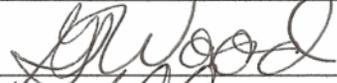
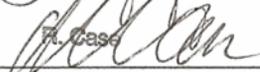


## Survey Unit Release Record

<b>Design #</b>	EP-B1	<b>Revision #</b>	Original	<b>Page 1 of 3</b>
<b>Survey Unit #(s)</b>	B1			
<b>Description</b>	<p>1) Embedded Pipe (EP) Survey Unit B1 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP B1 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP B1 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP2-5 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>			
<b>Approval Signatures</b>			<b>Date:</b>	
FSS/Characterization Engineer			10-9-07	
Technical Reviewer (FSS/Characterization Engineer)			10-11-07	
FSS/Characterization Manager			10/11/07	

Form CS-09/1 Rev 0
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## Survey Unit: B1

**1.0 History/Description**

- 1.1 The subject pipe system is a 1.25" conduit line located on the -25 elevation of the Rx annulus. The pipe section is approximately 40 feet in length.

**2.0 Survey Design Information**

- 2.1 EP B1 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 1.25" ID pipe was accessible for survey. The accessible 1.25" ID pipe was surveyed by static measurement at one foot increments, for a total of 40 survey measurements.
- 2.3 Surface area for the 1.25" ID piping is 304 cm<sup>2</sup> for each foot of piping, corresponding to a total 1.25" ID piping surface area of 12,161 cm<sup>2</sup> (1.2 m<sup>2</sup>) for the entire length of (approximately 40') of 1.25" 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 B1 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: B1

### 5.5 Statistical Summary Table

Statistical Parameter	1.25" Pipe
Total Number of Survey Measurements	40
Number of Measurements >MDC	1
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0116
Median	0.0114
Standard Deviation	0.0037
Maximum	0.0200
Minimum	0.0057

**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 B1 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.012 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 B1 & Spreadsheet

**SECTION 7**  
**ATTACHMENT 1**  
3 **PAGE(S)**



### BSI EP/BP SURVEY REPORT

<b>Pipe ID</b>	<b>B1</b>	<b>Survey Location</b>	Rx Annulus -25 el.
<b>Survey Date</b>	13-Mar-06	<b>2350-1 #</b>	203488
<b>Survey Time</b>	08:00	<b>Detector-Sled #</b>	44-159/238367-no sled
<b>Pipe Size</b>	1.25"	<b>Detector Efficiency</b>	0.0005
<b>DCGL (dpm/100cm2)</b>	2.41E+05	<b>Pipe Area Incorporated by Detector Efficiency (in cm2)</b>	304
<b>Pipe Area Incorporated by Survey Data (m<sup>2</sup>)</b>	1.2	<b>Field BKG (cpm)</b>	8.2
<b>Routine Survey</b>	X	<b>Field MDCR (cpm)</b>	12.8
<b>QA Survey</b>		<b>Nominal MDC (dpm/100cm2)</b>	4,318

#### Survey Measurement Results

Total Number of Survey Measurements	40
Number of Measurements >MDC	1
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0116
Median	0.0114
Standard Deviation	0.0037
Maximum	0.0200
Minimum	0.0057

<b>Survey Technician(s)</b>	ROSENHAGEN
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<b>Survey Unit Classification</b>	1
TBD 06-004 Piping Group	2
SR-13 Radionuclide Distribution Sample	EP2-5
Measured Nuclide	Co-60
Area Factor/EMC Used	No
Pass/Fail FSS	Pass
MREM/YR Contribution	<1

COMMENTS:  
ACTIVITY VALUES NOT BACKGROUND CORRECTED

RP Engineer   Date	<i>Paul Marshall 10-9-07</i>
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**EP B1**  
**1.25" Pipe**  
**TBD 06-004 Group 2**

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	4	4	8,000	2,631	1,364	22	15	1	76	0.011
2	3	3	6,000	1,974	1,023	16	12	1	57	0.009
3	6	6	12,000	3,947	2,047	33	23	2	114	0.017
4	2	2	4,000	1,316	682	11	8	1	38	0.006
5	5	5	10,000	3,289	1,706	27	19	2	95	0.014
6	4	4	8,000	2,631	1,364	22	15	1	76	0.011
7	5	5	10,000	3,289	1,706	27	19	2	95	0.014
8	4	4	8,000	2,631	1,364	22	15	1	76	0.011
9	6	6	12,000	3,947	2,047	33	23	2	114	0.017
10	5	5	10,000	3,289	1,706	27	19	2	95	0.014
11	7	7	14,000	4,605	2,388	38	27	2	133	0.020
12	4	4	8,000	2,631	1,364	22	15	1	76	0.011
13	3	3	6,000	1,974	1,023	16	12	1	57	0.009
14	5	5	10,000	3,289	1,706	27	19	2	95	0.014
15	4	4	8,000	2,631	1,364	22	15	1	76	0.011
16	5	5	10,000	3,289	1,706	27	19	2	95	0.014
17	4	4	8,000	2,631	1,364	22	15	1	76	0.011
18	3	3	6,000	1,974	1,023	16	12	1	57	0.009
19	4	4	8,000	2,631	1,364	22	15	1	76	0.011
20	2	2	4,000	1,316	682	11	8	1	38	0.006
21	2	2	4,000	1,316	682	11	8	1	38	0.006
22	6	6	12,000	3,947	2,047	33	23	2	114	0.017
23	5	5	10,000	3,289	1,706	27	19	2	95	0.014
24	3	3	6,000	1,974	1,023	16	12	1	57	0.009
25	6	6	12,000	3,947	2,047	33	23	2	114	0.017
26	5	5	10,000	3,289	1,706	27	19	2	95	0.014
27	2	2	4,000	1,316	682	11	8	1	38	0.006
28	5	5	10,000	3,289	1,706	27	19	2	95	0.014
29	3	3	6,000	1,974	1,023	16	12	1	57	0.009
30	5	5	10,000	3,289	1,706	27	19	2	95	0.014
31	3	3	6,000	1,974	1,023	16	12	1	57	0.009

**EP B1**  
**1.25" Pipe**  
**TBD 06-004 Group 2**

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	2	2	4,000	1,316	682	11	8	1	38	0.006
33	5	5	10,000	3,289	1,706	27	19	2	95	0.014
34	3	3	6,000	1,974	1,023	16	12	1	57	0.009
35	4	4	8,000	2,631	1,364	22	15	1	76	0.011
36	3	3	6,000	1,974	1,023	16	12	1	57	0.009
37	5	5	10,000	3,289	1,706	27	19	2	95	0.014
38	3	3	6,000	1,974	1,023	16	12	1	57	0.009
39	3	3	6,000	1,974	1,023	16	12	1	57	0.009
40	5	5	10,000	3,289	1,706	27	19	2	95	0.014
									MEAN	0.012
									MEDIAN	0.011
									STD DEV	0.004
									MAX	0.020
									MIN	0.006

**SECTION 7**  
**ATTACHMENT 2**  
2 **PAGE(S)**

**Pipe Interior Radiological Survey Form**

Date: 3-13-06 Time: 0800 1-51  
REC'D IT D  
 Pipe ID#: 01 Pipe Diameter: 1.25" Access Point Area: -25 Annulus  
 Building: T2X Elevation: -25 System: RX CONDUIT  
 Type of Survey Investigation  Characterization  Final Survey  Other   
 Gross  Co60  Cs   
 Detector ID# / Sled ID# 44-159 / 2383671 NO SLED  
 Detector Cal Date: 6-MAR-06 Detector Cal Due Date: 6-MAR-07  
 Instrument: 2350 H Instrument ID #: 180718  
 Instrument Cal Date: 28-JUN-05 Instrument Cal Due Date: 28-JUN-06

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

Background Value 8.2 cpm  
 MDCR<sub>static</sub> 12.8 cpm  
 Efficiency Factor for Pipe Diameter 0.0005 (from detector efficiency determination)  
 MDC<sub>static</sub> 4318 dpm/ 100 cm<sup>2</sup>  
 Is the MDC<sub>static</sub> acceptable?  Yes  No (if no, adjust sample count time and recalculate MDCR<sub>static</sub>)  
 Comments: INITIAL SURVEY

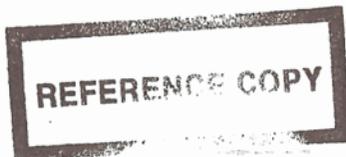
NO MAP AVAILABLE

COMPLETE

Technician Signature [Signature]

**Pipe Interior Radiological Survey**

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





**SECTION 7**  
**ATTACHMENT 3**  
  1   **PAGE(S)**

### DQA Check Sheet

Design #	EP B1	Revision #	Original			
Survey Unit #	EP B1					
<b>Preliminary Data Review</b>						
<b>Answers to the following questions should be fully documented in the Survey Unit Release Record</b>				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 <sub>W</sub> for Class 1 and 2 survey units, or below 0.5 DCGL <sub>W</sub> for Class 3 survey units?						X
3. Is the instrumentation MDC for embedded/buried piping static measurements below the DCGL <sub>W</sub> ?				X		
4. Was the instrumentation MDC for structure scan measurements, soil scan measurements, and embedded/buried piping scan measurements below the DCGL <sub>W</sub> , 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 <sub>W</sub> ?						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		
<b>Graphical Data Review</b>						
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
<b>Data Analysis</b>						
1. Are all sample measurements below the DCGL <sub>W</sub> (Class 1 & 2), or 0.5 DCGL <sub>W</sub> (Class 3)?				X		
2. Is the mean of the sample data < DCGL <sub>W</sub> ?				X		
3. If elevated areas have been identified by scans and/or sampling, is the average activity in each elevated area < DCGL <sub>EMC</sub> (Class 1), < DCGL <sub>W</sub> (Class 2), or <0.5 DCGL <sub>W</sub> (Class 3)?						X
4. Is the result of the Elevated Measurements Test < 1.0?						X
5. Is the result of the statistical test ( <b>S+</b> for Sign Test or <b>W<sub>r</sub></b> for WRS Test) ≥ the critical value?						X
Comments:						
FSS/Characterization Engineer (print/sign)			<i>Dale Randall</i>		Date	10-9-07
FSS/ Characterization Manager (print/sign)			<i>R. Case</i>		Date	10/6/07

Form  
 CS-09/2  
 Rev 0

**SECTION 7  
ATTACHMENT 4  
1 DISC**