

**DATA ANALYSIS  
TEST OF SCRAP MONITORING SYSTEMS  
KENTUCKY ELECTRIC STEEL, INC.  
ASHLAND, KY  
MARCH 7, 8, 2000**

**PREPARED BY**

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**APRIL 17, 2000**

**Data Analysis – Test of Scrap Monitoring Systems**  
**Kentucky Electric Steel, Inc., Ashland, KY**  
**March 7, 8, 2000**

**April 17, 2000**

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**Introduction**

A test was conducted at the Ashland, KY facility of Kentucky Electric Steel, Inc., on March 7 and 8, 2000. The test was requested by Kentucky Electric Steel, Inc., and was conducted by Health Physics Associates, Inc., using the radioactive source that was used during the 1996 test of scrap monitoring systems sponsored by the Steel Manufacturers Association (SMA). Three manufacturers of systems designed to detect radiation in scrap metal participated: Eberline, Exploranium and Ronan.

**Description of the Test**

The test was designed to provide Kentucky Electric Steel with a comparison of the three systems. The test was conducted with a steel sided trailer that is commonly used to haul scrap steel, with the exception that the trailer had side walls extending approximately 8 feet high. However, scrap was only loaded up to approximately 4 feet above the trailer floor. The floor of the trailer was 55 inches above the ground. Overall dimensions of the trailer were 7 feet wide by 25 feet long. A single driver was used for all runs. The test was divided into rounds with each round generally consisting of 10 runs. A run was a single pass through the detectors. A total of 16 rounds and 164 runs were conducted, including rounds with a radioactive source buried in the scrap load and rounds without a radioactive source (false alarm tests). Truck speed through the detectors was maintained below 5 mph. Several outside vehicles arrived or exited the plant during the test; however, these were not included in this test because of the difficulty of determining the cause of alarms produced by outside trucks. Outside trucks consisted of outbound vehicles carrying steel and steelmaking byproducts, as well as inbound trucks carrying scrap and materials used for steelmaking. The truck was driven through the detectors in one direction, usually east to west (outbound), turned around and driven west to east (inbound) through the detectors, turned around and the cycles repeated for the remainder of the round. All tests were conducted using shredded scrap (frag) because of the ease in producing test conditions that would test the systems to failure to detect; shredded scrap has a reasonable uniformity in packing, and was used in the SMA 1996 test, thus, affording the ability to compare with the results of the SMA test. Each manufacturer installed his detectors at a height chosen by the manufacturers. Detector height varied among the manufacturers and will have an influence on detectability. This should be considered in evaluating the results of this test and when designing installations, in order to optimize detection efficiency over the range of vehicle heights likely to be encountered.

The detectors were installed with the Ronan system closest to the scale (east most), followed by the Eberline system and the Exploranium system farthest to the west. The Ronan detectors are mounted at 52 and 82 inches above the ground for the side detectors. The Eberline detectors are mounted with the lower edge at 69 and upper edge at 96 inches above the ground (side detectors only). The Exploranium detectors are mounted with the lower edge at 75 and upper edge at 106 inches above the ground for the side detectors.

A single radioactive source was used for the test: a 15 mCi cesium 137 source in a lead shielded housing designed for 150 mCi. This source has an exposure rate at 1 foot from the source capsule of 60 microrentgens per hour ( $\mu\text{R/hr}$ ), when placed in the pipe stand. The source was placed in 5 inch

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vertical pipes positioned at fixed distances from the wall of the trailer. Distances of 18, 21 and 24 inches were used in this test. The vertical pipes were placed in a support stand and the scrap loaded around the pipes and throughout the trailer. The height of the source was varied using spacers above and below the source housing. Spacer heights were 6, 12 and 18 inches. The total height of the spacers was 42 inches.

Thirty-one runs (37 percent) were made with no source in the scrap load (false alarm tests).

### **Test Results**

The test parameters for each round and run are presented in Table 1 at the end of the report. The results of the test are presented in Table 2 at the end of the report.

The 1996 SMA Test used detection difficulty categories based on the thickness of the scrap to rank the results of detections. This has been modified by A. LaMastra to incorporate the exposure rate at the side of the vehicle, and are shown in Table 3. Table 3 is presented to allow comparisons with the results of the SMA 1996 Test results. Table 4 shows the overall results of the 1996 SMA Test.

**Table 3 – Comparison of Difficulty Categories**

<b>Difficulty Category</b>	<b>Scrap Thickness (Inches)</b>	<b>Exposure Rate Above Background "R/hr</b>
Easy	$\leq 6$	$> 50$
Moderate	7 to 13	35 to 50
Hard	14 to 16	20 to 34
Very Hard	17 to 19	5 to 19
Extremely Hard	20 to 22	1 to 4
Almost Impossible	$> 22$	Non-detectable

**Table 4 – Results of 1996 SMA Test**

<b>Scrap Cover (Inches)</b>	<b>Detection Efficiency (Percent)</b>
Moderate	100%
Hard	84%
Very Hard	69%
Extremely Hard	6%

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As can be seen in Table 3, the exposure rates measured during this test (KESI), the 18 inch distance is within the range considered “Very Hard” in the 1996 SMA Test. This scrap thickness was used for rounds 2 to 7. Rounds 10 to 14 (21 inch scrap thickness) corresponded to the SMA “Extremely Hard” category. Rounds 15 and 16 (24 inch scrap thickness) corresponded to the SMA “Almost Impossible” category.

No false alarms were noted from any system. The Ronan system showed an alarm on the bottom detector in round 15, run 4. This could be a valid alarm since the source was at the bottom of the trailer with no spacer below the source housing. Additionally, the source was 24 inches from the wall of the trailer, inside the heavy frame of the trailer. A summary of the test results is shown in Table 5. In Round 2, run 4, the alarm on the Exploranium system was not cleared before the next run, and this run was lost for the Exploranium system. Thus, in this round, Exploranium had only 11 runs, compared to 12 runs for the Eberline and Ronan systems.

**Table 5 – Summary of KESI Test Results – March, 2000 Test**

<b>1996 SMA Test Difficulty Category</b>						
<b>Manufacturer</b>	<b>Very Hard (Score) (Percent)</b>	<b>Extremely Hard (Score) (Percent)</b>	<b>Almost Impossible (Score) (Percent)</b>			
Eberline	25/62	40.3	8/50	16.0	2/21	0.0
Exploranium	57/61	93.4	28/50	56.0	0/21	0.0
Ronan	62/62	100.0	37/60	74.0	6/21	28.6

**Conclusions and Recommendations**

1. The total number of runs with and without a source in the scrap load is felt to be adequate to differentiate between the systems tested. While not of the number of conducted in the 1996 SMA test, it was almost 60 percent of the number of tests run using shredded scrap in the “very hard”, “extremely hard” and “almost impossible” categories in the SMA test.
2. The lack of “false alarms” noted in the KESI test is also felt to justify the rate of 37 percent of runs made with no source in the scrap load. It appears that no system was set too sensitive so that it randomly alarmed when no source was present. It was observed during the test that a few inbound scrap trucks alarmed on the Ronan system, but not on the other two systems. Based on the test results, it is recommended that any alarm on the Ronan system be considered valid.

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3. The Ronan system, as tested, appears to have a slight detection advantage, in this test. It appears that the design of the Ronan system, as tested, has a better solid angle of detection and is better able to detect the source at heights above and below the detector compared to the Exploranium and Eberline systems. This is felt by A. LaMastra to be due to the lack of substantial shielding below and above the detector, compared to the other two systems. It is recommended that the detector not be covered by any additional shielding or moved farther from the center of the detection area.

A. LaMastra  
Certified Health Physicist

**KESI Test – March 7, 8, 2000**
**Table 1**

Date Time	Round	Run	Source	From Wall (Inches)	From Bottom (Inches)	Top Cover (Inches)	Net Exposure Rate At Truck Wall (uR/hr)
3/7/00							
8:44:35	1	1					N/A
8:57:59		2					N/A
9:01:41		3					N/A
9:05:04		4					N/A
9:08:32		5					N/A
9:16:47		6					N/A
9:18:46		7					N/A
9:22:39		8					N/A
9:29:23		9					N/A
9:31:25		10					N/A
9:58:53	2	1	Yes	18	4	36	9
10:04:18		2	Yes	18	4	36	9
10:06:31		3	Yes	18	4	36	9
10:09:58		4	Yes	18	4	36	9
10:14:01		5	Yes	18	4	36	9
10:16:52		6	Yes	18	4	36	9
10:19:28		7	Yes	18	4	36	9
10:22:09		8	Yes	18	4	36	9
10:24:36		9	Yes	18	4	36	9
10:27:05		10	Yes	18	4	36	9
10:32:42		11	Yes	18	4	36	9
10:37:45		12	Yes	18	4	36	9
10:56:15	3	1	Yes	18	10	30	14
10:59:30		2	Yes	18	10	30	14
11:06:21		3	Yes	18	10	30	14
11:06:13		4	Yes	18	10	30	14
11:08:56		5	Yes	18	10	30	14
11:11:21		6	Yes	18	10	30	14
11:15:32		7	Yes	18	10	30	14
11:18:34		8	Yes	18	10	30	14
11:21:17		9	Yes	18	10	30	14
11:24:18		10	Yes	18	10	30	14
11:44:22	4	1	Yes	18	16	24	9
11:46:44		2	Yes	18	16	24	9
11:51:41		3	Yes	18	16	24	9
11:54:15		4	Yes	18	16	24	9
11:56:30		5	Yes	18	16	24	9
11:59:42		6	Yes	18	16	24	9
12:02:39		7	Yes	18	16	24	9
12:06:39		8	Yes	18	16	24	9
12:09:55		9	Yes	18	16	24	9
12:13:24		10	Yes	18	16	24	9

Date Time	Round	Run	Source	From Wall (Inches)	From Bottom (Inches)	Top Cover (Inches)	Net Exposure Rate At Truck Wall (uR/hr)
3/7/00							
12:27:32	5	1	Yes	18	22	18	8
12:30:17		2	Yes	18	22	18	8
12:34:18		3	Yes	18	22	18	8
12:36:56		4	Yes	18	22	18	8
12:39:49		5	Yes	18	22	18	8
12:42:03		6	Yes	18	22	18	8
12:49:13		7	Yes	18	22	18	8
12:51:07		8	Yes	18	22	18	8
12:54:31		9	Yes	18	22	18	8
12:57:21		10	Yes	18	22	18	8
13:39:23	6	1	Yes	18	36	6	9
13:41:43		2	Yes	18	36	6	9
13:44:11		3	Yes	18	36	6	9
13:47:22		4	Yes	18	36	6	9
13:49:42		5	Yes	18	36	6	9
13:52:08		6	Yes	18	36	6	9
13:54:36		7	Yes	18	36	6	9
13:57:06		8	Yes	18	36	6	9
13:59:37		9	Yes	18	36	6	9
14:02:06		10	Yes	18	36	6	9
14:13:38	7	1	Yes	18	42	0	7
14:20:39		2	Yes	18	42	0	7
14:23:08		3	Yes	18	42	0	7
14:27:07		4	Yes	18	42	0	7
14:29:47		5	Yes	18	42	0	7
14:33:53		6	Yes	18	42	0	7
14:36:41		7	Yes	18	42	0	7
14:39:04		8	Yes	18	42	0	7
14:41:21		9	Yes	18	42	0	7
14:45:14		10	Yes	18	42	0	7
15:07:02	8	1					N/A
15:09:35		2					N/A
15:12:01		3					N/A
15:14:44		4					N/A
15:17:16		5					N/A
15:20:16		6					N/A
15:23:24		7					N/A
15:26:24		8					N/A
15:30:35		9					N/A
15:33:48		10					N/A
15:37:09		11					N/A

Date Time	Round	Run	Source	From Wall (Inches)	From Bottom (Inches)	Top Cover (Inches)	Net Exposure Rate At Truck Wall (uR/hr)
3/8/00							
9:02:08	9	1					N/A
9:04:33		2					N/A
9:07:44		3					N/A
9:10:21		4					N/A
9:12:58		5					N/A
9:15:37		6					N/A
9:18:20		7					N/A
9:21:26		8					N/A
9:24:12		9					N/A
9:26:47		10					N/A
9:37:45	10	1	Yes	21	4	36	3
9:50:14		2	Yes	21	4	36	3
9:52:57		3	Yes	21	4	36	3
9:55:32		4	Yes	21	4	36	3
9:59:16		5	Yes	21	4	36	3
10:02:30		6	Yes	21	4	36	3
10:05:09		7	Yes	21	4	36	3
10:07:42		8	Yes	21	4	36	3
10:10:36		9	Yes	21	4	36	3
10:12:59		10	Yes	21	4	36	3
10:26:18	11	1	Yes	21	10	30	3
10:28:59		2	Yes	21	10	30	3
10:33:52		3	Yes	21	10	30	3
10:36:46		4	Yes	21	10	30	3
10:41:03		5	Yes	21	10	30	3
10:43:55		6	Yes	21	10	30	3
10:47:45		7	Yes	21	10	30	3
10:50:27		8	Yes	21	10	30	3
10:53:08		9	Yes	21	10	30	3
10:55:30		10	Yes	21	10	30	3
11:08:18	12	1	Yes	21	16	24	4
11:14:01		2	Yes	21	16	24	4
11:16:47		3	Yes	21	16	24	4
11:19:25		4	Yes	21	16	24	4
11:21:46		5	Yes	21	16	24	4
11:24:18		6	Yes	21	16	24	4
11:29:08		7	Yes	21	16	24	4
11:31:29		8	Yes	21	16	24	4
11:34:58		9	Yes	21	16	24	4
11:38:02		10	Yes	21	16	24	4



Date Time	Round	Run	Source	From Wall (Inches)	From Bottom (Inches)	Top Cover (Inches)	Net Exposure Rate At Truck Wall (uR/hr)
3/8/00							
11:54:26	13	1	Yes	21	22	18	6
11:57:20		2	Yes	21	22	18	6
12:00:35		3	Yes	21	22	18	6
12:03:49		4	Yes	21	22	18	6
12:06:54		5	Yes	21	22	18	6
12:08:50		6	Yes	21	22	18	6
12:11:47		7	Yes	21	22	18	6
12:14:32		8	Yes	21	22	18	6
12:17:11		9	Yes	21	22	18	6
12:20:00		10	Yes	21	22	18	6
12:30:37	14	1	Yes	21	28	12	6
12:33:17		2	Yes	21	28	12	6
12:35:58		3	Yes	21	28	12	6
12:41:10		4	Yes	21	28	12	6
12:44:16		5	Yes	21	28	12	6
12:46:51		6	Yes	21	28	12	6
12:49:25		7	Yes	21	28	12	6
12:53:45		8	Yes	21	28	12	6
12:56:34		9	Yes	21	28	12	6
12:59:36		10	Yes	21	28	12	6
13:13:37	15	1	Yes	24	4	36	2
13:20:36		2	Yes	24	4	36	2
13:24:41		3	Yes	24	4	36	2
13:27:26		4	Yes	24	4	36	2
13:30:08		5	Yes	24	4	36	2
13:36:30		6	Yes	24	4	36	2
13:42:27		7	Yes	24	4	36	2
13:44:53		8	Yes	24	4	36	2
13:54:45	16	1	Yes	24	16	24	2
13:57:49		2	Yes	24	16	24	2
13:59:08		3	Yes	24	16	24	2
14:00:03		4	Yes	24	16	24	2
14:00:53		5	Yes	24	16	24	2
14:01:47		6	Yes	24	16	24	2
14:02:35		7	Yes	24	16	24	2
14:03:27		8	Yes	24	16	24	2
14:06:08		9	Yes	24	16	24	2
14:16:59		10	Yes	24	16	24	2
14:07:54		11	Yes	24	16	24	2
14:08:48		12	Yes	24	16	24	2
14:09:33		13	Yes	24	16	24	2

# KESI TEST RESULTS – March 7, 8, 2000

Table 2

Date	Time	Round Run	Source	Net Exposure Rate At Truck Wall (uR/hr)	Ronan	Exploranium	Eberline
3/7/00	8:44:35	1-1	1	N/A			
	8:57:59	1-2	2	N/A			
	9:01:41	1-3	3	N/A			
	9:05:04	1-4	4	N/A			
	9:08:32	1-5	5	N/A			
	9:16:47	1-6	6	N/A			
	9:18:46	1-7	7	N/A			
	9:22:39	1-8	8	N/A			
	9:29:23	1-9	9	N/A			
	9:31:25	1-10	10	N/A			
3/7/00	9:58:53	2-1	1	Yes 9	North - 11	Low 1A	No alarm
	10:04:18	2-2	2	Yes 9	South - 11	Low 1B	No alarm
	10:06:31	2-3	3	Yes 9	North - 12	Low 1A	No alarm
	10:09:58	2-4	4	Yes 9	South -12	Didn't clear 3 alarm	No alarm
	10:14:01	2-5	5	Yes 9	North - 11	Low 1A	No alarm
	10:16:52	2-6	6	Yes 9	South - 11	No alarm	No alarm
	10:19:28	2-7	7	Yes 9	N-11/Top-11	Low 1A	No alarm
	10:22:09	2-8	8	Yes 9	South - 11	Low 1B	No alarm
	10:24:36	2-9	9	Yes 9	North - 11	No alarm	No alarm
	10:27:05	2-10	10	Yes 9	South - 11	No alarm	No alarm
	10:32:42	2-11	11	Yes 9	North - 11	Low 1A	No alarm
	10:37:45	2-12	12	Yes 9	South - 11	No alarm	No alarm
3/7/00	10:56:15	3-1	1	Yes 14	North - 11	Low 1A	Alarm
	10:59:30	3-2	2	Yes 14	South - 11	Low 1B	Alarm
	11:03:21	3-3	3	Yes 14	North -11	Low 1A	No alarm
	11:06:13	3-4	4	Yes 14	South -11	Low 1B	Alarm
	11:08:56	3-5	5	Yes 14	North -11	Low 1A	Alarm
	11:11:21	3-6	6	Yes 14	South 11	Low 1B	Alarm
	11:15:32	3-7	7	Yes 14	North -11	Low 1A	No alarm
	11:18:34	3-8	8	Yes 14	South - 11	Low 1B	Alarm
	11:21:17	3-9	9	Yes 14	North - 11	Low 1A	No alarm
	11:24:18	3-10	10	Yes 14	South - 11	Low 1B	No alarm

# KESI TEST RESULTS – March 7, 8, 2000

Table 2

Date	Time	Round		Source	Net Exposure Rate At Truck Wall (uR/hr)	Ronan	Exploranium	Eberline
		Run						
3/7/00	11:44:22	4-1	1	Yes	9	North - 11	Low 1A	No alarm
	11:46:44	4-2	2	Yes	9	South - 11	Low 1B	Alarm
	11:51:41	4-3	3	Yes	9	North -11	Low 1A	No alarm
	11:54:15	4-4	4	Yes	9	South -11	Low 1B	Alarm
	11:56:30	4-5	5	Yes	9	North -11	Low 1A	No alarm
	11:59:42	4-6	6	Yes	9	South 11	Low 1B	Alarm
	12:02:39	4-7	7	Yes	9	North -11	Low 1A	No alarm
	12:06:39	4-8	8	Yes	9	South - 11	Low 1B	No alarm
	12:09:55	4-8	9	Yes	9	North - 11	Low 1A	No alarm
	12:13:24	4-10	10	Yes	9	South - 11	Low 1B	Alarm
3/7/00	12:27:32	5-1	1	Yes	8	North - 11	Low 1A	No alarm
	12:30:17	5-2	2	Yes	8	South – 12	Low 1B	Alarm
	12:34:18	5-3	3	Yes	8	North –11	Low 1A	No alarm
	12:36:56	5-4	4	Yes	8	South -12	Low 1B	Alarm
	12:39:49	5-5	5	Yes	8	North –11	Low 1A	No alarm
	12:42:03	5-6	6	Yes	8	South 12	Low 1B	Alarm
	12:49:13	5-7	7	Yes	8	North –11	Low 1A	No alarm
	12:51:07	5-8	8	Yes	8	South – 13	Low 1B	Alarm
	12:54:31	5-9	9	Yes	8	North – 11	Low 1A	No alarm
	12:57:21	5-10	10	Yes	8	South – 12	Low 1B	No alarm
3/7/00	13:39:23	6-1	1	Yes	9	North – 12	Low 1A	Alarm
	13:41:43	6-2	2	Yes	9	South – 11	Low 1B	Alarm
	13:44:11	6-3	3	Yes	9	North –12	Low 1A	Alarm
	13:47:22	6-4	4	Yes	9	South -12	Low 1B	Alarm
	13:49:42	6-5	5	Yes	9	North –11	Low 1A	Alarm
	13:52:08	6-6	6	Yes	9	South 11	Low 1B	Alarm
	13:54:36	6-7	7	Yes	9	North –11	Low 1A	Alarm
	13:57:06	6-8	8	Yes	9	South – 11	Low 1B	Alarm
	13:59:37	6-9	9	Yes	9	North – 11	Low 1A	Alarm
	14:02:06	6-10	10	Yes	9	South – 11	Low 1B	Alarm

# KESI TEST RESULTS – March 7, 8, 2000

Table 2

Date	Time	Round		Source	Net Exposure Rate At Truck Wall	Ronan	Exploranium	Eberline
		Run			(uR/hr)			
3/7/00	14:13:38	7-1	1	Yes	7	North – 11	Low 1A	No alarm
	14:20:39	7-2	2	Yes	7	South – 12	Low 1B	No alarm
	14:23:08	7-3	3	Yes	7	North –12	Low 1A	No alarm
	14:27:07	7-4	4	Yes	7	South -14	Low 1B	Alarm
	14:29:47	4-5	5	Yes	7	North –13	Low 1A	No alarm
	14:33:53	7-6	6	Yes	7	South - 12	Low 1B	No alarm
	14:36:41	7-7	7	Yes	7	North –11	Low 1A	No alarm
	14:39:04	7-8	8	Yes	7	South – 13	Low 1B	No alarm
	14:41:21	7-9	9	Yes	7	North – 13	Low 1A	No alarm
	14:45:14	7-10	10	Yes	7	South – 18	Low 1B	No alarm
3/7/00	15:07:02	8-1	1		N/A			
	15:09:35	8-2	2		N/A			
	15:12:01	8-3	3		N/A			
	15:14:44	8-4	4		N/A			
	15:17:16	8-5	5		N/A			
	15:20:16	8-6	6		N/A			
	15:23:24	8-7	7		N/A			
	15:26:24	8-8	8		N/A			
	15:30:35	8-9	9		N/A			
	15:33:48	8-10	10		N/A			
	15:37:09	8-11	11		N/A			
3/8/00	9:02:08	9-1	1		N/A			
	9:04:33	9-2	2		N/A			
	9:07:44	9-3	3		N/A			
	9:10:21	9-4	4		N/A			
	9:12:58	9-5	5		N/A			
	9:15:37	9-6	6		N/A			
	9:18:20	9-7	7		N/A			
	9:21:26	9-8	8		N/A			
	9:24:12	9-9	9		N/A			
	9:26:47	9-10	10		N/A			

# KESI TEST RESULTS – March 7, 8, 2000

Table 2

Date	Time	Round Run		Source	Net Exposure Rate At Truck Wall (uR/hr)	Ronan	Exploranium	Eberline
3/8/00	9:37:45	10-1	1	Yes	3	North – 18	No alarm	No alarm
	9:50:14	10-2	2	Yes	3		No alarm	No alarm
	9:52:57	10-3	3	Yes	3	North – 16	No alarm	No alarm
	9:55:32	10-4	4	Yes	3	South – 18	No alarm	No alarm
	9:59:16	10-5	5	Yes	3		No alarm	No alarm
	10:02:30	10-6	6	Yes	3		No alarm	No alarm
	10:05:09	10-7	7	Yes	3		No alarm	No alarm
	10:07:42	10-8	8	Yes	3	South – 16	No alarm	No alarm
	10:10:36	10-9	9	Yes	3		No alarm	No alarm
	10:12:59	10-10	10	Yes	3		No alarm	No alarm
3/8/00	10:26:18	11-1	1	Yes	3		No alarm	No alarm
	10:28:59	11-2	2	Yes	3		No alarm	No alarm
	10:33:52	11-3	3	Yes	3	North – 17	No alarm	No alarm
	10:36:46	11-4	4	Yes	3		No alarm	No alarm
	10:41:03	11-5	5	Yes	3	North – 13	No alarm	No alarm
	10:43:55	11-6	6	Yes	3		No alarm	No alarm
	10:47:45	11-7	7	Yes	3	North – 18	Low 1A	No alarm
	10:50:27	11-8	8	Yes	3		No alarm	No alarm
	10:53:08	11-9	9	Yes	3	North – 18	No alarm	No alarm
	10:55:30	11-10	10	Yes	3		No alarm	No alarm
3/8/00	11:08:18	12-1	1	Yes	4	North – 16	Low 1A	No alarm
	11:14:01	12-2	2	Yes	4	South – 18	Low 1B	No alarm
	11:16:47	12-3	3	Yes	4	North – 13	Low 1A	No alarm
	11:19:25	12-4	4	Yes	4	South – 13	No alarm	No alarm
	11:21:46	12-5	5	Yes	4	North – 13	Low 1A	No alarm
	11:24:18	12-6	6	Yes	4	South – 16	No alarm	No alarm
	11:29:08	12-7	7	Yes	4	North – 13	Low 1A	No alarm
	11:31:29	12-8	8	Yes	4	South – 17	No alarm	No alarm
	11:34:58	12-9	9	Yes	4	North – 15	Low 1A	No alarm
	11:38:02	12-10	10	Yes	4	South - 12	Low 1B	No alarm

# KESI TEST RESULTS – March 7, 8, 2000

Table 2

Date	Time	Round		Source	Net Exposure Rate At Truck Wall (uR/hr)	Ronan	Exploranium	Eberline
		Run						
3/8/00	11:54:26	13-1	1	Yes	6	North – 14	Low 1A	No alarm
	11:57:20	13-2	2	Yes	6	South – 13	Low 1B	No alarm
	12:00:35	13-3	3	Yes	6	North –12	Low 1A	No alarm
	12:03:49	13-4	4	Yes	6		Low 1B	No alarm
	12:06:54	13-5	5	Yes	6	North –12	Low 1A	No alarm
	12:08:50	13-6	6	Yes	6	South – 12	Low 1B	No alarm
	12:11:47	13-7	7	Yes	6	North –11	Low 1A	No alarm
	12:14:32	13-8	8	Yes	6	South – 12	Low 1B	No alarm
	12:17:11	13-9	9	Yes	6	North – 12	Low 1A	No alarm
	12:20:22	13-10	10	Yes	6	South – 11	Low 1B	No alarm
3/8/00	12:30:37	14-1	1	Yes	6	North – 11	Low 1A	Alarm
	12:33:17	14-2	2	Yes	6	South – 11	Low 1B	Alarm
	12:35:58	14-3	3	Yes	6	North –12	Low 1A	No alarm
	12:41:10	14-4	4	Yes	6	South -11	Low 1B	Alarm
	12:44:16	14-5	5	Yes	6	North –11	Low 1A	Alarm
	12:46:51	14-6	6	Yes	6	South – 11	Low 1B	Alarm
	12:49:25	14-7	7	Yes	6	North –11	Low 1A	No alarm
	12:53:45	14-8	8	Yes	6	South – 11	Low 1B	Alarm
	12:56:34	14-9	9	Yes	6	North – 12	Low 1A	Alarm
	12:59:36	14-10	10	Yes	6	South – 12	Low 1B	Alarm
3/8/00	13:13:37	15-1	1	Yes	2		No alarm	No alarm
	13:20:36	15-2	2	Yes	2		No alarm	No alarm
	13:24:41	15-3	3	Yes	2		No alarm	No alarm
	13:27:26	15-4	4	Yes	2	Bottom – 14??	No alarm	No alarm
	13:30:08	15-5	5	Yes	2		No alarm	No alarm
	13:36:30	15-6	6	Yes	2		No alarm	No alarm
	13:42:27	15-7	7	Yes	2		No alarm	No alarm
	13:44:53	15-8	8	Yes	2		No alarm	No alarm

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Table 2

Date	Time	Round		Source	Net Exposure Rate At Truck Wall (uR/hr)	Ronan	Exploranium	Eberline
3/8/00	13:54:45	16-1	1	Yes	2	North – 13	<b>Eberline</b>	No alarm
	13:57:49	16-2	2	Yes	2	South – 14	No alarm	No alarm
	13:59:08	16-3	3	Yes	2		No alarm	No alarm
	14:00:03	16-4	4	Yes	2		No alarm	No alarm
	14:00:53	16-5	5	Yes	2		No alarm	No alarm
	14:01:47	16-6	6	Yes	2		No alarm	No alarm
	14:02:35	16-7	7	Yes	2		No alarm	No alarm
	14:03:27	16-8	8	Yes	2	South – 12	No alarm	No alarm
	14:06:08	16-9	9	Yes	2		No alarm	No alarm
	14:06:59	16-10	10	Yes	2	S–11/Top-11	No alarm	No alarm
	14:07:54	16-11	11	Yes	2		No alarm	No alarm
	14:08:48	16-12	12	Yes	2	South – 11	No alarm	No alarm
	14:09:33	16-13	13	Yes	2			