National Aeronautics and Space Administration

John H. Glenn Research Center Lewis Field Plum Brook Station Sandusky, OH 44870



August 9, 2007

Reply to Attn of: QD

U.S. NRC Region III Mr. William G. Snell, RIII/DNMS/DB 2443 Warrenville Road Suite 210 Lisle, IL 60532-4352

Subject: Submittal of Embedded Pipe Survey Unit Release Records, Plum Brook Reactor Facility, License No. TR-3, Docket No. 50-30, and License No. R-93, Docket No, 50-185

Dear Mr. Snell:

Enclosed for your review and assessment are copies of the following completed embedded pipe survey unit release records:

Survey Unit Release Record EP-1.13 Survey Unit Release Record EP-1.14 Survey Unit Release Record EP-1.41 Survey Unit Release Record EP-1.43 Survey Unit Release Record EP-1.93 Survey Unit Release Record EP-HPT 102 Survey Unit Release Record EP-Rx 139 Survey Unit Release Record EP-Rx 151 Survey Unit Release Record EP-Rx 162 Survey Unit Release Record EP-Rx 163 Survey Unit Release Record EP-1.37 Survey Unit Release Record EP-1.81 Survey Unit Release Record EP-Rx 127 Survey Unit Release Record EP-Rx 148 Survey Unit Release Record EP-Rx 152 Survey Unit Release Record EP-Rx 157 Survey Unit Release Record EP-1.31 Survey Unit Release Record EP-1.33 Survey Unit Release Record EP-1.82 Survey Unit Release Record EP-Rx 150 Survey Unit Release Record EP-Rx 160 Survey Unit Release Record EP-Rx 204 Survey Unit Release Record EP-Rx 207 Survey Unit Release Record EP-Rx 208

As discussed during your on site inspection on June 25 through June 27, 2007, we will periodically submit the completed survey unit release records for your inspection. Further, as discussed at the exit meeting, it is our intention to begin grouting of the embedded piping that has been shown by the Final Status Survey to meet the dose criteria of Subpart E, Section 20.1402, 10 CFR Part 20.

If you have no issues with the records under this submittal, we will begin the grouting process on August 20, 2007.

Should you have any questions or need additional information, please contact Mr. William Stoner of my staff, NASA Plum Brook Station, 6100 Columbus Avenue, Sandusky, OH 44870, at (419) 621- 3349, or Mr. John Thomas of my staff, NASA Plum Brook Station, 6100 Columbus Avenue, Sandusky, OH 44870, at (419) 621- 3357.

Sincerely,

74 M Bound

Keith M. Peecook Decommissioning Program Manager

	Survey	Unit Release R	ecord					
Design #	EP-1.13	Revision #	Original	Page 1 of 3				
Survey Unit #(s)	1.13							
Description	<ol> <li>Embedded Pip pipe for Plum Br</li> <li>EP 1.13 is a C Survey Plan (FSI</li> <li>Surveys in EP to measure gamm Survey Request of</li> <li>Survey Instruction accordance with Work Execution document constituacquisition of su</li> <li>Instrument eff BSI/LVS-002, W of radiation invo</li> </ol>	be (EP) Survey Unit cook Reactor Facilit class 1, Group 1 sur SP) and Technical H 1.13 were perform na energies represen (SR)-13 was referen ctions for this surve ith (IAW) the Babco Package (WEP) 05 tute "Special Metho rvey measurements ficiency determinati VEP 05-006, these d lved and the media	t 1.13 meets the o y (PBRF). vey unit as per the Basis Document ed using a scintil ntative of Co-60. need for this deci y unit are incorp bock Services Inco -006. Survey ins ods" and the surv ons are developed leterminations ar being surveyed.	definition of embedded he PBRF Final Status (TBD)-06-004. Ilation detector optimized Sample #EP 3-9 from ision. orated into and performed orporated (BSI)/LVS-002, tructions described in this rey design used in the ed in accordance with the e appropriate for the types				
	Approval Sign	atures		Date:				
FSS/Characterization	Engineer	Oal Runk	<u>ll</u>	7-13-07				
Technical Revie (FSS/Characterization	wer Engineer)	Maa	s	7-16-07				
FSS/Characterization	Manager "	illa	R. Case	1/25/07				

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Form
CS-09/1
Rev 0

Survey Unit: 1.13

#### 1.0 History/Description

- 1.1 The subject pipe is the 2" drain line for the 24" Rx Coolant return loop piping. The function of this piping was to convey water from the coolant loop to the sump in the sub pile room corridor on the -47.
- 1.2 EP 1.13 consists of 2" diameter piping that is approximately 39 feet in length and has three elbows from 45° to 90°.
- 2.0 Survey Design Information
  - 2.1 EP 1.13 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 39 survey measurements.
  - 2.3 Surface area for the 2" ID piping is 486 cm<sup>2</sup> for each foot of piping, corresponding to a total 2" ID piping surface area of 18,971 cm<sup>2</sup> (1.9 m<sup>2</sup>) for the entire length of (approximately 39') 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 1.13 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: 1.13

### 5.5 Statistical Summary Table

	2"
Statistical Parameter	Pipe
Total Number of Survey Measurements	39
Number of Measurements >MDC	5
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0224
Median	0.0184
Standard Deviation	0.0135
Maximum	0.0797
Minimum	0.0065

- 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 1.13 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.0224 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 – EP 1.13 SURR & Spreadsheet Disc

# SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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	D31 C	FIDE OVAVET REFURI	
Pipe ID	1.13	Survey Location	Sub Pile Room -42'
Survey Date	2/22/2006, 6/27/2007	2350-1 #	212223/189094
Survey Time	1025, 1145	Detector-Sled #	44-62 #212701/121 159#238367/nosled
Pipe Size	2"	Detector Efficiency	0.0002/0.00038
DCGL (dpm/100cm2)	2.41E+05	Pipe Area incorporated by Datactor Efficiency (in cm2)	486
Pipe Area incorporated by	1.9	Field BKG (cpm)	4.4/1.6
Routine Survey	X	Field MDCR (cpm)	10.6/7.4
QA Survey	Ref Ref Ref Ref Ref	Nominal MDC (dpm/100cm2)	6636/5314
		Survey Measurement Results	
·····	Total Number of S	urvey Measurements	39
. <u></u>	Number of Mea	asurements >MDC	5
	Number of Measuren	nents Above 50% DCGL	0
	Number of Measur	rements Above DCGL	0
	N	lean	0.0224
	0.0184		
	0.0135		
	0.0797		
	Mir	nimum	0.0065
Survey To	echnician(s)	DEBRAUX, FOW	
	Survey Uni	t Classification	1
	TBD 06-00	4 Piping Group	1
	SR-13 Radionuclid	le Distribution Sample	EP 3-9
	Measur		<u> </u>
		OF/EMC Used	No
	Pass		
<u> </u>	MREM/TH		<1
OMMENTS: CTIVITY VALUES	NOT BACKGROUND	) CORRECTED.	
RP Engi	neer   Date	A.I.R.I.A	7-12-17

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## EP 1.13 2" Pipe TBD 06-004 Group 1

Measurement #	gcpm	псрт	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	5.5	5.5	27,500	5,653	224	5,363	1,426	165	39	0.034
2	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
3	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
4	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
5	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
6	3	3	15,000	3,084	122	2,925	//8	90	21	0.010
7	5.5	5.5	27,500	5,653	224	5,363	1,426	105	38	0.034
8	4.5	4.5	22,500	4,625	183	4,388	1,166	135	32	0.020
9	3	3	15,000	3,084	122	2,925	//8	90	19	0.010
10	2.5	2.5	12,500	2,570	102	2,438	048	105	10	0.013
11	6.5	6.5	32,500	6,681	265	6,338	1,000	195		0.040
12	5.5	5.5	27,500	5,653	224	5,363	1,420	105	21	0.034
13	3	3	15,000	3,084	122	2,925	(10)	90	18	0.015
14	2.5	2.5	12,500	2,570	102	2,438	040	75	18	0.015
15	2.5	2.5	12,500	2,570	102	2,430	4 0 2 7	120	29	0.025
16	4	4	20,000	4,112	163	3,900	1,037	300	93	0.020
17	13	13	65,000	13,362	530	12,070	3,370	390	8	0.000
18	2	2	5,263	1,082	43	1,020	Z/3 546	63	15	0.000
19	4	4	10,526	2,164	80	2,053	1 001	126	30	0.026
20	8	8	21,053	4,328	1/2	4,105	682	79	19	0.016
21	5	5	13,158	2,705	107	2,000	546	63	15	0.013
22	4	4	10,526	2,104	150	2,000	955	111	26	0.023
23			18,421	3,707	300	7 185	1 910	221	53	0.045
24	14	14	30,042	1,514	103	4 619	1,010	142	34	0.029
25	9	40	23,004	4,009	279	6 671	1 774	205	49	0.042
20		13	34,211	7,035	107	2 566	682	79	19	0.016
			15,100	3.246	129	3.079	819	95	23	0.019
			2 21 052	4 328	172	4,105	1,091	126	30	0.026
			10 526	2 164	86	2.053	546	63	15	0.013
	4		13 158	2 705	107	2,566	682	79	19	0.016
3			5 13 158	2,705	107	2,566	682	79	19	0.016

## EP 1.13 2" 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
33	3	3	7,895	1,623	64	1,540	409	47	11	0.010
34	4	4	10,526	2,164	86	2,053	546	63	15	0.013
35	3	3	7,895	1,623	64	1,540	409	47	11	0.010
36	2	2	5,263	1,082	43	1,026	273	32	8	0.006
37	3	3	7,895	1,623	64	1,540	409	47	11	0.010
38	4	4	10,526	2,164	86	2,053	546	63	15	0.013
39	10	10	26,316	5,410	214	5,132	1,364	158	38	0.032
								1	MEAN	0.022
								1	MEDIAN	0.018
								1	STD DEV	0.013
									MAX	0.080
									MIN	0.006

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_6\_\_\_PAGE(S)

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BSI/LVSPipeCrawler-002 Revision 4

### Pipe Interior Radiological Survey Form

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Date: 2-22-06 Time: 1025
Pipe ID#: 1.13 Pipe Diameter: 2" Access Point Area: SPR Becoul GALITON
Building: <u>ex</u> Elevation: <u>-45</u> System: Market Dears Line
Type of Survey Investigation Characterization Final Survey A Other
Gross Co60 _/ Cs
Detector ID# / Sled ID# <u>44-62 Zi2701 / 121</u>
Detector Cal Date: 11-17-05 Detector Cal Due Date: 11-17-06
Instrument: 235-01 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 $4cq$ cpm
$MDCR_{static} $ (0.6 cpm
Efficiency Factor for Pipe Diameter $0.0002$ (from detector efficiency determination)
$MDC_{static}$ $(0036 dpm/000 cm^2)$
Is the MDC <sub>static</sub> acceptable? Yes No (if no, adjust sample count time and recalculate MDCR <sub>static</sub> )
Comments:SUNULY
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Technician Signature

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## 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		2,	11	5.5	nia	na
2	Z	2	7	3.5	1	
3	3	2	7	3.5		
4	4	Z	7	3.5		
5	5	2	7	3.5		
6	6	2	ي ا	3		
7	7	2	11	5.5		
8	8	2	9	4.5		
9	$ar{q}$	2	6	3		
10	10	5	5	2.5		

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BSI/LVSPipeCrawler-002 Revision 4

# Pipe Interior Radiological Survey Form (Continuation Form)

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Date:	2-22-06	Bine Diamete	~ 7 //	4		SPR THE CANE
Building:	 Q	Elevation:	-45	Access	s Point Area: <u>/</u> System:	SELOW GRATINE-
	<del>,</del>			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
#	from Opening	(min)	17	cpm	cpm	
17-	. 2.		13	6.5	Ma	11a
	12	2		33		
15	14	2	5	3		
15	15	2		2.5		+
16	110	Z	8			
17	17	j	ale	13		
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e pipe surveyed 1.13 4. 0-45° ELL SEE CF -114401 FOR CONTINUATION \$ ELEV. 29-0" 6 & HAT PRAIN- PIT 54. - 30-0" G" & PAWR - INST. SERVICE. \$ ELEV. -34-0" 7-6, AL BUADRANT SLEEVES -4 REPD AS SH 3'S WROUGHT IROM SCH 30 WITH 150 SORAIN NECK FLOS AND BLIND FLANGES AT 14 FOR STUD UP SLEVATIONS SEE CE-11 SUB PILE ROOM -ELEV. -39-4" 2" POUS- PRAIN 2" POWR - PRAIN-ZO CA-RT VENT 22 HOT DRAIN-SPR 15 2" STAINLESS STEEL SHEATH I 13 25403 CHECK VALVE. SEE DING CF-114420 FOR DETAIL DE GNIELDED VALVE BOX TOE OF FLITS EL - 44'2" (TOVOI) 14 DRAIN . -1 Y 26 DRAIN FROM SHRAPHEL SHELD PIT - SEE DWG CF-114419 50 -d =1.-45-6 D GEL - 44'-10" 52 - 2" CHECK VALVE 2 EL - 44-6 Ċ EL. -45-8" 6 CHECK SPLIE -ELEVATION REFERENCE ptc:25 COPY  $\mathcal{N}_{i}$ 

### Pipe Interior Radiological Survey Form

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1.

Date: <u>6-27-67</u> Time: <u>1145</u>	
Pipe ID#: Pipe Diameter: Access Point Area: Sub Pik Rm	
Building: Elevation: System: Remetration	-
Type of Survey Investigation Characterization Final Survey $X$ Other $$	
Gross Co60 _ Cs	
Detector ID# / Sled ID# 44-159 1238367 / N. SLJ	
Detector Cal Date: $(-2)-06$ Detector Cal Due Date: $(-2)-07$	_
Instrument: <u>2350-1</u> Instrument ID #: <u>189094</u>	_
Instrument Cal Date: $\left[-11-9\right]$ Instrument Cal Due Date: $\left[-11-9\right]$	-
From the Daily Pipe Survey Detector Control Form for the Selected Detector	
Background Value <u>ly</u> cpm	
MDCR <sub>static</sub> 7.4 cpm	
Efficiency Factor for Pipe Diameter $0.00038$ (from detector efficiency determination)	
$MDC_{static} = 5314$ 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: 3ª Post Auon EP3-9 1007, Complete	<u> </u>
Cal due is within 15 ments as per proceedure	
Technician Signature $R \rightarrow 0$	

## 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		<u> </u>	2	2	na	nia
2	5	1	4		1	1
3	3		8	8		
4	4		5	5		
5	5		4	4		
6	۲ ۲			'		
7	<u> </u>		14	14		
8	8		9	9		
9	9		13	13		
10	10	V	5	S	J.	V

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BSI/LVSPipeCrawler-002 Revision 5

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## Pipe Interior Radiological Survey Form (Continuation Form)

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Date: Pipe ID#:	<u>(-27-07</u>	Pipe Diamete	er: 2"	Access	Point Area: S	ub Pile Rm
Building:	C_V	Elevation:	-42'	S	ystem: $\overline{\rho}$	instruction
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
11	11	1	6	<u>í</u>	na	na
12	12	1	8	Ś		1
13	13		4	4		
14	14		5	5		
15	15		5	5		
16	16		3	3		
17	17		4	- J		1 1
18	18		3	3		
19	19		2	2		
20	20		3	3		
21	21		4	4		
22	22	$\checkmark$	D	TO		<u> </u>
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SECTION 7 ATTACHMENT 3 \_\_\_\_ PAGE(S)

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				DQA Chec	k Sheet				
Design #	EP 1.13	B Revis	sion #	Origina					
Survey Un	t#				EP 1.13				
	<u></u>		Pre	liminary D	ata Review`				
Answe	rs to the followin	g questions R	s shoul elease	d be fully o Record	locumented in	n the Survey Unit	Yes	No	N//
1. Have su	veys been performe	ed in accorda	nce with	survey instru	ictions in the Su	rvey Design?	X		
2. Is the ins survey u	trumentation MDC finits, or below 0.5 D	for structure s CGL <sub>W</sub> for Clas	tatic mea ss 3 surv	asurements ey units?	below the DCGL	w for Class 1 and 2			x
3. Is the ins	trumentation MDC	or embedded	/buried p	piping static	measurements t	pelow the DCGL <sub>w</sub> ?	X		
4. Was the embedd static me	instrumentation MD d/buried piping sca asurements or soil	C for structur n measureme samples addr	e scan m ents belo ressed in	easurement w the DCGL the survey o	s, soil scan mea <sub>w.</sub> or, if not, was lesign?	surements, and the need for additional			x
5. Was the	instrumentation MD	C for volume	ric meas	urements ar	nd smear analys	is < 10% DCGL <sub>W</sub> ?			X
6. Were the used to	MDCs and assumperform the survey?	otions used to	develop	them appro	priate for the ins	truments and techniques	x		
7. Were the media b	survey methods us aing surveyed?	ed to collect	data prop	per for the ty	pes of radiation	involved and for the	x		
3. Were "S	pecial Methods" for	data collection	n properi	y applied for	the survey unit	under review?	X		
<ol> <li>Is the data design, v</li> </ol>	ta set comprised of which accurately ref	qualified mea ects the radio	suremen	nt results coll tatus of the f	ected in accord	ance with the survey	x		
			Gr	aphical Da	ta Review		·····		·
I. Hasapo	sting plot been crea	ited?				·····			X
2. Has a hi	stogram (or other fre	equency plot)	been cre	ated?	, , <b></b> ,				X
3. Have oth	er graphical data to	ols been crea	ted to as	sist in analy	zing the data?				X
				Data An	alysis		1T		<del></del>
I. Are all s	ample measuremen	ts below the [	DCGLw (	Class 1 & 2)	, or 0.5 DCGLw	(Class 3)?	X		<u> </u>
2. Is the m	ean of the sample d	ata < DCGLw	?				X		<u> </u>
<ol> <li>If elevated</li> <li>elevated</li> </ol>	ed areas have been area_< DCGL <sub>EMC</sub> (	identified by s Class 1), < D	scans an CGL <sub>W</sub> (C	d/or samplin Class 2), or	g, is the average <0.5 DCGL <sub>W</sub> (Cl	e activity in each ass 3)?			X
4. Is the re	sult of the Elevated	Measurement	s Test <	1.0?					X
5. Is the re	sult of the statistical	test (S+ for S	ign Test	or W <sub>r</sub> for W	RS Test) $\geq$ the c	ritical value?			x
Comments:									
FSS/Chara	terization Engineer	(print/sign)	Da	le Ran	dat KP	al Rental	Date	7-1	3-0
FSS/ Chara	cterization Manage	(print/sign)			1 X X X	R. Case	Date	7/2	5/0
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# SECTION 7 ATTACHMENT 4 1 DISC

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Survey Unit Release Record							
Design #	EP-1.14	Revision #	Original	Page 1	of	3	
Survey Unit #(s)			1.14				
<ul> <li>1) Embedded Pipe (EP) Survey Unit 1.14 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</li> <li>2) EP 1.14 is a Class 1, Group 1 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</li> <li>3) Surveys in EP 1.14 were performed using a scintillation detector optimize to measure gamma energies representative of Co-60. Sample #EP 3-9 from Survey Request (SR)-13 was referenced for this decision.</li> <li>4) Survey Instructions for this survey unit are incorporated into and performed in accordance with (IAW) the Babcock Services Incorporated (BSI)/LVS-00 Work Execution Package (WEP) 05-006. Survey instructions described in the document constitute "Special Methods" and the survey design used in the acquisition of survey measurements.</li> <li>5) Instrument efficiency determinations are developed in accordance with the BSI/LVS-002, WEP 05-006, these determinations are appropriate for the typ of radiation involved and the media being surveyed.</li> </ul>							
	Approval Sign	atures			Date		
FSS/Characterization	Engineer	Ribod		7-1	8-1	27	
Technical Review (FSS/Characterization)	Technical Reviewer (FSS/Characterization Engineer) 101 7/18/07						
FSS/Characterization	FSS/Characterization Manager $1/30/07$						
Form CS-09/1 Rev 0							

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FSS Design # EP 1.14	Revision # Original	Page 2 of 3
Survey Unit: 1.14		

#### 1.0 History/Description

- 1.1 The subject pipe is the 2" drain line for the 24" Rx Coolant return loop piping. The function of this piping was to convey water from the coolant loop to the sump in the sub pile room corridor on the -47 foot elevation.
- 1.2 EP 1.14 consists of 2" diameter piping that is approximately 35 feet in length and has three elbows from 45° to 90°.
- 2.0 Survey Design Information
  - 2.1 EP 1.14 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 35 survey measurements.
  - 2.3 Surface area for the 2" ID piping is 486 cm<sup>2</sup> for each foot of piping, corresponding to a total 2" ID piping surface area of 17,025 cm<sup>2</sup>(1.7 m<sup>2</sup>) for the entire length of (approximately 35') 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 1.14 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: 1.14

### 5.5 Statistical Summary Table

	2"
Statistical Parameter	Pipe
Total Number of Survey Measurements	35
Number of Measurements >MDC	12
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0391
Median	0.0307
Standard Deviation	0.0519
Maximum	0.3227
Minimum	0.0032

- 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 1.14 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.0391 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 – EP 1.14 SURR & Spreadsheet Disc SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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DURAL	BSI E	P/BP SURVEY REPORT	
Pipe ID	1.14	Survey Location	Primary Coolant Drain -42
Survey Date	2/22/2006, 6/26/2007	2350-1 #	212223/189094
Survey Time	0851, 1600	Detector-Sled #	44-62 #212701/121 44 159#238367/nosled
Pipe Size	2"	Detector Efficiency	0.0002/0.00038
DCGL (dpm/100cm2)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm2)	486
Pipe Area incorporated by	1.7		4.4/1.3
Routine Survey	X		10.6/6.9
OA Survey			6636/5314
		Survey Measurement Results	
<u></u>	Total Number of St	urvey Measurements	35
	Number of Mea	surements >MDC	12
	Number of Measurem	ents Above 50% DCGI	
	Number of Measure	ements Above DCGI	0
	M		0.0304
<u> </u>	 		0.0391
	Standar		0.0510
	Stanuaru		0.0019
	Max		0.3227
	Min	imum	0.0032
	0	Oliver	
	Survey Unit		1
	1 BD 00-004	Piping Group	
	SR-13 Radionucida	e Distribution Sample	EP 3-9
	Measure		<u> </u>
<u>.</u>	Area Facto		No
	Pass/I		Pass
	MREM/YR	Contribution	<1
COMMENTS:		CORRECTED.	<u></u>

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# EP 1.14 2" Pipe TBD 06-004 Group 1

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Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm2)	Cs-137 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-164 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
1	5	5	25,000	5,139	204	4,875	1,296	150	36	0.031
2	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
3	3	3	15,000	3,084	122	2,925	778	90	21	0.018
4	5	5	25,000	5,139	204	4,875	1,296	150	36	0.031
5	3	3	15,000	3,084	122	2,925	778	90	21	0.018
6	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
7	3	3	15,000	3,084	122	2,925	778	90	21	0.018
8	2	2	10,000	2,056	81	1,950	518	60	14	0.012
9	7.5	7.5	37,500	7,709	306	7,313	1,944	225	54	0.046
10	6	6	30,000	6,167	244	5,850	1,555	180	43	0.037
11	5.5	5.5	27,500	5,653	224	5,363	1,426	165	39	0.034
12	6	6	30,000	6,167	244	5,850	1,555	180	43	0.037
13	4.5	4.5	22,500	4,625	183	4,388	1,166	135	32	0.028
14	5	5	25,000	5,139	204	4,875	1,296	150	36	0.031
15	4.5	4.5	22,500	4,625	183	4,388	1,166	135	32	0.028
16	7	7	35,000	7,195	285	6,825	1,814	210	50	0.043
17	7	7	18,421	3,787	150	3,592	955	111	26	0.023
18	15	15	39,474	8,115	322	7,698	2,046	237	57	0.048
19	11	11	28,947	5,951	236	5,645	1,501	174	41	0.035
20	6	6	15,789	3,246	129	3,079	819	95	23	0.019
21	14	14	36,842	7,574	300	7,185	1,910	221	53	0.045
22	100	100	263,158	54,099	2,144	51,318	13,642	1,579	377	0.323
23	8	8	21,053	4,328	172	4,105	1,091	126	30	0.026
24	16	16	42,105	8,656	343	8,211	2,183	253	60	0.052
25	7	77	18,421	3,787	150	3,592	955	111	26	0.023
26	10	10	26,316	5,410	214	5,132	1,364	158	38	0.032
27	12	12	31,579	6,492	257	6,158	1,637	189	45	0.039
28	6	6	15,789	3,246	129	3,079	819	95	23	0.019
29	10	10	26,316	5,410	214	5,132	1,364	158	38	0.032
30	6	6	15,789	3,246	129	3,079	819	95	23	0.019
31	27	27	71,053	14,607	579	13,856	3,683	426	102	0.087
32	4	4	10,526	2,164	86	2,053	546	63	15	0.013

# EP 1.14 2" 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
33	1	1	2,632	541	21	513	136	16	4	0.003
34	20	20	52,632	10,820	429	10,264	2,728	316	75	0.065
35	4	4	10,526	2,164	86	2,053	546	63	15	0.013
									MEAN	0.039
									MEDIAN	0.031
									STD DEV	0.052
									MAX	0.323
									MIN	0.003

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SECTION 7 ATTACHMENT 2 \_\_\_\_\_\_ PAGE(S)

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BSI/LVSPipeCrawler-002
Revision 4

Pip	e Int	erior	Radio	logical	Survey	Form
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Date: 2-22-	06 Time:	0851	
Pipe ID#:	Pipe Diameter:	<u> </u>	ess Point Area: SPR CAUE
Building: <u>e</u> y	Elevation:	-45	System: palanty Coolant DrAid Line
Type of Survey Inv	vestigation Charact	terization Final Sur	vey Other
Gross	Co60 🖌	Cs	·
Detector ID# / Sle	d ID# <u>44-62 * Z</u>	12701 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:	11-7-06
From the Daily Pipe S	Survey Detector Control Fo	orm for the Selected Detecto	r
Background Value	<u>7:</u> cpm		
MDCR <sub>static</sub>	<u>Ø. (</u> cpm	6	
Efficiency Factor for	Pipe Diameter <u>0,001</u>	22 (from detector eff	iciency determination)
MDC <sub>static</sub>	$dpm/_1DC$	$\sim$ cm <sup>2</sup>	
Is the MDC <sub>static</sub> accep	table? Yes No	(if no, adjust sample count	time and recalculate $MDCR_{static}$ )
Comments:/	HTIRE SURVEY		· · · · · · · · · · · · · · · · · · ·
· · · · · · · · · · · · · · · · · · ·	/		
	<u></u>		
	Trahul	ion Simoture C Arm	

Technician Signature

#### C. UShans/

# Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time	Gross Counts	Gross	Net	dpm/100cm <sup>2</sup>
1		Z.	10	<u> </u>	nia	Ma.
2	2	2	7	35		1.100
3	3	2	(0	3		
4	4	<u> </u>	10	5		
5	5	2	6	3		
6	6	<u> </u>	1	3.5		
7	7	2	6			
8	8	2	4	<u>Z,</u>		
9	q	<u> </u>	15	7.5		
10	/ò	2	12	<u>(e</u>		

Package Page 1 of  $\underline{3}$ 



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BSI/LVSPipeCrawler-002 Revision 4

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### Pipe Interior Radiological Survey Form (Continuation Form)

Date:	2-22-06					SPR
Pipe ID#:	1.14	Pipe Diameter	:2^′′	Access	Point Area:	THE LAVE
Building:	RX	Elevation:	-45	S	ystem:	
	·					
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
#	from Opening	(min)		cpm	cpm	
VL		7		5,5	na	11/0
12	12		12	<u>(</u>		
13	13	2		4.3		
14	14	2	10	<u> </u>		
	15	2	9	415	<b> -</b>	
14	14	2	14		J	<b>₩</b>
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Package Page 2 of 3

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BSI/LVSPipeCrawler-002	2
Revision 5	5

### Pipe Interior Radiological Survey Form

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Date: $(-27-07)$ Time: 1110
Pipe ID#: 1.14 Pipe Diameter: 2" Access Point Area: Sub Pile Rn
Building: CV Elevation: -42 System: Penetrotion
$Final Survey Investigation \ Characterization \ Final Survey \ Other \ $
Gross Co60 Cs
Detector ID# / Sled ID# 44-159 / 238367 / No Shid
Detector Cal Date: $(-2)-0$ Detector Cal Due Date: $(-2)-0$
Instrument: <u>2350-1</u> Instrument ID #: 189094
Instrument Cal Date: 1-11-07 Instrument Cal Due Date: 1-11-08
From the Daily Pipe Survey Detector Control Form for the Selected Detector Background Value 1.6 cpm $MDCR_{static}$ 7.4 cpm Efficiency Factor for Pipe Diameter 0.00038 (from detector efficiency determination) $MDC_{static}$ 5314 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: 3 Post Queen EP3-9 1007, Complete Col Due is within 15 menths as pur proceeding.
Technician Signature R Jowly

## Pipe Interior Radiological Survey

Positi	on Feet into Pipe	Count Time	Gross Counts	Gross_	- N	et	dmm/f00m2
#	from Opening	(min)	Ciuss Cuunts	cpm	ср	m	apine roucin
1	1	1	7	7	n	a	No
2	2	1	15	1.5			
3	3		11	11			
4	4		4	6			
5	Ś		14	14			
6	2		100	100	1		
7	<u>خ</u>		४	8		· · · ·	
8	8		16	16	1		
9	2			5			
10	10	$\checkmark$	10	10		/	/



Package Page 1 of  $\underline{3}$ 



BSI/LVSPipeCrawler-002 Revision 5

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## Pipe Interior Radiological Survey Form (Continuation Form)

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Building:			- 42.		system: Ł	enetration
Position #	from Opening	(min)	Gross Counts	Gross	Com	dpm/100ct
11		()	12	12	nra	nla
12	12	1	6	d		1.40
13	13		10	1 🖻		
14	14		6	<u> </u>		
15	15		27	27		ļ
16	16		4	<u> </u>		<u>  </u>
17		<u>}</u>				
18	18		20	2.0	<u>├</u>	
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# SECTION 7 ATTACHMENT 3 <u>1</u> PAGE(S)

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				DQA Check S	Sheet			
	Design #	EP 1.14	Revision #	Original				
Su	rvey Unit #	// // // // // // // // // // //			EP 1.14			
		· · · · · · · · · · · · · · · · · · ·	Pre	liminary Data	Review			
	Answers to	the following que	stions shoul Release	d be fully doo Record	umented in the Survey Unit	Yes	No	N//
1.	Have surveys I	been performed in ac	cordance with	survey instruction	ons 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?						1	x
3.	Is the instrume	ntation MDC for emb	edded/buried p	piping static mea	asurements below the DCGLw?	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 instru	mentation MDC for v	olumetric meas	urements and s	mear analysis < 10% DCGL <sub>w</sub> ?			X
6.	Were the MDC used to perform	s and assumptions un the survey?	ised to develop	them appropria	te for the instruments and techniques	x		
7.	Were the surve media being su	ey methods used to o urveyed?	ollect data prop	per for the types	of radiation involved and for the	x	I	
8.	Were "Special Methods" for data collection properly applied for the survey unit under review?					X		
9.	Is the data set design, which a	comprised of qualifie accurately reflects the	d measuremer e radiological s	nt results collect tatus of the facil	ed in accordance with the survey ity?	x		
	5	en <u>en service</u> en service en service	Gr	aphical Data	Review			
1.	. Has a posting plot been created?							X
2. Has a histogram (or other frequency plot) been created?							X	
3	Have other gra	phical data tools bee	n created to as	sist in analyzing	y the data?			X
		· · ·		Data Analys	315	- <b></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.	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 < DCGLENC (Class 1), < DCGLW (Class 2), or <0.5 DCGLW (Class 3)?				1		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) $\geq$ the critical value?						X	
Com	ments:	<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>						
FS	S/Characteriza	tion Engineer (print/s	sign) CL	WOOD	6 Mibad	Date	7-1	7-Û
EC	S/ Characteriza	tion Manager (print/	sign)	1//	R. Case	Date	7/3	20/0

SECTION 7 ATTACHMENT 4 1 DISC

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	I								
Design #	EP-1.41 Revision # Original Page 1 of 3								
Survey Unit #(s)			1.41						
Description	<ol> <li>Embedded Pipe (EP) Survey Unit 1.41 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</li> <li>EP 1.41 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</li> <li>Surveys in EP 1.41 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-2 from Survey Request (SR)-13 was referenced for this decision.</li> <li>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.</li> <li>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.</li> </ol>								
	Approval S	Signatures		Date:					
FSS/Characterization Engineer Del Manhell 7-13-07									
Technical Reviewer (FSS/Characterization Engineer)									
FSS/Characterization Manager 7/25/07									

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FSS	Design	#	EP	1.	41	l
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Revision # Original

### Survey Unit: 1.41

### 1.0 History/Description

- 1.1 The subject pipe system is the 6 inch header from the hot drain system service ring to the drain trench on the Rx building -25 foot elevation.
- 1.2 The pipe section has one 90 degree along its 45 foot length.
- 2.0 Survey Design Information
  - 2.1 EP 1.41 was surveyed IAW Procedure #BSI/LVS-002.
  - 2.2 100% of the 6" ID pipe was accessible for survey. The accessible 6" ID pipe was surveyed by static measurement at one foot increments, for a total of 45 survey measurements.
  - 2.3 Surface area for the 6" ID piping is 1,459 cm<sup>2</sup> for each foot of piping, corresponding to a total 6" ID piping surface area of 65,655 cm<sup>2</sup> (6.6 m<sup>2</sup>) for the entire length of (approximately 45') of 6" 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 1.41 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.

FSS	Design	#	EP	1.41
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**Revision # Original** 

Survey Unit: 1.41

### 5.5 Statistical Summary Table

	6"
Statistical Parameter	Pipe
Total Number of Survey Measurements	45
Number of Measurements >MDC	44
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0192
Median	0.0172
Standard Deviation	0.0126
Maximum	0.0876
Minimum	0.0086

- 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 1.41 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.019 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 – EP 1.41 SURR & Spreadsheet Disc SECTION 7 ATTACHMENT 1 3 PAGE(S)

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Babcock	BSI EI	P/BP SURVEY REPORT	
Pipe ID	1.41	Survey Location	Quad B Trench Drain
Survey Date	02-Apr-07	2350-1 #	189094
Survey Time	13:27	Detector-Sled #	1 <b>M</b> G1 LVS-1/107
Pipe Size	6"	Detector Efficiency	0.00038
DCGL (dpm/100cm2)	2.41E+05	Pipe Area incorporated by Detector Efficiency (in cm2)	1459
Pipe Area incorporated by Survey Data (m <sup>2</sup> )	6.6	Field BKG (cpm)	3.6
Routine Survey	x	Field MDCR (cpm)	9.5
QA Survey		Nominal MDC (dpm/100cm2)	2,066
		Survey Measurement Results	
	Total Number of S	Survey Measurements	45
	Number of Mea	asurements >MDC	44
	Number of Measuren	nents Above 50% DCGL	0
	Number of Measu	rements Above DCGL	0
	N	lean	0.0192
	M	edian	0.0172
	Standar	d Deviation	0.0126
	Ма	ximum	0.0876
	Mir	nimum	0.0086
Survey T	echnician(s)	Stock	
	Survey Uni TBD 06-00- SR-13 Radionuclic	t Classification 4 Piping Group le Distribution Sample	1 2 EP 2-2
	Measur	ed Nuclide	Co-60
<u>.</u>	Area Facto	or/EMC Used	No
	Pass/	/Fail FSS	Pass
<u> </u>	MREM/YF	R Contribution	<1
<u> </u>			
COMMENTS: ACTIVITY VALUES	NOT BACKGROUNE	OCORRECTED	
RP Eng	ineer   Date	Dal Amhill	7-13-07

## EP 1.41 6" Pipe TBD 06-004 Group 2

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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	16	16	42,105	2,886	1,496	24	17	1	83	0.013
2	24	24	63,158	4,329	2,245	36	25	2	125	0.019
3	18	18	47,368	3,247	1,683	27	19	2	93	0.014
4	14	14	36,842	2,525	1,309	21	15	1	73	0.011
5	23	23	60,526	4,148	2,151	34	24	2	119	0.018
6	22	22	57,895	3,968	2,058	33	23	2	114	0.017
7	31	31	81,579	5,591	2,899	46	33	3	161	0.024
8	24	24	63,158	4,329	2,245	36	25	2	125	0.019
9	20	20	52,632	3,607	1,871		21	2	104	0.016
10	22	22	57,895	3,968	2,058	33	23	2	114	0.017
11	28	28	73,684	5,050	2,619	42		2	145	0.022
12	22	22	57,895	3,968	2,058	33	23	2	114	0.017
13	20	20	52,632	3,607	1,871	30	21	2	104	0.016
14	24	24	63,158	4,329	2,245	36	25	2	125	0.019
15	21	21	55,263	3,788	1,964	31	22	2	109	0.016
16	26	26	68,421	4,690	2,432	39	27	2	135	0.020
17	14	14	36,842	2,525	1,309	21	15	1	73	0.011
18	14	14	36,842	2,525	1,309	21	15	1	73	0.011
19	21	21	55,263	3,788	1,964	31	22	2	109	0.016
20	22	22	57,895	3,968	2,058	33	23	2	114	0.017
21	17	17	44,737	3,066	1,590	25	18	1	88	0.013
22	16	16	42,105	2,886	1,496	24	1/		83	0.013
23	27	27	71,053	4,870	2,525	40	29	2	140	0.021
24	23	23	60,526	4,148	2,151	34	24	2	119	0.018
25	21	21	55,263	3,788	1,964	31	22	2	109	0.010
26	20	20	52,632	3,607	1,871	30	21	2	104	0.016
27	11	11	28,947	1,984	1,029	16	12	1	57	0.009
28	12	12	31,579	2,164	1,122	18	13		02	0.009
29	30	30	78,947	5,411	2,806	45	32	3	100	0.023
30	16	16	42,105	2,886	1,496	24	1/		83	0.013
31	19	19	50,000	3,427	1,777	28	20	2	99	0.015
32	20	20	52,632	3,607	1,871	30	21	2	104	0.016

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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BSI/LVSPipeCrawler-002 Revision 4

Pipe Interior Radiological Survey Form

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Date: <u>4/2/07</u>	Time:	1327	
Pipe ID#: 1,41	Pipe Diameter:	6"	Access Point Area: TRENCH
Building: <u>R</u>	Elevation:	-27'	System: OUND B Hot Dize
Type of Survey Investigation	n Charact	erization Fi	nal Survey X Other
Gross	Co60_		Cs
Detector ID# / Sled ID#	MGI LVS-	- / /	107
Detector Cal Date:	107	Detector Cal Due	Date: 1/11/0 <b>8</b>
Instrument: <u>Z</u>	350-1	Instrument ID	#: 189094-
Instrument Cal Date:1/11	107	Instrument Cal Due	Date: 1/11/08
From the Daily Pipe Survey De	etector Control For	m for the Selected D	etector
Background Value 3.6	cpm		
MDCR <sub>static</sub> 9.5	cpm		
Efficiency Factor for Pipe Dian	neter 0.0003	38 (from detec	tor efficiency determination)
MDC <sub>static</sub> Z066	dpm/10D	cm <sup>2</sup>	
Is the MDC <sub>static</sub> acceptable?	Yes No	(if no, adjust sample	e count time and recalculate MDCR <sub>static</sub> )
Comments: INITIM	EPZ-2		COMPLETE

Technician Signature

## Pipe Interior Radiological Survey

Position #	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
#	nom Opening	( <u>min</u> )		cpm	cpm	
1	1	4	16	16	na	na
2	2		24	24	1	
3	3		18	18		
4	4		14	14.		
5	5		23	23		
6	G.		72	12		
7	7		31	3/		
8	8		24	24		
9	9		20	20		<u>├───</u>
10	10	V	22	22	V	

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## Pipe Interior Radiological Survey Form (Continuation Form)

Date: Pipe ID#: Building:	<u> </u>	Pipe Diameter	·	Access	Point Area:	TRENCH
Dunung.	<u>p</u>			0.	stem. P	UND D MOL DKIV
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
11	11	4	28	28	nia	na
12	12		22	22	1	n/a
13	13		20	ZO		
14	j4		24	24		
15	15		21	21		
16	16		26	26		
17			14	14		
18	18		15	15		
19	19		21	21		
20	20		22	22		
21	21		17			
22	22		16	16		
23	23		~ 27	27		
24	24		23	23		
25	25		21	21		
26	26		20	ZÔ		
27	27			11		
28	28		12	12		
29	29		30	30		
30	30		16	16	1	
31	31		19	19		
32	32		20	20		
33	33		18	18		
34	34		27	27		
35	35		23	23		
36	36		28	28		
37	37		17	17		
38	38		26	26		
39	39		26	26		
40	40		21	21		
41	41		18	18		
42	42		25	25	·	
43	43		34	34		
44	49_		72	72		
45	45	4	112	112	V	V

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				DQA Check	Sheet				
	Design #	EP 1.41	Revision #	Original		······································			
S	urvey Unit #			<b></b>	EP 1.41				
			Pre	liminary Data	Review				
	Answers to t	the following qu	lestions shoul Release	d be fully doo Record	cumented in the	e Survey Unit	Yes	No	N//
1.	Have surveys t	peen performed in	accordance with	survey instructi	ons in the Survey	Design?	X		
2.	Is the instrume survey units, or	ntation MDC for st r below 0.5 DCGL	ructure static me <sub>W</sub> for Class 3 surv	asurements belovey units?	ow the DCGL <sub>w</sub> for	Class 1 and 2			x
3.	Is the instrume	ntation MDC for e	nbedded/buried	piping static me	asurements below	the DCGLw?	X		
4.	Was the instrur embedded/buri static measure	nentation MDC for ed piping scan me ments or soil samp	r structure scan n asurements belo bles addressed in	neasurements, s w the DCGL <sub>W</sub> o the survey des	soil scan measure or, if not, was the r ign?	ments, and need for additional			x
5.	Was the instrur	mentation MDC for	volumetric meas	surements and s	mear analysis < 1	10% DCGLw?			X
<del>3</del> .	Were the MDC used to perform	s and assumption: n the survey?	s used to develop	them appropria	ate for the instrum	ents and techniques	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 design, which a	comprised of qual accurately reflects	fied measurements the radiological s	nt results collect tatus of the faci	ed in accordance lity?	with the survey	x		
		······································	G	raphical Data	Review		·····	<u>.</u>	<b></b>
1.	Has a posting p	plot been created?							X
2.	Has a histogram	m (or other freque	ncy plot) been cre	eated?					X
3.	Have other gra	phical data tools b	een created to as	ssist in analyzing	g the data?				X
				Data Analy	sis				<b>.</b>
۱.	Are all sample	measurements be	low the DCGLw (	Class 1 & 2), or	0.5 DCGL <sub>W</sub> (Clas	s 3)?	X		
2.	Is the mean of	the sample data <	DCGLw?				X		
3.	If elevated area elevated area	as have been iden < DCGL <sub>EMC</sub> (Class	tified by scans an s_1), _< DCGL <sub>W</sub> (C	d/or sampling, i class_2), or _<0.	s the average acti 5 DCGLw (Class 3	vity in each )?			x
4.	Is the result of	the Elevated Meas	surements Test <	1.0?					X
5.	is the result of	the statistical test	(S+ for Sign Test	or Wr for WRS	Test) > the critica	I value?			X
Cor	nments:								
F	SS/Characteriza	tion Engineer (prin	it/sign)	le Rand	A Hal	Rudal	Date	17-1	3-0
F	SS/ Characteriza	tion Manager (prir	nt/sign)	(1/	1 All	R. Case	Date	7/2	510
				C.				For CS-0	rm )9/2

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Survey Unit Release Record							
Design #	EP-1.43	Revision #	Original	Page 1 of 3			
Survey Unit #(s)			1.43				
Description	<ol> <li>Embedded Pij pipe for Plum Bi</li> <li>EP 1.43 is a C Survey Plan (FS</li> <li>Surveys in EF to measure gam Survey Request</li> <li>Survey Request</li> <li>Survey Instru- in accordance w Work Execution document consti- acquisition of su</li> <li>Instrument eff BSI/LVS-002, V of radiation invo</li> </ol>	<ol> <li>Embedded Pipe (EP) Survey Unit 1.43 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</li> <li>EP 1.43 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</li> <li>Surveys in EP 1.43 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-2 from Survey Request (SR)-13 was referenced for this decision.</li> <li>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.</li> <li>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.</li> </ol>					
	Approval Sign	natures	·····	Date:			
FSS/Characterizatio	on Engineer	Del Ran	all	7-11-07			
Technical Reviewer (FSS/Characterization Engineer)							
FSS/Characterizatio	on Manager	A COM	, R. Case	7/25/07			
			PY	Form CS-09/1 Rev 0			

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Survey Unit: 1.43

### 1.0 History/Description

- 1.1 The subject pipe system is the 6 inch return header from the cooling water service ring to the drain trench on the Rx building -25 foot elevation.
- 1.2 A vertical 90 degree elbow is 34 feet into the pipe section. The pipe is approximately 47 feet in length.

### 2.0 Survey Design Information

- 2.1 EP 1.43 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 6" ID pipe was accessible for survey. The accessible 6" ID pipe was surveyed by static measurement at one foot increments, for a total of 47 survey measurements.
- 2.3 Surface area for the 6" ID piping is 1,459 cm<sup>2</sup> for each foot of piping, corresponding to a total 6" ID piping surface area of 68,573 cm<sup>2</sup> (6.9 m<sup>2</sup>) for the entire length of (approximately 47') of 6" 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 1.43 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.

FSS	Design	#	EP	1	.43
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**Revision # Original** 

Survey Unit: 1.43

### 5.5 Statistical Summary Table

	6"
Statistical Parameter	Pipe
Total Number of Survey Measurements	47
Number of Measurements >MDC	47
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0177
Median	0.0172
Standard Deviation	0.0041
Maximum	0.0258
Minimum	0.0094

- **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 1.43 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.018 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 – SURR EP 1.43 & Spreadsheet Disc

# SECTION 7 ATTACHMENT 1 3 PAGE(S)

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Babcock	BSI EF	P/BP SURVEY REPORT	
Pipe ID	1.43	Survey Location	Trench Service Ring
Survey Date	02-Apr-07	2350-1 #	189094
Survey Time	08:00	Detector-Sied #	1MG1 LVS-1/107
Pipe Size	6"	Detector Efficiency	0.00038
DCGL (dpm/100cm2)	2.41E+05	Pipe Area incorporated by Detector Efficiency (in can2)	1459
Pipe Area incorporated by Survey Date (m <sup>2</sup> )	6.9	Field BKG (cpm)	3.6
Routine Survey	X	Field MDCR (cpm)	9.5
QA Survey		Nominal MDC (dpm/100cm2)	2,066
	S	Survey Measurement Results	
	Total Number of S	urvey Measurements	47
	Number of Mea	surements >MDC	47
<u></u>	Number of Measurem	nents Above 50% DCGL	0
	Number of Measur	rements Above DCGL	0
	N	lean	0.0177
	M	edian	0.0172
	Standan	d Deviation	0.0041
	Max	ximum	0.0258
	Mir	nimum	0.0094
Survey T	echnician(s)	Stock	
	Survey Unit TBD 06-004 SR-13 Radionuclid	Classification Piping Group Distribution Sample	1 2 EP 2-2
	Measur	ed Nuclide	Co-60
	Area Facto	pr/EMC Used	No
	Pass/	Fail FSS	Pass
	MREM/YR	Contribution	<1
COMMENTS: ACTIVITY VALUES	NOT BACKGROUND	CORRECTED	
RP Eng	ineer   Date	Ocl Rulall	7-11-07

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## EP 1.43 6" Pipe TBD 06-004 Group 2

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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	28	28	73,684	5,050	2,619	42	30	2	145	0.022
2	20	20	52,632	3,607	1,871	30	21	2	104	0.016
3	27	27	71,053	4,870	2,525	40	29	2	140	0.021
4	20	20	52,632	3,607	1,871	30	21	2	104	0.016
5	25	25	65,789	4,509	2,338	37	26	2	130	0.020
6	20	20	52,632	3,607	1,871	30	21	2	104	0.016
7	26	26	68,421	4,690	2,432	39	27	2	135	0.020
8	20	20	52,632	3,607	1,871	30	21	2	104	0.016
9	15	15	39,474	2,706	1,403	22	16	1	78	0.012
10	15	15	39,474	2,706	1,403	22	16	1	78	0.012
11	17	17	44,737	3,066	1,590	25	18	1	88	0.013
12	19	19	50,000	3,427	1,777	28	20	2	99	0.015
13	18	18	47,368	3,247	1,683	27	19	2	93	0.014
14	23	23	60,526	4,148	2,151	34	24	2	119	0.018
15	19	19	50,000	3,427	1,777	28	20	2	99	0.015
16	22	22	57,895	3,968	2,058	33	23	2	114	0.017
17	22	22	57,895	3,968	2,058	33	23	2	114	0.01/
18	29	29	76,316	5,231	2,712	43	31	3	151	0.023
19	31	31	81,579	5,591	2,899	46	33	3	161	0.024
20	18	18	47,368	3,247	1,683	27	19	2	93	0.014
21	12	12	31,579	2,164	1,122	18	13	1	62	0.009
22	33	33	86,842	5,952	3,086	49	35	3	171	0.026
23	25	25	65,789	4,509	2,338	37	26	2	130	0.020
24	22	22	57,895	3,968	2,058	33	23	2	114	0.017
25	30	30	78,947	5,411	2,806	45	32	3	156	0.023
26	24	24	63,158	4,329	2,245	36	25	2	125	0.019
27	27	27	71,053	4,870	2,525	40	29	2	140	0.021
28	29	29	76,316	5,231	2,712	43	31	3	151	0.023
29	21	21	55,263	3,788	1,964	31	22	2	109	0.016
30	17	17	44,737	3,066	1,590	25	18	1	88	0.013
31	25	25	65,789	4,509	2,338	37	26	2	130	0.020
32	23	23	60,526	4,148	2,151	34	24	2	119	0.018

1 of 2

## EP 1.43 6" 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
33	14	14	36,842	2,525	1,309	21	15	1	73	0.011
34	23	23	60,526	4,148	2,151	34	24	2	119	0.018
35	29	29	76,316	5,231	2,712	43	31	3	151	0.023
36	22	22	57,895	3,968	2,058	33	23	2	114	0.017
37	22	22	57,895	3,968	2,058	33	23	2	114	0.017
38	19	19	50,000	3,427	1,777	28	20	2	99	0.015
39	29	29	76,316	5,231	2,712	43	31	3	151	0.023
40	19	19	50,000	3,427	1,777	28	20	2	99	0.015
41	27	27	71,053	4,870	2,525	40	29	2	140	0.021
42	14	14	36,842	2,525	1,309	21	15	1	73	0.011
43	32	32	84,211	5,772	2,993	48	34	3	166	0.025
44	28	28	73,684	5,050	2,619	42	30	2	145	0.022
45	24	24	63,158	4,329	2,245	36	25	2	125	0.019
46	22	22	57,895	3,968	2,058	33	23	2	114	0.017
47	16	16	42,105	2,886	1,496	24	17	1	83	0.013
										<u> </u>
	1								MEAN	0.018
									MEDIAN	0.017
									STD DEV	0.004
					<u>+</u>				MAX	0.026
									MIN	0.009

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Pine	Interior	Radiological	Survey	Form
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Date:	4/2/07	Time:	0700	_		
Pipe ID#:	1.43	Pipe Diameter:	6"	_ Access Point A	Irea: TREAC	H
Building:	₿¢	Elevation:	-27'	System:	MOUNDB	HOT DRU
	/				SERVICE	RING
Type of Su	rvey Investigatio	n Charact	erization F	inal Survey X	Other 🖌	
Gross				Cs		
Detector	· ID# / Sled ID#	IMG/ LUS	-1/	107		
Detector (	Cal Date:	1/07	Detector Cal Due	• Date:	1/11/08	·····
Instru	nent: <u>2</u>	350-1	Instrument II	)#:/	89094	<del></del>
Instrument	Cal Date:/	11/07	Instrument Cal Du	ie Date:,	11/08	
From the D	aily Pipe Survey D	etector Control For	rm for the Selected	Detector		
Backgroun	i Value <u>3.6</u>	cpm				
<b>MDCR</b> <sub>static</sub>	9.5	cpm				
Efficiency	Factor for Pipe Dia	meter 0,000	cfrom det	ector efficiency de	termination)	
MDC <sub>static</sub>	2066	dpm/102	$\sim$ cm <sup>2</sup>	-		
Is the MDC	static acceptable?	(Yes) No	(if no, adjust samj	ole count time and rec	alculate MDCR <sub>static</sub> )	I
Comments	INITIAL	EP2-2		<b>.</b>	Con	APLIETE
<u> </u>			·····		<u> </u>	
				<u>-</u>	· · · · · · · · · · · · · · · · · · ·	

Technician 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	28	28	nla.	na
2	2		20	GS	1	
3	3		22	27		
4	¢		20	20		
5	5		25	25		
6	6		20	20		
7	7		26	26		
8	8		20	20		
9	9		15	15		
10	10	V	15	15	Y	V

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## Pipe Interior Radiological Survey Form (Continuation Form)

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Date:	4/2/07	Diana Diana ata		A	Doint Aroo:	TORIFA
Pipe ID#:	1,45	Pipe Diamete	r:	Access	Point Area:	19encit
Building:	¥	Elevation:	-27		stem:	MO D HOT PRA
·	·		1	T		SERVICE KING
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
#	from Opening	(min)		cpm	cpm	
			17	17	na	nia
17	12		19	19		
13	13		18	18		1
14	14-		23	23		
15	15		19	19		
16	16		22	22		
17	17		22	22		
18	18		29	29		
19	19		31	3		
20	20		18	18		
21	21		12	12		
72	27		33	33		
73	7.3		25	25		
24	24		77.	22		
50	25		30	30		
26	21		24	24		
20	22		27	27		
24	k/		29	29		
48	7.8		$\frac{1}{21}$	- 7		
- 29	20		17			
30			25	25		
21	77		23	23		
26	22		25			
27	71		72	72		
24			27	20		+
71	53		27_	22		- <del> </del>
56	36		22			┽╾╌╌┥
37	37		20	- 44		
38	28			20		
39	29		29	- 29		·
40	40		19			
41	41		21	<u> </u>		<u> </u>
42	42		1 19	17		<b> </b>
43	43		32	32		<b></b>
44	44		28	28		
45	45	<u> </u>	24	Z4	¥	V

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## Pipe Interior Radiological Survey Form (Continuation Form)

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Date: Pipe ID#: Building:	4/2/07 _1.43 	Pipe Diameter Elevation:	:: <u> </u>	Access	s Point Area:	TRENCH 10 B-HOT DPW
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	dpm/100cm <sup>2</sup>
		(iiiiii) 1	77-	22		nia
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SECTION 7 ATTACHMENT 3 \_\_\_\_ PAGE(S) )

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				DQA Check	Sneet				
<b>~</b>	Design #	EP 1.43	Revision #	Original		<u></u>			
S	urvey Unit #		<u> </u>	<u> </u>	EP 1.43				
		· · · · · · · · · · · · · · · · · · ·	Pre	liminary Dat	a Review`				
	Answers to	the following ques	tions shoul Release	d be fully do Record	cumented in the	Survey Unit	Yes	No	N/A
1.	Have surveys	been performed in ac	cordance with	survey instruct	ions in the Survey I	Design?	X		1
2.	Is the instrum survey units, c	entation MDC for structor below 0.5 DCGLw for	ture static me or Class 3 surv	asurements be vey units?	low the DCGL <sub>w</sub> for	Class 1 and 2			x
3.	Is the instrum	entation MDC for emb	edded/buried ;	piping static me	asurements below	the DCGL <sub>W</sub> ?	X		
4.	Was the instru embedded/bu static measure	imentation MDC for st ried piping scan meas ements or soil sample:	ructure scan n urements belo s addressed in	neasurements, w the DCGL <sub>W,</sub> the survey de	soil scan measurer or, if not, was the n sign?	nents, and eed for additional			x
5.	Was the instru	mentation MDC for vo	olumetric meas	surements and	smear analysis < 1	0% DCGLw?			X
6.	Were the MDC used to perfor	Cs and assumptions u m the survey?	sed to develop	them appropr	iate for the instrume	ents and techniques	x		
7.	Were the surv media being s	ey methods used to o urveyed?	ollect data pro	per for the type	es of radiation involv	ed and for the	x		
В.	Were "Special	Methods" for data co	lection proper	y applied for th	e survey unit unde	review?	X		
9.	Is the data set design, which	comprised of qualifie accurately reflects the	d measuremer e radiological s	nt results collect tatus of the fac	ted in accordance v sility?	with the survey	x		
			G	raphical Data	Review				
1.	Has a posting	plot been created?							X
2.	Has a histogra	am (or other frequency	plot) been cre	eated?					X
3.	Have other gr	aphical data tools bee	n created to as	ssist in analyzi	ng the data?				X
				Data Analy	/sis				
1.	Are all sample	e measurements belov	the DCGL <sub>w</sub> (	Class 1 & 2), o	r 0.5 DCGL <sub>w</sub> (Clas	3)?	X		
2.	is the mean o	f the sample data < D(	CGLw?				X		
3.	if elevated area elevated area	eas have been identifie < DCGL <sub>EMC</sub> (Class 1)	ed by scans an ), < DCGL <sub>W</sub> (C	d/or sampling, Class 2), or <0	is the average actions of the second se	vity in each ?			X
4.	Is the result of	the Elevated Measur	ements Test <	1.0?					X
5.	is the result of	the statistical test (St	for Sign Test	or Wr for WR	5 Test) <u>&gt;</u> the critical	value?	I		X
Co	mments:								
F	SS/Characteriz	ation Engineer (print/s	ign) Da	le Ray	dell An	Robald	Date	7-1	1-07
F	SS/ Characteriz	ation Manager (print/s	ign)	iN	XIII	R. Case	Date	7/2	101
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								CS-0 Re	09/2 v 0

## SECTION 7 ATTACHMENT 4 1 DISC

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	Survey	Unit Release Ro	ecord			<u>.</u>	
Design #	EP 1.93	Revision #	Original	Page 1	of	3	
Survey Unit #(s)			1.93				
Description	<ol> <li>Embedded Pipe (EP) Survey Unit 1.93 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</li> <li>EP 1.93 is a Class 1, Group 3.2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</li> <li>Surveys in EP 1.93 were performed using a scintillation detector optimize to measure gamma energies representative of Cs-137. Sample #EP 3-11 from Survey Request (SR)-13 was referenced for this decision.</li> <li>Survey Instructions for this survey unit are incorporated into and performed in accordance with (IAW) the Babcock Services Incorporated (BSI)/LVS-00 Work Execution Package (WEP) 05-006. Survey instructions described in the document constitute "Special Methods" and the survey design used in the acquisition of survey measurements.</li> <li>Instrument efficiency determinations are developed in accordance with the BSI/LVS-002, WEP 05-006, these determinations are appropriate for the typ of radiation involved and the media being surveyed.</li> </ol>						
	Approval Signa	atures			Date	:	
FSS/Characterization	Engineer E	Jal Rulo	ll	7-1	3 - (	07	
Technical Review (FSS/Characterization)	wer Engineer)	Wood		7+	4-	077	
FSS/Characterization Manager 1/25/07						7	
			νγ		F CS R	orm -09/1 ev 0	

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**Revision # Original** 

Survey Unit: 1.93

### 1.0 History/Description

- 1.1 The subject pipe is a drain system overflow pipe servicing the Hot Dry Storage (HDS) pit in the Hot Lab. The header runs from the northwest side of the HDS pit to the valve pit on the -25 ft elevation of the Hot Lab.
- 1.2 EP 1.93 consists of 3" diameter piping that is approximately 24 feet in length.
- 2.0 Survey Design Information
  - 2.1 EP 1.93 was surveyed IAW Procedure #BSI/LVS-002.
  - 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 24 survey measurements.
  - 2.3 Surface area for the 3" ID piping is 486 cm<sup>2</sup> for each foot of piping, corresponding to a total 3" ID piping surface area of 17,512 cm<sup>2</sup>(1.8 m<sup>2</sup>) for the entire length of (approximately 24') of 3" 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 1.93 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.

FSS Design	#	EP	1.93
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Revision # Original

Survey Unit: 1.93

### 5.5 Statistical Summary Table

	3"
Statistical Parameter	Pipe
Total Number of Survey Measurements	24
Number of Measurements >MDC	12
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0020
Median	0.0019
Standard Deviation	0.0007
Maximum	0.0034
Minimum	0.0009

- 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 1.93 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.002 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 – EP 1.93 SURR & Spreadsheet Disc SECTION 7 ATTACHMENT 1 \_\_\_\_ PAGE(S)

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	BSI E	P/BP SURVEY REPORT		
Pipe ID	EP 1.93	Survey Location	HDS riser -25'	
Survey Date	16-Oct-06	2350-1 #	203488	
Survey Time	08:49	Detector-Sied #	44-159 #238369/10	
Pipe Size	3"	Detector Efficiency	0.00077	
DCGL (dpm/100cm2)	3.79E+06	Pipe Area incorporated by Detector Efficiency (in cm2)	730	
the Area Incorporated by	1.8	Field BKG (cpm)	6.4	
Routine Survey	X	Field MDCR (cpm)	11.7	
QA Survey		Nominal MDC (dpm/100cm2)	2,660	
		Survey Measurement Results		
<u> </u>	Total Number of S	urvey Measurements	24	
<u> </u>	Number of Mea	asurements >MDC	12	
	Number of Measuren	nents Above 50% DCGL	0	
	Number of Measur	rements Above DCGL	0	
	N	lean	0.0020	
	M	edian	0.0019	
Standard Deviation			0.0007	
	0.0034			
	0.0009			
			· · · · · · · · · · · · · · · · · · ·	
	and and the second s		and a straight of the straight	
alanga Constitution (s. 1993) Alanga ang ang ang ang ang ang ang ang ang	Survey Lini	t Classification	1 1	
	Survey Uni TBD 06-00	t Classification 4 Piping Group	32	
	Survey Uni TBD 06-00 SR-13 Radionuclid	t Classification 4 Piping Group le Distribution Sample	1 3.2 EP 3-11	
	Survey Uni TBD 06-00 SR-13 Radionuclid Measur	t Classification 4 Piping Group le Distribution Sample red Nuclide	1 3.2 EP 3-11 Cs-137	
	Survey Uni TBD 06-00- SR-13 Radionuclid Measur Area Fact	t Classification 4 Piping Group le Distribution Sample ed Nuclide or/EMC Used	1 3.2 EP 3-11 Cs-137 No	
	Survey Uni TBD 06-00- SR-13 Radionuclid Measur Area Facto Pass/	t Classification 4 Piping Group le Distribution Sample red Nuclide or/EMC Used Fail FSS	1 3.2 EP 3-11 Cs-137 No Pass	
	Survey Uni TBD 06-00 SR-13 Radionuclid Measur Area Facto Pass/ MREM/YF	t Classification 4 Piping Group te Distribution Sample red Nuclide or/EMC Used Fail FSS 8 Contribution	1 3.2 EP 3-11 Cs-137 No Pass <1	
	Survey Uni TBD 06-00- SR-13 Radionuclid Measur Area Fact Pass/ MREM/YF	t Classification 4 Piping Group te Distribution Sample red Nuclide or/EMC Used Fail FSS R Contribution	1 3.2 EP 3-11 Cs-137 No Pass <1	
DMMENTS: CTIVITY VALUES	Survey Uni TBD 06-00 SR-13 Radionuclio Measur Area Fact Pass/ MREM/YF	t Classification 4 Piping Group te Distribution Sample red Nuclide or/EMC Used (Fail FSS R Contribution O CORRECTED.	1 3.2 EP 3-11 Cs-137 No Pass <1	

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## EP 1.93 3" Pipe TBD 06-004 Group 3.2

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	14	14	18,182	2,492	273	-	17	-	-	0.002
2	11	11	14,286	1,958	214	-	14	-	-	0.001
3	8	8	10,390	1,424	156	-	10	-	-	0.001
4	12	12	15,584	2,136	234	-	15	-	•	0.002
5	12	12	15,584	2,136	234	-	15		-	0.002
6	17	17	22,078	3,026	331	-	21	-	-	0.002
7	11	11	14,286	1,958	214	-	14	-		0.001
8	15	15	19,481	2,670	292	-	19		-	0.002
9	15	15	19,481	2,670	292		19	-	-	0.002
10	13	13	16,883	2,314	253				-	0.002
	11	11	14,286	1,958	214	-		-	-	0.001
12	9	9	11,688	1,602	1/5	-		-	-	0.001
13	19	19	24,075	3,382	370		24			0.002
14	20	20	25,9/4	3,000	390	-	25			0.000
15		1	9,091	1,240	130		30			0.003
10	24	24	25.074	4,212	400	-	25	-	<u> </u>	0.003
1/	20	20	20,974	2 126	224		15		-	0.002
10	12	12	10,004	1 790	105		10		-	0.001
19	10	10	12,507	2 670	202	-	19	-	-	0.002
20	10	10	24 675	3 382	370	-	24	-	-	0.002
22	19	19	23 377	3 204	351	-	22	-	-	0.002
23	26	26	33,766	4,628	507	-	32	-	-	0.003
24	23	20	29,870	4,094	448	-	29	-	-	0.003
		LU								1
<b> </b>	+								MEAN	0.002
	+		+			1	1		MEDIAN	0.002
<b> </b>							1		STD DEV	0.001
									MAX	0.003
	+		+						MIN	0.001

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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BSI/LVSPipeCrawler-002 Revision 4

## Pipe Interior Radiological Survey Form

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1)

Date: 10/16/06 Time: 0849
Pipe ID#: 1.93 Pipe Diameter: 3' Access Point Area: Har DRY STREAM
Building: Hor LAB Elevation: -25' System: RISER
Type of Survey Investigation Characterization Final Survey $\bigwedge$ Other $\checkmark$
Gross Co60 Cs
Detector ID# / Sled ID# 44.159. 238369 / 101
Detector Cal Date: <u>9/5/06</u> Detector Cal Due Date: <u>9/5/07</u>
Instrument: 2350-/ 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 6.4 cpm
$MDCR_{static}$ $11.7$ cpm
Efficiency Factor for Pipe Diameter 0.00077 (from detector efficiency determination)
$MDC_{static} = 2660 dpm/100 cm^2$
s the MDC <sub>static</sub> acceptable? Yes No (if no, adjust sample count time and recalculate MDCR <sub>static</sub> )
Comments: <u>RESURVEY EP3-11</u> COMPLETE
Technician Signature AMD

## Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	ross Counts Gross cpm		dpm/100cm <sup>2</sup>
1	1	1	14	14-	nia	na
2	2	}	11	11	)	1
3	7		8	8		
4	4		12	IZ		
5	5		12	12		
6	6		17	17		
7	7		11	11		
8	8		15	15		1
9	9		15	15		
10	/0	V	13	13	*	4



Package Page 1 of 3



Attachment 3, Page 1
BSI/LVSPipeCrawler-002 Revision 4

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### Pipe Interior Radiological Survey Form (Continuation Form)

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Date:	93		17			
Pipe ID#:	10/16/06	Pipe Diameter	:: <u>3</u>	Access	Point Area:	OF DRY STOR
Building:	Hor LAB	Elevation:	-25'	Sy	ystem:	RISER
Position	Feet into Pipe	Count Time		Gross	Net	1 (100 2
#	from Opening	(min)	Gross Counts	cpm	cpm	apm/100cm <sup>-</sup>
11	11	<u> </u>	11	1/	nia	na
17	12	1	9	9		1
13	13		19	19		
14	14		20	20		
15	15		7	7		
16	14		24	24		
17	17		20	20		
18	18		12	12		
19	19		10	10		
20	20		15	/5		
21	21		19	19		
22	22		18	18		
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Package Page Zof <u>3</u>



Attachment 3, Page 2



SECTION 7 ATTACHMENT 3 \_\_\_\_ PAGE(S)

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			DQA Check	Sheet			
Design #	EP 1.93	Revision #	Original				
Survey Unit #	······································			EP 1.93	u <u></u>		
	£ <u></u>	Pre	liminary Data	a Review`			
Answers to	the following que	stions shoul Release	d be fully do Record	cumented in the Survey Unit	Yes	No	N/,
I. Have surveys	been performed in ac	cordance with	survey instructi	ons in the Survey Design?	X		
2. Is the instrume survey units, c	entation MDC for structor below 0.5 DCGL <sub>W</sub> for	cture static me or Class 3 surv	asurements bel vey units?	ow the $DCGL_W$ for Class 1 and 2			x
3. Is the instrume	entation MDC for emb	edded/buried	oiping static me	asurements below the DCGLw?	X		
<ol> <li>Was the instru embedded/but static measure</li> </ol>	mentation MDC for st ried piping scan meas ements or soil sample	ructure scan n urements belo s addressed in	neasurements, w the DCGLw, o the survey des	soil scan measurements, and or, if not, was the need for additional sign?			x
5. Was the instru	mentation MDC for vo	olumetric meas	surements and	smear analysis < 10% DCGL <sub>W</sub> ?			X
<ol> <li>Were the MDC used to perform</li> </ol>	Cs and assumptions u m the survey?	sed to develop	them appropria	ate for the instruments and techniques	X		
7. Were the surv media being s	ey methods used to c urveyed?	ollect data pro	per for the type	s of radiation involved and for the	X		
3. Were "Special	Methods" for data co	llection proper	ly applied for th	e survey unit under review?	X		
<ol> <li>Is the data set design, which</li> </ol>	comprised of qualifie accurately reflects the	d measuremer e radiological s	nt results collect tatus of the fac	ted in accordance with the survey lity?	x		
		G	raphical Data	Review	<b></b>	r	
I. Has a posting	plot been created?						×
2. Has a histogra	am (or other frequency	y plot) been cre	eated?				>
3. Have other gra	aphical data tools bee	n created to a	ssist in analyzin	g the data?			>
			Data Analy	sis			
I. Are all sample	measurements below	v the DCGLw (	Class 1 & 2), or	0.5 DCGL <sub>w</sub> (Class 3)?	X		
2. Is the mean of	the sample data < D	CGLw?			X		
<ol> <li>If elevated are elevated area</li> </ol>	eas have been identifie < DCGL <sub>EMC</sub> (Class 1	ed by scans an ), < DCGL <sub>W</sub> (0	d/or sampling, Class 2), or <0.	is the average activity in each 5 DCGL <sub>w</sub> (Class 3)?			×
4. Is the result of	the Elevated Measur	ements Test <	1.0?				×
5. Is the result of	the statistical test (S-	+ for Sign Test	or Wr for WRS	Test) ≥ the critical value?			X
Comments:							
FSS/Characteriza	ation Engineer (print/s	ign) Da	le Rando	In She Redail	Date	7-	13-6
FSS/ Characteriz	ation Manager (print/s	sign)	<u> </u>	R. Case	Date	7/2	510
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	Surve	ey Unit Release R	ecord			
Design #	EP HPT-102	Revision #	Original	Page	1 of	3
Survey Unit #(s)		H	HPT-102			
Description	<ol> <li>Embedded P embedded pipe</li> <li>EP HPT-102 Status Survey P</li> <li>Surveys in E optimized to me 3-11 from Survey</li> <li>Survey Instruin accordance v Work Execution document const acquisition of st</li> <li>Instrument et BSI/LVS-002, of radiation inve</li> </ol>	ipe (EP) Survey Unit for Plum Brook Rea is a Class 1, Group Plan (FSSP) and Tech P HPT-102 were per easure gamma energi ey Request (SR)-13 uctions for this surve vith (IAW) the Babcon n Package (WEP) 05 titute "Special Methourvey measurements fficiency determinati WEP 05-006, these co olved and the media	t HPT-102 meets actor Facility (PB 3.2 survey unit at mical Basis Doct formed using a s ies representative was referenced for y unit are incorp ock Services Inco -006. Survey ins ods" and the surv	the defin RF). s per the ument (T scintillation of Cs-12 or this de orated in orporated tructions ey design ed in accord re appropri	nition of PBRF BD)-00 on dete 37. Sate cision. to and descrile n used in ordance riate fo	of Final 5-004. ctor mple #EP performed LVS-002, bed in this in the e with the r the types
	Approval Sig	natures	N	<b>_</b>	Date	:
FSS/Characterization	Engineer	Ogl Pm	all	7-	13 - 0	7
Technical Revie (FSS/Characterization	ewer Engineer)	Allog	R	7-10	10-2	7
FSS/Characterization	Manager		ALCase	1/2	esto	7
						Form 5-09/1 Rev 0

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Revision # Original

Survey Unit: HPT-102

#### 1.0 History/Description

- 1.1 The subject pipe is part of the the 2" drain line for the 24" Rx Coolant return loop piping. The function of this piping was to convey water from the coolant loop to the sump in the sub pile room corridor on the -47.
- 1.2 EP HPT-102 consists of 4" diameter piping that is approximately 23 feet in length.
- 2.0 Survey Design Information
  - 2.1 EP HPT-102 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 23 survey measurements.
  - 2.3 Surface area for the 4" ID piping is 486 cm<sup>2</sup> for each foot of piping, corresponding to a total 4" ID piping surface area of 18,971 cm<sup>2</sup>(1.9 m<sup>2</sup>) for the entire length of (approximately 23') 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 HPT-102 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.

**Revision # Original** 

Survey Unit: HPT-102

#### 5.5 Statistical Summary Table

	4"
Statistical Parameter	Pipe
Total Number of Survey Measurements	23
Number of Measurements >MDC	14
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0017
Median	0.0017
Standard Deviation	0.0007
Maximum	0.0037
Minimum	0.0006

- 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 HPT-102 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.002 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 – EP HPT 102 SURR & Spreadsheet Disc SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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Batcock	BSI E	P/BP SURVEY REPORT	
Pipe ID	HPT 102	Survey Location	Valve Pit floor drains -25
Survey Date	18-Oct-06	2350-1 #	203488
Survey Time	14:58	Detector-Sled #	<b>44-159 #238369/101</b>
Pipe Size	4"	Detector Efficiency	0.00071
DCGL (dom/100cm2)	3.79E+06	Pipe Area incorporated by Detector Efficiency (in cm2)	973
Pipe Area incorporated by	2.2	Field BKG (cpm)	5
Routine Survey	X	Field MDCR (cpm)	10.7
QA Survey		Nominal MDC (dpm/100cm2)	2,165
	No de la companya de la companya de la companya de la	Survey Measurement Results	
	Total Number of S	urvey Measurements	23
	Number of Mea	asurements >MDC	14
	Number of Measuren	nents Above 50% DCGL	0
	Number of Measur	rements Above DCGL	0
	Ň	lean	0.0017
	M	edian	0.0017
	Standar	d Deviation	0.0007
	Ma	ximum	0.0037
	Mir	nimum	0.0006
Survey T	echnician(s)	STOCK	
	Survey Uni	t Classification	1
	TBD 06-00	4 Piping Group	3.2
	SR-13 Radionuclid	le Distribution Sample	EP 3-11
	Measur	ed Nuclide	Cs-137
	Area Fact	or/EMC Used	No
······	Pass/	/Fail FSS	Pass
	MREM/YF	R Contribution	<1
COMMENTS:		CORRECTED.	1
RP Eng	ineer   Date	Oct Rall	7-13-07

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## HPT 102 4" Pipe TBD 06-004 Group 3.2

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	15	15	21,127	2,172	238	-	15	-	-	0.002
2	13	13	18,310	1,882	206	-	13	-	-	0.001
3	16	16	22,535	2,316	254	-	16	-	-	0.002
4	20	20	28,169	2,895	317	-	20	-	-	0.002
5	11	11	15,493	1,592	174	-	11	-	-	0.001
6	6	6	8,451	869	95	-	6	-	-	0.001
7	16	16	22,535	2,316	254	-	16	-	-	0.002
8	17	17	23,944	2,461	270	+	17	-	-	0.002
9	18	18	25,352	2,606	285	-	18	-	-	0.002
10	16	16	22,535	2,316	254	-	16	-	-	0.002
11	15	15	21,127	2,172	238	-	15	-	-	0.002
12	11	11	15,493	1,592	174		11	-	-	0.001
13	16	16	22,535	2,316	254	-	16	-	-	0.002
14	10	10	14,085	1,448	159		10	-	-	0.001
15	19	19	26,761	2,751	301	-	19	-	-	0.002
16	14	14	19,718	2,027	222	-	14	-	-	0.001
17	18	18	25,352	2,606	285	-	18	-	-	0.002
18	8	8	11,268	1,158	127	-	8	-	-	0.001
19	14	14	19,718	2,027	222	-	14		-	0.001
20	11	11	15,493	1,592	174	-	11	-	-	0.001
21	19	19	26,761	2,751	301	-	19	-	-	0.002
22	35	35	49,296	5,067	555	•	36		-	0.004
23	31	31	43,662	4,488	492	-	32	-	-	0.003
									MEAN	0.002
									MEDIAN	0.002
									STD DEV	0.001
				· · · · · · · · · · · · · · · · · · ·					MAX	0.004
									IMIN	0.001

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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BSI/LVSPipeC	Crawler-002
	Revision 4

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Pipe Interior Radiological Survey Form
Date: <u><math>10/18/06</math></u> Time: <u><math>1458</math></u> Pipe ID#: <u>HPT 102</u> Pipe Diameter: <u>4</u> Access Point Area: <u>VALVE P.T.</u> Building: <u>HOT LAB</u> Elevation: <u>-25'</u> System: <u>PLR DRAVS</u>
Type of Survey       Investigation       Characterization       Final Survey       Other         Gross       Co60       Cs       Cs         Detector ID# / Sled ID#       44-159       Z38369       101
Detector Cal Date: 9/5/06 Detector Cal Due Date: 9/5/07
Instrument: <u>2350-/</u> Instrument ID #: <u>20348-8</u>
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 <u>5,0</u> cpm MDCR <sub>static</sub> <u>10,7</u> cpm Efficiency Factor for Pipe Diameter <u>0.00071</u> (from detector efficiency determination) MDC <sub>static</sub> <u>2165</u> dpm/ <u>100</u> cm <sup>2</sup>
Is the MDC <sub>static</sub> acceptable? (i es) No (i no, adjust sample count time and recalculate MDCR <sub>static</sub> )
Comments: LNIFIM2 SURVEY EF3-11 COMPLETE
Technician Signature

### Pipe Interior Radiological Survey

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Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	1	4	15	15	na	na.
2	2		13	3	1	11100
3	3		16	16		
4	4		20	20		
5	5		11	<u> </u>		
6	6		6	6		
7	7		16	16		
8	8		17	17		
9	1		18	18		
10	(1)		16	16	V	¥



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BSI/LVSPipeCrawler-002 Revision 4

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### Pipe Interior Radiological Survey Form (Continuation Form)

Date:	10/18/06		. 11			
Pipe ID#:	HPT 102	Pipe Diameter	:4"	Access	Point Area:	VALVE PIT
Building:	HOT LAB	Elevation:	-25'	S	ystem:	FLR DRN
					<b>,</b>	······
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
##	from Opening	(min)		cpm	cpm	
11			15		na	Ala
12	12		[]			
	13	· · ·	-16	16		
14	14		10	10		
15	15					
16	16		14			
	<u>ı</u> }		18	<u> </u>	ļ	
	18		8	X	<b> </b>	
19	19		14	14		
20	70					
21	21					
22	22		35	35		
23	23	V	31			
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Attachment 3, Page 2



HPT 102

# SECTION 7 ATTACHMENT 3 \_\_\_\_ PAGE(S)

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			DQA Check	Sheet			
Design #	HPT 102	Revision #	Original				
Survey Unit #			<b>.</b>	HPT 102			
	<u> </u>	Pre	liminary Data	Review`	<u> </u>		
Answers to	the following que	stions shou Release	id be fully do Record	cumented in the Survey Unit	Yes	No	N/,
. Have surveys	been performed in ac	cordance with	survey instructi	ons in the Survey Design?	X		
2. Is the instrum survey units, o	entation MDC for strue or below 0.5 DCGL <sub>W</sub> f	cture static me for Class 3 sur	easurements bel	ow the $DCGL_W$ for Class 1 and 2			x
3. Is the instrum	entation MDC for emb	edded/buried	piping static me	asurements below the DCGLw?	X		
I. Was the instruent embedded/bustatic measure	umentation MDC for s ried piping scan meas ements or soil sample	tructure scan r surements bek s addressed ir	neasurements, bw the DCGL <sub>W</sub> ( in the survey des	soil scan measurements, and or, if not, was the need for additional ign?			x
5. Was the instru	umentation MDC for v	olumetric mea	surements and	smear analysis < 10% DCGLw ?			X
<ol> <li>Were the MD0 used to perfor</li> </ol>	Cs and assumptions u m the survey?	used to develo	p them appropri	ate for the instruments and technique	<sup>s</sup> x		
7. Were the surv media being s	vey methods used to c surveyed?	collect data pro	pper for the type	s of radiation involved and for the	X		
3. Were *Specia	Methods" for data co	ellection proper	ly applied for th	e survey unit under review?	X		
<ol> <li>Is the data set design, which</li> </ol>	t comprised of qualifie accurately reflects the	ed measureme e radiological s	nt results collect status of the fac	ted in accordance with the survey lity?	x		
		G	raphical Data	Review		····-	<b></b>
I. Has a posting	plot been created?						X
2. Has a histogra	am (or other frequenc	y plot) been cr	eated?				X
3. Have other gr	aphical data tools bee	en created to a	ssist in analyzin	g the data?			×
			Data Analy	sis			
I. Are all sample	e measurements below	w the DCGLw	(Class 1 & 2), or	0.5 DCGL <sub>w</sub> (Class 3)?	X		
2. Is the mean o	f the sample data < D	CGLw?			X		
<ol> <li>If elevated are elevated area</li> </ol>	eas have been identified < DCGL <sub>EMC</sub> (Class 1)	ed by scans ar ), < DCGL <sub>W</sub> (	nd/or sampling, Class 2), or <0.	s the average activity in each 5 DCGL <sub>W</sub> (Class 3)?			×
I. Is the result of	f the Elevated Measur	rements Test <	: 1.0?	····			×
5. Is the result o	f the statistical test (S	+ for Sign Tes	t or Wr for WRS	Test) ≥ the critical value?			×
Comments:							
FSS/Characteriz	ation Engineer (print/s	sign)	K Radde	A MDal Ambell	Date	7-1	3-0
FSS/ Characteriz	ation Manager (print/	sign)		R. Case	Date	7/2.	slo
						Fo CS-	rm 09/2

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SECTION 7 ATTACHMENT 4 1 DISC

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	Survey	y Unit Release R	ecord			
Design #	EP-Rx 139	Revision #	Original	Page 1	of	3
Survey Unit #(s)		- <b>!</b>	Rx 139			
Description	<ol> <li>Endedded Pij pipe for Plum Bi</li> <li>EP Rx 139 is Survey Plan (FS</li> <li>Surveys in EP optimized to met 3-9 from Survey</li> <li>Survey Instruction accordance with Work Execution document constitiacquisition of su</li> <li>Instrument eff BSI/LVS-002, W of radiation involution</li> </ol>	a Class 1, Group 1 SP) and Technical P Rx 139 were perfo asure gamma energ Request (SR)-13 v ctions for this surve ith (IAW) the Babo Package (WEP) 05 tute "Special Mether rvey measurements ficiency determinat VEP 05-006, these lived and the media	ty (PBRF). survey unit as p Basis Document ormed using a so ies representative vas referenced for ey unit are incor- ock Services Inco- 5-006. Survey in ods" and the sur s. ions are develop determinations a being surveyed	er the PBRJ t (TBD)-06- cintillation of ve of Co-60 or this decis porated into corporated ( structions of vey design ped in accor are appropri	F Fina -004. letect . San sion. (BSI) lescri used dance ate fo	al Statu: or nple #E perform /LVS-0 bed in t in the e with the or the ty
	Approval Sign	atures	M		Date	e:
FSS/Characterizatio	n Engineer	Och R.	Mall	7-1	′Z-	07
Technical Rev (FSS/Characterizatio	iewer n Engineer)	Mood	7	7-1	6-	07
FSS/Characterizatio	n Manager	_d//d	LR. Case	7/25	lo	
		-				Form S-09/1 Rev 0
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FSS Design # EP Rx 139

Survey Unit: Rx 139

#### 1.0 History/Description

- 1.1 The subject pipe is the drain line from the Rx tank penetration on the Rx Building -8 foot elevation.
- 1.2 EP Rx 139 consists of 1" diameter piping that is approximately 4 feet in length.
- 2.0 Survey Design Information
  - 2.1 EP Rx 139 was surveyed IAW Procedure #BSI/LVS-002.
  - 2.2 100% of the 1" ID pipe was accessible for survey. The accessible 1" ID pipe was surveyed by static measurement at one foot increments, for a total of 4 survey measurements.
  - 2.3 Surface area for the 1" ID piping is 243 cm<sup>2</sup> for each foot of piping, corresponding to a total 1" ID piping surface area of 973 cm<sup>2</sup> (0.1 m<sup>2</sup>) for the entire length of (approximately 4') of 1" 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 139 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.

FSS	Design	#	EP	Rx	139	
LDD	DesiRii	π	LIL	IЛЛ	132	

**Revision # Original** 

Survey Unit: Rx 139

#### 5.5 Statistical Summary Table

	1"
Statistical Parameter	Pipe
Total Number of Survey Measurements	4
Number of Measurements >MDC	4
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.1247
Median	0.1165
Standard Deviation	0.0335
Maximum	0.1717
Minimum	0.0940

- **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 139 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.125 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 – SURR EP RX 139 & Spreadsheet Disc SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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Babcock	B\$I EF	P/BP SURVEY REPORT	
Pipe ID	Rx 139	Survey Location	Rx Tank -8 el.
Survey Date	22-Feb-07	2350-1 #	212223
Survey Time	13:30	Detector-Sied #	70006-047/ no sled
Pipe Size	1"	Detector Efficiency	0.0006
	2.41E+05	Pipe Aree Incorporated by Detector Efficiency (in cm2)	243
Pipe Area incorporated by	0.1	Field BKG (cpm)	7.7
Routine Survey	X		12.5
QA Survey		Nominal MDC (dpm/100cm2)	6,687
	S	Survey Measurement Results	
·····	Total Number of S	urvey Measurements	4
	Number of Mea	surements >MDC	4
	Number of Measuren	nents Above 50% DCGL	0
	Number of Measur	ements Above DCGL	0
	N	lean	0.1247
	0.1165		
	0.0335		
	0.1717		
	0.0940		
	echnician(s)		
	Survey Uni	t Classification	1
	SR-13 Radionuclid	le Distribution Sample	FD 2.1
<u> </u>	Magein	ed Nuclide	Ca-60
	Area Facto	pr/EMC Used	No
	Pass		
	<1		
CTIVITY VALUES	S NOT BACKGROUND	CORRECTED	
RP Eng	ineer   Date	Oil Raylall	7-13-07

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# EP Rx 139 1" 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-164 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
1	30	30	50,000	20,558	815	19,501	5,184	600	143	0.123
2	23	23	38,333	15,761	625	14,951	3,975	460	110	0.094
3	27	27	45,000	18,502	733	17,551	4,666	540	129	0.110
4	42	42	70,000	28,781	1,141	27,301	7,258	840	201	0.172
									MEAN	0.125
									MEDIAN	0.116
									STD DEV	0.033
									MAX	0.172
									MIN	0.094

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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BSI/LVSPipeCrawler-002 Revision 4

Pipe Interior Radiological Survey Form

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Date: 2/22/07 Time: 1330							
Pipe ID#: R 139 Pipe Diameter: 1.0" Access Point Area: R TANK							
Building: $\angle V$ Elevation: $-8'$ System: $PEN$							
Type of Survey       Investigation       Characterization       Final Survey       Other $V_{-}$ Gross       Co60 $V_{-}$ Cs							
From the Daily Pipe Survey Detector Control Form for the Selected Detector							
Background Value 7.7 cpm							
$MDCR_{static}$ <u>12,5</u> cpm							
Efficiency Factor for Pipe Diameter O. DOD( (from detector efficiency determination)							
$MDC_{static}$ <u>6687</u> dpm/ <u>100</u> 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 EP3-1 COMPLETE							

Technician Signature

### Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net	dpm/100cm <sup>2</sup>
1	1	1	30	30	Na	N/A
2	2		23	23		1
3	3		27	27		
4	F	V	42	42		
5						
6						
7	N		N			
8	/ ~			A		
9				1.		
10					Ţ	4

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Attachment 3, Page 1

SECTION 7 ATTACHMENT 3 / PAGE(S)

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			DQA Check S	iheet			
Design #	EP Rx 139	Revision #	Original				
Survey Unit #			E	P Rx 139			
<u></u>	<b>5</b> , <b>1</b>	Pre	liminary Data	Review			
Answers to	the following que	stions shoul Release	d be fully doc Record	umented in the Survey Unit	Yes	No	N/A
1. Have surveys	been performed in ac	cordance with	survey instruction	ons in the Survey Design?	X		1
<ol> <li>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?</li> </ol>							x
3. Is the instrume	entation MDC for emb	edded/buried j	piping static mea	surements below the DCGL <sub>W</sub> ?	X		
4. Was the instru embedded/bu static measure	mentation MDC for st ried piping scan meas ments or soil sample	ructure scan n urements belo s addressed in	neasurements, s w the DCGL <sub>W</sub> o the survey desi	oil scan measurements, and r, if not, was the need for additional gn?			x
5. Was the instru	mentation MDC for ve	olumetric meas	surements and s	mear analysis < 10% DCGL <sub>w</sub> ?			X
6. Were the MDC used to perfor	s and assumptions u m the survey?	sed to develop	them appropria	te for the instruments and techniques	x		
7. Were the survey methods used to collect data proper for the types of radiation involved and for the media being surveyed?							
8. Were "Special Methods" for data collection properly applied for the survey unit under review?							
9. Is the data set design, which	comprised of qualifie accurately reflects the	d measuremer e radiological s	nt results collectoristatus of the facil	ed in accordance with the survey ity?	x		
		G	raphical Data	Review			
1. Has a posting	plot been created?		<u></u>	<u></u>			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 Analys	iis			
1. Are all sample	measurements below	v the DCGL <sub>w</sub> (	Class 1 & 2), or	0.5 DCGLw (Class 3)?	X		
2. Is the mean of	the sample data < D	CGLw?		<u></u>	X		
<ol> <li>If elevated are elevated area</li> </ol>	as have been identifie < DCGL <sub>EMC</sub> (Class 1	ed by scans an ), < DCGL <sub>W</sub> (0	d/or sampling, in Class 2), or <0.5	s the average activity in each DCGL <sub>W</sub> (Class 3)?			X
4. Is the result of	the Elevated Measur	ements Test <	1.0?				X
5. is the result of	the statistical test (S-	+ for Sign Test	or Wr for WRS	Test) $\geq$ the critical value?			X
Comments:				,			
FSS/Characteriza	ation Engineer (print/s	ign)	ale Ran	dat But Ruloll	Date	7-1	12-0
FSS/ Characteriz	ation Manager (print/s	sign)	<u>A</u>	R. Case	Date	7/25	107
						For CS-0 Rev	rm 09/2 v 0

SECTION 7 ATTACHMENT 4 1 DISC

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Survey Unit Release Record								
Design #	EP-Rx 151	Revision #	Original	Page 1	of 3			
Survey Unit #(s)	Rx 151							
Description	<ul> <li>i) Encoded a product of point of the product of the definition of on both definition of the d</li></ul>							
	Approval Sign	atures			Date:			
FSS/Characterization Engineer Och Rulall 7-14-					4-07			
Technical Reviewer (FSS/Characterization Engineer)								
FSS/Characterization	Manager	MICO	R. Case	7/2	5/07			
		ר רעס []	Y		Form CS-09/1 Rev 0			

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FSS Design # EP Rx 15	1	
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**Revision # Original** 

Survey Unit: Rx 151

#### 1.0 History/Description

- 1.1 The subject pipe system is the 3" Quad "B" spare DI water system line.
- 1.2 EP Rx 151 consists of approximately 21 feet in length from the Reactor Building -25' elevation to Quad "B".
- 2.0 Survey Design Information
  - 2.1 EP Rx 151 was surveyed IAW Procedure #BSI/LVS-002.
  - 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 21 survey measurements.
  - 2.3 Surface area for the 3" ID piping is 729.7 cm<sup>2</sup> for each foot of piping, corresponding to a total 3" ID piping surface area of 15,330 cm<sup>2</sup> (1.5 m<sup>2</sup>) for the entire length of (21') of 3" 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 151 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.

FSS	Design	#	EP	Rx	151	
100	Dosign		1.11	104	1.5.1	

**Revision # Original** 

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Survey Unit: Rx 151

#### 5.5 Statistical Summary Table

	3"
Statistical Parameter	Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	7
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0105
Median	0.0098
Standard Deviation	0.0048
Maximum	0.0199
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 Rx 151 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.011 mrem/yr based on the average of the actual gross counts.
- 7.0 Attachments

Attachment 1 – BSI EP/BP Survey Report Attachment 2 – Pipe Interior Radiological Survey Form Attachment 3 – DQA Worksheet Attachment 4 – EP RX 151 SURR & Spreadsheet Disc SECTION 7 ATTACHMENT 1 2 PAGE(S)

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BOCK BSI EP/BP SURVEY REPORT						
Pipe ID	Rx 151	Survey Location	Quad B Spare line			
Survey Date	13- <b>De</b> c-05	2350-1 #	212223			
Survey Time	08:24	Detector-Sled #	44-62 204402/101			
Pipe Size	3"	Detector Efficiency	0.00014			
DCGL (dpm/100cm2)	2.41E+05	Pipe Area incorporated by Detector Efficiency (in cm2)	730			
Pipe Area Incorporated by	1.5	Field BKG (cpm)	5.2			
Routine Survey	Y		10.8			
Routine Survey	^		10.0			
QA Survey		Nominal MDC (4pm/100cm2)	2,842			
		Survey Measurement Results				
	Total Number of Survey Measurements					
	Number of Mea	asurements >MDC	7			
	0					
	0					
	0.0105					
	0.0098					
	0.0048					
	Max	ximum	0.0199			
· 	Mir	nimum	0.0042			
Survey T	echnician(s)	ROSENHAGEN				
	and the second second second	مریکی میکند. میکند میکند است. است است با				
	Survey Unit	Classification	1			
	TBD 06-004	Piping Group	2			
	SR-13 Radionuclid	e Distribution Sample	EP 2-1			
	Measured Nuclide					
	No					
	Pass					
MREM/YR Contribution <1						
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED						
RP Engi	RP Engineer   Date Och Rowlord 7-14-07					

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## EP Rx 151 3" 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 acti∨ity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
- 1	- 1	1	7 143	979	508	8	6	0	28	0.004
2		2	14,286	1,958	1,015	16	11	1	56	0.008
2	17	17	12,143	1,664	863	14	10	1	48	0.007
- J	27	2.7	19.286	2,643	1,370	22	15	1	76	0.011
5	23	2.3	16,429	2,251	1,167	19	13	1	65	0.010
6	43	4.3	30,714	4,209	2,183	35	25	2	121	0.018
7	3.3	3.3	23,571	3,230	1,675	27	19	2	93	0.014
8	1.3	1.3	9,286	1,273	660	11	7	1	31	0.000
9	4.3	4.3	30,714	4,209	2,183	35	25	2	121	0.010
10	1.3	1.3	9,286	1,273	660	11	7	1	37	0.000
11	1.7	1.7	12,143	1,664	863	14	10	1	40	0.007
12	4.7	4.7	33,571	4,601	2,386	38	27	2	132	0.020
13	3.3	3.3	23,571	3,230	1,675	27	19	2	93	0.014
14	3.3	3.3	23,571	3,230	1,675	27	19	2	93	0.014
15	2.3	2.3	16,429	2,251	1,167	19	13	1	113	0.017
16	4	4	28,571	3,916	2,030	32	23	2	65	0.010
17	2.3	2.3	16,429	2,251	1,167	19	13	1	28	0.010
18	1	1	7,143	979	508	8	6	0	56	0.004
19	2	2	14,286	1,958	1,015	16	11		18	0.000
20	1.7	1.7	12,143	1,664	863	14	10		40	0.007
21	1.7	1.7	12,143	1,664	863	14	10	<b>-</b>		0.007
									MEAN	0.011
						<u> </u>			MEDIAN	0.010
									STD DEV	0.005
				<b></b>					MAX	0.020
				<u> </u>	+				MIN	0.004

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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	Pi	pe Interior Radio	logical Survey Form	
Date:	12-13-05	Time: 08	32 Y	
Building:	RX BLOG	Elevation:	2, Access	Point Area: QUAO B
System: 😽	ENT-ORANDA	Pipe Diameter:		Pipe ID # <u>Q X 151</u>
Type of Surv	ey Investigation	Characterizat	ion Final Survey	) Other
Sled Size	3 *	inch		
Detector:	44-62		Detector ID #:	204402
Cal Date:	11-17-05		Cal Due Date:	11-17-06
Instrument:	2350-1	n na si ya na manana napan ya nguarna ke nakabika n Tana ya na na nakabika na	Instrument ID #:	212223
Cal Date:	11-17-05		Cal Due Date:	11-17-06
From the Dai	ly Pipe Survey Detecto	or Control Form for	the Selected Detector	
Background	Value <u>5.2</u>	cpm		
MDCR <sub>static</sub>	10.8	cpm /		efficiency determination
Efficiency Fa	actor for Pipe Diameter	0.00014	(taken from detector	calibration certificate)
MDC <sub>static</sub>	2842	dpm/100cm <sup>2</sup>		$\mathcal{O}$
Is the MD(	C <sub>static</sub> acceptable?	No (i	f no, adjust sample count tim	e and recalculate MDCR <sub>static</sub> )
Comments:				

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### Pipe Interior Radiological Survey

1.0010108-			······			
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
#	from Opening	(min)	0.000 000000	cpm	cpm	
1	1	3	3	1	-4.2	na
2	2	3	6	Z_	-3,2	
3	3	3	5	1.7	-3.5	
4	4	3	ଟ	2,7	-2.5	
5	5	3	7	2.3	-2.9	
6	Q	3	13	4.3	-0.9	
7	7	3 -	10	3-3	-1.9	
8	8	3	4	1.3	-3.9	
9	9	3	13	4.3	-0.9	
10	10	3	4	1.3	-3,9	1

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Radiological Survey Commenced: Date: 12-13:05 Time: 0824

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Package Page 1 of  $\underline{Z}$ 



12-13-05

I.

#### I.D. & RX 151 QUAD B Feet into Pipe Count Time Net Gross Position $dpm/100cm^2$ Gross Counts from Opening (min) # cpm cpm 3 -3.5 na 11 5 1.7 11 ତ୍ୟାଦାପାରାରାରା ହୋଇ -0.5 12 4.7 12 14 3.3 -1.9 13 13 ιO 3.3 O -1.9 14 E4 2.3 -2.9 15 15 7 -2.2 2 4 16 16 2.3 2.9 7 L 18 18 جع -4.2 1 19 2 9 (0 -3.2 1.7 005 20 20 na 5 12 7 21 21

#### Pipe Interior Radiological Survey Form (Continuation Form)

Package Page 2 of 2

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SECTION 7 ATTACHMENT 3 \_\_\_\_ PAGE(S)

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				DQA Check	Sheet			
Des	sign #	EP Rx 151	Revision #	Original				
Surve	ey Unit #		······································	E	EP Rx 151		·	
	A	······································	Pro	liminary Data	a Review`			
An	iswers to	the following ques	tions shou Release	ld be fully do Record	cumented in the Survey Unit	Yes	No	N//
1. Hav	ve surveys t	been performed in acc	cordance with	survey instruct	ions in the Survey Design?	X		
2. is ti sur	he instrume vey units, or	ntation MDC for struct below 0.5 DCGL <sub>W</sub> for	ture static me or Class 3 sur	easurements bel vey units?	low the $DCGL_W$ for Class 1 and 2			x
3. ist	he instrume	ntation MDC for emb	edded/buried	piping static me	asurements below the DCGLw?	X		
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. Wa	as the instru	mentation MDC for vo	lumetric mea	surements and	smear analysis < 10% DCGL <sub>w</sub> ?			X
5. We use	3. Were the MDCs and assumptions used to develop them appropriate for the instruments and techniques x used to perform the survey?							
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		ļ
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		
			G	raphical Data	Review			
I. Ha	s a posting p	plot been created?						X
2. Has a histogram (or other frequency plot) been created?							L	X
3. Ha	ve other gra	phical data tools been	r created to a	ssist in analyzin	g the data?			X
				Data Analy	sis			<del>.</del>
I. Are	ail sample	measurements below	the DCGLw	(Class 1 & 2), or	r 0.5 DCGLw (Class 3)?	X		<u> </u>
. is ti	he mean of	the sample data < DC	GLw?			X		
3. lfei elev	levated area vated area	as have been identifie < DCGL <sub>EMC</sub> (Class 1)	d by scans ai , <dcgl<sub>W (<sup>(</sup></dcgl<sub>	nd/or sampling, Class 2), or <0.	is the average activity in each 5 DCGLw (Class 3)?			x
l. ist	he result of	the Elevated Measure	ements Test <	: 1.0?				X
5. isti	he result of	the statistical test (S+	for Sign Test	or Wr for WRS	Test) ≥ the critical value?			X
Commen	nts:							
FSS/C	haracteriza	tion Engineer (print/si	gn) 🕖 (	ale Ryn,	Agh Jul Puls	Date	7-14	<u> 1-07</u>
FSS/ C	Characteriza	tion Manager (print/s	ign)		A. R. Case	Date	7/23	510
				V		[	For	rm
							CS-C	10/2

SECTION 7 ATTACHMENT 4 1 DISC

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	Surve	y Unit Release R	ecord				
Design #	EP-Rx 162	Revision #	Original	Page 1 of 3			
Survey Unit #(s)	Rx 162						
Description	<ol> <li>Embedded Pip pipe for Plum Bit</li> <li>EP Rx 162 is Survey Plan (FS</li> <li>Surveys in EF optimized to me</li> <li>Surveys in Survey</li> <li>Survey Instru- in accordance w Work Execution document consti- acquisition of su</li> <li>Instrument ef BSI/LVS-002, W of radiation invol</li> </ol>	pe (EP) Survey Uni rook Reactor Facilit a Class 1, Group 1 SP) and Technical 1 P Rx 162 were perfo- asure gamma energy Request (SR)-13 w ections for this surve ith (IAW) the Babc Package (WEP) 05 itute "Special Methor rvey measurements ficiency determinat WEP 05-006, these of olved and the media	t Rx 162 meets the ty (PBRF). survey unit as per Basis Document ormed using a sci- ies representative vas referenced for ey unit are incorp ock Services Inco 5-006. Survey ins ods" and the surves. ions are developed determinations are being surveyed.	he definition of embedded er the PBRF Final Status (TBD)-06-004. Intillation detector e of Co-60. Sample #EP r this decision. worated into and performed orporated (BSI)/LVS-002, structions described in this yey design used in the ed in accordance with the re appropriate for the types			
	Date:						
FSS/Characterization Engineer				7-15-07			
Technical Rev (FSS/Characterizatio	iewer n Engineer) 💊	Mad	1	7-17-07			
FSS/Characterizatio	n Manager	Man	R. Case	7/25/07			
		0		Form CS-09/1 Rev 0			

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Survey Unit: Rx 162

#### 1.0 History/Description

- 1.1 The subject pipe is the drain line from the dry annulus inside the CV to the drain trench on the Rx Building -25 foot elevation.
- 1.2 EP Rx 162 consists of 2" diameter piping that is approximately 27 feet in length.
- 2.0 Survey Design Information
  - 2.1 EP Rx 162 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 27 survey measurements.
  - 2.3 Surface area for the 2" ID piping is 486 cm<sup>2</sup> for each foot of piping, corresponding to a total 2" ID piping surface area of 13,134 cm<sup>2</sup> (1.3 m<sup>2</sup>) for the entire length of (approximately 27') 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 162 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.

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Revision # Original

Survey Unit: Rx 162

#### 5.5 Statistical Summary Table

	2"
Statistical Parameter	Pipe
Total Number of Survey Measurements	27
Number of Measurements >MDC	0
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0116
Median	0.0094
Standard Deviation	0.0055
Maximum	0.0259
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 Rx 162 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 – EP RX 162 SURR & Spreadsheet Disc

# SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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Pipe ID	Rx 162	Survey Location	CV -25ei.				
Survey Date	1/26/06, 1/30/06, 2/6/06 & 2/09/06	2350-1 #	212223, 203488				
Survey Time	0805, 1250, 1324 & 1050	Detector-Sied #	44-62/204402-12				
Pipe Size	2"	Detector Efficiency	0.00026				
DCGL (dpm/100cm2)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm2)	486				
tipe Area Incorporated by Survey Data (m <sup>2</sup> )	1.3	Field BKG (cpm)	6.4/5.9/5.1/5.1				
Routine Survey	X	Field MDCR (cpm)	11.7/11.3/10.7/10				
QA Survey		Nominal MDC (dpm/100cm2)	7,836				
	S	urvey Measurement Results					
	Total Number of St	urvey Measurements	27				
	Number of Mea	surements >MDC	0				
	Number of Measurem	ents Above 50% DCGL	0				
	Number of Measure	ements Above DCGL	0				
	0.0116						
	0.0094						
	0.0055						
	0.0259						
	0.0024						
ň. 751 - 3	Survey Unit	Classification	1				
	TBD 06-004	Piping Group	11				
	e Distribution Sample	EP 3-9					
		Measured Nuclide					
	Measure	ed Nuclide	00-00				
	Measure Area Facto	ed Nuclide n/EMC Used	No				
	Measure Area Facto Pass/I	ed Nuclide br/EMC Used Fail FSS	No Pass				
	Measure Area Facto Pass/I MREM/YR	ed Nuclide br/EMC Used Fail FSS Contribution	No           Pass           <1				
OMMENTS: CTIVITY VALUE:	Measure Area Facto Pass/I MREM/YR S NOT BACKGROUND	ed Nuclide nr/EMC Used Fail FSS Contribution CORRECTED	No           Pass           <1				

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#### EP Rx 162 2" 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	4	4	15,385	3,163	125	3,000	798	92	22	0.019
2	3.5	3.5	13,462	2,767	110	2,625	698	81	19	0.017
3	0.5	0.5	1,923	395	16	375	100	12	3	0.002
4	3.5	3.5	13,462	2,767	110	2,625	698	81	19	0.017
5	4	4	15,385	3,163	125	3,000	798	92	22	0.019
6	1	1	3,846	791	31	750	199	23	6	0.005
7	1	1	3,846	791	31	750	199	23	6	0.005
8	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
9	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007
10	2	2	7,692	1,581	63	1,500	399	46	11	0.009
11	4	4	15,385	3,163	125	3,000	798	92	22	0.019
12	2	2	7,692	1,581	63	1,500	399	46	11	0.009
13	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007
14	2	2	7,692	1,581	63	1,500	399	46	11	0.009
15	2	2	7,692	1,581	63	1,500	399	46	11	0.009
16	2	2	7,692	1,581	63	1,500	399	46	11	0.009
17	2	2	7,692	1,581	63	1,500	399	46	11	0.009
18	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
19	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
20	5.5	5.5	21,154	4,349	172	4,125	1,097	127	30	0.026
21	4	4	15,385	3,163	125	3,000	798	92	22	0.019
22	2	2	7,692	1,581	63	1,500	399	46	11	0.009
23	2	2	7,692	1,581	63	1,500	399	46	11	0.009
24	3	3	11,538	2,372	94	2,250	598	69	17	0.014
25	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007
26	3	3	11,538	2,372	94	2,250	598	69	17	0.014
1 27	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007

#### EP Rx 162 2" 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
									MEAN	0.012
									MEDIAN	0.009
									STD DEV	0.005
L									MAX	0.026
									MIN	0.002

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# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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Date:	1-26-06	_ Time:	1805	
Building:	RX	Elevation:	<u>25</u> Acc	cess Point Area: ANNULLUS
System:		Pipe Diameter:	<u></u>	Pipe ID # <u>R X 16</u> 2
Type of Surv	ey Investigation	Characteriz	ation Final Surve	Other 1/
Sled Size Z	"VINYL AUGON 4/21	inch		
Detector:	44.62		_ Detector ID #:	204402-5/10121
Cal Date:	11-17-05		_ Cal Due Date:	11-17-06
Instrument:	2350-1	· · · · · · · · · · · · · · · · · · ·	Instrument ID #:	2/2223
Cal Date:	11-17-05		_ Cal Due Date:	11-17-06
From the Dail Background V MDCR <sub>static</sub> Efficiency Fa	ly Pipe Survey Detect Value $6.4$ (1.7) ctor for Pipe Diameter 7836	cpm cpm <u>cpm</u> <u><b>O-00026</b> dpm/100cm<sup>2</sup></u>	or the Selected Detect	cor ector <del>calibration certificate) Z</del>
From the Dail Background V MDCR <sub>static</sub> Efficiency Fa MDC <sub>static</sub> Is the MDC	ly Pipe Survey Detect Value $6 - 4$ (1, 7) ctor for Pipe Diameter 7836 Curatic acceptable? $6$	or Control Form f cpm cpm <u><b>O-00026</b></u> dpm/100cm <sup>2</sup> es No	or the Selected Detect(taken from dete (if no, adjust sample cour	ector <del>calibration certificate)</del>

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### Pipe Interior Radiological Survey

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Radiologi	cal Survey Comm	enced: Date: <u>/-</u>	<u>26.06</u> Ti	me: <u>0805</u>		
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	l	2	G	4	na	na
2	Z	2	7	3.5	1	),
3						
4						
5						
6				a		
7			$\sim 10^{-1}$			
8						
9						
10						

Package Page 1 of \_/\_

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Pip	e Interior Radiological Survey Fo	orm
Date: <u>1-30-06</u>	Time: <u>1250</u>	
Building: <u>RX</u>	Elevation A	Access Point <u>CABLE TRENCH</u>
System: <u>SCUPPER DRAIN</u>	Pipe Diameter:	Area: Pipe ID <u>RX/62</u>
Type of Survey Investigation	Characterization Final Su	rvey <sup>#</sup> Other
Sled Size Z"VINYLALLOZ#121	inch	
Detector: <u>44-62</u>	Detector ID #:	804402-121
Cal Date:5_	Cal Due Date:	11-17-06
Instrument: 2350-1	Instrument ID ;	#: _2/222_3
Cal Date: <u>11-17-05</u>	Cal Due Date:	11-17-06
From the Daily Pipe Survey Detect	or Control Form for the Selected	Detector
Background Value 5.9	cpm	
MDCR <sub>static</sub> <u>11.3</u>	cpm	- Hierry determination
Efficiency Factor for Pipe	0.00026 (taken from o	detector calibration certificate) Ju
Diameter MDC <sub>static</sub> 7836	dpm/100cm <sup>2</sup>	V
Is the MDC <sub>static</sub> Yes	No (if no, adjust sample co	ount time and recalculate MDCR <sub>static</sub> )
Constitute? CONTINUATIO	N- POSISTION 1	TAILEN FROM
CADLE TRINCH		
		COMPLETE

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#### Pipe Interior Radiological Survey

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Radiologi	ical Survey Com	menced: Date: _/	-30-06	Time: <u>1257</u>	2	
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1		2	1	.5	na	na
2	2	2	7	3.5	1	)
3	3	2	E	4		
4	Ч	2	2	1		
5	5	2	2			
6	6	2	5	2.5		
7	7	Z	3	1.5		
8	も	2	4	2,		
9	9	Z	B	4		
10	10	2	4	2	¥	

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#### Pipe Interior Radiological Survey Form (Continuation Form) SCAPPER DRAIN #RX/62 Position Feet into Pipe Count Time Gross 0' RX BLOG 1-30-06 Net Gross $dpm/100cm^2$ Gross from Opening (min) cpm # cpm Counts 1.5 na nla 11 2 11 2 Z 12 4 2 2 1 $\frac{1}{13}$ 2 3 4 <u>4</u> 4 2 2 14 Z Ч 1 15 15 22222 2.5 2.5 5.5 The TU 5 ٦ 17 5 $\mathcal{B}$ 8 11 <u>4</u> 2 9 19 Ċ 20 2 20 4

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Attachment 3, Page 2



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<b>Pipe Interior</b>	Radiological	<b>Survey Form</b>
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Date: 8-6-04	Time: /	324	
Building: $\mathcal{R} \times$	Elevation:	- 2 5 Access P	oint Area: Auruns
System: D-A TO 1.51	Pipe Diameter:	2"	Pipe ID # $\frac{2}{RX} / \frac{62}{T_0}$
Type of Survey Investigation	Characterizat	ion Final Survey	Other Conter Birde
Sled Size	inch		
Detector: <u>44-67</u>		Detector ID #:	204402
Cal Date: // - / 7 - 0	5	Cal Due Date:	11-17-06
Instrument: 2350-1	: ·	Instrument ID #:	2(2223
Cal Date: //-17-0	-4	Cal Due Date:	11-17-06
From the Daily Pipe Survey Detector Background Value <u>5.1</u> MDCR <sub>static</sub> <u>10.7</u> Efficiency Factor for Pipe Diameter MDC <sub>static</sub> <u>7836</u> Is the MDC <sub>static</sub> acceptable? Yes Comments: CONTINIAT	r Control Form for cpm $O \circ O O O O O O O O O O O O O O O O O O$	the Selected Detector (taken from detector e (taken from detector e	Hickoncy determination alibration cortificate) and recalculate MDCR <sub>static</sub> )
		/	

#### Pipe Interior Radiological Survey

Radiologi	cal Survey Comin	ienceu. Date. <u>*</u>		ne	<u> </u>	
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	A	2	4	2	nia	nla
2	Ð	2	4	3	J	L.
3						
4						
5						
6						
7			5			
8						
9						
10						

Radiological Survey Commenced: Date: 2.6-0 6 Time: 13>4



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BSI/LVSPipeCrawler-002	
Revision 4	ŀ

#### Pipe Interior Radiological Survey Form

1)

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Date:	2.9-	06	Time:	1050			
Pipe ID#:	RXI62	Horiz	Pipe Diameter:	Z ( '	Access	Point Area:	-25 ANNULLIS
Building:	REAL	ron	Elevation:	-25	Sy	stem:	
Type of Su	rvey Inv	estigation	Charact	terization	Final Survey	, Oth	er
Gross			Co60		Cs		
Detector	r ID# / Sled	<b>D</b> #	44-62 20	044521	171		
Detector (	Cal Date:	17	- Nov -05	Detector Cal D	ue Date:	17-5	207-06
Instru	ment:	2	350 - 1	Instrument	ID #:	203	488
Instrument	Cal Date:	12-	1000 - 05	Instrument Cal	Due Date:	17-13	100 - 06
From the D Backgroun MDCR <sub>static</sub>	Daily Pipe'S d Value	urvey De <u>5.</u> / <u>10. 7</u>	tector Control Fo cpm cpm	rm for the Selecto	ed Detector		
Efficiency	Factor for F	ipe Dian	neter <u>0-000</u>	(from d	etector efficie	ency determin	ation)
MDC <sub>static</sub>	788	6,	dpm/ loc	<u> </u>			
Is the MDC	Static accept	able?	Yes No	(if no, adjust sa	imple count time	e and recalculate	MDCR <sub>static</sub> )
Comments	6	APTIN Y	ATION	Jul c/	·		
				····			
					20	~	······································

Technician 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	2	3	1.5	nia	nia
2	2	2	4	3		
3	3	2	3	1.5		
4						
5						
6				$\overline{\mathcal{O}}$		
7	4		N			
8						
9						
10					·	

Package Page 1 of \_\_\_\_\_



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# SECTION 7 ATTACHMENT 3

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SECTION 7 ATTACHMENT 1 \_\_\_\_\_PAGE(S)

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			DQA Chec	k Sheet				_
Design #	EP Rx 162	Revision #	Original					
Survey Unit #			<u> </u>	EP 162				
	· · · · · · · · · · · · · · · · · · ·	Pre	liminary Da	ata Review`				
Answers to	the following que	stions shoul Release	d be fully d Record	locumented in t	the Survey Unit	Yes	No	N//
. Have surveys	peen performed in a	ccordance with	survey instru	ctions in the Surv	ey Design?	X		
2. Is the instrume survey units, or	ntation MDC for stru below 0.5 DCGLw	cture static me for Class 3 surv	asurements t ey units?	pelow the DCGL <sub>W</sub>	for Class 1 and 2			x
8. Is the instrume	ntation MDC for em	bedded/buried	piping static r	neasurements bel	ow the DCGL <sub>w</sub> ?	X		
<ol> <li>Was the instrument of the instrumen</li></ol>	mentation MDC for s ied piping scan mea ments or soil sample	structure scan m surements belo es addressed in	neasurement w the DCGL the survey d	s, soil scan meası <sub>w,</sub> or, if not, was th lesign?	irements, and e need for additional			x
5. Was the instru	mentation MDC for v	volumetric meas	urements an	d smear analysis	< 10% DCGL <sub>w</sub> ?			X
<ol> <li>Were the MDC used to perform</li> </ol>	s and assumptions n the survey?	used to develop	them appro	priate for the instru	uments and techniques	x	i 	
7. Were the surve media being su	ey methods used to urveyed?	collect data pro	per for the ty	pes of radiation in	volved and for the	x		
8. Were "Special	Methods" for data c	ollection proper	y applied for	the survey unit ur	ider review?	X		
<ol> <li>Is the data set design, which a</li> </ol>	comprised of qualifi accurately reflects th	ed measuremer le radiological s	nt results coll tatus of the f	ected in accordan acility?	ce with the survey	x		
		G	raphical Da	ta Review			<u> </u>	<del>.</del>
1. Has a posting	plot been created?							×
2. Has a histogra	m (or other frequence	cy plot) been cre	eated?					X
3. Have other gra	phical data tools be	en created to as	ssist in analy	zing the data?				X
			Data Ana	alysis				
I. Are all sample	measurements belo	w the DCGL <sub>W</sub> (	Class 1 & 2),	or 0.5 DCGL <sub>w</sub> (C	lass 3)?	X		
2. Is the mean of	the sample data < [	OCGLw?				X		
<ol> <li>If elevated area elevated area</li> </ol>	as have been identif < DCGL <sub>EMC</sub> (Class	ied by scans an 1), < DCGL <sub>W</sub> (0	d/or samplin Class 2), or <	g, is the average a 0.5 DCGL <sub>W</sub> (Clas	activity in each s 3)?			X
4. Is the result of	the Elevated Measu	rements Test <	1.0?					X
5. Is the result of	the statistical test (S	+ for Sign Test	or W <sub>r</sub> for W	$RS Test) \ge the crit$	ical value?			X
Comments:					<u> </u>	<i>(</i>		
FSS/Characteriza	tion Engineer (print/	sign)	le Ry	actally (	Tel Indal	Date	7-1	5-9
FSS/ Characteriza	ation Manager (print	'sign)		Allen	R. Case	Date	7/2	510
			V	-		ſ	For	m
							CS-C	)9/2
							Rev	v 0 -

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Survey Unit Release Record					
Design #	EP-Rx 163	Revision #	Original	Page 1 of 3	
Survey Unit #(s)		<b> </b>	Rx 163		
Description	Survey Cant n(s)       IX 103         1) Embedded Pipe (EP) Survey Unit Rx 163 meets the definition of embedd pipe for Plum Brook Reactor Facility (PBRF).         2) EP Rx 163 is a Class 1, Group 1 survey unit as per the PBRF Final Statu Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.         3) Surveys in EP Rx 163 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #E 3-9 from Survey Request (SR)-13 was referenced for this decision.         4) Survey Instructions for this survey unit are incorporated into and perform in accordance with (IAW) the Babcock Services Incorporated (BSI)/LVS-00 Work Execution Package (WEP) 05-006. Survey instructions described in 1 document constitute "Special Methods" and the survey design used in the acquisition of survey measurements.         5) Instrument efficiency determinations are developed in accordance with t BSI/LVS-002, WEP 05-006, these determinations are appropriate for the ty of radiation involved and the media being surveyed.				
	Approval Sign	atures	·····	Date:	
FSS/Characterization	n Engineer	Och Kan	ull	7-15-07	
Technical Reviewer (FSS/Characterization Engineer)					
FSS/Characterization Manager Market R. Case 7/2 5/07					
			Ϋ́	Form CS-09/1 Rev 0	

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Revision # Original

Survey Unit: Rx 163

#### 1.0 History/Description

- 1.1 The subject pipe is the drain line from the dry annulus inside the CV to the drain trench on the Rx Building -25 foot elevation.
- 1.2 EP Rx 163 consists of 2" diameter piping that is approximately 23 feet in length.
- 2.0 Survey Design Information
  - 2.1 EP Rx 163 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 23 survey measurements.
  - 2.3 Surface area for the 2" ID piping is 486 cm<sup>2</sup> for each foot of piping, corresponding to a total 2" ID piping surface area of 7,783 cm<sup>2</sup> (0.8 m<sup>2</sup>) for the entire length of (approximately 23') 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 163 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.

FSS Desig	n # EP	Rx	163	
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Revision # Original

Page 3 of 3

Survey Unit: Rx 163

#### 5.5 Statistical Summary Table

	2"
Statistical Parameter	Pipe
Total Number of Survey Measurements	26
Number of Measurements >MDC	0
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0129
Median	0.0130
Standard Deviation	0.0051
Maximum	0.0234
Minimum	

- 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 163 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.013 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 – EP RX 163 SURR & Spreadsheet Disc

# SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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STOUGES NO	BSI EP	BP SURVET REPORT				
Pipe ID	Rx 163	Survey Location	Annulus -25el.			
Survey Date	1/26/06, 1/30/06, 2/6/06	2350-1 #	212223			
Survey Time	2/0/00 Invey Time 0815, 1350, 1250 Detector-Sled #					
Pine Size	2"	Detector Efficiency	0.00026/0.00021			
	2 41E+05	Pipe Area incorporated by Detector Efficiency (in cm2)	486			
Pipe Area Incorporated by	13	Field BKG (mm)	6 4/5 9/5 1			
<u>Survey Data (m²)</u> Routine Survey	×		11 7/11 3/10 7			
			7836/9701			
	S	Invery Measurement Results	1 100000101			
<u></u>	Total Number of Su	rvev Measurements	26			
	Number of Meas	surements >MDC	0			
	Number of Measureme	ents Above 50% DCGL				
	Number of Measure	ments Above DCGI	0			
	Me		0.0129			
······	Me	dian	0.0120			
	0.0051					
	0.0031					
<u> </u>	0.0204					
	Survey Unit	Classification	1			
	1					
	EP 3-9					
	Measured Nuclide					
<u> </u>	Area Factor/EMC Used					
	Area Factor	r/EMC Used				
······································	Area Factor Pass/F	ail FSS	Pass			
	Area Factor Pass/F MREM/YR	ail FSS Contribution	Pass <1			

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#### EP Rx 163 2" 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	2	2	7,692	1,581	63	1,500	399	46	11	0.009
2	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
3	3.5	3.5	13,462	2,767	110	2,625	698	81	19	0.017
4	1	1	3,846	791	31	750	199	23	6	0.005
5	2	2	7,692	1,581	63	1,500	399	46	11	0.009
6	2	2	7,692	1,581	63	1,500	399	46	11	0.009
7	2	2	7,692	1,581	63	1,500	399	46	11	0.009
8	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
9	4	4	15,385	3,163	125	3,000	798	92	22	0.019
10	2	2	7,692	1,581	63	1,500	399	46	11	0.009
11	4.5	4.5	17,308	3,558	141	3,375	897	104	25	0.021
12	3.5	3.5	13,462	2,767	110	2,625	698	81	19	0.017
13	3	3	11,538	2,372	94	2,250	598	69	17	0.014
14	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007
15	2	2	7,692	1,581	63	1,500	399	46	11	0.009
16	2	2	7,692	1,581	63	1,500	399	46	11	0.009
17	3	3	11,538	2,372	94	2,250	598	69	17	0.014
18	1	1	3,846	791	31	750	199	23	6	0.005
19	1	1	3,846	791	31	750	199	23	6	0.005
20	3	3	11,538	2,372	94	2,250	598	69	17	0.014
21	4	4	15,385	3,163	125	3,000	/98	92	22	0.019
22	3.5	3.5	13,462	2,767	110	2,025	098	81	19	0.017
23	4	4	19,048	3,916	155	3,/14	987	74	21	0.023
24	2.5	2.5	11,905	2,447	97	2,322			17	0.015
25	3	3	14,286	2,937	116	2,780	741	00	20	0.010
1 26	i∣ 3	3 3	14,286	2,937	116	2,780	/41	00	20	1.0.010

#### EP Rx 163 2" 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
										0.042
									MEAN	0.013
									MEDIAN	0.013
									STD DEV	0.005
									MAX	0.023
									MIN	0.005

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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Date: _/	-26-06	Time:	0315	
Building:	RX	Elevation:	-25	Access Point Area: ANNULCUS
System:		Pipe Diamete	er: <u>2</u> <sup><i>n</i></sup>	Pipe ID # $R \times 163$
Type of Survey	Investigation	Characte	rization Final Su	urvey Other
Sled Size Z" V	WYL PULLOR 121	inch		
Detector:	44.62	·	Detector ID #:	204402-32
Cal Date:	11-17-05		Cal Due Date:	11-17-06
Instrument:	2350-1	······································	Instrument ID #	212223
Cal Date:	17-17.05		Cal Due Date:	11-17-06
From the Daily Background Va MDCR <sub>static</sub> Efficiency Facto MDC <sub>static</sub> Is the MDC <sub>sta</sub>	Pipe Survey Detector lue $6.4$ 7.67 or for Pipe Diameter <b>7836</b> the acceptable? (Ye	cpm cpm <u>0,00020</u> dpm/100cm <sup>2</sup> s	<ul> <li>for the Selected Det</li> <li>(taken from details)</li> <li>(if no, adjust sample details)</li> </ul>	efficiency determinal letector-calibration cottificate)
Comments:	NITIAL SUR	VIY- PC	SITIONS 1+2	2 TAK(N) FROM
Annull	r t	· 1		

Pipe Interior Radiological Survey Form

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#### Pipe Interior Radiological Survey

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Radiological Survey Commenced: Date: 1-26-06 Time: 0815							
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>	
1	1	2	4	2	na	nlas	
2	2	2	5	2.3	4	V	
3							
4		_					
5				0			
6							
7			r				
8						$\checkmark$	
9							
10							

Package Page 1 of \_/\_

Attachment 3, Page 1




Pipe Interior Radiological Survey Form
Date: 1. 30.06 Time: 1350
Building: REACTON Elevation O Access Point OFLEV CABLE TRench
System: 2" Suupper Des." Pipe Diameter: 2" Area: Pipe ID Rx 143
Type of Survey Investigation Characterization Final Survey # Other
Sled Size 2 viny Puller inch
Detector: $44-62$ Detector ID #: $204402 - {}^{3}41777777777777777777777777777777777777$
Cal Date: Cal Due Date: /1.17-06
Instrument: $2350-1$ Instrument ID #: $2(2223)$
Cal Date: //7.05 Cal Due Date: //7.06
From the Daily Pipe Survey Detector Control Form for the Selected Detector
Background Value <u>5.9</u> cpm
MDCR <sub>static</sub> //.3 cpm
Efficiency Factor for Pipe 0.00026 (taken from detector calibration certificate)
$\frac{\text{Diameter}}{\text{MDC}_{\text{static}}} 7836  \text{dpm}/100 \text{cm}^2$
Is the MDC <sub>static</sub> (Yes) No (if no, adjust sample count time and recalculate MDCR <sub>static</sub> )
Constitution Survey
LOSITION TALLEN FROM CARLE TREACH
COMPLETE

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## Pipe Interior Radiological Survey

rtudiolog						
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	1	2	7	3-5	na	nla
2	2		2	1	]	
3	3		4	2		
4	d		4	2		
5	5		H	2		
6	4		5	2.5		
7	?		8	4		
8	8		4	2		
9	9		9	4.5		
10	10		7	3.5	¥	

## Radiological Survey Commenced: Date: 1350 Dime: 1350

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Package Page 1 of

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Pipe Interior Radiological Survey Form (Continuation Form) 1.30.06 Rx 163 Count Time Feet into Pipe Net  $dpm/100cm^2$ Position Gross Gross cpm 3 from Opening (min) # cpm Counts 6 3 Ma Z τl Na 11 12 ZZ 15 12 13 3 Z 4 4 2 Z 4 62 2\_ 3 5 2 16 16 2 2 11 2 1 2 3 6 18 18 4 19 19 2 20 20 7 3 - 5 Ъ

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	11		logical Sulvey			
Date:	2.6.04	Time: /e	250			
Building:	IZX	Elevation:	125	Access Point Are	ea: Anula	245
System:	D-C TO1-51	Pipe Diameter:	2''	Pipe II	)# <u>2x163</u>	APAT TO
Type of Surve	y Investigation	Characterizati	ion Final S	Survey O	ther	List
Sled Size	NO SCEN	inch				
Detector:	44-62		Detector ID #:	7	04402	
Cal Date:	11-17-0	5	Cal Due Date:		- 17-06	
Instrument:	2350-	)	Instrument ID	#:2	17233	
Cal Date:	11.17-0	15	Cal Due Date:	/	1-17-06	
From the Daily Background V MDCR <sub>static</sub> Efficiency Fac MDC <sub>static</sub> Is the MDC <sub>s</sub> Comments:	y Pipe Survey Detector falue $5 - 1$ $10 \cdot 7$ tor for Pipe Diameter 9,701 static acceptable? Yes Control UA	or Control Form for cpm cpm $\underline{O \cdot OOO21}$ $dpm/100cm^2$ s No (ii) $\overline{T, 3M}$	the Selected D (taken from f no, adjust sample	etector efficient detector <del>calibration</del> <u>count time and recal</u>	ency deter on celtificate) culate MDCR <sub>static</sub> )	mination

### Pipe Interior Radiological Survey

Radiologi	cal Survey Comm	enced: Date:	2-6-06 Ti	me: <u>17</u>	50	
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	1	2	8	4	na	na
2	7	2	5	2-5	1	
3	3	2	4	3		
4					<b>P</b>	
5						
6					a	
7				n		
8						
9						
10						

Pipe Interior Radiological Survey Form

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Attachment 3, Page 1

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Date:	2.6.04	Time:	317	
Building:	Rx,	Elevation:	-25	Access Point Area: Auruns
System:	D-C TIISI	Pipe Diameter:	2''	Pipe ID # Rx 163 To Come Bone
Type of Surve	y Investigation	Characterizat	ion Final S	Survey Other
Sled Size	No Scas	inch		
Detector:	44-62	······	Detector ID #:	204402
Cal Date:	11.1700	5	Cal Due Date:	11-17-06
Instrument:	2350-1		Instrument ID	#: 212223
Cal Date:	11-17-0	5	Cal Due Date:	11-17-06
From the Daily Background V MDCR <sub>static</sub> Efficiency Fac MDC <sub>static</sub> Is the MDC Comments:	y Pipe Survey Detecto alue $5 \cdot 1$ $10 \cdot 7$ tor for Pipe Diameter 97D1 static acceptable? Ye	r Control Form for cpm $O \circ O O O 2 [$ dpm/100cm <sup>2</sup> s No (i $A \tau : \delta \sim 5$	the Selected D (taken from f no, adjust sample $a A f E \neq$	etector efficiency determination detector calibration certificate) e count time and recalculate MDCR <sub>static</sub> )
			<u> </u>	Compte E

### Pipe Interior Radiological Survey

Radiologi	cal Survey Commo	enced:Date:_2	·6.06 Tin	ne: <u>1317</u>		
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	1	2	4	3	nia	nla
2						
3		······				
4						
5						
6				a		
7			81			
8						
9						
10						

Pipe Interior Radiological Survey Form

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# SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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			DQA Check	Sheet			
Design #	EP Rx 163	Revision #	Original				
Survey Unit #			E	P Rx 163			
	▲ <u></u>	Pre	liminary Data	Review`			
Answers to	the following que	stions shoul Release	d be fully doo Record	cumented in the Survey Unit	Yes	No	N//
. Have surveys	been performed in ac	cordance with	survey instructi	ons in the Survey Design?	X		
2. Is the instrume survey units, c	entation MDC for strue or below 0.5 DCGLw f	cture static me or Class 3 surv	asurements bei vey units?	bw the $DCGL_W$ for Class 1 and 2			x
B. Is the instrume	entation MDC for emb	edded/buried	piping static me	asurements below the DCGLw?	X		
<ul> <li>Was the instruet embedded/but static measure</li> </ul>	mentation MDC for stried piping scan measements or soil sample	tructure scan n surements belo s addressed in	neasurements, s w the DCGLw, o the survey des	soil scan measurements, and or, if not, was the need for additional ign?			x
5. Was the instru	mentation MDC for v	olumetric meas	surements and	smear analysis < 10% DCGLw?			X
<ol> <li>Were the MDC used to perform</li> </ol>	Cs and assumptions u m the survey?	sed to develop	o them appropria	ate for the instruments and techniques	x		
<ol> <li>Were the surv media being s</li> </ol>	ey methods used to a urveyed?	ollect data pro	per for the type:	s of radiation involved and for the	x		
3. Were "Special	Methods" for data co	llection proper	ly applied for the	e survey unit under review?	X		
). Is the data set design, which	comprised of qualifie accurately reflects the	d measuremen e radiological s	nt results collect status of the faci	ed in accordance with the survey lity?	x		
		G	raphical Data	Review	·· <del>• • • • • • • • • • • • • • • • • • </del>		<del></del>
. Has a posting	plot been created?						X
2. Has a histogra	im (or other frequency	y plot) been cre	eated?				X
B. Have other gra	aphical data tools bee	n created to a	ssist in analyzin	g the data?			X
			Data Analy	<b>Sis</b>			<del></del>
i. Are all sample	measurements below	w the DCGL <sub>W</sub> (	Class 1 & 2), or	0.5 DCGLw (Class 3)?	X		ļ
2. Is the mean of	the sample data < D	CGLw?			X		ļ
<ol> <li>If elevated are elevated area</li> </ol>	as have been identified < DCGL <sub>EMC</sub> (Class 1	ed by scans an ), < DCGL <sub>W</sub> ((	d/or sampling, i Class 2), or <0.	s the average activity in each 5 DCGL <sub>W</sub> (Class 3)?			X
I. Is the result of	the Elevated Measur	ements Test <	1.0?				X
5. Is the result of	the statistical test (S	+ for Sign Test	or Wr for WRS	Test) $\geq$ the critical value?		_	X
Comments:							-
FSS/Characteriza	ation Engineer (print/s	iign)	ale Raude	at 1And Amlet	Date	7-1.	5-0
FSS/ Characteriz	ation Manager (print/s	sign)	11/	R. Case	Date	The	-107
						For CS-( Rev	rm 09/2 v 0

SECTION 7 ATTACHMENT 4 1 DISC

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	Surve	y Unit Release R	ecord	
Design #	EP-1.37	Revision #	Original	Page 1 of 3
Survey Unit #(s)		<u></u>	1.37	
Description	<ol> <li>Embedded Pi pipe for Plum B</li> <li>EP 1.37 is a C Survey Plan (FS</li> <li>Surveys in El to measure gam Survey Request</li> <li>Survey Instru in accordance w Work Execution document consti acquisition of su</li> <li>Instrument ef BSI/LVS-002, V of radiation invol</li> </ol>	pe (EP) Survey Uni rook Reactor Facilit Class 1, Group 2 sur SP) and Technical I P 1.37 were perform ma energies represe (SR)-13 was referen (SR)-13 was referen totions for this surve ith (IAW) the Babc Package (WEP) 05 itute "Special Metho rvey measurements ficiency determination WEP 05-006, these colved and the media	t 1.37 meets the by (PBRF). vey unit as per t Basis Document and using a scint ntative of Co-60 need for this dec ey unit are incorp ock Services Incorpock Services Incorpock Services Incorpock Services Incorpock of Services Incorpock Services Incorpock incods" and the sur	e definition of embedded the PBRF Final Status t (TBD)-06-004. iillation detector optimized ). Sample #EP 2-1 from cision. porated into and performed corporated (BSI)/LVS-002, structions described in this vey design used in the ped in accordance with the are appropriate for the types
	Approval Sig	natures		Date:
FSS/Characterizatio	n Engineer	Dal Role	A	6-12-07
Technical Rev (FSS/Characterizatio	iewer n Engineer)	Milon		6-29-07
FSS/Characterizatio	n Manager	Man	R. Case	7/18/07
			)PY	Form CS-09/1 Rev 0

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1.0				
<b>T10</b>	Histo	ry/Description		
	1.1	The subject pip this pipe was to HD sump in Pu currently bread	be system is the 3" purge line for o convey water from the one 3 ir ump Room #22 on the Rx Buildi whed.	Canal "E". The function of the riser in Canal "E" to the ng -25 ft, where the pipe is
	1.2	EP 1.37 consis to the riser in C mitered elbows	ts of approximately 32 feet in leact the section has a canal "E". The pipe section has a sranging from 45° to 90°.	ngth from the pump room in approximately three
2.0	Surve	ey Design Inform	ation	
	2.1	EP 1.37 was su	urveyed IAW Procedure #BSI/L	VS-002.
	2.2	100% of the 3' pipe was surve total of 36 surv	" ID pipe was accessible for surveyed by static measurement at on vey measurements.	ey. The accessible 3" ID e foot increments, for a
	2.3	Surface area for corresponding for the entire le	or the 3" ID piping is 729.7 cm <sup>2</sup> f to a total 3" ID piping surface as ength of $(36')$ of 3" piping	For each foot of piping, rea of 26,280.6 cm <sup>2</sup> (2.6 m <sup>2</sup>
3.0	Surve	ey Unit Measuren	nent Locations/Data	
	3.1	Pipe interior ra this release rec	adiological survey forms are prov	vided in Attachment 2 of
4.0	Surve	ey Unit Investigat	tions/Results	
	4.1	None		
5.0	Data	Assessment Resu	ılts	
	5.1	Data assessmer Report provide	nt results are provided in the EP/ ed in Attachment 1.	Buried Pipe (BP) Survey
	5.2	All measureme Level (DCGL) mrem/yr dose	ent results are less than the Deriv for radionuclide specific EP tha goal established in Table 3-3 of t	ed Concentration Guidelin t corresponds to the 1 the FSSP.
	5.3	When impleme FSSP, and app the survey unit	enting the Unity Rule, provided i lying the Nuclide Fraction (NF), that is constituted by EP 1.37 pa	n Section 3.6.3 of the provided in TBD-06-004, asses FSS.
	5.4	Background wa Elevated Meas survey unit.	as not subtracted from the survey surement Comparison (EMC) wa	y measurements and the s not employed for this

FSS Design # EP 1.37	Revision # Original	Page 3 of 3
Survey Unit: 1.37		

### 5.5 Statistical Summary Table

	3"
Statistical Parameter	Pipe
Total Number of Survey Measurements	36
Number of Measurements >MDC	31
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.018
Median	0.020
Standard Deviation	0.007
Maximum	0.034
Minimum	0.004

- 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 1.37 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.018 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 1.37 & Spreadsheet

# SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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Pipe ID	1.37	Survey Location	-27 TRENCH
Survey Date	12-13-05/12-15-05	2350-1 #	212223
Survey Time	1305/1100	Detector-Sled #	44-62/204402-10
Pipe Size	3″	Detector Efficiency	0.00014
DCGL (dpm/100cm2)	240800	Pipe Area Incorporated by Detector Efficiency (in cm2)	730
Area Incorporated by Survey Date	2.6	Field BKG (cpm)	5.2/5.1
Routine Survey	X	Field MDCR (counts)	10.8/10.7
QA Survey		Nominal MDC (dpm/100cm2)	2,842
		Survey Measurement Results	
	Total Number o	of Survey Measurements	36
	Number of N	Aeasurements >MDC	31
<u></u>	Number of Measu	rements Above 50% DCGL	0
	Number of Mea	surements Above DCGL	0
		Mean	0.018
		Median	0.020
	Stand	dard Deviation	0.007
		Maximum	0.034
		Minimum	0.004
	Survey (	Jnit Classification	1
	Survey L TBD 06-	Jnit Classification 004 Piping Group	1 2
	Survey I TBD 06- SR-13 Radionus	Jnit Classification 004 Piping Group clide Distribution Sample	1 2 EP 2-1
	Survey I TBD 06- SR-13 Radionu Mea	Jnit Classification 004 Piping Group clide Distribution Sample sured Nuclide	1 2 EP 2-1 Co60
	Survey U TBD 06- SR-13 Radionu Mea Area Fa	Jnit Classification 004 Piping Group clide Distribution Sample sured Nuclide actor/EMC Used	1 2 EP 2-1 Co60 No
	Survey L TBD 06- SR-13 Radionu Mea Area Fa Pa	Jnit Classification 004 Piping Group clide Distribution Sample sured Nuclide actor/EMC Used ss/Fail FSS	1 2 EP 2-1 Co60 No Pass
	Survey I TBD 06- SR-13 Radionu Mea Area Fa Pa MREM	Jnit Classification 004 Piping Group clide Distribution Sample sured Nuclide actor/EMC Used ss/Fail FSS YYR Contribution	1 2 EP 2-1 Co60 No Pass <1
DMMENTS: CTIVITY VALUES NO	Survey I TBD 06- SR-13 Radionu Mea Area Fa Pa MREM	Unit Classification 004 Piping Group clide Distribution Sample sured Nuclide actor/EMC Used ss/Fail FSS YR Contribution	1 2 EP 2-1 Co60 No Pass <1

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### EP 1.37 3" 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 activiity (dpm/100cm2)	Ag-108m activity (dpm/100cm2) 57	Unity
1	2	2	14,286	1,958	1,016	16	12	1	114	0.000
2	4	4	28,571	3,916	2,032	32	23	2	0A	0.017
3	3.3	3.3	23,571	3,230	1,677	27	19		122	0.014
4	4.3	4.3	30,714	4,209	2,185	35	20	2	122	0.010
5	4.6	4.6	32,857	4,503	2,337	37	21	2	101 QA	0.020
6	3.3	3.3	23,571	3,230	1,677	21	19	2	122	0.014
7	4.3	4.3	30,714	4,209	2,185	35	20		85	0.013
8	3	3	21,429	2,937	1,524	24	21	3	150	0.022
9	5.3	5.3	37,857	5,188	2,693	43	31	2	142	0.021
10	5	5	35,714	4,894	2,540	41	17	1	85	0.013
11	3	3	21,429	2,937	1,524	24	13	1	65	0.010
12	2.3	2,3	16,429	2,251	1,100	19	21	2	102	0.015
13	3.6	3.6	25,/14	3,524	1,029	29	6	0	28	0.004
14	1	1	7,143	979	2 2 2 2 7	37	27	2	131	0.020
15	4.6	4.6	32,857	4,503	2,337	21	15	1	74	0.011
16	2.6	2.6	18,571	2,545	1,321	27	19	2	94	0.014
$\frac{17}{1}$	3.3	3.3	23,571	5,230	2,603	43	31	3	150	0.022
18	5.3	5.3	37,837	3,100	2,093	37	27	2	131	0.020
15	4.6	4.0	32,037	4,505	2,007	43	31	3	150	0.022
20	5.3	5.5	27,001	4 503	2,000	37	27	2	131	0.020
	4.0	4.0	57 143	7,000	4 064	65	46	4	227	0.034
- 24		6	A2 857	5 873	3 048	49	35	3	170	0.025
- 20		6	42,007	5,010	3 048	49	35	3	170	0.025
	+ 0	5	35 714	4 894	2,540	41	29	2	142	0.021
		6.7	45,000	6 167	3 201	51	36	3	179	0.027
20	7 5 3	5.3	37 857	5 188	2.693	43	31	3	150	0.022
	r 0.3 R 7		50,000	6,852	3,556	57	40	3	199	0.030
			28 571	3,916	2,032	32	23	2	114	0.017
2		61	45 000	6,167	3,201	51	36	3	179	0.027
2	1 57	57	40 714	5,580	2,896	46	33	3	162	0.024
3	2 5.3	5.3	37,857	5,188	2,693	43	31	3	150	0.022

## EP 1.37 3" 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
33	4.6	4.6	32,857	4,503	2,337	37	27	2	131	0.020
34	3	3	21,429	2,937	1,524	24	17	1	85	0.013
35	1.7	1.7	12,143	1,664	864	14	10	1	48	0.007
36	3	3	21,429	2,937	1,524	24	17	1	85	0.013
									MEAN	0.018
									MEDIAN	0.020
									STD DEV	0.007
									MAX	0.034
									MIN	0.004

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# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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Date:	12-13-05	Time: 1305
Building:	RX BLOG	Elevation: <u>-25</u> Access Point Area: <u>CANALE</u>
System:	PURGE DRAIN	Pipe Diameter: $3''$ Pipe ID # $1.37$
Type of Su	rvey Investigation	Characterization Final Survey Other
Sled Size	3"	inch
Detector:	44-62	Detector ID #: $Z \partial Y Y \partial Z - I D I$
Cal Date:	11-17-05	Cal Due Date: $(1-17-06)$
Instrument:	2350-1	Instrument ID #: 2/2223
Cal Date:	11-17-05	Cal Due Date: //-/7-076
From the D	aily Pipe Survey Detecto	r Control Form for the Selected Detector
Backgroun	d Value 5.2	cpm
MDCR <sub>static</sub>	10.8	cpm Aigiency determination
Efficiency	Factor for Pipe Diameter	•00014 (taken from detector calibration certificate)
MDC <sub>static</sub>	2842	-dpm/100cm <sup>2</sup>
Is the M	$DC_{static}$ acceptable? (Ye	No (if no, adjust sample count time and recalculate MDCR <sub>static</sub> )
Comments	INITIAL S	unvoy

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Pipe Interior Radiological Survey Form

## Pipe Interior Radiological Survey

Radiologi	cal Survey Comm		<u>- 73 07 1</u> m			
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	1	3	6	2	nla	nla
2	Z	3	12	4		
3	3	3	10	3.3		
4	4	3	13	4.3		
5	5	3	14	4.6		
6	6	3	10	3.3		
7	7	<u> </u>	13	4.3		
8		3	9	3		
9	9	C. 24 3	16	5.3	ļ	
10	10	ى	15	5	¥	↓ ↓

visal Survey Commenced: Date: 12-13-05 Time: 1305

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Package Page 1 of \_\_\_\_3





12-13-05

### Pipe Interior Radiological Survey Form (Continuation Form)

ripe Intel	Tor Kaulologica	I Survey Form (et		41.37	CANAL	E
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
#	from Opening	(min)		cpm	cpm	
11	11	3	9	3	nja	Ma
62	12	3	7	a.3	1	] ]
13	13	3	61	3.6		
14	14	3	3	1		
					Y	
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### Pipe Interior Radiological Survey Form

Date:/	2-15-05	Time:	1100		
Building: K	EACTOR	Elevation:	-25	Access Point Area:	TREACH
System: _/	AANAL E TURCE	Pipe Diameter:	3''	Pipe ID #	1.37
Type of Survey	y Investigation	Characterizat	ion Final S	Survey Other	·
Sled Size	3"	inch			
Detector:	44-6	2	Detector ID #:	2044	02-101
Cal Date:	11 - 17 - 0	5	Cal Due Date:	//-/`	7.06
Instrument:	23.50-1		Instrument ID	#:2122	23
Cal Date:	11-17.6	5	Cal Due Date:	11-1	7.06
From the Daily Background V MDCR <sub>static</sub> Efficiency Fac MDC <sub>static</sub> Is the MDC <sub>s</sub> Comments:	Pipe Survey Detecto alue $5 \cdot 1$ 10.7 tor for Pipe Diameter 2842 tatic acceptable? Ye CONTIMAT	r Control Form for cpm $O \cdot O O O I +$ $-dpm/100 cm^2$ No (i $O \cdot O O I +$	the Selected D (taken from f no, adjust sample	etector <u>Efficience</u> detector- <u>ealibration e</u> count time and recalculat	y deter minaticn ertificate) e MDCRstatic) UCTG

### Pipe Interior Radiological Survey

Radiologi	cal Survey Comm	enced: Date:/	8.15.05 Tin	ne: //00		
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	1	3	14	4.6	nia	nla
2	2	3	8	2.6	1	1
3	3	3	10	9.3		
4	4	£	16	5.3		
5	5	3	14	ef . (c		
6	6	3	16	5.3		
7	7	3	14	4.6		
8	8		24	8		
9	9	3	18	6		
10	10	3	18	6	4	

Package Page 1 of  $\frac{3}{2}$ 



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12-15-05

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### Pipe Interior Radiological Survey Form (Continuation Form)

	B		10#	1.37 CANA	LE PURGE	TIZCINCH -25"
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
11	11	3	15	5	nia	nla
12_	12	3	19	(0.3	1	
13	13	3	16	5.3		
14	14	उ	21	7		
15	15	3	12	4		
29	16	3	19	6.3		
17	17	3	17	5.7		
18	18	3	16	5.3		
19	19	.3	14	4.6		
20	20	3	9	3		
21	21	3	5	1.7		
22	_ 22	3	9	3		
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Attachment 3, Page 2



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# SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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		DQA Check Sheet				
Design #	EP 1.37	evision # Original	······································		·	
Survey Unit #		EP 1	.37			
	<u> </u>	Preliminary Data Revie	9W`			
Answers to	the following ques	ons should be fully documen Release Record	nted in the Survey Unit	Yes	No	N/A
1. Have surveys	been performed in acc	dance with survey instructions in t	the Survey Design?	x	···	
2. Is the instrume survey units, o	ntation MDC for struc r below 0.5 DCGL <sub>W</sub> fo	re static measurements below the Class 3 survey units?	$DCGL_W$ for Class 1 and 2			x
3. Is the instrume	ntation MDC for embe	ded/buried piping static measurem	nents below the DCGLw?	X		
4. Was the instru embedded/bur static measure	mentation MDC for str ied piping scan measu ments or soil samples	ture scan measurements, soil sca ements below the DCGLw, or, if no ddressed in the survey design?	n measurements, and t, was the need for additional			x
5. Was the instru	mentation MDC for vo	metric measurements and smear a	analysis < 10% DCGL <sub>w</sub> ?			X
6. Were the MDC used to perform	s and assumptions us n the survey?	to develop them appropriate for t	the instruments and techniques	x		
7. Were the surve media being su	ey methods used to co irveyed?	ect data proper for the types of rad	iation involved and for the	x		
8. Were "Special	Methods" for data col	tion properly applied for the surve	y unit under review?	X		
9. Is the data set design, which a	comprised of qualified accurately reflects the	neasurement results collected in a idiological status of the facility?	ccordance with the survey	x		
		Graphical Data Revie	w			<del></del>
1. Has a posting	plot been created?					X
2. Has a histogra	m (or other frequency	ot) been created?				X
3. Have other gra	phical data tools beer	reated to assist in analyzing the da	ata?			X
	• · · · · · · · · · · · · · · · · · · ·	Data Analysis				<del></del>
1. Are all sample	measurements below	e DCGL <sub>w</sub> (Class 1 & 2), or 0.5 DC	CGL <sub>w</sub> (Class 3)?	X		
2. Is the mean of	the sample data < DC	Lw?	····	X		
<ol> <li>If elevated area elevated area</li> </ol>	as have been identifie < DCGL <sub>EMC</sub> (Class 1)	oy scans and/or sampling, is the a < DCGL <sub>W</sub> (Class 2), or <0.5 DCGL	verage activity in each _w (Class 3)?			X
4. Is the result of	the Elevated Measure	ents Test < 1.0?				X
5. Is the result of	the statistical test (S+	r Sign Test or W <sub>r</sub> for WRS Test) <u>&gt;</u>	the critical value?			X
Comments:						
FSS/Characteriza	tion Engineer (print/si	) Dale Randall	aDal Rulell	Date	6-12	2-07
FSS/ Characteriza	tion Manager (print/si	B. Case	1m	Date	7/18	107
					For CS-0 Rev	m 99/2 7 0
		Page 1 of 1		L		

## SECTION 7 ATTACHMENT 4 1 DISC

Survey Unit Release Record						
Design #	EP-1.81	Revision #	Original	Page 1 of 3		
Survey Unit #(s)	Survey Unit #(s) 1.81					
Description	<ol> <li>Embedded I pipe for Plum</li> <li>EP 1.81 is a Survey Plan (H</li> <li>Surveys in I to measure gar Survey Reques</li> <li>Survey Reques</li> <li>Survey Instrin accordance Work Execution document com- acquisition of</li> <li>Instrument BSI/LVS-002, of radiation in</li> </ol>	Pipe (EP) Survey Unit Brook Reactor Facilit Class 1, Group 2 sur- FSSP) and Technical H EP 1.81 were perform nma energies represens tt (SR)-13 was referen ructions for this surve with (IAW) the Babco on Package (WEP) 05 stitute "Special Metho survey measurements efficiency determinati WEP 05-006, these d volved and the media	1.81 meets the y (PBRF). wey unit as per the Basis Document ed using a scinti- ntative of Co-60 need for this deci- y unit are incorp ock Services Inco- 006. Survey inso ods" and the surv- ons are developed leterminations are being surveyed.	definition of embedded he PBRF Final Status (TBD)-06-004. Illation detector optimized . Sample #EP 2-1 from ision. worated into and performed orporated (BSI)/LVS-002, structions described in this vey design used in the ed in accordance with the re appropriate for the types		
	Approval Sig	gnatures		Date:		
FSS/Characterization	Engineer	Dale M	lall	6-12-07		
Technical Revie (FSS/Characterization	Technical Reviewer (FSS/Characterization Engineer)					
FSS/Characterization	FSS/Characterization Manager 7-18-07					
			(	Form CS-09/1 Rev 0		

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Survey Unit: 1.81

- 1.1 The subject pipe is the floor drain line from Canals "J" & "K" to the -25 ft of the Rx Building in Pump Room #22. The function of this pipe was to convey water from floor drains located in Canals "J" & "K" to the HD sump in Pump Room #22 on the Rx Building -25 ft, where the pipe is currently breached.
- 1.2 EP 1.81 consists of approximately 30 feet in length from the valve pit in the Hot Laboratory Building to the Pump Room #22. The pipe section has at least 5 mitered elbows ranging between 300 and 500.
- 2.0 Survey Design Information
  - 2.1 EP 1.81 was surveyed IAW Procedure #BSI/LVS-002.
  - 2.2 100% of the 6" ID pipe was accessible for survey. The accessible 6" ID pipe was surveyed by static measurement at one foot increments, for a total of 20 survey measurements.
  - 2.3 Surface area for the 6" ID piping is 1,459 cm<sup>2</sup> for each foot of piping, corresponding to a total 6" ID piping surface area of 29,180 cm<sup>2</sup> (2.9 m<sup>2</sup>) for the entire length of (20') of 6" 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 Cesium-137/Cobalt-60 ratios, provided in TBD-06-004, the survey unit that is constituted by EP 1.81 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.

FSS Design # EP 1.81	Revision # Original	Page 3 of 3
Survey Unit: 1.81		

### 5.5 Statistical Summary Table

Statistical Parameter	Pipe	
Total Number of Survey Measurements	20	
Number of Measurements >MDC	19	
Number of Measurements Above 50% of DCGL	0	
Number of Measurements Above DCGL	0	
Mean	0.005	
Median	0.003	
Standard Deviation	0.004	
Maximum	0.018	
Minimum	0.001	

- 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 1.81 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.005 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 1.81 & Spreadsheet

# SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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## **BSI EP/BP SURVEY REPORT**

Pipe ID	1.81		Survey Location	-27 TRENCH		
Survey Date	04-Jan-06		2350-1 #	134708		
Survey Time	0750		Detector-Sled #	BICRON 1MG1		
Pipe Size	6"		Detector Efficiency	0.002		
DCGL (dpm/100cm2)	240800		Pipe Area incorporated by Detector Efficiency (in cm2)	1459		
Pipe Area incorporated by Survey Data (m <sup>2</sup> )	2.9		Field BKG (cpm)	18		
Routine Survey	Х		Field MDCR (counts)	18		
QA Survey			Nominal MDC (dpm/100cm2)	333		
	S	Surve	y Measurement Results			
Total N	Number of Su	rvey	Measurements	20		
Nur	mber of Meas	uren	nents >MDC	19		
Number o	of Measureme	ents /	Above 50% DCGL	0		
Numbe	er of Measure	men	ts Above DCGL	0		
	Me	an		0.005		
	Med	dian		0.003		
	0.004					
	0.018					
	0.001					
			ROSEN	HAGEN		
Survey Technician(s)				<u>,</u>		
		ي ۽ ھندي منڌ سيني ۽ سين				
	Survey Unit (	Class	sification	1		
	2					
SR-13	Radionuclide	Dist	ribution Sample	EP 2-1		
	Measure	d Nu	clide	Co60		
	No					
	Pass					
	<1					
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED						
RP Engineer   Date Oal Revelall 6-12-07						

## EP 1.81 3" 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	18	18	9,000	617	320	5	4	0	18	0.003
2	19	19	9,500	651	338	5	4	0	19	0.003
3	21	21	10,500	720	374	6	4	0	21	0.003
4	17	17	8,500	583	302	5	3	0	17	0.003
5	13	13	6,500	446	231	4	3	0	13	0.002
6	28	28	14,000	960	498	8	6	0	28	0.004
7	62	62	31,000	2,125	1,103	18	13	1	62	0.009
8	25	25	12,500	857	445	7	5	0	25	0.004
9	15	15	7,500	514	267	4	3	0	15	0.002
10	8	8	4,000	274	142	2	2	0	8	0.001
11	13	13	6,500	446	231	4	3	0	13	0.002
12	20	20	10,000	685	356	6	4	0	20	0.003
13	14	14	7,000	480	249	4	3	0	14	0.002
14	45	45	22,500	1,542	800	13	9	1	45	0.007
15	62	62	31,000	2,125	1,103	18	13	1	62	0.009
16	35	35	17,500	1,199	623	10	7	1	35	0.005
17	33	33	16,500	1,131	587	9	7_	1	33	0.005
18	32	32	16,000	1,097	569	9	6	1	32	0.005
19	53	53	26,500	1,816	943	15	11	1	53	0.008
20	123	123	61,500	4,215	2,188	35	25	2	122	0.018
									MEAN	0.005
	1					1		*	MEDIAN	0.003
			t						STD DEV	0.004
[			· · · · · · · · · · · · · · · · · · ·						MAX	0.018
	1								MIN	0.001

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# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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### Pipe Interior Radiological Survey Form

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Date:	1-4.06	Time:	0750		
Building:	REACTER BUDG	Elevation:	- 25	Access Point Area:	-27 TREFEIT
System:	PRIMARY DRAIN	Pipe Diameter:	6"	Pipe ID #	1.81
Type of Su	rvey Investigation	Characteriz	ation Final	Survey Other	
Sled Size	611	inch			
Detector:	Bieron	1MG 1	Detector ID #	: Lvs	-1 - 107
Cal Date:	12-20-	05	_ Cal Due Date	12-1	20-06
Instrument	: 2350-	· /	Instrument ID	#: 134	704
Cal Date:	12-20-0	5	Cal Due Date	12-	20-04
From the I Backgroun MDCR <sub>static</sub> Efficiency MDC <sub>static</sub> Is the M Comments	Daily Pipe Survey Detector ad Value <u>18</u> <u>78</u> Factor for Pipe Diameter <u>333</u> DC <sub>static</sub> acceptable? <u>Ye</u> <u>TMITIAL</u>	or Control Form f cpm O.00 $dpm/100cm^2$ S No SHRVey	Tor the Selected I (taken from (if no, adjust sampl	Detector efficience n detector <del>calibration c</del> e count time and recalculate	e MDCR <sub>static</sub> )
	<u> </u>				COMPLEIC

## Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 14.06 Time: 075								
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>		
1	IFT	/	18	18	nla	nia		
2	2ft	/	19	19	<u> </u>			
3	365	1	21	21				
4	487	1	17	17				
5	SFT	/	13	13				
6	4.47	<u> </u>	28	28				
7	74	<u> </u>	47	62				
8	8FT	/	25	25				
9	9fr	!	15	15				
10	/05	<u> </u>	8	8	1	V		

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Package Page 1 of 1




# Pipe Interior Radiological Survey Form (Continuation Form)

Position Feet into Pipe Count Time Gross Net Gross Counts dpm/100cm<sup>2</sup> from Opening # (min) cpm cpm IFT 1 nja 11 13 20 13 nla 17 12Fr r 20 13 13Fr <u>14</u> 45 1 445 14 14FT 1SFr 62 35 33 62 1 1677 16 35 33 1 17 1 32 18 187-1 32 19 19FT 2017 53 53 1 20 123 1 123 .  $\mathcal{N}$ a

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Attachment 3, Page 2

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1.81



# SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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				DQA Check	Sheet				
De	sign #	EP 1.81	Revision #	Original					
Surve	ey Unit #				EP 1.81				
		<b>.</b>	Pre	liminary Data	Review`	*** <u>**********************************</u>		<u> </u>	
A	nswers to	the following que	stions shoul Release	d be fully doo Record	cumented	in the Survey Unit	Yes	No	N/A
1. Ha	ive surveys	been performed in ac	cordance with	survey instructi	ons in the S	Survey Design?	X		
2. Is su	the instrume rvey units, c	entation MDC for strue or below 0.5 DCGLw f	cture static me or Class 3 surv	asurements bel /ey units?	ow the DC	GL <sub>w</sub> for Class 1 and 2			x
3. Is	the instrume	entation MDC for emb	edded/buried j	piping static me	asurement	s below the DCGLw?	X		
4. Wa en sta	as the instru nbedded/bui atic measure	mentation MDC for s ried piping scan meas ements or soil sample	tructure scan n surements belo s addressed in	neasurements, by the DCGLw, o the survey des	soil scan m or, if not, wa ign?	easurements, and as the need for additional			x
5. W	as the instru	mentation MDC for v	olumetric meas	surements and	smear anal	ysis < 10% DCGL <sub>w</sub> ?			X
6. W us	ere the MDC ed to perfor	Cs and assumptions u m the survey?	used to develop	o them appropria	ate for the i	nstruments and techniques	x		
7. W m	ere the surv edia being s	ey methods used to c urveyed?	collect data pro	per for the type	s of radiatio	n involved and for the	X		
8. W	ere "Special	Methods" for data co	ection proper	ty applied for th	e survey ur	nit under review?	X	L	
9. Is de	the data set sign, which	comprised of qualifie accurately reflects the	ed measuremen e radiological s	nt results collect status of the fac	ted in accor	rdance with the survey	x		
			G	raphical Data	Review			·	T
1. Ha	as a posting	plot been created?							X
2. Ha	as a histogra	am (or other frequenc	y plot) been cre	eated?					X
3. Ha	ave other gra	aphical data tools bee	en created to as	ssist in analyzin	g the data?	<b>)</b>			X
				Data Analy	sis				
1. Ar	e all sample	measurements below	w the DCGLw (	Class 1 & 2), or	0.5 DCGL	w (Class 3)?	X		
2. Is	the mean of	f the sample data < D	CGL <sub>w</sub> ?				X		
3. if ( ele	elevated are evated area	as have been identifi < DCGL <sub>EMC</sub> (Class 1	ed by scans ar ), < DCGL <sub>W</sub> ((	nd/or sampling, Class 2), or  <0.	is the avera 5 DCGL <sub>W</sub> (	age activity in each Class 3)?			X
4. Is	the result of	the Elevated Measur	rements Test <	: 1.0?	·		<u> </u>		<b>X</b>
5. Is	the result of	the statistical test (S	+ for Sign Test	or W <sub>r</sub> for WRS	Test) ≥ the	e critical value?			X
Comme	ents:				"   0		Dete		
FSS/	Characteriza	ation Engineer (print/s	sign) Da	le Ronald		al Reghall	Date	6-1	2-0
FSS/	Characteriz	ation Manager (print/	sign)		<u>n</u>	R. Case	Date	7-18	5-0-
							ſ	For CS-0	rm 09/2

SECTION 7 ATTACHMENT 4 1 DISC ì

Survey Unit Release Record							
Design #	EP-Rx 12	7 <b>Revision</b> #	Original	Page 1 of 3			
Survey Unit #(s)			Rx 127				
Description	<ol> <li>Embedde pipe for Plur</li> <li>EP Rx 12 Survey Plan</li> <li>Survey Plan</li> <li>Survey Plan</li> <li>Survey Plan</li> <li>Survey In in accordance</li> <li>Survey In in accordance</li> <li>Work Execu- document co acquisition of</li> <li>Instrument BSI/LVS-00 of radiation</li> </ol>	<ul> <li>pipe for Plum Brook Reactor Facility (PBRF).</li> <li>2) EP Rx 127 is a Class 1, Group 1 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</li> <li>3) Surveys in EP Rx 127 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.</li> <li>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 thi document constitute "Special Methods" and the survey design used in the acquisition of survey measurements.</li> <li>5) Instrument efficiency determinations are developed in accordance with the BSI/LVS-002, WEP 05-006, these determinations are appropriate for the type of radiation involved and the media being surveyed.</li> </ul>					
	Approval	Signatures		Date:			
FSS/Characterization	Engineer	Ocl Mark		7-14-07			
Technical Revie (FSS/Characterization	ewer Engineer)	Duro	$\mathcal{Q}_{}$	7-16-07			
FSS/Characterization	Manager	K M/A	R. Case	7/18/07			
				Form CS-09/1 Rev 0			

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FSS	Design	#	FΡ	Rx	127	
1.00	Design	π		IVV	121	

**Revision # Original** 

Survey Unit: Rx 127

## 1.0 History/Description

- 1.1 The subject pipe is the drain line on the Rx Building -25 foot elevation. The function of this pipe was to convey waste water from the drain openings to the drain trench on the Rx building -27ft.
- 1.2 EP Rx 127 consists of 4" diameter piping that is approximately 21 feet in length.
- 2.0 Survey Design Information
  - 2.1 EP Rx 127 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 21 survey measurements.
  - 2.3 Surface area for the 4" ID piping is 973 cm<sup>2</sup> for each foot of piping, corresponding to a total 4" ID piping surface area of 20,430 cm<sup>2</sup> (2.0 m<sup>2</sup>) for the entire length of (approximately 21') 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 Rx 127 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.

FSS	Design	# EP	Rx	127	
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**Revision # Original** 

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Survey Unit: Rx 127

## 5.5 Statistical Summary Table

	4"
Statistical Parameter	Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	17
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0177
Median	0.0141
Standard Deviation	0.0184
Maximum	0.0943
Minimum	0.0059

- 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 127 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.018 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 – EP RX 127 SURR & Spreadsheet Disc SECTION 7 ATTACHMENT 1 2 PAGE(S)

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Pipe ID	Rx 127	Survey Location	-27 el. RBDL-1
Survey Date	08-Feb-06	2350-1 #	203488
Survey Time	08:05	Detector-Sied #	LVS-1/101
Pipe Size	4"	Detector Efficiency	0.00052
DCGL (dpm/100cm2)	2.41E+05	Pipe Area incorporated by Detector Efficiency (in cm2)	973
Pipe Area Incorporated by Survey Data (m <sup>3</sup> )	2.0	Field BKG (cpm)	16.3
Routine Survey	X	Field MDCR (cpm)	16.9
QA Survey		Nominal MDC (dom/100cm2)	1,557
	S	urvey Measurement Results	
	Total Number of Su	urvey Measurements	21
	Number of Meas	surements >MDC	17
	Number of Measurem	ents Above 50% DCGL	0
	Number of Measure	ements Above DCGL	0
	ean	0.0177	
	Me	dian	0.0141
	0.0184		
	Max	imum	0.0943
	Min	imum	0.0059
	Survey Unit	Classification	1
	Survey Unit TBD 06-004	Classification Piping Group	<u>1</u> 1
	Survey Unit TBD 06-004 SR-13 Radionuclide	Classification Piping Group Distribution Sample	1 1 FP 3-8
	Survey Unit TBD 06-004 SR-13 Radionuclide Measure	Classification Piping Group a Distribution Sample ad Nuclide	1 1 EP 3-8 Co-60
	Survey Unit TBD 06-004 SR-13 Radionuclide Measure Area Facto	Classification Piping Group a Distribution Sample Nd Nuclide r/EMC Used	1 1 EP 3-8 Co-60 No
	Survey Unit TBD 06-004 SR-13 Radionuclide Measure Area Facto Pass/F	Classification Piping Group e Distribution Sample ed Nuclide r/EMC Used Fail FSS	1 1 EP 3-8 Co-60 No Pass
	Survey Unit TBD 06-004 SR-13 Radionuclide Measure Area Facto Pass/F MREM/YR	Classification Piping Group a Distribution Sample ad Nuclide r/EMC Used Fail FSS Contribution	1 1 EP 3-8 Co-60 No Pass <1
DMMENTS: CTIVITY VALUES	Survey Unit TBD 06-004 SR-13 Radionuclide Measure Area Facto Pass/F MREM/YR	Classification Piping Group a Distribution Sample ad Nuclide r/EMC Used Fail FSS Contribution CORRECTED	1 1 EP 3-8 Co-60 No Pass <1

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## EP Rx 127 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	15	15	28,846	2,965	118	2,813	748	87	21	0.018
2	11	11	21,154	2,174	86	2,063	548	63	15	0.013
3	5	5	9,615	988	39	938	249	29	7	0.006
4	10	10	19,231	1,977	78	1,875	498	58	14	0.012
5	7	7	13,462	1,384	55	1,313	349	40	10	0.008
6	8	8	15,385	1,581	63	1,500	399	46	11	0.009
7	14	14	26,923	2,767	110	2,625	698	81	19	0.017
8	80	80	153,846	15,813	627	15,001	3,988	461	110	0.094
9	14	14	26,923	2,767	110	2,625	698	81	19	0.017
10	6	6	11,538	1,186	47	1,125	299	35	8	0.007
11	12	12	23,077	2,372	94	2,250	598	69	17	0.014
12	12	12	23,077	2,372	94	2,250	598	69	17	0.014
13	9	9	17,308	1,779	71	1,688	449	52	12	0.011
14	10	10	19,231	1,977	78	1,875	498	58	14	0.012
15	12	12	23,077	2,372	94	2,250	598_	69	17	0.014
16	16	16	30,769	3,163	125	3,000	798	92	22	0.019
17	7	7	13,462	1,384	55	1,313	349	40	10	0.008
18	13	13	25,000	2,570	102	2,438	648	75	18	0.015
19	11	11	21,154	2,174	86	2,063	548	63	15	0.013
20	26	26	50,000	5,139	204	4,875	1,296	150	36	0.031
21	17	17	32,692	3,360	133	3,188	847	98	23	0.020
L										L
							·		MEAN	0.018
	ļ				ļ				MEDIAN	0.014
L									STD DEV	0.018
		ļ					·		MAX	0.094
1							<u></u>		MIN	0.006

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# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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BSI/LVSPipeCrawler-002 Revision 4

	Pipe Interior	Radiological Surv	vey Form		
Date: 2-3-06	Time:	0805	,		
Pipe (-25 2601-1)	Pipe		Acc	ess Point	
ID#: Rx 127	Diameter:	4''		Area:	TRENCH
Building: <b>R</b> ×	Elevation:	-27	S	ystem:	RX-25 HET COLO DARIN
Type of Survey Investigation	n Chara	cterization	_ Final Su	rvey 🗶	Other
Gross	Co60 🧹		Cs		
Detector ID# / Sled ID#	LV5-1	/	101		
Detector Cal Date: //-/]	-05	Detector Cal Du	e Date:	11-17	7-06
Instrument: 235	0-1	Instrument I	D #: _	203	£33
Instrument Cal		Instrument Ca	l Due		
Date: 11-17	1-05	. Date:	-	11-17	7-06
From the Daily Pipe Survey D	etector Control	Form for the Sele	cted Detec	tor	
Background Value <u>16-3</u>	cpm				
MDCR <sub>static</sub> 16-9	cpm				
Efficiency Factor for Pipe Diameter	0.000	5Z (from de	tector effic	ciency dete	rmination)
MDC <sub>static</sub> 1557	dpm/ 100	<u>O cm<sup>2</sup></u>			
Is the MDC <sub>static</sub> acceptable?	Yes No	(if no, adjust sam	ple count tin	ne and recalcu	late MDCR <sub>static</sub> )
Comments:					

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Technician 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	1	15	na	na	na
2	2	1	11		}	1
3	3	t	5			
4	4	1	10			
5	5	t	7			
6	6	(	B	-		
7	7	1	14			
8	S	1	60			
9	9	١	14		T	
10	10	1	(e		1	1



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## Pipe Interior Radiological Survey Form (Continuation Form)

Building:	Rx	Elevation:	~27	S.	vstem: $2x-2$	5 HAT (MO D
28.					<u> </u>	
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	dpm/100cm
<del></del>		(iiiii)	+			210
<u> </u>		<u>_</u>	14	ma	na	VIIA
14	12		14			
12						
14	14		+ 10 $+$			<u> </u>
15	16		12			<u>↓↓</u>
ما	16	l	16			l
<u> </u>	17					
13	81	<u> </u>	13			
19	<u> </u>	1				·
20	20	1	26			
21	21	1	17	V	¥	<b>V</b>
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			DQA Check	Sheet			
Design #	Rx 127	Revision #	Original				
Survey Unit #				Rx 127			
		Pre	iiminary Data	I Review`			
Answers to t	he following que	stions should Release	d be fully doo Record	cumented in the Survey Unit	Yes	No	N/A
. Have surveys b	been performed in ac	cordance with	survey instructi	ons in the Survey Design?	X		1
2. Is the instrumer survey units, or	ntation MDC for strue below 0.5 DCGL <sub>W</sub> f	cture static mea or Class 3 surv	asurements bel ey units?	ow the $DCGL_W$ for Class 1 and 2			x
3. Is the instrumer	ntation MDC for emb	edded/buried p	piping static me	asurements below the DCGLw?	X		
<ul> <li>Was the instrum embedded/buri static measurer</li> </ul>	nentation MDC for st ed piping scan meas ments or soil sample	tructure scan m surements belo s addressed in	neasurements, s w the DCGL <sub>W</sub> , o the survey des	soil scan measurements, and or, if not, was the need for additional ign?			x
5. Was the instrum	mentation MDC for vo	olumetric meas	urements and s	smear analysis < 10% DCGL <sub>w</sub> ?			X
<ol> <li>Were the MDCs used to perform</li> </ol>	s and assumptions u n the survey?	sed to develop	them appropria	ate for the instruments and techniques	x		
7. Were the surve media being su	ey methods used to c inveyed?	ollect data prop	per for the types	s of radiation involved and for the	x		
3. Were "Special I	Methods" for data co	llection properl	y applied for the	e survey unit under review?	X		ĺ
<ol> <li>Is the data set of design, which a</li> </ol>	comprised of qualifie accurately reflects the	d measuremen e radiological si	it results collect tatus of the faci	ed in accordance with the survey lity?	x		
		Gr	aphical Data	Review			
I. Has a posting p	plot been created?						X
2. Has a histogram	m (or other frequency	y plot) been cre	ated?			·	X
3. Have other gra	phical data tools bee	n created to as	sist in analyzin	g the data?		L	X
			Data Analy	sis	·····	·····	r
1. Are all sample	measurements below	w the DCGLw (	Class 1 & 2), or	0.5 DCGLw (Class 3)?	X		
2. Is the mean of t	the sample data < D	CGLw?			X		
<ol> <li>If elevated area elevated area</li> </ol>	as have been identifie < DCGL <sub>EMC</sub> (Class 1	ed by scans an ), < DCGL <sub>w</sub> (C	d/or sampling, i lass 2), or <0.!	s the average activity in each 5 DCGL <sub>w</sub> (Class 3)?			x
4. Is the result of t	the Elevated Measur	ements Test <	1.0?				X
5. Is the result of t	the statistical test (S·	+ for Sign Test	or Wr for WRS	Test) > the critical value?			X
Comments:							
FSS/Characterizat	tion Engineer (print/s	ign) D	ale 1 Days	tall Dal Rentest	Date	7-1	4-07
FSS/ Characteriza	tion Manager (print/s	sign)	MAC	R. Case	Date	7/18	rlor
					ſ	For	rm
						CS-0	09/2

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Survey Unit Release Record							
Design #	EP-Rx 148	Revision #	Original	Page 1 of 3			
Survey Unit #(s)		,,,,, <b>, 4</b> ,,,,*,,,_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Rx 148				
Description	<ol> <li>Embedded P pipe for Plum H</li> <li>EP Rx 148 is Survey Plan (F</li> <li>Surveys in H optimized to m</li> <li>from Survey</li> <li>Survey Instr in accordance v</li> <li>Work Execution document const acquisition of s</li> <li>Instrument e BSI/LVS-002, of radiation inv</li> </ol>	<ol> <li>Embedded Pipe (EP) Survey Unit Rx 148 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</li> <li>EP Rx 148 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</li> <li>Surveys in EP Rx 148 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2 1 from Survey Request (SR)-13 was referenced for this decision.</li> <li>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.</li> <li>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.</li> </ol>					
	Approval Sig	inatures		Date:			
FSS/Characterization	n Engineer	Och Roy	hell	7-15-07			
Technical Reviewer (FSS/Characterization Engineer)							
FSS/Characterization Manager All R. Case 7/18/07							
Form CS-09/1 Rev 0							

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## FSS Design # EP Rx 148

**Revision # Original** 

Survey Unit: Rx 148

## 1.0 History/Description

- 1.1 The subject pipe system is the 4" Quad "B" system line.
- 1.2 EP Rx 148 consists of approximately 21 feet in length from the Reactor Building -25' elevation to Quad "B".
- 2.0 Survey Design Information
  - 2.1 EP Rx 148 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 21 survey measurements.
  - 2.3 Surface area for the 4" ID piping is 973 cm<sup>2</sup> for each foot of piping, corresponding to a total 4" ID piping surface area of 20,430 cm<sup>2</sup> (2.0 m<sup>2</sup>) for the entire length of (21') 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 Rx 148 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.

FSS Design # EP Rx 148	
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**Revision # Original** 

Page 3 of 3

Survey Unit: Rx 148

### 5.5 Statistical Summary Table

	4"
Statistical Parameter	Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	2
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0098
Median	0.0094
Standard Deviation	0.0019
Maximum	0.0129
Minimum	0.0060

- 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 148 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.010 mrem/yr based on the average of the actual gross counts.
- 7.0 Attachments

Attachment 1 – BSI EP/BP Survey Report Attachment 2 – Pipe Interior Radiological Survey Form Attachment 3 – DQA Worksheet Attachment 4 – EP RX 148 SURR & Spreadsheet Disc SECTION 7 ATTACHMENT 1 2 PAGE(S)

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Babcock BSI EP/BP SURVEY REPORT					
Pipe ID	Rx 148	Survey Location	Quad B		
Survey Date	11-Jan-06	2350-1 #	134738		
Survey Time	10:55	Detector-Sled #	1 <b>MG1</b> LVS-1/101		
Pipe Size	4"	Detector Efficiency	0.00052		
DCGL (dom/100cm2)	2.41E+05	Pipe Area incorporated by Detector Efficiency (in cm2)	973		
Pipe Area incorporated by Survey Data (m <sup>3</sup> )	2.0	Field BKG (cpm)	22.2		
Routine Survey	x		19.3		
QA Survey		Nominal MDC (dpm/100cm2)	1,557		
	21				
· · · · · · · · · · · · · · · · · · ·	2				
	Number of Measuren	nents Above 50% DCGL	0		
Number of Measurements Above DCGL			0		
Mean			0.0098		
Median			0.0094		
	Standar	d Deviation	0.0019		
	Ma	ximum	0.0129		
	Mir	nimum	0.0060		
Survey T	echoician(s)	ROSENHAGEN			
	SR-13 Pedionuclic	e Distribution Sample	EP 2.1		
	Moseur	ed Nuclide	Ca-60		
Area Factor/FMC Used			No		
Pass/Fail FSS			Pass		
MREM/YR Contribution			<1		
COMMENTS: ACTIVITY VALUES	NOT BACKGROUNE	O CORRECTED			
RP Eng	ineer   Date	Oil nulall	7-15-07		

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## EP Rx 148 4" 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	10	10	19,231	1,977	1,025	16	12	1	57	0.009
2	13	13	25,000	2,570	1,332	21	15	1	74	0.011
3	11	11	21,154	2,174	1,127	18	13	1	63	0.009
4	14	14	26,923	2,767	1,435	23	16	1	80	0.012
_5	10	10	19,231	1,977	1,025	16	12	1	57	0.009
6	8	8	15,385	1,581	820	13	9	1	46	0.007
7	13	13	25,000	2,570	1,332	21	15	1	74	0.011
8	9	9	17,308	1,779	922	15	10	1	51	0.008
9	11	11	21,154	2,174	1,127	18	13	1	63	0.009
10	11	11	21,154	2,174	1,127	18	13	1	63	0.009
11	14	14	26,923	2,767	1,435	23	16	1	80	0.012
12	13	13	25,000	2,570	1,332	21	15	1	74	0.011
13	9	9	17,308	1,779	922	15	10	1	51	0.008
14	15	15	28,846	2,965	1,537	25	17	1	85	0.013
15	7	7	13,462	1,384	717	11	8	1	40	0.006
16	12	12	23,077	2,372	1,230	20	14	1	68	0.010
17	10	10	19,231	1,977	1,025	16	12	1	57	0.009
18	15	15	28,846	2,965	1,537	25	17	1	85	0.013
19	10	10	19,231	1,977	1,025	16	12	1	57	0.009
20	13	13	25,000	2,570	1,332	21	15	1	74	0.011
21	13	13	25,000	2,570	1,332	21	15	1	74	0.011
									MEAN	0.010
									MEDIAN	0.009
									STD DEV	0.002
									MAX	0.013
			1				]		MIN	0.006

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# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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## Pipe Interior Radiological Survey Form

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Date: 1-11-06	Time: <u>/ 6</u>	155	
Building: <u>12 ×</u> I	Elevation	2.5 Acc	cess Point QUAD B
System: 2nd coolene, To TESTS I	Pipe Diameter:	4 " Are	ea: Pipe ID RX 148
Type of Survey Investigation	Characteriza	tion Final Surv	rey <sup>#</sup> Other
Sled Size DOG BONE / 01 in	nch		
Detector: BICRON IM	61	Detector ID #:	LVS-1
Cal Date: 12-20-05		Cal Due Date:	12-20-06
Instrument: <u>2350-1</u>		Instrument ID #:	134738
Cal Date: 12-20-05		Cal Due Date:	12-20-06
From the Daily Pipe Survey Detecto Background Value <u>22.3</u> c MDCR <sub>static</sub> <u>19.3</u> c Efficiency Factor for Pipe Diameter <u>1557</u> d Is the MDC <sub>static</sub> Yes Comfilents!	or Control Form opm <i>O-00052</i> pm/100cm <sup>2</sup> No (if	for the Selected De (taken from det no, adjust sample coun	efficiency determination ector <del>calibration cortificate</del> ) gw t time and recalculate MDCR <sub>static</sub> )

## Pipe Interior Radiological Survey

Radiolog	ical Survey Com	menced: Date:	1-11 06	Time: <u>705</u>	<u>,</u>	
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	l	ł	10	10	Na	na
2	2	1	13	13	1	
3	3		11	r i		
4	4		14	14		
5	5	1	10	10		
6	(0	1	E	g		
7	う		13	13		
8	B		9	9		
9	9		11			
10	10	<u> </u>	11	11		

Radiological Survey Commenced: Date: 1-11-06 Time: 1055



Package Page 1 of <u>Z</u>

Attachment 3, Page 1



#### Pipe Interior Radiological Survey Form (Continuation Form) $R \times 148$ QUAD B 1-11-06 Count Time Feet into Pipe Net $dpm/100cm^2$ Gross Position Gross from Opening (min) cpm cpm # Counts na nla 11 17 1 3 13 12 12 1 3 13 9 9 4 13 15 L 7 1 2 2 6 16 Ο 0 8 B 5 $1 \sigma$ 9 P P 10 l O 33 20 7 20 21 21 2

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Package Page 2 of 2

**REFERENCE COPY** 



Attachment 3, Page 2



# SECTION 7 ATTACHMENT 3 \_\_\_\_ PAGE(S)

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				DQA Check	Sheet			
Des	sign #	EP Rx 148	Revision #	Original				
Surve	ey Unit #		<u> </u>	E	EP Rx 148			
			Pre	liminary Data	a Review`			
Ar	iswers to	the following que	estions shoul Release	d be fully do Record	cumented in the Survey Unit	Yes	No	N//
I. Ha	ve surveys l	been performed in a	ccordance with	survey instruct	ions in the Survey Design?	X		
2. Is t sur	he instrume vey units, o	ntation MDC for stn r below 0.5 DCGL <sub>W</sub>	icture static me for Class 3 sun	asurements be vey units?	ow the $DCGL_W$ for Class 1 and 2			×
3. ist	he instrume	ntation MDC for em	bedded/buried	piping static me	asurements below the DCGLw?	X		 
4. Wa em sta	is the instrum bedded/burn tic measure	mentation MDC for ied piping scan mea ments or soil sampl	structure scan n surements belo es addressed in	neasurements, w the DCGL <sub>W</sub> the survey des	soil scan measurements, and or, if not, was the need for additional sign?			x
5. Wa	is the instru	mentation MDC for	volumetric meas	surements and	smear analysis < 10% DCGLw ?			X
3. We US	ere the MDC ed to perform	s and assumptions n the survey?	used to develop	them appropri	ate for the instruments and techniqu	es 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		
). Is ( de:	he data set sign, which a	comprised of qualifi accurately reflects the	ed measurement he radiological s	nt results collect status of the fac	ted in accordance with the survey ility?	x		
			G	raphical Data	Review			
I. Ha	s a posting	plot been created?						>
2. Ha	s a histogra	m (or other frequen	cy plot) been cr	eated?				>
B. Ha	ve other gra	phical data tools be	en created to a	ssist in analyzir	ng the data?			)
				Data Analy	sis			
I. Are	ali sample	measurements belo	w the DCGL <sub>w</sub> (	Class 1 & 2), o	r 0.5 DCGLw (Class 3)?	X		
2. Ist	he mean of	the sample data < I	DCGLw?			X		
3. If e ele	levated area	as have been identi < DCGL <sub>EMC</sub> (Class	fied by scans ar 1), < DCGL <sub>W</sub> ((	nd/or sampling, Class 2), or <0.	is the average activity in each 5 DCGL <sub>W</sub> (Class 3)?			<b></b>
4. Ist	he result of	the Elevated Measu	irements Test <	: 1.0?				)
5. Is t	he result of	the statistical test (	S+ for Sign Test	or W <sub>r</sub> for WRS	S Test) ≥ the critical value?		L	)
comme	n <b>ts</b> :							
FSS/0	Characteriza	tion Engineer (print	/sign)	ale Ray	Alf I'vident	Date	$\frac{7}{2}$	<u>15-0</u>
FSS/	Characteriza	ation Manager (print	/sign)	MIN	M R. Case	Date	17/1	8/0
				·			For CS-0	rm 09/2

SECTION 7 ATTACHMENT 4 1 DISC

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Survey Unit Release Record							
Design #	EP-Rx 152	Revision #	Original	Page 1 of 3			
Survey Unit #(s)			Rx 152				
Description	<ol> <li>Embedded Pip pipe for Plum Br</li> <li>EP Rx 152 is Survey Plan (FS</li> <li>Surveys in EF optimized to me 1 from Survey R</li> <li>Survey Instructional forming occurrent constitution accordance with Work Execution document constitution of su</li> <li>Instrument eff BSI/LVS-002, W of radiation invol</li> </ol>	<ol> <li>Embedded Pipe (EP) Survey Unit Rx 152 meets the definition of embedde pipe for Plum Brook Reactor Facility (PBRF).</li> <li>EP Rx 152 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</li> <li>Surveys in EP Rx 152 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 1 from Survey Request (SR)-13 was referenced for this decision.</li> <li>Survey Instructions for this survey unit are incorporated into and performe in accordance with (IAW) the Babcock Services Incorporated (BSI)/LVS-000 Work Execution Package (WEP) 05-006. Survey instructions described in thi document constitute "Special Methods" and the survey design used in the acquisition of survey measurements.</li> <li>Instrument efficiency determinations are developed in accordance with the BSI/LVS-002, WEP 05-006, these determinations are appropriate for the type of radiation involved and the media being surveyed.</li> </ol>					
	Approval Sign	atures		Date:			
FSS/Characterizatio	on Engineer	Oal Rulas	ll	6-12-07			
Technical Reviewer (FSS/Characterization Engineer) AWOOD 6-29-0							
FSS/Characterization Manager AAA R. Case 7-18-07							
			<u>ا</u>	Form CS-09/1 Rev 0			
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Survey Unit: Rx 152

## 1.0 History/Description

- 1.1 The subject pipe system is the 3" Quad "B" De-ionized (DI) water line. The function of this pipe was to convey DI.
- 1.2 EP Rx 152 consists of approximately 21 feet in length from the Reactor Building -25' elevation to Quad "B".

## 2.0 Survey Design Information

- 2.1 EP Rx 152 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 21 survey measurements.
- 2.3 Surface area for the 3" ID piping is 729.7 cm<sup>2</sup> for each foot of piping, corresponding to a total 3" ID piping surface area of 15,330 cm<sup>2</sup>(1.5 m<sup>2</sup>) for the entire length of (21') of 3" 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 152 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.

FSS	Design	#	EP	Rx	152	
	-					

Survey Unit: Rx 152

#### 5.5 Statistical Summary Table

	3"
Statistical Parameter	Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	8
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.011
Median	0.011
Standard Deviation	0.003
Maximum	0.018
Minimum	0.007

- 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 152 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.011 mrem/yr based on the average of the actual gross counts.

#### 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 152 & Spreadsheet

# SECTION 7 ATTACHMENT 1 \_\_\_\_ PAGE(S)

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	BSI EP	BP SURVEY REPORT	
Pipe ID	Rx 152	Survey Location	-27 TRENCH
Survey Date	12-12-05/12-13-05	2350-1 #	212223
Survey Time	1245/1050	Detector-Sled #	44-62/204402-1
Pipe Size	3"	Detector Efficiency	0.00014
DCGL (dpm/100cm2)	240800	Pipe Area Incorporated by Datactor Efficiency (in cm2)	730
Area incorporated by Survey De	1.5	Field BKG (cpm)	5.2/5.2
Routine Survey	X	Field MDCR (counts)	10.8/10.8
QA Survey	18-18-18-19-10-10-10-10-10-10-10-10-10-10-10-10-10-	Nominal MDC (dpm/100cm2)	2,842
	S	urvey Measurement Results	
Total Number of Survey Measurements			21
Number of Measurements >MDC			8
Number of Measurements Above 50% DCGL			0
Number of Measurements Above DCGL			0
Mean			0.011
Median			0.011
Standard Deviation			0.003
Maximum			0.018
Minimum			0.007
	Survey Ur	nit Classification	1
	Survey Ur TBD 06-00	hit Classification D4 Piping Group	1 2
	Survey Ur TBD 06-00 SR-13 Radionucl	hit Classification 04 Piping Group ide Distribution Sample	1 2 EP 2-1
	Survey Ur TBD 06-00 SR-13 Radionucl Measu	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide	1 2 EP 2-1 Co60
	Survey Ur TBD 06-00 SR-13 Radionucl Measu Area Fac	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide stor/EMC Used	1 2 EP 2-1 Co60 No
	Survey Ur TBD 06-00 SR-13 Radionucl Measu Area Fac Pas	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide ctor/EMC Used s/Fail FSS	1 2 EP 2-1 Co60 No Pass
	Survey Ur TBD 06-00 SR-13 Radionucl Measu Area Fac Pass MREM/Y	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide ctor/EMC Used s/Fail FSS 'R Contribution	1 2 EP 2-1 Co60 No Pass <1
DAMMENTS: TIVITY VALUES N	Survey Ur TBD 06-00 SR-13 Radionucl Measu Area Fac Pass MREM/Y	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide tor/EMC Used s/Fail FSS R Contribution CORRECTED	1 2 EP 2-1 Co60 No Pass <1

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# EP Rx 152 3" Pipe TBD 06-004 Group 2

									(	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	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
2	2.6	2.6	18,571	2,545	1,321	21	15	1	74	0.011
3	1.6	1.6	11,429	1,566	813	13	9	1	45	0.007
4	2.6	2.6	18,571	2,545	1,321	21	15	1	74	0.011
5	2	2	14,286	1,958	1,016	16	12	1	57	0.008
6	4	4	28,571	3,916	2,032	32	23	2	114	0.017
7	4.3	4.3	30,714	4,209	2,185	35	25	2	122	0.018
8	3	3	21,429	2,937	1,524	24	17	1	85	0.013
9	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
10	3	3	21,429	2,937	1,524	24	17	1	85	0.013
11	2.6	2.6	18,571	2,545	1,321	21	15	1	74	0.011
12	1.6	1.6	11,429	1,566	813	13	9	1	45	0.007
13	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
14	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
15	4.3	4.3	30,714	4,209	2,185	35	25	2	122	0.018
16	2	2	14,286	1,958	1,016	16	12	1	57	0.008
17	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
18	2	2	14,286	1,958	1,016	16	12	1	57	0.008
19	3	3	21,429	2,937	1,524	24	17	1	85	0.013
20	2	2	14,286	1,958	1,016	16	12	1	57	0.008
21	2.7	2.7	19,286	2,643	1,372	22	16	1		0.011
										0.011
									MEDIAN	0.011
									STDDEV	0.011
	+						+		MAX	0.000
	<u> </u>		l		<u></u>				MIN	0.010
I			1			_		L		0.007

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# SECTION 7 ATTACHMENT 2 \_\_\_\_\_\_ PAGE(S)

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### Pipe Interior Radiological Survey Form

Date: 12-12-05	Time:	245		
Building: RX BUNG	Elevation:	-25	Access Point Area:	QUAD B
System: WAT BO	Pipe Diameter:	3'1	Pipe ID #	RX 152
Type of Survey Investigation	Characterizati	on Final S	urvey Other_	V
Sled Size <u>3"</u>	inch			
Detector:	2	Detector ID #:	204	407-101
Cal Date:/7	. 05	Cal Due Date:		17.06
Instrument: <u>2350-</u>	1	Instrument ID a	#:	223
Cal Date:	.05	Cal Due Date:	11.1	7-06
From the Daily Pipe Survey Detecto	r Control Form for	the Selected De	etector	
Background Value 5.2	cpm			
MDCR <sub>static</sub> <u>10.8</u>	cpm /		efficienc	y determination
Efficiency Factor for Pipe Diameter	.00014	(taken from	detector calibration ce	rtificate)
MDC <sub>static</sub> Z84Z	$-dpm/100cm^2$			V
Is the MDC <sub>static</sub> acceptable? <u>Ye</u>	s No (ii	f no, adjust sample	count time and recalculate	MDCR <sub>static</sub> )
Comments:				····

### Pipe Interior Radiological Survey

Radiologi	cal Survey Comm	lenceu. Dale		ne. <u>////</u>	·	
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	1	3	7	2.3	-2.9	nlo-
2	2	3	8	2.6	-2.6	
3	.3	3	5	. 1.6	-3.6	
4	4	3	8	2.6	-2.6	
5	5	3	le :	2	-3.8	
6	6	3	12	4	-1.2	
7	7	3	13	4.3	- 8	
8	8	3	9	3	-2.2	
9	9	3	7	2.3	-2.9	
10	10	<u> </u>	9	3	-2.2	4

Radiological Survey Commenced: Date: 12.12.05 Time: 1245

Package Page 1 of 🟒





## Pipe Interior Radiological Survey Form (Continuation Form)

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Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
	//	3	8	I la	C2.10	ala
12	12	3	5	1.6	-3.6	
13	13	3	7	2,3	-2.9	
14	14	3	10	3.3	-1.9	
15	15	3	13	4.3	9	
16	14	3	6	Z	-3.2	
11	11	3	10	3.3	-1.9	
18	18	3	4	2	-3.2	
19	19	3	9	3	-2.2	¥
			•			
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			·····			
						· · · · · · · · · · · · · · · · · · ·
		<u> </u>				
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			$\wedge A$			
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			<u> </u>	<u></u>		
				<u> </u>		
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Package Page 2 of 2







### Pipe Interior Radiological Survey Form

i.

Date:	12-13-05	Time:	050	
Building:	RX BLAG	Elevation:	25	Access Point Area: QUAD B
System:	NT ORA WED	Pipe Diameter:		Pipe ID # <u>RX 15 Z</u>
Type of Survey	/ Investigation	Characterizat	ion <u>Final</u>	Survey Other
Sled Size	3"	inch		
Detector:	44-62		Detector ID #	#: <u>204402-101</u>
Cal Date:	11-17-05		Cal Due Date	:: <u>//-/7-06</u>
Instrument:	2350-1	· · · · · · · · · · · · · · · · · · ·	Instrument ID	)#: 212223
Cal Date:	11-17-05	-	Cal Due Date	
From the Daily	Pipe Survey Detecto	r Control Form for	r the Selected D	Detector
Background Va	alue $5.2$	cpm		
MDCR <sub>static</sub>	10.8	cpm		efficiency determination
Efficiency Fact	or for Pipe Diameter	.00014	(taken from	n detector-calibration certificate)
$MDC_{static}$	2842	_dpm/100cm <sup>2</sup>		V
Is the $MDC_{st}$	atic acceptable? (Ye	s No (i	f no, adjust sample	le count time and recalculate MDCR <sub>static</sub> )
Comments:	CONTINU	ATION OF	PIPE SU	unuly FROM 12-12-05
				I

## Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-13-05 Time: 1050

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>	
1	20	3	6	ð	nia	nla	
2	21		B	2.7	1		
3	nla	nla	nla	Na			
4	<b> </b>			l -			
5							
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# SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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				C	QA Check	Sheet				
	Design #	EP Rx152	Revisio	n#	Original				· · · · ·	
Su	rvey Unit #		• •			EP Rx1	52			
		A.,,,		Preli	minary Da	ta Review	>			
	Answers to	the following que	estions s Rele	hould ease R	be fully do lecord	ocumente	d in the Survey Unit	Yes	No	N/A
1.	Have surveys	been performed in a	ccordance	e with s	urvey instruc	tions 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 instrum	entation MDC for em	bedded/bu	uried pi	ping static m	easuremen	ts below the DCGLw?	X		
4.	Was the instruembedded/bu static measure	imentation MDC for s ried piping scan mea ements or soil sample	structure s surements es address	s below sed in t	asurements the DCGL <sub>W</sub> he survey de	, soil scan r or, if not, v sign?	neasurements, and vas the need for additional			x
5.	Was the instru	mentation MDC for	volumetric	measu	rements and	l smear ana	alysis < 10% DCGL <sub>w</sub> ?			X
6.	Were the MDO used to perfor	Cs and assumptions m the survey?	used to de	evelop t	hem approp	riate for the	instruments and techniques	x		
7.	7. Were the survey methods used to collect data proper for the types of radiation involved and for the media being surveyed?							x		
8.	B. Were "Special Methods" for data collection property applied for the survey unit under review?							X		
9.	Is the data set design, which	comprised of qualifi accurately reflects the	ed measu ne radiolog	rement gical sta	results colle itus of the fa	cted in acc cility?	ordance with the survey	x		
				Gra	phical Dat	a Review		·····		
1.	I. Has a posting plot been created?								X	
2.	Has a histogra	am (or other frequend	cy plot) be	en crea	ted?					X
3.	Have other gr	aphical data tools be	en createo	d to ass	ist in analyzi	ng the data	?			X
					Data Anal	ysis				
1.	Are all sample	measurements belo	w the DC	GL <sub>W</sub> (C	lass 1 & 2), (	or 0.5 DCG	Lw (Class 3)?	X		
2.	Is the mean of	f the sample data < [	DCGLw?					X		
3.	If elevated area elevated area	as have been identif < DCGL <sub>EMC</sub> (Class	ied by sca 1), < DCG	<b>ins and</b> SLw (Cli	/or sampling ass 2), or <(	, is the ave ).5 DCGL <sub>W</sub>	rage activity in each (Class 3)?			X
4.	Is the result of	the Elevated Measu	rements T	「est < 1	.0?					X
5.	Is the result of	the statistical test (S	6+ for Sign	n Test o	r W, for WR	S Test) ≥ tł	ne critical value?			X
Con	ments:								_	
F٩	S/Characteriz	ation Engineer (print/	'sign)	Ag/	e Raud	H/L	Jol Bastall	Date	6-1	2-07
FS	S/ Characteriz	ation Manager (print	/sign)		MA	De	R. Case	Date	7/18	107
									Fo CS-	rm 09/2

# SECTION 7 ATTACHMENT 4 1 DISC

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Survey Unit Release Record									
Design #	EP-Rx 157	Revision #	Original	Page 1 of 3					
Survey Unit #(s)		Rx 157							
Description	<ol> <li>Embedded Pi pipe for Plum B</li> <li>EP Rx 157 is Survey Plan (FS</li> <li>Surveys in El optimized to me 3-9 from Survey</li> <li>Survey Instru in accordance w Work Execution document const acquisition of su</li> <li>Instrument ef BSI/LVS-002, V of radiation invol</li> </ol>	pe (EP) Survey Uni rook Reactor Facilit a Class 1, Group 1 SP) and Technical I P Rx 157 were perfor easure gamma energy Request (SR)-13 w actions for this survey in Package (WEP) 05 itute "Special Methor rvey measurements fficiency determination WEP 05-006, these of polved and the media	t Rx 157 meets they (PBRF). survey unit as person as the service of the service o	he definition of embedded r the PBRF Final Status (TBD)-06-004. ntillation detector e of Co-60. Sample #EP r this decision. orated into and performed orporated (BSI)/LVS-002, tructions described in this rey design used in the ed in accordance with the re appropriate for the types					
	Approval Sig	natures		Date:					
FSS/Characterizatio	n Engineer	Ocl Rus	nA	7-15-07					
Technical Rev (FSS/Characterizatio	iewer n Engineer)	Dipal		7-17-07					
FSS/Characterizatio	n Manager	Ma	R. Case	7/18/07					
		~		Form CS-09/1					

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FSS Design # EP Rx 157

Revision # Original

Survey Unit: Rx 157

#### 1.0 History/Description

- 1.1 The subject pipe is the drain line from the dry annulus inside the CV to the drain trench on the Rx Building -25 foot elevation.
- 1.2 EP Rx 157 consists of 4" diameter piping that is approximately 5 feet in length.
- 2.0 Survey Design Information
  - 2.1 EP Rx 157 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 5 survey measurements.
  - 2.3 Surface area for the 4" ID piping is 973 cm<sup>2</sup> for each foot of piping, corresponding to a total 4" ID piping surface area of 4,864 cm<sup>2</sup> (0.5 m<sup>2</sup>) for the entire length of (approximately 5') 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 Rx 157 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.

FSS	Design	#	EP	Rx	157	
100	Donen			1.01	101	

**Revision # Original** 

Page 3 of 3

Survey Unit: Rx 157

#### 5.5 Statistical Summary Table

	4"
Statistical Parameter	Pipe
Total Number of Survey Measurements	5
Number of Measurements >MDC	4
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0288
Median	0.0307
Standard Deviation	0.0064
Maximum	0.0337
Minimum	0.0184

- 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 157 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.029 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 – EP RX 157 SURR & Spreadsheet Disc SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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Babcock	BSI EP	BP SURVEY REPORT			
Pipe ID	Rx 157	Survey Location	CV -25el.		
Survey Date	28-Jul-06	2350-1 #	189094		
Survey Time	13:17	Detector-Sled #	44-159/238369-101		
Pipe Size	4"	Detector Efficiency	0.0002		
DCGL (dom/100cm2)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm2)	973		
Pipe Area Incorporated by	0.5	Field BKG (cpm)	12.3		
Routine Survey	X	Field MDCR (cpm)	15.1		
QA Survey		Nominal MDC (dpm/100cm2)	4,049		
	S	urvey Measurement Results			
	Total Number of S	urvey Measurements	5		
· · · · · · · · · · · · · · · · · · ·	Number of Mea	surements >MDC	4		
	Number of Measurem	ents Above 50% DCGL	0		
	Number of Measure	ements Above DCGL	0		
	M	ean	0.0288		
	Me	edian	0.0307		
·····	Standard	Deviation	0.0064		
	Max	ámum	0.0337		
	Min	imum	0.0184		
		STOCK			
Survey T	echnician(s)				
	<u></u>				
	Survey Unit	Classification	1		
	TBD 06-004	Piping Group	1		
	SR-13 Radionuclide	e Distribution Sample	EP 3-9		
	Measure	ed Nuclide	Co-60		
	Area Facto	r/EMC Used	No		
	Pass/I	Fail FSS	Pass		
	MREM/YR	Contribution	<1		
······	· · · · · · · · · · · · · · · · · · ·				
COMMENTS:	NOT BACKGROUND	CORRECTED			
RP Engi	ineer   Date	DON/M	7.15 07		

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## EP Rx 157 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	9	9	45,000	4,625	183	4,388	1,166	135	32	0.028
2	10	10	50,000	5,139	204	4,875	1,296	150	36	0.031
3	11	11	55,000	5,653	224	5,363	1,426	165	39	0.034
4	11	11	55,000	5,653	224	5,363	1,426	165	39	0.034
5	6	6	30,000	3,084	122	2,925	778	90	21	0.018
									MEAN	0.029
									MEDIAN	0.031
									STD DEV	0.006
									MAX	0.034
	1								MIN	0.018

# SECTION 7 ATTACHMENT 2 \_\_\_\_ PAGE(S)

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BSI/LVSPipeCrawler-002 Revision 4

Pipe Interior Radiological Survey Form
Date: $7/2F/06$ Time: $1317$ Pipe ID#: $R_{1.57}$ Pipe Diameter: $4''$ Access Point Area: $CV - 25'$ Building: $CV$ Elevation: $-25'$ System: $OR_{MN}$
Type of Survey       Investigation       Characterization       Final Survey       Other       Image: Construction         Gross       Co60       Cos       Cos
Detector Cal Date:         3/6/06         Detector Cal Due Date:         3/6/07           Instrument:         2350-/         Instrument ID #:         189094-
Instrument Cal Date: $3/15/06$ Instrument Cal Due Date: $3/15/07$
Background Value <u>12.3</u> cpm
$\frac{MDCR_{\text{static}}}{IS.1}  \text{cpm}$ Efficiency Factor for Pipe Diameter $\underbrace{\mathcal{O} \cdot \mathcal{O} \mathcal{O} \mathcal{O} \mathcal{O}}_{\text{(from detector efficiency determination)}}$ $\frac{MDC_{\text{static}}}{MDC_{\text{static}}}  \underbrace{\frac{4049}{\text{opm}}}_{\text{(from detector efficiency determination)}}  \text{cm}^2$ $\frac{15.1}{1S \text{ the MDC}_{\text{static}}}  \text{acceptable?}  \underbrace{\text{(Yes)}}_{\text{No}}  \underbrace{\text{(if no, adjust sample count time and recalculate MDCR_{\text{static}})}}$
Comments: INITIME SURVEY; EP3-9 COMPLIETE
MA-A->

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Technician Signature

## Pipe Interior Radiological Survey

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Position #	Feet into Pipe from Opening	Count Time	Gross Counts	Gross	Net	dpm/100cm <sup>2</sup>
1	I I I	<b>1</b>	a			10
1				7	na	nia
2	2		10	10		
3	3			11		
4	4		11	11		
5	5		6	6.		
6	6	NA	NA	N/A	1	J
7			N			
8			1			
9			H			
10						

Package Page 1 of Z



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SECTION 7 ATTACHMENT 3 \_\_\_\_ PAGE(S)

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				DQA Check	Sheet			
Desi	gn #	EP Rx 157	Revision #	Original				
Survey	Unit #			<u></u>	EP 157			
			Pre	liminary Data	Review`			
Ans	wers to	the following que	stions shoul Release	d be fully doo Record	cumented in the Survey Unit	Yes	No	N/A
1. Have	e surveys l	been performed in ac	cordance with	survey instructi	ons in the Survey Design?	x		
2. Is the surv	e instrume ey units, o	ntation MDC for strue r below 0.5 DCGL <sub>W</sub> f	cture static mea or Class 3 surv	asurements belovey units?	ow the DCGL <sub>w</sub> for Class 1 and 2			x
3. Is th	e instrume	ntation MDC for emb	edded/buried p	piping static me	asurements below the DCGLw?	X		
4. Was emb stati	the instru edded/bur c measure	mentation MDC for si ied piping scan meas ments or soil sample	tructure scan m surements belo s addressed in	neasurements, s w the DCGL <sub>W</sub> of the survey des	soil scan measurements, and or, if not, was the need for additional ign?			x
5. Was	the instru	mentation MDC for v	olumetric meas	urements and s	smear analysis < 10% DCGL <sub>w</sub> ?			X
6. Wen used	e the MDC I to perform	s and assumptions un the survey?	ised to develop	them appropria	ate for the instruments and technique	s x		
7. Wen med	e the surve ia being su	ey methods used to a urveyed?	ollect data prop	per for the types	s of radiation involved and for the	x		
8. Wer	e "Special	Methods" for data co	llection propert	y applied for the	e survey unit under review?	X		
9. is th desi	e data set gn, which	comprised of qualifie accurately reflects the	d measuremen e radiological s	nt results collect tatus of the faci	ed in accordance with the survey lity?	x		
		<u> </u>	Gr	aphical Data	Review			<b>_</b>
1. Has	a posting	plot been created?						X
2. Has	a histogra	m (or other frequency	y plot) been cre	eated?				X
3. Have	e other gra	phical data tools bee	n created to as	sist in analyzin	g the data?			X
			<u> </u>	Data Analy	Sis			
1. Are :	all sample	measurements below	w the DCGLw (	Class 1 & 2), or	0.5 DCGL <sub>W</sub> (Class 3)?	X		ļ
2. Is th	e mean of	the sample data < D	CGLw?			X		
3. If ele eleva	evated area	as have been identified < DCGL <sub>EMC</sub> (Class 1	ed by scans an ), < DCGL <sub>W</sub> (C	d/or sampling, i class 2), or _<0.	s the average activity in each 5 DCGL <sub>w</sub> (Class 3)?			X
4. Is th	e result of	the Elevated Measur	ements Test <	1.0?				X
5. is the	e result of	the statistical test (S-	+ for Sign Test	or Wr for WRS	Test) ≥ the critical value?			X
Comment	s:						<del></del>	
FSS/Ch	naracteriza	tion Engineer (print/s	sign) Dg	1C , RAG	Hell Del Mulik	Date	7-1-	5-07
FSS/C	haracteriza	ation Manager (print/s	sign)	MAA	R. Case	Date	7/1	107
						Γ	Fo	rm
							CS-0	)9/2

SECTION 7 ATTACHMENT 4 1 DISC

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Survey Unit Release Record									
Design #	EP-1.31	Revision #	Original	Page	1 of	3			
Survey Unit #(s)			1.31						
Description	<ol> <li>Embedder pipe for Plu</li> <li>EP 1.31 if Survey Plan</li> <li>Survey Plan</li> <li>Survey Plan</li> <li>Survey Req</li> <li>Survey Req</li> <li>Survey Req</li> <li>Survey Req</li> <li>Survey In in accordance</li> <li>Work Executed occument caracquisition</li> <li>Instrument BSI/LVS-00 of radiation</li> </ol>	ed Pipe (EP) Survey Uni m Brook Reactor Facilit is a Class 1, Group 2 sur a (FSSP) and Technical 1 in EP 1.31 were perform gamma energies represe uest (SR)-13 was referen astructions for this surve ce with (IAW) the Babca ution Package (WEP) 05 onstitute "Special Metho of survey measurements at efficiency determination 02, WEP 05-006, these of involved and the media	t 1.31 meets the ory (PBRF). vey unit as per the Basis Document and using a scintil intative of Co-60. inced for this deci by unit are incorp ock Services Inco -006. Survey ins ods" and the surv	definition he PBRF (TBD)-0 llation de Sample sion. orated in orporated tructions ey design ed in acco e approp	Final S 6-004. etector of #EP 2- to and j describ n used i ordance riate fo	bedded Status optimized 1 from performed /LVS-002, bed in this in the e with the or the types			
	Approval	Signatures		 	Date	8:			
FSS/Characterization	n Engineer	Dal Rande	ull	6-11	1-07				
FSS/Characterization	ewer n Engineer)	Awood		6-	28-	07			
FSS/Characterization	n Manager	Mar	1. Case	7/-	3/07				
		,				Form S-09/1 Rev 0			

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FSS Design # EP 1.31	Revision # Original	Page 2 of 3
Survey Unit: 1.31		

#### 1.0 History/Description

- 1.1 The subject pipe system is the 3" purge line for Quad "D". The function of this pipe was to convey water from the one 3 inch riser in Quad "D" to the HD sump in Pump Room #22 on the Rx Building -25 ft, where the pipe is currently breached.
- 1.2 EP 1.31 consists of approximately 150 feet in length from the pump room to the riser in Quad "D". The pipe section has approximately eight elbows ranging from 45° to 90°.
- 2.0 Survey Design Information
  - 2.1 EP 1.31 was surveyed IAW Procedure #BSI/LVS-002.
  - 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 141 survey measurements.
  - 2.3 Surface area for the 3" ID piping is 729.7 cm<sup>2</sup> for each foot of piping, corresponding to a total 3" ID piping surface area of 102,930 cm<sup>2</sup> (10.3 m<sup>2</sup>) for the entire length of (141') of 3" 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 1.31 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.

FSS Design # EP 1.31	Revision # Original	Page 3 of 3
Survey Unit: 1.31		

#### 5.5 Statistical Summary Table

	3"
Statistical Parameter	Pipe
Total Number of Survey Measurements	141
Number of Measurements >MDC	0
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.020
Median	0.020
Standard Deviation	0.006
Maximum	0.038
Minimum	0.008

- 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 1.31 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 1.31 & Spreadsheet

# SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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0-1 # 189094 pr-Sied # 44-159/238369 Efficiency 0.0003 Detector Efficiency (in cm2) 730 3KG (cpm) 13.9/13.9/11.7 DCR (counts) 15.9/15.9/14.8 DC (dpm/100cm2) 12.683 Results 141 0 3L 0 0 0.020 0.020 0.020 0.020 0.008 ROSENHAGEN
Or-Sied #         44-159/238369           Efficiency         0.0003           Delector Efficiency (in cm2)         730           3KG (cpm)         13.9/13.9/11.7           DCR (counts)         15.9/15.9/14.8           DC (dpm/100cm2)         12,683           Results         0           SL         0           0         0.020           0.020         0.020           0.020         0.038           0.038         0.008           ROSENHAGEN         1
Efficiency         0.0003           Detector Efficiency (in cm2)         730           BKG (cpm)         13.9/13.9/11.7           DCR (counts)         15.9/15.9/14.8           DC (downto)         12,683           Results         141           0         0           SL         0           0         0.020           0.020         0.020           0.038         0.038           0.008         ROSENHAGEN
Detector Efficiency (in cm2)         730           BKG (cpm)         13.9/13.9/11.7           DCR (counts)         15.9/15.9/14.8           DC (dpm/100cm2)         12,683           Results         141           0         0           3L         0           0.020         0.020           0.020         0.006           0.038         0.008           ROSENHAGEN         0
BKG (cpm)         13.9/13.9/11.7           DCR (counts)         15.9/15.9/14.8           DC (dpm/100cm2)         12,683           Results         141           0         0           3L         0           0         0.020           0.020         0.020           0.038         0.038           0.008         ROSENHAGEN
DCR (counts) 15.9/15.9/14.8 DC (counts) 12,683 Results 141 0 5L 0 0.020 0.020 0.020 0.020 0.038 0.038 0.008 ROSENHAGEN
DC (dpm/100cm2) 12,683 Results 141 0 3L 0 0 0.020 0.020 0.020 0.020 0.006 0.038 0.038 0.008 ROSENHAGEN
Cesults         141           0         0           3L         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0.020           0         0.006           0.038         0.008           ROSENHAGEN         0
141 0 3L 0 0 0.020 0.020 0.006 0.038 0.008 ROSENHAGEN
0 SL 0 0 0.020 0.020 0.020 0.006 0.038 0.008 ROSENHAGEN
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1 2 EP 2-1
1 2 EP 2-1 Co60
1 2 EP 2-1 Co60 No
1 2 EP 2-1 Co60 No Pass

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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	63,333	8,679	4,505	72	51	4	252	0.038
2	9	9	30,000	4,111	2,134	34	24	2	119	0.018
3	13	13	43,333	5,939	3,082	49	35	3	1/2	0.026
4	9	9	30,000	4,111	2,134	34	24	2	119	0.018
5	13	13	43,333	5,939	3,082	49	35	3	172	0.026
6	8	8	26,667	3,654	1,897	30	22	2	106	0.016
7	16	16	53,333	7,309	3,793	61	43	4	212	0.032
8	9	9	30,000	4,111	2,134	34	24	2	119	0.018
9	14	14	46,667	6,395	3,319	53	38	3	185	0.028
10	15	15	50,000	6,852	3,556	57	40	3	199	0.030
	14	14	46,667	6,395	3,319	53	38	3	185	0.028
12	11	11	36,667	5,025	2,608	42	30	2	140	0.022
	7	7	23,333	3,198	1,660	27	19	2	93	0.014
	8	8	26,667	3,654	1,897	30	22	2	100	0.016
15	12	12	40,000	5,482	2,845	45	32	3	159	0.024
16	8	8	26,667	3,654	1,897	30	22	2	100	0.010
		11	36,667	5,025	2,608	42	30	2	140	0.022
		11	36,667	5,025	2,608	42	30	2	140	0.022
19	6	6	20,000	2,/41	1,423	23	01	1	19	0.012
20		11	35,667	5,025	2,608	42	30	2	140	0.022
21	12	12	40,000	5,482	2,845	40	32	3	109	0.024
22	10	10	33,333	4,508	2,3/1	30	21		132 66	0.020
23	5	5		2,284	1,100	19	13		1/6	0.010
24		11	50,00/	7 300	2,000	42			212	0.022
25	16	16	23,333	1,309	3,793	10	40		106	0.002
20	× ×	8	20,00/	3,004	1,097	30	22	2	122	0.010
21	10	10	33,333	4,008	2,3/1		20	2	192	0.020
28	14	14	40,007	0,395	3,319	03	30		146	0.020
29			30,00/	5,025	2,008	42	20	2	1/10	0.022
30	11	11	30,667	5,025	2,008	42	30	2	140	0.022
31	8	8	20,007	3,004	1,09/	30			70	0.010
32	6	6	20,000	L 2,741	1,423	23	10	I	79	1.0.012

Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co- <del>8</del> 0 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
33	6	6	20,000	2,741	1,423	23	16	1	79	0.012
34	11	11	36,667	5,025	2,608	42	30	2	140	0.022
35	9	9	30,000	4,111	2,134	34	24	2	119	0.018
36	14	14	46,667	6,395	3,319	53	38	3	100	0.020
3/	9	9	30,000	4,111	2,134	34	24	2	119	0.010
38	9	9	30,000	4,111	2,134	34	24	2	119	0.010
39	9	9	30,000	4,111	2,134	34		2	119	0.010
40	1	1	23,333	3,198	1,000	21	19	2	172	0.014
41	13	13	43,333	5,939	3,062	49	35	3	172	0.020
42	13	13	43,333	0,939	3,062	49	30	3	238	0.020
43	10	10	00,000	6,223	4,200	42	49	4	146	0.000
44	10	10	50,007	9,025	2,000		30	Z	238	0.022
45	10	10	20,000	0,223	4,200	23	16	1	79	0.000
40	7	7	20,000	3 108	1,423	23	10	2	93	0.014
41	· · · ·	0	30,000	<u> </u>	2 134	34	24	2	119	0.018
40		14	46 667	6 3 9 5	2,104	53	38	3	185	0.028
- 43	12	12	40,007	5 482	2 845	45	32	3	159	0.024
51	11	11	36 667	5 025	2 608	42	30	2	146	0.022
52	13	13	43 333	5 939	3 082	49	35	3	172	0.026
53	13	13	43,333	5 939	3.082	49	35	3	172	0.026
54	5	5	16,667	2,284	1,185	19	13	1	66	0.010
55	14	14	46,667	6.395	3.319	53	38	3	185	0.028
56	8	8	26,667	3.654	1.897	30	22	2	106	0.016
57	10	10	33.333	4,568	2,371	38	27	2	132	0.020
58	13	13	43.333	5.939	3.082	49	35	3	172	0.026
59	4	4	13.333	1,827	948	15	11	1	53	0.008
60	8	8	26.667	3.654	1.897	30	22	2	106	0.016
61	5	5	16.667	2,284	1,185	19	13	1	66	0.010
62	12	12	40.000	5,482	2,845	45	32	3	159	0.024
63	12	12	40,000	5,482	2,845	45	32	3	159	0.024

<b>Measurement</b> #	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
64	9	9	30,000	4,111	2,134	34	24	2	119	0.018
65	9	9	30,000	4,111	2,134	34	24	2	119	0.018
66	6	6	20,000	2,741	1,423	23	16	1	79	0.012
67	7	7	23,333	3,198	1,660	27	19	2	93	0.014
68	7	7	23,333	3,198	1,660	27	19	2	93	0.014
69	12	12	40,000	5,482	2,845	45	32	3	159	0.024
70	12	12	40,000	5,482	2,845	45	32	3	159	0.024
71	4	4	13,333	1,827	948	15	11	1	53	0.008
72	12	12	40,000	5,482	2,845	45	32	3	159	0.024
73	12	12	40,000	5,482	2,845	45	32	3	159	0.024
74	10	10	33,333	4,568	2,371	38	27	2	132	0.020
75	4	4	13,333	1,827	948	15	11	1	53	0.008
76	9	9	30,000	4,111	2,134	34	24	2	119	0.018
77	9	9	30,000	4,111	2,134	34	24	2	119	0.018
78	10	10	33,333	4,568	2,371	38	27	2	132	0.020
79	10	10	33,333	4,568	2,371	38	27	2	132	0.020
80	9	9	30,000	4,111	2,134	34	24	2	119	0.018
81	8	8	26,667	3,654	1,897	30	22	2	106	0.016
82	11	11	36,667	5,025	2,608	42	30	2	146	0.022
83	9	9	30,000	4,111	2,134	34	24	2	119	0.018
84	6	6	20,000	2,741	1,423	23	16	1	79	0.012
85	9	9	30,000	4,111	2,134	34	24	2	119	0.018
86	9	9	30,000	4,111	2,134	34	24	2	119	0.018
87	9	9	30,000	4,111	2,134	34	24	2	119	0.018
88	6	6	20,000	2,741	1,423	23	16	1	79	0.012
89	14	14	46,667	6,395	3,319	53	38	3	185	0.028
90	13	13	43,333	5,939	3,082	49	35	3	172	0.026
91	8	8	26,667	3,654	1,897	30	22	2	106	0.016
92	13	13	43,333	5,939	3,082	49	35	3	172	0.026
93	8	8	26,667	3,654	1,897	30	22	2	106	0.016

Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm2)	Cs-137 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-1 <del>54</del> activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
94	9	9	30,000	4,111	2,134	34	24	2	119	0.018
95	9	9	30,000	4,111	2,134	34	24	2	119	0.018
96	12	12	40,000	5,482	2,845	45	32	3	159	0.024
97	11	11	36,667	5,025	2,608	42	30	2	146	0.022
98	14	14	46,667	6,395	3,319	53	38	3	185	0.028
99	13	13	43,333	5,939	3,082	49	35	3	172	0.026
100	5	5	16,667	2,284	1,185	19	13	1	66	0.010
101	7	7	23,333	3,198	1,660	27	19	2	93	0.014
102	11	11	36,667	5,025	2,608	42	30	2	146	0.022
103	11	11	36,667	5,025	2,608	42	30	2	146	0.022
104	9	9	30,000	4,111	2,134	34	24	2	119	0.018
105	7	7	23,333	3,198	1,660	27	19	2	93	0.014
106	9	9	30,000	4,111	2,134	34	24	2	119	0.018
107	6	6	20,000	2,741	1,423	23	16	1	79	0.012
108	12	12	40,000	5,482	2,845	45	32	3	159	0.024
109	11	11	36,667	5,025	2,608	42	30	2	146	0.022
110	10	10	33,333	4,568	2,371	38	27	2	132	0.020
111	13	13	43,333	5,939	3,082	49	35	3	172	0.026
112	7	7	23,333	3,198	1,660	27	19	2	93	0.014
113	8	8	26,667	3,654	1,897	30	22	2	106	0.016
114	8	8	26,667	3,654	1,897	30	22	2	106	0.016
115	11	11	36,667	5,025	2,608	42	30	2	146	0.022
116	15	15	50,000	6,852	3,556	57	40	3	199	0.030
117	11	11	36,667	5,025	2,608	42	30	2	146	0.022
118	6	6	20,000	2,741	1,423	23	16	1	79	0.012
119	9	9	30,000	4,111	2,134	34	24	2	119	0.018
120	8	8	26,667	3,654	1,897	30	22	2	106	0.016
121	9	9	30,000	4,111	2,134	34	24	2	119	0.018
122	8	8	26,667	3,654	1,897	30	22	2	106	0.016
123	12	12	40,000	5,482	2,845	45	32	3	159	0.024
124	10	10	33,333	4,568	2,371	38	27	2	132	0.020

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Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm2)	Cs-137 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-164 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
125	6	6	20,000	2,741	1,423	23	16	1	79	0.012
126	7	7	23,333	3,198	1,660	27	19	2	93	0.014
127	7	7	23,333	3,198	1,660	27	19	2	93	0.014
128	13	13	43,333	5,939	3,082	49	35	3	172	0.026
129	6	6	20,000	2,741	1,423	23	16	1	79	0.012
130	5	5	16,667	2,284	1,185	19	13	1	66	0.010
131	6	6	20,000	2,741	1,423	23	16	1	79	0.012
132	6	6	20,000	2,741	1,423	23	16	1	79	0.012
133	12	12	40,000	5,482	2,845	45	32	3	159	0.024
134	15	15	50,000	6,852	3,556	57	40	3	199	0.030
135	9	9	30,000	4,111	2,134	34	24	2	119	0.018
136	9	9	30,000	4,111	2,134	34	24	2	119	0.018
137	17	17	56,667	7,766	4,030	64	46	4	225	0.034
138	11	11	36,667	5,025	2,608	42	30	2	146	0.022
139	10	10	33,333	4,568	2,371	38	27	2	132	0.020
140	16	16	53,333	7,309	3,793	61	43	4	212	0.032
141	14	14	46,667	6,395	3,319	53	38	3	185	0.028
									MÉAN	0.020
									MEDIAN	0.020
									STD DEV	0.006
									MAX	0.038
									MIN	0.008

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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#### BSI/LVSPipeCrawler-002 Revision 4

### Pipe Interior Radiological Survey Form

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Date: 7/5/06	Time:	1025			
Pipe ID#: 1.3 /	Pipe Diameter:	3.0 11	Access	Point Area:	-27' TRENDA
Building:	Elevation:	- 27'	S	/stem:	DRAINS
¢.					
Type of Survey Investigati	on Charact	erization	Final Surve	y <u>X</u> or	ther
Gross	Co60		Cs		
Detector ID# / Sled ID#	44-159 #2	38369 /	121	<u> </u>	_
Detector Cal Date:	16/06	Detector Cal I	Due Date: _	3/6/0	7
Instrument: <b>23</b> S	0-1	Instrument	: ID #:	18909.	4
Instrument Cal Date: 3	115/06	Instrument Cal	Due Date:	3/15/	07
From the Daily Pipe Survey	Detector Control Fo	rm for the Select	ed Detector		
Background Value /3.9	cpm				
MDCR <sub>static</sub> 15.9	cpm				
Efficiency Factor for Pipe Di		<b>3</b> (from a	letector effici	ency determ	ination)
MDC <sub>static</sub> 12683	dpm/100	cm <sup>2</sup>			
Is the MDC <sub>static</sub> acceptable?	Yes No	(if no, adjust s	ample count tim	e and recalcula	te MDCR <sub>static</sub> )
Comments: INITIAL	SURVEY; EP	2-3			
					<u> </u>

Technician 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	1	19	19	nla	nla
2	2	1	9	9		ì
3	3		13	13		
4	4		9.	9		
5	5		13	13		
6	6		8	8		
7	7		16	16	•	
8	6		9	9		
9	9		14	14		
10	10	Y	15	15	V V	



Package Page 1 of <u>3</u>



## Pipe Interior Radiological Survey Form (Continuation Form)

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Date: Pipe ID#:	7/5/06	 Pipe Diameter	: 3.0″	Access	Point Area: _	27 TRBARH
Building:	R	Elevation:	-27'	Sy	/stem:	DRAINS
			· · · · · · · · · · · · · · · · · · ·			
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
#	from Opening	(min)		cpm	cpm	
11	<u>r(</u>		14-		na	nja
12			<u> </u>			
13	13					
14	14		8	8		
15	15	<i> </i>	16			
16			8	<u> </u>		
17	17			<u> </u>		
18	15			[1]		
19	19		6	6		
20	20		└ <u>└</u> └			
21	21		12	12		
22	22		10			
23	23		5	5		
24	2.4		1(	!(		
25	25		16			
26	26		8	8		
27	27	`	10	10		
28	29		14	14		
29	21			11		
30	30		11	<u> </u>		I
31	31		8	8		
32	32		6	6		
33	33		6	6		
34	34		(	!/		
35	35		9	9		
36	36		14	14		
37	37		9	9		
. 38	38		9	9		
39	39		9	9		
40	40		7	7		
41	41		13	13		
42	42		13	13		
43	43		18	18		
44	44		1	11		
45	45	$\checkmark$	18	18	V	V





Attachment 3, Page 2

Package Page 2 of 3


#### BSI/LVSPipeCrawler-002 Revision 4

#### Pipe Interior Radiological Survey Form

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Date:	7/5/06	Time:	1313		
Pipe ID#:	1.31	Pipe Diameter:	3.0″	Access Point Area:	E-CANAL
Building:	<u>C</u> V	Elevation:	-25'	System:	PRAINS
Type of Su Gross Detector Detector Instrument Instrument From the D Backgroun MDCR <sub>static</sub> Efficiency MDC <sub>static</sub> Is the MDC	rvey Investigation r ID# / Sled ID# 4 Cal Date: $3/6$ ment: 23 Cal Date: $3/6$ cal Da	n Character Co60 4 - 159 238369 6 C 5 - 1 5 - 1 5 - 1 5 - 1 5 - 2 - 1 5 - 1 5 - 2 - 1 5 - 1 5 - 2 - 1	erization Fi / Detector Cal Due Instrument ID Instrument Cal Due Instrument Cal Due Instrument Cal Due (from detected I (if no, adjust samp) (if no, adjust samp)	nal Survey $\bigwedge$ Oth Cs 12.1 Date: $3/c/a$ #: $189094$ te Date: $3/15/a$ Detector ctor efficiency determined the count time and recalculat	her $\underline{\checkmark}$ 27
	<b></b>				

Technician Signature

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#### Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross	Net cpm	dpm/100cm <sup>2</sup>
1		1	6	6	nia	nla
2	2		7	7	)	
3	3		9	9		
4	4		[4.	14	· ·	
5	5		12	12		
6	6		11	1/		
7	7		13	13		
8	8		13	-13		
9	9		5	5		
10	10	$\mathbf{V}$	14	14	V	J

Package Page 1 of <u>3</u>



REFERENCE COPY

### Pipe Interior Radiological Survey Form (Continuation Form)

Date:	7/5/06		- 11	,		<b>.</b>
Pipe ID#:	1.31	Pipe Diamete	r: <u> </u>	Access	Point Area: _	E · CANAL
Building:	<u> </u>	Elevation:	-25'	S	ystem:	DRAINS
					· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
#	from Opening	(min)		cpm	cpm	
11	11		8	5	nla	nja
12	12		10	10		
13	13		13	13		
14	14		4	4		
15	15		4	F		
16	16		5	5		
17	17		12	12		
18	18		12	12		
19	19		9	9		
20	20		9	9		
21	21		6	6		
22	22		7	7		
23	23		7	1		
24	7.4		12	12		
25	25		12	12		
26	26		4	4		
27	27		12	12		
28	28		12	12		
29	21		10	10		
30	30		4	4		
3(	31		9	9		
32	32		9	9		
33	33		10	10		
34	34		10	ID		
35	35		9	9		
36	36		8	- C		
37	37		11	11		
38	38		9	9		
39	39		6	6		
40	40		9	9		
4)	41		9	_ 9		
42	42		9	9		
43	43		6	6		
44	44		14-	14		
45	45	Y	13	13		





Attachment 3, Page 2

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PIPE SURVEYED 1.31



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BSI/LVSPipeCrawler-002 Revision 4

#### Pipe Interior Radiological Survey Form

Date: 7/6/06	Time:	0800		
Pipe ID#: 1.3/	Pipe Diameter:	3.0 "	Access Point Area:	QUAD D
Building: <u>CV</u>	Elevation:	-25'	System:	DRAINS
Type of Survey Investigation	Character	rization Fin	al Survey X O	ther $\checkmark$
Gross	Co60		Cs	
Detector ID# / Sled ID#	44-159 # 23	8369 / 12	<u> </u>	_
Detector Cal Date: 3/6	100	Detector Cal Due I	Date: <u>3/6/0</u>	7
Instrument: 23	50-1	Instrument ID #	t:	4
Instrument Cal Date:3//	5/00	Instrument Cal Due	Date: 3/15/0	7
From the Daily Pipe Survey De	tector Control Forr	n for the Selected D	etector	
Background Value 11.7	cpm			
MDCR <sub>static</sub> 14,8	cpm			
Efficiency Factor for Pipe Diam	neter 0.000	3 (from detect	tor efficiency determ	ination)
MDC <sub>static</sub> 12683	dpm/00	$cm^2$		
Is the MDC <sub>static</sub> acceptable?	Yes No	(if no, adjust sample	count time and recalcula	ate MDCR <sub>static</sub> )
Comments: <u>CONTINUATION</u>	SURVEY	: EP2-3		COMPLIETTE

Technician Signature

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### Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross	Net cpm	dpm/100cm <sup>2</sup>
1	1	1	8	8	Ma	nia
2	2	1	13	13	1	1
3	3		8	8		
4	4		9	9		
5	5		9	9		
6	6		12	12		
7	7					
8	8	( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	14	14		
9	9		13	13		
10	10	Ý	5	5	- 1	



Package Page 1 of <u></u>



# Pipe Interior Radiological Survey Form (Continuation Form)

Date;	7/6/06					
Pipe ID#:	1.31	Pipe Diamete	r: <u>3.0</u> "	Access	Point Area: (	DUAD D
Building:	CV	Elevation:	-25'	S	ystem:	DRAINS
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dnm/100 cm^2$
· #	from Opening	(min)	Croos Counts	cpm	cpm	upine robern
11		1	7	7	nla	nla
12	12		11	11	1	
13	3		11			
14	14		9	9		
15	15		7	. 7		
16	16		9	9		
17			6	6		
18	18		12	12		
19	19		11			
20	20		10	10		
21	21		13	13		
22	22		7	7		
23	23		8	8		
24	24		8	8		
25	25		11	11		
26	26		15	15		
27	2]		11	11		
28	28		6	6		
29	29		9	9		
30	30		8	8		
31	31		9	9		
32	32		8	8		
33	33		12	12		
34	34		10	10		1
35	35		6	6		
36	36		7.	7		
37	37		7	7		
38	38		/3	13		
39	39		6	6		+
40	40		S	5		+
41	41		6	6		
42	42		6	6		1 - 1
+3	43		12	12		
44	44		15	15		-
45	45	Y	9	9	V	

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#### BSI/LVSPipeCrawler-002 Revision 4

### Pipe Interior Radiological Survey Form (Continuation Form)

Date:	7/6/06	Dino Diamotor		(	Daint Areas	
Pipe ID#:		Fipe Diameter	3.0	Access	Politi Area:	PUAD U
Dunung.			- 25			DICHINS
Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dpm/100cm^2$
#	from Opening	(min)		cpm	cpm	
46	46	1	9	9	nla	nla
47	47		17	17	]]	· · · · · · · · · · · · · · · · · · ·
48	48					
49	49	i	10	10		
50	50		16	16		
	51	¥	14	14		<u> </u>
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Attachment 3, Page 2

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# SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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				AA CHOCK	Suger				
Design #	EP 1.31	Revision	#	Original					
Survey Unit #					EP 1.31				
			Prelim	ninary Dat	a Review`				
Answers to	the following que	stions sh Relea	ould b ase Re	e fully do	cumented in	the Survey Unit	Yes	No	N/A
. Have surveys	been performed in a	ccordance	with sur	vey instruct	ions in the Sur	vey Design?	X		
2. Is the instrum survey units, o	entation MDC for stru or below 0.5 DCGL <sub>W</sub>	icture static for Class 3	: measu survey	irements be units?	low the DCGL	v for Class 1 and 2			x
3. Is the instrum	entation MDC for em	bedded/bur	ied pipi	ng static me	asurements b	elow the DCGLw?	X	L	
<ol> <li>Was the instru- embedded/bu static measure</li> </ol>	Imentation MDC for ried piping scan mea ements or soil sampl	structure sca surements es addresse	an mea below t ed in the	surements, he DCGL <sub>W,</sub> e survey de	soil scan meas or, if not, was t sign?	surements, and he need for additional			x
5. Was the instru	mentation MDC for	volumetric n	neasure	ements and	smear analysis	s < 10% DCGL <sub>W</sub> ?		<u> </u>	X
<ol> <li>Were the MD used to performed</li> </ol>	Cs and assumptions m the survey?	used to dev	elop the	em appropr	ate for the inst	ruments and techniques	X		
7. Were the surv media being s	ey methods used to urveyed?	collect data	proper	for the type	s of radiation in	nvolved and for the	X		
3. Were "Specia	i Methods" for data c	ollection pro	operty a	pplied for th	e survey unit u	nder review?	X		
<ol> <li>Is the data se design, which</li> </ol>	comprised of qualifi accurately reflects the	ed measure ne radiologic	ement re cal statu	esults collec us of the fac	ted in accordance ility?	nce with the survey	x		
			Grap	hical Data	Review				
I. Has a posting	plot been created?								X
2. Has a histogra	am (or other frequen	cy plot) beer	n create	ed?		·····			X
3. Have other gr	aphical data tools be	en created	to assis	t in analyzir	ng the data?				X
	,,,,		,i_	Data Analy	/sis		r		<del></del>
1. Are all sample	e measurements belo	w the DCG	L <sub>w</sub> (Cla	ss 1 & 2), o	r 0.5 DCGLw (	Class 3)?	X		
2. Is the mean o	f the sample data < [	CGLw?		<u> </u>		<u></u>	X		
<ol> <li>If elevated area elevated area</li> </ol>	eas have been identit < DCGL <sub>EMC</sub> (Class	ied by scan 1), < DCGL	ls and/o ₋w (Clas	r sampling, is 2), or <0	is the average 5 DCGL <sub>w</sub> (Cla	activity in each ss 3)?			X
4. Is the result of	f the Elevated Measu	rements Te	est < 1.0	)?					X
5. Is the result o	f the statistical test (S	+ for Sign	Test or	Wr for WRS	S Test) ≥ the cr	itical value?			X
Comments:									
FSS/Characteriz	ation Engineer (print	sign)	Dale	Randa	11/ 80	Rental	Date	6-11;	-07
FSS/ Characteriz	ation Manager (print	/sign)	F	R. Case	MAD	L	Date	71:	3/ <i>17</i>
								For CS-(	 rm )9/2

# SECTION 7 ATTACHMENT 4 1 DISC

Survey Unit Release Record							
Design #	EP-1.33	Revision #	Original	Page	1 of	3	
Survey Unit #(s)			1.33	<u> </u>			
Description	<ol> <li>Embedded pipe for Plun</li> <li>EP 1.33 is Survey Plan</li> <li>Survey Plan</li> <li>Survey Requinants</li> <li>Survey Requina</li></ol>	1 Pipe (EP) Survey Unit n Brook Reactor Facilit a Class 1, Group 2 sur (FSSP) and Technical I n EP 1.33 were perform amma energies represen- test (SR)-13 was referen- structions for this surve e with (IAW) the Babca tion Package (WEP) 05- institute "Special Methor f survey measurements t efficiency determinati 2, WEP 05-006, these d involved and the media	t 1.33 meets the y (PBRF). vey unit as per the Basis Document ed using a scinti- intative of Co-60 need for this dec ey unit are incorp ock Services Inc -006. Survey ins ods" and the surv dons are develop determinations are being surveyed.	definition he PBRF (TBD)-0 illation de . Sample ision. corporated in corporated in corporated structions vey design ed in accorre approp	Final S 6-004. etector of #EP 2- tto and j d (BSI)/ descril n used i ordance	bedded tatus optimized 1 from performed LVS-002, bed in this n the with the r the types	
	Approval S	Signatures			Date	*	
FSS/Characterization	Engineer	Dal Roy	lall	6-	11-07	7	
Technical Revie (FSS/Characterization	wer Engineer)	Dwood	7	6-	26	-07	
FSS/Characterization	Manager	1/10	R. Case	7/3	107		
			OPY		I CS R	Form S-09/1 Rev 0	

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FSS	Design	# EP 1.33	Revision # Original	Page 2 of 3
Surv	ey Unit	: 1.33		
1.0	Histo	ory/Description		

1.2 EP 1.33 consists of approximately 90 feet in length from the pump room to the riser in Quad "C". The pipe section has a approximately six mitered elbows ranging from 45° to 90°.

2.0 Survey Design Information

- 2.1 EP 1.33 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 90 survey measurements.
- 2.3 Surface area for the 3" ID piping is 729.7 cm<sup>2</sup> for each foot of piping, corresponding to a total 3" ID piping surface area of 65,700 cm<sup>2</sup> (6.6 m<sup>2</sup>) for the entire length of (90') of 3" piping..

#### 3.0 Survey Unit Measurement Locations/Data

currently breached.

- 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 1.33 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.

FSS Design # EP 1.33	Revision # Original	Page 3 of 3
Survey Unit: 1.33		

#### 5.5 Statistical Summary Table

	3"
Statistical Parameter	Pipe
Total Number of Survey Measurements	90
Number of Measurements >MDC	71
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.020
Median	0.018
Standard Deviation	0.019
Maximum	0.184
Minimum	0.006

- 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 1.33 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 1.33 & Spreadsheet

# SECTION 7 ATTACHMENT 1 \_5\_PAGE(S)

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Pipe ID	1.33	Survey Location	-27 TRENCH
Survey Date	12-13-05/12-16-05/1-3-08/1-4-06	2350-1 #	212223
Survey Time	1430/0900/1030/0810	Detector-Sled #	44-62/204402-101
Pipe Size	3"	Detector Efficiency	0.00013
DCGL (dpm/100cm2)	240800	Pipe Area Incorporated by Detector Efficiency (in cm2)	730
Pipe Area Incorporated by Survey Data (m <sup>2</sup> )	6.6	Field BKG (cpm)	5.2/5.1/6.4/7.0
Routine Survey	X	Field MDCR (counts)	10.8/10.7/11.7/13.0
QA Survey		Nominal MDC (dpm/100cm2)	2842/2842/2779/2779
		Survey Measurement Results	
	Total Number of S	urvey Measurements	90
	Number of Mea	asurements >MDC	71
	Number of Measuren	nents Above 50% DCGL	0
	Number of Measur	rements Above DCGL	0
	N	lean	0.020
	M	edian	0.018
	Standar	d Deviation	0.019
	Ma	ximum	0.184
	Mir	nimum	0.006
			······································
	Survey Uni	t Classification	1
	Survey Uni TBD 06-00-	t Classification 4 Piping Group	1 2
	Survey Uni TBD 06-00- SR-13 Radionuclid	t Classification 4 Piping Group le Distribution Sample	1 2 EP 2-1
	Survey Uni TBD 06-00- SR-13 Radionuclid Measur	t Classification 4 Piping Group le Distribution Sample ed Nuclide	1 2 EP 2-1 Co60
	Survey Uni TBD 06-00- SR-13 Radionuclid Measur Area Factr	t Classification 4 Piping Group le Distribution Sample ed Nuclide or/EMC Used	1 2 EP 2-1 Co60 No
	Survey Uni TBD 06-00- SR-13 Radionuclid Measur Area Facto Pass/	t Classification 4 Piping Group le Distribution Sample ed Nuclide or/EMC Used Fail FSS	1 2 EP 2-1 Co60 No Pass
	Survey Uni TBD 06-00- SR-13 Radionuclid Measur Area Fact Pass/ MREM/YF	t Classification 4 Piping Group le Distribution Sample ed Nuclide or/EMC Used Fail FSS R Contribution	1 2 EP 2-1 Co60 No Pass <1
	Survey Uni TBD 06-00- SR-13 Radionuclid Measur Area Fact Pass/ MREM/YR	t Classification 4 Piping Group le Distribution Sample ed Nuclide or/EMC Used Fail FSS 8 Contribution O CORRECTED	1 2 EP 2-1 Co60 No Pass <1

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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	6	6	46,154	6,325	3,283	52	37	3	183	0.027
2	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
3	4	4	30,769	4,217	2,188	35	25	2	122	0.018
4	3.6	3.6	27,692	3,795	1,970	31	22	2	110	0.016
5	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
6	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
7	4	4	30,769	4,217	2,188	35	25	2	122	0.018
8	3	3	23,077	3,163	1,641	26	19	2	92	0.014
9	5	5	38,462	5,271	2,736	44	31	3	153	0.023
10	4	4	30,769	4,217	2,188	35	25	2	122	0.018
11	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
12	3.6	3.6	27,692	3,795	1,970	31	22	2	110	0.016
13	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
14	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
15	5.6	5.6	43,077	5,903	3,064	49	35	3	171	0.026
16	3	3	23,077	3,163	1,641	26	19	2	92	0.014
17	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
18	4	4	30,769	4,217	2,188	35	25	2	122	0.018
19	6	6	46,154	6,325	3,283	52	37	3	183	0.027
20	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
21	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
22	4.6	4.6	35,385	4,849	2,517	40	29	2	141	0.021
23	6	6	46,154	6,325	3,283	52	37	3	183	0.027
24	5	5	38,462	5,271	2,736	44	31	3	153	0.023
25	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
26	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
27	2.6	2.6	20,000	2,741	1,423	23	16	1	79	0.012
28	4	4	30,769	4,217	2,188	35	25	2	122	0.018
29	3	3	23,077	3,163	1,641	26	19	2	92	0.014
30	3	3	23,077	3,163	1,641	26	19	2	92	0.014
31	3.6	3.6	27,692	3,795	1,970	31	22	2	↓110	0.016
32	2.6	2.6	20,000	2,741	1,423	23	16	1	79	0.012

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
33	2	2	15,385	2,108	1,094	17	12	1	61	0.009
34	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
35	3	3	23,077	3,163	1,641	26	19	2	92	0.014
36	2.6	2.6	20,000	2,741	1,423	23	16	1	79	0.012
37	4	4	30,769	4,217	2,188	35	25	2	122	0.018
38	3.6	3.6	27,692	3,795	1,970	31	22	2	110	0.016
39	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
40	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
41	2.6	2.6	20,000	2,741	1,423	23	16	1	79	0.012
42	4.6	4.6	35,385	4,849	2,517	40	29	2	141	0.021
43	2	2	15,385	2,108	1,094	17	12	1	61	0.009
44	3	3	23,077	3,163	1,641	26	19	2	92	0.014
45	3.6	3.6	27,692	3,795	1,970	31	22	2	110	0.016
46	1.6	1.6	12,308	1,687	875	14	10	1	49	0.007
47	4	4	30,769	4,217	2,188	35	25	2	122	0.018
48	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
49	2.7	2.7	20,769	2,846	1,477	24	17	1	83	0.012
50	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
51	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
52	5	5	38,462	5,271	2,736	44	31	3	153	0.023
53	4	4	30,769	4,217	2,188	35	25	2	122	0.018
54	6.7	6.7	51,538	7,063	3,666	59	42	3	205	0.031
55	7.3	7.3	56,154	7,695	3,994	64	45	4	223	0.033
56	6.3	6.3	48,462	6,641	3,447	55	39	3	193	0.029
57	5.7	5.7	43,846	6,009	3,119	50	35	3	174	0.026
58	6.3	6.3	48,462	6,641	3,447	55	39	3	193	0.029
59	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
60	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
61	5	5	38,462	5,271	2,736	44	31	3	153	0.023
62	5.7	5.7	43,846	6,009	3,119	50	35	3	174	0.026
63	2	2	15,385	2,108	1,094	17	12	1	61	0.009

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
64	5	5	38,462	5,271	2,736	44	31	3	153	0.023
65	3	3	23,077	3,163	1,641	26	19	2	92	0.014
66	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
67	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
68	7	7	53,846	7,379	3,830	61	44	4	214	0.032
69	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
70	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
71	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
72	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
73	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
74	3	3	23,077	3,163	1,641	26	19	2	92	0.014
75	2.7	2.7	20,769	2,846	1,477	24	17	1	83	0.012
76	1.3	1.3	10,000	1,370	711	11	8	11	40	0.006
77	4	4	30,769	4,217	2,188	35	25	2	122	0.018
78	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
79	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
80	3.7	3.7	28,462	3,900	2,024	32	23	2	113	0.017
81	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
82	1.7	1.7	13,077	1,792	930	15	11	1	52	0.008
83	2.7	2.7	20,769	2,846	1,477	24	17	1	83	0.012
84	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
85	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
86	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
87	4	4	30,769	4,217	2,188	35	25	2	122	0.018
88	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
89	3	3	23,077	3,163	1,641	26	19	2	92	0.014
90	40.3	40.3	310,000	42,483	22,049	353	251	21	1,232	0.184

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
									MEAN	0.020
	1				· · · · · · · · · · · · · · · · · · ·				MEDIAN	0.018
							·		STD DEV	0.019
	<u> </u>								MAX	0.184
	+								MIN	0.006

# SECTION 7 ATTACHMENT 2 <u>10</u> PAGE(S)

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Date: 12-13.05	Time:	1430			
Building: ReActor	Elevation:	~ 25	Access Point	Area:	PULO C
System: <u>Furce</u>	Pipe Diameter:	3′′	Pip	e ID #	1-33
Type of Survey Investigation	Characterizat	ion Final S	Survey	Other	~
Sled Size <u>3</u> "	inch				
Detector: 44-62	· · · · · · · · · · · · · · · · · · ·	Detector ID #:		204	102-101
Cal Date:		Cal Due Date:		11.17	-06
Instrument: <u>MiSUUM</u>	2350-1	Instrument ID	#:	212	223
Cal Date: // · / 7 · U	5	Cal Due Date:	/	1-17.	06
From the Daily Pipe Survey Detecto	r Control Form for	the Selected D	etector		
Background Value <u>5-2</u>	cpm				
MDCR <sub>static</sub> / O. 8	cpm		e ff	'ciencu	determinatio
Efficiency Factor for Pipe Diameter	0.00014	(taken from	detector ealib	ration cert	ificate)
MDC <sub>static</sub> 2842	dpm/100cm <sup>2</sup>				U
Is the MDC <sub>static</sub> acceptable? Ye	s) No (i	f no, adjust sample	count time and i	ecalculate M	(DCR <sub>static</sub> )
Comments: / NITIAL S	URUCY				
	/				

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#### Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-13-05 Time: 143 3									
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>			
1	/	3	9	3	nia	nla			
2	2	3	121	40.3					
3									
4									
5				~					
6			N						
7									
8									
9									
10		-		· · ·					

Package Page 1 of **2** 







Date: /	2.16.05	Time:	0900	
Building:	REACTOR	Elevation:	-25	Access Point Area: -27 TRENCH
System:	PUHD C PURGE	Pipe Diameter:		Pipe ID # 3 3
Type of Survey	y Investigation	Characteriza	tion Final	Survey Other
Sled Size		inch	·	
Detector:	44-6	<u>ک</u>	_ Detector ID #	204402-101
Cal Date:	11.17.05		_ Cal Due Date:	11-17.06
Instrument:	2350-1	•	_ Instrument ID	#: 212283
Cal Date:	11.17.09	5	Cal Due Date:	11-17.04
From the Daily	Pipe Survey Detecto	r Control Form fo	or the Selected D	letector
Background V	alue <u><u>S</u>, I</u>	cpm		
MDCR <sub>static</sub>	10.7	cpm		- Aciency determination
Efficiency Fact	tor for Pipe Diameter	0.00014	(taken from	detector <del>calibration certificate)</del>
MDC <sub>static</sub>	2842	dpm/100cm <sup>2</sup>		ð
Is the $MDC_s$	tatic acceptable? Ye	s No	(if no, adjust sample	e count time and recalculate $MDCR_{static}$ )
Comments:	CONTINUAT	ion sen	Joy	
<u> </u>	<u>**</u>	··· <del>···</del> ······		

## Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 10-16-03 Time: 0906										
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross	Net	dpm/100cm <sup>2</sup>				
1	/	3	18	6	nla	nia				
2	2	.3	13	4.3						
3	3	3	12	4						
4	4	3	11	3.6	1	~				
5	5	3	.,							
6	6	3								
7	7	3								
8	8	3								
9	9	3			•					
10	10	3								

Package Page 1 of \_\_\_\_



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Date: 1-3.04	Time:	1030		
Building: REACTOR	Elevation:	- 25 Acces	s Point Area: <u>-27</u>	TRENCH
System: QUAD C PARGE	Pipe Diameter:	3"	Pipe ID #	33
Type of Survey Investigation	Characterizat	ion Final Survey	Other	~
Sled Size <u>3'vinyl pullen</u>	inch			
Detector: $44 - 6$	2	Detector ID #:	212201-	121
Cal Date: <u>17 - Nor</u>	-05	Cal Due Date:	17 - NOV - C	24
Instrument: 2350-1		Instrument ID #:	217223	
Cal Date: $17 - Nor$	- 05	Cal Due Date:	17 - xlor -2	56
From the Daily Pipe Survey Detecto	r Control Form fo	r the Selected Detector		
Background Value 6-4	cpm			
MDCR <sub>static</sub> //. 7	cpm		= ficiency de	termination
Efficiency Factor for Pipe Diameter	0.00013	(taken from detect	or calibration certifica	te) Jr
MDC <sub>static</sub> 2776	dpm/100cm <sup>2</sup>			0
Is the MDC <sub>static</sub> acceptable? $\underbrace{Ye}$	No (	if no, adjust sample count ti	ime and recalculate MDCF	R <sub>static</sub> )
Comments: CUNTINATU	W JURNEY			
	/			

## Pipe Interior Radiological Survey

Position #	Feet into PipeCount Time (min)from Opening(min)		Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>				
1	5 LATEO	3	10	3.3	nia	nja				
2	6 Afrio	3	7	• 2.3						
3	7 340	3	12	4						
4	8 45Tro	3	6	گ						
5	9 540	3	15	_ کے						
6	10 fifting	3	12	4						
7	11 2550	3	18	3.5						
8	12 8000	3	1	3.4						
9	13 250	3	14	5.3						
10	14 1057-00	3	10	3.3						

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Radiological Survey Commenced: Date: 1.3.06 Time: 1030

Package Page 1 of 🤰



Position	Feet	into Pipe	Count Time	Gross Counts	Gross	N	let	dpm/	100cm <sup>2</sup>
#	from	Opening	(min)		cpm	cr	om	- 1	1
1(	15,	HEIO	3	17	5.6		a	1	10
12	16 1	12 FT LD	92473	9	3		f		·····
13	17	13ftcs	33	1	2.3				
14	18	HFTO	3	12	4		<b> </b>		
15	19	ISTRO	3	18	6		1		
14	20	HEFTO	3	16	5.3		· ·		
17	21	17Frco	3	10	3.3				
18	22	18FTED	3	14	4.6				
19	22	195700	3	18	6				
20	24	204709	3	15	5				
21	25	21500	3	16	5.3				
22	26	22500	3	14	5.3				
23	27	23500	3	8	8.6				
24	28	24=70	3	12	4				
25	29	25100	3	9	3				
24	30	26FTD	3	9	3				
27	31	27500	3	. 11	3.6				
28	32	285-0	3	8	1.6		1		
29	22	29500	3	6	2	-			
30	21	BOETO	3	7	2.3				
21	25	215-0	3	.9	3				
32	26	375-0	2	8	2.6				
32	21	33 5-03	3	12	4				
211	78	34500	3	11	3.4				
39	20	3	3		14.3		······································		
26	51	2100		7	23				
37	10	3200	B	\$	21/2	+			
20	41	2200	3	14	4/0				
39	112	396-0	3	10	2				
	45	1/10	3	9	3				
40	49	410	2	11	31				
	40-	110	<u> </u>						
40	46	17.00			10		1		/
43	41	47710	3	11	<u>Z</u>	<b>N</b>			
ļ	+		· · · · · · · · · · · · · · · · · · ·						=
	<u> `</u>			71	0				
					a				
						1		1	-

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## Pipe Interior Radiological Survey Form (Continuation Form)

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Date:	1.4.04	Time:	0810		
Building:	REACTION	Elevation:	- 2.5	Access Point Area:	-27 Trench
System:	QUEAD C. PURDE	Pipe Diameter:		Pipe ID #	1.33
Type of Su	rvey Investigation	Characteriz	ation Final S	Survey Other	$\checkmark$
Sled Size	3' viny' sted fulle	Vinch			
Detector:	44-	42	Detector ID #:	217	701-121
Cal Date:	11-	-17-05	Cal Due Date:	11~	17-06
Instrument	: 235:	> -1	Instrument ID	#: 21 1	2223
Cal Date:	11-	17-05	Cal Due Date:	11-	12-06
From the D	Daily Pipe Survey Detecto	or Control Form	for the Selected D	etector	
Backgroun	d Value 7	cpm			
MDCR <sub>static</sub>	13	cpm		e fficience	determination
Efficiency	Factor for Pipe Diameter	0,00013	(taken from	detector <del>calibration co</del>	rtificate) p
MDC <sub>static</sub>	2779	$dpm/100cm^2$		· · · · · · · · · · · · · · · ·	
Is the M	DC <sub>static</sub> acceptable? (Ye	es No	(if no, adjust sample	e count time and recalculate	MDCR <sub>static</sub> )
Comments	: CONTIN	YATION S	Survet		·
<u></u>				^	1 1 1 1
	· · · · · · · · · · · · · · · · · · ·	·		<u> </u>	/ Complete

#### Pipe Interior Radiological Survey

Radiologi	cal Survey Collin	ienceu. Date/	<u> </u>			
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	48 44 00	3	10	3.3	nia	nla
2	49 4545 10.	3	8	2.7		
3	50 4655 CD	3	10	2.3		
4	51 4770	3	7	73		
5	52 48fp co	3	15	5		
6	S3 HARTO	3	17	4		
7	SY SPATO	3	20	6,7		
8	55 SATO	3	22	7.7		
9	56 524700	3	19	6.3		
10	57 537.0	3	17	5.7	1	

Radiological Survey Commenced: Date: 1.4.04 Time: 0810

Package Page 1 of  $\underline{\mathcal{V}}$ 





# Pipe Interior Radiological Survey Form (Continuation Form)

# 1.33

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
11	58 540	3	19	6.3	nia	nla
12	59 FFM	3	14	4.7	1	
13	60 500	3	14	Y.7		
14	61 5700	3	15	5		
15	62 500	.3	17	5.7		
16	63 590	3	6	Z		
17	64 600	3	15	5		
18	6 000	3	9	3		
19	66 4200	3	13	Ý,3		
20	67 670	3	14	4.7		
21	68 640	3	21	7		
22	69 50	3	14	4.7		
23	70 660	ۆ	7	2,3		
15	71 670	3	<i>j</i> 3	4,3		
25	72 680	3	13	4.3		
26	73 6900 .	3	7	2.3		
22	74 70-19	3	9	3		
28	15 740	3	8	2.7		
29	1627-10	3	4	1.3		
30	77 730	3	12	4		
31	18 24 00	3	1	2.3		
32	79 75-00	3	10	3.3		
33	80 74 19	3	. I	3.7		
34	81 77 0	3	14	4.7		<u> </u>
35	82 770	3	5	1.7		
34	B 290	3	8	2.7		
37	8 80 0	3	14	4.7		
38	85 \$4 10	3	16	5.7		
39	86 870	. 3	1	2.3		
L) 0	87 8250	3	12	4		
41	88 84 00	3	13	4.3		
	-					
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# SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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			[	DQA Check S	iheet			
	Design #	EP 1.33	Revision #	Original				
Sı	urvey Unit #				EP 1.33			
	<u></u>	••••••••••••••••••••••••••••••••••••••	Preli	iminary Data	Review			
	Answers to	the following que	stions should Release F	be fully doc Record	umented in the Survey Unit	Yes	No	N/A
1.	Have surveys	been performed in a	ccordance with s	urvey instruction	ons in the Survey Design?	X		†
2.	Is the instrum survey units, c	entation MDC for stru or below 0.5 DCGL <sub>W</sub>	icture static meas for Class 3 surve	surements belo y units?	w the $DCGL_W$ for Class 1 and 2			x
3.	Is the instrume	entation MDC for em	bedded/buried pi	ping static mea	surements below the DCGL <sub>w</sub> ?	X		
4.	Was the instruembedded/but static measure	mentation MDC for s ried piping scan mea ements or soil sample	structure scan me surements below es addressed in t	easurements, s v the DCGL <sub>W,</sub> o he survey desi	oil scan measurements, and r, if not, was the need for additional gn?			x
5.	Was the instru	mentation MDC for v	volumetric measu	rements and s	mear analysis < 10% DCGL <sub>w</sub> ?			X
6.	Were the MDC used to perfor	Cs and assumptions of the survey?	used to develop t	lhem appropria	te for the instruments and techniques	x		
7.	Were the surv media being s	ey methods used to ourveyed?	collect data prop	er for the types	of radiation involved and for the	x		
<b>8</b> .	Were "Special	Methods" for data co	ollection property	applied for the	survey unit under review?	X		
9.	Is the data set design, which	comprised of qualific accurately reflects the	ed measurement ne radiological sta	results collecter atus of the facil	ed in accordance with the survey ity?	x		
			Gra	phical Data	Review			
1.	Has a posting	plot been created?						X
2.	Has a histogra	im (or other frequenc	cy plot) been crea	ited?				X
3.	Have other gra	aphical data tools be	en created to ass	sist in analyzing	the data?			X
				Data Analys	is	····	·	<b>.</b>
1.	Are all sample	measurements belo	w the DCGL <sub>W</sub> (C	lass 1 & 2), or	0.5 DCGL <sub>W</sub> (Class 3)?	X		L
2.	Is the mean of	the sample data < D	CGLw?			X		ļ
3.	If elevated are elevated area	as have been identif < DCGL <sub>ЕМС</sub> (Class 1	ied by scans and 1), < DCGL <sub>w</sub> (Cl	/or sampling, is ass 2), or <0.5	s the average activity in each DCGL <sub>w</sub> (Class 3)?			X
4.	Is the result of	the Elevated Measu	rements Test < 1	.0?				X
5.	Is the result of	the statistical test (S	+ for Sign Test o	r Wr for WRS	Test) > the critical value?			x
Соп	nments:					<b></b>		
F	SS/Characteriza	ation Engineer (print/	sign) <u>) q</u> /	c Roudo	11/1 Brock Rushall	Date	6-11	<u>'-07</u>
FS	SS/ Characteriz	ation Manager (print/	/sign)	R. Case	Milt	Date	7/3	107
					ι.	ſ	For CS-( Rev	m )9/2 v 0
							CS R	וכ -0 פיי

SECTION 7 ATTACHMENT 4 1 DISC

	Surve	ey Unit Release R	ecord			
Design #	EP-1.82	Revision #	Original	Page 1 of 3		
Survey Unit #(s)	1.82					
Description	<ol> <li>Embedded Pipe (EP) Survey Unit 1.82 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</li> <li>EP 1.82 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</li> <li>Surveys in EP 1.82 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 from Survey Request (SR)-13 was referenced for this decision.</li> <li>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.</li> <li>Instrument efficiency determinations are developed in accordance with the BSI/LVS-002, WEP 05-006, these determinations are appropriate for the type of radiation involved and the media being surveyed.</li> </ol>					
	Approval Sig	natures		Date:		
FSS/Characterization	n Engineer	Ocl Mufer	lla	6-12-07		
fechnical Revie (FSS/Characterization	ewer n Engineer)	Alla	<b>\$</b>	6-26-07		
FSS/Characterization	n Manager	Alla	R. Case	7/3/07		
				Form		

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FSS I	Design #	EP 1.82	Revision # Original	Page 2 of 3				
Surve	y Unit:	1.82						
1.0	History/Description							
	1.1	The subject pipe s function of this pi Interim Storage A Building -25 ft, w	system is the 3" purge line for pe was to convey water from trea to the HD sump in Pump where the pipe is currently brea	Interim Storage Area. The the one 3 inch riser in Room #22 on the Rx inched.				
	1.2	EP 1.82 consists of approximately 34 feet in length from the pump room to the riser in Interim Storage Area. The pipe section has an approximately five mitered elbows ranging from 45° to 90°.						
2.0	Surve	y Design Information	on					
	2.1	EP 1.82 was surv	eyed IAW Procedure #BSI/LV	/S-002.				
	2.2	100% of the 3" II pipe was surveyed total of 16 survey	D pipe was accessible for surv d by static measurement at on measurements.	ey. The accessible 3" ID e foot increments, for a				
	2.3	Surface area for the corresponding to for the entire lenge	he 3" ID piping is 729.7 cm <sup>2</sup> f a total 3" ID piping surface an th of (16') of 3" piping	for each foot of piping, ea of 11,680 cm <sup>2</sup> (1.1 m <sup>2</sup> )				
3.0	Survey Unit Measurement Locations/Data							
	3.1	Pipe interior radio this release record	blogical survey forms are prov 1.	rided in Attachment 2 of				
4.0	Surve	y Unit Investigation	ns/Results					
	4.1	None						
5.0	Data Assessment Results							
	5.1	Data assessment a Report provided i	results are provided in the EP/ n Attachment 1.	Buried Pipe (BP) Survey				
	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 1.82 passes FSS.						
	5.4	Background was Elevated Measure survey unit.	not subtracted from the survey ement Comparison (EMC) wa	y measurements and the s not employed for this				
FSS Design # EP 1.82	Revision # Original	Page 3 of 3						
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Survey Unit: 1.82								

#### 5.5 Statistical Summary Table

	3"
Statistical Parameter	Pipe
Total Number of Survey Measurements	16
Number of Measurements >MDC	14
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.019
Median	0.018
Standard Deviation	0.008
Maximum	0.037
Minimum	0.006

- 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 1.82 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.019 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 1.82 & Spreadsheet

## SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

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Pipe ID	1.82	Survey Location	-27 TRENCH
Survey Date	21-Dec-05	2350-1 #	212223
Survey Time	0815	Detector-Sled #	44-62/204402-101
Pipe Size	3"	Detector Efficiency	0.00014
DCGL (dpm/100cm2)	240800	Pipe Area Incorporated by Datactor Efficiency (in cm2)	730
Pipe Area incorporated by Survey Data (m <sup>3</sup> )	1.1	Field BKG (cpm)	5.9
Routine Survey	X	Field MDCR (counts)	11.3
QA Survey		Nominal MDC (dpm/100cm2)	2,842
		Survey Measurement Results	
	Total Number of S	Survey Measurements	16
	14		
	Number of Measurer	ments Above 50% DCGL	0
	Number of Measu	rements Above DCGL	0
	0.019		
	0.018		
	0.008		
	0.037		
	Mi	nimum	0.006
······································			······································
	Survey Uni	it Classification	1
	Survey Uni TBD 06-00	it Classification 4 Piping Group	1 2
	Survey Uni TBD 06-00 SR-13 Radionuclic	it Classification 4 Piping Group de Distribution Sample	1 2 EP 2-1
	Survey Uni TBD 06-00 SR-13 Radionuclic Measu	it Classification 4 Piping Group de Distribution Sample red Nuclide	1 2 EP 2-1 Co60
	Survey Uni TBD 06-00 SR-13 Radionuclic Measur Area Fact	it Classification 4 Piping Group de Distribution Sample red Nuclide tor/EMC Used	1 2 EP 2-1 Co60 No
	Survey Uni TBD 06-00 SR-13 Radionuclik Measur Area Fact Pass	it Classification 4 Piping Group de Distribution Sample red Nuclide tor/EMC Used /Fail FSS	1 2 EP 2-1 Co60 No Pass
	Survey Uni TBD 06-00 SR-13 Radionuclik Measur Area Fact Pass MREM/YF	it Classification 4 Piping Group de Distribution Sample red Nuclide tor/EMC Used /Fail FSS R Contribution	1 2 EP 2-1 Co60 No Pass <1
COMMENTS: ACTIVITY VALUES	Survey Uni TBD 06-00 SR-13 Radionuclik Measur Area Fact Pass MREM/YF	it Classification 4 Piping Group de Distribution Sample red Nuclide tor/EMC Used /Fail FSS R Contribution D CORRECTED	1 2 EP 2-1 Co60 No Pass <1

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# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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### Pipe Interior Radiological Survey Form

Date: /2	-21-05	Time: C	1815	
Building:	RX	Elevation:	<u>25</u> Access	Point Area: TREWLH
System: HOS	VALVE BOX HEADON	Pipe Diameter:	3"	_ Pipe ID # 8 2
Type of Survey	Investigation	Characterizat	ion Pinal Survey	Other /
Sled Size		inch		
Detector:	44-62		Detector ID #:	204402-101
Cal Date:	11-17-0	5	Cal Due Date:	11-17-06
Instrument:	2350-1		Instrument ID #:	212.223
Cal Date:	17-17-05		Cal Due Date:	11-17-06
From the Daily Background Va MDCR <sub>static</sub> Efficiency Fact MDC <sub>static</sub> Is the MDC <sub>st</sub> Comments:	Pipe Survey Detector lue  5.9 11.3 or for Pipe Diameter 2842 $atic$ acceptable? $\sqrt{e}$ TNITIAZ 54	r Control Form for cpm 0.0001 dpm/100cm <sup>2</sup> No (i children SSF	the Selected Detector (taken from detector f no, adjust sample count tim	efficiency determination r <del>calibration certificate</del> ) Jn ne and recalculate MDCR <sub>static</sub> )

### Pipe Interior Radiological Survey

Radiologi	car Survey Comm	ichicod. Date. <u>7</u>	11	100 - 000		
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	1	Ŋ		3.7	na	Ma
2	2	3	11	3.7		
3	Ś	#Z 3	10	3,3		
4	4	3	21	7		
5	5	3	18	6	· · · · · · · · · · · · · · · · · · ·	
6	6	3	10	3.3		
7	7	S.	15	5		
8	8	3	26	8.7		
9	9	3	16	5.3		
10	10	3	8	2.7		

Radiological Survey Commenced: Date: 12-21-05 Time: 0815

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Package Page 1 of  $\underline{3}$ 

12-21-05



Pipe Interior Radiological Survey Form (Continuation Form)

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Package Page  $\frac{2}{0}$  of  $\underline{3}$ 





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# SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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			DUA Chec	K Sneet				
Design #	EP 1.82	Revision #	Original					
Survey Unit #				EP 1.82				
		P	reliminary Da	ta Review`				
Answers to	the following que	stions sho Releas	uld be fully d se Record	ocumented in the Su	rvey Unit	Yes	No	N/A
1. Have surveys	been performed in a	ccordance wi	ith survey instru	ctions in the Survey Desig	gn?	X		
<ol> <li>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?</li> </ol>								x
3. Is the instrume	entation MDC for em	bedded/burie	d piping static n	neasurements below the	DCGL <sub>W</sub> ?	X		
<ol> <li>Was the instru embedded/bur static measure</li> </ol>	mentation MDC for a ied piping scan mea ments or soil sample	structure scar surements be addressed	n measurements elow the DCGLy I in the survey d	s, soil scan measurement y, or, if not, was the need esign?	s, and for additional			x
5. Was the instru	mentation MDC for v	olumetric me	easurements an	d smear analysis < 10% l	DCGLw?			X
6. Were the MDC used to perform	s and assumptions in the survey?	used to deve	lop them approp	riate for the instruments	and techniques	X		
7. Were the surve media being se	ey methods used to urveyed?	collect data p	proper for the typ	es of radiation involved a	ind for the	x		
8. Were "Special Methods" for data collection properly applied for the survey unit under review?								
9. Is the data set design, which	comprised of qualific accurately reflects the	ed measuren e radiologica	nent results colle Il status of the fa	ected in accordance with acility?	the survey	x		
			Graphical Da	ta Review		·		<b>┭</b> ·───
1. Has a posting	plot been created?		·					X
2. Has a histogra	m (or other frequence	y plot) been	created?					X
3. Have other graphical data tools been created to assist in analyzing the data?								X
			Data Ana	lysis			<u>-</u>	
1. Are all sample	measurements belo	w the DCGL	w (Class 1 & 2),	or 0.5 DCGLw (Class 3)?	•	X		ļ
2. Is the mean of	the sample data < D	CGLw?	·	~ <u>~~~~~</u>		X		
<ol> <li>If elevated are elevated area</li> </ol>	as have been identif < DCGL <sub>ЕМС</sub> (Class	ied by scans I), < DCGL <sub>W</sub>	and/or sampling (Class 2), or <	, is the average activity in 0.5 DCGL <sub>W</sub> (Class 3)?	n each			X
4. Is the result of	the Elevated Measu	rements Tes	t < 1.0?					X
5. Is the result of	the statistical test (S	+ for Sign Te	est or W <sub>r</sub> for WF	$RS Test) \ge the critical values of the criti$	ie?			X
Comments:								_
FSS/Characterization Engineer (print/sign) Dale Randallh Bal Rulall						Date	6-1	2-07
FSS/ Characteriz	ation Manager (print/	'sign)	R. Case	1/1/Der		Date	7/3	3/07
						Γ	For CS-( Rev	 rm 09/2 v 0

## SECTION 7 ATTACHMENT 4 1 DISC

	Survey Unit Release Record							
Design #	EP-Rx 15	0 <b>Revision</b> #	Original	Page	1 of	3		
Survey Unit #(s)	EP-Rx 150							
Description	<ul> <li>pipe for Plum Brook Reactor Facility (PBRF).</li> <li>2) EP 150 is a Class 1, Group 2 survey unit as per th Survey Plan (FSSP) and Technical Basis Document</li> <li>3) Surveys in EP 150 were performed using a scintit to measure gamma energies representative of Co-60 Survey Request (SR)-13 was referenced for this dec</li> <li>4) Survey Instructions for this survey unit are incorp in accordance with (IAW) the Babcock Services Inco Work Execution Package (WEP) 05-006. Survey in document constitute "Special Methods" and the sur- acquisition of survey measurements.</li> <li>5) Instrument efficiency determinations are develop BSI/LVS-002, WEP 05-006, these determinations a of radiation involved and the media being surveyed.</li> </ul>				Final S 6-004. tector of #EP 2- to and 1 (BSI)/ descrift n used	bedded tatus optimized 1 from performed /LVS-002, bed in this in the e with the or the types		
	Signatures			Date	e:			
FSS/Characterization	Engineer	Och Y	Jall	6 -	20-	.07		
Technical Revie (FSS/Characterization	ewer Engineer)	Subse		6-0	28-	07		
FSS/Characterization	Manager	R. Case	la	7/3	107			
						Form S-09/1 Rev 0		

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<ul> <li>Survey Unit: EP Rx 150</li> <li>1.0 History/Description</li> <li>1.1 The subject piping described in this report is an air supply line for equipment and accessories utilized in Quad B. This survey unit involves 20° of air supply piping.</li> <li>2.0 Survey Design Information <ol> <li>EP Rx 150 was surveyed IAW Procedure #BSI/LVS-002.</li> <li>I EP Rx 150 was surveyed IAW Procedure #BSI/LVS-002.</li> <li>100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 21 survey measurements.</li> <li>Surface area for the 3" ID piping is 729.7 cm<sup>2</sup> for each foot of piping, corresponding to a total 3" ID piping surface area of 14,594 cm<sup>2</sup> (1.5 m<sup>2</sup> for the entire length of (20') of 3" piping.</li> </ol> </li> <li>3.0 Survey Unit Measurement Locations/Data <ol> <li>Pipe interior radiological survey forms are provided in Attachment 2 of this release record.</li> </ol> </li> <li>4.0 Survey Unit Investigations/Results <ol> <li>None</li> </ol> </li> <li>5.1 Data assessment results are provided in the EP/Buried Pipe (BP) Survey Report provided in Attachment 1.</li> <li>All measurement results are less than the Derived Concentration Guideli Level (DCGL) for radionuclide specific EP that corresponds to the 1 mrem/yr dose goal established in Table 3-3 of the FSSP.</li> <li>S.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 150 passes FSS.</li> <li>S.4 Background was not subtracted from the survey measurements and the Elevated Measurement Comparison (EMC) was not employed for this survey unit.</li> </ul>	FSS I	Design	# EP Rx 150	<b>Revision # Original</b>	Page 2 of 3					
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		5.4	Background wa Elevated Measu survey unit.	is not subtracted from the survey n arement Comparison (EMC) was n	neasurements and the not employed for this					

FSS Design # EP Rx 150	Revision #
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Survey Unit: EP Rx 150

#### 5.5 Statistical Summary Table

	3"
Statistical Parameter	Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	12
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.012
Median	0.013
Standard Deviation	0.004
Maximum	0.022
Minimum	0.004

Original

- 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 repeat QA survey was performed on this survey unit. It was concluded that the QA comparison results were acceptable based on the fact that all results differing by more than 20% were calculated to be less than 3% of the DCGL.
  - 6.2 A review of the survey results has shown that the dose contribution for EP Rx 150 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 Rx 150 & Spreadsheet

## SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)

Pipe ID	Rx 150	Survey Location	-25 TRENCH
Survey Date	12/12/05 12/13/05	2350-1 #	212223
Survey Time	1350/ 0756	Detector-Sied #	44-62/204402-10
Pipe Size	3"	Detector Efficiency	0.00014
DCGL (dpm/100cm2)	240800	Pipe Area incorporated by Detector Efficiency (in cm2)	730
Area incorporated by Survey De	<sup>ta</sup> 1.5	Field BKG (opm)	5.2
Routine Survey	X	Field MDCR (counts)	10.8
QA Survey	1. 4. 6	Nominal MDC (dpm/100cm2)	2,842
		Survey Measurement Results	
	Total Number o	f Survey Measurements	21
	Number of N	feasurements >MDC	12
	0		
	0		
	0.012		
	0.013		
	0.004		
	0.022		
		Minimum	0.004
			an a
	Survey I	Init Classification	
	Survey L	Jnit Classification	1
	Survey L TBD 06-4 SB-13 Radionud	Jnit Classification 004 Piping Group clide Distribution Sample	2 EP 2-1
	Survey L TBD 06-0 SR-13 Radionud Meas	Unit Classification 004 Piping Group Clide Distribution Sample sured Nuclide	1 2 EP 2-1
	Survey L TBD 06- SR-13 Radionud Meas Area Fa	Unit Classification 004 Piping Group Clide Distribution Sample sured Nuclide actor/EMC Used	2 EP 2-1 Co60
	Survey L TBD 06- SR-13 Radionud Meas Area Fa Pa	Unit Classification 004 Piping Group clide Distribution Sample sured Nuclide actor/EMC Used ss/Fail FSS	2 EP 2-1 Co60 No Pass
	Survey L TBD 06- SR-13 Radionud Meas Area Fa Pa MREM/	Unit Classification 004 Piping Group Clide Distribution Sample sured Nuclide actor/EMC Used ss/Fail FSS YR Contribution	1           2           EP 2-1           Co60           No           Pass           <1

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### EP Rx 150 3" 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	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
2	3	3	21,429	2,937	1,524	24	17	1	85	0.013
3	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
4	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
5	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
6	1.6	1.6	11,429	1,566	813	13	9	1	45	0.007
7_	2.3	2.3	16,429	2 <u>,</u> 251	1,168	19	13	1	65	0.010
8	5.3	5.3	37,857	5,188	2,693	43	31	3	150	0.022
9	3	3	21,429	2,937	1,524	24	17	1	85	0.013
10	3.6	3.6	25,714	3,524	1,829	29	21	2	102	0.015
11	3.7	3.7	26,429	3,622	1,880	30	21	2	105	0.016
12	3	3	21,429	2,937	1,524	24	17	1	85	0.013
13	2	2	14,286	1,958	1,016	16	12	1	57	0.008
14	1	1	7,143	979	508	8	6	0	28	0.004
15	2.7	2.7	19,286	2,643	1,372	22	16	1	77	0.011
16	3.7	3.7	26,429	3,622	1,880	30	21	2	105	0.016
17	3.7	3.7	26,429	3,622	1,880	30	21	2	105	0.016
18	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
19	3	3	21,429	2,937	1,524	24	17	1	85	0.013
20	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
21	2	2	14,286	1,958	1,016	16	12	1	57	0.008
[ 7										
									MEAN	0.012
									MEDIAN	0.013
									STD DEV	0.004
	<u>+</u>	<b></b>							MAX	0.022
									MIN	0.004

	Survey Unit EP Rx 150 QA Worksheet										
	QA				ORIG						
Ft into Pipe from Access	gcpm	net cpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm 2)	Ft into Pipe from Access	gcpm	net cpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm 2)	% DIFF	Unity Value
1	1.7	1.7	12,143	1,664	1	3.3	3.3	23,571	3,230	48.5	0.014
2	2	2	14,286	1,958	2	3	3	21,429	2,937	33.3	0.013
3	3.7	3.7	26,429	3,622	3	3.3	3.3	23,571	3,230	12.1	0.014
4	1.3	1.3	9,286	1,273	4	2.3	2.3	16,429	2,251	43.5	0.010
5	4.3	4.3	30,714	4,209	5	2.3	2.3	16,429	2,251	87.0	0.010
6	3	3	21,429	2,937	6	1.6	1.6	11,429	1,566	87.5	0.007
7	4.7	4.7	33,571	4,601	7	2.3	2.3	16,429	2,251	104.3	0.010
8	3	3	21,429	2,937	8	5.3	5.3	37,857	5,188	43.4	0.022
9	4	4	28,571	3,916	9	3	3	21,429	2,937	33.3	0.013
10	2.3	2.3	16,429	2,251	10	3.6	3.6	25,714	3,524	36.1	0.015
11	4.3	4.3	30,714	4,209	11	3.7	3.7	26,429	3,622	16.2	0.016
12	2.7	2.7	19,286	2,643	12	3	3	21,429	2,937	10.0	0.013
13	3	3	21,429	2,937	13	2	2	14,286	1,958	50.0	0.008
14	4	4	28,571	3,916	14	1	1	7,143	979	300.0	0.004
15	1.7	1.7	12,143	1,664	15	2.7	2.7	19,286	2,643	37.0	0.011
16	2.7	2.7	19,286	2,643	16	3.7	3.7	26,429	3,622	27.0	0.016
17	2.3	2.3	16,429	2,251	17	3.7	3.7	26,429	3,622	37.8	0.016
18	2.3	2.3	16,429	2,251	18	2.3	2.3	16,429	2,251	0.0	0.010
19	3.3	3.3	23,571	3,230	19	3	3	21,429	2,937	10.0	0.013
20	3.3	3.3	23,571	3,230	20	3.3	3.3	23,571	3,230	0.0	0.014
21	4.3	4.3	30,714	4,209	21	2	2	14,286	1,958	115.0	0.008

### NOTE: ALL QUALITY ASSURANCE RESULTS DIFFERING BY MORE THAN 20% WERE LESS THAN 3% OF THE DCGL

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_\_ PAGE(S)

Pipe Interior Radio	ological Survey Form
Date: <u>12 - 12 - 05</u> Time:	1350
Building: <u>Rx BUIG</u> Elevation:	-25 Access Point Area: Quite B
System: OCUME BUTTLIFY Pipe Diameter:	3' Pipe ID # Rx 150
Type of Survey Investigation Characterizat	tion Final Survey Other
Sled Size inch	
Detector: <u>44-62</u>	Detector ID #: 204407-101
Cal Date: 11 117.05	Cal Due Date: 1/1/2,06
Instrument: <u>LADCUM 9350-1</u>	Instrument ID #: \$1 7273
Cal Date: 11-17.05	Cal Due Date: 11.17.06
From the Daily Pipe Survey Detector Control Form for	r the Selected Detector
Background Value 5-2 cpm	
MDCR <sub>static</sub> / <sup>2</sup> · <sup>8</sup> cpm	Rician determination
Efficiency Factor for Pipe Diameter 0.00014	(taken from detector ealibration certificate)
MDC <sub>static</sub> $Z 842 \text{ dpm/100cm}^2$	
Is the MDC <sub>static</sub> acceptable? Yes No (i	f no, adjust sample count time and recalculate MDCR <sub>static</sub> )
Comments: INITIRE SURVEY	

### Pipe Interior Radiological Survey

Radiologi	cal Survey Comm	enced: Date: <u>/</u>	2-12-05 Tim	ne: <u>13</u>	50	
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
<u>1</u> ·	1	3	10	3-3	-1.9	Na
2	2	3	9	3	-2.2	
3	3	3	10	3.3	-1.9	
4	4	3	7	2.3	-219	
5	5	3	2	2-3	-2.9	
6	6	3	5	1.6	-3.6	
7	2	3	7	2.3	-2.9	
8	8	3	14	5.3		
9	9	3	9	3	-2.2	<b>  </b>
10	10	3	l (İ	3.6	-1.6	

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Attachment 3, Page 1

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### Pipe Interior Radiological Survey Form

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Date: $12 - 13 - 05$		756	
Building: RY BLOG	Elevation:	25 Acce	ss Point Area: QUAD <i>B</i>
System: CALENT ONAIN ALL	Pipe Diameter:	34	Pipe ID # <u>Rx 150</u>
Type of Survey Investigation	Characterizat	ion Final Survey	Other
Sled Size 3"	inch		
Detector: <u>44-62</u>		Detector ID #:	204402-101
Cal Date: <u>11-17-05</u>		Cal Due Date:	11-17-06
Instrument: <u>2350-1</u>	·	Instrument ID #:	212223
Cal Date:		Cal Due Date:	11-17-06
From the Daily Pipe Survey Detec	tor Control Form fo	r the Selected Detecto	r
Background Value 5.2	_ cpm		
MDCR <sub>static</sub> (0.8	_ cpm		efficiency determination
Efficiency Factor for Pipe Diameter	T 0.00014	(taken from detec	tor ealibration certificate) Au
MDC <sub>static</sub> 2842	dpm/100cm <sup>2</sup>		V
Is the $MDC_{static}$ acceptable?	es No (	if no, adjust sample count	time and recalculate $MDCR_{static}$ )
Comments: CONTINUAT	ION OF PI	PE SURVEY	FROM 12-12-05

#### Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-13-05 Time: 0756

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	11	3	11	3.7	-1.5	Ma
2	12	3	9	3	-2,2,	
3	13	3	200 6	2	-3,2	
4	14	3	3	<u> </u>	-4.2	
5	15	3	B	2.7	-2.5	
6	16	3		3.7	-1.5	
7	17	3		3.7	-1,5	
8	1 3	3	7	2.3	-2.9	
9	١٩	3	9	3	- 2, 2	
10	ZO	023	10	3.3	nia	

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12-13-05

SURVEY CONTINUETION

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Pipe Inter	rior Radiologica	al Survey Form (Co	ontinuation For	·m) TD-F/ 1	X150	DUAD R
Position #	Feet into Pipe	Count Time	Gross Counts	Gross	Net	dpm/100cm <sup>2</sup>
71	7 /	7	1	- CDIII		
	21	S		·····	ria	nia
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### Pipe Interior Radiological Survey Form

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Date:	1-6-05	Time:	0900	
Building:	RX	Elevation: <u>2</u>	-5	Access Point Area: QUAD B
System: Jun	B Hrierry Ark	Pipe Diameter:	3	Pipe ID # <u>Rx 150</u>
Type of Survey	/ Investigation	Characteriza	tion Final St	urvey $\bigcirc$ Other $\bigcirc A$
Sled Size	3" Viny/Rillion	inch		
Detector:	44-62		Detector ID #:	212701-121
Cal Date:	11-17-05		Cal Due Date:	11-17-06
Instrument:	2350-1		Instrument ID #	#: _2/2222
Cal Date:	117-05		Cal Due Date:	11-17-06
From the Daily	Pipe Survey Detector	r Control Form fo	r the Selected De	etector
Background Va	lue <u>5, 2</u>	cpm		
MDCR <sub>static</sub>	10-8	cpm		Ciciona determinatio
Efficiency Fact	or for Pipe Diameter	0.00013	(taken from d	detector-calibration certificate)
MDC <sub>static</sub>	Z779	$dpm/100cm^2$	if no adjust sample	count time and recalculate MDCR
Comments:				
· · · ·				

### Pipe Interior Radiological Survey

Radiologi	cal Survey Comm	ienced: Date: _/-	111 111	$ne: \underline{-0700}$	·	
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	- (	3	5	1.7	nia	nla
2	2	3	4	Z	1	,
3	3	3	11	3.7		
4	9	3	4	1.3		
5	5	3	13	4.3		
6	6	3	9	3		
7	7	3	14	4.7		
8	в	3	9	3		
9	9	3	12	Ÿ.		
10	i U	3	7	2.3	$\downarrow$	V

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Package Page 1 of 1



1-6-06

Pipe Inte	rior Radiologica	al Survey Form (C	ontinuation For アン	m)	CR	DA
Position	Feet into Pipe	Count Time		Gross	Net	
# .	from Opening	(min)	Gross Counts	cpm	cpm	dpm/100cm <sup>2</sup>
11	11	3	13	4.3	nla	nia
12	12	3	Ë	2.7		
13	13	3	9	3		
14	19	3	12	4		
15	15	3	5	1.7		
16	6	3	E	2.7		
.17	17	3	7	2.3		
18	18	<u> </u>	(	2.7		
9	19	3	10	3.3		
20	<u>2.0</u>	<u> </u>	10	3.5	·	
21		3	1.3	4.3		
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## SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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				DQA Check	Sheet			
D	esign #	EP Rx150	Revision #	Original				
Sur	vey Unit #				EP Rx 150			
		<u></u>	Prei	liminary Dat	a Review`			
	Answers to	the following que	stions should Release	d be fully do Record	cumented in the Survey Unit	Yes	No	N/A
1. H	lave surveys	been performed in ac	cordance with	survey instruct	ions in the Survey Design?	X		
2. I 8	s the instrume survey units, o	ntation MDC for struct r below 0.5 DCGLw f	cture static mea or Class 3 surv	asurements be ey units?	low the $DCGL_W$ for Class 1 and 2			x
3. I	s the instrume	entation MDC for emb	edded/buried p	piping static me	easurements below the DCGLw?	X		
4. \ 6	Vas the instru embedded/bur static measure	mentation MDC for st ied piping scan meas ments or soil sample	tructure scan m surements below s addressed in	easurements, w the DCGL <sub>W,</sub> the survey de	soil scan measurements, and or, if not, was the need for additional sign?			x
5. \	Vas the instru	mentation MDC for ve	olumetric meas	urements and	smear analysis < 10% DCGL <sub>W</sub> ?			X
3. \ ι	Nere the MDC used to perform	s and assumptions unter survey?	sed to develop	them appropr	iate for the instruments and techniques	x		
7. \ 	Nere the survi nedia being si	ey methods used to c urveyed?	ollect data prop	per for the type	es of radiation involved and for the	x		
3. \	Nere "Special	Methods" for data co	lection properly	y applied for th	ne survey unit under review?	X		
9. I c	s the data set design, which	comprised of qualifie accurately reflects the	d measuremen e radiological st	t results collect tatus of the fac	ted in accordance with the survey ility?	x		
			Gr	aphical Data	Review			
1. ł	las a posting	plot been created?						X
2. ł	las a histogra	m (or other frequency	y plot) been cre	ated?				X
3. H	lave other gra	aphical data tools bee	n created to as	sist in analyzii	ng the data?			X
_				Data Anal	ysis			
1. /	Are all sample	measurements below	w the DCGL <sub>W</sub> ((	Class 1 & 2), o	r 0.5 DCGLw (Class 3)?	X		
2. 1	s the mean of	the sample data < D	CGL <sub>w</sub> ?			X		
3. I	f elevated are elevated area	as have been identifie < DCGL <sub>EMC</sub> (Class 1	ed by scans and ), < DCGL <sub>W</sub> (C	d/or sampling, Class 2), or <0	is the average activity in each .5 DCGL <sub>W</sub> (Class 3)?			X
4. I	s the result of	the Elevated Measur	ements Test <	1.0?	······			X
5. 1	s the result of	the statistical test (S	+ for Sign Test	or W <sub>r</sub> for WR	5 Test) <u>&gt;</u> the critical value?			X
Comn	nents:					- <u>_</u>	<del></del>	
FS	S/Characteriza	ation Engineer (print/s	sign) D ql	le Randa	11/ Dol Rulall	Date	6-2	0-07
FSS	Characteriza	ation Manager (print/s	sign)	R. Case	Mich	Date	7/5	3/07
							Fo CS- Re	orm 09/2 ev 0

## SECTION 7 ATTACHMENT 4 1 DISC

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<u></u>	Surve	y Unit Release R	ecord			
Design #	EP-Rx160	Revision #	Original	Page	1 of	3
Survey Unit #(s)			Rx160	· • • • • • • • • • • • • • • • • • • •		
Description	<ol> <li>Embedded Pij pipe for Plum Bi</li> <li>EP RX160 is Survey Plan (FS</li> <li>Surveys in EF optimized to me</li> <li>from Survey R</li> <li>Survey Instru- in accordance w Work Execution document consti acquisition of su</li> <li>Instrument eff BSI/LVS-002, V of radiation invo</li> </ol>	pe (EP) Survey Uni rook Reactor Facili a Class 1, Group 2 SP) and Technical P Rx160 were perfo asure gamma energ lequest (SR)-13 wa ctions for this surve ith (IAW) the Babc Package (WEP) 05 tute "Special Meth rvey measurements ficiency determinat VEP 05-006, these olved and the media	it Rx160 meets t ty (PBRF). survey unit as p Basis Document ormed using a sc ties representatives referenced for ey unit are incor cock Services Inco 5-006. Survey in ods" and the sur s. ions are develop determinations a being surveyed	the definit er the PBI t (TBD)-0 intillation we of Co-6 this decis porated in corporated in corporated instructions vey desig	ion of a RF Fina 6-004. detecto ion. ion. to and d (BSI) descri n used	embedded al Status or pple #EP 2 performed /LVS-002 bed in this in the e with the or the type
	Approval Sign	atures			Dat	e:
FSS/Characterizatio	n Engineer	Pal Roy	laft	6-	12-0	07
Technical Rev (FSS/Characterizatio	lewer n Engineer)	Miloc		6-	<u>28</u>	-07
FSS/Characterizatio	n Manager		250	7/3	3/07	
			∩p∨			Form S-09/1 Rev 0

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1.0 2.0	Histor 1.1 1.2	y/Description EP Rx160 is a RT dr described in this repo Building. The purpos to the sump. This sys	ain that terminates in the sump. ort is integral to the drain system	The subject piping for the Reactor
2.0	1.1	EP Rx160 is a RT dr described in this repo Building. The purpos to the sump. This sys	ain that terminates in the sump. To ort is integral to the drain system	The subject piping for the Reactor
2.0	1.2	system piping.	stem involves approximately 2 lir	te water from the RT her feet of drain
2.0		EP Rx160 consists o piping starting in the for EP Rx160 is 2'.	f 2 linear feet (') of 8 inch (") Ins -25 foot elevation RT to the sum	ide Diameter (ID) p. The total piping
	Survey	y Design Information		
	2.1	EP Rx160 was surve	yed IAW Procedure #BSI/LVS-0	02.
	2.2	100% of the 8" ID p pipe was surveyed by total of 2 survey mea	ipe was accessible for survey. The static measurement at one foot is usurements.	e accessible 8" ID increments, for a
:	2.3	Surface area for the corresponding to a to for the entire length	8" ID piping is 1,946 cm <sup>2</sup> for each otal 8" ID piping surface area of 3 of (2') of 8" piping	1 foot of piping, $3.982 \text{ cm}^2 (0.4 \text{ m}^2)$
3.0	Survey	y Unit Measurement I	ocations/Data	
	3.1	Pipe interior radiolog this release record.	gical survey forms are provided in	h Attachment 2 of
4.0	Survey	y Unit Investigations/I	Results	
	4.1	None		
5.0	Data A	Assessment Results		
	5.1	Data assessment resu Report provided in A	ults are provided in the EP/Buried Attachment 1.	Pipe (BP) Survey
	5.2	All measurement res Level (DCGL) for ra mrem/yr dose goal e	ults are less than the Derived Condionuclide specific EP that correstablished in Table 3-3 of the FSS	acentration Guidelin sponds to the 1 SP.
:	5.3	When implementing FSSP, and applying the survey unit that i	the Unity Rule, provided in Section the Nuclide Fraction (NF), provides s constituted by EP Rx160 passes	ion 3.6.3 of the led in TBD-06-004, s FSS.
:	5.4	Background was not Elevated Measureme survey unit.	subtracted from the survey meas ant Comparison (EMC) was not e	urements and the mployed for this

Survey Unit: Rx160

#### 5.5 Statistical Summary Table

Statistical Parameter			
Number of Measurements >MDC	2		
Number of Measurements Above 50% of DCGL	0		
Number of Measurements Above DCGL	0		
Mean	0.016		
Median	0.016		
Standard Deviation	0.000		
Maximum	0.016		
Minimum	0.016		

- 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 160 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.016 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 Rx160 & Spreadsheet

## SECTION 7 ATTACHMENT 1 \_\_\_\_\_ PAGE(S)



### **BSI EP/BP SURVEY REPORT**

Pipe ID	Rx160		Survey Location	-25 Rx			
Survey Date	05-Apr-06		2350-1 #	203488			
Survey Time	1250		Detector-Sled #	BICRON 1MG1			
Pipe Size	8"		Detector Efficiency	0.00015			
DCGL (dpm/100cm2)	240,800		Pipe Area Incorporated by Detector Efficiency (in cm2)	1946			
Pipe Area Incorporated by Survey Data (m <sup>2</sup> )	0.4		Field BKG (cpm)	20.3			
Routine Survey	X		Field MDCR (counts)	18.5			
QA Survey			Nominal MDC (dpm/100cm2)	3394			
	S	urve	y Measurement Results				
Total I	Number of Sur	rvey	Measurements	2			
Nu	mber of Meas	uren	nents >MDC	2			
Number o	of Measureme	ents /	Above 50% DCGL	0			
Numbe	er of Measure	men	ts Above DCGL	0			
······	Ме	an		0.016			
	0.016						
	Standard	Devi	ation	0.000			
	Maxir	mum		0.016			
	Minir	num		0.016			
Survey Tec	hagen						
	Survey Unit (	Class	sification	1			
	TBD 06-004 I	Pipin	g Group	2			
SR-13	Radionuclide	Dist	ribution Sample	EP 2-1			
	Co60						
	No						
	Pass/Fa	ail FS	SS	Pass			
	<1						
COMMENTS: Activity values are not background corrected.							
RP Engineer   Date Oal Parkell 6-12-07							

### EP Rx160 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	73,333	3,768	1,956	31	22	2	109	0.016
2	11	11	73,333	3,768	1,956	31	22	2	109	0.016
									MEAN	0.016
									MEDIAN	0.016
l									STD DEV	0.000
									MAX	0.016
									MIN	0.016

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## SECTION 7 ATTACHMENT 2 \_\_\_\_ PAGE(S)

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BSI/LVSPipeCrawler-002 Revision 4

### Pipe Interior Radiological Survey Form

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Date: <u>4-</u>	5.06 Tim	ne: 12:5	50		
Pipe ID#: $\mathcal{R} \mathcal{X}$	160 Pipe Dia	ameter: 8"	Access	Point Area:	-Z7 TRench
Building: R>	C Eleva	tion: -27	S	ystem:	
Type of Survey In	vestigation	Characterization	Final Surve	y <u> </u>	ner
Gross	Co60	<u> </u>	Cs		
Detector ID# / Sle	ed ID# <u>]M6</u>	1/285-11	107		
Detector Cal Date:	20- DEL -	م Detector C	Cal Due Date:	20 - DE	6-06
Instrument:	2350-1	Instrun	nent ID #:	20348	8
Instrument Cal Date	17. Nov.0	5 Instrument	Cal Due Date: _	17 · NO	1.04
From the Daily Pipe	Survey Detector Co	ntrol Form for the Se	lected Detector		
Background Value	20.3 cpm				
MDCR <sub>static</sub>	18-5 cpm				
Efficiency Factor for	Pipe Diameter	00015 (fro	om detector effic	iency determin	nation)
MDC <sub>static</sub>	<u>3394</u> dpm/	100 cm <sup>2</sup>			,
Is the MDC <sub>static</sub> accept	otable? Yes	No (if no, adj	ust sample count tin	ne and recalculate	e MDCR <sub>static</sub> )
Comments:	INITIAL SUR	VCY			
		······································			
	MAP ALAIN	TOLE		C	omplete
		Technician Signature	- AC	Zulyn	
Pipe Interior Radio	logical Survey		0	$\bigcirc$	
PositionFeet into#from Ope	Pipe Count Tin ming (min)	<sup>ne</sup> Gross Counts	Gross	Net cpm	dpm/100cm <sup>2</sup>

#	from Opening	(min)	Gross Counts	cpm	cpm	dpm/100cm <sup>2</sup>
1	1	1	11	11	nia	nla
2	2 1 11 11		/)			
3	nia	nla	nla	nja		
4						
5						
6						
7						
8						
9						
10	*			ł		$\checkmark$

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Package Page 1 of \_\_\_\_

Attachment 3, Page 1


## SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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				DQA Check	Sheet			
	Design #	EP Rx160	Revision #	Original				
S	rvey Unit #				EP Rx160		<u> </u>	
			Pre	liminary Data	a Review`			
	Answers to	the following qu	estions shoul Release	d be fully do Record	cumented in the Survey Unit	Yes	No	N/A
1.	Have surveys I	been performed in a	ccordance with	survey instruct	ions in the Survey Design?	X		
2.	Is the instrume survey units, o	ntation MDC for str r below 0.5 DCGLw	ucture static mea for Class 3 surv	asurements bel ey units?	low the $DCGL_w$ for Class 1 and 2			x
3.	Is the instrume	ntation MDC for em	nbedded/buried p	piping static me	asurements below the DCGLw?	X		1
4.	Was the instru embedded/bur static measure	mentation MDC for ied piping scan mea ments or soil samp	structure scan m asurements belo les addressed in	easurements, w the DCGL <sub>W</sub> , the survey des	soil scan measurements, and or, if not, was the need for additional sign?			x
5.	Was the instru	mentation MDC for	volumetric meas	urements and	smear analysis < 10% DCGL <sub>w</sub> ?			X
6.	Were the MDC used to perform	s and assumptions n the survey?	used to develop	them appropri	ate for the instruments and techniques	X		
7.	Were the surve media being su	ey methods used to irveyed?	collect data prop	per for the type	s of radiation involved and for the	x		
8.	Were "Special	Methods" for data o	collection properl	y applied for th	e survey unit under review?	X		
9.	Is the data set design, which a	comprised of qualif accurately reflects t	ied measuremer he radiological s	it results collec tatus of the fac	ted in accordance with the survey lity?	x		
			Gr	aphical Data	Review			
1.	Has a posting (	olot been created?						X
2.	Has a histogra	m (or other frequen	cy plot) been cre	ated?				X
3.	Have other gra	phical data tools be	en created to as	sist in analyzin	g the data?			X
				Data Analy	sis			
1.	Are all sample	measurements belo	w the DCGLw (	Class 1 & 2), or	0.5 DCGLw (Class 3)?	X		
2.	is the mean of	the sample data < I	DCGLw?			X		
3.	If elevated area elevated area	as have been identi < DCGL <sub>EMC</sub> (Class	fied by scans an 1), < DCGL <sub>W</sub> (C	d/or sampling, i class 2), or <0.	is the average activity in each 5 DCGL <sub>W</sub> (Class 3)?			x
4.	Is the result of	the Elevated Measu	urements Test <	1.0?				X
5.	Is the result of	the statistical test (	S+ for Sign Test	or <b>W</b> , for WRS	Test) ≥ the critical value?			X
Con	iments:							
F	S/Characteriza	tion Engineer (print	/sign) Par	12 Raya	H Dal Rindall	Date	6-10	2-07
FS	S/ Characteriza	tion Manager (print	/sign)	In A sta	an	Date	7/3	07
							For CS-0 Rev	m )9/2 7 0

### SECTION 7 ATTACHMENT 4 1 DISC

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Design #	EP-Rx 204	Revision #	Original	Page 1 of 3
Survey Unit #(s)	EP-Rx 204			
Description	<ol> <li>Embedded P embedded pipe</li> <li>EP 204 is a 0 Survey Plan (F</li> <li>Survey Plan (F</li> <li>Surveys in E to measure gan Survey Reques</li> <li>Survey Reques</li> <li>Survey Instr in accordance v Work Execution document const acquisition of s</li> <li>Instrument e BSI/LVS-002, of radiation inv</li> </ol>	Pipe (EP) Survey Uni for Plum Brook Rea Class 1, Group 2 surv SSP) and Technical CP 204 were perform and energies represe t (SR)-13 was refere uctions for this survey with (IAW) the Babc on Package (WEP) 05 titute "Special Metho survey measurements officiency determinat WEP 05-006, these volved and the media	it EP Rx-204 me actor Facility (P wey unit as per t Basis Documen ed using a scint intative of Co-66 nced for this de ey unit are incor ock Services In 5-006. Survey ir ods" and the sur s. ions are develop determinations a being surveyed	eets the definition of BRF). the PBRF Final Status tt (TBD)-06-004. illation detector optimized 0. Sample #EP 2-1 from cision. rporated into and performed corporated (BSI)/LVS-002, nstructions described in this rvey design used in the ped in accordance with the are appropriate for the types 1.
	Approval Sig	natures		Date:
FSS/Characterizatio	n Engineer	Oal Ra	fall	6-21-07
Technical Rev (FSS/Characterizatio	iewer n Engineer)	ANood	//	6-29-07
FSS/Characterizatio	n Manager		a	7/3/07
				Form

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Surve	ey Unit:	EP-KX 204		
1.0	Histo	ory/Description		
	1.1	The subject pip equipment and 10' of instrume	oing described in this report is an accessories utilized in Quad B. Tont piping.	instrumentation line for This survey unit involves ~
2.0	Surve	ey Design Informa	ation	
	2.1	EP Rx 204 was	surveyed IAW Procedure #BSI/	LVS-002.
	2.2	100% of the 2.5 ID pipe was sur- total of 10 surve	5" ID pipe was accessible for sur rveyed by static measurement at ey measurements.	rvey. The accessible 2.5" one foot increments, for a
	2.3	Surface area for corresponding t for the entire le	r the 2.5" ID piping is 608 cm <sup>2</sup> for to a total 3" ID piping surface ar ngth of (10') of 2.5" piping	or each foot of piping, ea of $6,080 \text{ cm}^2 (0.61 \text{ m}^2)$
3.0	Surve	ey Unit Measurem	ent Locations/Data	
	3.1	Pipe interior rates this release reco	diological survey forms are prov ord.	ided in Attachment 2 of
4.0	Surve	ey Unit Investigat	ions/Results	
	4.1	None		
5.0	Data	Assessment Resu	lts	
	5.1	Data assessmen Report provide	nt results are provided in the EP/ d in Attachment 1.	Buried Pipe (BP) Survey
	5.2	All measureme Level (DCGL) mrem/yr dose g	nt results are less than the Derive for radionuclide specific EP that goal established in Table 3-3 of t	ed Concentration Guideline t corresponds to the 1 he FSSP.
	5.3	When impleme FSSP, and appl the survey unit	nting the Unity Rule, provided in ying the Nuclide Fraction (NF), that is constituted by EP Rx 204	n Section 3.6.3 of the provided in TBD-06-004, passes FSS.
	5.4	Background wa Elevated Measu survey unit.	as not subtracted from the survey urement Comparison (EMC) was	r measurements and the s not employed for this

FSS Design #	EP Rx 204
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Survey Unit: EP-Rx 204

#### 5.5 Statistical Summary Table

	2.5"
Statistical Parameter	Pipe
Total Number of Survey Measurements	10
Number of Measurements >MDC	10
Number of Measurements Above 50% of DCGL	1
Number of Measurements Above DCGL	0
Mean	0.257
Median	0.227
Standard Deviation	0.123
Maximum	0.521
Minimum	0.078

- 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 204 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.257 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 204 & Spreadsheet

## SECTION 7 ATTACHMENT 1 \_\_\_\_ PAGE(S)

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#### **BSI EP/BP SURVEY REPORT**

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•	Rx 204	Survey Location	-25 el.
Survey Date	02-Mer-06	2350-1 #	203488
Survey Time	0825/ 1042	Detector-Sled #	44-62/212701-12
Pipe Size	2.5"	Detector Efficiency	0.00015
DCGL (dpm/100cm2)	240800	Pipe Area incorporated by Detector Efficiency (in cm2)	608
rea Incorporated by Survey Det (m <sup>2</sup> )	0.61	Field BKG (cpm)	4.7
Routine Survey	X		10.4
QA Survey		Nominal MDC (dpm/100cm2)	4,099
	S	urvey Measurement Results	
	Total Number of	Survey Measurements	10
	Number of Me	easurements >MDC	10
······································	Number of Measure	ements Above 50% DCGL	1
	Number of Measu	urements Above DCGL	0
		Mean	0.257
	N	Median	0.227
	Standa	ard Deviation	0.123
	M	aximum	0.521
	M	linimum	0.078
		DEBRAUX	
		nit Classification	
	Survey Ur TBD 06-00	nit Classification	
	Survey Ur TBD 06-00	hit Classification D4 Piping Group Ide Distribution Sample	
	Survey Ur TBD 06-00 SR-13 Radionucii	nit Classification 04 Piping Group ide Distribution Sample	1 2 EP 2-1
	Survey Ur TBD 06-00 SR-13 Radionucli Measu Area Fac	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide tor/EMC Lised	1 2 EP 2-1 Co60
	Survey Ur TBD 06-00 SR-13 Radionucli Measu Area Fac	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide stor/EMC Used	1 2 EP 2-1 Co60 No
	Survey Ur TBD 06-00 SR-13 Radionuci Measu Area Fac Pass MREM/Y	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide stor/EMC Used s/Fail FSS R Contribution	1 2 EP 2-1 Co60 No Pass
	Survey Ur Survey Ur TBD 06-00 SR-13 Radionucli Measu Area Fac Pase MREM/Y	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide stor/EMC Used s/Fail FSS IR Contribution	1 2 EP 2-1 Co60 No Pass <1
MMENTS: IVITY VALUES NC	Survey Ur TBD 06-00 SR-13 Radionuci Measu Area Fac Pass MREM/Y	nit Classification 04 Piping Group ide Distribution Sample ured Nuclide ctor/EMC Used s/Fail FSS R Contribution	1 2 EP 2-1 Co60 No Pass <1
MMENTS: IVITY VALUES NC	Survey Ur TBD 06-00 SR-13 Radionucli Measu Area Fac Pase MREM/Y	hit Classification D4 Piping Group ide Distribution Sample ured Nuclide stor/EMC Used s/Fail FSS IR Contribution	1 2 EP 2-1 Co60 No Pass <1

### EP Rx 204 2.5" 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 <del>a</del> ctivity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
1	51.5	51.5	343,333	56,469	29,308	469	333	28	1,638	0.245
2	16.5	16.5	110,000	18,092	9,390	150	107	9	525	0.078
3	109.5	109.5	730,000	120,066	62,314	997	708	59	3,482	0.521
4	70	70	466,667	76,754	39,836	637	453	38	2,226	0.333
5	42	42	280,000	46,053	23,901	382	272	23	1,336	0.200
6	44	44	293,333	48,246	25,039	400	285	24	1,399	0.209
7	33.5	33.5	223,333	36,732	19,064	305	217	18	1,065	0.159
8	73.5	73.5	490,000	80,592	41,827	669	475	39	2,337	0.349
9	59	59	393,333	64,693	33,576	537	382	32	1,876	0.281
10	40	40	266,667	43,860	22,763	364	259	21	1,272	0.190
									MEAN	0.257
									MEDIAN	0.227
									STD DEV	0.123
									MAX	0.521
									MIN	0.078

# SECTION 7 ATTACHMENT 2 \_\_\_\_\_ PAGE(S)

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BSI/LVSPipeCrawler-002 Revision 4

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Pipe Interior Radiological Survey Form
Date:3 · 2 · 0 bTime:0 8 2 5QUAD BAccessPipe ID#: $\mathbb{R} \times 204$ Pipe Diameter:2 · 5 ''Access Point Area:STAINLESS BCY - 400Building: $\mathbb{R} \times$ Elevation:-2 5System:Instrument Live
Type of Survey       Investigation       Characterization       Final Survey       Other       Image: Comparison of the state of the stat
Detector Cal Date:         11-17-05         Detector Cal Due Date:         11-17           Instrument:         2350-1         Instrument ID #:         203488
Instrument Cal Date: $(-7-7-0.5)$ Instrument Cal Due Date: $(7-7-0.6)$ From the Daily Pipe Survey Detector Control Form for the Selected Detector Background Value $(4.7)$ cpm MDCR <sub>static</sub> $10.4$ cpm
Efficiency Factor for Pipe Diameter $0.00015$ (from detector efficiency determination)MDC_static $40999$ dpm/ $100$ cm²Is the MDC <sub>static</sub> acceptable?YesNo(if no, adjust sample count time and recalculate MDCR <sub>static</sub> )
Comments: POS#I = RX 204 RIGHT POS#Z = RX 204 LEFT INITIAL SURVEY COMPLETE
Technician Signature C. DEBRAUD

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### Pipe Interior Radiological Survey

Position #	Feet into P from Open	ripe Cour ing (r	nt Time nin)	Gross	Counts	Gr	oss om	l c	Net pm	dpm	/100cm <sup>2</sup>
1	1		2	10	3	51	.5	Λ	a	n	a.
2			2	3	3	16	5.5				
3	nla	<u> </u>	la	n	la	nl	a				
4	1		1				1				
5											
6								-			
7											
8											
9											
10		1	¥		/				/	1	,

Package Page 1 of \_\_\_\_



Attachment 3, Page 1





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BSI/LVSPipe(	Crawler-002
	Revision 4

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Pipe Interior Radiological Survey Form
Date:       3-2-06       Time:       1042       Quad B         Pipe ID#: $\mathbb{E} \times 2.04$ Pipe Diameter: $2.5^{\prime\prime\prime}$ Access Point Area: $378000000000000000000000000000000000000$
Type of Survey Investigation Characterization Final Survey A Other
Gross Co60 Cs
Detector ID# / Sled ID# $44-62$ $212701 / 121$
Detector Cal Date: 1177-05 Detector Cal Due Date: 11-17-06
Instrument:         2350-(         Instrument ID #:         203488
Instrument Cal Date: 242 11-17-05 Instrument Cal Due Date: 11-17-06
From the Daily Pipe Survey Detector Control Form for the Selected Detector Background Value <u>4.7</u> cpm MDCR <sub>static</sub> <u>12.4</u> cpm Efficiency Factor for Pipe Diameter <u>0.0005</u> (from detector efficiency determination) MDC <sub>static</sub> <u>40999</u> dpm/ <u>100</u> cm <sup>2</sup> Is the MDC <sub>static</sub> acceptable? <u>Yes</u> No (if no, adjust sample count time and recalculate MDCR <sub>static</sub> ) Comments: <u>1N1714C</u> CURVY
Complete
Technician Signature C-DEDIRUC

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### Pipe Interior Radiological Survey

Position	Feet into Pipe	Count Time	Gross Counts	Gross	Net	$dnm/100 cm^2$
#	from Opening	(min)		169.5 cpm	cpm	
1		2	219	109.50	nla	na
2	2	2	140	70	)	
3	3	2	84	42		
4	4	<u> </u>	88	44		
5	5	2	67	33.5		
6	le	<u> </u>	147	73.5		
7	7	<u>Z</u>	118	59		
8	<u>ଟ</u>	2	80	40		
9	n/a	nla	nla	Na		
10	V		1	1.	L L	

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Package Page 1 of





R 207 2.

## SECTION 7 ATTACHMENT 3 \_\_\_\_\_PAGE(S)

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			DQA Check	Sheet			
Design #	EP Rx 204	Revision #	Original				
Survey Unit #							
		Pre	liminary Data	Review`			
Answers to	the following que	stions shoul Release	d be fully do Record	cumented in the Survey Unit	Yes	No	N/A
1. Have surveys	been performed in a	ccordance with	survey instruct	ons in the Survey Design?	X		
2. Is the instrum survey units,	entation MDC for stru or below 0.5 DCGLw	cture static mea for Class 3 surv	asurements bel ey units?	ow the $DCGL_W$ for Class 1 and 2			x
3. Is the instrum	entation MDC for eml	pedded/buried p	piping static me	asurements below the DCGLw?	X		1
4. Was the instru embedded/bu static measure	imentation MDC for s ried piping scan mea ements or soil sample	tructure scan m surements belo as addressed in	neasurements, w the DCGL <sub>W</sub> , the survey des	soil scan measurements, and or, if not, was the need for additional ign?			x
5. Was the instru	mentation MDC for v	olumetric meas	urements and	smear analysis < 10% DCGL <sub>w</sub> ?			X
6. Were the MD used to perfor	Cs and assumptions a m the survey?	used to develop	them appropri	ate for the instruments and techniques	x		
7. Were the surv media being s	ey methods used to a surveyed?	collect data prop	per for the type	s of radiation involved and for the	x	 	
8. Were "Specia	Methods" for data co	pllection propert	y applied for th	e survey unit under review?	X		
9. Is the data se design, which	comprised of qualified accurately reflects the	ed measuremen e radiological s	t results collect tatus of the fac	ed in accordance with the survey lity?	x		
·		Gr	aphical Data	Review		·	
1. Has a posting	plot been created?						X
2. Has a histogra	am (or other frequenc	y plot) been cre	ated?				X
3. Have other gr	aphical data tools be	en created to as	sist in analyzin	g the data?			X
			Data Analy	<b>sis</b>			·····
1. Are all sample	measurements belo	w the DCGLw (	Class 1 & 2), or	0.5 DCGLw (Class 3)?	X		
2. Is the mean o	f the sample data < D	CGLw?	<u>.                                    </u>		X		
<ol> <li>If elevated are elevated area</li> </ol>	eas have been identifi < DCGL <sub>EMC</sub> (Class 1	ed by scans an ), < DCGL <sub>w</sub> (C	d/or sampling, Class 2), or <0.	s the average activity in each 5 DCGL <sub>W</sub> (Class 3)?			x
4. Is the result of	the Elevated Measu	rements Test <	1.0?				X
5. Is the result of	the statistical test (S	+ for Sign Test	or Wr for WRS	Test) ≥ the critical value?			X
Comments:	,						
FSS/Characteriz	ation Engineer (print/	sign) Da	10 Rand	Hold Rulel	Date	6-2	1-07
FSS/ Characteriz	ation Manager (print/	sign) R. (	Case	nue	Date	7/3	107
			/		Г	Fo	rm
						CS-0 Re	09/2 v 0

### SECTION 7 ATTACHMENT 4 1 DISC

	Su	rvey Unit Release R	ecord				
Design #	EP-Rx 20	7 <b>Revision</b> #	Original	Page 1	of 3		
Survey Unit #(s)	EP-Rx 207						
Description	<ol> <li>Embedded pi embedded pi</li> <li>EP 207 is Survey Plan</li> <li>Survey Plan</li> <li>Survey Plan</li> <li>Survey Requisition of accordance Work Executed document contact acquisition of acquisition of radiation</li> </ol>	d Pipe (EP) Survey Uni ipe for Plum Brook Rea a Class 1, Group 2 surv (FSSP) and Technical 1 n EP 207 were performe gamma energies represe uest (SR)-13 was referen astructions for this surve with (IAW) the Babca tion Package (WEP) 05 onstitute "Special Metho of survey measurements at efficiency determination 2, WEP 05-006, these of involved and the media	t EP Rx-207 mee actor Facility (PB yey unit as per the Basis Document ed using a scintill ntative of Co-60. need for this deci ey unit are incorp ock Services Inco 5-006. Survey ins ods" and the surv the ions are developed leterminations ar being surveyed.	ets the define RF). e PBRF Fine (TBD)-06- lation dete . Sample # ision. orated inter- orporated ( per design ed in accor- re appropri	nition of nal Status -004. ctor optimized EP 2-1 from and performed (BSI)/LVS-002, lescribed in this used in the dance with the ate for the types		
	Approval S	Signatures			Date:		
FSS/Characterization	n Engineer	Dele 9	Rulal	6-2	6-21-07		
Technical Revi (FSS/Characterization	ewer 1 Engineer)	Ahbod.		6-2	8-07		
FSS/Characterization	n Manager		ł	7/3	107		
		-			Form CS-09/1 Rev 0		

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FSS	Design # EP Rx 207	Revision # Original	Page 2 of 3
Surv	ey Unit: EP-Rx 207		
1.0	History/Description		

- 2.0 Survey Design Information
  - 2.1 EP Rx 207 was surveyed IAW Procedure #BSI/LVS-002.
  - 2.2 100% of the 2" ID pipe was accessible for survey. The accessible 2.5" ID pipe was surveyed by static measurement at one foot increments, for a total of 3 survey measurements.
  - 2.3 Surface area for the 2" ID piping is 486 cm<sup>2</sup> for each foot of piping, corresponding to a total 2" ID piping surface area of 1,459 cm<sup>2</sup> (0.15 m<sup>2</sup>) for the entire length of (3') 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 207 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.

FSS Design # EP Rx 207	Revision # Original	Page 3 of 3
Survey Unit: EP-Rx 207		

#### 5.5 Statistical Summary Table

	2"
Statistical Parameter	Pipe
Total Number of Survey Measurements	3
Number of Measurements >MDC	1
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.153
Median	0.125
Standard Deviation	0.084
Maximum	0.248
Minimum	0.086

- 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 207 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.153 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 207 & Spreadsheet

## SECTION 7 ATTACHMENT 1 \_2\_\_PAGE(S)

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Bubcock	BSI E	P/BP SURVEY REPORT	
Pipe ID	Rx 207	Survey Location	-25 el. Quad B
Survey Date	02-Mar-06	2350-1 #	203488
Survey Time	1034	Detector-Sled #	44-62/212701-121
Pipe Size	2"	Detector Efficiency	0.00016
DCGL (dpm/100cm2)	240800	Pipe Area incorporated by Detector Efficiency (in cm2)	486
Pipe Area incorporated by Survey Data (m <sup>3</sup> )	0.15	Field BKG (cpm)	4.7
Routine Survey	X	Field MDCR (counts)	10.4
QA Survey		Nominai MDC (dpm/100cm2)	33,268
		Survey Measurement Results	
	Total Number of	of Survey Measurements	3
	Number of M	Measurements >MDC	1
	Number of Measu	rements Above 50% DCGL	0
	Number of Mea	surements Above DCGL	0
		Mean	0.153
		Median	0.125
	Stan	dard Deviation	0.084
		Maximum	0.248
		Minimum	0.086
Survey Techr	nician(s)	DEBRAUX	
			·······
	·		
		······································	
		· · · · · · · · · · · · · · · · · · ·	
	Survey I	Unit Classification	1
	TBD 06-	004 Piping Group	2
	SR-13 Radionu	clide Distribution Sample	EP 2-1
	Mea	SURECINUCIDE	<u>Co60</u>
ļ	Area F		<u>No</u>
		ISS/Fall FSS	Pass
	MREM	/rk Contribution	<1
COMMENTS: ACTIVITY VALUES NO	T BACKGROUN	D CORRECTED	<u>I</u> ,,,
RP Engineer	r   Date	Dal Ranhall	6-21-07

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### EP Rx 207 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	22.5	22.5	140,625	28,911	15,005	240	171	14	838	0.125
2	15.5	15.5	96,875	19,917	10,337	165	118	10	578	0.086
3	44.5	44.5	278,125	57,180	29,677	475	337	28	1,658	0.248
									MEAN	0.153
									MEDIAN	0.125
									STD DEV	0.084
				]					MAX	0.248
									MIN	0.086

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## SECTION 7 ATTACHMENT 2 \_\_\_\_ PAGE(S)

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Pipe	Interior	Radiological	Survey	Form
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Date:	3-2-0	96	Time:	1034			QUAD B	Access R
Pipe ID#: Building:	RXZ RX	.07	Pipe Diameter Elevation:	r: <u>2"</u> -25	Acces	ss Point Area: System:	STAINLES. BOX-RI INSTRUMENT	57662 647 -642 TO
Type of Su	rvey Inve	estigation	Char	acterization	Final Surv	ey_ <b>A</b> _0	ther 🖌	the Tetl
Gross			Co60 🖌		Cs			
Detector	r ID# / Sled	.ID#	44-62 #	212701 /_	121		_	
Detector (	Cal Date:	11-17	-05	Detector Ca	l Due Date:	11-17-0	6	
Instru	ment:	2357	<u>)~</u>	Instrume	ent ID #:	Z0348	88	
Instrument	Cal Date:	11-7	-05	Instrument C	al Due Date:	11-17-0	4	
From the D	aily Pipe S	urvey De	tector Control	Form for the Sele	ected Detector			
Backgroun	d Value _	9.1	cpm					
MDCR <sub>static</sub>	l	0.4	cpm					
Efficiency I	Factor for F	ipe Diam	eter _000	<b>6/6</b> (from	n detector effic	ciency det <del>erm</del>	ination)	
MDC <sub>static</sub>	33	268	dpm//	$\mathcal{D}$ cm <sup>2</sup>				
Is the MDC	Static accept	able?	Yes No	(if no, adjus	st sample count ti	me and recalcula	ate MDCR <sub>static</sub> )	
Comments:	INIT	IAL L	survey					<u> </u>
							Panala	TR
					ι Λ	/	compre.	
			Tech	nician Signature	C.DEL	SAMELY a		(Se)

### 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	2	45	22.5	nla	Ma
2	Ż	Z	31	15.5		
3	3	2	ଅନ	44,5		
4	/					
5						
6						
7			0			
8		$\gamma \gamma -$				
9						
10				$\sim$		d

Package Page 1 of ]

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Attachment 3, Page 1



Rx 201

## SECTION 7 ATTACHMENT 3 \_\_\_\_ PAGE(S)

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			DQA Check S	Sheet			
Design #	EP Rx207	Revision #	Original				
Survey Unit #		<u> </u>	Ε	P Rx 207			
		Pre	liminary Data	Review`			
Answers to	o the following que	stions shoul Release	d be fully doo Record	cumented in the Survey Unit	Yes	No	N/
I. Have survey	s been performed in a	ccordance with	survey instructi	ons in the Survey Design?	X		
<ol> <li>Is the instrun survey units,</li> </ol>	nentation MDC for stru or below 0.5 DCGLw	octure static me for Class 3 surv	asurements belovey units?	ow the $DCGL_w$ for Class 1 and 2			x
3. Is the instrun	nentation MDC for em	bedded/buried	piping static me	asurements below the DCGLw?	X		
<ol> <li>Was the instr embedded/b static measu</li> </ol>	rumentation MDC for uried piping scan mea rements or soil sampl	structure scan n surements belo es addressed in	neasurements, s w the DCGL <sub>W,</sub> c the survey des	soil scan measurements, and or, if not, was the need for additional ign?			×
5. Was the inst	rumentation MDC for	volumetric meas	surements and s	smear analysis < 10% DCGL <sub>w</sub> ?			X
<ol> <li>Were the MD used to perform</li> </ol>	OCs and assumptions form the survey?	used to develop	them appropria	ate for the instruments and techniques	×		
7. Were the sur media being	vey methods used to surveyed?	collect data pro	per for the type:	s of radiation involved and for the	x		
3. Were "Specia	al Methods" for data c	ollection proper	ly applied for the	e survey unit under review?	X		Ì
<ol> <li>Is the data se design, which</li> </ol>	et comprised of qualifi h accurately reflects t	ed measurement ne radiological s	nt results collect status of the faci	ed in accordance with the survey lity?	×		
	-	G	raphical Data	Review			·······
1. Has a postin	g plot been created?		- <u></u>	·····			×
2. Has a histog	ram (or other frequen	cy plot) been cro	eated?				×
3. Have other g	raphical data tools be	en created to a	ssist in analyzin	g the data?			×
			Data Analy	<b>Si6</b>			<del></del>
1. Are all samp	le measurements belo	w the DCGL <sub>W</sub> (	Ciass 1 & 2), or	0.5 DCGLw (Class 3)?	X		
2. Is the mean	of the sample data < I	DCGLw?	- <u></u>		X		
<ol> <li>If elevated an elevated area</li> </ol>	reas have been identii a < DCGL <sub>EMC</sub> (Class	ied by scans ar 1), < DCGL <sub>w</sub> (0	id/or sampling, i Class 2), or <0.	s the average activity in each 5 DCGL <sub>w</sub> (Class 3)?			X
4. Is the result of	of the Elevated Measu	irements Test <	1.0?				X
5. Is the result of	of the statistical test (	S+ for Sign Test	or Wr for WRS	Test) $\geq$ the critical value?			X
Comments:						<u></u>	
FSS/Characteri	zation Engineer (print	/sign)	ale Rana	Lall And Rushulk	Date	6-	21-0
FSS/ Characteri	zation Manager (print	/sign)	R Case	MAXL	Date	17/3	10
					Γ	Fo	rm
						CS-	09/2

SECTION 7 ATTACHMENT 4 1 DISC

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<u> </u>	Survey	Unit Release R	ecord			
Design #	EP-Rx 208	Revision #	Original	Page	1 of	3
Survey Unit #(s)	EP-Rx 208		<u></u>			
Description	<ol> <li>Embedded Pipe f</li> <li>EP 208 is a C</li> <li>Survey Plan (FS</li> <li>Surveys in EF</li> <li>Surveys in EF</li> <li>Survey Request</li> <li>Survey Request</li> <li>Survey Instruction</li> <li>Survey Instructin</li> <li>Survey Instructin</li> <li>Survey Instructi</li></ol>	<ol> <li>Embedded Pipe (EP) Survey Unit EP Rx-208 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</li> <li>EP 208 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</li> <li>Surveys in EP 208 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 from Survey Request (SR)-13 was referenced for this decision.</li> <li>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.</li> <li>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.</li> </ol>				
	Approval Sign	atures			Dat	e:
FSS/Characterization	n Engineer	Oul Roule	Il	6-21-07		
Technical Reviewer (FSS/Characterization Engineer)			6-28-07			
FSS/Characterization Manager R. Case///// 7/3/07						
			רסר		C ]	Form S-09/1 Rev 0

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FSS I	Design # EP Rx 208	Revision # Original	Page 2 of 3
Surve	ey Unit: EP-Rx 208		

- 1.1 The subject piping described in this report is an instrumentation line for equipment and accessories utilized in Quad B. This survey unit involves ~
   4' of instrument piping.
- 2.0 Survey Design Information
  - 2.1 EP Rx 208 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 4 survey measurements.
  - 2.3 Surface area for the 2" ID piping is 486 cm<sup>2</sup> for each foot of piping, corresponding to a total 2" ID piping surface area of 1,944 cm<sup>2</sup> (0.19 m<sup>2</sup>) for the entire length of (4') 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 208 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.

Revision # Origina
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Survey Unit: EP-Rx 208

FSS Design # EP Rx 208

#### 5.5 Statistical Summary Table

Statistical Parameter	2" Pipe
Total Number of Survey Measurements	4
Number of Measurements >MDC	0
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.042
Median	0.046
Standard Deviation	0.017
Maximum	0.056
Minimum	0.020

- 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 208 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.042 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 208 & Spreadsheet

## SECTION 7 ATTACHMENT 1 \_\_\_\_ PAGE(S)

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Pine ID	Rx 208	Survey Location	-25 el. Quad B
Survey Date 02-Mar-06 Survey Time 1300		2350-1 #	203488
		Detector-Sied #	44-62/212701-12
Pipe Size	pe Size 2" Detector Efficiency		0.00016
	240800	Pipe Area Incorporated by Detector Efficiency (in cm2)	486
e Area incorporated by Survey Data	0.19	Field BKG (cpm)	4.7
Routine Survey	X	Field MDCR (counts)	10.4
QA Survey	11 - C	Nominal MDC (dpm/100cm2)	33,268
		Survey Measurement Results	
	Total Number	of Survey Measurements	4
	Number of	Measurements >MDC	0
1	Number of Measu	urements Above 50% DCGL	0
	Number of Mea	asurements Above DCGL	0
		Mean	0.042
		Median	0.046
	0.017		
	0.056		
	0.020		
	Survey TBD 06	Unit Classification -004 Piping Group	
	Survey TBD 06 SR-13 Radionu	Unit Classification -004 Piping Group uclide Distribution Sample	1 2 EP 2-1
	Survey TBD 06 SR-13 Radionu Mea	Unit Classification -004 Piping Group uclide Distribution Sample asured Nuclide	1 2 EP 2-1 Co60
	Survey TBD 06 SR-13 Radionu Mea Area F	Unit Classification -004 Piping Group uclide Distribution Sample asured Nuclide Factor/EMC Used	1 2 EP 2-1 Co60 No
	Survey TBD 06 SR-13 Radionu Mea Area F	Unit Classification -004 Piping Group uclide Distribution Sample asured Nuclide Factor/EMC Used ass/Fail FSS	1 2 EP 2-1 Co60 No Pass
	Survey TBD 06 SR-13 Radionu Mea Area F Pa MREM	Unit Classification -004 Piping Group uclide Distribution Sample asured Nuclide Factor/EMC Used ass/Fail FSS VYR Contribution	1 2 EP 2-1 Co60 No Pass <1
	Survey TBD 06 SR-13 Radionu Mea Area F Pr MREM	Unit Classification -004 Piping Group uclide Distribution Sample asured Nuclide Factor/EMC Used ass/Fail FSS VYR Contribution	1 2 EP 2-1 Co60 No Pass <1

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### EP Rx 208 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	3.5	3.5	21,875	4,497	2,334	37	27	2	130	0.020
2	10	10	62,500	12,850	6,669	107	76	6	373	0.056
3	7	7	43,750	8,995	4,668	75	53	4	261	0.039
4	9.5	9.5	59,375	12,207	6,335	101	72	6	354	0.053
									MEAN	0.042
									MEDIAN	0.046
1									STD DEV	0.017
									MAX	0.056
									MIN	0.020

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## SECTION 7 ATTACHMENT 2 \_\_\_\_ PAGE(S)

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BSI/LVSPipeCrawler-002 Revision 4

## Pipe Interior Radiological Survey Form

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Date:	3.2	.06	Time:		1300				
Pipe ID#:	RX	208	Pipe Diameter:		2"	Acces	s Point Area	: Access R	STEEL
Building:	R	×	Elevation:	-25	QUAD B	, i	System:	INSTRAME	ent Linte
Type of Su	rvey Inv	restigation	Charact	terizatio	on	Final Surv	ey_ <b>X</b> _ (	Other	70 :-+
Gross			Co60 <u> </u>			Cs			
Detector	ID#/Sle	d ID#	14-62 /2	1270	<u> / /</u>	121	· · · · · ·		
Detector (	Cal Date:	17-	NOU 05	Dete	ector Cal I	Oue Date:	17.1	000.06	
Instrur	nent:	235	50-1	I	nstrument	ID #:	70	3488	
Instrument	Cal Date:	17.	NOX. 05	Instru	iment Cal	Due Date:	17.1	sev - e 6	
From the D Background MDCR <sub>static</sub>	aily Pipe S i Value	Survey De 4.7 10.4	tector Control Fo cpm cpm	rm for	the Selecte	ed Detector			
Efficiency I	Factor for	Pipe Dian	neter .000	6	(from d	letector effic	ciency detern	nination)	
$MDC_{static}$	3;	3268	dpm/	2	cm <sup>2</sup>				
Is the MDC	static accep	table?	Yes No	(if	no, adjust sa	ample count ti	me and recalcul	late MDCR <sub>static</sub> )	
Comments:		FNITIAL	SURVEY	'.	LOTE: PA.	SITION E	1 # 2 A	RE in B	ΰχ
SURVEYI	ay Dow	IN TO H	opizonithe Pip	E A	FOTE PO.	STITIS #	314.1	rs in u	AU
RUNNIN	16 HOM	ZONTAL					~ (	COMP	VETE
			Technic	ian Sig	mature	Join (	Lully		
							$\cup$		

## 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	ð	. 7	3.5	nla	na	
2	2	2	80	10	1		
3	1	2	74	7			
4	2	2	19	9.5			
5	nia	<u>pla</u>	na	nla			
6	1		<u> </u>				
7							
8							
9							
10				L	V	V	

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Attachment 3, Page 1



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## SECTION 7 ATTACHMENT 3 \_\_\_\_ PAGE(S)

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			DQA Check S	heet			
Design #	EP Rx208	Revision #	Original				
Survey Unit #		····	E	P Rx 208			_
	* <u>************************************</u>	Pr	eliminary Data	Review`	··		
Answers to	Answers to the following questions should be fully documented in the Survey Unit						
1. Have surveys	Have surveys been performed in accordance with survey instructions in the Survey Design?						
2. Is the instrum survey units, o	entation MDC for strip or below 0.5 DCGLw	ucture static m for Class 3 su	easurements belo rvey units?	w the $DCGL_{W}$ for Class 1 and 2			x
3. Is the instrum	entation MDC for em	bedded/buried	I piping static mea	surements below the DCGLw?	X		
4. Was the instruer embedded/bu static measure	umentation MDC for ried piping scan mea aments or soil sampl	structure scan asurements be les addressed	measurements, s low the DCGL <sub>W</sub> of in the survey design the surve	oil scan measurements, and ; if not, was the need for additional gn?			x
5. Was the instru	mentation MDC for	volumetric mea	asurements and s	mear analysis < 10% DCGL <sub>W</sub> ?			X
<ol><li>Were the MD0 used to perfor</li></ol>	Were the MDCs and assumptions used to develop them appropriate for the instruments and techniques used to perform the survey?						
7. Were the surv media being s	ey methods used to surveyed?	collect data pr	oper for the types	of radiation involved and for the	x		
8. Were *Specia	Methods" for data c	collection prope	erly applied for the	survey unit under review?	X		
9. Is the data se design, which	comprised of qualifi accurately reflects t	ied measurem he radiological	ent results collecte status of the facili	d in accordance with the survey ty?	x		
			Graphical Data	Review			<b>.</b>
1. Has a posting	Has a posting plot been created?						X
. Has a histogram (or other frequency plot) been created?						 	X
3. Have other gr	aphical data tools be	en created to a	assist in analyzing	the data?			X
		·····	Data Analys	<b>is</b>			<del></del>
. Are all sample measurements below the DCGL <sub>W</sub> (Class 1 & 2), or 0.5 DCGL <sub>W</sub> (Class 3)?							
2. Is the mean o	f the sample data < I	DCGLw?			X		ļ
<ol> <li>If elevated are elevated area</li> </ol>	Sas have been identified as a second seco	1), < DCGLw	(Class 2), or <0.5	the average activity in each DCGL <sub>w</sub> (Class 3)?			X
4. Is the result of	f the Elevated Measu	urements Test	< 1.0?				X
5. Is the result of	the statistical test (	S+ for Sign Tes	st or W <sub>r</sub> for WRS	Fest) ≥ the critical value?			X
Comments:							
FSS/Characterization Engineer (print/sign) Dale Randall In Faul Randell						6-2	1-07
FSS/ Characteriz	ation Manager (print	/sign)	R. Case	1 Allen	Date	7/3	3/07
			ιν			For CS-(	rm 09/2
					1	Re	v U

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