Survey Unit Release Record				
Design #	EP-WHB-111-3	**Revision #**	Original	**Page 1 of 3**
Survey Unit #(s)	WHB-111-3			
Description	1) Embedded Pipe (EP) Survey Unit WHB-111-3 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF). 2) EP WHB-111-3 is a Class 1, Group 3.3 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004. 3) Surveys in EP WHB-111-3 were performed using a scintillation detector optimized to measure gamma energies representative of Cs-137. Sample #EP 3-3 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	O. L. Randall	10-31-07
Technical Reviewer (FSS/Characterization Engineer)	L. R. Wood	11-6-07
FSS/Characterization Manager	R. Case	11/7/07

Form CS-09/1 Rev 0

1.0 History/Description

1.1 The subject pipe system is the laundry drain line located on the Waste Handling Building (WHB) -5' el.

1.2 EP WHB-111-3 consists of 2" diameter piping that is approximately 30 feet in length.

2.0 Survey Design Information

2.1 EP WHB-111-3 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 30 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 14,593 cm^2 (1.5 m^2) for the entire length of (approximately 30') 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 WHB-111-3 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	30
Number of Measurements >MDC	30
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0093
Median	0.0045
Standard Deviation	0.0115
Maximum	0.0436
Minimum	0.0024

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 WHB-111-3 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.009 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 WHB-111-3 & Spreadsheet

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BSI EP/BP SURVEY REPORT

Pipe ID	EP WHB-111-3	Survey Location	Evap Pit -5' el.
Survey Date	23-Oct-06	**2350-1 #**	203488
Survey Time	10:07	**Detector-Sled #**	238369 / no sled
Pipe Size	2"	**Detector Efficiency**	0.0009
DCGL (dpm/100cm2)	3.79E+06	Pipe Area Incorporated by Detector Efficiency (in cm2)	486
Pipe Area Incorporated by Survey Data (m^2)	1.5	**Field BKG** (cpm)	4.5
Routine Survey	X	**Field MDCR** (cpm)	10.3
QA Survey		**Nominal MDC** (dpm/100cm2)	2,052

Survey Measurement Results	
Total Number of Survey Measurements	30
Number of Measurements >MDC	30
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0093
Median	0.0045
Standard Deviation	0.0115
Maximum	0.0436
Minimum	0.0024

Survey Technician(s)	STOCK

Survey Unit Classification	1
TBD 06-004 Piping Group	3.3
SR-13 Radionuclide Distribution Sample	EP 3-3
Measured Nuclide	Cs-137
Area Factor/EMC Used	No
Pass/Fail FSS	Pass
MREM/YR Contribution	<1

COMMENTS:
ACTIVITY VALUES NOT BACKGROUND CORRECTED

RP Engineer | Date	Dal Rudall 10-30-07

EP WHB-111-3
2" Pipe
TBD 06-004 Group 3.3

Measurement #	gcpm	ncpm	Cs-137 activity (total dpm)	Cs-137 activity (dpm/100cm2)	Co-60 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	48	48	53,333	10,964	541	-	-	-	-	0.005
2	47	47	52,222	10,736	529	-	-	-	-	0.005
3	35	35	38,889	7,995	394	-	-	-	-	0.004
4	83	83	92,222	18,959	935	-	-	-	-	0.009
5	103	103	114,444	23,527	1,160	-	-	-	-	0.011
6	63	63	70,000	14,390	710	-	-	-	-	0.007
7	42	42	46,667	9,594	473	-	-	-	-	0.004
8	45	45	50,000	10,279	507	-	-	-	-	0.005
9	52	52	57,778	11,878	586	-	-	-	-	0.006
10	41	41	45,556	9,365	462	-	-	-	-	0.004
11	42	42	46,667	9,594	473	-	-	-	-	0.004
12	33	33	36,667	7,538	372	-	-	-	-	0.004
13	37	37	41,111	8,451	417	-	-	-	-	0.004
14	40	40	44,444	9,137	451	-	-	-	-	0.004
15	28	28	31,111	6,396	315	-	-	-	-	0.003
16	33	33	36,667	7,538	372	-	-	-	-	0.004
17	33	33	36,667	7,538	372	-	-	-	-	0.004
18	22	22	24,444	5,025	248	-	-	-	-	0.002
19	27	27	30,000	6,167	304	-	-	-	-	0.003
20	39	39	43,333	8,908	439	-	-	-	-	0.004
21	43	43	47,778	9,822	484	-	-	-	-	0.005
22	34	34	37,778	7,766	383	-	-	-	-	0.004
23	27	27	30,000	6,167	304	-	-	-	-	0.003
24	35	35	38,889	7,995	394	-	-	-	-	0.004
25	52	52	57,778	11,878	586	-	-	-	-	0.006
26	141	141	156,667	32,207	1,588	-	-	-	-	0.015
27	380	380	422,222	86,799	4,280	-	-	-	-	0.041
28	407	407	452,222	92,966	4,584	-	-	-	-	0.044
29	308	308	342,222	70,353	3,469	-	-	-	-	0.033
30	284	284	315,556	64,871	3,199	-	-	-	-	0.030

EP WHB-111-3
2" Pipe
TBD 06-004 Group 3.3

Measurement #	gcpm	ncpm	Cs-137 activity (total dpm)	Cs-137 activity (dpm/100cm2)	Co-60 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
									MEAN	0.009
									MEDIAN	0.004
									STD DEV	0.011
									MAX	0.044
									MIN	0.002

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Pipe Interior Radiological Survey Form

Date: 10/23/06 Time: 1007

Pipe ID#: WHB 111-3 Pipe Diameter: 2" Access Point Area: EVAP. PIT

Building: WHB Elevation: -5' System: LAUNDRY DRAIN

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

Gross ____ Co60 ____ Cs ✓

Detector ID# / Sled ID# 44-159 > #238369 / NO SLED

Detector Cal Date: 9/5/06 Detector Cal Due Date: 9/5/07

Instrument: 2350-1 Instrument ID #: 203488

Instrument Cal Date: 7/5/06 Instrument Cal Due Date: 7/5/07

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

Background Value 4.5 cpm

$MDCR_{static}$ 10.3 cpm

Efficiency Factor for Pipe Diameter 0.0009 (from detector efficiency determination)

MDC_{static} 2052 dpm/ 100 cm^2

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

Comments: RESURVEY, POST GRIT BLAST EP3-3 COMPLETE

INITIAL SURVEY: 8/28/06

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	↓	48	48	n/a	n/a
2	2		47	47	↓	↓
3	3		35	35		
4	4		83	83		
5	5		103	103		
6	6		63	63		
7	7		42	42		
8	8		45	45		
9	9		52	52		
10	10	↓	41	41	↓	↓

Babcock SERVICES INC.

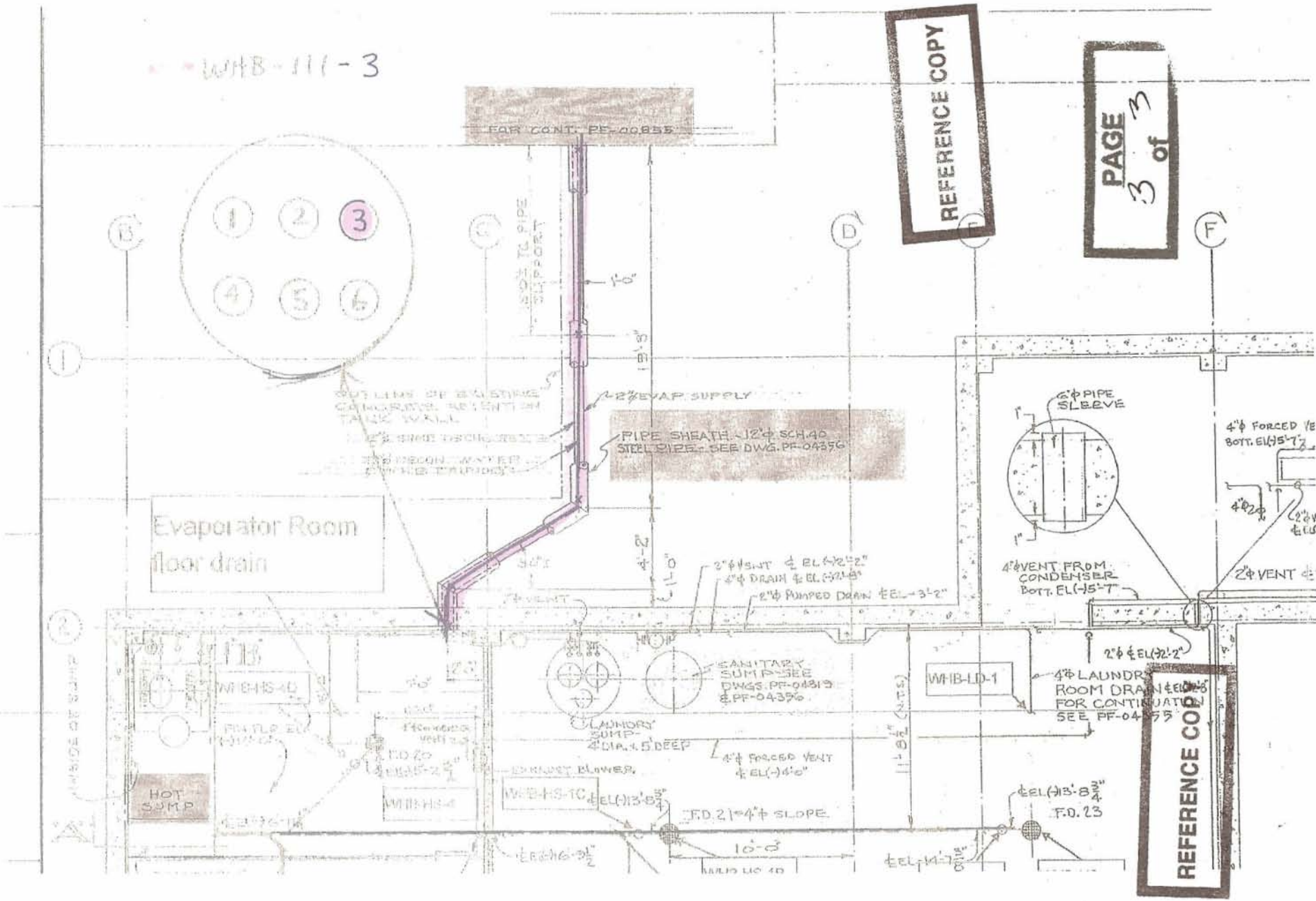
Pipe Interior Radiological Survey Form (Continuation Form)

Date: 10/23/06
Pipe ID#: WHB III-3 Pipe Diameter: 2" Access Point Area: EVAP. PIT
Building: WHB Elevation: -5' System: LAUNDRY DRN.

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm^2
11	11	1	42	42	n/a	n/a
12	12		33	33		
13	13		37	37		
14	14		40	40		
15	15		28	28		
16	16		33	33		
17	17		33	33		
18	18		22	22		
19	19		27	27		
20	20		39	39		
21	21		43	43		
22	22		34	34		
23	23		27	27		
24	24		35	35		
25	25		52	52		
26	26		141	141		
27	27		380	380		
28	28		407	407		
29	29		308	308		
30	30		284	284		

N

A


WHB-111-3
REFERENCE COPY
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FOR CONT. PE-00855
PIPE SHEATH 12"ϕ SCH.40 STEEL PIPE - SEE DWG. PE-04356
2"ϕ EVAP. SUPPLY
6"ϕ PIPE SLEEVE
Evaporator Room floor drain
4"ϕ VENT FROM CONDENSER BOTT. EL(-)5'-7"
2"ϕ PUMPED DRAIN ℄EL(-)3'-2"
4"ϕ DRAIN ℄EL(-)2'-8"
2"ϕ VENT
SANITARY SUMP-SEE DWGS. PE-04319 & PE-04356
LAUNDRY SUMP- 4'DIA. x 5'DEEP
4"ϕ FORCED VENT ℄EL(-)4'-0"
WHB-LD-1
4"ϕ LAUNDRY ROOM DRAIN ℄EL(-)2'-6" FOR CONTINUATION SEE PE-04355
WHB-HS-1C ℄EL(-)13'-8 3/4"
F.D. 21 - 4"ϕ SLOPE
F.D. 23
HOT SUMP
WHB-HS-4
WHB-HS-4D
10'-0"
REFERENCE COPY

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DQA Check Sheet				
Design #	WHB-111-3	Revision #	Original	
Survey Unit #	WHB-111-3			

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	10-30-07
FSS/ Characterization Manager (print/sign)	R. Case	Date	11/7/07

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1 DISC