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There have been references to a leak or seep associated with Bldg. #4 which may be the same as above. A taped recording (Christensen, 1986) of a field trip 12/17/86, indicates in three places on both sides of the tape, that there was a hole due to an HF leak under the north end of Building 4. Although no hole was apparent on the field trip, Christensen, in response to the question, "Where was the HF trench..." responded, "Underneath the north end of 4 there's one area if you drop a rock in the hole its hard to hear it hit bottom" (Christensen, 1986, side A, lines 328-332). Later, on the same field tour, Christensen explains, "In the early days this is where they did the first hydrofluorination. They used a steam aspirator for vacuum. So, then that steam condensate would pick up all the HF gas coming off the hydrofluorination furnace and it ate thru the lines and then ducked underneath the building and that's where you find the big hole". Christensen then acknowledges that the tour group was at the "north end of building 4" (Christensen, 1986, side B, lines 137-150). [Note that in the above quoted conversation, Christensen uses the word "aspirator" and remember that the Tribby memo of 1947 speaks about "water aspirations".] Upon further urging to point out this HF hole, Christensen responds, "Well, it's underneath this building,.. It's in the utility tunnel that runs the perimeter of the building. There's no way to see that kind of a hole. They saw it when they were down looking at the HF line in this utility tunnel. There was a tremendous amount of excavation at the northwest corner when they put in those hot cells, but how much was done on this other side which then later was converted to working with P-238 for the artificial heart program....." (Christensen, 1986, side #2, lines 172-198). Engineering drawing Eng.-C43338 (no sheet #, no date), states however, "On the east side of Building #4 south there was a gaping hole in the tunnel which leached out with HF water. USGS sampled the water down canyon. The hole was covered with plywood and tar". This placement of the hole off the south end of building 4 is consistent with the 1947 Tribby memo which mentions room #413 and the south side of DP West. The question of whether the HF hole was/is off the northeast or southeast end of Building #4 is not resolved.

Whether this is the same as 21-006(f) which was identified by the Tribby memo, or yet another release-site is not yet resolved. It is also possible that this hole has been "remediated" since it's discovery, which is remembered as occuring in the mid- to late-50's.

Christensen and Maraman (1969) show various flow diagrams for chemical processing of Pu and state that purification and recovery of Pu was "transferred to DP Site West in September 1945". The flow diagram for the new process instituted when the move to DP was made, shows the ether extraction steps (Figure 3, p.5). This is consistent with the construction date of 1945 given for the drain lines to and from the ether pit as indicated in the line description, Figure 8. However, later (p.69) in the same reference, it is stated, "Therefore, when purification operations were transferred to DP Site in September 1945, the acetate precipitations were eliminated and the resulting process of two ether extractions and an oxalate precipitation was called Process "B" ...After a few months, the purity level of the feed had increased to a level that permitted the omission of the ether extraction." If the start and finish dates of the ether extraction portion of the Pu processing at DP Site (synonymous with TA-21) are accurate, the ether pit was used for only "a few months" for this purpose.

The use of nondestructive geophysics techniques (Gerety et al., 1989) between Buildings 2 and 3 in the bay areas both north and south of the central corridor will determine how many candidate seepage pit structures (1-3) are present and their exact location and size. All pit(s) so determined and the adjacent area should be sampled to define potential sources of hazardous, radioactive and mixed waste, and their lateral and vertical extent. Pit(s) should be sampled and holes should be drilled under the pit(s) to sample potentially contaminated soil. Samples should be analyzed for hazardous and radioactive constituents.

21-006(b)

The precise location of the brick manhole and the surrounding pit need to be determined, using geophysical techniques if necessary. A sample of any sediments at the bottom of the manhole should be obtained and analyzed. Subsurface samples around the outside of the pit should be taken to determine the lateral and vertical extent of contamination. The area over this pit is not paved, and the vegetation growing over the area should be sampled and analyzed. All samples should be analyzed for hazardous and radioactive constituents.

21-006(e) and (f)

It is recommended that a combination of geophysics techniques (Gerety et al., 1989) be used around the north and south perimeters of Building #4 to determine the presence, location, and size of candidate seepage pits/holes. The pit(s) so identified and surrounding area should be sampled to define the lateral and vertical extent of contamination. All samples should be analyzed for hazardous and radioactive constituents.

It is recommended that estimated contaminant input to Los Alamos Canyon, and possibly DP Canyon from seepage pits at TA-21 be taken into account as only one of many inputs to the Canyons and that the whole canyon system be treated separately as a major cumulative pathway for the whole Los Alamos site. (See section 3.1.2.3) Pertinent to TA-21, recommendations for data needs made (HydroGeoLogic, Inc., 1989) are general enough to determine the importance of vadose zone transport (includes lateral transport to canyon walls) at Los Alamos and for guiding the selection of remedial alternatives. These recommendations are as follows:

Physical Characteristics   Chemical Characteristics -----
-------------------   ------------------------
Matri
x bulk density   Distribution coefficients
Fracture
geometry   Migration process com-
plexation   Fracture hydraulic
characteristics

Decay and chemical
transformation   Porosity

Matrix hydraulic
conductivity

Matrix water retention   chara
cteristics

Dispersivity

3.1.2.3. Potential Public Health and Environmental Impacts:

21-006(a), (c), and (d)

The use of geophysical techniques between Buildings 2 and 3 on both the north and south will determine if there is more than one underground structure which might be a seepage pit. If there is, it could be assumed to be 21-006(a). If there is not, then this swmu should be considered to be synonymous with 21-006(c) and 21-006(d), which almost certainly reference the same swmu. Sample into the pit if possible, and drill under it to obtain potentially contaminated soil; analyze. Based on the analytical results, either:

(1) Take no action;

(2) Take no action, but institute monitoring;

(3) Excavate the pit area; sample, analyze and excavate until constituents are at background or risk-based levels; or

(4) Take other action based on geophysics findings.

21-006(b)

After sampling through the top of the brick manhole and analyzing any sediments, and based on analytical results, either:

(1) Take no action;

(2) Take no action, but institute monitoring;

(3) Cap the access to the inlet pipe, cap the outfall pipe and leave the pit, inlet, and outlet pipes in place;

(4) Excavate the pit area of about 63.72 m^3 [250 cubic yards]; sample, analyze and excavate until constituents are at background or risk-based levels;

(5) Cap the outfall pipe and leave the outfall pipe in place;

(6) Remove outfall pipe (estimated at 27.4 m to 32.3 m [90' to 106'] in length);

(7) Cap the access to the inlet pipe and leave the inlet pipe in place;

(8) Remove the inlet pipe (estimated at 59.1 m to 64.0 m [194' to 210'] in length); or

(9) Combine actions #5,6,7, and 8 with #4 as appropriate.

21-006(e) and (f)

There is so much room for variation in this case---ranging from already remediated to a non-remediated deep hole---that a discussion of data needs for potential response actions is somewhat premature. However, in general terms, the existance of this hole, it's size and status must first be determined. After these determinations are made, and assuming that a hole or remediated hole is found, drilling to determine the vertical and lateral extent of potential contaminants can be considered (there is concern that drilling may compromise the structural integrity of the building). Review of the anaytical results would then lead to the same general alternatives:

(1) no action

(2) monitor

(3) remove the seepage pit and associated contaminated soil

Healy, 1977, with considerable attention to questions of wind resuspension, mechanical resuspension, local resuspension, ingestion from foodstuffs, casual ingestion, and deliberate (pica) ingestion has suggested a Pu in soil upper limit of 100 pCi/g of soil to a depth of 5 cm. Healy presents this value as appearing to provide an adequate safety margin for the multiple pathway exposure of the infrequent maximum individual in any environment based on a dose to the critical organs of this individual of 500 mrem/yr. Thus, for example, mechanical resuspension was considered for a farmer tilling his fields, ingestion was considered for a vegetarian growing the large bulk of his food in contaminated soil, etc. Note that the concern is for dose to the maximum individual, not the average population dose which would result in higher suggested soil limits. Although the uncertainties in the data presented are large, and there are many assumptions made in the derivation of this suggested upper limit of soil concentration, it appears that the approach is reasonably conservative.

More recently, Gilbert et al.(1989) have used a model scenario of a family that establishes a farm on a contaminated site after the site has been released for use without radiological restrictions. The lifetime average limit of 100 mrem/yr effective dose equivalent was applied to a member of this critical population group--the farm family--in deriving site-specific soil guidelines. This was accomplished by developing a generic procedure for deriving soil criteria rather than generic soil concentration limits. The development of this procedure resulted in the code, RESRAD, which derives site-specific soil concentration guidelines for nuclides other than those covered under the UMTRA standard, using site-specific input data. The family-farm scenario is considered credible, in the long term. These site-specific calculations to derive soil concentration guidelines will eventually need to be accomplished for TA-21, but the site-specific input data are not, at this time, available.

The only current set of analyses pertinent to a seepage pit (see section 3.1.1.1.--21-006(b) above), found 1.3 pCi of plutonium-239/g of soil. This is well below the suggested upper limit of plutonium in soil of 100 pCi/g (Healy, 1977). This sample result is, of course, only indicative, not conclusive. Many more samples will have to be collected and analyzed before enough information is available to quantify health risk and evaluate potential remedial alternatives.

Contamination of vadose zone soils and degradation of the quality of surface waters, and stream channel sediments in Los Alamos Canyon were potential environmental impacts of leachate and overflow from the seepage pits in years past. If contaminants reached the Rio Grande, it would have been impossible to associate them exclusively with the seepage pits. Although probably unlikely, it is also possible that vegetation growing over seepage pit areas may have taken up toxic or hazardous constituents from the liquid wastes and provided a more direct pathway into the food chain. However, in selected situations, it may be advisable to analyze current samples of vegetation growing on seepage pit areas.

There is not enough site specific data to perform a public health assessment for any one, or even all seepage pits collectively. It is however recommended that risk assessments be performed which would include inputs from the seepage pits (See section 3.1.2.3).

3/6/80

RG —

Blackie & I counted only the cans in 208, 56 total., 70 remain in 213.

Following in the readings, the nCi/g figure was calculate from graph.

I took two more samples to 50 #8 & 41 — they both jammed any machine numbers had to figured from reduced times. But they seem to have held up — However, I have never taken 1/2-min counts an adjusted them before, we could be off by a factor (5 to 10?

The 70 cans remaining are said to be lower — Save me 2 or 3 of them I would like to try another set on the Zn S.

[signature]

PS: To be Safe I think we should multiply the total given by 5 + [initials] We were looking at only one side + the counting error.

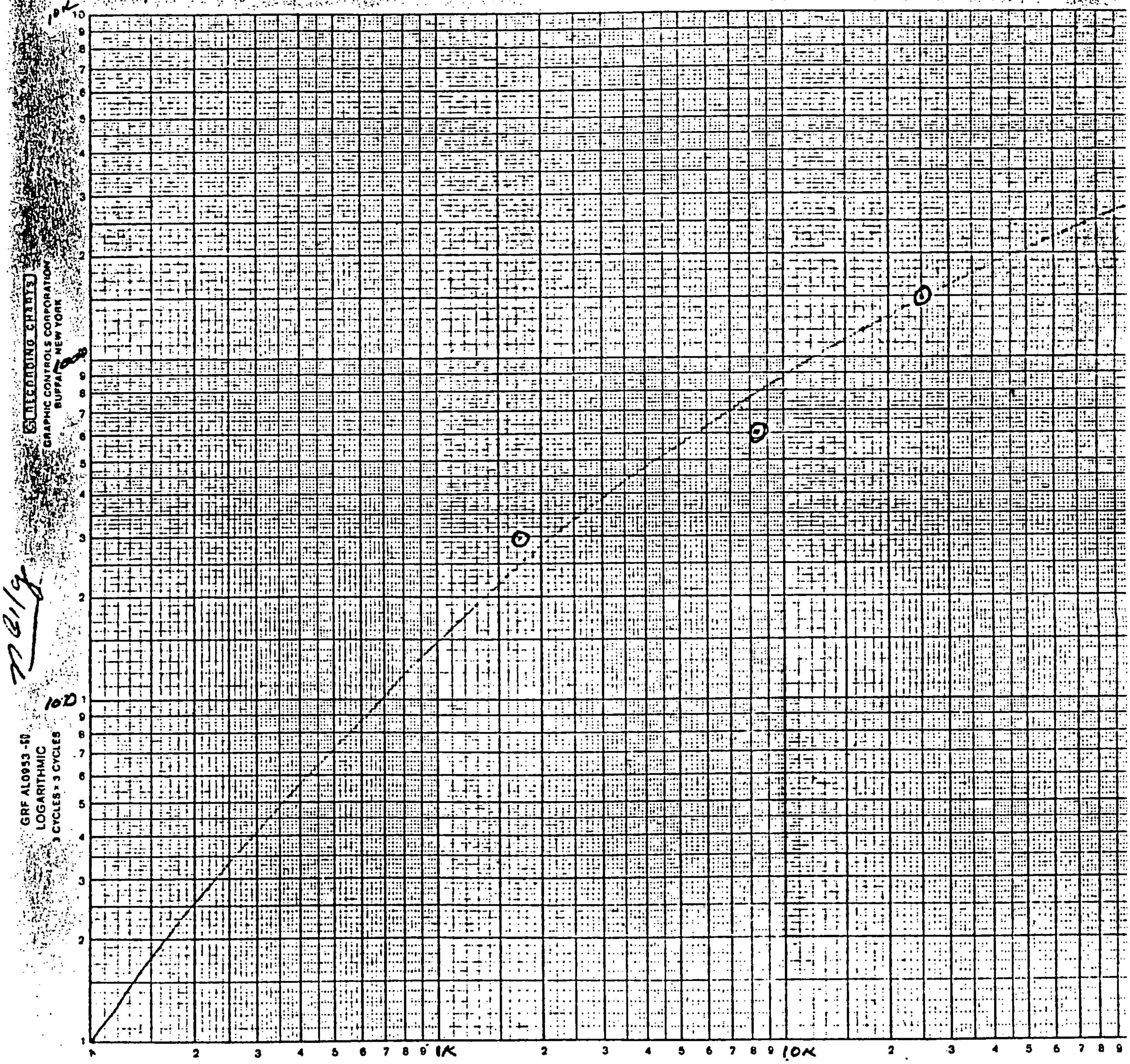
213 Tunnel Material

5900 / 7,000 = 340 NCi/gm
Scatter = 1800 − 1700
1.5 lbs.

Can #	Phos Reading Scatter	Phos Reading Phos	NCi/gm	lbs	Total gms (Pu)
10	3900	30,000	390	15	.037
7	9400	60,000	820	12	.063
6	9200	60,000	800	12	.061
11	18,000	90,000	~~1000~~ 1300	27	.224
17	26,200	100,000	1500	27	.259
22	28,300	100,000+	1650	26	.274
23	17,200	90,000	~~[illegible]~~ 1200	27	.207
47	9,400	60,000	820	13	.068
55	18,000	90,000	1120	12	.086
47	17,000	90,000	1060	13	.088
51	~~[illegible]~~ 6,300	35,000	660	13	.055
46	24,300	100,000	1460	13	.121
45	11,500	75,000	980	12	.075
16	15,500	80,000	1100	27	.190
50	4,000	20,000	480	14	.043
12	24,500	100,000	1480	12	.113
15	18,600	90,000	1300	13	.108
19	7,400	40,000	720	28	.129
18	8,000	50,000	760	26	.126
5	7,200	40,000	700	11	.049
25	15,500	80,000	1000	26	.166
24	8,000	50,000	760	25	.121
1	5,000	35,000	555	17	.060
52	6,200	40,000	660	13	.055
48	9,000	60,000	860	12	.066

Pen #	Phos Scatter	— Phos	Neil gms	lbs	Total gms P
54	2,500	8,000	360	12	.028
58	3300	10,000	460	12	.035
31	11,100	65,000	960	22	.135
39	18,400	80000	1300	12	.100
56	13,300	70 000	1080	12	.083
28	7400	40000	710	22	.100
29	10,000	60,000	880	25	.141
27	7800	4500	750	12	.057
42	19,600	80,000	1300	12	.100
43	11,000	60,000	940	13	.078
8	8500	50,000	800	10	.051
9	7000	40,000	700	25	.112
13	9,600	50,000	850	24	.130
41	25,600	98,000	1550	13	.129
3	10,100	50,000	900	26	.149
40	19,100	80,000	.1300	13	.108
44	18700	90,000	1280	13	.106
59	1900	7,000	260	14	.023
34	26,600	95,000	1550	24	.238
36	21,100	85000	1375	12	.105
33	6,700	35,000	680	24	.104
37	13,300	65,000	1050	15	.101
30	16,100	75,000	1200	23	.176
42	14,700	70,000	1150	14	.103
53	6,200	35,000	660	13	.055

Plant #	Phos Scales	- Phos	Nei/Gun	Sales	Total Gms
4	4,300	25,000	500	26	.083
2	7,800	40,000	750	19	.091
14	10,000	50,000	880	12	.067
20	20,600	80,000	1500	26	.249
12	10,000	60,000	880	26	.146
32	25,100	90,000	1400	11	.098
35	9,000	40,000	820	12	.063
38	14,000	65,000	1080	13	.090



Cts/20 sec. Phoz

Conc. + Plastic Bag.

⊙ Inshot Parts

2/11/80

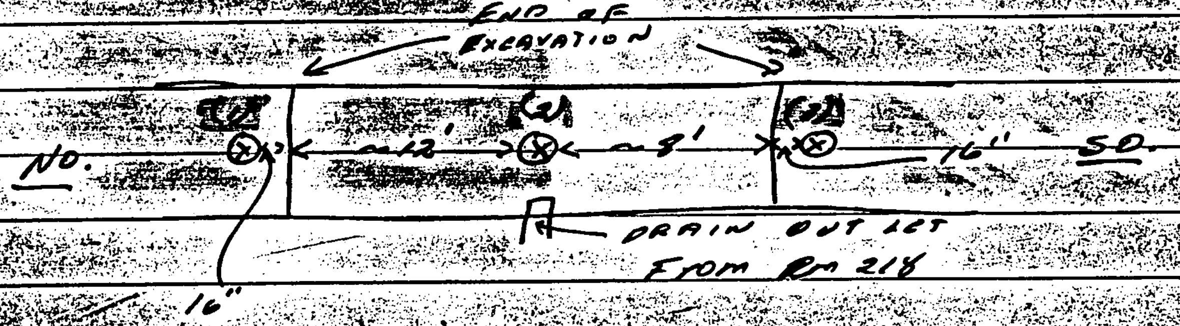
3/14/80

To: Ray G.

From: J.L.

Subject: Counting Results: Tunnel Bldg 2 Between Rm's 213 - 218.

Three Soil Samples were taken as indicated on Drawing:

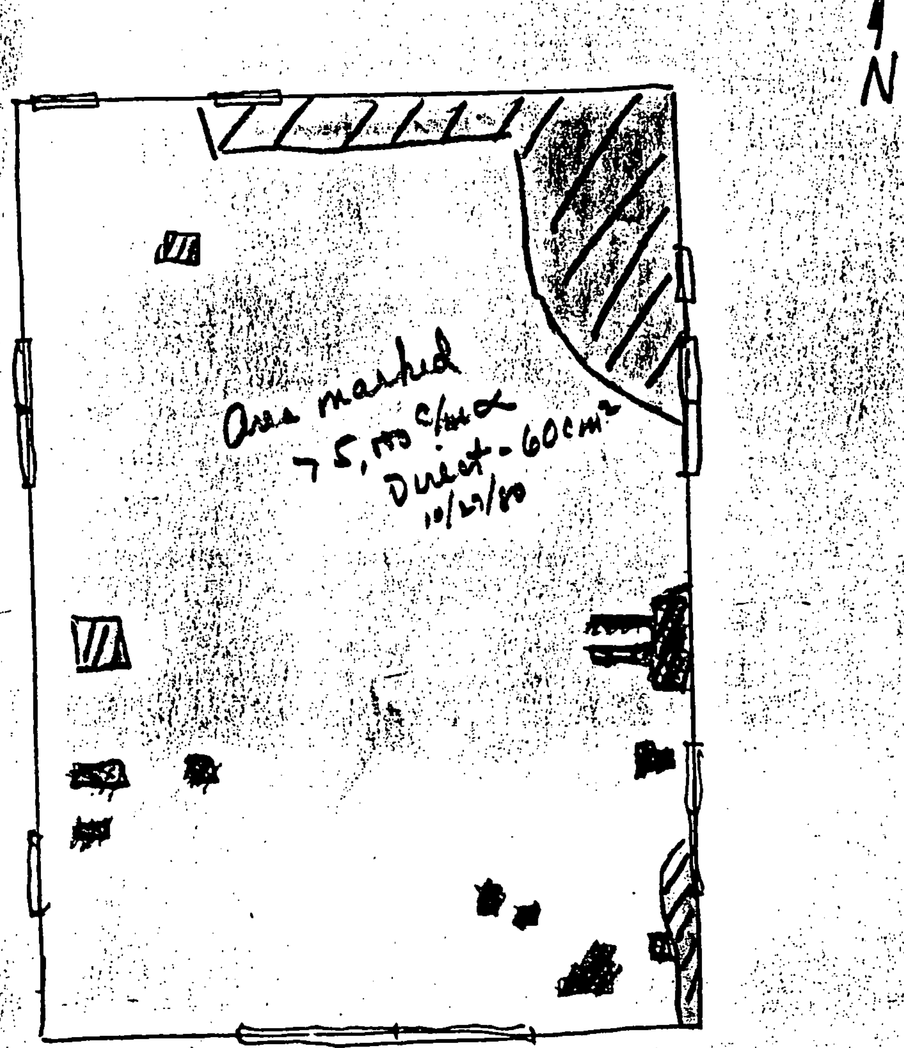


IMS Results:

1. 8.8 nCi/g
2. 524 "
3. 75.7 "

Rm 213
TA-21
8/26/80
AL

FLOOR PLAN



Resurveyed
10-27-80
Al.

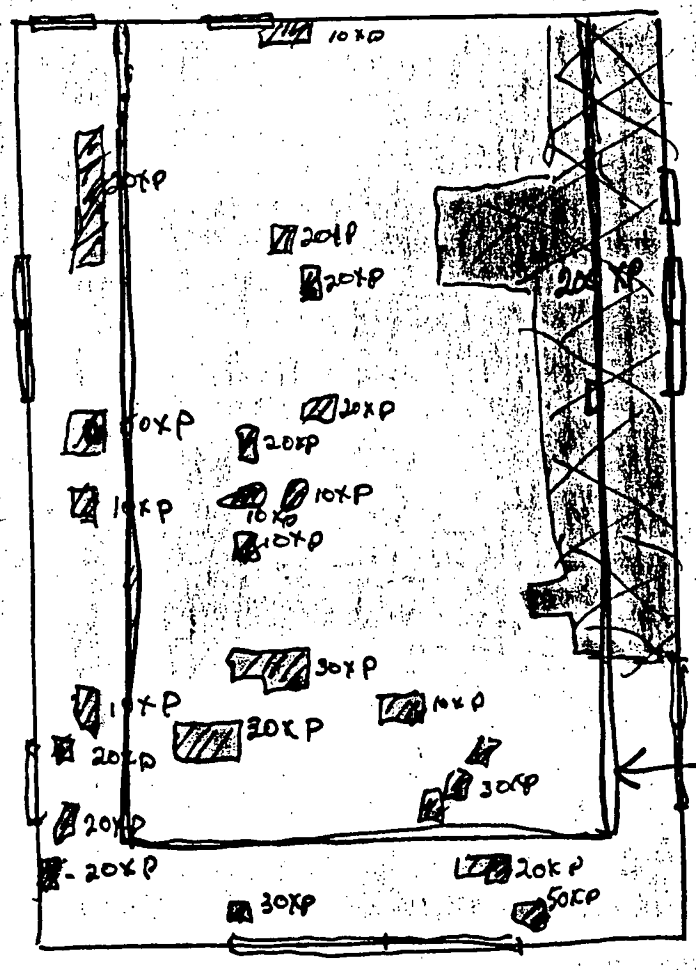
Re-scabbled all areas (▨)
found > 5,000 c/m - 60 cm²

To do any further decontamination on floor area
is not feasible at this time.
Contamination remaining is (No Survey)
11/21/80 AL

FLOOR PLAN

Rm 213
TA-21
8/26/80
AL

N



area where metal expansion joint was removed
Are >50 XP
>100,000 c/m-D.

9/29/80 All floor area has been scabbled
AL

Phoswich Survey
9/29/80 [hatched box]

Appx 80% of floor area is Below BKG on Phoswich and <1,000 c/m Direct 60 cm².

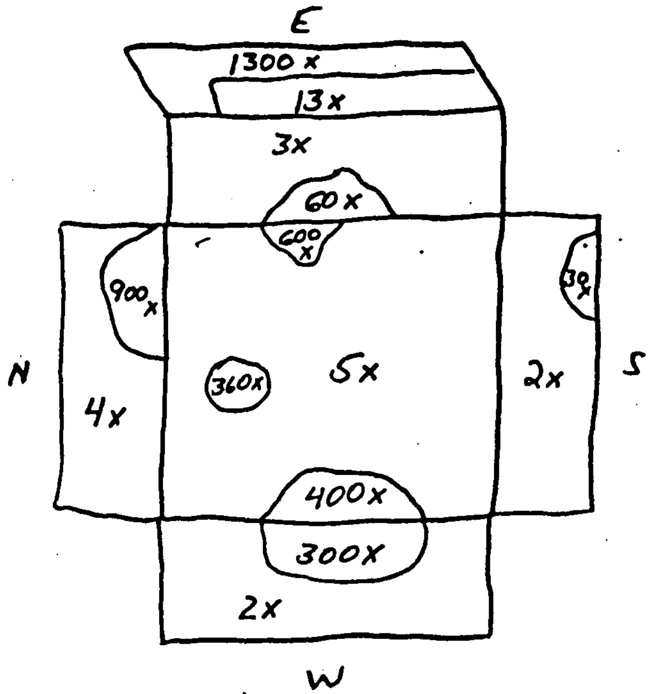
Direct Survey -
50XP = >100,000 c/m - 60 cm²
200XP = >100,000 c/m - 60 cm²
30XP = 70,000 c/m - 60 cm²
10XP = 20,000 c/m - 60 cm²

40 Backgr--d 20sec

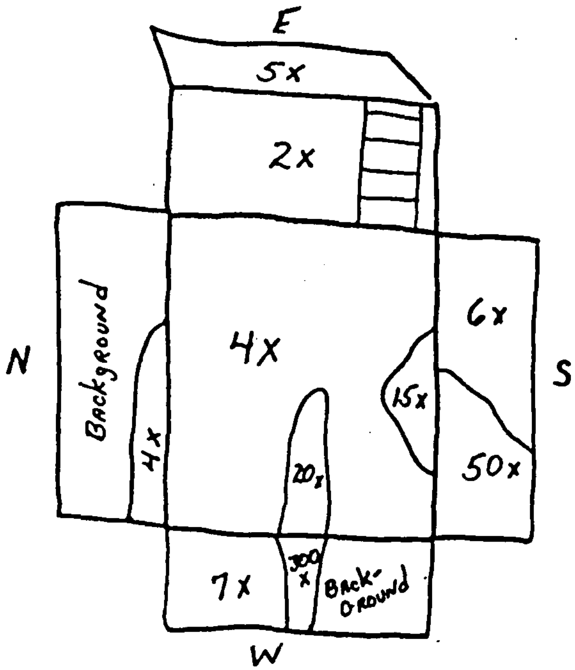
SURVEYED 3-25-80

Disolver Pits

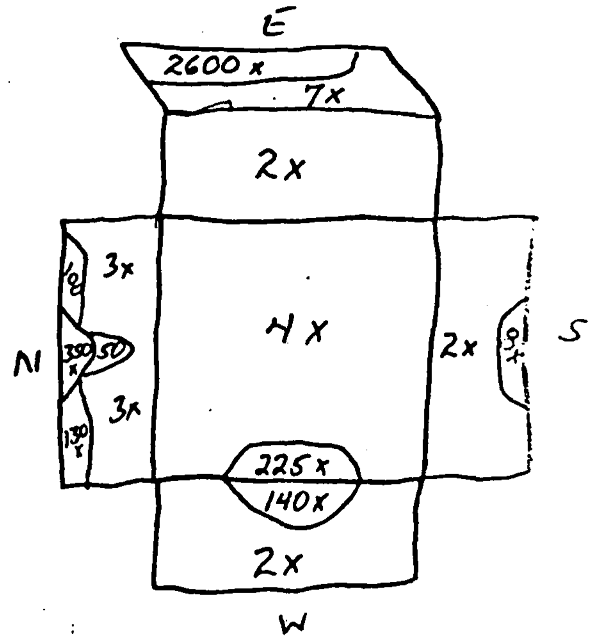
Center Pit



North Pit



South Pit



RD-20

Phos Readings

Can #	Scaler	Phos	NCi/gm	Cts	Total gms Pu
80	850	2000	125	14	.011
81	850	200	125	12	.010
96	290	800	40	24	.006
97	650	2000	95	26	.016
66	10,400	60000	1100	13	.091
74	2200	7000	300	13	.025
67	3800	11000	470	13	.039
68	6750.	30000	680	12	.052
69	2350	8000	320	13	.027
129	8300	40000	780	17	.085
88	515	1000	94	26	.012
87	1290	5000	190	24	.029
70	3475	10000	430	12	.033
73	4125	11,000	490	13	.041
71	2560	8000	350	13	.029
122	1875	7000	270	24	.041
104	3560	10000	460	9	.026
103	3275	9000	400	9	.023
89	1725	7000	250	25	.040
90	1280	4000	190	26	.032
118	1600	9000	230	25	.037
92	1510	6000	220	27	.038
65	5455	25000	600	13	.050
72	2575	7000	340	13	.028
101	2285	7000	310	20	.040

Can #	Phos Reading Scaler	Phos	Neifger	lbs.	Total gms Pu
111	7580	35000	740	18	.085
106	4165	11000	490	9	.028
124	895	2000	130	26	.022
110	9090	40,000	880	18	.101
107	4070	10,000	460	18	.053 (T 1.15 :28
				525	
					11.50

6-90 RD 19 213 Tunnel Material

Std 4000 / 1,000 = 340 NCi/gm
Scatter = 1800 / 1900
1.5 lbs.

Can #	Phos Reading Scatter	Phos	NCi/gm	lbs	Total gms (Pu)
10	3900	30,000	390	15	.037
7	9400	60,000	820	12	.063
6	9200	60,000	800	12	.061
11	18,000	90,000	1300	27	.224
17	26,200	100,000	1500	27	.259
22	28,300	100,000+	1650	26	.274
23	17,200	90,000	1200	27	.207
47	9,400	60,000	820	13	.068
55	18,000	90,000	1120	12	.086
47	17,000	90,000	1060	13	.088
51	6,300	35,000	660	13	.055
46	24,300	100,000	1460	13	.121
45	11,500	75,000	980	12	.075
16	15,500	80,000	1100	27	.190
50	4000	20,000	480	14	.043
12	24,500	100,000	1480	12	.113
15	18,600	90,000	1300	13	.108
19	7,400	40,000	720	28	.129
18	8,000	50,000	760	26	.126
5	7,200	40,000	700	11	.049
25	15,500	80,000	1000	26	.166
24	8,000	50,000	760	25	.121
1	5,000	35,000	555	17	.060
52	6,200	40,000	660	13	.055
8	9,800	60,000	860	12	.066
				446	

Cen #	Phos Scatter	Phos	Neis/Sm	lbs	Total Sms Pu
54	2,500	8,000	360	12	.028
58	3300	10,000	460	12	.030
31	11,100	65,000	960	22	.135
39	18,400	80000	1300	12	.100
56	13,300	70 000	1080	12	.083
28	7400	40000	710	22	.100
29	10,000	60,000	880	25	.141
27	7800	4500	750	12	.057
42	19,600	80,000	1300	12	.100
43	11,000	60,000	940	13	.078
8	8500	50,000	800	10	.051
9	7000	40,000	700	25	.112
13	9600	50,000	850	24	.130
41	25,600	98,000	1550	13	.129
3	10,100	50,000	900	26	.149
40	19,100	80,000	1300	13	.108
44	18700	90,000	1280	13	.106
59	1900	7,000	260	14	.023
34	26,600	95,000	1550	24	.238
36	21,100	85000	1375	12	.105
33	6,700	35,000	680	24	.104
37	13,300	65,000	1050	15	.101
30	16,100	75,000	1200	23	.176
42	14,700	70,000	1150	14	.103
53	6,200	35,000	660	13	.055

Can #	Phos Scaler	Phos	Ncif/gm	Solns	Total gms
4	4,300	25,000	500	26	.083
2	7,800	40,000	750	19	.091
14	10,000	50,000	880	12	.067
20	20,600	80,000	1500	26	.249
12	10,000	60,000	880	26	.146
32	25,100	90,000	1400	11	.098
35	9,000	40,000	820	12	.063
38	14,000	65,000	1080	13	.090
				145	.88[illegible]

RD-19

Can #   Phos Reading

	Scaler	Phos	Nci/gm	lbs	Total Ru gm
61	2000	8000	290	13	~~[illegible]~~ .023
94	1600	6000	230	25	~~.072~~ .037
95	950	4000	140	24	.021
83	2800	9000	380	13	.032
82	2550	9000	340	13	.028
121	1350	5000	200	26	.033
100	520	1000	74	23	.011
76	5500	25000	600	12	.046
62	2470	8000	330	13	.027
86	1935	7000	280	25	.045
113	1625	7000	220	14	.020
63	5785	30000	600	12	.046
78	3600	10000	440	14	.039
123	2975	8000	380	23	.056
91	875	2000	130	26	.022
114	5400	25000	580	16	.059
75	3800	10000	460	13	.038
77	1600	6000	230	13	.019
60	650	2000	95	13	.008
64	4500	12000	520	13	.043
79	2730	7000	350	13	.029
98	375	800	54	26	.009
84	1100	4000	160	25	.026
128	7390	30000	730	19	.089
99	730	2000	110	27	.019

RD-19

Can #	Phos Reading Sealer	Phos	Nei/gm	lbs	Total gms Pc
93	1240	4000	180	24	.028
85	1685	6000	240	26	.040
112	7365	30000	720	17	.078
115	5910	25000	620	16	.063
125	3125	8000	400	26	.066
105	3835	9000	460	9	.026
127	5820	25000	620	24	.095
119	1870	7000	260	24	.040
116	4840	15000	540	12	.041
109	6400	30000	640	15	.061
120	1040	4000	160	24	.025
126	1705	6000	250	24	.038
102	4885	20000	550	18	.063
117	1600	5000	230	25	.037
108	7220	35000	700	17	.076
				301	

.777
.825
.887
2.547
2.545

7.881

T 1716

X 10 = 78.81