Survey Unit Release Record				
Design #	EP-Rx 135	**Revision #**	Original	**Page 1 of 3**
Survey Unit #(s)	Rx 135			
Description	1) Embedded Pipe (EP) Survey Unit Rx 135 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF). 2) EP Rx 135 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 Rx 135 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	Carl Ronfeldt	10-23-07
Technical Reviewer (FSS/Characterization Engineer)	D Wood	11-5-07
FSS/Characterization Manager	R. Case	11/6/07

Form CS-09/1 Rev 0

1.0 History/Description

1.1 The subject pipe system is the 2" cavity drain line on the -6' elevation.

1.2 EP Rx 135 consists of 2" diameter piping that is approximately 36 feet in length.

2.0 Survey Design Information

2.1 EP Rx 135 was surveyed IAW Procedure #BSI/LVS-002.

2.2 100% of the 2" ID pipe was accessible for survey. The accessible 2" ID pipe was surveyed by static measurement at one foot increments, for a total of 36 survey measurements.

2.3 Surface area for the 2" ID piping is 486 cm^2 for each foot of piping, corresponding to a total 2" ID piping surface area of 17,512 cm^2 (1.8 m^2) for the entire length of (approximately 36') of 2" 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 Rx 135 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	2" Pipe
Total Number of Survey Measurements	36
Number of Measurements >MDC	36
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.1634
Median	0.1582
Standard Deviation	0.0599
Maximum	0.2718
Minimum	0.0512

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 Rx 135 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.163 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 Rx 135 & Spreadsheet

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BSI EP/BP SURVEY REPORT

Pipe ID	EP Rx 135	Survey Location	Cavity Vessel drain-6'el.
Survey Date	2/24/2006	2350-1 #	212223
Survey Time	08:20	Detector-Sled #	44-62 212701/121
Pipe Size	2"	Detector Efficiency	0.0002
DCGL (dpm/100cm2)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm2)	486
Pipe Area Incorporated by Survey Data (m^2)	1.8	Field BKG (cpm)	4.7
Routine Survey	X	Field MDCR (cpm)	10.4
QA Survey		Nominal MDC (dpm/100cm2)	6,636

Survey Measurement Results	
Total Number of Survey Measurements	36
Number of Measurements >MDC	36
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.1634
Median	0.1582
Standard Deviation	0.0599
Maximum	0.2718
Minimum	0.0512

Survey Technician(s)	ROSENHAGEN

Survey Unit Classification	1
TBD 06-004 Piping Group	2
SR-13 Radionuclide Distribution Sample	EP 2-5
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 10-23-07

EP Rx 135
2" 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	19	19	95,000	19,530	10,127	162	114	10	562	0.085
2	14	14	70,000	14,390	7,462	119	84	7	414	0.062
3	11.5	11.5	57,500	11,821	6,129	98	69	6	340	0.051
4	18.5	18.5	92,500	19,016	9,860	158	111	9	547	0.082
5	33.5	33.5	167,500	34,434	17,855	286	202	17	991	0.149
6	27	27	135,000	27,753	14,391	230	162	14	799	0.120
7	22	22	110,000	22,613	11,726	188	132	11	651	0.098
8	30.5	30.5	152,500	31,350	16,256	260	184	15	902	0.136
9	16.5	16.5	82,500	16,960	8,794	141	99	8	488	0.074
10	24	24	120,000	24,669	12,792	205	144	12	710	0.107
11	35.5	35.5	177,500	36,490	18,921	303	214	18	1,050	0.158
12	38	38	190,000	39,059	20,254	324	229	19	1,124	0.169
13	45.5	45.5	227,500	46,768	24,251	388	274	23	1,346	0.203
14	57.5	57.5	287,500	59,103	30,647	490	346	29	1,701	0.256
15	49.5	49.5	247,500	50,880	26,383	422	298	25	1,464	0.221
16	32.5	32.5	162,500	33,406	17,322	277	196	16	961	0.145
17	41.5	41.5	207,500	42,657	22,119	354	250	21	1,228	0.185
18	47	47	235,000	48,310	25,051	401	283	24	1,390	0.209
19	39	39	195,000	40,087	20,787	332	235	20	1,154	0.174
20	48.5	48.5	242,500	49,852	25,850	413	292	24	1,435	0.216
21	24	24	120,000	24,669	12,792	205	144	12	710	0.107
22	33	33	165,000	33,920	17,589	281	199	17	976	0.147
23	51	51	255,000	52,422	27,183	435	307	26	1,509	0.227
24	55.5	55.5	277,500	57,047	29,581	473	334	28	1,642	0.247
25	61	61	305,000	62,701	32,513	520	367	31	1,805	0.272
26	57.5	57.5	287,500	59,103	30,647	490	346	29	1,701	0.256
27	45.5	45.5	227,500	46,768	24,251	388	274	23	1,346	0.203
28	39	39	195,000	40,087	20,787	332	235	20	1,154	0.174
29	29.5	29.5	147,500	30,322	15,723	251	177	15	873	0.131
30	31.5	31.5	157,500	32,378	16,789	269	190	16	932	0.140
31	31	31	155,000	31,864	16,523	264	187	16	917	0.138

EP Rx 135
2" 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	39	39	195,000	40,087	20,787	332	235	20	1,154	0.174
33	28.5	28.5	142,500	29,295	15,190	243	171	14	843	0.127
34	56	56	280,000	57,561	29,848	477	337	28	1,657	0.250
35	35.5	35.5	177,500	36,490	18,921	303	214	18	1,050	0.158
36	52	52	260,000	53,450	27,716	443	313	26	1,538	0.232
									MEAN	0.163
									MEDIAN	0.158
									STD DEV	0.060
									MAX	0.272
									MIN	0.051

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Pipe Interior Radiological Survey Form

Date: 2-24-06 Time: 0820

Pipe ID#: RX 135 AW Pipe Diameter: 2" Access Point Area: CAVITY VESSEL

Building: RX Elevation: -6 System: DRAIN LINES

Type of Survey Investigation ____ Characterization ____ Final Survey X Other ✓ SHRADDED SHIELD

Gross ____ Co60 ✓ Cs ____

Detector ID# / Sled ID# 44-62 # 212701 / #2 2nd 121

Detector Cal Date: 11-17-05 Detector Cal Due Date: 11-17-06

Instrument: 2350-1 Instrument ID #: 212223

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 4.7 cpm

$MDCR_{static}$ 18.4 cpm

Efficiency Factor for Pipe Diameter 0.0002 (from detector efficiency determination)

MDC_{static} 6636 dpm/ 100 cm^2

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

Comments: INITIAL SURVEY

NOTE - NO MAP AVAILABLE

Technician Signature

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm²
1	1	2	38	19	n/a	n/a
2	2	2	28	14		
3	3	2	23	11.5		
4	4	2	37	18.5		
5	5	2	67	33.5		
6	6	2	54	27		
7	7	2	44	22		
8	8	2	61	25		
9	9	2	33	16.5		
10	10	2	48	24	↓	↓

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 2-29-06
Pipe ID#: RX135 Pipe Diameter: 2" Access Point Area: CAVITY VESSEL
Building: RX Elevation: -6 System: DRAIN LINES SCRAPER SHIELD

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm²
11	11	2	71	35.5	n/a	n/a
12	12	2	76	38		
13	13	2	91	45.5		
14	14	2	115	57.5		
15	15	2	99	49.5		
16	16	2	65	32.5		
17	17	2	83	41.5		
18	18	2	94	47		
19	19	2	78	39		
20	20	2	97	48.5		
21	21	2	48	24		
22	22	2	66	33		
23	23	2	102	51		
24	24	2	111	55.5		
25	25	2	122	61		
26	26	2	115	57.5		
27	27	2	91	45.5		
28	28	2	78	39		
29	29	2	59	29.5		
30	30	2	63	31.5		
31	31	2	62	31		
32	32	2	78	39		
33	33	2	57	28.5		
34	34	2	112	56		
35	35	2	71	35.5		
36	36	2	104	52		
				n a		

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DQA Check Sheet				
Design #	Rx 135	Revision #	Original	
Survey Unit #	Rx 135			

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	10-23-07
FSS/ Characterization Manager (print/sign)	R. Case	Date	11/6/07

Form CS-09/2 Rev 0

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1 DISC