Survey Unit Release Record				
Design #	EP-1.61	**Revision #**	Original	**Page 1 of 3**
Survey Unit #(s)	1.61			
Description	1) Embedded Pipe (EP) Survey Unit 1.61 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF). 2) EP 1.61 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004. 3) Surveys in EP 1.61 were performed using a scintillation detector optimized to measure gamma energies representative of Cs-137. Sample #EP2-5 from Survey Request (SR)-13 was referenced for this decision. 4) Survey Instructions for this survey unit are incorporated into and performed in accordance with (IAW) the Babcock Services Incorporated (BSI)/LVS-002, Work Execution Package (WEP) 05-006. Survey instructions described in this document constitute "Special Methods" and the survey design used in the acquisition of survey measurements. 5) Instrument efficiency determinations are developed in accordance with the BSI/LVS-002, WEP 05-006, these determinations are appropriate for the types of radiation involved and the media being surveyed.			

Approval Signatures		**Date:**
FSS/Characterization Engineer	Carl Randall	10-23-07
Technical Reviewer (FSS/Characterization Engineer)		10/30/07
FSS/Characterization Manager	R. Case	10/31/07

Form CS-09/1 Rev 0

1.0 History/Description

1.1 The subject pipe system is the 6" drain line for canal "K". The piping is located on the Rx building -25ft.

1.2 EP 1.61 consists of 6" diameter piping that is approximately 52 feet in length.

2.0 Survey Design Information

2.1 EP 1.61 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 52 survey measurements.

2.3 Surface area for the 6" ID piping is 1,459 cm^2 for each foot of piping, corresponding to a total 6" ID piping surface area of 75,855 cm^2 (7.6 m^2) for the entire length of (approximately 52') 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 1.61 passes FSS.

5.4 Background was not subtracted from the survey measurements and the Elevated Measurement Comparison (EMC) was not employed for this survey unit.

5.5 Co-60 is designated as the primary nuclide of concern for Piping Group 2 per Technical Basis Document TBD-06-004, which would typically lead to a survey design based on the direct measurement of Co-60. The field measurements were acquired using a detector windowed for Cs-137 versus Co-60. The survey results documented in this release record are valid as Cs-137 was present in the nuclide distribution for this pipe group in sufficient abundance and the correct nuclide distribution was used to calculate total activity.

5.6 Statistical Summary Table

Statistical Parameter	6" Pipe
Total Number of Survey Measurements	52
Number of Measurements >MDC	52
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.1545
Median	0.1298
Standard Deviation	0.0781
Maximum	0.4353
Minimum	0.0802

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 1.61 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.155 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 1.61 & Spreadsheet

SECTION 7
ATTACHMENT 1
3 PAGE(S)

BSI EP/BP SURVEY REPORT

Pipe ID	1.61	Survey Location	Canal K Drain
Survey Date	11/15/2006, 11/16/2006	2350-1 #	203488
Survey Time	14:52, 08:00	Detector-Sled #	1MG1 LVS-1/107
Pipe Size	6"	Detector Efficiency	0.0003
DCGL (dpm/100cm2)	3.79E+06	Pipe Area Incorporated by Detector Efficiency (in cm2)	1,459
Pipe Area Incorporated by Survey Data (m^2)	7.6	Field BKG (cpm)	9.5, 11.6
Routine Survey	X	Field MDCR (cpm)	13.6, 14.7
QA Survey		Nominal MDC (dpm/100cm2)	3,306

Survey Measurement Results	
Total Number of Survey Measurements	52
Number of Measurements >MDC	52
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.1545
Median	0.1298
Standard Deviation	0.0781
Maximum	0.4353
Minimum	0.0802

Survey Technician(s)	STOCK

Survey Unit Classification	1
TBD 06-004 Piping Group	2
SR-13 Radionuclide Distribution Sample	EP2-5
Measured Nuclide	Cs-137
Area Factor/EMC Used	No
Pass/Fail FSS	Pass
MREM/YR Contribution	<1

COMMENTS:
ACTIVITY VALUES NOT BACKGROUND CORRECTED

RP Engineer | Date	Oal Rudall 10-23-07

EP 1.61
6" Pipe
TBD 06-004 Group 2

Measurement #	gcpm	ncpm	Cs-137 activity (total dpm)	Cs-137 activity (dpm/100cm2)	Co-60 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
1	158	158	526,667	36,090	69,600	577	407	34	2,003	0.302
2	76	76	253,333	17,360	33,478	278	196	16	964	0.145
3	105	105	350,000	23,984	46,253	384	271	23	1,331	0.200
4	221	221	736,667	50,480	97,351	807	570	47	2,802	0.422
5	228	228	760,000	52,079	100,435	833	588	49	2,891	0.435
6	165	165	550,000	37,689	72,683	603	425	35	2,092	0.315
7	107	107	356,667	24,441	47,134	391	276	23	1,357	0.204
8	92	92	306,667	21,014	40,526	336	237	20	1,166	0.176
9	87	87	290,000	19,872	38,324	318	224	19	1,103	0.166
10	94	94	313,333	21,471	41,407	343	242	20	1,192	0.179
11	91	91	303,333	20,786	40,086	332	235	20	1,154	0.174
12	98	98	326,667	22,385	43,169	358	253	21	1,242	0.187
13	97	97	323,333	22,156	42,729	354	250	21	1,230	0.185
14	86	86	286,667	19,644	37,883	314	222	18	1,090	0.164
15	80	80	266,667	18,273	35,240	292	206	17	1,014	0.153
16	62	62	206,667	14,162	27,311	226	160	13	786	0.118
17	75	75	250,000	17,131	33,038	274	193	16	951	0.143
18	51	51	170,000	11,649	22,466	186	132	11	647	0.097
19	47	47	156,667	10,736	20,704	172	121	10	596	0.090
20	50	50	166,667	11,421	22,025	183	129	11	634	0.095
21	67	67	223,333	15,304	29,514	245	173	14	849	0.128
22	47	47	156,667	10,736	20,704	172	121	10	596	0.090
23	51	51	170,000	11,649	22,466	186	132	11	647	0.097
24	56	56	186,667	12,791	24,668	205	144	12	710	0.107
25	55	55	183,333	12,563	24,228	201	142	12	697	0.105
26	43	43	143,333	9,822	18,942	157	111	9	545	0.082
27	42	42	140,000	9,594	18,501	153	108	9	532	0.080
28	67	67	223,333	15,304	29,514	245	173	14	849	0.128
29	45	45	150,000	10,279	19,823	164	116	10	571	0.086
30	47	47	156,667	10,736	20,704	172	121	10	596	0.090
31	61	61	203,333	13,933	26,871	223	157	13	773	0.116

EP 1.61
6" Pipe
TBD 06-004 Group 2

Measurement #	gcpm	ncpm	Cs-137 activity (total dpm)	Cs-137 activity (dpm/100cm2)	Co-60 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
32	52	52	173,333	11,878	22,906	190	134	11	659	0.099
33	80	80	266,667	18,273	35,240	292	206	17	1,014	0.153
34	63	63	210,000	14,390	27,752	230	162	14	799	0.120
35	84	84	280,000	19,187	37,002	307	217	18	1,065	0.160
36	86	86	286,667	19,644	37,883	314	222	18	1,090	0.164
37	83	83	276,667	18,959	36,562	303	214	18	1,052	0.158
38	74	74	246,667	16,903	32,597	270	191	16	938	0.141
39	98	98	326,667	22,385	43,169	358	253	21	1,242	0.187
40	176	176	586,667	40,201	77,529	643	454	38	2,231	0.336
41	89	89	296,667	20,329	39,205	325	229	19	1,128	0.170
42	63	63	210,000	14,390	27,752	230	162	14	799	0.120
43	47	47	156,667	10,736	20,704	172	121	10	596	0.090
44	56	56	186,667	12,791	24,668	205	144	12	710	0.107
45	53	53	176,667	12,106	23,347	194	137	11	672	0.101
46	65	65	216,667	14,847	28,633	237	168	14	824	0.124
47	79	79	263,333	18,045	34,800	289	204	17	1,002	0.151
48	64	64	213,333	14,619	28,192	234	165	14	811	0.122
49	55	55	183,333	12,563	24,228	201	142	12	697	0.105
50	56	56	186,667	12,791	24,668	205	144	12	710	0.107
51	69	69	230,000	15,761	30,395	252	178	15	875	0.132
52	65	65	216,667	14,847	28,633	237	168	14	824	0.124
									MEAN	0.155
									MEDIAN	0.130
									STD DEV	0.078
									MAX	0.435
									MIN	0.080

SECTION 7
ATTACHMENT 2
5 PAGE(S)

Pipe Interior Radiological Survey Form

Date: 11/15/06 Time: 1452

Pipe ID#: 1.61 Pipe Diameter: 6" Access Point Area: CANAL K

Building: HOT LAB Elevation: -25' System: DRAIN

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

Gross ____ Co60 ____ Cs ✓

Detector ID# / Sled ID# IMG1 LVS-1 / 107

Detector Cal Date: 12/20/05 Detector Cal Due Date: 12/20/06

Instrument: 2350-1 Instrument ID #: 203488

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

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

Background Value 9.5 cpm

$MDCR_{static}$ 13.6 cpm

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

MDC_{static} 3393 dpm/ 100 cm^2

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

Comments: FOURTH POST HYDRO SURVEY

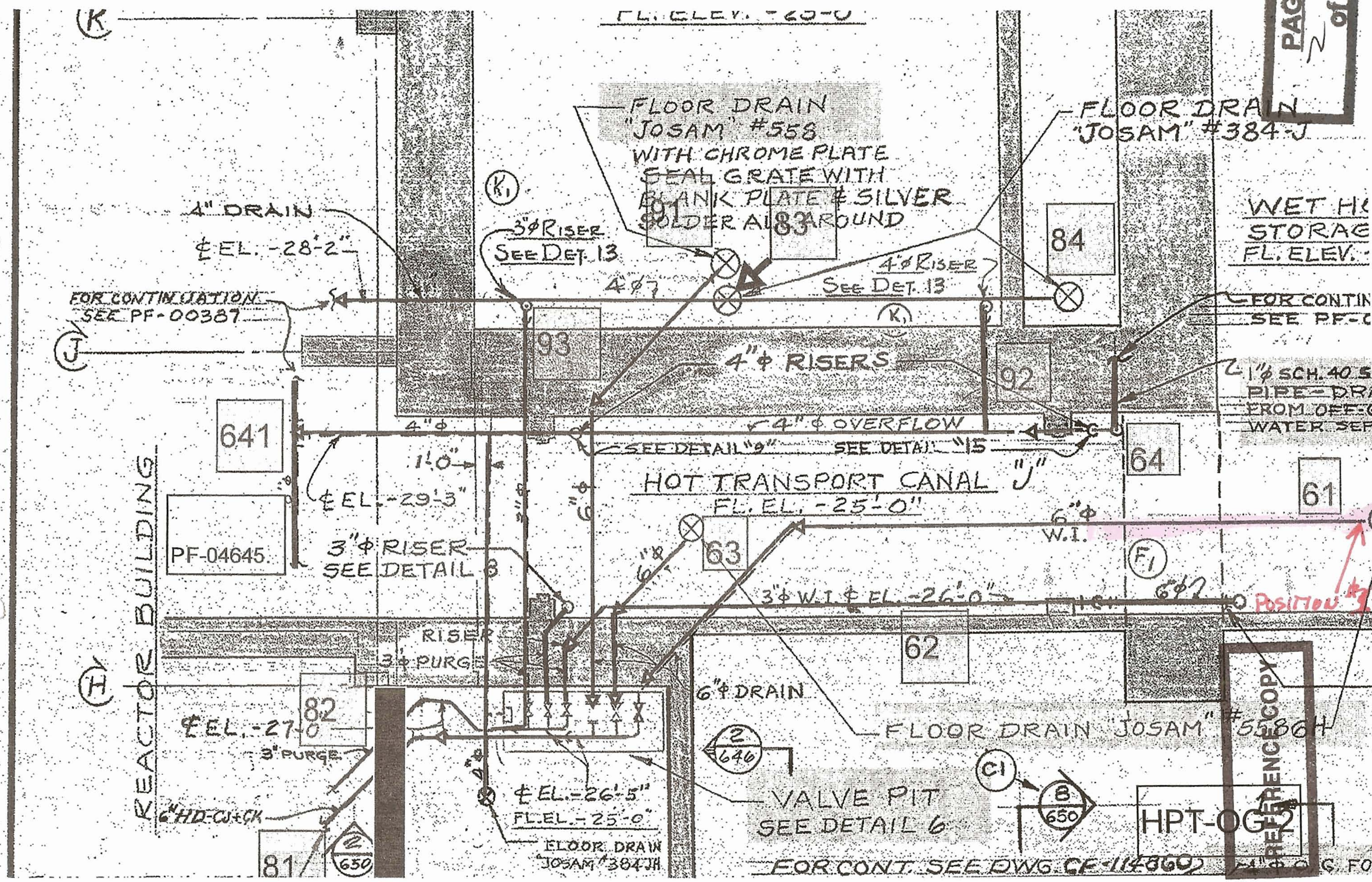
Technician Signature C Wood

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm²
1	1	1	158	158	na	N/a
2	2		76	76		
3	3		105	105		
4	4		221	221		
5	5		228	228		
6	6		165	165		
7	7		107	107		
8	8		92	92		
9	9		87	87		
10	10	↓	94	94	↓	↓

PF-04645

1.61


FL. ELEV. -25-0
FLOOR DRAIN "JOSAM" #558 WITH CHROME PLATE SEAL GRATE WITH BLANK PLATE & SILVER SOLDER ALL AROUND
FLOOR DRAIN "JOSAM" #384-J
4" DRAIN
℄ EL. -28'-2"
3"ϕ RISER SEE DET. 13
4"ϕ RISER SEE DET. 13
FOR CONTINUATION SEE PF-00387
91
83
84
93
92
4"ϕ RISERS
WET HO
STORAG
FL. ELEV.
FOR CONTIN
SEE PF-0
1"ϕ SCH. 40 S
PIPE - DRA
FROM OFF-G
WATER SER
641
4"ϕ
4"ϕ OVERFLOW
SEE DETAIL "9"
SEE DETAIL "15"
64
1'-0"
℄ EL. -29'-3"
HOT TRANSPORT CANAL "J"
FL. EL. -25'-0"
61
6"ϕ W.I.
PF-04645
3"ϕ RISER SEE DETAIL 8
63
REACTOR BUILDING
3"ϕ W.I. ℄ EL. -26'-0"
POSITION
RISER
3"ϕ PURGE
62
82
℄ EL. -27'-0"
3" PURGE
6"ϕ DRAIN
FLOOR DRAIN "JOSAM" #5586H
2
646
VALVE PIT SEE DETAIL 6
C1
8
650
HPT-OG-2
REFERENCE COPY
℄ EL. -26'-5"
FL. EL. -25'-0"
FLOOR DRAIN "JOSAM" #384JH
6" HD-CJ+CK
81
2
650
FOR CONT. SEE DWG. CF-114860
4"ϕ O.G. FO

Pipe Interior Radiological Survey Form

Date: 11/16/06 Time: 0800

Pipe ID#: 1.61 Pipe Diameter: 6" Access Point Area: CANAL K

Building: HOT LAB Elevation: -25' System: FLR DRN

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

Gross ____ Co60 ____ Cs ✓

Detector ID# / Sled ID# IMG1 LVS-1 / 107

Detector Cal Date: 12/20/05 Detector Cal Due Date: 12/20/06

Instrument: 2350-1 Instrument ID #: 203488

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

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

Background Value 11.6 cpm

$MDCR_{static}$ 14.7 cpm

Efficiency Factor for Pipe Diameter 0.0007 (from detector efficiency determination)

MDC_{static} 3393 dpm/ 100 cm^2

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

Comments: POST HYDRO DECON SURVEY; EPZ-5 COMPLETE POSITION # 30 – ELBOW

Technician Signature

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm²
1	11	1	91	91	n/a	n/a
2	12	↓	98	98	↓	↓
3	13		97	97		
4	14		86	86		
5	15		80	80		
6	16		62	62		
7	17		75	75		
8	18		51	51		
9	19		47	47		
10	20	↓	50	50	↓	↓

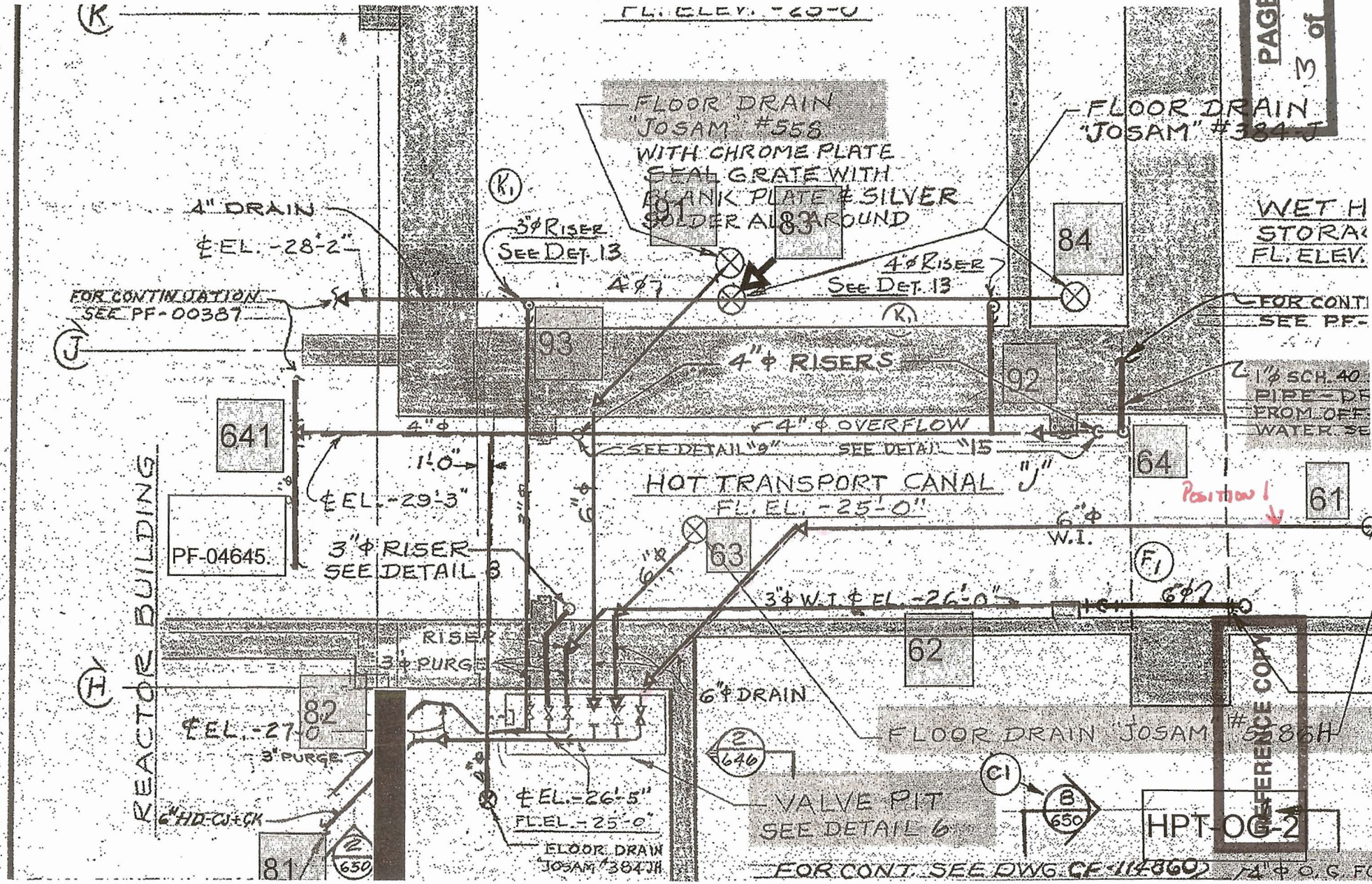
Pipe Interior Radiological Survey Form (Continuation Form)

Date: 11/16/06
Pipe ID#: 1.61 Pipe Diameter: 6" Access Point Area: CANAL K
Building: HOT LAB Elevation: -25' System: PLR DRN

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm^2
11	21	4	67	67	N/A	N/A
12	22		47	47		
13	23		51	51		
14	24		56	56		
15	25		55	55		
16	26		43	43		
17	27		42	42		
18	28		67	67		
19	29		45	45		
20	30		47	47		
21	31		61	61		
22	32		52	52		
23	33		80	80		
24	34		63	63		
25	35		84	84		
26	36		86	86		
27	37		83	83		
28	38		74	74		
29	39		98	98		
30	40		176	176		
31	41		89	89		
32	42		63	63		
33	43		47	47		
34	44		56	56		
35	45		53	53		
36	46		65	65		
37	47		79	79		
38	48		64	64		
39	49		55	55		
40	50		56	56		
41	51		69	69		
42	52		65	65		
43	53		N			
44	54			A		
45	55					

PF-04645

1.161



SECTION 7
ATTACHMENT 3
___1___ PAGE(S)

DQA Check Sheet				
Design #	EP 1.61	Revision #	Original	
Survey Unit #	EP 1.61			

Preliminary Data Review`			
Answers to the following questions should be fully documented in the Survey Unit Release Record	Yes	No	N/A
1. Have surveys been performed in accordance with survey instructions in the Survey Design?	X		
2. Is the instrumentation MDC for structure static measurements below the $DCGL_W$ for Class 1 and 2 survey units, or below 0.5 $DCGL_W$ for Class 3 survey units?			X
3. Is the instrumentation MDC for embedded/buried piping static measurements below the $DCGL_W$?	X		
4. Was the instrumentation MDC for structure scan measurements, soil scan measurements, and embedded/buried piping scan measurements below the $DCGL_W$, or, if not, was the need for additional static measurements or soil samples addressed in the survey design?			X
5. Was the instrumentation MDC for volumetric measurements and smear analysis < 10% $DCGL_W$?			X
6. Were the MDCs and assumptions used to develop them appropriate for the instruments and techniques used to perform the survey?	X		
7. Were the survey methods used to collect data proper for the types of radiation involved and for the media being surveyed?	X		
8. Were "Special Methods" for data collection properly applied for the survey unit under review?	X		
9. Is the data set comprised of qualified measurement results collected in accordance with the survey design, which accurately reflects the radiological status of the facility?	x		
Graphical Data Review			
1. Has a posting plot been created?			X
2. Has a histogram (or other frequency plot) been created?			X
3. Have other graphical data tools been created to assist in analyzing the data?			X
Data Analysis			
1. Are all sample measurements below the $DCGL_W$ (Class 1 & 2), or 0.5 $DCGL_W$ (Class 3)?	X		
2. Is the mean of the sample data < $DCGL_W$?	X		
3. If elevated areas have been identified by scans and/or sampling, is the average activity in each elevated area < $DCGL_{EMC}$ (Class 1), < $DCGL_W$ (Class 2), or <0.5 $DCGL_W$ (Class 3)?			X
4. Is the result of the Elevated Measurements Test < 1.0?			X
5. Is the result of the statistical test (***S+*** for Sign Test or W_r for WRS Test) $\geq$ the critical value?			X

Comments:

FSS/Characterization Engineer (print/sign)	Dale Randall	Date	10-23-07
FSS/ Characterization Manager (print/sign)	R. Case	Date	10/31/07

Form CS-09/2 Rev 0

SECTION 7
ATTACHMENT 4
1 DISC