Survey Unit Release Record				
Design #	EP-D6	**Revision #**	Original	**Page 1 of 3**
Survey Unit #(s)	D6			
Description	1) Embedded Pipe (EP) Survey Unit D6 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF). 2) EP D6 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004. 3) Surveys in EP D6 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. 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. 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.			

Approval Signatures		**Date:**
FSS/Characterization Engineer	Ord Rudd	10-10-07
Technical Reviewer (FSS/Characterization Engineer)		10-11-07
FSS/Characterization Manager	R. Case	10/11/07

Form CS-09/1 Rev 0

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 44 feet in length.

2.0 Survey Design Information

2.1 EP D6 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 44 survey measurements.

2.3 Surface area for the 1.25" ID piping is 304 cm^2 for each foot of piping, corresponding to a total 1.25" ID piping surface area of 13,377 cm^2 (1.3 m^2) for the entire length of (approximately 44') 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 D6 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.

5.5 Statistical Summary Table

Statistical Parameter	1.25" Pipe
Total Number of Survey Measurements	44
Number of Measurements >MDC	15
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0167
Median	0.0171
Standard Deviation	0.0065
Maximum	0.0314
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 D6 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.017 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 D6 & Spreadsheet

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BSI EP/BP SURVEY REPORT

Pipe ID	D6	Survey Location	Rx Annulus -25 el.
Survey Date	16-Mar-06	2350-1 #	203488
Survey Time	08:50	Detector-Sled #	44-159/238367-no sled
Pipe Size	1.25"	Detector Efficiency	0.0005
DCGL (dpm/100cm2)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm2)	304
Pipe Area Incorporated by Survey Data (m^2)	1.3	Field BKG (cpm)	9.9
Routine Survey	X	Field MDCR (cpm)	13.8
QA Survey		Nominal MDC (dpm/100cm2)	4,318

Survey Measurement Results	
Total Number of Survey Measurements	44
Number of Measurements >MDC	15
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0167
Median	0.0171
Standard Deviation	0.0065
Maximum	0.0314
Minimum	0.0057

Survey Technician(s)	ROSENHAGEN

Survey Unit Classification	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	Dal Rudall 10-10-07

EP D6
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	11	11	22,000	7,236	3,752	60	42	4	208	0.031
2	5	5	10,000	3,289	1,706	27	19	2	95	0.014
3	10	10	20,000	6,578	3,411	55	39	3	189	0.029
4	8	8	16,000	5,263	2,729	44	31	3	151	0.023
5	9	9	18,000	5,921	3,070	49	35	3	170	0.026
6	7	7	14,000	4,605	2,388	38	27	2	133	0.020
7	10	10	20,000	6,578	3,411	55	39	3	189	0.029
8	7	7	14,000	4,605	2,388	38	27	2	133	0.020
9	8	8	16,000	5,263	2,729	44	31	3	151	0.023
10	4	4	8,000	2,631	1,364	22	15	1	76	0.011
11	6	6	12,000	3,947	2,047	33	23	2	114	0.017
12	4	4	8,000	2,631	1,364	22	15	1	76	0.011
13	5	5	10,000	3,289	1,706	27	19	2	95	0.014
14	8	8	16,000	5,263	2,729	44	31	3	151	0.023
15	4	4	8,000	2,631	1,364	22	15	1	76	0.011
16	8	8	16,000	5,263	2,729	44	31	3	151	0.023
17	5	5	10,000	3,289	1,706	27	19	2	95	0.014
18	9	9	18,000	5,921	3,070	49	35	3	170	0.026
19	6	6	12,000	3,947	2,047	33	23	2	114	0.017
20	9	9	18,000	5,921	3,070	49	35	3	170	0.026
21	6	6	12,000	3,947	2,047	33	23	2	114	0.017
22	6	6	12,000	3,947	2,047	33	23	2	114	0.017
23	8	8	16,000	5,263	2,729	44	31	3	151	0.023
24	6	6	12,000	3,947	2,047	33	23	2	114	0.017
25	4	4	8,000	2,631	1,364	22	15	1	76	0.011
26	4	4	8,000	2,631	1,364	22	15	1	76	0.011
27	8	8	16,000	5,263	2,729	44	31	3	151	0.023
28	2	2	4,000	1,316	682	11	8	1	38	0.006
29	3	3	6,000	1,974	1,023	16	12	1	57	0.009
30	6	6	12,000	3,947	2,047	33	23	2	114	0.017
31	5	5	10,000	3,289	1,706	27	19	2	95	0.014

EP D6
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	5	5	10,000	3,289	1,706	27	19	2	95	0.014
33	3	3	6,000	1,974	1,023	16	12	1	57	0.009
34	2	2	4,000	1,316	682	11	8	1	38	0.006
35	4	4	8,000	2,631	1,364	22	15	1	76	0.011
36	5	5	10,000	3,289	1,706	27	19	2	95	0.014
37	5	5	10,000	3,289	1,706	27	19	2	95	0.014
38	2	2	4,000	1,316	682	11	8	1	38	0.006
39	3	3	6,000	1,974	1,023	16	12	1	57	0.009
40	4	4	8,000	2,631	1,364	22	15	1	76	0.011
41	5	5	10,000	3,289	1,706	27	19	2	95	0.014
42	6	6	12,000	3,947	2,047	33	23	2	114	0.017
43	7	7	14,000	4,605	2,388	38	27	2	133	0.020
44	6	6	12,000	3,947	2,047	33	23	2	114	0.017
									MEAN	0.017
									MEDIAN	0.017
									STD DEV	0.006
									MAX	0.031
									MIN	0.006

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Pipe Interior Radiological Survey Form

Date: 3-16-06 Time: 0850 DRAIN PIT 1-51 A

Pipe ID#: D6 Pipe Diameter: 1.25" Access Point Area: -25 ANNULUS

Building: RX Elevation: -25 System: RX CONDUIT

Type of Survey Investigation ____ Characterization ____ Final Survey ✓ Other ✓

Gross ____ Co60 ✓ Cs ____

Detector ID# / Sled ID# 44-159 / 238367 / NO SLED

Detector Cal Date: 6-MAR-06 Detector Cal Due Date: 6-MAR-07

Instrument: 2350-1 Instrument ID #: 203488

Instrument Cal Date: 17-NOV-05 Instrument Cal Due Date: 17-NOV-06

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

Background Value 9.9 cpm

$MDCR_{static}$ 13.8 cpm

Efficiency Factor for Pipe Diameter 0.0005 (from detector efficiency determination)

MDC_{static} 4318 dpm/ 100 cm^2

Is the MDC_{static} acceptable? (Yes) No (if no, adjust sample count time and recalculate $MDCR_{static}$)

Comments: INITIAL SURVEY

NO MAPS 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/100cm²
1	1	1	11	11	N/A	N/A
2	2	↓	5	5	↓	↓
3	3		10	10		
4	4		8	8		
5	5		9	9		
6	6		7	7		
7	7		10	10		
8	8		7	7		
9	9		8	8		
10	10	↓	4	4	↓	↓

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 3.16.06
Pipe ID#: D6 Pipe Diameter: 1.25" Access Point Area: DRAIN PIT 1.5T A
Building: RX Elevation: -25 System: -25 ANNULUS RX CONDUIT

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		4	4		
13	13		5	5		
14	14		8	8		
15	15		4	4		
16	16		8	8		
17	17		5	5		
18	18		9	9		
19	19		6	6		
20	20		9	9		
21	21		6	6		
22	22		6	6		
23	23		8	8		
24	24		6	6		
25	25		4	4		
26	26		4	4		
27	27		8	8		
28	28		2	2		
29	29		3	3		
30	30		6	6		
31	31		5	5		
32	32		5	5		
33	33		3	3		
34	34		2	2		
35	35		4	4		
36	36		5	5		
37	37		5	5		
38	38		2	2		
39	39		3	3		
40	40		4	4		
41	41		5	5		
42	42		6	6		
43	43		7	7		
44	44	1	6	6		
n/a	n/a	n/a	n/a	n/a		

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DQA Check Sheet				
Design #	EP D6	Revision #	Original	
Survey Unit #	EP D6			

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)	Dale Randall	Date	10-10-07
FSS/ Characterization Manager (print/sign)	R. Case	Date	10/11/07

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1 DISC