 6:23 AM	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM	39 Iy Dose in mRad: Voltage Drop 37	22.4 23.3 Quarterly Dose Normalized 22.0
WIPP NW Electret ID SGJ 042 SFC 022	Corner of Fence D Start Date and Time 1/8/13 6:23 AM 1/8/13 6:23 AM	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM 4/1/13 2:08 PM	39 Iy Dose in mRad: Voltage Drop 37 35	22.4 23.3 Quarterly Dose Normalized 22.0 23.5
WIPP NW Electret ID SGJ 042	Corner of Fence D Start Date and Time 1/8/13 6:23 AM	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM 4/1/13 2:08 PM 4/1/13 2:08 PM	39 Iy Dose in mRad: Voltage Drop 37 35 40	22.4 23.3 Quarterly Dose Normalized 22.0 23.5 26.9
WIPP NW Electret ID SGJ 042 SFC 022	Corner of Fence D Start Date and Time 1/8/13 6:23 AM 1/8/13 6:23 AM	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM 4/1/13 2:08 PM 4/1/13 2:08 PM	39 Iy Dose in mRad: Voltage Drop 37 35	22.4 23.3 Quarterly Dose Normalized 22.0 23.5
WIPP NW Electret ID SGJ 042 SFC 022 SFC 054	Corner of Fence D Start Date and Time 1/8/13 6:23 AM 1/8/13 6:23 AM	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM 4/1/13 2:08 PM 4/1/13 2:08 PM Average Quarter	39 Iy Dose in mRad: Voltage Drop 37 35 40	22.4 23.3 Quarterly Dose Normalized 22.0 23.5 26.9
WIPP NW Electret ID SGJ 042 SFC 022 SFC 054	Corner of Fence D Start Date and Time 1/8/13 6:23 AM 1/8/13 6:23 AM 1/8/13 6:23 AM 1/8/13 6:23 AM 1/8/13 6:23 AM	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM 4/1/13 2:08 PM 4/1/13 2:08 PM Average Quarter	39 Iy Dose in mRad: Voltage Drop 37 35 40	22.4 23.3 Quarterly Dose Normalized 22.0 23.5 26.9 24.2
WIPP NW Electret ID SGJ 042 SFC 022 SFC 054 WIPP Load	Corner of Fence D Start Date and Time 1/8/13 6:23 AM 1/8/13 6:23 AM 1/8/13 6:23 AM	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM 4/1/13 2:08 PM 4/1/13 2:08 PM Average Quarter st) DPR12	39 Iy Dose in mRad: Voltage Drop 37 35 40 Iy Dose in mRad:	22.4 23.3 Quarterly Dose Normalized 22.0 23.5 26.9 24.2 Quarterly Dose
WIPP NW Electret ID SGJ 042 SFC 022 SFC 054 WIPP Load Electret ID	Corner of Fence D Start Date and Time 1/8/13 6:23 AM 1/8/13 6:23 AM 1/8/13 6:23 AM ding Dock WHB (West Start Date and Time	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM 4/1/13 2:08 PM 4/1/13 2:08 PM Average Quarter st) DPR12 Finish Date and Time	39 Iy Dose in mRad: Voltage Drop 37 35 40 Iy Dose in mRad: Voltage Drop	22.4 23.3 Quarterly Dose Normalized 22.0 23.5 26.9 24.2 Quarterly Dose Normalized
WIPP NW Electret ID SGJ 042 SFC 022 SFC 054 WIPP Load Electret ID SFK 344	Corner of Fence D Start Date and Time 1/8/13 6:23 AM 1/8/13 6:23 AM 1/8/13 6:23 AM ding Dock WHB (Wes Start Date and Time 1/8/13 11:32 AM	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM 4/1/13 2:08 PM 4/1/13 2:08 PM Average Quarter st) DPR12 Finish Date and Time 4/5/13 10:54 AM	39 Iy Dose in mRad: Voltage Drop 37 35 40 Iy Dose in mRad: Voltage Drop 32	22.4 23.3 Quarterly Dose Normalized 22.0 23.5 26.9 24.2 Quarterly Dose Normalized 18.5
WIPP NW Electret ID SGJ 042 SFC 022 SFC 054 WIPP Load Electret ID SFK 344 SFK 441	Corner of Fence D Start Date and Time 1/8/13 6:23 AM 1/8/13 6:23 AM 1/8/13 6:23 AM ding Dock WHB (West Start Date and Time 1/8/13 11:32 AM 1/8/13 11:32 AM	Average Quarter PR11 Finish Date and Time 4/1/13 2:08 PM 4/1/13 2:08 PM 4/1/13 2:08 PM Average Quarter st) DPR12 Finish Date and Time 4/5/13 10:54 AM 4/5/13 10:54 AM	39 Iy Dose in mRad: Voltage Drop 37 35 40 Iy Dose in mRad: Voltage Drop 32 34	22.4 23.3 Quarterly Dose Normalized 22.0 23.5 26.9 24.2 Quarterly Dose Normalized 18.5 19.6

WIPP Load	ling Dock WHB (Cente			
Electret ID	Start Date and Time	Finish Date and Time	Valtaga Dran	Quarterly Dose Normalized
SFC 094	1/8/13 11:43 AM	4/5/13 11:49 AM	Voltage Drop 42	24.8
SFC 094 SFC 053	1/8/13 11:43 AM	4/5/13 11:49 AM	42 36	24.0
SGJ 041	1/8/13 11:43 AM	4/5/13 11:49 AM	30 44	24.8
3GJ 041	1/0/13 11.43 AIVI			
		Average Quarter	ly Dose in mRad:	24.1
WIPP Load	ling Dock WHB (East)	WIPP 14		Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
SFK 473	1/8/13 11:52 AM	4/5/13 11:25 AM	38	22.3
SFK 574	1/8/13 11:52 AM	4/5/13 11:25 AM	35	20.5
SFK 578	1/8/13 11:52 AM	4/5/13 11:25 AM	37	21.7
		Average Quarter	ly Dose in mRad:	21.5
Loving We	igh Station WIPP 16			Outertark, Dece
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Quarterly Dose Normalized
SFC 075	1/3/13 6:29 AM	4/2/13 1:43 PM	54	32.1
SFC 075 SFC 195	1/3/13 6:29 AM	4/2/13 1:43 PM	51	29.0
SFC 212	1/3/13 6:29 AM	4/2/13 1:43 PM	53	30.5
51 0 2 12	1/3/13 0.23 AW			
		Average Quarter	ly Dose in mRad:	30.6
Malaga VF	D WIPP 17			Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
SFK 380	1/7/13 9:06 AM	4/2/13 1:50 PM	46	26.3
SFK 524	1/7/13 9:06 AM	4/2/13 1:50 PM	47	26.9
SFK 543	1/7/13 9:06 AM	4/2/13 1:50 PM	54	31.1
		Average Quarter	ly Dose in mRad:	28.1
Hobbs Hw	y/ North Access Rd	VIPP 18		Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
SFC 092	1/2/13 11:57 AM	4/5/13 4:42 PM	46	26.6
SFC 182	1/2/13 11:57 AM	4/5/13 4:42 PM	44	25.0
SFC 183	1/2/13 11:57 AM	4/5/13 4:42 PM	47	27.3
		Average Quarter	ly Dose in mRad:	26.3
Southeast	Control WIPP 19			
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Quarterly Dose Normalized
SFK 410	1/7/13 4:01 PM	4/5/13 4:47 PM	46	26.7
SFK 443	1/7/13 4:01 PM	4/5/13 4:47 PM	46	26.7
0111440				
SFK 562	1/7/13 4:01 PM	4/5/13 4:47 PM	43	24.6
			43 Iy Dose in mRad:	24.6 26.0

NMED Guadalupe Office Interior DPR20				Quarterly Dose
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
SFK 364	1/2/13 11:08 AM	4/2/13 1:28 PM	109	62.7
SFK 514	1/2/13 11:08 AM	4/2/13 1:28 PM	116	66.8
SFK 542	1/2/13 11:08 AM	4/2/13 1:28 PM	105	60.2
		Average Quarter	ly Dose in mRad:	63.2
NMED Gua	dalupe Office Exterio		Quarterly Dose	
Electret ID	Start Date and Time	Finish Date and Time	Voltage Drop	Normalized
Electret ID SFK 450	Start Date and Time 1/7/13 11:17 AM	Finish Date and Time 4/2/13 1:55 PM	Voltage Drop 53	
			ě i	Normalized
SFK 450	1/7/13 11:17 AM	4/2/13 1:55 PM	53	Normalized 31.3

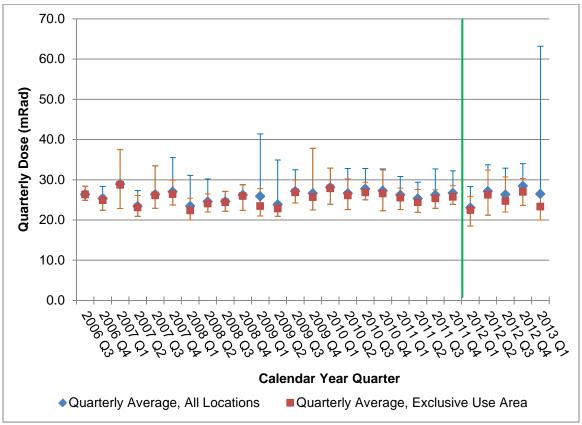


Figure 3. Average DPR Results for all locations and for the WIPP Exclusive Use Area by Quarter. The error bars represent maximum and minimum results for the quarter. The green line denotes the implementation of 2012 program changes, most significantly, the application of temperature and pressure correction factors and correcting for the inherent discharge of electrets.

<u>**Conclusions</u>** These calculated doses from DPR are comparable with past results obtained by the Bureau and do not show a trend of increased gamma radiation exposure at</u> the WIPP.