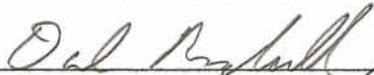
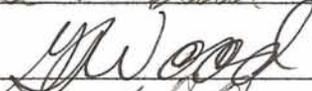
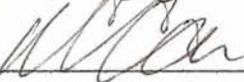


Survey Unit Release Record

Design #	EP-RBDL-2 (Rx-147)	Revision #	Original	Page 1 of 3
Survey Unit #(s)	RBDL-2 (Rx-147)			
Description	<p>1) Embedded Pipe (EP) Survey Unit RBDL-2 (Rx-147) meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP RBDL-2 (Rx-147) is a Class 1, Group 1 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP RBDL-2 (Rx-147) were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 3-8 from Survey Request (SR)-13 was referenced for this decision.</p> <p>4) Survey Instructions for this survey unit are incorporated into and performed in accordance with (IAW) the Babcock Services Incorporated (BSI)/LVS-002, Work Execution Package (WEP) 05-006. Survey instructions described in this document constitute "Special Methods" and the survey design used in the acquisition of survey measurements.</p> <p>5) Instrument efficiency determinations are developed in accordance with the BSI/LVS-002, WEP 05-006, these determinations are appropriate for the types of radiation involved and the media being surveyed.</p>			
Approval Signatures			Date:	
FSS/Characterization Engineer		11-26-07		
Technical Reviewer (FSS/Characterization Engineer)		11-27-07		
FSS/Characterization Manager	F. Case 	11/29/07		

Form CS-09/1 Rev 0

Survey Unit: RBDL-2 (Rx-147)

1.0 History/Description

- 1.1 The subject pipe system is a 4" drain line located in the trench on the -27' el. of the Rx building.
- 1.2 EP RBDL-2 (Rx-147) consists of 4" diameter piping that is approximately 44 feet in length.

2.0 Survey Design Information

- 2.1 EP RBDL-2 (Rx-147) was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 4" ID pipe was accessible for survey. The accessible 4" ID pipe was surveyed by static measurement at one foot increments, for a total of 44 survey measurements.
- 2.3 The total surface area for the 4" ID piping is 42,807 cm² (4.3 m²) for the entire length of (approximately 44') of 4" piping.

3.0 Survey Unit Measurement Locations/Data

- 3.1 Pipe interior radiological survey forms are provided in Attachment 2 of this release record.

4.0 Survey Unit Investigations/Results

- 4.1 None

5.0 Data Assessment Results

- 5.1 Data assessment results are provided in the EP/Buried Pipe (BP) Survey Report provided in Attachment 1.
- 5.2 All measurement results are less than the Derived Concentration Guideline Level (DCGL) for radionuclide specific EP that corresponds to the 1 mrem/yr dose goal established in Table 3-3 of the FSSP.
- 5.3 When implementing the Unity Rule, provided in Section 3.6.3 of the FSSP, and applying the Nuclide Fraction (NF), provided in TBD-06-004, the survey unit that is constituted by EP RBDL-2 (Rx-147) passes FSS.
- 5.4 Background was not subtracted from the survey measurements and the Elevated Measurement Comparison (EMC) was not employed for this survey unit.

Survey Unit: RBDL-2 (Rx-147)

5.5 Statistical Summary Table

Statistical Parameter	4" Pipe
Total Number of Survey Measurements	44
Number of Measurements >MDC	34
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0203
Median	0.0159
Standard Deviation	0.0172
Maximum	0.0778
Minimum	0.0042

6.0 Documentation of evaluations pertaining to compliance with the unrestricted use limit of 25 mrem/yr and dose contributions from Embedded Pipe and radionuclides contributing 10% in aggregate of the total dose for both structural scenarios and soils.

6.1 A review of the survey results has shown that the dose contribution for EP RBDL-2 (Rx-147) to be less than 1 mrem/yr. The dose contribution is estimated to be 0.020 mrem/yr based on the average of the actual gross counts measured.

7.0 Attachments

Attachment 1 – BSI EP/BP Survey Report

Attachment 2 – Pipe Interior Radiological Survey Form

Attachment 3 – DQA Worksheet

Attachment 4 – Disc containing RR for EP RBDL-2 (Rx-147) & Spreadsheet

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BSI EP/BP SURVEY REPORT

Pipe ID	RBDL-2(Rx-147)	Survey Location	Rx 25 Hot-cold drain Trench el.-27
Survey Date	2/8/2006, 11/15/07	2350-1 #	203488, 203438
Survey Time	10:03, 14:10	Detector-Sled #	LVS-1 /101, 44- 159 247697/101
Pipe Size	4"	Detector Efficiency	0.00052, 0.00044
DCGL (dpm/100cm ²)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm ²)	973
Pipe Area Incorporated by Survey Data (m ²)	4.3	Field BKG (cpm)	16.3, 1.7
Routine Survey	X	Field MDCR (cpm)	16.9, 8.9
QA Survey		Nominal MDC (dpm/100cm ²)	1557, 2313
Survey Measurement Results			
Total Number of Survey Measurements		44	
Number of Measurements >MDC		34	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0203	
Median		0.0159	
Standard Deviation		0.0172	
Maximum		0.0778	
Minimum		0.0042	
Survey Technician(s)	ROSENHAGEN, JACOBS		
Survey Unit Classification		1	
TBD 06-004 Piping Group		1	
SR-13 Radionuclide Distribution Sample		EP 3-8	
Measured Nuclide		Co-60	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS:			
RP Engineer Date		<i>Oral Probst 11-26-07</i>	

EP RBDL-2 (Rx 147)

4" Pipe

TBD 06-004 Group 1

Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm2)	Cs-137 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
1	13	13	25,000	2,570	102	2,438	648	75	18	0.015
2	66	66	126,923	13,046	517	12,376	3,290	381	91	0.078
3	10	10	19,231	1,977	78	1,875	498	58	14	0.012
4	60	60	115,385	11,860	470	11,251	2,991	346	83	0.071
5	9	9	17,308	1,779	71	1,688	449	52	12	0.011
6	8	8	15,385	1,581	63	1,500	399	46	11	0.009
7	7	7	13,462	1,384	55	1,313	349	40	10	0.008
8	7	7	13,462	1,384	55	1,313	349	40	10	0.008
9	13	13	25,000	2,570	102	2,438	648	75	18	0.015
10	13	13	25,000	2,570	102	2,438	648	75	18	0.015
11	6	6	11,538	1,186	47	1,125	299	35	8	0.007
12	16	16	30,769	3,163	125	3,000	798	92	22	0.019
13	14	14	26,923	2,767	110	2,625	698	81	19	0.017
14	11	11	21,154	2,174	86	2,063	548	63	15	0.013
15	6	6	11,538	1,186	47	1,125	299	35	8	0.007
16	11	11	21,154	2,174	86	2,063	548	63	15	0.013
17	15	15	28,846	2,965	118	2,813	748	87	21	0.018
18	11	11	21,154	2,174	86	2,063	548	63	15	0.013
19	16	16	30,769	3,163	125	3,000	798	92	22	0.019
20	15	15	28,846	2,965	118	2,813	748	87	21	0.018
21	28	28	53,846	5,535	219	5,250	1,396	162	39	0.033
22	43	43	82,692	8,500	337	8,063	2,143	248	59	0.051
23	17	17	32,692	3,360	133	3,188	847	98	23	0.020
24	15	15	28,846	2,965	118	2,813	748	87	21	0.018
25	13	13	25,000	2,570	102	2,438	648	75	18	0.015
26	15	15	28,846	2,965	118	2,813	748	87	21	0.018
27	61	61	117,308	12,058	478	11,438	3,041	352	84	0.072
28	7	7	13,462	1,384	55	1,313	349	40	10	0.008
29	15	15	28,846	2,965	118	2,813	748	87	21	0.018
30	18	18	34,615	3,558	141	3,375	897	104	25	0.021
31	15	15	28,846	2,965	118	2,813	748	87	21	0.018

EP RBDL-2 (Rx 147)
4" Pipe
TBD 06-004 Group 1

Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm2)	Cs-137 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
32	14	14	26,923	2,767	110	2,625	698	81	19	0.017
33	12	12	23,077	2,372	94	2,250	598	69	17	0.014
34	35	35	67,308	6,918	274	6,563	1,745	202	48	0.041
35	31	31	59,615	6,128	243	5,813	1,545	179	43	0.037
36	11	11	21,154	2,174	86	2,063	548	63	15	0.013
37	4	4	9,091	934	37	886	236	27	7	0.006
38	4	4	9,091	934	37	886	236	27	7	0.006
39	9	9	20,455	2,102	83	1,994	530	61	15	0.013
40	3	3	6,818	701	28	665	177	20	5	0.004
41	12	12	27,273	2,803	111	2,659	707	82	20	0.017
42	5	5	11,364	1,168	46	1,108	295	34	8	0.007
43	18	18	40,909	4,205	167	3,989	1,060	123	29	0.025
44	12	12	27,273	2,803	111	2,659	707	82	20	0.017
									MEAN	0.020
									MEDIAN	0.016
									STD DEV	0.017
									MAX	0.078
									MIN	0.004

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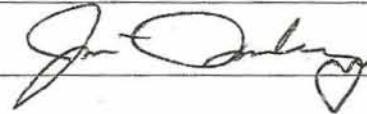
Pipe Interior Radiological Survey Form

Date: 2-8-06 Time: 1030
 Pipe ID#: RX147 (25RBDL-2) Pipe Diameter: 4" Access Point Area: TRENCH
 Building: RX Elevation: -27 System: RX-25 HOT COLD DRAIN
 Type of Survey Investigation Characterization Final Survey Other
 Gross Co60 Cs
 Detector ID# / Sled ID# LVS-1 / 1 / 101
 Detector Cal Date: 11-17-05 Detector Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 203498
 Instrument Cal Date: 11-17-05 Instrument Cal Due Date: 11-17-06

From the Daily Pipe Survey Detector Control Form for the Selected Detector

Background Value 16.3 cpm
 MDCR_{static} 16.9 cpm
 Efficiency Factor for Pipe Diameter 0.00052 (from detector efficiency determination)
 MDC_{static} 1557 dpm/ 100 cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: _____

Technician Signature



Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	1	13	13	n/a	n/a
2	2	1	66	66	↓	↓
3	3	1	10	10		
4	4	1	60	60		
5	5	1	9	9		
6	6	1	8	8		
7	7	1	7	7		
8	8	1	7	7		
9	9	1	13	13		
10	10	1	13	13		

REFERENCE COPY

Package Page 1 of 3

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 2-8-06
 Pipe ID#: RX147 (25 BBDL-2) Pipe Diameter: 4" Access Point Area: TRENCH
 Building: RX Elevation: -27 System: RX-25 HOT COLD DRAIN

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	6	6	n/a	n/a
12	12	1	16	16		
13	13	1	14	14		
14	14	1	11	11		
15	15	1	6	6		
16	16	1	11	11		
17	17	1	15	15		
18	18	1	11	11		
19	19	1	16	16		
20	20	1	15	15		
21	21	1	28	28		
22	22	1	43	43		
23	23	1	17	17		
24	24	1	15	15		
25	25	1	13	13		
26	26	1	15	15		
27	27	1	61	61		
28	28	1	7	7		
29	29	1	15	15		
30	30	1	18	18		
31	31	1	15	15		
32	32	1	14	14		
33	33	1	12	12		
34	34	1	35	35		
35	35	1	31	31		
36	36	1	11	11		
n/a						

REFERENCE COPY



Pipe Interior Radiological Survey Form

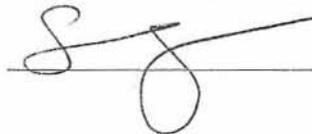
Date: 11 15 07 Time: 1410
 Pipe ID#: RX 147 / RBDL2 Pipe Diameter: 4" Access Point Area: -25
 Building: RX BLDG. Elevation: -25' System: DRAIN
 Type of Survey Investigation _____ Characterization _____ Final Survey Other
 Gross _____ Co60 Cs _____
 Detector ID# / Sled ID# 44-159 / 247697 / 101
 Detector Cal Date: 16 OCT 07 Detector Cal Due Date: 16 OCT 08
 Instrument: 2350-1 Instrument ID #: 203438
 Instrument Cal Date: 16 OCT 07 Instrument Cal Due Date: 16 OCT 08

From the Daily Pipe Survey Detector Control Form for the Selected Detector

Background Value 1.7 cpm
 MDCR_{static} 8.86 cpm
 Efficiency Factor for Pipe Diameter 0.00044 (from detector efficiency determination)
 MDC_{static} 2313 dpm/ 100 cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: Det# 5

EP3-8 for 11.20-07

Technician Signature



Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	ONE	1	4	4	n/a	n/a
2	2	1	4	4	↓	↓
3	3	1	9	9		
4	4	1	3	3		
5	5	1	12	12		
6	6	1	5	5		
7	7	1	18	18		
8	8	1	12	12		
9	N/A	N/A	N/A	N/A		
10	N/A	N/A	N/A	N/A	N/A	N/A

REFERENCE COPY

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DQA Check Sheet

Design #	RBDL-2(Rx-147)	Revision #	Original
Survey Unit #	RBDL-2(Rx-147)		

Preliminary Data Review

Answers to the following questions should be fully documented in the Survey Unit Release Record	Yes	No	N/A
1. Have surveys been performed in accordance with survey instructions in the Survey Design?	X		
2. Is the instrumentation MDC for structure static measurements below the DCGL _W for Class 1 and 2 survey units, or below 0.5 DCGL _W for Class 3 survey units?			X
3. Is the instrumentation MDC for embedded/buried piping static measurements below the DCGL _W ?	X		
4. Was the instrumentation MDC for structure scan measurements, soil scan measurements, and embedded/buried piping scan measurements below the DCGL _W , or, if not, was the need for additional static measurements or soil samples addressed in the survey design?			X
5. Was the instrumentation MDC for volumetric measurements and smear analysis < 10% DCGL _W ?			X
6. Were the MDCs and assumptions used to develop them appropriate for the instruments and techniques used to perform the survey?	X		
7. Were the survey methods used to collect data proper for the types of radiation involved and for the media being surveyed?	X		
8. Were "Special Methods" for data collection properly applied for the survey unit under review?	X		
9. Is the data set comprised of qualified measurement results collected in accordance with the survey design, which accurately reflects the radiological status of the facility?	x		

Graphical Data Review

1. Has a posting plot been created?			X
2. Has a histogram (or other frequency plot) been created?			X
3. Have other graphical data tools been created to assist in analyzing the data?			X

Data Analysis

1. Are all sample measurements below the DCGL _W (Class 1 & 2), or 0.5 DCGL _W (Class 3)?	X		
2. Is the mean of the sample data < DCGL _W ?	X		
3. If elevated areas have been identified by scans and/or sampling, is the average activity in each elevated area < DCGL _{EMC} (Class 1), < DCGL _W (Class 2), or <0.5 DCGL _W (Class 3)?			X
4. Is the result of the Elevated Measurements Test < 1.0?			X
5. Is the result of the statistical test (S + for Sign Test or W _r for WRS Test) ≥ the critical value?			X

Comments:

FSS/Characterization Engineer (print/sign)	<i>Dale Randall</i>	Date	11-26-07
FSS/ Characterization Manager (print/sign)	<i>R. Case</i>	Date	11/29/07

Form
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Rev 0

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1 DISC**