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HW-89075

Regional Survey Monthlies 1949

H.J. Paas

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4W-89075
January 31, 1949

TO: L. Cinclevich

FROM: H. J. Paas

SITE SURVEY MONTHLY REPORT FOR THE MONTH
OF JANUARY, 1949.

The attached report is compiled from the following number of surveys:

Water Sampling Program

	Drinking Water (500 cc) -----	216
	Drinking Water (11.7 liter) -----	50
T	Test Wells (500 cc) -----	29
	Test Wells (11.7 liter) -----	8
	River -----	140
	Waste -----	181
	Rain -----	32
	Snow -----	0
	Total Liquid -----	642

Air Sampling Program

	Air Filters ⁴⁹⁴ -----	75	540
	Detachable Chambers -----	703	75
	Hand Pump ^{any} -----	0	703
	Film Packets -----	113	1500
	Total Air -----	891	113

29 31

Land Sampling Program

	On Area Vegetation -----	516
	Off Area Vegetation -----	10
	Solids (mud - lint - soil) -----	69
	Total Land -----	595

Instrument Surveys

	Portable Instrument (land) -----	2
--	----------------------------------	---

Portable Instrument (waste) ----- 11
 Mobile Instrument (Test Holes) ----- 13
 Total Instrument ----- 24

TOTAL SURVEYS ----- ~~234~~

4194

The above number of surveys were made by traveling approximately 9000 miles. This figure includes those miles made on replacement and pool cars at times our vehicles were in for repair. Of mention in this summary is the fact that the off area sampling was at a minimum in the month elapsed.

***** V E G E T A T I O N *****

516 routine vegetation samples were collected during the month of January. The direct counting of vegetation samples was discontinued early in the month, in favor of the iodine extraction and long half live analysis. At the time the direct counting was discontinued approximately twenty nine samples had been direct counted. As the location of these samples are widely separated and very little continuity can be gathered from random locations, the current report does not make mention of these results. The result of the I^{131} extraction of five gram samples is tabulated in the following table:

LOCATION	BETA ACTIVITY DETECTED BY I^{131} EXTRACTION; CALC. AS UC I^{131} /Kg.		
	AVERAGE	MAXIMUM	LAST MONTH AVERAGE
North of the 200 Areas	.005	.053	.005
Near the 200 Areas	.041	.798	.072
South of the 200 Areas	.004	.021	.002
Richland	<.002	.004	<.002
Pasco	<.002	.003	<.002
Kennewick	<.002	.004	<.002
Benton City	.003	.035	<.002
Richland Y	.002	.003	<.002
Hanford	.003	.006	.002
Ringold to Pasco	<.002	.003	
Wahluke Slope	<.002	.005	.002

Table II

The same samples that were analyzed for I^{131} activity, were also analyzed for the long half life beta activity. The results obtained in the identical locations are summarized in the following table which includes the previous months average:

Table II

LOCATION	BETA ACTIVITY ANALYZED AS LONG HALF LIFE: CALC. AS uc/kg.		
	AVERAGE	MAXIMUM	LAST MONTH AVERAGE
North of the 200 Areas	.014	.037	.011
Near the 200 Areas	.055	.400	.045
South of the 200 Areas	.014	.035	.011
Richland	.009	.016	.013
Pasco	.007	.013	.009
Kennewick	.007	.013	.010
Benton City	.012	.015	.006
Richland Y	.009	.012	<.005
Hanford	.008	.015	.012
Ringold to Pasco	.006	.013	.012
Mahluke Slope	.012	.030	.012

A tremendous variation in the beta activity found on vegetation exists in the area 'Near the 200 Areas'. The I^{131} activity found at the 200 West gate averages .321 uc/kg with a maximum of .733 uc/kg. Those samples from Rte. 3 & meteorology average .068 uc with individuals as high as .430 uc/kg. These are grouped into the same zone which includes Rte. 4 and Rte 11A samples which average around .006 uc/kg. This same trend of difference exists in the long half life results where the average beta activity due to long half life found at the gate in 200 West averages 0.206 uc/kg and is included a zone average that also includes values of .010 uc/kg about four miles away. In addition to the above tabulated samples, thirty six samples were taken within

the separation areas. These samples were analyzed for the short half life I^{131} activity and the long half life component. The results were as follows:

Location	I^{131} as uc/kg (I^{131} Extraction)			Long Half Life Activ. As uc/kg		
	AVERAGE	MAXIMUM	PREVIOUS AVE.	AVERAGE	MAXIMUM	PREVIOUS AVE.
200 West	.013	.044	.004	.057	.452	.046
200 East	.029	.067	.007	.086	.309	.057

In general, the overall I^{131} activity as detected within the operation areas has increased between a factor of three to seven, when compared to last months average. As more usually expected due to the prevailing winds from the west quadrant, the higher averages are found inside the east area, however the increase beta activity due to I^{131} far overshadows a smaller increase in long half life activity. Two possible explanations for this increase are offered, 1) the dissolving schedule in the 200 East area was increased in the month of January, from 39 cuts in December to 53 cuts in January; and 2) at present dissolving is carried on in the day time about the same amount of time as it is in the evening, and dilutions in general are considerably lower on the average in the daylight hours, thus causing a more localized deposition of activity.

Twelve samples taken in the Plymouth to Kennewick ~~area~~ to Hover area show an average long life activity of 0.007 uc/kg. It is very interesting to note that the six samples taken between Kennewick and Hover show an average of 0.003 uc/kg (longlife) whereas the six samples taken between Plymouth and Kennewick average 0.010 uc/kg. A comparison of the two averages gives a 't' of 5.15 indicating a highly significant difference. Am currently at a loss to offer explanation for same until we repeat the survey. The I^{131} extraction results were all less than 0.002 uc/kg.

Ten samples from the area between Pasco and Eltopia average less than .002 uc I^{131} / kg whereas the long half life activity early in the month was 0.005 uc/kg. A repeat survey in this area later in the period indicated the long half life activity to be less than 0.005 uc/kg. As this is the initial survey in this zone, it will evidently take more information to adequately appraise the long life beta activity in this re

~~Survey~~ Ninety samples were taken from the Wahluke Slope on Jan. 7th. The average long lived beta activity was 0.012 uc/kg, however it was noted that certain general locations showed considerable difference in the beta level detected. The highest contamination level was found at the west extremities of the slope where 24 samples showed an average of 0.016 uc/kg. In general, the long live activity level decreased

as the sampling continued south and east of Ringold. This observation is conflicting with the observed wind pattern and at the moment perhaps indicates the presence of varying amounts of natural radioactivity, possibly due to I^{131} . The average I^{131} beta activity on the slope was less than .002 uc/kg, with a maximum of 0.005 uc/kg. The I^{131} trend did not agree with the long life activity trend as far as direction was concerned.

A three-fold increase in I^{131} activity was observed in the area between Hanford and 300 Area. Currently the average I^{131} activity averages .005 uc/kg with a maximum of .010 uc/kg. The long half life activity in this area compares favorably to the previous months average, 0.010 uc/kg currently and 0.013 uc/kg last month.

Confirming results were obtained in the area south east of the separation areas (Goose Egg Hill etc) where the current I^{131} activity averaged 0.027 uc/kg as compared to last months average of 0.023 uc/kg. The long half life activity averaged 0.017 uc/kg as compared to 0.019 uc/kg in December. It is unusual that the increased I^{131} activity found inside the separation areas is not reflected in this zone which is nearly adjacent to and directly southeast of the areas.

A survey consisting of six samples secured between Highway and Priest Rapids shows negligible radioactive iodine activity, however the long half life activity averaged 0.010 uc/kg with a maximum of 0.013 uc/kg. Again it must be emphasized that this order of magnitude (0.010) of long life activity prevails at many nearby locations which are more in the prevailing wind pattern, thus it appears that the natural activity may be around this order of magnitude. (This has yet to be proven, but seems indicative of from the current reager results.

COMMENT: In the last report, some question was raised as to the higher levels found near the 200 West gate, whereas the magnitude of activity found in the East area is considerably lower. Investigation of the comparative locations shows that in respect to the stacks, a similar location in East area would be inside the area about midway between the 27075 building and the ESE 614 bldg. This general area is sampled routinely and included in the results listed under the averages within the 200 East area.

***** RAW WATER - RIVER EXPORT LINE *****

A total of twenty-two raw water samples were taken from the 183 and 203 buildings during the month of January. The following results were obtained from these 500 cc samples.

LOCATION	BETA ACTIVITY AS MICROC-MICROCURIES/L		ALPHA ACTIV. AS dis/min/lit	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
183 Bldg-100E	< 50	< 50	< 6	6.0
183 Bldg-100D	100	188	< 6	< 6
183 Bldg-100F	122	183	< 6	6.2
100-H At Float	131	263	< 6	< 6
203 Bldg-200E	< 50	< 50	< 6	< 6
203 Bldg-200F	< 50	50	< 6	< 6

The beta activity in the magnitude of 100 to 175 micr-microcuries per liter can well be expected at this time of the year when the river is at a very low stage. The water tabulated above is obtained directly from the river and has been subject to but one chlorination process, thus the activity source can be attributed directly to the river and the magnitude is dependent on the river concentration at the time. The absence of activity in the 203 supplies is apparently due to the decay interval created by the time elapsed between the 100 and 200 areas. The tracer alpha activity reported is within the realm of error of the counters for all practical purposes. In the past the activity of the 100H water has consistently shown higher results, and as it has been consumed at times, special three gallon samples were taken in this period. The results of three large volume samples showed activities to be well below the detectable levels in the cases of both beta and alpha.

Of interest in connection with the export samples is the pumping data. A tabulation shows that in the last twenty-nine days the water was supplied to the export line as follows: from 100E, 12 days; from 100D, 14 days; and from 100F, 3 days. The only positive result obtained in the 200 Areas, was obtained at the time 100F was pumping

***** R I V E R S A M P L I N G *****

Following the special Columbia River samplings taken in the cross-section depth surveys, thirty-three routine samples were collected from the river. The flow rate of the Columbia River, as measured by the Lower Department at Richland averaged 328,000 gallons per second. The flow fluctuated very little, the only changes were due to ice jams in tributaries and the subsequent breaking up of these jams. The following table summarizes the results of the Columbia River sampling program:

LOCATION	ALPHA dis/min/liter		BETA MICROCURI/GRAMS PER LITER	
	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE
Wills Ranch	<6.0	<6.0	<50	<50
Above 1007	<6.0	<6.0	<50	<50
101 B	11.0	<6.0	<50	<50
101 D	7.7	<6.0	1120	60
101 F	<6.0	<6.0	310	520
Hanford So. Bk.	<6.0	<6.0	2150	1560
<u>Hanford Middle</u>	<6.0	<6.0	1560	1000
Hanford No. Bk.	<6.0	<6.0	1570	340
300 Area	17.1	6.8	645	320
Richland	10.5	6.0	550	480
F-F Bridge (Henn Side)	<6.0	<6.0	350	170
F-F Bridge (Pasco Side)	<6.0	<6.0	335	205
McMurry Dam	<6.0	<6.0	<50	<50

The results tabulated above are in very good agreement with the previous months observations. The alpha activity found in the vicinity of 300 Area and downstream, is in tracer amounts, many samples showing negative results. Repeated checking by fluorophotometer analysis has shown that this activity is due to uranium, approximately 3 ug/liter being detected near 300 Area, and one sample from the F-F Bridge showing 4 ug/liter. A total of twenty-eight samples were checked on the fluorophotometer in an effort to validate the occasional (flyer) indication of alpha contamination. With the exception of the

above mentioned, there were no positive indications of uranium contamination in the Columbia.

YAKIMA RIVER These samples which are normally taken by the survey department at the mouth of the Yakima were not obtained in this period, as the boat was frozen and the Yakima was ice jammed. Samples secured from the Yakima Horn showed alpha and beta activity well below the normally accepted detectable limits.

FOSTER RANCH Sampling of the river in the vicinity of Fosters Ranch on the other side of the river (opposite 100F) was initiated at the request of the Biology group. Alpha activity was less than 6 dis/min/liter whereas the beta activity was less than 50 micro-microcuries per liter. (Sample obtained from rather dormant water)

***** RIVER BED SAMPLING *****

Sixty-four mud samples were obtained from along the banks of the Columbia. Thirty-two were taken on the shore, and another thirty-two were taken five feet out from shore at the identical location where the shore sample was taken. The slight reduction in sample frequency this month is due to the frozen condition found on the bank at many of the locations the past two weeks. Results are summarized below:

LOCATION	NO SAMPLES (Each Loc.)	BETA ACTIVITY IN MILLI-MICROCURIES PER LITER ^{gram} KG.			
		ONSHORE MAXIMUM	SAMPLES AVERAGE	FIVE FEET FROM SHORE MAXIMUM	AVERAGE
Near Mills Ranch	3	.011.1	.010.0	.008.2	.008.6
Allard Pumping Sta.	4	.012.6	.010.1	.010.0	.007.9
At 100 H Area	2	.022.6	.018.8	.015.2	.014.0
Below 100F Area	3	.016.9	.016.5	.012.0	.011.8
Richland Dock	4	.019.7	.010.2	.016.8	.011.8
At 300 Area	3	.014.1	.009.1	.026.2	.017.8
P-K Bridge	4	.021.7	.014.2	.016.5	.014.3
Hanford Ferry	5	.014.3	.012.7	.011.9	.008.5

Alpha activity in the magnitude of 13 dis/min/liter was detected at Mills Ranch and Allard Station. These sample were checked on the flourophotometer and the maximum result

of three samples from each location were, Mills - 575 ug/kg, Allard - 1100 ug/kg. No other positive indications of alpha activity were detected.

Samples from Priest Rapids (non-routine) showed beta activity comparable to the other locations, averaging 11.5 milli-microcuries per liter. Alpha activity was negligible.

**Note - Close examination of these results indicates that there is very little difference in the levels found at any of the locations on the river. It is possible that some outside emitter may account for the entire activity as one would normally believe that the activity would correlate favorably with the river water contamination as measured in our 500 cc samples.

A total of fifty mud samples were analyzed on the fluorophotometer in this period.

***** DRINKING WATER *****

A total of 305 samples were obtained from the drinking water supplies on and adjacent to the site. Of this total, 218 samples were 500 cc volume and 50 were 11.7 liters in volume. In addition, 6 large volume test well samples were obtained and twenty-nine 500 cc samples from test wells were collected. Of this total, thirty five of these were analyzed on the fluorophotometer to identify any detectable amounts of uranium which might have been indicated by the normal ether extraction alpha analysis method.

As in the past, all water supplies which indicated any detectable amount of alpha activity (6 d/m/l on 500cc & 1 d/m/lit on 11.7 liters) were rechecked on the fluorophotometer.

In all cases the contaminant has been identified as uranium, however the exact check results quantitatively do not correspond in each case. This can be attributed to the fact that the samples measured are not necessarily the identical sample on which the initial alpha analysis is run. This fact is only occurring in very isolated cases. The following four tables summarize the water program results. The large volume samples are tabulated separately from the 500 cc, and the test wells likewise are tabulated separately.

The fluorophotometer results are tabulated along with the routine results;

500 cc SAMPLE RESULTS

LOCATION	NUMBER SAMPLES	ALPHA AS d/m/1 MAXIMUM AVERAGE		BETA-GAMMA duc/1 MAXIMUM AVERAGE		EITHER R ug U/lit MAXIMUM AVERAGE	
Columbia Camp	5	6.8	<6	<50	<50	--	--
Headgate	5	7.5	<6	<50	<50	--	--
Hanford #7 San	18	6.0	<6	<50	<50	1.4	1.4
Hanford #7 Raw	18	12.2	<6	<50	<50	1.7	1.7
3000 Area Well E	2	6.1	<6	<50	<50	1.6	1.6
3000 Durand 5	4	8.5	<6	<50	<50	--	--
Richland #13 ✓	18	27.1	7.6	<50	<50	9.6	4.7
Richland #12 ✓	3	13.2	12.0	<50	<50	--	--
Richland #14 ✓	5	13.0	7.9	<50	<50	--	--
Richland #15	4	6.6	<6	<50	<50	--	--
Richland #12 ✓	4	13.8	7.8	<50	<50	--	--
Richland #14	4	9.3	<6	<50	<50	--	--
Richland #15 ✓	3	22.3	16.7	<50	<50	12.3	12.3
Richland #16	4	7.2	<6	<50	<50	--	--
Trct Hse K748	5	7.0	<6	<50	<50	--	--
Trct Hse J615	5	18.5	<6	<50	<50	--	--
Bent. City Chev. Sta. ✓	4	28.7	24.8	<50	<50	20.5	18.5
Bent. City Water Co ✓	3	28.0	18.9	<50	<50	21.6	17.9
Cobbs Corner	4	6.4	<6	<50	<50	--	--
Midway	4	11.2	<6	<50	<50	--	--
Fasco	4	8.8	<6	<50	<50	--	--
Fistol Rnge	5	8.6	<6	<50	<50	--	--
White Bluffs City ✓	11	25.8	15.5	<50	<50	9.4	9.4
Sanitary 1003	5	8.3	<6	<50	<50	--	--
Sanitary 100F	5	10.7	<6	<50	<50	--	--
Sanitary 100H ✓	3	14.9	6.6	118	<50	18.7	10.7
Sanitary 300 Area	-	--	--	--	--	4.0	2.0

TEST WELLS

300 Area Well #1	1	8.3	8.3	<50	<50	2.2	2.2
300 Area Well #2	1	9.9	9.9	<50	<50	4.1	4.1
300 Area Well #3	1	<6	<6	<50	<50	2.5	2.5
300 Area Well #4	1	58.5	58.5	<50	<50	34.7	34.7
BY Well	5	7.9	<6	<50	<50	--	--
Spring 13	3	7.0	<6	<50	<50	--	--
Snively Well	1	6.1	<6	<50	<50	--	--
White Bluff Q1439	4	19.3	16.6	<50	<50	--	--
White Bluff Q1440	3	15.8	11.0	<50	<50	--	--

Total 20

The only indications of beta activity above the normal reporting limit are found at Pasco and 100H. The Pasco activity, as in the past is evidently from the Columbia, where the sanitary water used at 160 H has its source in White Bluffs which apparently also has the Columbia as the contributing factor. Tracer activity at Cobbs Corner has not been observed in the past and will not be emphasized at this low magnitude until confirming results are available.

LARGE VOLUME SAMPLES

LOCATION	NUMBER SAMPLES	ALPHA AS d/m/1 MAXIMUM AVERAGE		BETA-GAMMA uuc/1 MAXIMUM AVERAGE		FLUORIMETER MAXIMUM	uuc/lit AVERAGE
Columbia Camp	2	1.1	1.0	<10	<10	-	-
Headgate	2	3.2	2.6	<10	<10	-	-
Hanford #7	1	2.4	2.4	<10	<10	-	-
3000 Well A	2	6.4	3.8	<10	<10	1.7	1.7
3000 Well B	1	4.7	4.7	<10	<10	-	-
3000 Well C	2	2.7	2.2	<16	<10	1.2	1.2
3000 Well E	1	3.2	3.2	<10	<10	1.6	1.6
3000 Durand S	2	4.7	2.6	<10	<10	-	-
Richland #13	2	4.9	2.6	<10	<10	9.6	4.7
Richland #12	3	10.3	9.3	<10	<10	--	--
Richland #4	1	11.6	11.6	<10	<10	--	--
Richland #5	1	2.3	2.3	<10	<10	--	--
Richland #12	1	7.5	7.5	<10	<10	--	--
Richland #14	1	7.8	7.8	<10	<10	--	--
Richland #15	2	9.7	5.5	<10	<10	12.3	12.3
Richland #16	1	4.6	4.6	<10	<10	--	--
Tct. Hse. K743	2	3.3	2.6	<10	<10	--	--
Tct. Hse. J635	2	2.7	2.1	<10	<10	--	--
Benton Cty Chev Sta. 2	2	17.6	11.0	<10	<10	20.5	18.5
Benton Cty Water Co. 1	1	14.5	14.5	<10	<10	21.6	17.9
Cobbs Corner	2	5.1	4.2	<10	<10	--	--
Kennewick Std. Sta. 1	1	2.3	2.3	<10	<10	--	--
Riverland	1	5.4	5.4	<10	<10	--	--
Midway	2	1.6	1.3	<10	<10	--	--
Fasco	2	1.6	1.4	15.3	14.3	--	--
Pistol Range	2	5.6	3.5	<10	<10	--	--
White Bluffs	1	8.4	8.4	<10	<10	--	--
12C							
TEST WELLS							
B-Y Well	2	5.5	3.6	10	10	--	--

Again, the alpha contamination detected in large water samples can be best explained by the results of the fluorophotometer analysis which identifies the emitter as uranium. In the cases where more uranium is detected than the initial alpha result indicates, it may be due to the sample variation, however it seems that in this period the uranium results are not in as good relationship with the total alpha as they were in the past.

The only detectable positive alpha activity was found in the Pasco well, this being barely above the detectable limits. This well contamination apparently has as its source the Columbia river, the water from which averages beta activity around 200 micro-microcuries per liter in the vicinity of the city of Pasco.

--- AIR MONITORING 'CHAMBERS' ---

Investigation into the ionization chamber data as tabulated over the past four months indicated that the frequency of reading could be reduced at some of the locations. With the loss of one man on Jan. 3rd and simultaneously having one new man in training, the magnitude of the program had to be reduced to offset the loss of manpower temporarily. Thus, the chambers in the construction areas which were previously read once per shift (8-4 and 4-12) were reduced to reading once per day, on the 4-12 shift only. In the main, this has worked out successfully; however, certain additional changes are still necessary, and, manpower providing, these will be made in the immediate future.

A summary of the average dosage rates measured, using detachable ionization chambers, is tabulated in the following table:

LOCATION	AVERAGE mrep per 24 hours.	
	JANUARY 1949	DECEMBER 1948
100 Areas and Environs		
Route 1, Mile 8	0.53	0.45
Route 2N Mile 10	0.67	- - -
Within 105 DR	0.91	0.81
Route 2N Mile 5	0.39	- - -
At White Bluffs	0.58	0.68
Route 11A Mile 1	0.71	0.48
Hanford 614 Bldg.	0.82	0.48
Intersection Rt. 1 & 4N	0.53	0.44
Hanford 101 Area	0.67	0.72
Within 5 Miles of 200 East		
Route 4S Mile 6	0.71	0.74
Route 11A, Mile 6	1.03	0.72
Route 3 Mile 1	1.00	0.55
Inside 234-235 Area	0.87	0.89
Meteorology 200'	0.82	0.60
Within 10 Miles of 200 East		
Route 4S Mile 10	- - -	0.94
Route 10 Mile 1	0.93	0.48
Route 2S Mile 4	1.79	0.94
Near 300 Area		
Route 4S Mile 16	- - -	- - -
Route 4S Mile 22	0.96	0.60
Outlying		
Benton City	0.48	0.48
Richland	0.48	0.48

Table I

In general, a very noticeable increase is observed at all locations that are adjacent and nearby to the stacks. This general increase can only be attributed to the increased amount of dissolving in daylight hours which is possibly accompanied by the usual seasonal increase noted in winter..

New chamber installations were made at the 3000 Area and the batch plant area near the 200 Areas. The current dosage rates at each of these are, 3000 Area - average 0.48 mrep/24 hours and at the batch plant average of 0.44 mrep/24 hours.

In addition to the dosage rates measured using the ionization chambers, the following results were obtained at the atmospheric monitoring stations using Integrans and 'C' chambers:

LOCATION	AVERAGE DOSE IN mrep per 24 HOURS			
	INTEGRONS		'C' CHAMBERS	
	JANUARY	DECEMBER	JANUARY	DECEMBER
100 B Area	0.1	0.3	0.3	0.3
100 D Area	0.3	0.9	0.4	0.4
100 F Area	0.4	1.1	0.4	0.4
200 West Area	0.2	0.4	0.4	0.7
200 East Area	0.2	0.4	0.5	0.7
Riverland	0.1	0.6		
Hanford	1.7	2.5		
300 Area	0.6	0.9		0.6
700 Area	0.2	0.4		
Kennewick	0.1	0.1		
Pasco	0.1	0.3		
Benton City	0.2	0.2		

Two new 614 buildings have been turned over to the group during this period. They are located at the extreme south and extreme north ends of the 3000 Area. Currently the work orders for the installation of integrans in each of these are in progress.

Review of the above tabulation indicates a slight downward trend in the overall averages. In general, this decrease is more noticeable in the more remote locations.

The following results for beta and gamma activity were obtained by the use of air filtering devices during the month of January, 1949.:

LOCATION	MAXIMUM EIGHT HOUR PERIOD CONCENTRATIONS IN uc/liter	MONTHLY AVERAGE IN UNITS OF uc/liter
200 East, SE Corner	4.8×10^{-7}	8.1×10^{-10}
200 West, Twr. #4	1.8×10^{-7}	7.8×10^{-10}
Gable Mountain	Inst. Erratic	2.4×10^{-10}
Richland	1.6×10^{-7}	7.0×10^{-11}
Pasco		6.0×10^{-11}
300 Area		2.0×10^{-10}
200 East, Twr. #16		1.4×10^{-9}
100 D Area		3.1×10^{-10}
200 West Gate		4.6×10^{-10}
Benton City		1.4×10^{-10}
Hanford 614 Bldg.		3.9×10^{-10}
105 DR Const. Zone		1.1×10^{-10}
Hanford 101 Bldg.		1.5×10^{-10}
White Bluffs		6.0×10^{-11}
3000 Area ***		2.4×10^{-10}

The maximum eight hour concentrations are included for those locations at which the constant monitoring equipment is installed.

****The 3000 Area location is a new monitoring location, this data being the first obtainable from this zone.

In general, the airborne beta and gamma activity levels as measured by the air filter remains about the same, very minor increases being noted at some locations. These increases do not reflect the same magnitude as the increases observed on the ionization chamber monitoring.

In addition to the normal filtering program, airborne activity measurements by the use of caustic scrubber solutions behind the filter are being followed. This study is still in the experimental stage, however three pairs of samples were submitted in this period (the filter and the scrubber). In one case the scrubber solution was lost, however the other results were as follows:

	ACTIVITY ON FILTER	ACTIVITY IN SCRUBBER
Run #1	6.2×10^{-10} uc/l	lost in process
Run #2	2.5×10^{-10} uc/l	1.37×10^{-10} uc/l
Run #3	2.6×10^{-9} uc/l	2.0×10^{-10} uc/l

These runs were made in the 200 West area, the exposure time varying from 7 to 10 days. The activity found on the filter of Run #3 was rather high for the location and the proportionate amount collected ~~xxx~~ in the scrubber solution appears a bit lower than expected. If a particle were collected on this particular filter, this would satisfy the reason for the wide magnitude of difference. The radiographs are not available to the writer to elaborate on this.

Further expansion is underway, currently an installation at the 200 West Gate (usually high activity) is supplementing the above data. This installation at the 200 West gate is regarded as an experimental station and at presents consists of the following equipment which is being used to study the air monitoring program: 1) interron unit, 2) CI unit, 3) film pack, 4) rain gauge, 5) four little sucker type air filters, two of which are mounted vertically and two are mounted horizontally, exposing all four for one week and attempting to determine the difference in activity pickup between vertical and horizontal planes; also the range of variation in magnitude of airborne activity as monitored by our units will be determined, thirdly the difference in particle deposition will be available, 6) protective polyethylene bags are being exposed to determine the amount of deposition on the bags over various accumulated time intervals.

As of Jan. 3, 1949 the far off area air monitoring program was incorporated into the program. Thirteen air filters from Mullen Pass were analyzed for beta and alpha activity by direct

counting methods. In all cases the activity was well within the normal accuracy of the counters, many negative counting results being obtained. The natural activity in air is apparently the only thing that evidences any counting rate, and this is not present at the time of counting as the filters are removed about ten days before arrival on the site. The natural radioactivity in air is available from the EA charts that accompany the filters, this data is plotted and studied for any unusualities. The current months data gave no indications of any unusual conditions.

The off area data from the Mt. Ranier station has not been coming in as the station at Longmire, Wash. is snowbound for the winter.

**** R A I N ****

Only thirty two rain samples were collected. This was due the lack of rain, most of the collections being the result of melted snow. The beta activity results as grouped according to the various zones on and adjacent to the site are as follows:

LOCATION	Number Samples	Units of milli -microcuries/liter	
		Average Beta Activity	Maximum Beta Activity
Within 200 West	3	.006.7	.012.2 1.2×10^{-3}
Within 200 East	4	.002.5	.005.4
Intermediate Zone	7	.003.6	.050.0
Within 100 Areas	13	.000.2	.000.4
Outlying Zone	2	.000.3	.000.4

The maximum sample obtained from the outlying zone was secured in the 700 Area. In addition to the above, two samples were collected in the 234-235 construction zone. These samples averaged 0.23 milli-microcuries per liter.

**** WASTE MONITORING ****

300 AREA

Due to the extended cold weather, only one set of samples was obtained from the old waste pond. This pond is not receiving any 300 Area waste at the present and currently is frozen over.

In addition to the results of the weekly waste sampling program, the results of the daily samples obtained direct from the waste line (via manhole) are tabulated in the table below:

LOCATION	ALPHA AS d/d/min/lit.		B-G AS MILLI-MICROCURIES PER LITER	
	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE
Old Pond (1)	1340	1340	0.22	0.22
New Pond (4)	3250	1120	0.63	0.33
Waste Line (20)	3050	795	0.67	0.33

The results obtained from the direct sampling are in very good agreement with those obtained at the new pond inlet. In an effort to identify the alpha emitter, several of the higher counting individual samples that were obtained from the waste line, were measured for plutonium by the TTA process. Negative results were obtained on eight of these whereas two samples showed positive results (confirmed). These samples were not taken on consecutive days. The d/m/liter due to Pu on a sample taken 12/21 was 10.9 and 7.7, whereas the sample taken on 12/29 showed 10.6 and 7.6 d/m/liter (TTA). As the normal result on TTA is negative, it appears that on these two occasions some tracer amounts of Plutonium may have been disposed of thru the waste line with a likely source being the laboratory. If this is not the case, the activity is not understandable.

In addition to the ~~xxx~~ liquid samples above, one mud sample from the old pond showed negligible alpha and beta activity. (2 d/m/gr and 3.0 micro-microcuries/kg)

200 AREAS

As in the 300 Area, the frequency of samples from the open waste areas in the 200 Areas was greatly reduced due to the frozen condition of the swamps. The liquid and solid sampling programs are equally affected. The following table summarizes the results obtained from the sampling of liquid waste solutions in the separation areas:

LOCATION	ALPHA dis/min/liter		B&G micro-microcuries/liter	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
T Swamp Inlet (3)	30	30	115	162
T Swamp West Side (1)	45	45	198	198
T Swamp South Side (1)	1078	1078	425	425
U Swamp West Side (1)	105	105	55	55
U Swamp Inlet (1)	90	90	60	60
Laundry Ditch Inlet (3)	32	52	33	43
Laundry Ditch 600'	373	790	122	228
231 Ditch Inlet	30	30	50	57
231 Ditch 1st Underpass	30	30	70	127

An appraisal of the above table indicates that no unusually high results were obtained from any of the waste areas. The alpha contamination found in the T swamp again is somewhat high, however the last month maximum is in agreement with the current average which is obtained from but one sample.

Only two routine mud samples were obtainable from the waste areas. No unusual results were obtained.

Three samples of laundry lint showed alpha activity of 262, 67, and 52 dis/min/gram respectively, whereas the beta activity was 106, 49, and 223 milli-microcuries per kg on the same samples. The activity found in these samples is below that detected in the month of December by a factor of three to ten.

66-----
Thirteen test holes in the East Area and four test holes in the West area were checked, using a GM probe in connection with the mobile equipment. No unusual counting rates were observed on either survey.

The waste line mobile instrument surveys which were previously taken once per month in each area have been discontinued due to an agreement reached with the S department. The S department was duplicating our efforts in this case, and the duplication of results was deemed unnecessary. (By contacts Chapman and Foskett)

Three portable instrument surveys using VGM's were made around the perimeters of the T and U swamps in the 200 West Area. No unusual readings were obtained, the maximum reading being around 250 c/m in an area where the normal air background is about 100 c/m.

Three portable instrument surveys using a VGM were made of the laundry ditch area in the West Area. No unusual readings were obtained, the maximum reading being about 225 c/m in an area where the normal background usually is 100 c/m.

Two surveys, using portable instruments were made around the B ditch and swamp in the 200 East Area. Unusually high readings of around 1000 to 3000 c/m were obtained at various locations in this zone. These readings prompted a special direct sampling ^{beta} program. Initially, six samples were taken, the greatest activity being found on the mud which contained 476 milli-microcuries per kg. The maximum on the liquid was around 100 micro-microcuries per liter. With the exception of one alpha sample from the swamp water (65 dis/min/lit) all alpha results were below 30 dis/min/liter. Seven additional samples of vegetation which showed evidence of algae deposition were secured and unusual high beta activity resulted when they were analyzed. Individual results on these samples were 6.8, 2.1, 4.4, 3.0, 3.5, 1.1, 4.2, microcuries per kg. Decay studies are underway the results not being available at this time. The alpha activity was checked by ether extraction and found to be between 3 and 10 dis/min/gram on individual samples. Further investigation is contemplated, pending on outcome of decay studies. Normally the inst. readings in this zone are barely in excess of background.

Three portable instrument surveys of the top soil and vegetation in the separation areas were completed. In general the normal readings average a little over 100 c/m, which figure can be appraised as the background. Higher readings around 400 c/m are obtained within a radius of 2000' of the stacks. None of the higher readings were due to isolate sources as there was a general buildup in the zone adjacent to the stacks. The burning grounds were surveyed on the same frequency, no unusual observations resulted.

Twelve samples were obtained from the retention ponds in the 200 Areas. The results obtained on the alpha, and beta and gamma activity analysis are summed as follows:

Location	Alpha dis/min/liter		Beta & Gamma micro-microcuries per liter	
	Maximum	Average	Maximum	Average
200 East Ret. Pd.	<30	<30	80.5	.073.5
200 West Ret. Pd.	<30	<30	400.4	.153.3

These results are in good agreement with previous observations, the 200 West Area retention pond continuing to be higher than the 200 East Pond by a factor of 4 to 5.

Surveys, using portable instruments in the 200 North area indicate that maximum readings of around 8.5 mrep/hr exist at the inlet of the R ditch. This level tapers to around 2 mrep/hr at the entrance to the swamp. The levels in the M and P ditch do not exceed 2 mrep/hr at any location.

***** 100 AREA WASTES *****

A total of 78 samples were obtained from the effluent water in the 100 Areas. Of these 37 came from the 107 line and 6 from the 1904 bldg. The 1904 bldg sampling was discontinued toward the end of the month, at the request of the HI division in the 100 Areas. The following table summarizes the results of these samples: (pile shutdown and extreme decay corrections are omitted in the summary)

Location	Number Samples	Alpha dis/min/liter		Beta & Gamma uc/l		d/m/l Pu (TT)	
		Maximum	Average	Maximum	Average	Max.	Ave.
107 B	12	<30	<30	.366	.289	<6	<6
107 D	13	<30	<30	.385	.294	<6	<6
107 F	12	<30	<30	.508	.353	<6	<6
1904 B	3	<30	<30	.240	.157	<6	<6
1904D	4	<30	<30	.519	.410	<6	<6
1904 F	1	<30	<30	---	---	<6	<6

The average beta activity is in good agreement with last months average. No positive alpha activity was detected. On the basis of last months data which indicated tracer amounts of alpha activity, the samples in this period were analyzed for Pu by the TTA process, all results being less than the detectable limits. (Only three samples were omitted because the decay period was in excess of the prescribed 12 hours).

In connection with the TTA above, twenty two of the 107 & 1904 samples were run on the flourophotometer. All results (ignoring one flyer at 11.0 ug/l) were less than one ug uranium per liter.

Polonium Analysis: A total of eight samples from the 107 and 1904 bldgs were submitted for polonium analysis. No individual result exceeded the detectable limit of 6 dis/min, liter.

Dryer Room Condensate: The results of three dryer room condensate analysis are summarized as follows:

Location	Total Beta Activity as microcuries/ml		SC ₄ Activity as microcuries/ml.	
	Maximum	Average	Maximum	Average
107 F Dryer Room	0.96	0.74	1.40	1.11

107 Effluent Sulfate Analysis: Ten waste effluent samples were analyzed for that activity due to sulphur. The following summarizes the individual area results:

Location	Number Samples	Average as milli-microcuries/l	Maximum as milli-microcuries/l
107 B	3	13.0	20
107 D	3	12	16
107 F	4	13	24

SPECIAL COLUMBIA RIVER STUDY

Seventy - two 500 cc samples were obtained from the Columbia River, continuing the cross-section, depth study initiated several months ago. That part of the river laying between the Pasco-Kennewick bridge and Richland, and that part between the 300 Area and Hanford were studied in this survey. ~~Three~~ Samples were obtained from each shore and the center of the river at four locations in each of the zones mentioned above. Samples were secured from the surface, the middle and the bottom in each instance. ^{beta activity} Figures _____ and _____ portray the results obtained from each sample. These figures also identify the sampling locations on the river.

This survey was made on January 5th and 6th at which time the average flow of the Columbia was 326, 000 gallons per second. The pile status in the 100 Areas was as follows: 100B was at full power on the 4th, 5th, & 6th of January; 100D was down on the 4th, operating at 260 megawatts on the 5th and at full power on the 6th; 100F was at full power on 4th and 6th, and was shut down on the 5th. As evidenced above, this three day period would be very indicative of the normal operating conditions within the three 100 Areas. The purpose of the survey was two-fold; 1) to determine at what point in the river uniform dispersion exists, and to determine if there is any difference currently between the magnitude of contamination carried at the various depths of the river, and 2) to determine the decay rate of the contaminant as found at the various locations, identify the contaminant, and compare the existing decay rate to the decay correction now applied in the normal routine sample corrections.

Initial investigation of the contamination levels at various depths in the zone between Richland and Pasco-Kennewick showed no difference between the amounts of contamination found on the surface, at the middle, and on the bottom. Then, taking the three samples from each location and using the average to represent the beta activity existing at this location, the difference between the means of the twelve sample locations in this zone were tested by an analysis of variance. From the results obtained, it was found that no significant difference exists between the means at any of the river locations below Richland. Thus, assuming that no difference exists in the means, the possibility of one

individual sample differing from the entire population was investigated by applying the standard 'Students T Test'. It was found that no samples fall beyond the 99% limit, two samples fall beyond the 95% limits, and three samples fall beyond the 90% limits. This is in extreme good agreement with the expected results if one were assuming uniform dispersion in this zone.

Continuing the investigation into the upstream data (between 300 Area and Hanford), vi observation indicated large differences in magnitude between the results at the four cross section locations, the difference in beta activity level being as much as four times greater at Hanford as found eleven miles below Hanford. These nine samples taken eleven miles below Hanford, again were in good agreement with each other, indicating uniform dispersion at this point. Those samples taken in the cross section eight miles below Hanford gave the first indication of non-uniform dispersion in the river. At this point, statistical comparison (chi-square) showed the difference in magnitude of beta activity across the river, to be greater than that normally expected. Continuing upstream this difference tends to magnify.

Investigation of the decay rates was based on the samples obtained at the cross section locations. As the downstream locations showed no difference within the individual samples taken from a cross-section, the average decay rate of all samples studied from one cross-section was appraised as the best decay line. On this basis the following half lives were determined at the locations listed: 1) 29 miles downstream from Hanford, 17 hours, 2) 9 miles downstream from Hanford, 18 hours, 3) 4 miles downstream from Hanford, 15 hours, and 4) at Hanford, 16 hours. These observations are in very good agreement with the expected 14.8 hour Na^{24} half life. Extending the decay line back to the time of sampling by correcting for volume and converting to c/m, plotting these points on plane of c/m decay line for 500cc sample, it was found that with the exception of the Hanford location, the 'corrected to sampling time c/m' value was in good agreement with the later decay rate. At Hanford a somewhat shorter half life was observed between time of sampling and actual initial count, this half life being in the order of 8 hours. The only possible explanation of this may be the presence of shorter half life components (Mn^{56} @ 2.6 hrs, Ca^{49} @ 30 min. etc) at the Hanford location which

based on a five mile per hour river flow is only one hour removed from the basin effluent.

Comparing the decay rate correction currently used by the group on routine samples, to that observed by counting the above river samples, it can be concluded that the current correction applied is in very good agreement with observations. Essentially, the correction applied below Hanford is $14.8 \text{ hr } \text{Na}^{24}$ and the tracer short half life emitters accompanying samples secured from Hanford and above are accounted for in the routine correction.

CONTROL SAILING

For the major part, the control data is now coming into the group. Considerable difficulty has been experienced in attempting to analyze this data due to the inconsistency of the nomenclature at the head of the sheet. Our initial meeting will probably settle this and establish a routine nomenclature procedure.

The I^{131} control was in favorable shape. An analysis of the control data between 12/23 and 1/24 showed that the yield averaged 73.2%, which is in extreme good agreement with the figure we use in correcting our routine results (70%). This yield ranged from about a minimum of 50% to a maximum of 100%, each of the extremes being very infrequent.

1-1 1000 miles - Maryland (from the ... to ... - ...)

NEUFEL & ESSER CO., N. Y. NO. 388-72
Semi-Logarithmic, 3 Cycles X 12 to the Inch.
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 2-1-10

KEUFFEL & ESSER CO., N. Y. NO. 358-72
 Semi-Logarithmic, 3 Cycles x 12 to the inch.
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EURENE DIETZEN CO.
SEATTLE, WASH.

NO. 340-L310 DIETZEN GRAPH PAPER
SEMI-LOGARITHMIC - 3 CYCLES X 20 DIVISIONS

11/5

To: J. Singlevich

From: H. J. Paas

Re: Information on Sections 18, 20, 21, 22, & 23; Township 11N, Range
25 East.

The routine surveys show that there are four locations in the immediate vicinity of the above sections on which results have been obtained in the past.

These locations are as follows:

Post 17 is located within Section 19

Post 24 is located within Section 22

Post 32 is located in Section 18 which is directly above section 19.

Post 25 is located in Section 14 which is directly above section 23.

These four should be adequate to supply the information you need.

Date	Post 17	Post 24	Post 32	Post 25
9-30-47	.168	.218	.070	.071
2-3-48		.012		.044
5-15-48	.002	.020	.070	.050
8-18-48	-.010		.060	
8-7-48	.041	.066	.008	.026
10-9-48	.006	-.006	-.004	.028

The above figures represent microcuries per kilogram. Recent data is not available due to the conditions of the roads in winter time.

HP
1-18-49

February 28, 1949

TO: W. H. Lindbergh
FROM: A. C. Foss

SITE SURVEY REPORT
Reference
OF ~~February~~ 1948.

The attached report is compiled from the following number of surveys:

Water Sampling Program

Drinking Water 500 cc -----	10
Drinking Water 11.7 liter -----	45
Test Wells 500 cc -----	31
Test Wells 11.7 liter -----	15
River -----	35
Waste -----	60
Rain -----	70
Snow -----	11
Total Liquid -----	546

Air Sampling Program

Air Filters -----	92
Detachable Chambers -----	647
Hand Pump -----	0
Film Packets -----	116
Total Air -----	855

Land Sampling Program

On Area Vegetation -----	502
Off Area Vegetation -----	14
Solids (mud, lint, soil,) -----	77
Total Land -----	673

Instrument Surveys

Portable Instrument (land) -----	2
Portable Instrument (waste) -----	3
Mobile Instrument (test holes) -----	0
Total Instrument ---	11

TOTAL SURVEYS ----- 2095

The above number of surveys were made by traveling approximately miles. This figure does not include that mileage on the off area collection of vegetation samples by personnel outside of the site survey group. Again, due to weather conditions, the off area vegetation surveys were at a minimum.

**** VEGETATION ****

~~522~~ routine vegetation samples were collected during the month of February. All samples were analyzed for that activity due to I^{131} and also for that activity that is non-volatile. (Previous to this report, the non-volatile beta activity was referred to as long half life beta activity).

The results of the extraction of five gram samples for I^{131} is tabulated in the table below:

Location	BETA ACTIVITY DETECTED BY I^{131} EXTRACTION; CALC. AS uc I^{131} /Kg.		
	AVERAGE	MAXIMUM	LAST MONTH AVERAGE
North of the 200 Areas	.004	.011	.005
Near the 200 Areas	.009	.047	.041
Rte. 3 & Met. Pwr.	.106	1.180	.001 .006
200 West Gate	.520	1.646	.321
South of the 200 Areas	.000	.008	.004
Richland	.000	.000	← .002
Pasco	.001	.001	← .002
Kennewick	.002	.007	← .002
Benton City	.003	.006	.003
Richland 'Y'	.002	.004	.002
Hanford	.004	.016	.003
Ringold to Pasco	.003	.005	← .002
Wahluke Slope	.003	.005	← .002

Tabular
Note that the ~~category~~ ^{section} "Near the 200 Areas" is subdivided into two other general locations, which are included in the figures that represents ^{the entire area} ~~this area~~. It is felt that these should be mentioned separately, as the beta activity at these locations is considerably higher than that in the overall area which the average represents.

The same samples tabulated above in the I^{131} activity table, were also analyzed for

the non-volatile beta activity. The results obtained from these identical locations are summarized in the following table, which includes the previous months average:

LOCATION	BETA ACTIVITY (NON-VOLATILE) : CALCULATED as uc/kg.		
	AVERAGE	MAXIMUM	PREVIOUS MONTH AVERAGE
North of the 200 Areas	.013	.023	.014
Near the 200 Areas *	.024	.150	.055
Rte 3 & Met. Twr	.037	.602	.086
200 West Gate	.215	.275	.263
South of the 200 Areas	.013	.046	.014
Richland	.010	.032	.009
Pasco	<.010	.015	.007
Kennewick	.011	.020	.007
Benton City	.012	.025	.012
Richland "Y"	.016	.029	.009
Hanford	.013	.011	.006
Ringold to Pasco	<.010	.017	.008
Mahluke Slope	<.010	.014	.012

Again, as in the I^{131} table, the two higher activities areas are shown separately as this activity is considerably higher than at other locations in this zone (Near the 200 Areas).

In addition to the above tabulated samples, results of samples from thirty-six locations within the separation areas showed the following activity:

LOCATION	I^{131} as uc/kg (I^{131} Extraction)			Non-Volatile Beta Activity as uc/kg.		
	AVERAGE	MAXIMUM	PREV. AVE	AVERAGE	MAXIMUM	PREVIOUS AVE.
200 East	.023	.158	.029	.067	.557	.036
200 West	.042	.317	.013	.036	.226	.057

As in the past, the results of samples obtained inside the separation areas and immediately outside the areas, show a wide range of results, the wider range occurring in the activity due to radioactive iodine. Certain select locations, in the vicinity of the 200 West Gate and the meteorology tower continually show higher activity and spotty changes are observed at various locations in the areas. An initial attempt at controls

sampling in this general vicinity was effected on February 3rd. An area about 25 $\frac{1}{2}$ square miles was sampled at intervals of each half-mile. This area was centered around the deposition areas, with a few more samples being obtained from the downwind south east direction. These samples were analyzed for both the I^{131} and non-volatile activity. The overall beta activity can best be appraised from the accompanying iso-activity map (attached). The following observations were of extreme interest: 1) the longer half life activity measured on this survey is in good agreement with that found on our routine sample collections, the iso ^{activity} ~~count~~ of same agreeing with the attached iso-^{activity} ~~count~~ activity map of the area and vicinity, 2) the I^{131} activity results are not in as good agreement with those found in the routine sampling during the month, possibly explained by the short half life and the daily changing depositions in this zone 3) a very sharp drop in activity of both types is observed about two miles from the areas, this fact being duplicated in the case of each area, 4) the occasional high flyer I^{131} result again occurs, very much in the same manner as experienced in the past, however only one result in excess of 1 uc/kg was found on this survey. One sample obtained inside the 200 foot area contained an unusually high I^{131} activity of 16.6 uc/kg. This was recounted and confirmed and then studied for identification by placing on a beta analysis. The suspicion of a contaminant other than radioactive iodine was refuted when the following decay was observed: initial count on 2/4 @ 1300 was 1745 c/m, on 2/7 @ 2145 was 1342 c/m, on 2/8 @ 1355 was 1255 c/m, on 2/9 @ 1355 was 1119 c/m, on 2/10 @ 1520 was 1047 c/m, and on 2/21 @ 1245 was 403 c/m. This 6 day iodine decay confirms the lab analysis and shows that it is possible to find I^{131} depositions in the area that are higher by a factor of 400 when compared to the prevailing average (comparing the 16 uc to the current months average of .04 uc). This is the first confirming information of this type and an I^{131} activity deposition of this magnitude was rather surprising. An exact duplicate of this type of survey will be completed early in March, the results of same will be used as a basis for proposing this type of survey in localized high activity zones in the future possibly extending the controlled sampling program to the residential communities and non populated areas. (A graph is attached showing the decay of the high sample mentioned)

Twelve samples obtained in the Plymouth to Kennewick to Hovey area showed average I^{131}

activity less than .002 uc/kg and non-volatile beta activity less than .010 uc/kg. Maximum results barely exceeded these levels and the higher long half life activity detected between Pennwick and Plymouth in last months survey again was found to be higher than that activity detected between Pennwick and Dover. Assuming the P^{40} activity to account for about .010 uc/kg, the averages in both the above zones would be well below this, thus indicating a difference only in the K^{40} activity.

Six samples from the Pasco to Eltonia area showed negligible activity and in general compared favorably with the activity found in the Pennwick-Plymouth zone.

An attempt to survey the Nahluke Slope area was made early in the month, however the melting snow made the majority of the roads impassible and consequently only twenty samples were obtained from the routine locations. The results should not be regarded as representative of the slope, as most of the samples were obtained at the immediate cross-river locations. The average non-volatile activity was less than .010 uc/kg with maximum of .014 uc/kg, whereas the I^{131} activity averaged .0025 uc/kg with a .005 uc/kg maximum.

Results on K^{40} analysis of fifteen samples from the Nahluke Slope were received and compared to the total non-volatile activity measured in these samples at the time of sampling. The results showed randomness, some of them being considerably higher than original activity, and again some of them being negative or considerably lower than the original activity. We feel this data is not very good and the inconsistency indicates that the process used may not be consistent. Further data will be necessary before we can appraise these levels by our analytical methods.

Seventeen samples obtained from the Pasco to Ringold area showed average I^{131} activity .003 uc/kg and non-volatile activity less than .010 uc/kg. ~~There~~ There is no significant difference between these levels and the previous months, and the current activity in this zone compares to that found in the general area across the river.

Fourteen samples were taken at ten mile intervals in the area between Pasco and Daytor. The maximum I^{131} activity was .003 uc/kg and all samples showed non-volatile beta activity

less than .010 uc/kg. The lower than usual non-volatile activity found in this area indicates that that activity due to K^{40} may vary by a factor of two in many low levels.

Samples obtained in the Hanford to 300 Area zone show I^{131} activity of $<.002$ uc/kg and long life activity of .014 uc/kg (ave). This does not differ significantly from January, however is still considerably higher than conditions in December.

Samples obtained in the 'Goose Egg Hill' area show average I^{131} activity of .010 uc/kg and non-volatile beta activity of .017 uc/kg (ave). Maximum activity detected was .036 uc/kg and .027 uc/kg respectively. Both of the averages are lower than the previous month, however two of the highest contaminated locations in the past (posts 59461) were omitted from this survey because of bulldozer operations in this area at the present time. If we would eliminate these two posts from the previous months average and then compare the trend, no difference would be noted.

COMMENT: The accepted level of .010 uc/kg due to K^{40} still seems to be the best figure however some indication that this level is not uniform in outer areas is apparent, and as these are the zones that we would like to appraise the low level contamination most accurately in, it appears that a good analytical process for this measurement be encouraged as soon as possible, and when available and reliable, we would like to furnish samples from the zones we suspect these differences in, and measure the degree of this difference in K^{40} activity.

A total of twenty-seven raw water samples were taken from the 133 and 233 buildings during the month of ~~XXXX~~ February. The following results were obtained from these:

LOCATION	BETA ACTIVITY AS DIS/MIN/LITER	ALPHA ACTIVITY AS DIS/MIN/LITER
133 Bldg-100B	<50	<6
133 Bldg-100D	60	<6
133 Bldg-100F	120	33
100F At Float	145	<6
233 Bldg-200E	<50	<6
233 Bldg-200W	<50	7

The beta activity in the magnitude tabulated above is directly attributed to the river and is not greater than would be expected at this period of low river flow. These beta levels compare very favorably with those reported in the previous month.

The alpha activity in all raw water samples should be less than 6 dis/min/liter and that activity detected at the 133 Bldg in 100F is very unusual. Some reflection of this same activity is evidenced in the 233 Bldg samples, which in reality are obtained in the 200 Areas but have as their source the 100 Area raw water supplies. This alpha activity has been a build-up the last two weeks, the maximum results being obtained in the last samples taken. Each sample taken from the raw water supplies is measured for that activity ~~test~~ due to ^{238}U uranium by fluorophotometer analysis. Five samples from 100F average around 1 ug/l on the uranium analysis, with a maximum result of 1.6 ug U per liter. This does not identify the activity as uranium as the total alpha is greater by around a factor of twenty than the uranium content. Also, the other 133 Bldg samples show uranium activity in the order of 1 ug/liter, which we assume to be the normal contamination level. Analysis for Pu by the TTA method were requested, but the results are not available at this time, however it is doubtful that we should find this amount of Pu in the raw water system at these locations. All analysis were recounted and confirmed. Special samples are in process at the present time for alpha analysis using the larger volumes and making measurements for uranium and plutonium.

A total of sixteen raw water samples were analyzed on the fluorophotometer.

-- 8 --
 **** RIVER SAMPLING ****

Fifty-two routine river samples were obtained from the Columbia river during the month. The river flow again was very constant, and currently is around 355,000 cfs per second which is identical to the flow measured at the beginning of the period. A slight rise was observed in the middle of the month, which was immediately followed by a similar decrease. Samples which are taken for us by the power dept. were minimized in the period because their boat was frozen to shore. The following table summarizes the results of the Columbia River sampling program:

LOCATION	ALPHA dis/min/liter		B&G 1000 MICROCURIES PER LITER			
	MAXIMUM	AVERAGE	MAXIMUM		AVERAGE	
Wills-Ranch	<8	<8	<50	<50		
Above 1000	<8	<8	<50	$<5 \times 10^{-5}$	<50	$<5 \times 10^{-5}$
101 B	<8	<8	<50	$<5 \times 10^{-5}$	<50	$<5 \times 10^{-5}$
101 D	<8	<8	610	6.1×10^{-4}	260	2.6×10^{-4}
101 F	<8	8*	1390	1.4×10^{-3}	820	6.2×10^{-4}
Henford So. Bk.	<8	<8	2570	2.6×10^{-3}	1170	1.9×10^{-3}
Henford Middle	<8	<8	1200	1.9×10^{-3}	1200	1.2×10^{-3}
Henford-No. Bk.	<8	<8	531	5.9×10^{-4}	378	3.8×10^{-4}
300 Area	<8	<8	350	3.6×10^{-4}	283	2.9×10^{-4}
Richland	<8	<8	465	4.7×10^{-4}	377	3.8×10^{-4}
F-H Bridge (Ream Side)	<8	8*	275	2.8×10^{-4}	183	1.6×10^{-4}
F-H Bridge (Pasco Side)	<8	<8	236	2.4×10^{-4}	210	2.1×10^{-4}
McMurry Dam	(See Write Up Below)					

The results tabulated above are very much the same as last month, the beta activity measured at the North Bank at Henford showing around a threefold decrease being the only significant change. The tracer amounts of alpha activity detected last month were not found in this period, all results being below the detectable level with the exception of the one location at the FH bridge. Fluorophotometer analysis on this sample showed about 1 ug U per liter at this location. All river samples were analyzed on the fluorometer with a general average result in the magnitude of 1 ug U per liter.

Cross-section samples from McMurry dam show negligible alpha and beta activity. The samples taken on shore showed 6 dis/min/liter, but the remaining samples, along with the large

volume samples showed no alpha activity at this location.

YAKIMA RIVER ^{SAY} Samples taken by the power department from the mouth of the Yakima showed no beta or alpha activity in excess of the normal detectable limits. Samples secured from the Yakima Horn showed no detectable beta activity, however one sample contained the equivalent of 8 dis/min/liter alpha activity. An analysis for uranium was requested and request sheet submitted, however the sample was not analyzed for same. We would ordinarily expect this to be a flyer, however as it was the last sample secured from this location, we have no information to confirm this opinion.

FOSTER RANCH Samples obtained from Fosters Ranch, on the north side of the river opposite 100F showed negligible alpha activity, the beta activity averaging 200 micro-microcuries per liter with a maximum of 350 micro-microcuries per liter.

*** RIVER MUD SAMPLING ***

Sixty-two ~~thirty-four~~ mud samples were obtained from the bank of the Columbia River. The cold weather the early part of the month caused a reduction in the total number of mud samples, however at this writing the normal sample frequency is in effect. A summary of the results obtained on these samples is as follows:

LOCATION	LOC SAMPLES (Examine)	BETA ACTIVITY IN 1000 MICROCURIES PER KILOGRAM			
		ONSHORE SAMPLES		FIVE FEET FROM SHORE	
		MAXIMUM	AVERAGE	MAXIMUM	AVERAGE
✓ Near Mills Rch.	3	.015.8	.014.5	.017.0	.012.5
✓ Allard Pump Sta.	5	.010.2	.008.2	.009.7	.009.7
✓ At 100H Area	3	.012.0	.012.5	.015.6	.015.6
✓ Below 100F Area	5	.022.1	.014.8	.019.3	.011.2
✓ Richland Dock	3	.016.9	.010.2	.019.8	.015.8
6 At 300 Area	2	.016.7	.014.5	.015.0	.014.5
✓ P-K Bridge (Pasco)	5	.013.2	.010.8	.016.7	.011.2
✓ P-K Bridge (Kenn)	3	.013.7	.011.1	.015.0	.010.4
✓ Hanford Ferry	2	.018.2	.015.3	.028.8	.018.8

The higher beta activity that was previously observed at locations downstream from 300 Area, no longer is noticed, currently a rather random distribution of activity is found along the river with no significant difference between any two locations.

A large number of the river mud samples were analyzed on the fluorophotometer and the following table summarizes this data. All alpha activity detected in the river mud is found to be uranium, the magnitude usually being in tracer amounts:

Location	Number Samples	ONSHORE SAMPLES		FIVE FEET FROM SHORE	
		AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
Hills Ranch	3	676.	1000.	740	850
Allard Sta.	2	883.	1165.	693.	1030.
At 100th Area	2	818.	855.	730.	730.
Below 100th	5	1434.	5455.	436.	560.
Richland Dock	3	576.	1300.	303.	505.
300 Area	2	1170.	1711.	1026.	1510.
PK Bridge (Kenn)	3	424.	635.	402.	484.
PK Bridge (Pasco)	5	716.	2015.	552.	695.
Hanford Ferry	2	1595.	2895.	1450.	1450.

** Note that the values are reported on a per kilogram basis in order to be consistent in volume with the beta activity tabulation.

Two observations are of interest in the above tabulation: 1) the onshore samples continually run higher than the five feet out samples which may be definite indication that there is a deposition on the ~~silt~~ bottom as currently the water level is at a very low stage and the off shore samples are not as indicative as a bottom sample as are the onshore samples. We find it difficult to obtain the off shore sample without doing considerable scraping and diluting with the river water, 2) the higher orders of magnitude are observed at locations where waste emission is known to exist or have existed, whereas the more downstream or isolated locations show reduced activity.

**** DRINKING WATER ****

A total of 274 drinking water samples were obtained in this period. Of this total, 219 samples were of 500cc volume and 55 were large volume three gallon samples. Ten of the three gallon samples were from test wells as were thirty-one of the 500 cc samples. The following table summarizes the results of the 500 cc program and includes all samples which showed a result in excess of 6 dis/min/lit alpha activity and or 50 uuc/liter beta activity:

RESULTS OF 500 cc. DRINKING WATER SAMPLING PROGRAM

LOCATION	NUMBER SAMPLES	ALPHA ACTIV. AS d/m/1		BETA-GAMMA uuc/1		FLUORINE AS ug U/1	
		MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE
Hanford Well	2	5.7	<6	<50	<50		
Hanford #7	13	22.0	6.2			2.0	2.0
3000 Area 'A'	3	7.5	<6			3.2	3.0
3000 Area 'C'	4	13.2	7.0			2.6	2.6
3000 Area 'E'	4	11.0	<6			2.5	2.3
3000 Durand S	4	7.9	<6				
Richland #13	16	15.4	8.8		5	5.9	4.1
Richland #2	5	12.4	7.8			8.6	7.3
Richland #4	3	23.2	14.0			6.1	5.6
Richland #5	4	9.8	7.8			4.2	3.9
Richland #12	4	17.2	10.3			7.6	5.6
Richland #14	3	16.5	12.1			8.4	5.6
Richland #15	4	27.8	20.4			13.7	12.4
Richland #18	4	7.4	<6				
Trot. Hse. K748	4	9.0	<6				
Bent. Cty. Chev.	2	44.4	33.3				
Bent. Cty. H2O Co.	5	32.8	28.1			24.1	17.9
Cobbs Corner Sta.	4	13.6	7.0				
Kennewick 614	1	<6	<6	133.	133.		
Kennewick Std Sta	4	7.0	<6	124.	73.		
Midway	4	9.6	<6	<50	<50		
Wills Ranch	3	6.5	<6	"	"		
Pasco	4	10.1	<6	97.	61.		
Pistol Range	4	12.0	6.1	<50	<50	2.9	2.4
300 Area Sanitary	19	20.6	7.1			1.7	1.7
White Bluffs Cty.	12	21.4	15.1				
Sanitary 1008	4	16.2	<6			2.9	2.9
Sanitary 1007	4	10.1	<6			7.2	3.9
Sanitary 1002	11	35.0	1.4	120.	58.	1.4	1.4
Hanford #7 Raw	14	<6	<6	<50	<50	2.0	2.0
Trot Hse. JG25	4	<6	<6	"	"		

TEST WELLS

300 Area Well #1	3	12.6	6	<50	<50	2.6	2.6
300 Area Well #2	3	15.4	14.1	<50	<50	13.9	13.9
300 Area Well #4	3	39.7	24.6			2.5	2.5
E-Y Well	4	16.1	6				
Rattlesnake Spr.	1	8.7	8.7				
McGee Well	3	10.23	6.8				
White Bl #Q1439	4	23.7	13.8				
White Bl #Q1440	4	17.4	16.2				

The only measurable beta activity, at Pasco, Kennewick and 100H can be directly attributed to the river as each of these locations has the Columbia River as its well water source. Ordinarily, one would expect that the maximum beta activities would be in the wells at a time as the river is at low stage and thus the activity concentration is greatest. Alpha activity in almost all cases is confirmed to be due to uranium as evidenced by the fluorine photometer results.

unc micro-microscopic activity

RESULTS OF LARGE VOLUME DRINKING WATER SAMPLING PROGRAM: ORIGINAL SAMPLE 11.7 LITERS.

Table 2

LOCATION	NUMBER SAMPLES	ALPHA ACTIVITY AS d/m/1		BETA ACTIVITY AS dpm/1		U as ug/1	
		MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE
Columbia Camp	1	1.1	<1	<10	<10		
3000 Area Well A	1	3.3	3.3			3.6	3.6
3000 Area Well C	2	3.1	3.1			2.3	2.3
3000 Area Well E	2	3.1	3.1			2.5	2.3
3000 Durand 5	1	4.4	4.4				
Richland #13	1	4.3	4.3			5.9	4.3
Richland #2	2	4.8	5.1			6.6	7.3
Richland #4	2	9.7	7.8			8.1	5.6
Richland #5	2	4.5	4.1			4.7	3.9
Richland #12	2	2.2	6.8			7.6	5.6
Richland #14	2	7.6	8.4			6.4	5.8
Richland #15	1	9.3	10.0			13.7	12.0
Richland #16	1	1.1	1.1				
Tract Hse K748	1	4.3	4.3				
Tract Hse JC85	1	1.1	1.1			1.9	1.9
Bent. Cty. Chev.	1	12.6	13.0				
Bent. Cty. H ₂ O Co.	2	26.4	23.7			24.1	17.9
Cobbs Corner Sta.	2	6.5	4.9				
Kennewick Std. Sta.	2	1.9	2.1				
Riverland	2	1.3	1.2				
Midway	1	1.2	1.2				
Wills Reh.	2	1.3	2.5				
Pasco	2	1.6	1.0	11.6			
Pistol Rge.	2	6.5	6.8	<10.		2.6	2.4
White Bl. Cty.	2	17.3	16.4	<10.			
100H Raw ater	1	1.9	2.5	10.7	10.7	1.7	0.8

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TEST WELLS:

B-Y Well	2	5.4	5.2	<10	<10
200N #5	1	4.2	4.2	<10	<10

The three gallon samples do not indicate the amount of alpha activity by ether extraction that the small samples do, however the same general locations and ratios appear. Very definite uranium content in drinking water is found in the Benton City and Richland area. It is interesting to note that the beta activity found in the smaller volume samples is barely detectable at Pasco and not detectable at Kennewick in the large volume samples. This tracer beta activity evidently decays to a minimum during the longer period evaporation, and if our previous estimate (Jan rept) of 99% Na²⁴ activity is correct, this fact further substantiates this figure.

One very unusual alpha result of 54 d/m/1 was obtained from a sample of Richland Well #1 on Feb. 21st and confirmed by recount. An attempt at resampling yesterday failed as the house was locked and the sample was unobtainable. This is the only result ignored in the above tabulation and feel it should be excluded until confirming evidence is available.

300 AREA

Some suspicion of uranium emission in the atmosphere from the 313 bld- in the 300 area prompted a survey of this area on February 4th. During the previous night, a heavy snowfall occurred and the snow samples were obtained early the next morning, expecting that any uranium admitted to the atmosphere during the night and early morning hours would be collected in the falling snow. Ten samples ranging in volume from 115cc to 250 cc were collected around the 313 building. The results ranged from 0 d/m/l to 84 d/m/l with an average of 28 d/m/l. The higher samples were collected nearest the building as would be expected. In addition, one very large sample (4520 cc when evaporated) contained 12.7 d/m/l (ether extracted).

Surveys and samples of the 300 Area Ponds indicate a steadily rising activity deposition in the new pond. This data is confirmed in both the direct pond samples, the ether extractions, and the waste line direct samples. The following table summarizes the pond data

for this period:

Location	Alpha as dis/min/liter		B-23 as milli-microcuries per liter	
	Maximum	Average	Maximum	Average
Old Pond Inlet	3150	1000	0.64	0.32
New Pond Inlet	13890	4225	3.31	0.94

The data from the direct sampling of the 300 Area Waste Line which is the source of the activity in the new pond, is very wide spread and it does not seem reasonable to take an average as a representative condition. Beta activity ranging from 7 micro-microcuries per liter to 6661 micro-microcuries per liter was detected, whereas the alpha activity ranged from around 200 d/m/l to 37000 d/m/l. Fluorophotometer analysis on all samples confirms the uranium contamination, the range of uranium content varying from 5 ug/l to 25000 ug/l. From the above wide ranges it can be concluded that at times very great amounts of uranium are admitted to the pond and the deposition of these causes the excessive mud and liquid readings in the pond. Seventeen samples were obtained from the line directly. TTA analysis shows very tracer amounts of Pu, however on one unusual occasion 100 d/m/l was detected due to Pu. Currently, a summary of the all time observations and variations on this waste line direct sampling is being prepared and should more accurately appraise the condition.

poor
Samples of mud were obtained from the old 300 Area pond but were too hot to count, alpha meter readings on these samples showed the activity to be in excess of 20,000 d/m/g. The beta activity in the mud ranged from 2.6 to 9.2 uc/kg.

200 AREA

The following table summarizes the results of the direct sampling program of waste areas :

Location	Alpha dis/min/liter		B-G micro-microcuries/liter	
	Average	Maximum	Average	Maximum
T Swamp Inlet	<30	42	76	93
T Swamp West Side	<30	<30	84	84
T Swamp So. Side	<30	<30	41	41
U Swamp West Side	42	83	<10	<10
U Swamp Inlet	<30	<30	<10	34
Laundry Ditch Inlet	80	197	457	1233
Laundry Ditch 600'	<30	34	122	266
231 Ditch Pipe Outlet	<30	47	39	75
231 Ditch 1st Underpass	<30	32	482	1895

1.9 m - uc

The only unusual result in the above table is the beta activity observed in the No. 231 ditch. This activity source is unexplainable, however similar activity is found in the laundry ditch and the possibility of backwater may be the reason. It is unusual that this ditch activity does not show up in the U Swamp.

Mud samples from the T Swamp indicate tracer alpha activity with individual results as great as 130 d/m/gram. The beta activity on the mud is in the order of 10 milli-microcuries per kg, with a maximum found to be 15 milli microcuries per kg.

Four samples of laundry lint showed alpha activity of *not run* 528, 920, and 304 d/m/gram respectively. The beta activity on these same samples was 1.43, 0.11, 0.33, and 0.07 microcuries per kg.

The test hole surveys were not possible this month because the GM tube with the preamp. is in the instrument development group shop, pending design of portable equipment for the survey.

Four surveys of the entire ditch and swamp areas in the separation areas ~~in~~ using portable instrumentation showed no unusual readings. The activity recorded in the North Area was 200 c/m on mud about 500 feet from the T Swamp Inlet.

Portable instrument surveys of the 200 North Area ditches showed maximum readings as follows: 'H' Ditch - 15,000 c/m and 7.5 mrep/hr; 'F' Ditch - 3,900 c/m on mud along ditch; 'R' Ditch - 5,900 c/m on water. These readings are in agreement with the normal findings in the north area.

A very interesting study of the alpha contamination found in the waste areas in the separation areas was completed for this period. The alpha activity as measured by ether extraction was compared to that activity found to be due to uranium by the fluorophotometer analysis. In comparison, the activity due to uranium is considerably less than the total activity, as the summation of the individual results in the following table indicates:

Location of sample	Alpha d/m/l (ether extract)	Uranium ug/l (fluorophotometer)
T Swamp Inlet	23.7	0.5
	2.2	0.3
	42.2	1.7
	0.8	0.0
T Swamp So Side	21.2	0.1
T Swamp West Side	10.2	0.0
T Swamp Inlet	22.0	5.6
T Swamp West Side	24.3	1.1
	33.0	1.1
	0.3	3.0
231 Ditch Outlet	7.7	1.2
	46.3	1.4
	30.5	0.4
231 Ditch (underpass)	10.2	0.6
	32.0	0.9
	5.9	7.4
Laundry Ditch Inlet	62.2	10.6
	2.5	3.6
	35.7	1.0
	197.1	94.0

As the solutions entering these waste areas vary in activity, it would be very hard to estimate the average alpha concentration in the waste areas, however the above indicates that at times large amounts of alpha activity, other than uranium are admitted to these waste zones.

17 Samples from the Retention ponds in the separation areas indicated negligible alpha activity and average beta activity of .147 micro-cururies per liter. The average beta activity was .10 micro-cururies per liter.

**** 100 AREA TESTS *****

A total of 52 waste samples were obtained from the effluent water in the 100 Areas in the month. No samples were obtained from the 1904 Bldg in the period. The following table summarizes the results of these samples: (pile shutdowns and extreme decay correct are omitted from this tabulation)

Location	Alpha dis/min/liter		Beta & Gamma uc/liter		Pu dis/min/liter	
	Maximum	Average	Maximum	Average	Maximum	Average
107E	43	< 30	.376	.320	< 6	< 6
107D	46	< 30	.336	.186	< 6	< 6
107F	38	< 30	.444	.362	< 6	< 6

The beta activity in the effluents is consistent with last months observations, however tracer alpha activity again is found in this waste. Tracer alpha activity was detected in December, but the last month sampling gave no indication of any alpha activity. No Pu was detected in excess of the reporting limits, however the most positive indication that we have obtained occurred in this period from a sample secured from 100B where the sample contained the equivalent of 4.3 dis/min/liter as determined by the TTA process. (positive result on TTA is a rarity in these samples) Five samples from each effluent line were analyzed for uranium and only tracer amounts were detected. The uranium activity ranged from around 1 ug/liter to 3 ug/liter with the higher results coming from 100D area.

Dryer Room Condensate: Four samples of dryer room condensate from the 100B area were analyzed, the activity due to SO_2 again being higher than the total beta activity. The average activity due to SO_2 was 0.52 microcuries per ml. and the maximum was 0.69 microcuries per ml. Total beta activity averaged 0.43 microcuries per ml. with maximum of 0.75 microcuries per ml.

107 Effluent Sulfate Analysis: One sample from each area was analyzed for the activity due to sulphur. The following beta activity was detected: 107B - 2.1 milli-microcuries per liter, 107D - 1.3 milli-microcuries per liter, 107F - 0.3 milli-microcuries per liter. Each of the results are lower by a factor between ten and twenty than compared to last months averages.

Water Soluble Oil: Two samples of water soluble oil (Calol) obtained from 100B showed beta activity of 10.1 and 23.1 milli-microcuries per liter. No calol samples were submitted last month, however these results are within the range of samples measured in December.

**** AIR MONITORING ****

A summary of the average dosage rates measured using detachable ionization chambers is tabulated in the following table:

Location	Average mrep/24 hours	
	February 1949	January 1949
<u>100 Area and Environs</u>		
Route 1, Mile 5	0.55	0.53
Route 2N, Mile 10	0.12	0.67
Within 105DR	0.53	0.91
Route 2N, MI 5	0.52	0.39
At White Bluffs	0.54	0.58
Route 11A, Mile 1	0.62	0.71
Hanford 614 Bldg	0.54	0.62
Intersection Rte 1 & 4N	0.46	0.53
Hanford 101 Area	0.55	0.67
<u>Within 5 Miles 200 East</u>		
Route 4S, Mile 6	----	0.71
Route 11A, Mile 6	0.76	1.03
Route 3, Mile 1	1.11	1.00
At Hatch Plant	0.44	----
Meteorology 200'	0.72	0.82
234-235 Area	0.65	0.87
<u>Within 10 Miles 200 East</u>		
Route 4S, Mile 10	0.94	----
Route 10, Mile 1	1.01	0.93
Route 2S, Mile 4	1.15	1.79
<u>Near 300 Area</u>		
Route 4S, Mile 16	0.78	----
Route 4S, Mile 22	0.94	0.96
<u>Outlying</u>		
Benton City	0.48	0.48
Richland	0.48	0.48

Table 6

No highly significant trends or changes in the air activity concentrations is noticed in the ionization chamber data. The first data from the Patch Plant between the separator area is included and found to be somewhat lower in dosage rate than the nearby locations. Ionization chambers are being removed from the 105DR area and are being relocated within the 100H area. Data will be available from 100H in the month of March.

In addition to the dosage rates measured using ionization chambers, the following dosage rates were recorded using integrators and 'C' chambers:

Location	Average dose in mrep/24 hours			
	Integrators		'C' Chambers	
	February	January	February	January
100 B Area	0.3	0.1	0.3	0.3
100 D Area	0.1	0.3	0.4	0.4
100 F Area	0.8	0.4	0.4	0.4
200 West Area	0.2	0.2	0.7	0.1
200 East Area	0.2	0.2	0.5	0.5
Riverland	0.5	0.1		
Hanford	2.0	1.7		
300 Area	0.4	0.6	0.6	----
700 Area	0.4	0.2		
Kennebec	0.1	0.1		
Pasco	0.7	0.1		
Benton City	0.1	0.2		
3000 Area North			0.4	----

* This unit is to be repaired or replaced.
The 3000 Area North is a new location and consequently no data available from the previous month. Integrator installation is complete and operation should be forthcoming in the month of March at the 3000 Area.

The following results for beta and gamma activity were obtained by the use of air filtering devices during the month of February, 1949:

Location	Monthly Average In Units	Maximum Eight Hour Period
	Cf uc/liter	Concentrations In uc/liter
200 East, SE Corner	3.9×10^{-10}	2.0×10^{-7}
200 West, Twr #4	2.0 x 10⁻¹⁰ 4.2×10^{-10}	1.2×10^{-7}
Gable Mountain	1.6×10^{-10}	
Richland	1.3×10^{-10}	0.2×10^{-7}
Pasco	9.0×10^{-11}	
300 Area	1.3×10^{-10}	
200 East Twr 16	3.1 x 10⁻¹⁰	
100 D Area	3.1×10^{-10}	
200 East Twr 16	3.1 x 10⁻¹⁰	
Benton City	9.0×10^{-11}	
Hanford 614 Bldg	3.6×10^{-10}	
105 DR Const. Zone	2.0×10^{-10}	
Hanford 101 Bldg	3.2×10^{-10}	
White Bluffs	1.4×10^{-10}	
3000 Area	1.9×10^{-10}	

The air concentration is at minimum levels throughout the site. No data is available from Twp 10 in 200 West area due to a combination of motor and electrical failures. Monitoring equipment was installed adjacent to the Rodex area and this location will be known as 200 West, Twp 15. Currently the average airborne activity at this location is 1.7×10^{-10} mc/l and the maximum eight hour concentration recorded was 1.2×10^{-9} mc/l.

Initial data on the experimental filter station is available and of interest. Four little sucker type filters are running continuously at the 200 WEC station, two filters are on a vertical plane, and two are on a horizontal plane. In addition, one filter is followed by a caustic scrubber solution. The following observations are of interest:

1. In every case, the filter on a horizontal plane picks up more short half life activity
2. The amount of long half life activity is nearly identical on the vertical and horizontal
3. The initial activity shows that the ratio of I^{131} to longer half life material varies depending on the week collected. In some cases all the activity is long half life, whereas on other occasions around 75% of the total activity disappears within three days, or can be assumed to be very short half life material.
4. The scrubber solution will pick up activity nearly equal to the total activity on the filter at the end of a three day decay period. Currently, the activity in the scrubber is between 20% and 50% of the total initial activity. Theoretically, this figure may even be higher, as the scrubber will decay considerably between its removal and counting whereas the filter will only decay in the magnitude of the short half life material it contains.

This study will continue until a large volume of correlative data is obtained.

A study of the activity buildup on the new polyethylene chamber bags is underway, and it is observed that after two weeks exposure, the activity deposition on the bag increased by a factor of four during the second week. This experiment is continuing and the result of the buildup will determine the correct interval of time that we can expect to change bags on the chambers at the field stations.

**** FAR OFF AREA MONITORING ****

Mt. Renier Station: This station has not reported during the month, it is presumed that the station is snowed in and therefore is unable to report to us.

Mullen Pass Station: This station has also had weather troubles, but has been sending charts regularly. The receiving date on these charts and filters has been a little late than usual due to the weather conditions. Eight filters have been received in the month the mean of these, reported in microcuries per liter $\times 10^{-9}$ is negative (-0.024).
The maximum reading is 0.05 microcuries $\times 10^{-9}$.

The E. A. charts have been counted and graphed for both the collection and decay period. A summary of the collection period data, including the average, maximum, and end of collection counting rates is tabulated as follows:

Date	Average c/m	Maximum c/m.	End of Collection c/m
January 3	150	290	107
January 6	50	91	45
January 8	250	332	332
January 11	200	281	245
January 13	300	850	850
January 19	275	450	350
January 21	200	350	140
January 26	600	1000	375

The decay curves show nothing unusual in the air, and decay directly to the background of the counting system in almost every case. Where this does not occur, the counting rate has remained so close to the background rate that nothing can be determined from the data. As a rule the counting rate will decay to background in these cases.

Control Sampling: Due to the inconsistency and unintelligibility of the control data in the past, a new program has been set up by our group which we hope will make this data more valuable as an appraisal of the process efficiencies. Currently, we are submitting the request sheets for this data, and will be analyzing it according to each type of control and each type of sample. This program went into effect the latter part of the month, and a full complete tabulation should be available in the month of March. Analysis of current data shows that the I^{131} spike ~~excess~~^{samples} ran higher than would be expected the latter part of the month (excess of 100%) which caused the average yield to be about 60%. If the isolated cases where the high yields occurred were omitted, then the average yield would be only around 50% which is considerably lower than that observed last month, and also considerably lower than the current corrections applied (70%).

Control analysis on the long half life, 500 cc water samples, and 3 gallon water samples was not possible due to incomplete data returned to this office. No information was available on the 100% spike values in the above cases.

***-----

An investigation into the relationship existing between changing elevations in the Columbia River and their effect on the well levels of wells in the Richland and North Richland areas was completed. Using the monthly reports of J. M. Heffner as a source of the elevation figures on a weekly basis, it was found that there was no relationship during the months of November, December and January. The wells fluctuate independently and appear to reflect the effect of pumping rather than the fluctuation in the river level. Similar study is contemplated during a period of abnormal river elevation fluctuation and if the above is confirmed, we will initiate an investigation into the effect of the pumping.

Investigation into background data from the counters is nearly completed and the two counters mentioned in our letter (2/11) for further study have been selected on the basis of past operation. BGO # 9 and BGO #12 should be used for the proposed further study and currently are awaiting the completion of the standards mentioned in the above letter.

As a result of the background analysis, a table showing the limits into which a 'spot' 10 minute background count should fall, has been prepared and is attached to this report. It may be possible to use this table at any time that any suspicion of a change in background during the day is evidenced or it may be valuable in appraising the range into which one would expect these checks to fall.

Initial data from the 706 laboratory has been received and it appears that a slight modification in the forms we originally suggested would be advisable. We are currently analyzing this data and will have ~~xxxxx~~ recommendations when completed. Current results indicate that the sample data no longer follows the Pearson Type III distribution, and we are now trying to fit the proper distribution to the data as it now stands.

**** RAIN ****

should be under all

Seventy-eight rain samples were collected from locations on and adjacent to the site. Very little rain occurred during this period, and many of the samples are the result of melted snow. The following table shows the results according to the customary zone grouping:

Table 9

LOCATION	Number Samples	Units of milli-microcuries/liter	
		Average Beta Activity	Maximum Beta Activity
Within 200 West	12	4.7 x 10⁻³ 6.04 x 10⁻³ 1.1 x 10⁻³	2.1 x 10⁻² 0.21 x 10⁻² 4.0 x 10⁻³
Within 200 East	12	6.01 x 10⁻⁴ 5.9 x 10⁻⁴	2.2 x 10⁻³ 2.2 x 10⁻³
Intermediate Zone	15	0.0059	1.32 x 10⁻³
Within 100 Areas	12	1.1 x 10⁻³ 0.011	2.4 x 10⁻⁴ 0.024
Outlying Zones	16	2.0 x 10⁻³ 1.6 x 10⁻³	1.4 x 10⁻³ 1.37
Construction Zones	11	1.4 x 10⁻³ 0.14	6.5 x 10⁻⁴ 0.65

** One sample collected from Rte 4S, Mi. 6 was omitted from this tabulation due to the magnitude of sample in respect to the result. This one sample was 0.5 ml and by correcting to a liter volume by a factor of 2000, the activity on a liter basis would be 115.0 ~~mc/l~~ milli-microcuries per liter. This is considerably higher than the usual in this area, and can only be appraised by examination of the radiosautograph of the sample, which as yet is unobtainable here.

The activity found in rain is well within the normal range one would expect for the locations at which samples are collected. The maximum result outside the area perimeter was found in the 700 Area where a sample contained activity equivalent to 1.4 milli-microcuries per liter.

We are continuing to monitor rain in the construction zones as in the past and current are collecting about three samples from each of the zones namely, 234-235, Hanford 101, White Bluffs, and 105DR. We also have installed rain collectors in the 3000 area at each of the new stations, and would like clarification on the status of this area, is it a construction zone or is it directly under our jurisdiction and responsibility??

To: J. W. Healy-W. Singlevich
From: H. J. Paas

SITE SURVEY MONTHLY REPORT FOR THE MONTH
OF MARCH, 1949

The attached report is compiled from the following number of surveys:

Water Sampling Program

Drinking Water 500cc-----	237 ✓
Drinking Water 11.7 liter-----	43 ✓
Test Wells 500 cc-----	35 ✓
Test Wells 11.7 liter-----	35 ✓
Raw Water 500cc-----	37 ✓
River-----	187 ✓
Waste-----	118 ✓
Rain-----	77
Total Liquid	739

Air Sampling Program

Air Filters-----	83
Detachable Chambers-----	657
Hand Pump-----	0
Film Packets-----	120
Total Air	860

Land Sampling Program

On Area Vegetation -----	538
Off Area Vegetation-----	43
Solids (mud, lint, soil)-----	120
Total Land	701

Instrument Surveys

Portable Instrument (land)-----	2
Portable Instrument (waste)-----	9
Mobile Instrument (test Holes)-----	1
Total Instrument	12

TOTAL SURVEYS 2312

The above number of surveys were made by traveling approximately miles. This figure includes all mileage made off area. Due to road conditions some of the more usual locations were inaccessible during March. Some of these include the MP posts, Wahluke Slope and Benton Gap.

*****VEGETATION*****

538 routine vegetation samples were collected during the month of March. All samples were analyzed for that activity due to I^{131} and also for that activity which is non-volatile (long half-life).

The results of the extraction of five gram samples for I^{131} is tabulated in the table below:

LOCATION	BETA ACTIVITY DETECTED BY I^{131} EXTRACTION: CALC. AS I^{131} AS I^{131} Ag		
	AVERAGE	MAXIMUM	LAST MONTH AVERAGE
North of the 200 Areas	.003	.011	.004 <i>increase - February 1957</i>
Near the 200 Areas	.009	.068	.009
Rt. 3	.096	.613	.166
200 West Gate	.314	.418	.528
Meteorology Tower	.045	.065	.047
South of the 200 Areas	.006	.036	.006
Richland	.003	.009	.003
Pasco	.002	.007	.002
Kennewick	.002	.006	.002
Benton City	.003	.007	.003
Richland "Y"	.003	.006	.003 <i>.0027</i>
Hanford	.002	.004	.002 <i>.0047</i>
Ringold to Pasco			.003
Wahluke Slope			.003

With the exception of the very localized high I^{131} deposition areas, the beta activity measured as I^{131} on the site and nearby vicinity has remained essentially the same as was measured in the month of February. In the area of higher activity, immediately outside the West Gate and in the vicinity

of the meteorology tower, the I^{131} activity has decreased by nearly a factor of two. This reduction is observed in both the monthly average and the monthly maximum. It is felt that this reduction, is not nearly as significant as was the high results found last month. The current levels are in the order of magnitude that was observed previous to last month.

The same samples tabulated above were also analyzed for the non-volatile beta activity. These results are summarized as follows:

LOCATION	BETA ACTIVITY (NON-VOLATILE) CALCULATED AS uc/kg		LAST MONTH AVERAGE
	AVERAGE	MAXIMUM	
North of the 200 Areas	.011	.029	.013
Near the 200 Areas	.023	.216	.024
Rt. 3	.065	.266	.087
200 W. Gate	.233	.367	.218
Meteorology Tower	.030	.050	.052
South of the 200 Areas	.013	.036	.013
Richland	.007	.019	.010
Pasco	.009	.018	< .010
Kennewick	.009	.023	.011
Benton City	.008	.011	.012
Richland 'Y'	.015	.019	.016
Hanford	.010	.020	.013
Ringold to Pasco			< .010
Wahluke Slope			< .010

The amount of non-volatile beta activity measured on vegetation shows negligible change from the past. There are no average increases at any on-site locations and a few very minor decreases are observed. The higher activity region is identical to that showing the higher I^{131} depositions.

In addition to the above tabulated samples, results from thirty six locations within the separation areas showed the following activity.

LOCATION	I^{131} as uc/kg (I^{131} Extraction)			Non-Volatile Beta Activity as uc/kg.		
	AVERAGE	MAXIMUM	PREV. AVE	AVERAGE	MAXIMUM	PREVIOUS AVE.

200 East	.020	.100	.023	.064	.444	.067
200 West	.044	.331	.042	.060	.536	.036

Again, a very wide range of results is found to exist within the separation areas. The occasional high beta activity found is indicative of the concentrations that are possible, however the more usual individual result is considerably below the infrequent high. A very significant increase in non-volatile beta activity is found inside the West Area, where the previous average of .036 uc/kg increased to .060 uc/kg. An increase by a factor of two is also observed in the maximum. The results obtained on a controlled sampling survey more clearly portray the contamination pattern in the vicinity of the separation areas.

A survey consisting of 108 samples taken from a 32 square mile area, sampling at each half mile interval showed the following interesting results: (1) the highest I^{131} deposition is again found near the West Gate, an area extending over about 3 sq. mi. showing I^{131} activity ranging from 0.1 uc/kg to 0.5 uc/kg. (2) the individual sample showing the maximum activity was located about $\frac{1}{4}$ mile north of the West Gatehouse. (3) A very abrupt decrease in I^{131} activity is observed at the edge of the above mentioned zone, the activity decreasing from around 0.15- 0.25 uc/kg to around .02 to .05 uc/kg within a mile. (4) the pattern is very definitely elongated to the south-east, (5) the activity inside the east area is considerably lower than that found in west, this being true for both I^{131} and non-volatile. (6) the long half life activity deposition has a near identical pattern in both areas, the greater activity again being found in the vicinity of the West Gatehouse where the range is from 0.4 to 0.7 uc/kg over one square mile. (7) this survey was identical to the one reported last month, however the maximum activity at this time for I^{131} is lower by a factor of 4. An iso activity map for both I^{131}

and non-volatile beta activity is attached and may be referred to for the iso pattern existing during the month of March.

A survey of the region between Pasco and Eltopia shows negligible measurable beta activity the average results for I^{131} being less than .002 uc/kg and for non-volatile activity being less than .010 uc/kg. Current results are identical to last months at all the locations.

Eleven samples from the Kennewick-Finley-Hover area showed average activity as follows: I^{131} less than .002 uc/kg, non-volatile beta activity less than 0.010 uc/kg. The maximums for each type of beta activity were just at the detectable levels, ie .002 uc/kg for I^{131} and .010 for non-volatile. There is no significant change from the previous months.

A survey of the Goose Egg Hill region consisting of twenty samples, showed average I^{131} deposition of .013 uc/kg (max. .050 uc/kg) and average non-volatile beta activity of .018 uc/kg (max .062 uc/kg) . These results do not differ from last month, however it is worthy to mention that the maximums consistently come for the same location, Post # 62 which is almost adjacent to the southeast fence in the 200 West Area.

Samples secured from the region between 300 Area and Hanford show positive activity, the average I^{131} being .003 uc/kg (Max. .006 uc/kg) and average non-volatile beta activity of .016 uc/kg (max..031 uc/kg). The averages last month were .002 uc/kg and .014 uc/kg respectively, which indicates no significant change.

A survey consisting of vegetation sampling at five mile intervals in the area bounded by Moxee City, Yakima, Ellensburg and Sunnyside showed average I^{131} activity of less than .002 uc/kg (max. .004 uc/kg), and average non-volatile activity of .010 uc/kg. (max. .019 uc/kg). It is of interest to note that thirteen of the twenty-seven samples were greater than .010 uc/kg

on non-volatile activity. As this figure of .010 is the more generally accepted level of K^{40} activity, it appears that either the K content is greater in this area or possibly tracer beta activity is present.

****DRINKING WATER****

A total of 320 ~~drinking~~ water samples were obtained in this period. Of this total, 272 samples were of 500cc volume and 48 were large volume three gallon samples. Five of the three gallon samples were from test wells as were thirty-five of the 500cc samples. The following table summarizes the results of the 500cc program and includes all samples which showed a result in excess of 6 dis/min/lit alpha activity or 50 uc/liter beta activity:

RESULTS OF 500cc DRINKING WATER SAMPLING PROGRAM

LOCATION	NO. SAMPLES	ALPHA ACTIV. AS d/m/l		BETA-GAMMA uc/l		FLUOR. AS ug U/l	
		Maximum	Average	Maximum	Average	Maximum	Average
Head Gate Well	4	9.7	< 6	< 50	< 50		
Hanford Well #7	17	9.2	< 6	< 50	< 50	2.8	1.5
San. H ₂ O							
3000 Area Well #A	3	7.3	< 6	< 50	< 50	2.7	2.2
3000 Area Well E	4	9.7	< 6	< 50	< 50	1.3	0.8
Richland Well #13	17	22.7	10.0	< 50	< 50	6.1	3.6
Richland Well #2	5	24.0	11.1	< 50	< 50	4.2	2.6
Richland Well #4	2	13.4	12.2	< 50	< 50	16.9	9.1
Richland Well #5	2	6.3	< 6	< 50	< 50	5.7	5.7
Richland Well #12	4	8.3	< 6	< 50	< 50	4.9	3.8
Richland Well #14	4	19.8	10.6	< 50	< 50	7.8	5.8
Richland Well #15	3	10.8	8.3	< 50	< 50	10.9	7.6
Richland Well #16	4	12.5	8.0	< 50	< 50	1.9	1.9
Richland Well #18	1	11.3	11.3	< 50	< 50	5.2	5.2
Tract House K-748	4	7.9	< 6	< 50	< 50	1.9	1.7
Benton City Store	3	29.6	22.6	< 50	< 50	15.9	13.2
Bentoh City Chev. Station	1	38.2	38.2	< 50	< 50		

LOCATION	NO. SAMPLES	ALPHA ACTIV. Maximum	AS d/m/1 Average	BETA-GAMMA Maximum	uuc/1 Average	FLUOR. AS ug U/1 Maximum Average
Benton City H ₂ O Co. Well 2	5	51.7	28.7	< 50	< 50	18.9 16.5
Cobb's Corner Chev. Station	5	7.5	< 6	< 50	< 50	3.4 2.0
Barott's Assoc. Ser. Station	2	12.4	< 6	< 50	< 50	
Texaco Station across 4 from Golf Course, Kenn.	4	6	< 6	70.1	< 50	2.2 1.0
Kenn. Std. Station	5	6	< 6	127.4	53.4	2.3 1.5
Riverland Well	5	10.9	6.0	< 50	< 50	0.9 0.9
Midway	5	6.7	< 6	< 50	< 50	0.4 0.4
Wills Ranch	5	9.6	< 6	< 50	< 50	0.2 0.2
Pasco	5	6	< 6	191.6	70.5	1.1 0.9
Pistol Range	4	8.0	< 6	< 50	< 50	1.9 1.9
300 Area Sanitary	19	15.0	< 6	< 50	< 50	2.0 1.4
White Bluffs City Well	16	26.4	16.8	52.8	< 50	8.1 7.6
Sanitary Water 100F	4	7.9	< 6	< 50	< 50	0 0
Sanitary Water 100H	13	38.8	8.4	134.7	59.6	6.4 2.4
TEST WELLS						
300 Area Well #1	3	6.6	< 6	< 50	< 50	1.9 1.9
300 Area Well #2	3	8.6	< 6	< 50	< 50	2.3 2.1
300 Area Well #4	3	46.2	41.1	< 50	< 50	31.2 21.2
B-Y Well	4	12.2	< 6	< 50	< 50	2.8 2.8
White Bluffs Q1439	4	24.0	15.0	< 50	< 50	
White Bluffs Q1440	4	13.2	11.1	< 50	< 50	9.1 9.1

Positive alpha activity, as determined by ether extraction for total alpha is for the most part confined to those wells in the Richland and Benton City systems. The White Bluffs well and 100H sanitary water continually show positive alpha activity. The activity found in Richland wells is confirmed as uranium by the fluorophotometer results.

In most cases the proportion is within reasonable error of the ratio of 1.5:1 which satisfies the identification as uranium. In isolated cases, such as Richland Well #4 and Richland Well #15, the ratio of uranium detected to total alpha shows more uranium than the total alpha. This is attributed to the withholding of a vial for uranium analysis, and the subsequent using of same at times when the plates cannot be washed of the activity. In these cases it is possible to create some variance within the same sample. These cases are isolated and even when they occur, the confirming results tend to emphasize the prevalence of, rather than the absence of uranium.

At Benton City, the sampling of the Chevron Station has been discontinued because of the source of supply has been changed from the private well to the supply from the Benton City Water Company Well. The Water Company Well is one of our routine samples. A comparison of the averages from ^{the} ~~from~~/total alpha activity in the Benton City Water Company with that activity confirmed as uranium shows that the alpha activity in this region is entirely due to uranium emission.

The following wells showed but one sample above the detectable limit for total alpha activity; Riverland, Midway, Wills Ranch and Pistol Range. In each of these cases the total alpha activity was barely positive and in no case was this alpha emission found to be attributed to uranium. Similarly, successive samples at these locations did not confirm the positiveness of the total alpha activity.

Again, the only measurable beta activity is confined to those locations which use the Columbia River for the source of their sanitary supplies. The Pasco and Kennewick systems are the only residential supplies showing this activity, each of these showing average beta activity between 50 and 70 micro-microcuries per liter. Occassinal maximum activity as high as 190 micro-microcuries per liter was detected at Pasco. Current

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decay studies on the Pasco samples show an initial half life of slightly more than twelve hours, with roughly 7% of the total activity remaining after three days. This half life and long activity estimate is based on two samples, taken under identical conditions and time on March 11, 1949. It is worth mention that a similar duplicate set of samples taken from the Kennewick Std. Station on the same date showed negligible activity. Apparently, the pumping time, reservoir storage time, and length of time in the sanitary piping at the sampling location are influencing the magnitude of beta activity we detect. This statement is based on the short half life found to exist in the Pasco samples.

The beta activity detected in the 100H sanitary supply is directly attributed to the river, as this water is taken directly from the river and only chlorinated once. Decay studies on 100H sanitary water are identical to those on the 100H raw water, the contamination fluctuating in the same magnitude. The contaminant is Na^{24} with tracer long life activity of approximately 7% to 10%.

The alpha activity found in the 300 Area sanitary system is currently averaging less than the detectable limit. Apparently almost all tracer alpha activity that remained from the use of the old 300 Area Wells has now been flushed out. Occasionally one sample shows activity greater than 6 dis/min/liter, the fluorophotometer samples show negligible uranium activity, and the TTA analysis indicate tracer plutonium. Two samples showed positive Pu, the results being 7.2 and 7.0 dis/min/liter.

The following is a tabulation of the large volume water sampling Program:

LOCATION	NO. SAMPLES	ALPHA ACTIV. Maximum	AS d/m/l Average	BETA-GAMMA Maximum	uuc/l Average	PLUCK. AS Maximum	ug U/l Average
Col. River The Dalles, Ore.	1	1.9	1.9	< 10	< 10		
Col. River McNary Dam	1	1.5	1.5	< 10	< 10		
100H Raw H ₂ O	1	1.5	1.5	< 10	< 10		
3000 Area Well C	1	1.8	1.8	< 10	< 10		
3000 Area Well E	1	2.8	2.8	< 10	< 10	1.3	1.3
3000 Durand # 5	2	3.6	3.3	< 10	< 10	0.2	0.2
Richland Well 13	2	6.5	5.7	< 10	< 10	6.1	3.6
Richland Well #2	1	14.0	14.0	< 10	< 10	4.2	2.6
Richland Well #5	1	3.5	3.5	< 10	< 10	5.7	5.7
Richland Well #12	1	1.6	1.6	< 10	< 10	4.9	3.8
Richland Well #14	2	6.2	4.5	< 10	< 10	7.8	5.8
Richland Well #15	1	6.8	6.8	< 10	< 10	10.9	7.6
Richland Well #16	2	4.7	3.7	< 10	< 10	1.9	1.9
Tract House K-748	2	1.7	1.6	< 10	< 10	1.9	1.7
Tract House J-685	2	7.3	5.0	< 10	< 10	1.6	1.4
Benton City Chev. Station	1	20.3	20.3	< 10	< 10		
Benton City H ₂ O Co.1 Well		33.8	33.8	< 10	< 10	18.9	16.5
Cobb's Corner Chev.1 Station		1.9	1.9	< 10	< 10	3.4	2.0
Texaco Stat. Across1 from Golf Course, Ken.		1.6	1.6	26.8	26.8	2.2	1.1
Kenn. Std. Station	2	1.8	1.6	< 10	< 10	2.3	1.5
Riverland	1	1.5	1.5	< 10	< 10	0.9	0.9
Midway	1	1.0	1.0	< 10	< 10	0.4	0.4
Pistol Range	1	2.6	2.6	< 10	< 10	1.9	1.9
White Bluffs City	1	16.5	16.5	< 10	< 10	8.1	7.6
B-Y Test Well	1	4.3	4.3	< 10	< 10	2.8	2.8

RIVER SAMPLING

The cross-section depth studies for beta activity distribution in the Columbia were continued in this period. A survey consisting of ninety samples taken in that part of the river between the 100B Area and the 300 Area on the 25th of February showed very little difference existing between the amounts of activity detected on the surface, in the middle, and on the bottom of the river. The usual trend in decreasing activity as the survey progresses downstream was observed, with the higher activity again occurring immediately below the 100F effluent and gradually dispersing downstream.

The background activity above the 100B Area ranged from zero to 6 micro-microcuries per liter, this information based on nine samples from various depths of the river. A smaller than usual beta activity distribution was observed below the B effluent, the reason being that the area had been down for twelve hours preceding the survey. As 100D and 100F had been operating normally, the activity measured immediately below the areas was found to increase accordingly.

Uniform dispersion was not observed at the most downstream location; 2 miles below Hanford the middle of the river showed almost 400 micro-microcuries per liter which compared favorably to the east bank which averaged 300 micro-microcuries per liter. The activity measured on the west bank at this same location averaged over 650 micro-microcuries per liter. This non-uniformity is not in agreement with the observations made last fall, and can be only accounted for by the low river flow at this time, which would tend to decrease the dilution per river mile. Last fall the flow rate was roughly twice the volume that it is now. It must be emphasized that with the exception of one or two isolated cases where the higher activity exists, no significant difference in

activity measured at different levels was observed in this survey.

Figure _____ accompanies this report and includes a shaded portrayal of the magnitude and distribution of beta activity in the Columbia as measured in this survey.

SURFACE DISPERSION OF BETA ACTIVITY BETWEEN 100B AND 100D

As the above mentioned survey did not present a representative picture of the activity in the river between 100B and 100F it was felt that a resurvey of this area was necessary. As there was no difference in the depth activity at the locations measured in the previous survey, the sampling on this survey was confined to the surface. Instead of taking only three samples across the river, a total of five were secured. It was thought that a better appraisal of the distribution would be obtained in this manner. A series of six of these cross section were made, these cross sections being about one mile apart. The results obtained were very unusual as compared to the patterns observed immediately below the other areas on previous surveys. The following table presents the results obtained on the individual samples taken:

	<u>BETA ACTIVITY AS MICRO-MICROCURIES PER LITER</u>					
	At 100B	One Mile Below	Two Miles Below	Three Miles Below	Four Miles Below	Five Miles Below
Near South Bank	321	400	19	340	563	343
Between So. Bank & 228 Middle		10	170	610	373	390
Middle of River	2	140	370	40	450	510
Between Middle & N _o . 5 Bank		370	10	365	530	385
Near North Bank	1720	2	185	373	112	431

The activity seems to be fairly well dispersed four and five miles below the 100B effluent, however the high activity (1720 micro-microcuries per liter) measured on the surface at 100B above the effluent pipe seems to disappear very quickly at the one mile below and two miles below, locations. Apparently it tends to the middle of the stream as higher results are found there, but the reason why the activities in the

magnitude of 400 to 600 micro-microcuries found at the four and five mile below locations are not detected two and three miles below is unexplainable. The only possible explanation would be to suspect that an undertow may carry the diluted effluent to the middle or bottom of the stream, however this phenomenon has been disproved on the basis of previous surveys. A complete study of the underground formations, and currents in this region may clear this fact, this information is not available at the present writing but should be forthcoming from the U.S.G.S. hydrographic data very shortly. Ninety of the samples taken in the above surveys were measured for alpha activity, no indication of any positive results were obtained.

SPECIAL COLUMBIA RIVER SAMPLES:

Three samples of the river were secured from the vicinity of Priest Rapids. Negligible beta activity in the range of zero to 10 micro-microcuries per liter was detected. The alpha activity measured was below the detectable limits.

One large volume sample was obtained from the Columbia River, mid-stream at the Dalles, Oregon. This sample showed beta activity of 3 micro-microcuries per liter and alpha activity of 1.9 dis/min/liter. (2.3 liters analyzed for beta and 9.4 liters analyzed for alpha).

LONG LIFE ACTIVITY IN THE COLUMBIA RIVER:

Very meager data in the past has indicated that the long/^{life} component of the beta contamination carried in the Columbia River was approximately 1% to 5% of the total activity. Several attempts to qualify this statement were completed in this period. It was found that this statement is a very good estimate of the longer activities, with possibly a general figure of around 3% being the best estimate based on current data.

Decay studies of six samples taken at various locations during the cross section depth surveys were studied until the magnitude of counting became constant or, possibly within the range of the accuracy of the background and counter. On the basis of these results, the following long life activity was found to remain after a period of about ten days.

LOCATION OF SAMPLE	Initial c/m	c/m after Decay	% Long half-life B
At 100 B	379	7.8	2.1
One Mi. Below 100B	88.5	2.5	2.8
Two Miles Below 100B	38.	5.1	13.4
Three Miles Below 100B	134.2	4.5	3.4
Four Miles Below 100B	123.7	6.4	5.2
Five Miles Below 100B	85	2.7	3.2

I believe the sample taken two miles below 100B, was initially counted in error, as no decay was observed on the first three counts. Ignoring this result on the basis, the 2% to 3% figure seems to be fairly well satisfied.

In addition to the above, several large volume samples were secured from the Columbia at various midstream locations, and allowed to decay in excess of one week and then analyzed for total beta remaining. It was initially intended to analyze these large volumes micro-chemically for the identity of the longer activity, however the samples were destroyed after counting. The results on these samples as compared to the prevailing average at the identical locations indicate that the following percentage of long life activity prevailed: Below 100B-0.2%, Above 300 Area- 0.6%, and Below 100F- 1.5%. These results are somewhat lower than the decay studies, however this may be due to the increased accuracy which results from larger volumes being used for the study. (Correlative information may be reviewed in the well section of this report where the activity found in the Pasco- Kennewick supplies is similarly reviewed).

ROUTINE RIVER:

Fifty-one routine river samples were obtained from the Columbia during the month. A very slight increase in flow rate was observed during the month, the average flow being 409,000 gallons per second with a peak flow of 430,000 gallons per second. In general, slightly higher beta activity was measured in this period, the higher results occurring early in the month when the flow was at a minimum. Roughly, all downstream locations showed an increase of about a factor of $1\frac{1}{2}$ to 2 when compared to February.

Tracer alpha activity was found on three individual results, each of these being barely above the detectable level, the averages at each of the locations being well below the limit of 6 dis/min/liter for 500cc samples. Twenty-nine of the samples were analyzed on the fluorophotometer for uranium. With the exception of one sample all results showed less than 1 ug U per liter. The one sample from Hanford showed 3 ug U per liter, this result has not been duplicated on successive routine sampling. The following table summarizes the results of the Columbia River sampling:

LOCATION	ALPHA dis/min/liter		B&G MICRO-MICROCURIES PER LITER	
	MAXIMUM AVERAGE	AVERAGE MAXIMUM	MAXIMUM	AVERAGE
Wills Ranch	< 6	< 6	< 50	< 50
Above 100B	< 6	< 6	< 50	< 50
181 B	< 6	< 6	< 50	< 50
181 D	< 6	7	970	680
181 F	< 6	< 6	1040	700
Hanford So.Bk.	< 6	< 6	2960	2350
Hanford Middle	< 6	< 6	1660	1275
Hanford No.Bk.	< 6	7	1930	790
300 Area	< 6	< 6	500	320
Richland	< 6	9	735	515

LOCATION	ALPHA dis/min/liter		B&G MICRO-MICROCURIES PER LITER	
	MAXIMUM AVERAGE	AVERAGE MAX.	MAXIMUM	AVERAGE
P-K Bridge (Kenn. Side)	6	6	185	175
P-K Bridge (Pasco Side)	6	7	380	305

FOSTERS RANCH:

Four samples from the north side of the river at Foster's Ranch showed negligible alpha activity, the beta activity averaging 300 micro-microcuries per liter with a maximum of 380 micro-microcuries per liter. These are in line with previous observations.

YAKIMA RIVER:

Eight samples obtained from the mouth of the Yakima showed negligible alpha and beta activity, all results being well below the detectable limits. Four samples from the Yakima Horn have similar results. (One sample showed alpha activity of 10 dis/min/liter, confirmed by recount. This result was very much out of line with all results obtained this year and is regarded as a flyer and ignored).

DOWNSTREAM DECAY STUDIES:

Duplicate samples from the Columbia River at the Pasco-Kennewick Bridge were obtained in early March, decay studies on these samples indicate that the amount of long life activity is somewhat greater at this location than it is on the samples studied from farther upstream locations. After twelve days the amount of activity remaining ranged from a minimum of 2.8% to a maximum of 7.4%. This is higher than upstream as would normally be expected, as a large amount of the short Na^{24} would have decayed during the time consumed flowing downstream. The initial magnitude of counting on these samples was 75 c/m, thus the samples were deemed fit for the decay study.

RIVER MUD SAMPLING

Eighty-four mud samples were obtained from the banks of the Columbia. The advent of milder weather enabled the normal sampling frequency to be resumed this month. A summary of the results obtained on these samples is as follows:

LOCATION	NO SAMPLES (Ea. Loc.)	BETA ACTIVITY IN MILLI-MICROCURIES PER KILOGRAM			
		ONSHORE MAXIMUM	SAMPLES AVERAGE	FIVE FEET FROM SHORE MAXIMUM	AVERAGE
Near Wills Rch.	7	45.7**	17.9	35.9	13.7
Allard Pump Sta.	5	15.5	10.0	12.5	6.9
At 100H Area	5	15.5	12.5	15.0	12.9
Below 100F Area	5	19.1	13.4	19.1	15.9
Richland Dock	5	15.0	11.0	18.7	14.6
At 300 Area	5	37.5	22.5	53.6	32.0
P-K Bridge (Pasco)	5	15.5	11.0	17.3	13.9
P-K Bridge (Kenn.)	5	23.9	13.7	15.2	10.7
Hanford Ferry	4	13.4	9.9	21.1	14.4

** One sample from this location showed 158 milli-microcuries per kg.

Resamples immediately refuted this result, consequently this individual is ignored in the tabulation.

The beta activity detected in mud is in good agreement with the previous results at all locations above 300 Area. At the 300 Area the average beta activity has increased two fold. Accordingly, the maximum in this period (53.6 milli-microcuries per kilogram) is higher than last months maximum by a factor of nearly four. Slight increases are also noted on each side of the PK Bridge. These are unusual in a period of rising water. A possible explanation may be that as we are now sampling on higher ground we may be picking up tracer activity from the old 300 Area pond break. A special on shore-ground sampling program is underway at the present writing, the results of this program should clarify this unusuality.

Alpha activity was less than 6 dis/min/kg gram on all Samples. Fluorophotometer analysis disproved the presence of uranium in the shore line mud, as all results were less than 1 ug per gram.

RAW WATER- EXPORT LINES

A total of thirty-seven raw water samples were obtained from the 183 and 283 buildings during the month of March. The following table summarizes the results:

LOCATION	BETA ACTIVITY AS MICRO-MICROCURIES /L		ALPHA ACTIVITY AS dis/min/lit	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
183 Bldg. 100B	<50	<50	<6	<6
183 Bldg. 100D	86	100	<6	7
183 Bldg. 100F	115	165	<6	<6
100H At Float	164	411	<6	17
283 Bldg. 200E	<50	<50	<6	<6
283 Bldg. 200W	<50	64	<6	<6

The beta activity detected at 100D and 100F again is in relation to the river activity, however the activity detected at 100H in raw water is continually increasing. From all appearances I believe that the 100H water will increase accordingly with the trend of river contamination. Investigation into the course and methods of supply at this location indicate that the raw water is obtained directly from the river (a barge is located on the river for pumping), then pumped to a chlorination plant and subsequently to the sanitary supplies throughout the area. The only other source of consumed water in 100H is that which is consumed by construction personnel from the wooden barrels around the area. This water is obtained from the White Bluffs Wells which also are slightly contaminated. Decay studies on samples of raw water indicate the half life of the beta activity to be approximately 10 hours. This activity and accompanying decay is reflected in the sanitary water, analysis of same being summarized under

the drinking water section.

The tracer activity detected in the 200W raw water is rather unusual as only upon very rare occasions does this water show any amount of detectable activity. The time at which the activity occurred the water was being pumped by F area, which continually carries more beta activity in its export than the other 100 Areas. It is of interest to note that in the last 28 days, the water was exported from B on 13 days, from D on 13 days, and from F on only 3 days. This type of pumping schedule is very desirous from a standpoint of suppressing the tracer beta activities in the 200 Areas.

With the exception of 100H, negligible alpha activity is found in the raw supply. At 100H the average total alpha activity was 6 dis/min/liter with a maximum of 17 dis/min/liter. Five samples analyzed on the fluorophotometer show the average U content to be around 1.5 ug/liter with a maximum result of 1.8 ug/liter. Normally the result of 17 dis/min/liter would be regarded as a flyer, however in this case it is a repeat on a similar observation last month when one sample showed 21 dis/min/liter.

****AIR MONITORING****

A summary of the average dosage rates measured using detachable ionization chambers is tabulated in the following table:

LOCATION	AVERAGE mrep/24 hours	
	March 1949	February 1949
<u>100 Area and Environs</u>		
Route 1, Mile 8	0.45	0.55
Route 2N, Mile 10	0.31	0.12
Within 105DR	Discontinued	0.59
Route 2N, Mi.5	0.44	0.52
At White Bluffs	0.76	0.54
Route 11A, Mile 1	0.71	0.82
Hanford 614 Bldg.	0.48	0.54
Intersection Rt. 1 & 4N	0.52	0.46
Hanford 101 Area	0.49	0.55
<u>Within 5 Miles 200 East</u>		
Route 4S, Mile 6	----	----
Route 11A, Mile 6	----	0.76
Route 3, Mile 1	0.78	1.11
At Batch Plant	0.48	0.44
Meteorology 200'	1.04	0.72
234-235 Area	0.51	0.65
<u>Within 10 Miles 200 East</u>		
Route 4S, Mile 10	0.62	0.94
Route 10, Mile 1	0.93	1.01
Route 2S, Mile 4	0.92	1.15
<u>Near 300 Area</u>		
Route 4S, Mile 16	0.60	0.78
Route 4S, Mile 22	0.75	0.94
<u>Outlying</u>		
Benton City	0.48	0.48
Richland	0.48	0.48

The average dosage rates as measured by ionization chambers remains in the order of magnitude that is normally expected, the levels corresponding favorably with the measured I^{131} deposition, on vegetation. Chamber maintenance has been a problem due to vacations and insufficient data is available from the 4S, Mi. 6 and 11A, Mi. 6 locations for this reason.

In addition to the dosage rates measured using ionization chambers, the following dosage rates were recorded using integrons and 'C' chambers:

<u>Location</u>	Integrons		Average dose in mrep/24 hours 'C' Chambers	
	March	February	March	February
100B Area	0.6	0.3	0.3	0.3
100 D Area	0.1	<0.1	0.4	0.4
100F Area	0.2	0.8	0.4	0.4
200 West Area	0.2	0.2	0.4	0.7
200 East Area	0.4	0.2	0.5	0.5
Riverland	0.3	0.5	—	—
Hanford	—	2.0	*	0.1
300 Area	0.1	0.4	—	—
700 Area	0.1	0.4	—	—
Kennewick	0.5	<0.1	—	—
Pasco	1.1	0.7	—	—
Benton City	<0.1	<0.1	—	—
3000 Area North	<0.1		0.3 0.4	0.4
3000 Area South	<0.1			

* out of order,

The following results for beta and gamma activity were obtained by the use of air filtering devices during the month of March, 1949.

LOCATION	Monthly Average in Units of uc/liter <i>Average on Filters</i>	Maximum Eight Hour Period Concentrations in uc/liter <i>Maximum noted 8 hour period</i>
200 East, SE Corner	7.1×10^{-10}	1.6×10^{-7}
200 West, Twr. # 4	4.9×10^{-10}	No Sig. reading $< 1 \times 10^{-7}$
Gable Mountain	3.0×10^{-10}	1.2×10^{-7}
Richland	1.2×10^{-10}	1.0×10^{-7}
Pasco	1.0×10^{-10}	
300 Area	3.6×10^{-10}	
200 East Twr. 16	1.0×10^{-9}	
100 D Area	1.4×10^{-10}	
200 West Gate	4.9×10^{-10}	
Benton City	9.6×10^{-11}	
Hanford 614 Bldg.	1.3×10^{-10}	
105 DR Const. Zone	6.0×10^{-11}	
Hanford 101 Bldg.	1.1×10^{-10}	
White Bluffs	6.8×10^{-11}	
3000 Area	1.5×10^{-10}	
200 West Twr. # 15	3.7×10^{-10}	

The air concentrations around the site continue to be at minimum levels, all locations showing beta activity less than 1.0×10^{-9} uc/liter as measured by air filters. The above table refers to those collections in which scrubbers are not used.

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ACTIVITY COLLECTION IN SCRUBBER SOLUTIONS: The following table summarizes the results obtained on the scrubber collection as compared to that activity initially deposited on the filter, as well as that activity remaining on the filters after a ^{day} three/decay period. The scrubber consists of a 0.1 N caustic solution, which is placed in a 1½ cu. ft. air stream immediately behind the filter proper. The tabulation is from data collected at the 200 West Gate-hose, which currently is one of the higher I¹³¹ deposition regions on the site.

WEEK ENDING	FILTER (IMMEDIATE COUNT) x 10 ⁹ uc/liter	FILTER (THREE DAY DECAY) x 10 ⁹ uc/liter	SCRUBBER (DAY OF COLLECTION) x 10 ⁹ uc/liter
Jan. 28	1.5	0.3	
Feb. 4	2.4	0.4	0.4
Feb. 11	1.1	0.6	0.02
Feb. 18	1.1	0.6	0.5
Feb. 25	1.3	0.7	0.3
Mar. 4	0.3	0.3	0.3
Mar. 11	1.1	0.7	0.3
Mar. 18	0.7	0.5	

The scrubbers from Jan. 28, and Mar. 18, were lost in the Laboratory.

A comparison of the activity collected in the scrubber to the difference in the amount of activity between the first and second counts, indicates that in many cases, an equivalent amount of I¹³¹ is collected in the scrubber, as is initially deposited on the filter. If this is the case, percentage of longer half life activity that is represented in our total airborne activity measurements, would be greatly decreased as the activity collected in the scrubber has not previously been accounted for in the total activity measured. In an effort to appraise what this difference in the longer life component would be, decay studies have been extended for 38 days, a period which it is felt is sufficiently long to allow for the major I¹³¹ decay.

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Based on the filter collection only, it was found that 7.6% of the activity was long life material, whereas based on the activity found on the filter plus that in the scrubber, the percent of long life activity was 6.6% . Granting that this difference is not too great, it does show that a greater I^{131} deposition exists than our equipment previously measured.

PERCENTAGE OF LONG LIFE ACTIVITY IN AIRBORNE CONTAMINATION:

A total of twelve decay studies on filters which represented a weeks air collection in the 200 West Area shows the following decay rates and the accompanying percentage figures; the filters were counted each week, however the intervening counts are omitted as that data is deemed superfluous in this tabulation:

Date Collected: Plane		Initial Count	Count 38 days later	% Long Life
January 28	Horizontal	489	39	8.0
January 28	Horizontal	425	39	9.2
January 28	Vertical	541.1	35	6.6
January 28	Vertical *	155	10	6.3
February 4	Horizontal	807	86	10.6
February 4	Horizontal	608	77	12.7
February 4	Vertical	675	79	11.8
February 4	Vertical *	255	19	11.8
February 11	Horizontal	248	15	6.2
February 11	Horizontal	213	13	6.1
February 11	Vertical	199	9	4.4
February 11	Vertical *	64	2.4	3.8

* Represents only $1\frac{1}{2}$ cu. ft. flow, others represent 2 cu. ft. flow.

It is of interest to note the good continuity in both the total activity and the lingering long life activity for the respective weeks. Also, there apparently is no difference in the amount of activity deposited on the horizontal and vertical planes. The four filters measured per week are located at identical heights and are not over two feet apart. (I have decay curves on each.)

WASTE MONITORING

300 Area

Samples from the 300 Area waste ponds show the following beta and alpha activity for the month of March:

Location	Alpha as dis/min/liter		Beta as milli-microcuries/l	
	Average	Maximum	Average	Maximum
Old Pond Inlet	11328	16420	4.7	21.0
New Pond Inlet	7950	27900	1.0	4.8

The beta activity is somewhat higher in this period, the maximum at the old pond being higher by a factor of 40 than last month. The alpha activity is also higher by a factor of 10. Fluorophotometer analysis shows that about 16000 ug/l of U are in the old pond and about 9000 ug U/l in the new pond.

Similarly, a very wide range of results are observed on mud measurements at the old pond. The alpha activity ranges from 150 dis/min/gram to 18000 dis/min/gram on successive samples, the result depending on the selection of the sample site at the inlet. Very little of this emission is found to be uranium, the range of fluorophotometer results being from 9 ug/gram to 90 ug/gram.

Daily samples from the waste line show the beta activity to vary between 10 uuc/l to 2000 uuc/l and the alpha activity to vary between 10 and 5000 dis/min/liter. As above the fluorophotometer results only indicate that from 17 ug/l to 200 ug/liter are due to uranium. The TTA results are negative in all cases. Roughly, 20 samples are included in the above summation, all results being too widespread to strike an average from.

200 EAST AREA

'B' Ditch

Portable instrument surveys the early part of the month indicated a contamination level of around 4000 to 5000 c/m (VGM) along the B ditch inside the 200 East area along the east fence. As this ditch passes under the fence and empties into a relatively large swamp area outside the enclosure, a direct sampling program was effected in this area. It was

found that the ditch continues as an open stream for about 0.2 to 0.3 miles and then empties into a swamp area, conservatively estimated as covering an area well over a mile in circumference.

Direct samples of mud from along this ditch showed an average beta activity of 70 milli-microcuries per kg, with a maximum result of 0.3 microcuries per kg. Alpha activity averaged 9.5 dis/min/liter^{7.4} with a maximum of 23 dis/min/liter. Samples of the water showed average alpha activity of 55 dis/min/liter (max. 92 dis/min/liter) and average beta activity around 100 micro-microcuries per liter (max. 200 uuc/l). Samples taken a week later showed increased beta activity averaging around 800 uuc/liter with mud samples as high as 0.4 uc/kg, the higher readings appearing on algae containing samples.

This area is not fenced, it is hidden fro normal cross country travel and could easily be entered by any vehicle unknowingly. The swamp proper is soggy, and indicative of widespread surface seepage. It is estimated that the far perimeter of this area is roughly two miles from the east fence. On the basis of the above spot checks, it is recommended that this area be enclosed, and measures taken for preventing anyone from accidentally driving into same.

200 West Area Laundry Effluent

A special survey of the laundry effluent at the time of washing contaminated clothing gave the following alpha and beta results based on 500 cc samples:

OPERATION	BETA ACTIVITY as uuc/liter	ALPHA ACTIVITY as dis/min/lit
Inlet before washing	150	100
Wash Waster before Washing	20	7
First Rinse	24670	2970
First Soap Wash	10340	95
Second Soap Wash	2900	64
Inlet After Washing	220	26

The above table is offered for purposes of estimating the amounts of contamination that may enter the ditch and U swamp from what is normally considered a low level source.

200 AREAS

WASTE ZONES: The following table summarizes the results of the direct sampling program of waste areas.

LOCATION	Alpha dis/min/liter		B&G micro-microcuries/liter	
	Average	Maximum	Average	Maximum
T Swamp Inlet	< 30	< 30	170	160
T Swamp West Side	< 30	< 30	60	80
T Swamp So. Side	< 30	45	30	40
U Swamp West Side	40	60	20	30
U Swamp Inlet	< 30	2940**	40	960**
Laundry Ditch Inlet	55	60	800	2300
Laundry Ditch 600'	140	375	110	195
231 Ditch Pipe Outlet	< 30	< 30	15	25
231 Ditch 1st. Underpass	< 30	< 30	25	36

** Not included in average.

The activity found in the waste swamps is somewhat higher at all routine locations. The most unusual result was observed at the U swamp, a region of normal low level activity, however the observations tabulated previously in this section regarding the activity emitted from the laundry effluent can easily account for a result of this magnitude.

Mud samples secured from the T swamp show alpha activity varying from 20 to 275 dis/min/^{gm}liter, whereas the fluorophotometer results on the identical samples show 1.0 to 3.0 ug/gram. This ratio is consistent and am not able to understand the unbalance between the two. Beta activity on mud from the T swamp averages around 40 milli-microcuries per kg.

RETENTION PONDS:

Four samples from each of the retention ponds show alpha activity less than 30 dis/min/liter and beta activity around 100 uuc/liter in each area.

LAUNDRY LINT:

Three samples of laundry lint show alpha activity of 173, 37, and 1085 dis/min/gram respectively. The beta activity on these same samples was 0.16, 0.08, and 0.71 uc/kg.

INSTRUMENT SURVEYS:

Several portable instrument surveys of the ditch and swamp zones show no unusual activity. In general these areas are measured at background, with the maximum observations on a VGM being around 300 to 500 c/m/.

200 NORTH AREA:

Portable instrument surveys in this area show that around 5.0 mrep/hr or 4.0 mr/hr exist along the N ditch. The P and R Ditches average about 2 and 3 mrep/hr as measured on a beckman.

100 AREA WASTES:

107 Effluent- A total of 37 waste samples were obtained from the effluent water in the 100 Areas in the month. The following table summarizes the results of these samples: (pile shutdowns and extreme decay correction are omitted from this tabulation).

Location	Alpha dis/min/liter		Beta & Gamma uc/liter		Pu dis/min/literTT	
	Maximum	Average	Maximum	Average	Maximum	Average
107B	< 30	< 30	.388	.315	< 6	< 6
107D	< 30	< 30	.740	.335	< 6	< 6
107F	< 30	< 30	.465	.331	< 6	< 6

With the exception of the maximum observation at 100D, the activity measurements of the effluent are consistent with previous data. This one result (.740 uc/l) is an isolated high result, checking operating conditions indicates normal operation in all respects, the pile operating at

275 mw at the time.

Investigation into the pile operation, flow rates of the effluent, and calculation of the beta activity found in our samples presented the following tabulation of beta activity entering the river at the 100 Areas, for the period February 25 thru March 21, 1949.

	<u>At 100F</u>	<u>At 100D</u>	<u>At 100B</u>
Flow rate of effluent	31,500 gpm.	34,500 gpm.	31,500 gpm.
Total curies in period	1284.7	1742.3	1334.9
Average curies/day	51.4	69.7	53.4
Approx. curies Na ²⁴ /day**	46.0 to 49.0	63.0 to 66.0	48.0 to 51.0
Approx. curies long activity**	2.6 to 5.1	3.5 to 7.0	2.7 to 5.3

** These figures are based on decay studies which indicate that the Na²⁴ component is about 90% to 95% of the total activity, the long half life component being from 5% to 10% of the total. Shutdowns and startup operations are included in the summation as tabulated above.

107 EFFLUENT SULFATE ANALYSIS:

Samples submitted for sulfate analysis showed the following activity: 107B, one sample @0.9 millimicrocuries/liter, 107D average 1.0 maximum 1.2 millimicrocuries/liter, 107F average 1.3 and maximum 1.4 millimicrocuries per liter. These results are consistent with previous months analysis.

WATER SOLUBLE OIL:

One sample from 100B of Calol contained 7.06 milli-microcuries per liter. This is slightly lower than the range in which results fell last month, that range being 10 to 23 milli-microcuries per liter.

POLONIUM ANALYSIS:

Two samples were analyzed for polonium from each area; the activity was less than 6 dis/min/liter in all cases.

RAIN

Seventy-seven rain samples were collected from locations on and adjacent to the site. The following table shows the results according to the customary zone grouping:

LOCATION	Number Samples	Average Beta Activity u uc/liter	max. u uc/l. <i>max. u uc/l.</i>
Within 200 West	12	15.5	59.9
Within 200 East	12	3.3	19.1
Intermediate Zone	30	1.57	11.1
Within 100 Areas	9	0.09	0.12
Outlying Zones	14	0.07	1.25

The above table includes all results with the exception of one sample collected at North Richland. This sample showed unusually high activity, 0.12 uc/liter and it is possible that a particle may have been collected in the rainfall. Radio-autograph data is available at the laboratory for this confirmation.

It is interesting to note that the maximum off area activity collection in rain was found at the Benton City station, this sample containing 0.25 milli-microcuries per liter.

TO: J. W. Healy- W. Singleovich
cc: Jack Ehrig
From: H. J. Paas

SUPPLEMENT TO MONTHLY REPORT FOR MARCH, 1949

<u>Sample Type</u>	<u>Number Samples</u>	<u>Average Yield</u>	<u>Yield Correction</u>	
			<u>Now in Use</u>	<u>Percent Error</u>
Iodine ¹³¹	18	69.1	70.0	1.3
Non-Volatile Beta	6	126.8	100.0	21.1
Water 500cc Beta	14	111.2	100.0	10.1
Water 500cc Alpha	14	75.1	65.0	13.4
Water 3 gal. Beta	3	65.3	100.0	34.7
Water 3 gal. Alpha	3	53.1	65.0	18.3
Mud Alpha	6	73.8	65.0	11.9

The above table summarizes the results of a tabulation of the control sample data.

To: J.W. Healy-W. Singlevich
From: H. J. Paas

SITE SURVEY MONTHLY REPORT FOR THE MONTH
OF APRIL 1949

The attached report is compiled from the following number of surveys:

Water Sampling Program

Drinking Water 500cc-----	219
Drinking Water 11.7 liter -----	93
Test Wells 500cc -----	31
Test Wells 11.7 liter -----	8
Raw Water 500cc -----	32
Raw Water 50 gallon-----	1
River-----	136
Waste-----	139
Rain-----	8
Total Liquid	<u>667</u>

Air Sampling Program

Air Filters-----	87
Scrubbers-----	13
Detachable Chambers-----	564
Film Packets-----	150
Total Air	<u>814</u>

Land Sampling Program

Land Sampling Program on Area Vegetation -----	555
Off Area Vegetation -----	5
Mud -----	128
Soil -----	312
Lint-----	4
Total Land	<u>1004</u>

Instrument Surveys

Portable Instrument (land)-----	22
Portable Instrument (waste)-----	14
Mobile Instrument (test holes)-----	11
Total Instrument	<u>47</u>

TOTAL SURVEYS -----
2532

The above number of surveys were made by traveling approximately 100 miles. Road conditions allowed completion of surveys such as Wahluke, Rattlesnake, Benton Gap etc., which were inaccessible during the winter months. One new unit, a Dodge Power Wagon #10 4493 (Radio Car #89) was added to the equipment in this period.

**** DISSOLVING DATA ****

Based on the weight of uranium dissolved, a calculated 281 curies of I-131 was expelled from the separation area stacks in this period. As compared to the month of March (654 C) this figure is 42% of the previous months liberation. Of the total expelled, 166 curies were from 200 E, and 114 curies from 200 W. The figure in East compares to last months, however the total curies liberated in West Area is lower by a factor of four in this month.

Mean cooling times during the month were: 200 East, 90.4 days, 200 West 89.7 days. The dissolving summary is inclusive of operation on 4/23/49.

*** VEGETATION ***

A total of 560 vegetation samples were collected in the month of April. All samples were analyzed for that activity due to I^{131} and also for that activity which is non-volatile (long half life).

The reduction in the liberation of I^{131} during this period is directly reflected in the amount of I^{131} measured in vegetation. Of the 43 general localities from which samples are collected routinely, all but three are lower than the previous month. This reduction in activity in vegetation is most noticeable adjacent to the separation areas, especially in the vicinity of 200 W, this area also showing the greatest reduction in I^{131} liberation.

The results of the extraction of five gram samples for I^{131} is tabulated in the following table:

LOCATION	BETA ACTIVITY DETECTED BY I ¹³¹ EXTRACTION: CALC. AS uc I ¹³¹ /kg		
	AVERAGE	MAXIMUM	LAST MONTH AVERAGE
North of the 200 Areas	.002	.032	.003
Near the 200 Areas	.005	.026	.009
Rt. 3	.053	.177	.096
200 West Gate	.225	.432	.314
Meteorology Tower	.027	.087	.045
South of the 200 Areas	.003	.069	.006
Richland	< .002	.004	.003
Pasco	< .002	.004	.002
Kennewick	< .002	.004	.002
Benton City	< .002	.002	.003
Richland "Y"	< .002	.003	.003
Hanford	< .002	.005	.002
Ringold to Pasco	.002	.005	
Wahluke Slope	< .002	.006	

The same samples tabulated above were analyzed for the non-volatile beta activity. In general, minor decreases are noticeable in this months data, however as expected when compared to last months data, the long half life beta activity does not reflect the ratio reduction that the I¹³¹ does. The following table summarizes the results of the non-volatile beta activity vegetation sampling program:

LOCATION	BETA ACTIVITY (NON*VOLATILE)		CALCULATED AS uc/kg
	AVERAGE	MAXIMUM	LAST MONTH AVERAGE
North of 200 Areas	.011	.020	.011
Near 200 Areas	< .010	.026	.023
Rt. 3	.061	.162	.065
200 W. Gate	.173	.602	.233
Meteorology Tower	.017	.026	.030
South of the 200 A.	.010	.024	.013
Richland	.010	.023	< .010
Pasco	< .010	.016	< .010
Kennewick	< .010	.018	< .010
Benton City	< .010	.015	< .010

(cont'd.)

LOCATION	BETA ACTIVITY (NON-VOLATILE) AVERAGE	MAXIMUM	CALCULATED AS uc/kg LAST MONTH AVERAGE
Richland 'Y'	< .010	.014	.015
Hanford	.013	.028	.010
Ringold to Pasco	.011	.038	
Wahluke Slope	< .010	.018	

In addition to the above tabulated samples, results from thirty six locations within the separation areas showed the following activity.

LOCATION	¹³¹ I as uc/kg AVERAGE	(¹³¹ I Extraction) MAXIMUM	PREV. AVE.	Non-Volatile Beta Activity as uc/kg AVERAGE	MAXIMUM	PREVIOUS AVE.
200 East	.029	.069	.020	.033	.109	.064
200 West	.011	.056	.044	.017	.057	.060

With the exception of the ¹³¹I beta activity measured on the 200 East vegetation all measurements of beta activity inside the separation areas show significant decreases. Most noticeable is the decrease by a factor of four in the measured ¹³¹I activity in the West Area samples, this magnitude of decrease being in direct agreement with the reduced liberation in this area. Similarly, the ¹³¹I activity measured in 200 East is nearly identical with last months, again in good agreement with the dissolving data.

VEGETATION

Nineteen sample from the Goose Egg Hill region to the south and south-east of the separation areas showed average I^{131} activity of 0.019 uc/kg as compared to 0.013 uc/kg last month. The maximum I^{131} activity in this region was 0.103 uc/kg. Non-Volatile beta activity averaged 0.031 uc/kg with a maximum of 0.115 uc/kg. The previous average was 0.018 uc/kg. The averages in both cases were higher than in the past, however upon investigation of the data it is found that the variances are also higher this month. One of the contributing reasons is the sampling procedure which includes all even number posts one month and the odd the next. Post #62 which is immediately adjacent to the south east corner of 200W is continually high and is included in this survey.

Sixteen samples in the Hanford 300 Area region average .005 uc/kg I^{131} with a maximum of .012 uc/kg. The non volatile activity averaged .009 uc/kg with a maximum of .018 uc/kg. Last month these averages were .003 and .016 respectively. Analysis of data shows that there is no significant difference in the I^{131} deposition however the non volatile activity is significantly lower.

Seventy samples were obtained from the Benton Gap region of Rattlesnake Mountain. These samples were taken at elevations from the Yakima River bed (500') to the summit at 3,600'. The average results of these samples were less than the sensitivity limit for both I^{131} and non-volatile activity, the respective maximums being .004 uc/kg for I^{131} and 0.015 uc/kg for non-volatile beta. This is one of the lowest sets of results obtained from the more immediate sampling locations. Comparison to previous data is not desirous as the last time the roads permitted this trip- in early November of 1948, the beta measurements were by direct count, at

that time the average being 0.004 uc/kg. In the past an increasing deposition was observed in the plateau at around 1,800', this was not evidenced in this survey.

One hundred and two samples from the Wahluke Slope showed beta activity less than .002 for I^{131} and less than .010 for long half life. A very significant decrease in the I^{131} deposition is observed ($T = 5.3$) when this average is compared to last months 0.0025 uc/kg, however the same samples show no significant trend in the amount of non-volatile beta activity on them.

Eighteen samples from the Pasco to Ringold area averaged 0.011 uc/kg non-volatile beta activity with a maximum of .038 uc/kg, I^{131} in the same samples averaged .002 uc/kg with a maximum of .005 uc/kg. This compares favorably with last month when the average was less than .010 uc/kg for I^{131} and .003 for long half life. Also, this survey does not differ from the results of last months survey of the nearby Pasco to Eltopia region.

The results of five samples taken between Pasco and Eltopia were identical to last months results, the average beta activity in the vegetation being less than the sensitivity limits of .002 and .010 for I^{131} and non-volatile respectively. Only one sample exceeded these limits, 0.012 uc/kg was found in one non-volatile analysis.

DECAY STUDIES:

All samples that are under decay study were examined. In the case of the I^{131} samples, the decay rates are in extreme good agreement with the 8 day I^{131} decay. Many of the unusually high samples are being studies, all decay rates confirm the above and validate the analysis.

The decay studies on non-volatile beta analysis are in process,

many of these samples have not as yet decayed to the point where the half life can be appraised. In only one instance where a sample from between the 200 Areas was studied, has a half life of about 31 days been indicated. Half lifes in excess of 90 days are indicated on many samples.

2 of 4

RAW WATER-EXPORT LINES

Thirty two raw water samples were collected in the month. All samples were taken at the 183 and 283 buildings with the exception of 100H, in which case the samples are obtained at the float. The following table summarizes the results:

LOCATION	BETA ACTIVITY AS MICRO-MICROCURIES/L		ALPHA ACTIVITY AS dis/min/lit	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
183 Bldg. 100B	< 50	< 50	< 6	< 6
183 Bldg. 100D	100	175	< 6	< 6
183 Bldg. 100F	136	235	< 6	< 6
100H at Float	150	295	< 6	11
283 Bldg. 200E	< 50	55	< 6	< 6
283 Bldg. 200W	< 50	70	< 6	< 6

The measured beta activity in raw water is in the same order of magnitude as in the past, again very closely following the trend of river activity. Slightly higher results from 100H are due to the direct sampling at the float. Another of the 100H samples was studied on decay in this period and found to follow the Na²⁴ 14.8 hour half life for about 95% of the total activity. The long life activity at the end of six days is about 5% of the total, whereas after twenty days is only 2% of the total activity. This fact is interesting as the raw water in this area is available for immediate consumption. Normally, during the working hours, the water consumption in this area requires the output of two pumps which must operate continually to furnish an adequate supply. A good share of this water is used for mixing etc. thus requiring the steady output. According to the A&J. Supt., the pumped water would never be in the lines for more than 48 hours before use. An estimate on the amount of this water consumed is not available from the above source, however

all drinking fountains in the area carry this water.

The alpha activity in the export lines is below the detectable limits, only one sample showing activity in excess of 6 dis/min/liter.

DRINKING WATER

A total of 351 drinking water samples were obtained in this period. Of this total, 250 samples were of 500cc volume and 101 were large volume three gallon samples. Eight of the three gallon samples were from test wells as were thirty-one of the 500cc samples. The following table summarizes the results of the 500cc program and includes all samples which showed a result in excess of 6 dis/min/lit alpha activity of 50 uc/liter beta activity:

RESULTS OF 500cc DRINKINGWATER SAMPLING PROGRAM

LOCATION	NO. SAMPLES	ALPHA ACTIV. AS d/m/l		BETA-GAMMA uuc/l		FLUOR. AS ug U/l	
		Maximum	Average	Maximum	Average	Maximum	Average
Hanford #7, San. H ₂ O	13	7.5	<6	<50	<50	5.5	1.7
3000 Area Well B	2	17.1	8.7 ✓	<50	<50	1.7	1.7
3000 Area Durand #5	3	9.4	<6	<50	<50	1.9	1.7
Richland #13	17	15.2	7.9	<50	<50	7.8	3.9
Richland Well #2	3	10.3	7.9 ✓	115	<50	6.8	5.3
Richland Well #4	5	16.3	9.7 ✓	<50	<50	5.6	4.4
Richland Well #5	4	12.3	7.9 ✓	<50	<50	3.8	3.0
Richland Well #14	4	15.1	11.8 ✓	<50	<50	6.5	5.8
Richland Well #15	4	15.3	13.1 ✓	<50	<50	13.1	9.6
Richland Well #16	4	18.9	7.0 ✓	<50	<50	2.1	1.8
Richland Well #18	2	14.2	11.8 ✓	<50	<50	5.3	4.5
Tract House K-748	3	<6	<6	72	<50	1.2	0.8
Benton City Store	4	29.4 ②	20.6	<50	<50	12.3	10.8
Benton City H ₂ O Co.W.	4	31.4 ①	30.6	<50	<50	17.5	14.9
Chevron Sta. Cobbs Cor.	4	6.8	<6	<50	<50	2.2	1.8
Texaco Sta. Kenn.	4	6	<6	67	57 ✓	2.3	1.3
Kenn. Std. Station	4	6	<6	100	<50	0.8	0.4
Midway	5	6.1	<6	<50	<50	0.2	0.1
Wills Ranch	5	7.2	<6	<50	<50	0.3	0.3
Pasco	4	6.2	<6	<50	<50	1.4	1.0
Pistol Range	4	8.9	<6	<50	<50	2.9	2.4
300 Area San.	20	10.1	<6	<50	<50	2.6	1.3
White Bluffs City	2	15.7	14.1 ✓	<50	<50	7.5	7.5
San. H ₂ O 100H	11	12.4	8.3 ✓	260	75 ✓	9.5	4.5
300 Area Well #1	5	14.4	<6	<50	<50	3.3	1.7
300 Area Well #2	5	33.3	16.1	<50	<50	7.1	3.4
B-Y Well	4	6.1	<6	<50	<50	3.9	2.8
Spring #13	4	8.7	<6	<50	<50		
Snively Ranch	1	9.6	9.6	<50	<50		
J. Ehrig El-Rancho	3	<6	<6	<50	<50	12.1	5.2
Foster's Ranch Well	4	23.0	10.1	<50			

RESULTS OF LARGE VOLUME DRINKING WATER SAMPLING

LOCATION	NO. SAMPLES	ALPHA ACTIV. AS d/m/l		BETA-GAMMA uuc/l		FLUOR. AS ug U/l	
		Maximum	Average	Maximum	Average	Maximum	Average
Col. Camp	3	3.1	1.8	<10	<10		
Headgate	3	2.8	1.8	<10	<10		
3000 Area Well A	3	3.7	3.0	<10	<10	1.1	1.0
3000 Area Well C	2	2.9	2.1	<10	<10	1.2	0.9
3000 Area Well D	1	3.9	3.9	<10	<10		
3000 Area Well E	3	2.9	2.0	<10	<10	0.5	0.3
3000 Durand #5	3	4.7	4.3	<10	<10	1.9	1.7
Richland Well #13	3	3.5	2.4	<10	<10	7.8	3.9
Richland Well #2	3	8.1	5.8	<10	<10	6.8	5.3
Richland Well #4	2	7.7	7.4	<10	<10	5.6	4.4
Richland Well #5	3	5.0	3.4	<10	<10	3.8	3.0
Richland Well #12	1	8.3	8.3	<10	<10		
Richland Well #14	2	13.3	10.4	<10	<10	6.5	5.8
Richland Well #15	3	7.8	4.7	<10	<10	13.1	9.6
Richland Well #16	3	4.5	3.1	<10	<10	2.1	1.8
Richland Well #18	3	9.7	8.2	<10	<10	5.3	4.5
Tract House K-748	3	3.8	2.4	<10	<10	1.2	0.8
Tract House J-685	2	2.1	1.6	<10	<10	1.4	1.0
Benton City Store	3	29.2	24.5	13.2	<10	12.3	10.8
Benton City H ₂ O Co.	3	33.2	16.3	<10	<10	17.5	14.9
Chevron Sta. Cobbs C.	4	10.4	5.0	<10	<10	2.2	1.8
Tex. Sta. Kenn.	2	3.0	2.1	19.4	15.4 ✓	2.3	1.3
Kenn. Std. Sta.	2	2.2	1.7	19.7	16.9 ✓	0.8	0.4
Barrott's Assoc. S.	3	<1		11.7	<10	0.4	0.1
Riverland	4	3.2	1.5	<10	<10	1.4	0.8
Midway	2	2.2	1.8	<10	<10	0.2	0.1
Lower Knob	3	1.3	<1	<10	<10		
Wills Ranch	3	1.3	1.1	10.6	<10	0.3	0.3
Pasco	3	1.7	1.6	2.4	2.1 ✓	1.4	1.0
Pistol Range	4	5.1	3.4	<10	<10	2.9	2.4
White Bluffs Ice H.	1	1.9	1.9	<10	<10		
White Bluffs City W.	3	15.6	8.8	<10	<10	7.5	7.5
B-F Well	2	7.5	7.4	<10	<10	3.9	2.8
Spring #13	3	1.1	<1	19.1	<10		
Rattlesnake Spring	1	2.2	2.2	<10	<10		
McGee Well	1	<1		<10	<10	0.4	0.4

The frequency of three gallon samples was greatly increased in this period, the reason being that a better appraisal of the total alpha and uranium content in drinking water supplies can be made if the greater accuracy and sensitivity which larger volume samples offer is used for the basis of this appraisal.

The presence of uranium at all locations showing positive alpha content is definite, in this months data. The areas showing positive average alpha contamination are confined to the Richland, Benton City, and White Bluffs region; each of these zones showing that this activity is nearly entirely uranium. An increase at Richland Well # 18 has been observed in this period, however it again must be considered part of the underground Richland system which shows positive alpha activity due to uranium at nearly all wells sampled.

Two former wells which continually showed alpha activity were placed out of service in this period, White Bluffs #Q1439 & Q1440 being dismantled on 3/31/1949. In addition Well #1515 at White Bluffs was placed in standby condition. Currently the entire WB area is being serviced by the export line.

The beta activity in drinking water supplies is better appraised from the 500cc samples which possibly portray this activity more accurately due to the short time delay between sampling and analysis. As in the past, the two Kennewick supplies and the Pasco supply show measurable beta activity which has its source in the Columbia River. Beta activity at these locations is barely above our detection limits and currently is lower than in the past. Beta Activity detected at LOOH sanitary water is traced to the river, the system being explained under the raw water section of this report.

RIVER SAMPLING

Table 1 below

Forty-five routine samples were obtained from the Columbia River this month. A near two-fold increase in the flow rate occurred during April, the average for the month being about 700,000 gps. with a peak flow measured on the 20th of 1,298,000 gps. This increase is weighted at the end of the month as the reading on 4/13 was only 698,000 gps. (Incidentally, last year a flow rate of 1,300,000 was measured on May 3rd. so the current rise is about two weeks ahead of last year.) As this rise occurred at the end of the month, the effect of the added dilution is not as noticeable as would be normally expected. All locations show decreasing beta activity, most noticeable being the Hanford cross-section location, at which very significant decreases are noticed at each bank, but the center of the river shows nearly identical average beta activity as did last month. This is a good indication of a flow or current build-up in the center of the river.

Alpha activity in the river is negligible, only two positive results being obtained in the period. These were at the downstream P-K Bridge locations, their order of magnitude barely exceeding the sensitivity level. Fluorophotometer analysis show that all samples contained less than 1 ug U per liter.

The following table summarizes the results of the Columbia River sampling program.

LOCATION	ALPHA dis/min/liter		B&G MICRO-MICROCURIES PER LITER	
	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE
Wills Ranch	< 6	< 6	< 50	< 50
Above 100B	< 6	< 6	< 50	< 50
181 B	< 6	< 6	< 50	< 50
181 D	< 6	< 6	785	465
181 F	< 6	< 6	1020	625

See - (next page - Full table in HW 12984 p. 4.)

LOCATION	ALPHA dis/min/liter		B&G MICRO-MICROCURIES PER LITER	
	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE
Hanford S. Bank	< 6	< 6	2170	1310
Hanford Middle	< 6	< 6	2040	1210
Hanford N. Bank	< 6	< 6	620	480
300 Area	< 6	< 6	460	360
Richland	< 6	< 6	495	250
P-K Bridge (Kenn. Side)	7	< 6	140	140
P-K Bridge (Pasco Side)	6	< 6	260	205

FOSTERS RANCH:

Four samples obtained from the shore at Foster's Ranch on the other side of the river show maximum beta activity of 355 uuc/liter with a monthly average of 225 uuc/liter. The alpha activity at this location is less than 6 dis/min/liter.

YAKIMA RIVER:

Four samples from each of two locations at the mouth of the Yakima show average beta activity of less than 50 uuc/liter at each location. Maximum beta activity measured was 105 uuc/liter. As the power dept. takes these samples, it appears that the location may vary, the results showing activity coming from farther out in the Columbia, while those that are negligible come from the Yakima itself. Alpha activity was less than 6 dis/min/liter on all samples.

Samples from the Yakima Horn show beta activity less than 50 uuc/liter on all samples. One sample showed alpha activity of 6 dis/min/liter. A sample obtained late in March from the Horn counted 14 c/m which is indicative of beta activity. Decay study on same sample showed a half life of thirteen days which is much different than any study in the past. No duplicates confirmed the above activity and it is possible that we may have a lab contaminated sample.

DOWNSTREAM COLUMBIA:

The cross section study of the Columbia River which was completed for that part of the river between the 100B Area and the 300 Area during the month of March, was extended downstream to the Pasco-Kennewick Bridge in this period. Seventy-five samples were taken at fifteen cross-section locations, each cross section consisting of five individual samples. The results of this survey are combined with the upper Columbia survey previously reported and are portrayed on Figure_____ which shows the river concentrations and dispersion for a flow rate of about 430,000 gallons per second.

The results of the beta activity measurements at this time indicate that a rather uniform dispersion becomes existent in the vicinity of the 300 Area, the average activity at this point being around 400 uuc/liter. A comparison of samples on the two shores in the region between 300 Area and Richland indicates slightly higher activity on the west bank (project side), however this difference is not significant and is in the order of around 75 uuc/liter. Very little decrease in the average activity is observed in the six miles between the 300 Area and Richland, the cross-section average at the Richland dock being 325 uuc/liter.

Immediately below Richland, at the point where the Yakima River enters the Columbia, a very significant change in the contamination pattern results. The activity is pushed to the far (east) bank by the Yakima, the uncontaminated water from the Yakima flowing down the west bank and middle of the Columbia. A better appraisal of this beta activity shift can be had from the following two comparisons:

LOCATION	NUMBER SAMPLES	AVERAGE uuc/l	MAXIMUM uuc/l	'T' Test	CONCLUSION
East Side Above Yakima	16	345	495	1.44	No difference-uniform distribution, with occasional high on west
West Side Above Yakima	24	386	595		
East Side Below Yakima	14	306	381		
West Side Below Yakima	21	226	363	4.67	East side significantly higher than west below Yakima River.

total 75

According to the above data, it appears that we cannot assume continued uniform distribution of the beta activity, even though it is once established. The dilution effect of the Yakima according to this data varies from around 50% on the extreme west bank to zero on the far east bank. Currently, the flow rates are 68,000 gps. in the Yakima and 1,298,000 gps. in the Columbia. A similar study at the mouth of the Snake is contemplated.

In general, the alpha activity as measured by direct count was negligible, only four results in excess of 6 dis/min/liter; these were values of 6.7, 6.8, 6.6 and 9.3. It is of interest to note that negative results are nearly equal and randomly mixed above the Yakima, whereas immediately below the Yakima mouth from the center to the east bank a solid series of 17 positive (above zero) alpha results occur. Granting that the order of magnitude is barely measurable, this block of results is unusual in the data and also very closely parallels the beta activity trend below the Yakima.

Several of the above samples were placed on decay study, in most cases the total activity was reduced by slightly more than a factor of two which is in good agreement with similar studies on previous data.

Very noticeable is the amount of long half life material remaining at the various locations, this being in the order of 3 to 5 c/m in each case. Roughly this component accounts for around 4 to 5% of the total activity in the vicinity of 300 Area, and about 9% of the total activity near Pasco.

RIVER MUD SAMPLING

Seventy-two mud samples were obtained from the banks of the Columbia. Samples were analyzed for beta, alpha (EE), and uranium. The following table summarizes the results for the month of April:

LOCATION	NO. SAMPLES (Ea.Loc.)	BETA ACTIVITY IN MILLI-MICROCURIES PER KILOGRAM		FIVE FEET FROM SHORE	
		ONSHORE MAXIMUM	SAMPLES AVERAGE	MAXIMUM	AVERAGE
Near Wills Ranch	4	14.6 15	12.7	20.6	13.9
Allard Pump Sta.	4	15.2 15	12.9	44.7	18.1
At 100H Area	4	18.0 18	10.0	15.8	11.4
Below 100F Area	4	20.7	15.5	14.9	9.3
Richland Dock	4	13.2	8.7	16.7	12.3
At 300 Area	4	25.0	12.3	14.1	12.7
P-K Bridge Pasco	4	25.8	15.5	15.8	10.3
P-K Bridge Kenn.	4	13.4	10.1	15.8	12.3
Hanford Ferry	4	16.4	15.6	20.7	16.7

Table II

Previous data has indicated a slightly higher beta content in the mud along the Columbia River in the vicinity of the 300 Area. In an effort to establish the validity of these few indications, a special survey consisting of 34 mud and soil samples were taken on 3/29/49. Mud samples from one mile above 300 Area, 300 Area opposite the new pond, 300 Area opposite the old pond, and at 3000 Area showed no difference between them. The average beta content in the mud was 0.013 uc/kg with a maximum of 0.016 uc/kg, each figure in very good agreement with observations made at other locations. Soil samples taken on shore and at 10 to 20 ft. increments back from shore showed no difference among them in addition to no difference between the sets of samples from the same above mentioned locations. The average of 26 soil samples was 0.011 uc/kg which is nearly identical to the average

soil activity on the site which is 0.010 uc/kg. From this survey it is indicated that there is no unusual or excessive beta activity on or adjacent to the shore in the vicinity of the 300 Area. Also, the mud samples were analyzed for alpha activity, this activity being negligible and well below the usual reporting level of 6 dis/min/gram.

AIR MONITORING

A summary of the average dosage rates measured using detachable ionization chambers is tabulated in the following table:

LOCATION	AVERAGE mrep/24 hrs.	
	April 1949	March 1949
<u>100 Area & Environs</u>		
Route 1, Mile 8	0.47	0.45
Route 2N, Mile 10	0.42	0.31
Route 2N, Mile 5	0.34	0.44
At White Bluffs	0.53	0.76
Route 11A, Mile 1	0.86	0.71
Hanford 614 Bldg.	0.48	0.48
Intersection Rt.1 & 4N	0.38	0.52
Hanford 101 Area	0.46	0.49
<u>Within 5 Miles 200 East</u>		
Route 4S, Mile 6		
Route 11A, Mile 6		
Route 3, Mile 1	1.2	0.78
Meteorology 200'	0.89	1.04
234-235 Area	0.40	0.51
<u>Within 10 Miles 200 East</u>		
Route 4S, Mile 10	.94	0.62
Route 10, Mile 1	.82	0.93
Route 2S, Mile 4	1.63	0.92
<u>Near 300 Area</u>		
Route 4S, Mile 16	1.27	0.60
Route 4S, Mile 22	0.54	0.75
3000 Area No.	0.48	< 0.48
3000 Area So.	0.55	< 0.48

Table III

<u>Outlying</u>	April	March
Benton City	0.48	0.48
Richland	1.06	0.48

With the exception of the Rt. 2S, Mile 4 and Rt. 4S, Mile 16 locations, the airborne dosage rates as measured by detachable M&S Chambers show no significant trend. The above mentioned locations show increases about twofold, the current averages being about three times that of background for this type chamber.

Chamber maintenance remains behind schedule due to vacations and sickness in the group, this reason accounting for the missing data from two locations. The 105Dr and Batch Plant locations are discontinued due to the lack of construction personnel in the respective areas.

In addition to the dosage rates measured using ionization chambers, the following dosage rates were recorded using integrons and 'C' Chambers:

<u>LOCATION</u>	<u>INTEGRONS</u>		<u>'C' CHAMBERS</u>	
	Average dose in mrep/24 hours		April	March
	April	March	April	March
100B Area	0.8	0.6	0.3	0.3
100D Area	0.2	0.1	0.3	0.4
100f Area	0.4	0.2	0.4	0.4
200 West A.	0.1	0.2	0.5	0.4
200 East A.	0.1	0.4	0.5	0.5
Riverland	0.5	0.3		
Hanford				
300 Area	< 0.1	< 0.1	0.5	0.5
700 Area	0.1	0.1		
Kennewick	0.7	0.5		
Pasco	≥ 0.1	1.1		

Table IV

<u>LOCATION</u>	April	March
Benton City	0.1	0.1
3000 Area North	0.1	0.1
3000 Area South	0.1	0.1

Integron data shows very little trend, and is in good agreement with the previous data. With the exception of Kennewick, all residential areas are well below the measurable dosage rates on the integrons. 'C' chamber averages are nearly identical to these measured the previous month.

The following results for beta and gamma activity were obtained by the use of air filtering devices during the month of April, 1949.

<u>LOCATION</u>	Monthly Average in Units of uc/liter	Maximum Eight Hour Period Concentrations in uc/liter
200 East, SE Corner	1.1×10^{-9}	$< 1.0 \times 10^{-7}$
200 West, Twr. # 4	1.2×10^{-9}	2.2×10^{-7}
Gable Mountain	6.3×10^{-10}	$< 1.0 \times 10^{-7}$
Richland	1.0×10^{-10}	$< 1.0 \times 10^{-7}$
Pasco	5.0×10^{-11}	
300 Area	2.2×10^{-10}	
200 East Twr. 16	2.0×10^{-9}	
100 D Area	1.0×10^{-10}	
200 West Gate	2.5×10^{-10}	1.0×10^{-7}
Benton City	1.3×10^{-10}	
Hanford 614 Bldg.	9.0×10^{-11}	
105 DR Const. Zone	5.0×10^{-11}	
Hanford 101 Bldg.	1.2×10^{-10}	
White Bluffs	3.0×10^{-11}	
3000 Area North	1.5×10^{-10}	
3000 Area South	1.0×10^{-10}	
200 West Twr. # 15	1.4×10^{-10}	

Table IV

Airborne concentrations, as measured by air filters continue to remain in the order of $\text{uc/liter} \times 10^9$ in the separation areas and around 1.0×10^{-10} uc/liter in the residential areas. The new printing register has been installed in 200 ESE and currently is working satisfactorily. A prevalence of power outages on the outside lines in this area has hindered our experimental studies on this instrument.

Supplementing the routine air filter program tabulated above I^{131} scrubbers have been installed during the past month at four additional locations. For the period in which the scrubber-filter combinations have been operating, the following table summarized the respective beta activities collected by each method, (it must be remembered that the scrubber and filter are in series, the air stream passing thru the filter previous to entering the scrubber.)

LOCATION	Ave. Beta Activity on Filter uc/liter $\times 10^{-10}$	Ave. Beta Activity in Scrubber uc/liter $\times 10^{-10}$
200 WEC (4)	2.6	1.9
700 Area (2)	0.8	0.3
300 Area (3)	0.7	0.4
200 ESE (3)	1.4	3.4
Benton City (1)	< 0.1	< 0.1

() Parenthesis indicate number of weeks operation at each location.

From the above data it is evident that in low airborne activity zones, the scrubbers collect around 50% additional beta activity when compared to the filter collection. In higher activity areas it appears that this ratio increases, in the most unusual case (200ESE) over twice as much beta activity as I^{131} was collected in the scrubber as was the total beta activity collected on the filter.

Decay studies available on the scrubber activity confirm I^{131} activity, one filter counting 255 c/m in early February currently counting 13 c/m. Straight 8 day decay would show a current count of 5 c/m.

Additional scrubber installations are being withheld at present due to the evaporation problem and the inaccessability of the locations in which we would like to make the new installations.

AIR SAMPLING

Background measurements: A number of measurements of the background around the site were made by taking ten minute counts with a portable scaler at the various locations. The average background was 56 c/m $\pm$ 5 c/m whereas the individual observations are best appraised as follows:

LOCATION	c/m	LOCATION	c/m
101 Building	44	Prosser Barricade	60
200 West A.	55	Rt. 2S, Mile 4	61
200 East A.	46	Rt. 11A, Mile 4	53
300 Area	45	Rt. 4S, Mile 0	51
Int. 4S & 2S	52	Rt. 1, Mile 3	66
100 F Area	47	100 B area	76
100 D Area	47	Riverland	57
Kadlec Hosp.	51	Yakima Barricade	51
Benton City	57	Benson Ranch	79
2707EA outside	64	2707EA inside	46

The error on these can be considered plus or minus 5 c/m in all cases.

SOIL SAMPLING

Three hundred and twelve soil samples were obtained this month from the same locations at which the routine vegetation samples are taken. Currently the soil sampling program is effected once every three months, this data representing the second quarter of 1949. These samples indicated tracer beta activity, possibly all due to natural occurring beta emitters (K^{40}). An analysis of the data indicated that the accumulated results nearly perfectly fits a normal distribution with an average beta activity of 0.010 uc/kg for all samples taken. The range of these results was from 0.001 uc/kg to 0.020 uc/kg, with over 50% of the results falling between 0.007 uc/kg and 0.015 uc/kg.

All special groups of soil samples were tested in respect to the overall beta activity in soil, the only set of samples showing any significant difference from the entire population was those samples secured from the Benton Gap region of Rattlesnake Mountain. An average beta activity of 0.007 uc/kg for 24 samples from this area was significantly lower than all other results ($T = 3.18$). This fact closely follows the current beta activity on vegetation in this region, which is the lowest of any of the nearby locations.

LOCATION	NUMBER SAMPLES	AVERAGE uc/kg	MAXIMUM uc/kg
Pasco to Ringold	7	0.013	0.018
Benton Gap	24	0.007	0.014
Goose Egg Region	7	0.011	0.015
Pasco to Eltopia	5	0.010	0.018
Wahluke Plateau	35	0.011	0.016
All Samples (site)	312	0.010	0.020

RAIN SAMPLING

Only one measurable rainfall was recorded at the Meteorology Station during the month of April, at which time 0.06" fell. Three other instances of tracer (unmeasurable) rainfall occurred. As a result of the abnormal dryness, only eight rain samples were collected, four of these coming from off area locations. A tabulation of these eight samples follows:

LOCATION	BETA ACTIVITY uc/liter	LOCATION	BETA ACTIVITY uc/liter
Benton City	8.0×10^{-5} uc/l	Meteorology Twr.	8.0×10^{-3} uc/l
Benson Ranch	6.0×10^{-5} uc/l	Rt. 4S, Mile 6	0.18 uc/l
Pasco	1.0×10^{-5} uc/l	Hanford	1.1×10^{-3} uc/l
Riverland	1.0×10^{-5} uc/l	Hanford	4.8×10^{-4} uc/l

With the exception of the sample from Rt. 4S, Mile 6, all above results are very low. This one sample was a very small volume collection which counted 80 c/m, the volume correction to a liter basis greatly magnifying the beta concentration. The sample was submitted to radioautograph, the results of same not being available at this writing.

WASTE MONITORING

Samples from the 300 Area waste ponds show the following beta and alpha activity for the month of April:

LOCATION	ALPHA as dis/min/liter		BETA as milli-microcuries /l	
	Average	Maximum	Average	Maximum
Old Pond Inlet	2700	13000	0.11	.30
New Pond Inlet	270	830	0.20	.40

The average beta activity at each of the ponds has decreased in this period, this decrease ranging from a factor of 5 to 40, these current averages being more in line with the monthly averages earlier this winter. The alpha activity trends lower along with the beta activity, the only high result being obtained on one sample from the old pond which is the maximum value listed in the table. This high result magnifies an otherwise very low average for this location.

Fluorophotometer analysis of samples from each pond indicates that the average uranium contents are: 340 uc/l in old pond and 75 uc/liter in the new pond. Individual analysis showed maximum uranium concentrations of 650 ug/liter in the old pond.

Four mud samples were taken from the old pond inlet; the alpha activity averaged 9400 dis/min/gram with a maximum of 15,000 dis/min/gram, fluorophotometer analysis confirms the uranium content as an average of 6700 ug/gram with a maximum of 9700 ug/gram. The beta activity on the same samples averaged 1.4 uc/kg with a maximum result of 3.1 uc/kg.

Twenty-three samples from the 300 Area waste line in this period show the usual amount of fluctuation in the individual results; the beta activity ranging from less than 1 uuc/liter to over 600 uuc/liter with an average of about 100 uuc/liter. Alpha activity varied from 50 dis/min/liter to 2300 dis/min/liter in individual samples. This activity

is accounted for as uranium in many cases, however, TTA analysis showed an excessive concentration (210 dis/min/liter) of Plutonium in one sample. The uranium analysis varied from around 10 dis/min/liter per sample to 1500 dis/min/liter maximum.

Location	ALPHA		200 A R E A S FLUOROPHOTOMETER		BETA	
	dis/min/liter		ug/liter		uuc/liter	
	AV.	MAX.	AV.	MAX.	AV.	MAX.
"T" Swamp						
Inlet (5)	< 30	< 30	< 4	< 4	< 50	80
West Side (5)	< 30	67	< 4	< 4	370	1700
South Side (5)	< 260	1200	< 4	< 4	60	90
	87					
"U" Swamp						
Inlet (5)	< 30	40	16	25	380	1800
West Side (5)	42	100	30	40	< 50	130
Laundry Ditch						
Inlet (5)	78	270	140*	420	60	110
600' from Inlet (5)	63	150	64*	240	< 50	120
231 Ditch						
Pipe Outlet (5)	< 30	48	< 4	< 4	< 50	70
1st. Underpass (5)	< 30	< 30	< 4	< 4	< 50	110
234-235 Ditch						
Pipe Outlet (3)	< 30	< 30			< 50	< 50
Retention Ponds						
200 East (1)	< 30	< 30			180	180
200 West (0)						
200 E "B" Ditch						
Inlet (3)	< 50	< 50			140	360
1st. St. Underpass (3)	34	92			66	110

() Parenthesis shows number of samples analyzed.

* High average results from the one high result.

The above table summarizes the results of the direct sampling program in the Waste Areas.

In general the results from the waste areas is within the normal range of expectancy. Somewhat higher than usual were results on individual samples analyzed for alpha activity from the south side of the "T" Swamp, those that were higher in beta activity were from the "U" Swamp inlet and the "T" Swamp west side. None of the individual highs were confirmed

on the subsequent samples. More unusual were the results of fluorophotometer analysis on samples from the laundry ditch which showed uranium present to the extent of 420 ug/liter at the inlet and 240 uc/liter 600' below the inlet. These results again show that the laundry ditch is a possible zone of excessive contamination and tend to confirm the results of spot checks made and reported last month when samples were taken at a time when it was a known fact that excessively hot clothes were being washed.

In addition to the liquid samples, 22 samples of mud were obtained from the edge of the waste zones. The following results were obtained:

<u>Location</u>	No.	Alpha Activity dis/min/grm.		No.	Beta Activity uc/kg	
		Average	Maximum		Average	Maximum
T Swamp						
So. Side	4	170	250	4	0.052	0.118
West Side	5	310	630	4	0.067	0.141
		<u>280</u>				
234-235 Area						
Pipe Outlet	3	<30	<30	2	0.006	0.008
B Ditch						
Inlet	3	43	120	3	0.141	0.233
Underpass	3	<30	<30	3	0.168	0.307

Four samples of laundry lint were collected in the West Area, average alpha activity on these samples was 280 dis/min/liter with a maximum result of 570 dis/min/liter. The beta activity on these same samples averaged 0.166 uc/kg with a maximum of 0.317 uc/kg. Portable instrument surveys of the test holes in West Area showed the 'E' hole to be about six times above background, counting around 300 c/m/. This is consistent with previous results at this locations.

Four surveys of the T swamp and ditch, using portable instruments showed maximum counting rates around 200 to 250 c/m on the edge of the waste areas.

Four surveys around the laundry ditch using portable instruments showed maximum readings of 260 c/m around the ditch, with one reading of 500 c/m on the mud at the 600' below the inlet location.

One survey of the ditches in the 200 north area showed that the dosage rates around the ditches ranges from 1 to 5 mrep/hr., the higher readings being obtained around the N ditch.

100 AREA WASTES

107 Effluent- A total of 34 waste samples were obtained from the effluent water in the 100 Areas in the month. The following table summarizes the results of these samples:

Location	Alpha dis/min/liter		Beta & Gamma uc/liter		Pu dis/min/liter		TTA
	Maximum	Average	Average	Maximum	Average	Maximum	Maximum
107B	30	36	.433	.888	< 6	< 6	
107D	48	390	.404	.660	< 6	< 6	
107F	51	410	.388	.674	< 6	< 6	

One sample from each area showed unusual alpha activity, which is strongly suspected to be a laboratory contamination, as resampling did not confirm the activity. Fluorophotometer and TTA analysis on several samples from each area were negative. These alpha results are included above because they were common to each area. If these maximums were omitted, all averages would be well below 30 dis/min/liter.

Unusually, high beta averages were prevalent in the 107 samples, the current averages being higher than any previous monthly average during the years of 1948 and 1949. The maximum results are also higher than the far majority of previous maximums recorded, only 100D has ever been greater than current maximum. No operational changes explain this increase, however some indication of slightly higher readings have been observed in

other periods but were not of this magnitude nor were they simultaneous in each area.

Based on the flow rates and the beta activity measured in the samples tabulated above, the following table summarizes the calculated number of curies of Na^{24} and long activity which are currently being emptied into the river from the 107 basins. (Based on 90% to 95% Na^{24} in total activity)

	At 100F	At 100D	At 100B
Flow rate of effluent	31,500 gps.	34,500 gps.	31,500 gps.
Total curies in period	1716	2128	2229
Average curies/day	68.6	76.0	74.3
Approx. curies Na^{24} /day**	61.0 to 65.0	68.0 to 72.0	67.0 to 71.0
Approx. curies long activity**	3.4 to 6.9	3.8 to 7.6	3.7 to 7.4

107 Sulfate Analysis:

One sample submitted from each area showed the following activity; 100B, 3.0 milli-microcuries per liter; 100D, 3.0 milli-microcuries per liter; 100F, 2.3 milli-microcuries per liter.

Polonium Analysis:

One sample from 107F was analyzed for Polonium, this sample showing less than 6 dis/min/liter.

Dryer Room Condensate:

Three samples from 100B showed average sulfate to be 1.3 uc/ml with a maximum of 2.2 uc/ml. Total beta on these same samples average 0.45 uc/ml with a maximum of 0.62 uc/ml.

Calol Analysis:

One calol sample from 100B contained beta activity of 0.7 uc/liter. This was the only calol sample received.

To: J. Healy-H. Singievic
From: H.J. Paas

SITE SURVEY MONTHLY REPORT FOR THE
MONTH OF MAY 1949

The attached report is compiled from the following number of surveys:

WATER SAMPLING PROGRAM

Drinking Water 500cc-----	229
Drinking Water 11.7 liter-----	77
Test Wells 500cc-----	31
Test Wells 11.7 liter-----	10
Raw Water 500cc-----	40
River-----	103
Waste-----	144
Rain-----	29
Total Liquid	<u>663</u>

AIR SAMPLING PROGRAM

Air Filters-----	83
Scrubbers-----	20
Detachable Chambers-----	592
Film Packets-----	128
Total Air	<u>823</u>

LAND SAMPLING PROGRAM

On Area Vegetation-----	612
Off Area Vegetation-----	27
Mud-----	109
Soil-----	8
Lint-----	4
Total Land	<u>760</u>

INSTRUMENT & MISC.

Portable Instrument (land)-----	22
Portable Instrument (waste)-----	14
Smears-----	40
Total Instrument	<u>76</u>

TOTAL SURVEYS_____ 2322

The above number of surveys were made by traveling approximately 8200 miles. In addition to the road miles, about six miles were made on the river. Only one off area trip was made in the month, this trip being to Ellensburg.

DISSOLVING DATA

Basing the calculations on the weight of uranium dissolved and the interval cooling period, the amount of radioactive I ¹³¹ liberated in the dissolver increased this month. The magnitude of increase in each area was about a factor of 1.3 in 200 East and 1.9 in 200 West. The cooling period for each area was nearly identical to that in the month of April. This tabulation includes the operation of 5/23/49.

VEGETATION SAMPLING

A total of 639 vegetation samples were collected in the month of April. All samples were analyzed for that activity due to I ¹³¹ and also for that activity which is non-volatile (long half life).

The above mentioned increase in I ¹³¹ liberation is not reflected in the I ¹³¹ activity measured on vegetation samples, all locations showing a decrease in this activity for the month of May. Currently, the average I ¹³¹ activity on vegetation is less than .002 uc/kg at all routinely monitored locations that are more than five miles distant from the separation areas. The following table includes the results of the extraction of five gram samples and subsequent measurement for radioactive iodine:

BETA ACTIVITY DETECTED BY I ¹³¹ EXTRACTION: CALC. AS ^{mc} ~~μc~~ I ¹³¹/kg

LOCATION	AVERAGE		MAXIMUM		LAST MONTH AVERAGE	
No. of the 200 Areas	<.002	< 2	.004	4	.002	2
Near the 200 Areas	.002	2	.019	19	.005	5
Rt. 3	.036	36	.163	163	.093	93
200 West Gate	.063	63	.158	158	.225	225
Meteorology Tower	.021	21	.033	33	.027	27
South of the 200 Areas	<.002	< 2	.014	14	.003	3
Richland	<.002	< 2	.002	2	<.002	< 2
Pasco	<.002	< 2	.002	2	<.002	< 2
Kennewick	<.002	< 2	<.002	< 2	<.002	< 2
Benton City	<.002	< 2	.002	2	<.002	< 2
Richland "Y"	<.002	< 2	<.002	< 2	<.002	< 2
Hanford	<.002	< 2	.002	2	<.002	< 2
Ringold to Pasco	<.002	< 2	.003	3	.002	2
Wahluke Slope	<.002	< 2	.007	7	<.002	< 2

Table VI

The same samples tabulated above were analyzed for the non-volatile beta activity. In general, minor decreases are noticeable in this months data, however as expected when compared to last months data, the long half life beta activity does not reflect the ratio reduction that the I ¹³¹ does. The following table summarizes the results of the non-volatile beta activity vegetation sampling program:

LOCATION	BETA ACTIVITY(Non-Volatile)		CALCULATED as ^{mc} μc /kg	
	AVERAGE	MAXIMUM	LAST MONTH AVERAGE	MAY
N. of 200 Areas	<.010	< 10	.020	20
Near 200 Areas	.010	10	.034	34
Rt. 3	.025	25	.084	84
200 W. Gate	.027	27	.045	45
Meteorology Tower	.022	22	.030	30
S. of the 200 Area	<.010	< 10	.018	18
Richland	<.010	< 10	.014	14
Pasco	<.010	< 10	.014	14
Kennewick	<.010	< 10	.013	13

Table VII

(see next page also)

(cont'd.)

muc/kg

LOCATION	BETA ACTIVITY (Non-Volatile)		CALCULATED as $\mu\text{C}/\text{kg}$		LAST MONTH AVERAGE	
	AVERAGE	MAXIMUM				
Benton City	<.010	<10	.022	22	<.010	<10
Richland "Y"	<.010	<10	.011	11	<.010	<10
Hanford	<.010	<10	.013	13	.013	13
Ringold to Pasco	<.010	<10	.016	16	.011	11
Wahluke Slope	<.010	<10	.034	34	<.020	<10

In addition to the above tabulated samples, results from thirty six locations within the separation areas showed the following activity.

LOCATION	I ^{131}I as $\mu\text{C}/\text{kg}$		(I ^{131}I Extraction)		Non-Vol. Beta Activity as $\mu\text{C}/\text{kg}$		
	AVERAGE		MAXIMUM	PREV. AVE.	AVERAGE	MAX.	PREV. AVE.
200 East	.010	10	.034	34	.010	10	.021 21 .033 33
200 West	.002	2	.016	16	.010	10	.027 27 .017 17

The decrease observed in beta activity inside the separation areas is again found in this months data. Currently the averages for both I ^{131}I and non-volatile activity are at the limit of sensitivity of the counters. Maximum long life activity results were nearly identical in each area indicating that the differences observed last winter are now in much better agreement.

This general decrease in the overall activity can only be explained by the fact that effective around the first of May, the separation areas were not allowed to dissolve unless the dilutions were at least 1000:1. It has been observed that dilutions less than 1000:1 occur less than 10% of the normal dissolving hours and granting that this would greatly contribute to despositing the emitted activity over a larger and more remote area, it does not seem to entirely account for the observed decreases which have occurred in a month when the total curies liberated were increasing. Secondly, no increases in beta activity have been observed at the more remote locations during the month. Additional checking into the possibility of process changes or technical manipulations which may account for the observed decrease show no contributing evidence.

Nineteen samples from the Goose Egg Hill region show a significant decrease in the beta activity measured; I ¹³¹ activity averaging .002 uc/kg as compared to last months .019 uc/kg and the non-volatile activity currently averaging less than .010 uc/kg as compared to a previous average on .031 uc/kg. The maximum results for I ¹³¹ and non-volatile activity were .005 and .018 uc/kg respectively. The current level of beta activity in this region is lower than that found on any previous survey.

Sixteen samples from the 300 Area to Hanford cross country survey show the I ¹³¹ and non-volatile beta activity to be less than the measurable limits of .002 uc/kg and .010 uc/kg respectively. These averages are in agreement with the past month at which time the only measurable beta activity was the I ¹³¹ which averaged .005 uc/kg. The maximum results were I ¹³¹ .002 uc/kg and non-volatile .013 uc/kg.

The I ¹³¹ activity in the Pasco to Eltopia region continues to be below the measurable limits of .002 uc/kg whereas the non-volatile beta activity currently averages .007 uc/kg as compared to .008 uc/kg last month. Current maximums were I ¹³¹ less than .002 uc/kg and non-volatile .010 uc/kg.

As in the Pasco-Eltopia region, that area between Pasco and Ringold shows beta activity to be below the limits of sensitivity. The current decrease in non-volatile activity from an average of .011 uc/kg in April is not significant, whereas the decrease in I ¹³¹ activity from a previous average of .002 uc/kg is significant. Maximum I ¹³¹ activity was .003 uc/kg and maximum non-volatile activity was .016 uc/kg in this period.

Twenty samples taken near the MP posts in the Rattlesnake region show

the I ¹³¹ activity to average .002 uc/kg as compared to .003 uc/kg in February. Non-volatile beta activity currently averages .009 uc/kg as compared to .015 uc/kg in February. (No survey of this region in March or April.) The maximum beta activity detected this month was .010 uc I ¹³¹/kg and .020 uc non-volatile beta/kg.

A survey of the Wahluke Slope was completed early in May. Maximum activity detected on the slope was .007 uc I ¹³¹/kg and .009 uc non-volatile/kg. The averages for each type of analysis were less than the sensitivity limits in each case. The decrease in non-volatile is not significant whereas the decrease in I ¹³¹ is significant. The current level of I ¹³¹ in this region is the lowest observed on any of the monthly surveys this year.

One off area survey was made in the month, this survey including the Sunny-side-Yakima-Ehlersburg region. Current averages are below the sensitivity limits for both I ¹³¹ and non-volatile activity, the maximum results for each being at the sensitivity level, .011 uc/kg for the non-volatile activity and .002 uc/kg for the I ¹³¹. It is worth mentioning that a decrease in non-volatile activity is observed in this region when this data is compared to the results of another survey early in March, the average in March being .010 uc/kg.

Sixty-seven samples were obtained from the Benton Gap region of Rattlesnake Mountain. Samples were taken at 50' elevations and at quarter mile intervals on the plateau. Beta activity measurements averaged less than .002 uc/kg for I ¹³¹ and less than .010 for the non-volatile emitters.

The only positive result was obtained on one non-volatile sample which showed .023 uc/kg.

BETA ACTIVITY DISTRIBUTION IN SAGEBRUSH:

Pinus 18/12/51

measured at 1000 ft

A medium or average size sagebrush was selected at Route 3 Mile 2, for a study of the beta activity as distributed in the various parts of the plant. The following table summarizes the results:

Location of Sample	I^{131} as uc/kg	Non-Volatile as uc/kg
Leaf from top of plant (5)	.041	.016
Leaf from middle of plant (5)	.025	.025
Leaf from bottom of plant (5)	.035	.024
Stem from top of plant (5)	.043	.083
Stem from middle of plant (5)	.035	.031
Stem from bottom of plant (5)	.030	.027
Root at ground surface (5)	.005	.010
Feeder Root (5)	.005	.010
Surface Soil (5) *	.015	
Underground soil (5) *	.009	

* Results are for total beta activity .

In general, very little difference is observed in the beta activities detected at the various heights of the plant; similarly activity deposition in leaf and stem does not seem to differ materially. The only possible exception to this statement is the top stem which shows about three times the activity that the balance of the plant does.

The roots show no detectable activity and do not reflect the slight difference in beta activity shown in the soil. The slightly higher beta activity on the surface would be expected due to the exposure to the atmosphere.

DRINKING WATER

A total of 347 drinking water samples were obtained in this period. Of this total 260 samples were of 500cc volume and 87 were large volume three gallon samples. Ten of the three gallon samples were from test wells as were thirty-one of the 500cc samples. The following table summarizes the results of the 500cc program and includes all samples which showed a result in excess of 6 dis/min/lit alpha activity of 50 uc/liter beta activity:

RESULTS OF 500cc DRINKING WATER SAMPLING PROGRAM

LOCATION	NO. SAMPLES	ALPHA ACTIV. as d/m/1 MAX.	AVE.	BETA-GAMMA MAX.	uuc/1 AVE.	FLUOR.as ug U/1 MAX.	AVE.
Fosters Ranch Well	4	14.0	< 6	< 50	< 50		
J.Ehrig ElRancho	4	7.6	< 6	< 50	< 50	0.4	0.4
Hanford #7 Raw H ₂ O	16	< 6	< 6	60	< 50	1.7	0.7
3000 Area Well B	2	< 6	< 6	65	< 50	1.0	0.5
Richland Well #13	15	13.5	6.2	< 50	< 50	5.2	3.3
Richland Well #2	4	8.3	< 6	< 50	< 50	2.7	1.5
Richland Well #4	4	10.6	< 6	< 50	< 50	6.4	4.9
Richland Well #12	3	12.3	7.3	< 50	< 50	3.8	3.5
Richland Well #14	4	9.9	< 6	< 50	< 50	5.4	3.6
Richland Well #15	4	12.0	8.2	< 50	< 50	14.0	7.8
Richland Well #16	4	7.0	< 6	< 50	< 50	2.9	1.7
Richland Well #18	4	13.7	9.1	< 50	< 50	5.4	5.2
Tract House K-748	4	9.4	< 6	< 50	< 50	1.6	1.2
Tract House K-685	4	7.8	< 6 10.0	< 50	< 50	1.8	1.5
Benton City Store	4	22.2	10 26.0	< 50	< 50	15.2	7.9
Benton City H ₂ O W.	4	30.0	24.8	< 50	< 50	15.9	7.4
Chevron S. Cobbs Cor.	4	9.1	< 6	< 50	< 50	2.9	1.8
Kenn. Std. Sta.	4	7.7	< 6	< 50	< 50	2.4	1.8
Pistol Range	4	6.5	< 6	< 50	< 50	4.8	2.9
300 Area San.	17	9.2	< 6	< 50	< 50	3.3	0.8
San. H ₂ O 100H	12	7.0	< 6	53.2	< 50	1.4	0.7
San. H ₂ O 200W	4	20.8	6.8	< 50	< 50		
Hanford #7, San.	17	< 6	< 6	< 50	< 50	2.6	0.7
TEST WELLS							
300 Area Well #3	3	39.4	15.9	< 50	< 50	1.4	1.0
300 Area Well #4	3	18.5	9.6	< 50	< 50	8.9	6.3
B-Y Well	4	6.2	6	< 50	< 50	3.8	2.6

12 Liter Samples

LOCATION	NO. SAMPLES	ALPHA ACTIV. as d/m/1 MAX.	AVE.	BETA-GAMMA MAX.	uuc/1 AVE.	FLUOR. as ug U/1 MAX.	AVE.
100H Raw H ₂ O	1	< 1	< 1	31	31	20.7	3.8
Columbia Camp	2	3.2	3.1	< 10	< 10		
Headgate	2	1.7	1.1	< 10	< 10		
Hanford #7, Raw H ₂ O	1	1.9	1.9	< 10	< 10	1.7	0.7
3000 Area Well A	3	1.3	< 1	< 10	< 10	1.3	0.5
" " Well B	3	1.6	1.2	< 10	< 10	1.0	0.5
" " Well C	2	2.2	1.7	< 10	< 10	1.0	0.7
" " Well E	3	7.0	3.1	< 10	< 10	1.2	0.7
3000 Durand #5	2	2.3	1.4	55	28	3.2	1.9
Richland # 13	2	7.8	6.5	12	< 10	5.2	3.3
" # 2	1	4.1	4.1	< 10	< 10	2.7	1.5
" # 4	2	17.4	10.3	< 10	< 10	6.4	4.9
" # 5	2	9.9	7.5	< 10	< 10	3.9	2.6
" # 12	1	9.5	9.5	< 10	< 10	3.8	3.5
" # 14	2	8.0	6.0	< 10	< 10	5.4	3.6
" # 15	2	8.7	7.8	< 10	< 10	14.0	7.8
" # 16	2	9.1	5.9	< 10	< 10	2.9	1.7
" # 18	2	9.6	9.1	< 10	< 10	5.4	5.1
Tract House K-748	1	1.1	1.1	< 10	< 10	1.6	1.2
Tract House J-685	2	4.6	4.0	< 10	< 10	1.8	1.5
Benton City Store	2	25.0	13.1	< 10	< 10	15.2	7.9
B. C. H ₂ O Co. Well	2	18.9	14.7	< 10	< 10	15.9	7.4
Cobb's Cor. Chev. S. 2	2	2.9	1.6	< 10	< 10	2.9	1.8
Tex. Sta. across from Golf course	3	1.1	< 1	19	< 10	1.3	0.9
Kenn. Sta. on US 410	3	1.1	< 1	< 10	< 10	2.4	1.8
Riverland	2	2.7	1.6	10.0	< 10	1.7	0.7
Lower Knob	3	1.6	< 1	< 10	< 10		
Wills Ranch	3	2.3	1.1	< 10	< 10	0.8	0.5
Pasco	3	2.1	< 1	29	< 10	2.4	0.8
Pistol Range	2	4.1	3.9	< 10	< 10	4.8	2.9
White Bluffs Ice H.	2	1.0	< 1	< 10	< 10		
<u>TEST WELLS</u>							
B-Y Well	2	6.6	6.4	< 10	< 10	3.8	2.6
Spring # 13	2	1.3	1.1	22	13		
Snively Ranch	1	2.7	2.7	< 10	< 10		

cont'd.

	No. Samples	ALPHA ACTIV. as d/m/l MAX.	AVE.	BETA-GAMMA MAX.	unc/l AVE.	FLUOR. as ug U/l MAX.	AVE.
200N #5	1	4.2	4.2	< 10	< 10		
McGee Well	1	3.5	3.5	< 10	< 10	0.5	0.2
Ford Well	1	65.9	65.9	< 10	< 10		

Those wells which show an average alpha activity in excess of the detectable limits, also show confirming uranium activity. As in the past the presence of natural occurring uranium is confined to the Benton City and Richland Areas. Certain test wells show alpha activity, the 300 Area wells indicating the more significant amounts.

Beta activity barely above the limits of sensitivity is found at Pasco, Kennewick, and 3000 Area. Previously, the 3000 Area wells did not show this activity, and in this period two of the wells, # 5 and Well B, have shown tracer beta activity. Each of the cases are based on only two samples, the frequency will be increased and more confirming data will be available.

In addition to the routine samples, several samples were obtained from outer locations, continuing the measurement of natural uranium in the nearby ground water. The first indication of any positive alpha activity in these outer supplies was from a sample taken of the Sunnyside City Water, this sample containing 16 dis/min/liter (3 gallon sample and confirmed by recount.) The samples from Moxee City, Ellensburg, Zillah, and Granger were less than 6 dis/min/liter. No positive indications of beta activity were found in these outer supplies.

Several samples were analyzed for Pu, the only positive result being obtained from the 300 Sanitary Water in which one sample contained 6.6 dis/min/liter. The average at this location was less than 6 dis/min/liter.

RAW WATER EXPORT LINES

Thirty seven raw water samples were collected in the month. All samples were taken at the 183 and 283 buildings with the exception of 100H, in which case the samples were obtained at the float. The following table summarizes the results:

LOCATION	BETA ACTIVITY AS MICRO*MICROCURIES/L		ALPHA ACTIVITY as dis/min/lit	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
183 Bldg. 100B	< 50	< 50	< 6	< 6
183 Bldg. 100D	< 50	< 50	< 6	6.0
183 Bldg. 100F	55	90	< 6	< 6.0
100H at Float	50	115	< 6	14.0
283 Bldg. 200E	< 50	< 50	< 6	< 6
283 Bldg. 200W	< 50	< 50	< 6	< 6

The measured beta activity in raw water has decreased at those locations which have previously shown detectable activity. This decrease is around a factor of three at 100D, 100F, and 100H. The contributing reason for this decrease is the increase in river flow which when compared to last month indicates that about three to four times the volume is coming down the Columbia at the present time.

In the past some question as to the supply system at 100H has arisen, and consequently this was investigated around the first of May. The water is taken directly from the river at a float located adjacent to the 100H Area. This water is sampled at the float in the line that comes from the river and that sample is the 'raw water' sample. Except for the fact that this float is located in rather dormant water, this sample would be identical to a direct river sample from this location. This water is pumped from the float to the chlorinator and then into a storage tank from which it is distributed as sanitary water. The next sampling port after the float is at the storage tank. I observed that the storage tank was nearly

empty and upon questioning the operator found that the supply is used as fast as it is fed into the tank. I also found that the enormous consumption in this area is due to the usage of this water at some of the concrete mixing stations etc., in addition to the human consumption. I would estimate that the consumed water would be removed from the river about $\frac{1}{2}$ to 1 hour previous to consumption in the extreme cases and in the overnight case it would be an interval of 16 hours. Three special samples were obtained as the water was followed through the system, the beta activity being 200 uuc/l at the float, 120 uuc in the tank, and 70 uuc at the first drinking fountain. No positive alpha results were obtained. The rapid decay of the short life components was evidenced from these samples and tend to confirm our decay studies which were mentioned in last months report as indicative of about 95% Na ²⁴ and about 5% long life activity. Currently the activity at this location is much lower due to the additional dilution by the river.

RIVER SAMPLING

Fifty-five routine samples were obtained from the Columbia River this month. An increase in the river fold by a factor of three to four in this period has greatly reduced the beta activity concentrations at these locations. In this period the flow averaged 2,400,000 gps. this average being not to good an appraisal for this period as the minimum flow at the start of the month was around 1,180,000 gps. as compared to 3,150,000 gps. at the end of the period. The river rising continually during the period has caused the maximum results included in the table on the following page, to occur at the start of the month whereas the lower results prevail at the end of the period. All locations show this decrease in activity. Another significant observation is the fact that as the river comes up we find a more uniform average distribution at the cross section sampling locations at Hanford, the average activity across

the river being nearly identical at the present writing. This uniformity is again confirmed when the two sides of the river at Pasco-Kennewick are confirmed. The following table summarizes the results of the Columbia River sampling program:

LOCATION	ALPHA dis/min/liter		B & G MICRO-MICROCURIES PER LITER	
	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE
Wills Ranch	< 6	< 6	< 50	< 50
Above 100B	< 6	< 6	< 50	< 50
181 B	< 6	< 6	< 50	< 50
181 D 36	< 6	< 6	110	80
181 F	< 6	< 6	1090	425
Hanford S. Bank	< 6	< 6	445	300
Hanford Middle	< 6	< 6	500	305
Hanford N. Bank	< 6	< 6	510	220
300 Area	< 6	< 6	330	290
Richland	< 6	< 6	200	235
P ^{as} Bride (Kenn. Side)	< 6	< 6	160	110
P ^{as} Bride (Pasco Side)	< 6	< 6	220	110

FOSTERS RANCH:

Three samples obtained from this location show that the beta activity has decreased by better than a factor of two, currently averaging 125 uuc/liter with a maximum result early in May of 175 uuc/liter. No positive alpha activity was detected.

YAKIMA RIVER:

Four samples from each of two locations at the mouth of the Yakima River show that the beta activity is less than 50 uuc/l and the alpha activity is less than 6 dis/min/liter in all cases. Four samples from the horn show no positive beta or alpha activity.

90014

IRRIGATION DITCH - LEE BLVD.:

Four samples taken from this ditch which originates in the Yakima River show no positive beta or alpha results.

3000 AREA POND INLET:

Four samples from the inlet to the large 3000 Area pond show no positive alpha or beta results. This water is the water that filters through the bed at the 3000 Area and later becomes the sanitary supply of the 3000 Area wells. At times in the past these wells have shown tracer activity due to uranium.

RIVER MUD SAMPLING

Seventy-two mud samples were obtained from the banks of the Columbia.

Samples were analyzed for beta, alpha (EE), and uranium. The following table summarizes the results for the month of May:

LOCATION	NO. SAMPLES (Ea. Loc.)-	BETA ACTIVITY IN MILLI-MICROCURIES PER KILOGRAM			
		ONSHORE MAX.	SAMPLES AVE.	FIVE FT. FROM SHORE MAX.	AVE.
Near Wills Ranch	4	19-18.7	12.5	22.8	14.1
Allard Pump Sta.	4	16.8	14.6	18.8	14.4
At 100H Area	4	13.0	12.0	16.2	12.1
Below 100F Area	4	15.0	14.5	19.1	16.8
Richland Dock	4	15.2	10.5	14.8	12.8
At 300 Area	4	16.9	12.5	17.2	15.4
P-K Bridge Pasco	4	22.8	10.8	25.8	15.9
P-K Bridge Kenn.	4	13.1	10.8	12.8	10.8
Hanford Ferry	4	16.4	11.8	16.4	13.9

Table II

9/15/54

8/25/54

The results summarized above show no unusual beta activity in the mud and are in good agreement with last months data.

The same samples were analyzed for alpha activity, and at only two locations the Richland Dock and the 300 Area, showed results in excess of 6 dis/min/liter. In each of these the months average was less than 6 dis/min/liter, the individual results referred to above being around 10 dis/min/liter. All samples were checked of the fluorophotometer for U with no positive results being obtained.

100-100-100

COLUMBIA RIVER - CROSS SECTION DEPTH STUDY:

A survey consisting of twenty-five samples taken between 100B and 100D area, indicated a dispersion pattern which was concentrated in the center of the river for about four miles and then spread more uniformly across the river as the contaminant approached 100D. Tracer activity is detected along the north bank. A low activity area comparable to the north bank is found immediately above 100D. Maximum beta activity found in the region is about 350 uuc/liter, immediately below the effluent pipe. As the point where more uniform cross-river dispersion occurs the beta activity is slightly in excess of 100 uuc/liter. The pattern found on this survey tends to agree with previous data, these concentrations being slightly lower than usual due to the increased river flow. Figure_____ shows the distribution of beta-gamma activity in this region as found in this survey.

Five samples were taken from the bottom in the center of the stream for purpose of comparing the depth activity. The activity on the bottom was lower than that on the surface at all locations above the point where the more uniform surface dispersion occurs. At those locations where uniform surface dispersion is indicated, activity concentrations on surface and bottom are nearly identical.

** Current samples taken from the bottom are diluted by one part in each twenty, the samples in this survey were not corrected for this negligible dilution.

AIR MONITORING

A summary of the average dosage rates measured using detachable ionization chambers is tabulated in the following table:

LOCATION	AVERAGE mrep/24 hrs.	
	May 1949	April 1949
<u>100 Area & Environs</u>		
Route 1, Mile 8	0.44	0.47
Route 2N, Mile 10	0.41	0.42
Route 2N, Mile 5	0.35	0.34
At White Bluffs	0.43	0.53
Route 11A, Mile 1	1.29	0.86
Hanford 614 Bldg.	0.71	0.48
Intersection Rt.1 & 4N	0.42	0.38
Hanford 101 Area	0.41	0.46
100H Area	0.40	
<u>Within 5 Miles 200 East</u>		
Batch Plant - 200 West Area	0.82	
Route 11A, Mile 6	0.83	
Route 3, Mile 1	0.71	1.2
Meteorology 200	1.17	0.89
234-235 Area	0.40	0.40
<u>Within 10 Miles 200 East</u>		
Route 4S, Mile 10	0.95	0.94
Route 10, Mile 1	1.12	0.82
Route 10, Mile 3	0.71	
Route 2S, Mile 4	1.98	1.63
<u>Near 300 Area</u>		
Route 4S, Mile 16	0.54	1.27
Route 4S, Mile 22	0.54	0.54
3000 Area No.	0.48	0.48
3000 Area So.	0.48	0.55

(Next page also)

<u>Outlying</u>	May	April
Benton City	0.60	0.48
Richland	0.48	1.06

Some progress has been made in the chamber repair program, three locations being added to the routine program in this period. These are the 100H area, the batch plant area, and route 10, mile 3. No unusual fluctuation is observed in the airborne radiation levels near the areas, while those locations more remotely located continue to be at the background level of about 0.5 mrep/24 hours.

In addition to the dosage rates measured using ionization chambers, the following dosage rates were recorded using intergrons and 'C' Chambers:

<u>LOCATION</u>	<u>INTEGRONS</u>		<u>'C' CHAMBERS</u> (Average dose in mrep/24 hrs.)	
	May	April	May	April
100B area	0.5	0.8	0.3	0.3
100D Area	0.2	0.2	0.3	0.3
100F Area	0.4	0.4	0.3	0.4
200 West A.	0.6	0.1	0.3	0.5
200 East A.	0.1	0.1	0.5	0.5
Riverland	0.1	0.5		
Hanford	0.9			
300 Area	1.1	< 0.1	0.7	0.5
700 Area	0.3	0.1		
Kennewick	0.2	0.7		
Pasco	0.3	< 0.1		
Benton City	0.3	0.1		
3000 Area N.	0.1	0.1		
3000 Area S.	0.1	0.1		

The integron and 'C' Chamber data shows very little trend from the previous data. The Kennewick station has been out of operation since early May due

to the cutting of the power lines to the building. Investigation of this cutoff, indicated that no definite arrangement had been made for power at the time the building was located at its present site, and consequently we could not be expecting the service. As Mr. Seymour handled this originally, I placed the matter in his hands and at present he is trying to arrange for electrical service with the PUD of Kennewick.

The following results for beta and gamma activity were obtained by the use of air filtering devices during the month of May, 1949.

<u>LOCATION</u>	Monthly Average in Units of uc/liter	Maximum Eight Hr. Period Concentrations in uc/liter
200 East, SE Corner	4.5×10^{-10}	
200 West, Twr. #4	1.2×10^{-10}	2.0×10^{-7}
Gable Mountain	1.3×10^{-9}	2.4×10^{-7}
Richland	1.1×10^{-10}	$< 1.0 \times 10^{-7}$
Pasco	1.0×10^{-10}	
300 Area	1.2×10^{-10}	
200 East Twr. 18	7.5×10^{-10}	
100D Area	3.0×10^{-11}	
200 West Gate	1.8×10^{-10}	$< 1 \times 10^{-7}$
Benton City	2.0×10^{-11}	
Hanford 614 Bldg.	9.7×10^{-11}	
105 Dr. Const. Zone	5.0×10^{-11}	
Hanford 101 Bldg.	8.0×10^{-11}	
White Bluffs	5.0×10^{-11}	
3000 Area North	1.1×10^{-10}	
200 West Twr. #15	4.0×10^{-11}	

In general, the airborne beta activity detected by means of air filters is about as low as it ever has been at the site, nearly all locations

7 00070

showing concentrations less than 10^{-9} uc per liter. This is possibly due to the recent dissolving requirements which do not permit operation at times when the dilutions are less than 1000:1. This is further evidenced by the fact that the highest average beta activity in air was detected at the summit of Gable Mountain which indicates that the activity is far above our normal ground level monitoring stations.

Supplementing the air filter program, I 131 scrubbers were in service at five locations. Again the data indicates that in the higher airborne activity zones the amount of I 131 passing thru the filter and collected in the scrubber is nearly as much as that found on the filter. This ratio tends to decrease at the more remote locations. The following table includes a comparison of the data for this period, each unit operating throughout the entire month:

<u>LOCATION</u>	AVE. BETA ACTIVITY ON FILTER uc/liter x 10^{10}	AVE. BETA ACTIVITY IN SCRUBBERS uc/liter x 10^{10}
200 West Gate	9.4	8.9
Benton City	0.2	0.1
200 ESE	4.5	4.0
300 Area	1.2	0.2
700 Area	1.1	0.2

FILM PACKS:

A total of 128 film packs were serviced during the month. Five locations showed radiation levels in excess of 5.0 mrep/24 hrs, for the week of 5/23/49, these being 200 West Gate House- 8.5 mrep/24 hrs, 200 W Twr. #4 15 mrep/24 hrs., White Bluffs - 7 mrep/24 hrs., and 105 DR -5 mrep/24 hrs. These results were received from the badge group at the levels indicated, however, all other means of monitoring tend to offset the validity of these

exposures. Air filters, chamber readings and portable instrument readings in these zones showed no excessive levels. As the chambers were in service continually at each location and indicate the levels to be less than 0.1 mrep/24 hrs., I believe that the packs were possibly exposed accidentally.

PARTICLE DETECTION:

A review of the radioautographs indicates that several particles were deposited on the air filters in the separation areas during the week ending April 11th, three particles on the 200 WEC filter and one particle on the 200 ESE filter. (Correlation with other factors is rather difficult in the particle data as it is being received in this office about six weeks after we deliver the filter.)

RAIN

With only one rainfall occurring during the last month, only one sample was collected from each of the twenty-nine locations. The following table summarizes these results according to the selected zones on and adjacent to the site:

<u>Location</u>	Milli-microcuries/liter	
	Average	Maximum
Inside 200East	3.9	6.4
Inside 200 West	15.1	49.2
Inside 100 Areas	0.2	0.1
Intermediate on Area	2.2	14.2
Off Area	1.8	11.6

The maximum off area result was collected inside the 3000 Area. The possibilities of a particle being collected inside the 200 West Area (49.2 muc/l) has not been checked as the filter is currently being radio-autographed.

RICHLAND VILLAGE

Around 40 smears were taken in the village of Richland. Most of the smears were obtained from the commercial facilities, with the cooperation of the public health unit from Kadlec Hospital. In only one instance was beta activity detected in excess of the counting error, a smear from one of the pool tables in the rec hall counting 3.7 c/m (confirmed by recount.) Four ~~samples~~^{smears} from various locations showed alpha activity between 2 and 3 dis/min/~~smear~~, all other samples being within the error of count.

WASTE MONITORING

300 AREA

Eight samples were obtained from the 300 Area waste ponds. The following table summarizes these results:

LOCATION	Alpha dis/min/liter		Uranium ug/liter		Beta as muc/liter	
	Average	Maximum	Average	Maximum	Average	Maximum
Old Pond Inlet	3600	8900	1200	2200	0.16	0.30
New Pond Inlet	4300	14000	600	800	0.15	0.50

In the past, the total alpha activity has been identified as uranium in most instances, whereas in this months data this has not been the base as the ratio above indicates. In order to more closely identify the time of admitting the alpha activity, 24 samples were obtained from the waste line which feeds into the pond. Complete analysis of these samples indicates that in two cases positive plutonium activity was detected entering the pond. On 5/16 the daily sample contained 133 plutonium dis/min/liter, and 5/3 10 dis/min/liter from plutonium were detected. It is apparent that plutonium is entering the pond at various times, and due to the random sampling it is not possible to state the total deposition over any time interval.

The alpha activity in the daily samples varied from 30 to 15,000 dis/min/liter and the uranium activity ranged from 5 to 300 ^{avg. → 300} uc/liter in the same samples.

Four samples of mud from the inlet of the old pond show average alpha activity of ^{3x10⁶ dis/min/liter} ~~3000~~ dis/min/liter, uranium activity averageing 120 uc/liter and beta activity averageing 2.0 muc/liter. Maximum results on these samples were higher than the average by a factor of two to three.

200 AREAS:

The following table summarizes the results of the direct sampling program in the waste areas:

LOCATION	ALPHA dis/min/liter		FLUOROPHOTOMETER ug/liter		BETA uuc/liter	
	AVE.	MAX.	AVE.	MAX.	AVE.	MAX.
<u>"T" SWAMP</u>						
Inlet (4)	< 30	< 30	< 4	< 4	80	160
West Side (4)	< 30	50	< 4	7	120	200
South Side (4)	< 30	30	< 4	< 4	70	140
<u>"U" SWAMP</u>						
Inlet (4)	< 30	< 30	7	15	70	200
West Side (4)	< 30	< 30	25	65*	< 50	190*
<u>Laundry Ditch</u>						
Inlet (4)	< 30	70	5	15*	70	180
600' from Inlet	< 30	50	5	8	70	130
<u>231 DITCH</u>						
Pipe Outlet (4)	< 30	75	< 4	< 4	< 50	< 50
1st. Underpass (4)	< 30	85	< 4	< 4	< 50	110*
<u>234-234 DITCH</u>						
Pipe Outlet (4)	50	560*			< 50	110*
<u>RETENTION PONDS</u>						
200 East (4)	< 30	< 30			70	210
200 West (4)	< 30	< 30			< 50	< 50
<u>200 E "B" DITCH</u>						
Inlet (4)	< 30	80			340	760
1st. St. Underpass (4)	30	80			240	640*

() Parenthesis show number of samples analyzed.

* Only result above reporting level.

With the exception of the B ditch, no waste area shows significant increasing activity. The B ditch shows increasing beta activity by around a factor of three, when compared to last months and the maximums at each sampling location are 2 and 6 times greater than observed previously. This area tends to be emphasized in the appraisal as it is not fenced or roped, and is accessible to anyone in the vicinity.

In addition to the liquid samples, 33 samples of mud were obtained from the edges of the waste zones. The following table summarizes these results:

<u>Location</u>	Alpha Activity dis/min/grm.			Beta Activity uc/kg		
	No.	Average	Maximum	No.	Average	Maximum
<u>"T" Swamp</u>						
So. Side	5	110	390 1.9×10^5	4	.059	.103
West Side	5	210	280 1.2×10^5	4	.025	.040
<u>234-235 Area</u>						
Pipe Outlet	4	< 30	< 30	2	.010	.014
<u>"B" Ditch</u>						
Inlet	4	< 30	< 30	3	.075	.175
Underpass	4	"	"	3	.160	.250

No unusual results were obtained on the mud samples, the beta and alpha activity being in the normally expected range.

Four samples of laundry lint were collected, the activity detected being nearly identical to that in the past. The beta activity averaged 165 muc/kg with a maximum result of 244 muc/kg. Alpha activity averaged 200 dis/min/gr. with a maximum of 560 dis/min/gram.

PORTABLE INSTRUMENT SURVEYS:

The weekly surveys of the waste areas showed that the radiation levels were slightly in excess of background, the maximum readings at the "T" Ditch, "T" Swamp, and Laundry Ditch being around 300 c/m.

200 NORTH DITCHES:

Portable instrument surveys of the north area ditches indicated the following maximum readings: "N" Ditch- 16,000 c/m, "P" Ditch- 7000 c/m, and "R" Ditch - 7000 c/m.

TEST WELLS:

Due to the continued absence of one employee, we were unable to survey the test wells in the separation areas during the month of May.

100 AREA WASTES

107 EFFLUENT

A total of 32 waste samples were obtained from the effluent water in the 100 Areas in the month. The following table summarizes the results of these samples:

Location	Alpha dis/min/liter		Beta & Gamma uc/liter		Pu dis/min/liter TTA	
	Average	Maximum	Average	Maximum	Average	Maximum
107 B	<30	<30	.371	.522	<6	<6
107 D	<30	88	.384	.971	<6	<6
107 F	<30	<30	.319	.472	<6	7.4

The results from the effluent samples show that the higher beta activity observed last month has decreased and currently is in the normal order of magnitude. Also, the alpha activity that was detected on certain samples in the previous period is not found in this months results-only one sample indicating a positive result. The effluent samples were analyzed for uranium, all results being less than 4 ug/liter.

Based on the flow rates the beta activity measured in the samples tabulated above, the following table summarizes the calculated number of curies of Na²⁴ and long activity which are currently being emptied into the river from the 107 basins. (Based on 90% to 95% Na²⁴ in total activity.)

	AT 100F	AT 100D	AT 100B	<u>Totals</u>
Flow rate of effluent	31,500gps.	34,500 gps.	31.500 gps.	
Total curies in period	1650	2170	1910	5730
Average curies / day	66	54	76	196
Approx. curies Na ²⁴ /day**	59 to 63	48 to 51	68 to 72	175-186
Approx. curies long activity**	3 to 7	3 to 6	4 to 8	13-21

107 SULFATE ANALYSIS:

No samples were obtained for sulfate analysis in this period.

POLONIUM ANALYSIS:

Two samples from each area were analyzed for Polonium, all results being less than six dis/min/liter.

DRYER ROOM CONDENSATE:

Two samples obtained from 100B showed the average sulfate to be 1.3 uc/ml whereas the total beta was 0.7 uc/ml. Maximums for each were 1.6 uc/ml and 0.9 uc/ml respectively.

CALOL:

One sample analyzed showed beta activity of 0.7 uc/liter.

To: J. W. Healy - W. Singlevich
From: H. J. Paas

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SITE SURVEY MONTHLY REPORT FOR
THE MONTH OF JUNE 1949

The attached report is compiled from the following number of surveys:

WATER SAMPLING PROGRAM

Drinking Water 500 cc -----	273
Drinking Water 11.7 liter -----	77
Test Wells 500 cc -----	34
Test Wells 11.7 liter -----	11
Raw Water 500 cc -----	31
River -----	212
Waste -----	148
Rain -----	6
Total Water Samples	<u>792</u>

AIR SAMPLING PROGRAM

Air Filters -----	125
Scrubbers -----	25
Detachable Chambers -----	817
Film Packets -----	160
Total Air Samples	1127

LAND SAMPLING PROGRAM

On Area Vegetation -----	593
Off Area Vegetation -----	27
Mud -----	122
Soil -----	0
Lint -----	4
Total Land	747

INSTRUMENT & MISC.

Portable Instrument (Land) -----	20
Portable Instrument (Waste) -----	16
Total Instrument	36

TOTAL SURVEYS FOR MONTH 2702
(excluding particle program)

The above number of surveys were made by traveling approximately 9000 miles. In addition to the road miles, about fifty miles were made on the Columbia River in completing a cross-section survey of the beta activity in the river.

One off area trip is included in this months summary, this trip being to Ellensburg. The site survey group took over the plant assistance group and the particle program on June 15th. The milage by this group is not included in this months summary above.

DISSOLVING DATA

Basing the calculations on the weight of uranium dissolved and the interval of the cooling period, the amount of radioactive iodine and xenon liberated from the seperation areas to the atmosphere has decreased in this month. Compared to the previous month (May) the magnitude of this decrease is as follows:

200 East Area: 21.1 % less I^{131} in current month
18.0 % less Xe in current month.

200 West Area: 37.9 % less I^{131} in current month.
34.3 % less Xe in current month.

A good rough appraisal of the dissolving data would be to say that the decrease in the total iodine emitted in this period was about 25%. This figure does not include the effect or any changes in the effectiveness of the filters and scrubbers.

VEGETATION SAMPLING

A total of 620 vegetation samples were collected in the month of June. These samples were analyzed for the beta activity as I^{131} and as non-volatile activity.

The decrease in the amount of I^{131} liberated in the separation areas os somewhat reflected in the averages for this period. As only the more adjacent locations are showing an average I^{131} deposition above the limit of sensitivity, a comparison of the current averages to the previous averages at these locations shows that the I^{131} activity on vegetation has decreased by factors rangeing from two to three. The locations along Route 3, Meteorology Twr., and 200 West Gate are used as a basis for this statement.

PARTICLES DETECTED BY FILMING MOTOAIR FILTERS

PARTICLES COLLECTED VERSUS MONTHLY
INHALATION RATE OF MAN
200-W AREA—JUNE 1949
PARTICLES DETECTED BY FILMING MOTOAIR FILTERS

PARTICLES COLLECTED VERSUS MONTHLY INHALATION RATE OF MAN

METEOROLOGY TOWER — JUNE 1949

PARTICLES DETECTED BY FILMING MOTOAIR FILTERS

PARTICLES DETECTED BY FILMING MOTOAIR FILTERS*

*Special 12" x 12" filter

As in the past the vegetation activity as I^{131} detected in the residential areas and more remote locations is below the limit of sensitivity (2 muc/kg). Very scattered indications of measurable activity are detected in these zones, however when present, this positive activity barely exceeds the above limits, usually being in the order of two to three muc/kg.

Again the maximum I^{131} activity is found along Route 3 in the vicinity of the 200 West area gatehouse. It is interesting to note that the magnitude of this activity has decreased around a factor of two to three, the current maximum in this region being 70 muc/kg as compared to 158 muc/kg last month. A complete summary of the results of extraction of five gram samples for I^{131} measurement is as follows:

BETA ACTIVITY DETECTED BY I^{131} EXTRACTION: CALCULATED AS muc I^{131} /kg.

Location	Average	Maximum	Last Month Average Average May 1959
North of the 200 Areas	< 2	5	< 2
Near the 200 Areas	2	23	2
Route 3	12	46	36
200 West Gate	37	70	63
Meteorology Twr.	8	15	21
South of the 200 Areas	< 2	7	< 2
Richland	< 2	3	< 2
Pasco	< 2	2	< 2
Kennewick	< 2	2	< 2
Benton City	< 2	< 2	< 2
Richland 'Y'	< 2	< 2	< 2
Hanford	< 2	< 2	< 2
Ringold to Pasco	< 2	2	< 2
Wahluke Slope	< 2	8	< 2

Table 9

The same samples tabulated above were analyzed for the longer life activity, that activity that is non-volatile and is not detected in the I^{131} extraction. The current months averages compare favorably to last months, however the maximum results detected in this period tend to be somewhat higher. This is true in both the nearb locations

and at those closer to the areas. As there is no definite reason for this, it appears that the maximum results are quite dependent on the sample selection, their magnitude depending on the randomness of sample collection. Current studies are underway which will determine the variance of beta activity on sage, within one bush. The following ~~xample~~ table summarizes the results of the non-volatile beta analysis:

Location	NON VOLATILE BETA ACTIVITY AS CALCULATED IN UNITS OF muc/kg		
	Average	Maximum	Last Month Average Average - May 1949
North of the 200 Areas	10	26	< 10
Near the 200 Areas	12	30	10
Route 3	19	34	25
200 West Gate	32	76	27
Meteorology Tower	17	22	22
South of the 200 Areas	11	42	< 10
Richland	< 10	22	< 10
Pasco	12	33	< 10
Kennewick	< 10	13	< 10
Benton City	< 10	21	< 10
Richland 'Y'	< 10	20	< 10
Hamford	10	20	< 10
Ringold to Pasco	< 10	16	< 10
Wahluke Slope	< 10	26	< 10

In addition to the above, the results obtained from the sampling at thirtysix locations within the separation areas are as follows:

Location	¹³¹ I Activity as muc/kg			Non-volatile Activity as muc/kg		
	Average	Maximum	Prev. Ave	Average	Maximum	Previous Ave.
200 East Area	7	28	10	11	19	10
200 West Area	8	56	2	10	43	10

With the exception of the maximum results recirded in the 200 West Area, the above res: are within the normal expected range. The maximum I activity detected is ~~twice~~ ^{three times} that found last month and the maximum non-volatile acrivity is twice as high as previous.

Tablet

Supplementing the on area routine program, several surveys were made adjacent to the project. In all cases the vegetation measured showed that the beta activity was at minimum quantities, all adjacent sites averaging less than the sensitivity limits for the I^{131} and Non-volatile activity analysis. In general, individual samples exceeded these limits in most zones however the prevalence of these results occurred so infrequently that it appears safe to conclude that very little positive activity exists outside the project. A summary of these surveys follows:

Wahluke Slope: A survey consisting of 105 samples from the Wahluke Slope was completed in early June. The average I^{131} activity was less than 2 $\mu\text{c}/\text{kg}$ and the average non-volatile activity was less than 10 $\mu\text{c}/\text{kg}$. A total of 18 samples exceeded the limit of sensitivity on the I analysis, the maximum result being 6.0 $\mu\text{c}/\text{kg}$. The maximum result obtained for non-volatile activity was 26 $\mu\text{c}/\text{kg}$., however a total of 31 samples or nearly one third of the total samples from the slope exceeded 10 $\mu\text{c}/\text{kg}$. A comparison of the results obtained last month with the current activity measurements shows that there has been no significant change in the beta activity deposition on the slope.

Pasco to Ringold: A total of 18 samples were collected between Pasco and Ringold. Samples were taken at each two mile interval. As in the Wahluke survey, the beta activity due to I^{131} and non-volatile activities was below the sensitivity limits, of 2 and 10 $\mu\text{c}/\text{kg}$ respectively. Four of the I^{131} analysis showed activity in excess of 2 $\mu\text{c}/\text{kg}$, the maximum result being 2.4 $\mu\text{c}/\text{kg}$. Only two of the non-volatile analysis showed positive activity, the maximum activity being 16 $\mu\text{c}/\text{kg}$. Again, there was no significant change in the comparison between the current and last months averages.

Plymouth to Kennewick: Six samples were obtained at five mile intervals between Plymouth and Kennewick. No positive I^{131} activity was detected on any sample, the maximum value of any result being less than 2 $\mu\text{c}/\text{kg}$. The average of the non-volatile activity in this region was less than 10 $\mu\text{c}/\text{kg}$ with only one result being positive at 14 $\mu\text{c}/\text{kg}$.

Yakima Barricade-Yakima-Ellensburg: Twenty seven vegetation samples were collected at five mile intervals in the area between Yakima Barricade - Yakima - and Ellensburg. The

The sample results show the I^{131} activity and non-volatile activity in this area to be below 2 muc/kg and 10 muc/kg respectively. Seven individual samples showed tracer positive I^{131} activity, the maximum activity in these seven samples being 6 muc/kg. Similarly eleven of the non-volatile analysis were greater than 10 muc/kg, the maximum individual result in this group being 18 muc/kg. A similar survey was completed in the month of May, and a comparison of the results from each indicates no significant trends or changes in this region.

Comment: It is observed that the non volatile activity measurements at all zones outside the project are below the 10 muc/kg which heretofore is possibly the best estimate of the beta activity which may be due to K^{40} . The following table summarizes some of the actual average non-volatile activity results which were made in the month of June, and should be helpful in making a better appraisal of the possible general K^{40} activity deposition in the adjacent regions.

Location:	Number of Samples	Average Non-volatile beta activity
Yakima-Elensburg	27	6.9 muc/kg
Plymouth-Kennewick	6	7.1 muc/kg
Pasco-Ringold	18	7.2 muc/kg
Wahluke Slope	102	8.2 muc/kg
Pasco-McNary Ore.	14	6.2 muc/kg
Total	167	7.7 muc/kg

The similarity of the individual averages seems to establish the uniformity of natural K^{40} in this region and may indicate that our accepted temporary figure of 10 muc/kg is slightly high. On the other hand it must be considered that practically all the samples from which the above results and conclusions are drawn, are sage, and again upon further investigation we may find the K^{40} content to vary if we were to sample from other types vegetation.

Drinking Water & Test Wells

A total of 395 water samples were analyzed, of this total 350 of the samples were directly from drinking water supplies and 45 were from test well sources. Of the 350 drinking water samples, 273 were 500 cc in volume and 77 were three gallon samples. Similarly, 34 of the test well samples were 500 cc and 11 were three gallon samples.

In addition to the routine program, several of the sanitary supplies of the nearby communities were sampled for comparison to our uncontaminated wells and also to ascertain the presence of natural occurring uranium in this area of the state. Samples taken at Boardman, Oregon, Umatilla, Oregon, Yakima, Wash, and Eleensburg Wash. showed no positive beta or alpha activity. The following positive indications of alpha activity were detected: Moxee City Wash - 1.5 dis/min/liter, Zillah Wash - 1.2 dis/min/liter and Granger Wash - 1.4 dis/min/liter, and Sunnyside Wash - 3.2 dis/min/liter. In each case the samples were 3 gallon samples. The presence of tracer alpha activity at those nearby locations to the west of the project is indicated and seems to indicate that this may be a continuance of the natural uranium activity found in the Benton City region.

The following table summarizes the results obtained from the analysis of three gallon samples:

Location	Number Samples	Alpha Activity as d/m/liter		B&G Activity as uuc/l		U as ug U/l	
		Maximum	Average	Maximum	Average	Max.	Ave
Columbia Camp	1	7.0	7.0 ✓	<10	<10	---	-
Hanford # 7	1	2.0	2.0	<10	<10	1.7	0
Hanford #1	3	5.1	2.4	24	<10	---	-
Hanford #4	2	3.9	2.6	<10	<10	---	-
3000 Area #A	2	2.4	1.4	<10	<10	1.7	0
3000 Area #B	2	1.2	<1.0	<10	<10	1.3	0
3000 Area #C	2	8.7	4.7	<10	<10	1.7	0
3000 Area #D	2	1.2	<1.0	<10	<10	1.0	0
3000 Area #E	2	2.4	2.1	<10	<10	1.3	1

-three gallon table continued-

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Location	Number Samples	Alpha Activity as d/m/l		R&G Activ. as uuc/l		U as ug U/lit	
		Maximum	Average	Maximum	Average	Max	Ave.
3000 Area #5	2	2.4	2.1	<10	<10	1.3	1.0
Richland # 13	1	5.1	5.1	<10	<10	8.2	4.0
Richland # 2	2	3.1	2.0	<10	<10	4.8	3.1
Richland # 4	3	9.6	7.4 ✓	<10	<10	8.9	6.0
Richland # 5	2	9.4	6.4 ✓	<10	<10	5.2	3.1
Richland # 12	3	4.4	2.7	<10	<10	4.3	3.0
Richland # 14	3	9.8	4.0	<10	<10	7.0	5.9
Richland # 15	2	1.8	1.6	<10	<10	9.4	5.2
Richland # 16	1	3.1	3.1	<10	<10	2.5	2.5
Tot Hse K748	2	3.3	2.3	<10	<10	1.0	0.7
Tot Hse J685	1	2.9	2.9	<10	<10	2.7	1.9
Bentpn City Store	2	17.2	8.8 ✓	<10	<10	7.7	3.4
Bentpn City Water Co	2	18.8	17.9 ✓	<10	<10	16.9	11.5
Cobbs Corner	1	5.2	5.2	<10	<10	3.4	3.4
Kenn Highlands	1	1.3	1.3	<10	<10	---	---
Kenn Std Station	2	3.9	2.6	23.0	<10	3.7	2.6
Enterprise	2	1.2	1.2	<10	<10	0.7	0.4
Riverland	3	1.6	1.0	<10	<10	1.3	1.0
Midway	2	2.2	1.1	<10	<10	1.5	0.6
Segersons Ranch	2	2.5	1.2	<10	<10	---	---
Pistol Range	3	5.5	4.2	<10	<10	5.3	2.2
White Bluffs	3	2.7	1.4	<10	<10	---	---
<u>TEST WELLS</u>							
B-Y Well	2	3.3	2.3	<10	<10	3.6	2.9
Spring 13	1	1.7	1.7	<10	<10	---	---
Snively Ranch	1	3.3	3.3	<10	<10	---	---
Ford Well	2	2.7	1.4	<10	<10	---	---

Summary of results of the 500 cc drinking water sampling program. All results in excess of 6 dis/min/liter alpha activity and 50 uuc/liter beta activity are included:

Location	Number Samples	Alpha Activity d/m/l		B & G as uuc/liter		U as ug U/liter	
		Maximum	Average	Maximum	Average	Maximum	Average
Columbia Camp	5	7.6	< 6.0	< 50	< 50	-	-
Richland Well 13	20	19.8	6.1 ✓	< 50	< 50	8.2	4.0
Richland Well 4	4	15.4	7.9 ✓	< 50	< 50	8.9	6.0
Richland Well 5	4	11.2	7.8 ✓	< 50	< 50	5.2	3.1
Richland Well 12	4	8.0	< 6.0	< 50	< 50	4.2	3.0
Richland Well 14	5	18.1	9.2 ✓	< 50	< 50	7.0	5.9
**Richland Well 15	4	47.4	20.4 ✓	< 50	< 50	9.4	5.2
Richland Well 16	5	6.2	< 6.0	< 50	< 50	4.0	2.3
Richland Well 18	3	13.2	6.4 ✓	< 50	< 50	2.7	2.7
Benton City Store	5	22.7	10.5 ✓	< 50	< 50	7.7	3.4
Bent. City Water	20. 5	35.1	19.9 ✓	< 50	< 50	16.9	11.5
Kennewick Std Sta	5	11.4	< 6.0	< 50	< 50	3.7	2.6
Lower Knob	5	11.0	< 6.0	< 50	< 50	0.5	0.2
Pasco	5	< 6.0	< 6.0	50	< 50	---	---
Pistol Range	4	7.0	< 6.0	< 50	< 50	5.3	2.2
Hanford #7 San	14	< 6.0	< 6.0	125	< 50	---	---

** This result of 47.7 is unusually high for this location, however it was confirmed by recount. Further request for TTA and flourophotometer on this sample showed uranium to be presnt in the amount of 5.2 ug/liter. The TTA showed 9.6 dis/min/liter. It is apparent that this sample was contaminated in handeling as all previous results and all subsequent results did not confirm this result. Sucessive resamples showed the following alpha activity, 7.6, 11.5, and 14.7 dis/min/liter. These are well in agreement with the usual result from this location.

A comparison of the averages of the alpa activity vs the average of the uranium activit shows fairly good correlation. In remote cases such as Benton City we have had better comparisons, the current difference can only be attributed to the inefficiencies incurr when the samples are taken from the plate for the flourophotometer.

The following table summarizes the results obtained from the sampling of test wells. The samples were 500 cc in volume, this table includes all results in excess of six dis/min/liter alpha activity and in excess of 50 uuc/liter beta activity.

Location	Number Samples	Alpha Activity d/m/l		Beta G Activity uuc/l		U as ug U/liter	
		Maximum	Average	Maximum	Average	Maximum	Average
* 300 Area Well #1	4	7.1	< 6.0	< 50	< 50	1.6	1.0
* 300 Area Well #2	3	121.9	43.1	< 50	< 50	1.7	1.2
* 300 Area Well #3	3	91.8	63.3	< 50	< 50	17.3	8.7
* 300 Area Well #4	2	128.1	71.5	< 50	< 50	18.9	10.6
B-Y Well	5	10.8	< 6.0	< 50	< 50	3.6	2.9
**200 N Well #5	2	< 6.0	< 6.0	< 50	< 50	---	---

* On June 10th a series of high alpha results were obtained from the 300 Area Wells, all the maximums listed above being of this date. For some unknown reason these samples were not analyzed on the flowrophotometer as requested and currently were unobtainable for analysis. Successive samples from these same wells indicated these maximums to unusually high and it is possible that they may have been laboratory contaminated.

** One result from this well is not included in tabulation as resamples are currently underway and believe this unreported result should be verified before reporting. (The omitted result indicated alpha activity of 380 dis/min/liter and Pu activity of 175 dis/min/liter.)

In the tabulation of the 500 cc results it is of interest to note the absence of the 300 Area sanitary water in the tabulation, this location currently does not show any positive indication of either alpha or beta activity.

RAW WATER EXPORT LINES

Thirty raw water samples were collected. All samples were obtained from the 183 and 283 buildings with the exception of the 100H sample which is taken on the float which has the river as a direct source of supply. The following table summarizes the results of the raw water monitoring program for the month of June:

Location	Beta Activity as micro-microcuries/l		Alpha Activity as dis/min/liter	
	Average	Maximum	Average	Maximum
183 Building 100B	<50	< 50	< 6	< 6
183 Building 100D	<50	< 50	< 6	12
183 Building 100F	<50	< 50	< 6	< 6
283 Building 200E	< 50	< 50	< 6	6
283 Building 200W	< 50	< 50	< 6	< 6
100H At Float	< 50	70	< 6	< 6

The only detectable beta activity was found at the 100H area float, and again as this is practically a direct river sample the source of this activity is the Columbia River. This activity is lower than the results of the previous months, last months maximum at this location being 115 uuc/liter. The decrease again reflects the added dilution of the Columbia River which currently was at peak flow.

As the newly proposed 251 building of electrical distribution is approaching construction, the group was requested to take samples of the supply entering the building. This water has not been consumed up to the present time, however with the pending construction they anticipate using it as a source of sanitary water. The source of the water supply is in the 200 North Area Well system. Only one sample has been obtained to date, the results of this sample indicate no beta activity, however the alpha activity was 17 dis/mliter. As this was the first sample from this location we did not anticipate a positive alpha indication and consequently did not request a U analysis. Upon rechecking it was found that the sample had been disposed of and as a result the alpha activity detected is not identified or verified.

RIVER SAMPLING

Eighty samples were taken from the rivers adjacent to the project, sixty-five of these samples coming from the Columbia. As the river flow was at peak flow rate in this period, the average beta activity detected at the various sampling locations shows a comparable decrease when compared to the previous month. The decrease in average beta activity detected is in the order of a factor of two, the only location which does not show this effect being the Hanford South Bank, where the beta activity averaged about the same as it did in the month of May. Accompanying the decreased activity, is the more uniform distribution of the activity at the locations up and down the Columbia. For example, the average of ten samples taken at Richland was 110 uuc/liter as compared to an average of 180 uuc/liter in the middle of the river at Hanford. The maximum activity detected at these two locations was identical, 220 ~~uuc~~ uuc/liter. The more uniform distribution of the activity is attributed to the increased flow rate. ~~maximum~~ The alpha activity in the river is less than six dis/min/liter in all samples collected. The following table summarizes the results of the Columbia River sampling program:

Location	Alpha Activity dis/min/liter		B & G Activity as uuc/liter	
	Maximum	Average	Maximum	Average
Wills Ranch	< 6	< 6	< 50	< 50
Above 100B	< 6	< 6	< 50	< 50
181-B	< 6	< 6	< 50	< 50
181-D	< 6	< 6	< 50 (50) HP	< 50
181-F	< 6	< 6	180	125
Hanford South Bank	< 6	< 6	695	360
Hanford Middle	< 6	< 6	220	180
Hanford North Bank	< 6	< 6	120	90
300 Area	< 6	< 6	150	130
Richland	< 6	< 6	220	110
Pasco				
P-K Bridge (Kenn.)	< 6	< 6	90	60
P-K Bridge (Pasco)	< 6	< 6	60	55

Table II

Fosters Ranch: Five samples obtained from the Columbia at Fosters Ranch show a reduction in the detected beta activity by factor of two, the current average being 65 uuc/liter and the maximum being 80 uuc/liter. No positive alpha activity was detected.

Yakima River: Fifteen samples were taken from the Yakima, five of the samples from the Horn and ten of the samples from the mouth. In all cases the beta activity was less than 50 uuc/liter. One sample showed tracer alpha activity of 6.5 dis/min/liter, this sample coming from the mouth. All other samples showed the alpha activity to be less than six dis/min/liter.

Irrigation Ditch- Lee Boulevard: Five samples were taken from this ditch, the source of the water in the ditch being the Yakima River. The beta activity was less than 50 uuc/liter and the alpha activity was less than 6 dis/min/liter in all cases.

3000 Area Pond Inlet: Five samples from this inlet showed that the average beta activity was less than 50 uuc/liter. One sample showed measurable alpha activity, this sample containing 8 dis/min/liter, however the average of all samples showed that the alpha activity was less than 6 dis/min/liter. This water filters into the 3000 Area Well system and at times positive alpha activity due to uranium is found in this water table.

RIVER MUD SAMPLING

Ninety samples of river mud were obtained from the banks of the Columbia. The following table summarizes the results of these samples (half the samples are taken on shore and the remainder are obtained from a location approximately five feet from the shore)

(see following page for table)

Location	No. Samples Ea. Location	BETA ACTIVITY IN UNITS OF MILLI-MICROCURIES PER KG			
		ON SHORE SAMPLES		FIVE FEET FROM SHORE	
		Maximum	Average	Maximum	Average
Near Wills Ranch	5	15	11	17	14
Allard Pumping Sta	5	21	13	25	16
At 100H Area	5	16	12	13	8
Below 100F Area	5	33	17	18	13
Richland Dock	5	13	10	18	14
At 300 Area	5	17	15	17	12
P-K Bridge Pasco	5	42	19	17	12
P-K Bridge Kenn	5	13	11	24	13
Hanford Ferry	5	15	10	18	13

Table 4

The above results are in very good agreement with the previous several months observation and apparently have not been influenced by the change in the level of the river.

All mud samples were analyzed for alpha activity, only one sample indicating any tracer amount. This sample was from the 300 Area location and contained six dis/min/liter.

Off Area River Monitoring: Several samples were taken from off area rivers for comparison to our background studies. The samples were three gallon samples and were counted for fifteen minutes. Several samples showed alpha activity in excess of the usual 1 dis/min/liter reporting level. They are tabulated as follows:

Location:	dis/min/liter	Location	dis/min/liter
Umatill River	2.20	McNary Dam (south)	1.8
Yakima River (Yak)	1.0	McNary Dam (middle)	1.9
Naches River (Yak)	2.0	McNary Dam (north)	1.6
Yakima River (Sunny)	1.0		

These same samples were analyzed for beta activity, all results being less than 10 uuc/liter.

Columbia River Cross Section Survey: A cross-section survey of the Columbia River was completed on June 15th and 16th. This survey consisted of taking five samples from each of twenty-five cross section locations between the 100B area and the Pasco Kennewick bridge. The individual samples were spaced across the river at intervals depending on the width of the river at the sampling location, the general scheme of sampling consisting of taking one sample from the shore nearest the plant, one sample between this shore and the middle, one sample from the middle, one sample from a point midway between the middle and far shore, and lastly one sample from the far shore.

The flow rate of the Columbia on this date was measured as 2.4×10^6 gallons per second by the power department. This flow rate compares favorably with the peak flow of the Columbia recorded this year, this peak being 3.2×10^6 gallons per second. The river temperature at the time of this survey was 13°C , as measured at the 100F area.

The results of this survey directly reflect the effect of the high river flow, the average beta activity measured at any given cross section location being considerably lower than found on any survey in the past. In general, current beta activity measurements are lower by a factor of from 5 to 10 at the Hanford locations, and two to three at the Pasco-Kennewick locations, when compared to the minimum flow in the winter time. Apparently the faster flow carries the activity downstream more rapidly and thus the decrease at Pasco is not as great as it is upstream.

The results of the survey indicate that there is no homogeneity in the five samples taken any given cross-section location. The bulk of the activity confines itself to ~~the~~ a channel alongside the plant-side shore, this channel occupies an area equivalent to around $\frac{1}{4}$ of the total width of the river. The far shore activity at peak river flow is extremely low, at many locations downstream from Hanford the measured activity being at the limit of sensitivity which is 50 ~~dpm~~ uuc/liter. In the past when river flow is lower, activity measurements on the far side were from three to four times greater than they are at this time.

Contrary to the previous surveys, a very small difference in measured activity is observed

when the measurements at Pasco are compared to the measurements immediately below Hanford. The reason for this slight difference (not a factor of two) appears to be the increased speed of the river.

Another interesting observation was made in comparing the activity measurements at the point where the Yakima enters the Columbia. Previously, the addition of the Yakima further diluted the activity concentrations and tended to carry the activity to the far shore. Currently, the addition of the Yakima is almost ineffective as the volume of the Columbia is around 25 to thirty times greater than the Yakima.

Based on this survey the effect of the peak river flow on the beta activity measured in the Columbia can be summed up as: 1) the activity pattern does not become uniformly dispersed at any point between the 100 Areas and Pasco, 2) the activity is carried in a channel along the plant side shore and remains in ~~the~~ this channel as far as Richland, then tending to move toward the center of the river, 3) very little activity is found at any downstream far shore location 4) average activity measurements are lower by factors ranging from two to ten, depending on the location compared, the greater reductions occurring adjacent to the 100 Areas, 5) the addition of the volume of water from the Yakima (60, 000 to 80, 000) gpm, has little or no effect on the dispersion or dilution of the activity.

One sample taken on this survey, immediately above the 100D effluent exit showed unusual high activity (1500 uuc/l) when compared to other individual results. Apparently the sample received the highest concentration of 107 effluent that existed in the river. A decay study of this sample showed that the initial decay rate was approximately five hours, the latter decay giving the evidence of the high Na^{24} content, which at the end of three days showed an ensuing decay rate of around 26 days. The 26 day component possibly may be Cs^{134} , however at the time when this ~~activity~~ half life was evidenced very little of the initial activity remained. At the end of five days the remaining activity constituted a little more than 3% of the total activity in the sample at period of initial count. This amount of long half life activity agrees with previous observations based on decay studies.

AIR MONITORING - INTEGRONS & 'C' CHAMBERS

The following dosage rates were measured using integrons and 'C' chambers:

Location	Average Dose in mrep/24 hours			
	INTEGRONS		'C' CHAMBERS	
	June	May	June	May
100 B Area	0.2	0.5	0.2	0.3
100 D Area	0.3	0.2	0.3	0.3
100 F Area	0.3	0.4	0.3	0.3
200 West Area	0.2	0.6	0.3	0.3
200 East Area	< 0.1	0.1	0.6	0.5
Riverland	< 0.1	0.1		
Hanford**		0.9		
300 Area	1.2	1.1	0.5	0.7
700 Area	0.1	0.3		
Kennewick ***		0.2		
Pasco	0.8	0.3		
Benton City	0.1	0.3		
3000 Area N ****	0.7	0.1		
3000 Area S	< 0.1	0.1		

Table
6

** Considerable instrumentation trouble has been found at Hanford. A tabulation of the readings at the times that the instrument dept. felt the integron recorder to be working properly indicated the average to be 2.4 mrep/24hrs. This was not confirmed by the low level chamber readings at Hanford, thus I felt it was an erroneous average and believe it should not be included in the report.

*** The Kennewick station is without an AC supply, same depending on arrangements that currently are in F. P. Seymours hands.

**** A total of 128 hours were lost at this station and the few readings obtained give the above tabulated average. This figure apparently high and is influenced by the later failure of the instrument.

The number of power outages have increased all over the site in the past month, our integron data thus does not cover the entire period as well as it usually does. An example of some of the more evident outages are as follows: 200 West Area - lost 48 hours, 200 East Area - lost 176 hours, Pasco - lost 152 hours, and 3000 No - lost 128 hours.

The results of 160 film packs were received in this period. With the exception of one location, all average dosage rates were less than 5 mrep/24 hours. The station at 200 West, Tower #4, showed two positive exposures, the occurrence being on consecutive weeks. In the first instance, for the period ending 6-14-49 the dosage rate at this location was 7 mrep/24 hours and 3 mr/24 hours. The following week the dosage rate was 20 mrep/24 hours and 7 mr/24 hours. This observation is rather unusual as the random positive readings obtained on film badges usually are not repetitive and when they do occur can be traced to mishandeling or source exposure etc. These observations were checked by reviewing the data from the CRM recorder, this station having a GM probe and CRM - Micromax recorder. A review of the micromax chart have no indication of abnormal background or of any radiation level in this area. The background apparently fluctuates between 30 and 40 c/m thru the period in question, this level being in good agreement with background measurements by the same means at nearby locations. From this investigation it appears that the exposure indicated on the badges is not due to an existing radiation level at the station.

A summary of the dosage rates measured using detachable ionization chambers is tabulated in the following table:

(table on following page to allow continuity to reader)

Location	AVERAGE mrep/24 hours	
	June 1949	May 1949
<u>100 Areas & Environs</u>		
Route 1, Mile 8	0.37	0.44
Route 2N, Mile 10	0.34	0.41
Route 2N, Mile 5	0.31	0.35
White Bluffs	0.36	0.43
Route 11A, Mile 1	1.40	1.29
Hanford 614 Bldg	0.48	0.51
Intersection Rte 1 & 4N	0.43	0.42
Hanford 101 Area	0.39	0.41
100H Area	0.38	0.40
<u>Within 5 Miles of 200 East</u>		
Route 4S, Mile 6	0.71	
Batch Plant	0.56	0.82
Route 11A, Mile 6	0.81	0.83
Route 3, Mile 1	0.89	0.71
Meteorology 200	0.94	1.17
234-235 Area	0.40	0.40
<u>Within 10 Miles of 200 East</u>		
Route 4S, Mile 10	0.71	0.95
Route 10, Mile 1	0.48	1.12
Route 10, Mile 3	0.48	0.71
Route 2S, Mile 4	1.06	1.98
<u>Near 300 Area</u>		
Route 4S, Mile 16	0.53	0.54
Route 4S, Mile 22	0.48	0.54
3000 Area North	< 0.48	0.48
3000 Area South	< 0.48	0.48
<u>Outlying</u>		
Richland	< 0.48	0.48
Benton City	0.57	0.60

Tables

AIR MONITORING - AIR FILTERS

A total of eighty little sucker type air filters were taken from sixteen locations in this period. The results of the analysis of the aerosol beta activity of these filters for the month of June are as follows:

Location	Monthly Average Beta Activity In Units Of uc/liter of air.	Maximum Eight Hour Period Concentrations in uc/liter.
200 East, SE Corner	5.4×10^{-10}	
200 West, Twr #4	7.4×10^{-11}	2.6×10^{-7}
Gable Mountain	2.7×10^{-10}	$< 1.2 \times 10^{-7}$
Richland	6.6×10^{-11}	$< 1.0 \times 10^{-7}$
Pasco	1.0×10^{-10}	
300 Area	1.2×10^{-10}	
200 East, Twr # 16	6.0×10^{-10}	
100 D Area	4.6×10^{-11}	
200 West Gate	9.6×10^{-10}	1.2×10^{-7}
Benton City	2.4×10^{-11}	
Hanford 614 Bldg.	4.0×10^{-11}	
105 DR Const. Zone	4.0×10^{-11}	
Hanford 101 Bldg.	6.3×10^{-11}	
White Bluffs	2.8×10^{-11}	
3000 Area North	5.2×10^{-11}	
200 West, Twr #15	5.0×10^{-11}	

table 7

With the exception of the 200 West Gate location, the airborne beta activity concentrations are within a factor of two of the previous months results. The 200 West station shows the largest increase observed in this period, averaging 9.6×10^{-10} uc/liter of air as compared to 1.8×10^{-10} uc/liter of air last month.

The study of the activity deposition on the vertical and horizontally mounted little sucker filters was continued this month. A tabulation of the results is of interest as there apparently is very little difference in the amount of beta activity filtered out onto the two planes. The following table summarizes these results:

Position Of Filter	Beta Activity As Units of uc/liter of air.
Horizontal (Filter # 1)	5.9×10^{-10}
Horizontal (Filter # 2)	7.2×10^{-10}
Vertical (Filter # 3)	6.0×10^{-10}
Vertical (Filter # 4)	5.5×10^{-10}

The above filters are located at the 200 West Gatehouse 614 building. The beta activity quoted above, is the average of five readings from each of the units.

Supplementing the air filter program, I^{131} scrubbers were in continuous service at five different locations. As in the past, the data indicates a very significant pickup of I in those locations which are in the higher activity zones. At the remotely located ~~xx~~ units the average airborne activity is so close to the limit of sensitivity that it is difficult to compare the results. For the first time since the study was started, one of the locations showed an average Iodine pickup in the scrubber that was greater than that deposited on the filter. (at 200 ESE). The following table shows the average results of the scrubber monitoring program as compared to the activity on the filters at the same locations:

Location	Average Beta Activity On Filter As uc/liter $\times 10^{10}$	Average Beta Activity In Scrubber As uc/liter $\times 10^1$
200 West Gate	9.6	2.7
Benton City	0.2	0.1
200 East, SE	5.4	6.8
300 Area	1.2	0.3
700 Area	0.6	0.1

The above table indicates the fact that there is definitely some I^{131} passing thru the filters, the magnitude or ratio depending on the airborne concentration at the location of the unit.

RAIN SAMPLING

A nearly complete absence of rainfall in the month of June is reflected in the small number of rain collections made. Only one rainfall was of measurable magnitude, this rain occurring on the 31st of May when the precipitation was measured as 0.02" at the meteorology station in 200 West. In one other instance a trace amount of rain was recorded (June 16th), however no samples were collected from the trace rainfall.

The rainfall of May 31st was collected at the 200 East area, Gable Mountain, and the construction areas. There was no evidence of collection at any of the other locations. As this is a minimum number of samples (6), this report will include each of the results for beta activity measurement:

Location of collection	Beta Activity $\mu\text{mc}/\text{liter}$
200East Area - 7000' from stack	1.2
200East Area - 4000' from stack	32.8
200East Area - 8000' from stack	1.0
Gable Mtn Summit	1.4
234-235 Area	3.9
622 bldg - 200 West Area	6.2

Of interest in this data is the fact that of three collections inside the 200 East area, the greatest activity was collected at the location nearest the stack and the minimum activity was collected at the most distant location. The magnitude of these activities is in agreement with that observed at the identical locations in the past.

WASTE MONITORING

300 Area:

Ten liquid samples were obtained from the 300 Area Waste Ponds, the following table summarizing the results of these samples for the month of June:

Location	Alpha Activity		Uranium Activity		Beta Activity As	
	As	dis/min/l	As	ug U / liter	muc/liter	
	Average	Maximum	Average	Maximum	Average	Maximum
Old Pond Inlet	600	1100	475	825	0.18	0.54
New Pond Inlet	7900	37000	----	----	1.94	8.80

* This information not available as sheet remained in the counting room, a report on same will be forthcoming as a supplement to this report.

The measured activities in the new pond have increased considerable thru the month, the average alpha activity increasing by a factor of two and the current maximum being about three times greater than last month. Similarly the beta activity has increased from a previous average of 0.015 muc/liter to a current average of 1.94 muc/liter.

Supplementing the liquid monitoring, five mud samples were obtained from the old pond in. These samples show an average alpha activity of 3300 dis/min/gram with a maximum of 12000 dis/min/gram. Very little of this activity was detected as uranium, this analysis averaging 110ug/gram with a maximum of 190 ug/gram. It must be emphasized that the uranium analysis does not necessarily come from the identical sample, but rather from a part of the identical sample. The beta activity in the mud averaged 0.43 muc/kg with a maximum activity of 1.00 muc/kg detected.

Twenty-two samples were obtained directly from the waste line feeding the pond. This data is unusually good for the period and the following summarizes the activity detected: The average alpha activity was 340 dis/min/liter, fluctuating from a maximum of 2000 dis/min/liter to as low as 20 dis/min/liter. Of this activity it was found that the uranium accounted for an average of 166 ^{ug} ~~dis/min~~/liter, at times the uranium content being around 350 ^{ug} ~~dis/min~~/liter ~~and~~ maximum. Each sample showed some positive Pu activity however the amount varied by a factor of ten, the minimum amount of Pu found being 2.6

dis/min/liter and the maximum being 25 dis/min/liter. Amounts of plutonium in excess of 10 dis/min/liter were not uncommon as the average of the Plutonium analysis by the TTA process was 10.2 dis/min/liter.

200 Areas:

The following table summarizes the results of the direct sampling of the 200 Area

liquid waste:	ALPHA		Uranium		Beta	
	dis/min/liter		ug/liter		uuc/liter	
Location	Average	Maximum	Average	Maximum	Average	Maximum
T Swamp Inlet	<30	<30	<4	<4	<50	85
T Swamp West Side	<30	<30	<4	<4	<50	170
T Swamp South Side	<30	<30	<4	<4	<50	70
U Swamp Inlet	<30	<30	<4	<4	<50	<50
U Swamp West Side	<30	<30	<4	<4	<50	<50
200 E B Ditch Inlet	<30	<30	-	-	130	360
200 E B Ditch Un's	<30	400*	-	-	70	110
234-235 Outlet	<30	<30	-	-	<50	<50
200 E Retention	<30	<30	-	-	170	210
200 W Retention	-	-	-	-	-	-
Ldry Ditch Inl.	<30	50	<4	<4	70	300
Ldry Ditch 600'	30	120	<4	40	100	300
231 Outlet	<30	35	<4	<4	<50	100
231 Underpass	<30	40	<4	<4	70	350

* This result not included in average as it was only result above reporting level.

Mud samples from the above waste areas showed no unusual activity with the exception of the T Swamp area. Alpha activity averaged 140 dis/min/gram and 240 dis/min/gram on the West and south side respectively. Fluorophotometer analysis of these samples show that no detectable uranium is present, however the TTA indicates that there is a plutonium deposition in the mud. The average of three analysis showed 160 dis/min/gram with a maximum of 310 dis/min/gram due to plutonium. (200 W HI was notified of this).

As in the past, the laundry lint shows alpha activity averaging about 220 dis/min/gram with a maximum of 380 dis/min/gram. The beta activity on the same samples averaged 150 uuc per kg with a maximum of 200 uuc/kg. Our field men have indicated that currently the amount of lint found around the laundry is more prevalent than in the past.

Portable instrument surveys have been routinely made of all waste zones, these surveys indicating that the dosage rates at all areas is within the normal range of background measurements at all locations except the T swamp. One location at the T swamp gave a VGM reading of 1000 c/m which is roughly twice as high as any reading in the same area this year. The receding water level at this time of the year exposes the mud which previously was underwater, consequently the activity which has settled out over the winter and spring becomes exposed. This fact probably accounts for the instrument readings as well as the alpha activity and plutonium activity mentioned above.

200 North Ditches; Routine instrument surveys of the 200 North Area ditches indicate the normal radiation levels prevail, the maximum readings at the respective ditches in the month of June being as follows: N Ditch 3.0 mrep/hr, P Ditch 5.0 mrep/hr and R Ditch 2.5 mrep/hr.

The test well surveys were not completed this period as the portable scaling unit which accomadates the pre-amplifier tube used in this survey failed in the timing mechanism. This unit was submitted to the instrument development group early in the month and has not been repaired at this writing.

100 Area Wastes

A total of forty samples were obtained from the 107 effluent, the following table summarizing the results for the month of June:

Location	Alpha dis/min/lit		Uranium ug/lit		Plutonium dis/min/lit		Beta Activity uc/lit	
	Ave	Max	Ave	Max	Ave	Max	Ave	Max
107B	< 30	34	< 4	< 4	< 6	< 6	.256	.366
107D	< 30	30	< 4	< 4	< 6	7	.251	.392
107F	< 30	< 30	< 4	< 4	< 6	< 6	.252	.357

The results of the alpha activities analyzed in the 107 samples is about the same as in the past, however in the beta results it is observed that a slight decrease in the average activity has occurred in this period. More noticeable is the absence of the high maximum results found in the month of May. The current maximum results are in about the same order of magnitude as the averages were last month. A better comparison of the two months can be made by comparing the results in the following table, this tabulation now including the comparative results of the past and current month:

	100B	100D	100F
Flow Rate of Effluent	31,500 gps	34,500 gps	31,500 gps
Total Curies In Period	1150	1200	1100
Average Curies / Day	44	46	42
Approx Curies Na ²⁴ / Day (June)	40 - 42	41 - 44	38 - 40
Approx Curies Na ²⁴ / Day (May)	59 - 63	48 - 51	68 - 72
Approx Curies Long Life (June)	2 - 4	2 - 5	2 - 4
Approx Curies Long Life (May)	3 - 7	3 - 6	4 - 8

Re
C152
P32

107 Sulfate Analysis: No samples were obtained for this analysis in this period.

Polonium Analysis: Two samples from each area were analyzed for Polonium, all results being less than six dis/min/liter.

Dryer Room Condensate: Three samples were obtained from the 100B area, the average sulfate being 1.22 uc/ml and the average total beta being 0.84 uc/ml. Maximums for each were 1.6 uc/ml and 1.6 uc/ml respectively. These results are almost identical to last months, the only exception being the maximum total beta which is almost twice as great as that last period.

Calol: One sample from 100D showed the beta activity to be 2.04 uc/liter. This is higher than previous samples as the beta activity on the sample submitted last month was 0.7 uc/liter.

Particle Program: The particle program was encompassed in the site survey program as of June 15, 1949. The following tabulation of the data in this period covers the interval for the month of June, the tabulations being completed on the same basis as was done by the plant assistance group in the past. The breakdown of this data in this report will closely follow the breakdown of this data as reported in previous months.

Moto Air Studies: A summary of the moto air studies based on those locations which are located outside of buildings in the vicinity of the separation areas and 100 areas is tabulated on the basis of particle inhalation rates, this inhalation rate being estimate by the filming of the air filters and comparing the deposition of the number of particles per air sampled to the inhalation rate of man: (upon checking with Bruce I find that the inhalation rates used as a basis of arriving at this tabulation are as follows: 7700 cu ft per month for a man that works a five day week, 9100 cu ft per month for a man that works a six day week, and 25000 cu ft per month for an individual that is a 24 hour resident in the location):

(tabulation on following page)

Location	Inhalation rate in particles per month*	
	May	June
2701-E Badgehouse	0.03	0.2
2701-W Badgehouse	0.30	0.08
B Plant Gatehouse	4.3	0.9
T Plant Gatehouse	1.1	0.4
222B - East End	3.1	2.1
222T - East End	0.6	1.5
Meteorology Tower 3'	0.4	0.4
Meteorology Tower 250'	0.08	0.1
Meteorology Tower 400'	0.6	0.08
100B Changehouse	none	0.07
100D Changehouse	0.06	none
100F Changehouse	0.10	0.07
White Bluffs Fire Sta	0.04	0.03

* Based on a five day work week.

A similar tabulation of the inhalation based on that data obtained from the moto air filters located inside buildings is as follows:

Location	Inhalation rate in particles per month*	
	May	June
✓ 2701 E Badgehouse	0.06	0.1
✓ 2701 W Badgehouse	0.4	0.8
✓ 221 B Operating Gallery	0.5	0.4
✓ 2704 E Bldg	0.4	0.4
✓ 222B Lab: East End Hall	24.8	6.4
222B Lab: Room 7	46.0	35.7
✓ 272 W Maint Shop	0.3	0.2
224 W Air Cond Rm/	0.4	0.08

*Based on five day work week

The inhalation rates of the particles as tabulated for those location at which units are installed off area, is tabulated separately in the following table, this data being based on an inhalation rate for a 24 hour day, assuming that those in these areas are continual residents thereof:

Location	Total ft ³ sampled	Total particles	Particles/month inhaled
Richland	224,000	0	0
Benton City	504,000	1	0.05
Pasco	384,000	0	0
Boise, Ida.	100,000	0	0
Klamath Falls, Ore.	166, 000	0	0
Spokane, Wash.	137,000	2	0.4
Lewiston, Ida.	170,000	0	0
Meacham, Wash.	175,000	1	0.1
Walla Walla, Wash.	170,000	1	0.1
Stampede Pass	173,000	0	0
Great Falls, Montana	173,000	2	0.3

In addition to the study of particle deposition rates and inhalation rates by the filtering program, frame studies made within the separation areas indicated the following deposition rates for the month of June as compared to the previous months:

Area	Particles Per Month	
	May	June
200 East	2.3×10^8	2.4×10^8
200 West	4.5×10^8	2.0×10^8

----- Supplement -----

Being somewhat curious as to the basis of the calculations of the particle inhalation rates as converted from the number of particles deposited on a filter after filtering a certain volume of air, I find the following figures to estimates of the inhalation rates of man and after calculating them out on a five day week or month basis they are far from agreement with those currently used. Investigation of the source of the figures now used as quoted in this report shows that the basis lies in the report on the particle program issued by HMP. This report is not available to me at this time and I cannot better evaluate the current figures. It is entirely possible that we have omitted some vital correction in the following tabulation and will gladly stand corrected:

Volume of air breathed by man: *1 cubic meter/hr.*
~~400 cc~~ per breath and an average of 15 breaths per minute.
 Source of figure is Dr. Fuqua.

Volume breathed per minute: 6000 cc or 6 liters (400 x 15)

Volume breathed per hour: 360 liters (6 x 60 min)

Cu ft breathed per hour: 0.035316 ft³ equals 1 liter, thus man breathes 12.714 ft³/hr.

Ft³ per five day week: 508.56 (12.7 x 40hrs)

Ft³ breathed by a man wrking 5 day week in a one month period: 2203 (508.56 x 4.33)

Ft³ breathed by a 24 hour resident in one month: 9144 (12.714 x 720 hrs in month)

Difference:	Above tabulation	Current figure used
5 day week	2203 ft ³ /mo	7700 ft ³ /mo
24 hr resident	9144 ft ³ /mo	25000 ft ³ /mo

To; J.W. Healy-T. Singleovich
From: H. J. Peas

S.S. Report

SITE SURVEY MONTHLY REPORT FOR
THE MONTH OF JULY 1949

The attached report is compiled from the following number of surveys:

WATER SAMPLING PROGRAM

Drinking Water 500 cc-----	220
Drinking Water 11.7 liter-----	81
Test Wells 500 cc-----	34
Test Wells 11.7 liter-----	9
Raw Water 500 cc-----	25
River -----	64
Waste -----	135
Rain-----	1
Total Water Samples	569

AIR SAMPLING PROGRAM

Particle Filter-----	179
Particle Traps-----	96
Particle Frames-----	60
Air Filters-----	79
Scrubbers-----	20
Detachable Chambers-----	573
Film Packets-----	160
Total Air Samples	1167

LAND SAMPLING PROGRAM

On Area Vegetation-----	397
Off Area Vegetation-----	27
Mud & Lint-----	105
Total Land	529

INSTRUMENT & DISC.

Portable Instrument (Land)-----	12
Portable Instrument (Waste)-----	16
Total Instrument	28

TOTAL SURVEYS FOR MONTH 2293

GENERAL:

The results tabulated in this report were obtained by traveling approximately 9500 miles. It was necessary to reduce the magnitude and frequency of sample coverage during the month due to personnel shortage and vacation schedules. Most off area work was deleted as well as special survey work contemplated on the Columbia River.

DISSOLVING DATA:

Basing the calculations on the weight of uranium dissolved and the interval cooling period, the total liberation of iodine in the dissolvers showed a small increase of about 10% over the month of June. This increase occurred mostly within the 200 West Area, the schedule in 200 East remaining essentially the same.

WEATHEROLOGICAL:

A summary of the wind direction data indicates very little change in the prevalence of the directions as compared to the month of June. Again the West and Northwest directions prevail, accounting for about 80% of the total wind during the hours of iodine liberation. A complete absence of wind from the eastern quadrant is in agreement with last month. The percentage of time that the wind prevailed from the given directions is summarized as follows: North 1%, Northeast & Southeast all less than 1%, South 3%, Southwest 13%, West 42%, and Northwest 39%.

WATER MONITORING:

Two hundred and twenty 500 ml. samples and eighty-one 12 liter samples of drinking water were taken during the month of July. The following table includes a summation of the locations at which the water samples averaged greater than six dis/min/liter for either the 500 ml. or 12 liter samples:

Table 1:

Location	dis/min/liter 500 ml. samples			12 liter samples		
	No. Samples	Maximum	Average	No. Samples	Maximum	Average
Richland Well 12	5	12.1	7.4	2	5.8	5.5
Richland Well 13	18	9.4	6.0	3	8.3	7.7
Richland Well 14	4	19.2	12.1	2	10.3	8.9
Richland Well 15	1	8.2	8.2	1	6.6	6.6
Benton City (Store)	4	17.5	13.3	1	2.8	2.8
Benton City Water Company	4	47.8	26.4	2	8.4	5.8

The alpha activity found in the above wells is consistent with the confirmed uranium analysis in previous months. Current fluorophotometer analysis again confirms the presence of natural occurring uranium in the underground supplies of both the village of Richland and Benton City.

No samples showed beta activity averaging more than 50 uuc/liter, however individual samples from two locations, Kennewick and 3000 Well C, showed tracer beta activity.

Two new water locations were sampled in the month, in each case only two samples were obtained and in each case positive alpha activity was indicated. Neither of the results are tabulated in the above table, as the uranium analysis were not completed. Gerricks Well at Benton City (350'-400' deep) showed alpha activity as 9 dis/min/liter and raw water at the 251 building averaged 58 dis/min/liter with a maximum of 74 dis/min/liter. Further confirming results are necessary before accepting these new locations as positive alpha contaminated supplies.

The following table summarizes all sample results which showed alpha activity in excess of 6 dis/min/liter alpha activity, on an individual sample:

The following table summarizes the results obtained from the analysis of three gallon samples:

<u>Location</u>	<u>Number Samples</u>	<u>Alpha activity d/m/l</u>		<u>U as ur U/liter</u>	
		<u>Maximum</u>	<u>Average</u>	<u>Maximum</u>	<u>Average</u>
Columbia Camp	3	3.3	2.5	-	-
Headgate	3	1.2	1.2	-	-
Hanford Well #4	1	3.6	3.6	-	-
Hanford Well #7 (san)	3	3.9	2.4	< 4.0	-
3000 Area Well A	2	1.9	1.4	< 4.0	< 4.0
3000 Area Well C	2	2.5	2.5	< 4.0	< 4.0
3000 Area Well D	2	3.1	2.6	< 4.0	< 4.0
3000 Area Well E	2	2.6	2.3	< 4.0	< 4.0
3000 Durand #5	2	6.0	3.7	< 4.0	< 4.0
Richland Well #13	3	7.5	6.7	7.7	< 4.0
Richland Well #4	2	1.0	< 1.0	4.9	4.5
Richland Well #5	2	5.0	4.2	5.4	< 4.0
Richland Well #12	2	4.8	4.5	4.0	< 4.0
Richland Well #14	2	9.5	7.9	< 4.0	< 4.0
Richland Well #15	1	5.6	5.6	7.9	7.9
Richland Well #16	3	4.3	3.5	< 4.0	< 4.0
Richland Well #18	3	7.6	5.3	< 4.0	< 4.0
Tract House K-748	3	1.9	1.5	< 4.0	< 4.0
Tract House J-685	2	2.1	1.1	4.0	< 4.0
Benton City Store	1	1.8	1.8	15.8	12.0
B.C.; Water Co. Well	2	8.4	5.3	19.5	15.7
Cobbs Corner Chev. Sta.	3	4.2	3.1	< 4.0	< 4.0
Kennewick Highlands	2	1.5	1.0	-	-
Kenn. Std. Station	2	2.1	1.5	< 4.0	< 4.0
Barrotts Ass. Ser. Sta. (Ken.)	2	3.1	1.6	< 4.0	< 4.0
Riverland	2	1.4	1.4	< 4.0	< 4.0
Midway	2	1.8	1.4	< 4.0	< 4.0
Wills Ranch	2	1.5	1.0	< 4.0	< 4.0
Paso H & R Depot	2	1.1	1.0	< 4.0	< 4.0
White Bluffs Ice House	1	3.7	3.7	-	-
251 Bldg. Raw H ₂ O	2	74.5	58.8	-	-
<i>to be confirmed WS.</i>					
<u>Test Wells</u>					
B-Y Well	2	6.4	6.3	< 4.0	-
Spring #13	2	2.4	1.4	-	-
Snively Ranch	1	1.5	1.5	-	-
200 North #5	1	6.5	6.5	-	-

Supplementing the tabulation of 3 gallon samples, the following table summarizes the results of all samples showing alpha activity in excess of 6 dis/min/liter, as measured in 500 ml. samples:

<u>Location</u>	<u>Number Samples</u>	<u>Alpha Activity d/m/l</u>		<u>U as ur U/liter</u>	
		<u>Maximum</u>	<u>Average</u>	<u>Maximum</u>	<u>Average</u>
Gerricks Well (E.C.)	1	8.9	8.9	-	-
Richland Well #13	18	9.4	< 6.0	7.7	< 4.0
Richland Well #4	5	10.3	< 6.0	4.9	4.5
Richland Well #5	5	11.0	< 6.0	5.4	< 4.0
Richland Well #12	5	12.1	6.6	4.0	< 4.0
Richland Well #14	4	19.2	12.1	< 4.0	< 4.0
Richland Well #15	1	8.2	8.2	7.9	7.9
Richland Well #2	4	7.0	< 6.0	5.3	4.2
Fosters Ranch Well	3	16.3	< 6.0	-	-
3000 Area Well A	4	6.5	< 6.0	< 4.0	< 4.0
Benton City Store	4	16.5	13.3	15.8	12.0
B.C. Water Co. Well	4	46.8	26.4	19.5	15.7
Cobbs Corner Chev. Sta.	4	6.5	< 6.0	< 4.0	< 4.0
Kennewick Std. Sta.	4	6.1	< 6.0	< 4.0	< 4.0
300 Area Sanitary	19	9.2	< 6.0	< 4.0	< 4.0

Test Wells

300 Area Well #1	5	267.4	105.8	187.0	70.1
300 Area Well #2	4	49.9	18.8	20.3	10.4
300 Area Well #4	2	320.9	164.8	172.3	172.3
B-Y Well	4	7.2	6.0	< 4.0	< 4.0
200 North Well #5	4	10.5	< 6.0	-	-

RADIOACTIVE CONTAMINATION IN THE COLUMBIA RIVER

July - 1949

Location	Alpha- dis/min/liter		Beta-Gamma-uuc/liter	
	Maximum	Average	Maximum	Average
Above 100-B Area	<6	<6	<50	<50
181-B Area	<6	<6	60	<50
181-D Area	<6	<6	80	.70
181-F Area	<6	<6	210	135
Hanford South Bank	<6	<6	1000	860
Hanford Middle	<6	<6	420	310
Hanford North Bank	<6	<6	180	150
300 Area	<6	<6	225	130
Richland	<6	<6	180	150
Pasco Bridge (Kennewick Side)	<6	<6	150	80
Pasco Bridge (Pasco Side)	<6	<6	220	150

* Note: The reporting level for the minimum activity detected in river samples is currently established at 50 uuc/liter (5×10^{-5} uc/liter).

The above table summarizes the results obtained from weekly samples at the listed locations. A very noticeable increase in the measured beta activity in these samples is observed, this increase being in direct agreement with the reduced river flow and subsequent reduced dilution of the 107 effluent in the Columbia. In general, the average beta activity at all locations has increased by a factor approaching two, during the month of July. A corresponding decrease in river flow by a factor around two accompanies this period. Currently the river is flowing at a million gps., the average for the month being around 1,500,000 gps. During the month of June the peak flow was around 3,000,000 gps. with a monthly average around 2,750,000 gps.

No measurable alpha activity was detected in the river samples.

Weekly samples were obtained from three locations in the Yakima River, and one irrigation ditch location which carries water from the Yakima. The beta activity was less than 50uuc/liter in all samples. No positive indications of alpha activity were obtained.

Four samples from Fosters Ranch showed beta activity averageing 150 uuc/liter with a maximum of 215 uuc/liter. Alpha activity measurements were less than 6 dis/min/liter in all cases.

No cross-section depth surveys were made during the month due to the lack of manpower in the laboratory and Site Survey Group.

COLUMBIA RIVER MUD SAMPLES

Total Beta-Gamma Activity - muc/kg (milli-microcurie per kilogram)

July 1949

Location	No. Samples	Beta Activity in milli-microcuries per Kilogram			
		Onshore Samples		Five Feet From Shore	
		Maximum	Average	Maximum	Average
Near Wills Ranch	4	13	11	15	13
Allard Pump Station	4	80	29	12	10
At 100-H Area	4	14	10	12	10
Below 100-F Area	4	13	13	18	12
Richland Dock	4	16	12	19	15
At 300 Area	4	15	13	17	12
Pasco Bridge (Pasco Side)	4	14	12	13	9
Pasco Bridge (Kennewick Side)	4	10	7	24	13
Hanford Ferry	4	28	23	17	13

Table 3

The results of the beta activity measurements in river mud are comparable to those found last month. One sample obtained at Allard Station contained 80 muc/kg, this result being about four times greater than usual at this location. This result was confirmed by recount, but efforts to obtain a decay study proved futile as the sample was not available when we obtained the result.

With the exception of Wills Ranch, no measurable alpha activity was detected in the mud samples. Two samples from Wills (shore & 5 feet out) showed alpha activity of 150 and 27 dis/min/gram. Analysis for uranium and plutonium showed negative results, thus it is assumed that these samples were subjected to an erroneous counting condition. Resamples also showed no positive confirming results.

RAW WATER - RIVER EXPORT LINES

Twenty-five samples were taken from the export lines at the 183 and 283 buildings. Measurable beta activity was detected at the 183 building in 100F and at the 100H Area float. This activity averaged around 50 uuc/liter with maximum results of 70 uuc/liter. All other locations showed the beta activity to be less than 50 uuc/liter. No measurable alpha activity, as measured for uranium and plutonium was detected.

AIR MONITORING:

A summary of the average dosage rates measured using detachable chambers is given in the following table:

RADIATION LEVELS IN AIR

Detachable Chambers

Location	Average mrep* per 24 Hours	
	July 1949	June 1949
<u>100 Area and Environs</u>		
Route 1, Mile 8	0.44	0.37
Route 2N, Mile 10	0.37	0.34
Route 2N, Mile 5	0.34	0.31
White Bluffs	0.39	0.36
Route 11A, Mile 1	0.81	1.40
Hanford 614 Bldg.	0.48	0.48
Intersection Rt. 1 & 4N	0.55	0.43
Hanford 101 Area	0.38	0.39
100H Area	0.37	0.38
<u>Within 5 Miles of 200 East</u>		
Route 4S, Mile 6	0.94	0.71
Batch Plant	0.54	0.56
Route 11A, Mile 6	0.58	0.81
Route 3, Mile 1	0.63	0.89
Meteorology 200	0.94	0.94
234-235 Area	0.36	0.40
<u>Within 10 Miles of 200 East</u>		
Route 4S, Mile 10	1.17	0.71
Route 10, Mile 1	0.66	0.48
Route 10, Mile 3	0.78	0.48
Route 2S, Mile 4	0.94	1.06
<u>Near 300 Area</u>		
Route 4S, Mile 16	0.86	0.53
Route 4S, Mile 22	0.78	0.48
3000 Area North	0.48	< 0.48
3000 Area South	0.48	< 0.48
<u>Outlying</u>		
Richland	0.48	< 0.48
Fenton City	0.48	0.57

* The above values included the background measurements of the instruments which vary from about 0.3 to 0.5 mrep per 24 hours.

The following results were obtained at the atmospheric monitoring station from the Integrations and C Chambers:

Location	Average Dose in mrep per 24 Hours			
	Integrations		C Chambers	
	July	June	July	June
100-B Area	0.2	0.2	0.3	0.2
100-D Area	0.2	0.3	0.3	0.3
100-F Area	<0.1	0.3	0.3	0.3
200-West Area	0.2	0.2	0.3	0.3
200-East Area	0.2	<0.1	0.5	0.6
Riverland	0.1	<0.1	--	--
Hanford	---	---	---	---
300 Area	0.7	1.2	0.5	0.5
700 Area	0.3	0.1	--	--
Kennawick	---	---	---	---
Pasco	0.3	0.8	--	--
Benton City	0.2	0.1	--	--
3000 Area North	0.5	0.7	--	--
3000 Area South	0.2	<0.1	--	--

~~* Motor supply not available to unit.~~

The following results for the total aerosol beta-gamma activity were obtained by the use of air filtering devices during the month of July.

Location	Maximum Noted in 8 Hour Period	Average on Filters
	uc/liter	uc/liter
200 East, SE Corner	4×10^{-7}	3.8×10^{-10}
200-West, Tower #4	$<1 \times 10^{-7}$	$<5.0 \times 10^{-12}$
Gable Mountain	-----*	2.4×10^{-10}
Richland	$<1.0 \times 10^{-7}$	1.1×10^{-10}
Pasco	-----	-----**
300 Area	-----	1.4×10^{-10}
200-East, Tower #18	-----	8.9×10^{-10}
100-D Area	-----	6.0×10^{-11}
200-West Gate	1.4×10^{-7}	6.0×10^{-11}
Benton City	-----	4.0×10^{-11}
Hanford 614 Building	-----	9.0×10^{-11}
105 DR Construction Zone	-----	4.5×10^{-11}
Hanford 101 Building	-----	1.5×10^{-11}
White Bluffs	-----	3.5×10^{-11}
3000 Area North	-----	7.5×10^{-11}
200-West Tower #15	1.8×10^{-7}	4.0×10^{-11}

* Unit not operating satisfactory.

** Motor Failure.

The above tabulations of dosage rates as based on the ionization chambers and integron readings are indicative of very little change during the current month. A slight downward trend is observed at a few random locations, this being in agreement with the reduced dissolving and reduced contamination detected on the vegetation.

Supplementing the aerosol beta activity measurements as made by use of air filters, specific measurements of I^{131} were made by using a caustic scrubber connected behind and in series with the filters. Due to the excessive heat wave in the early part of the month, the scrubbers operation was somewhat retarded as it was impossible to service the units more than three times a week. On three occasions the scrubbers were found to be dry, however the balance of the time the units were operated successfully. The following table summarizes this data, as observed at locations:

AIR MONITORING DATA

July - 1949

Location	Beta Activity on Filter*	I^{131} In Scrubber Solution*
	uc/liter air	uc/liter air
200 West Gate	6.0×10^{-11}	6.2×10^{-10}
Benton City	4.0×10^{-11}	$< 1.0 \times 10^{-11}$
200-East S.E.	3.8×10^{-10}	5.4×10^{-10}
300 Area	1.4×10^{-10}	4.0×10^{-11}
Richland	1.1×10^{-10}	1.0×10^{-11}

Again, it should be noted that the iodine activity detected in those scrubbers located in the separation areas exceeds the total aerosol beta activity collected on the filter.

RAIN SAMPLE ANALYSIS:

The total measurable precipitation during the month of July was less than .01 inches. Only one trace sample was collected throughout the month, this sample coming from Riverland which evidently had a slightly greater rainfall than the other locations. No measurable beta activity was detected in the Riverland sample.

PARTICLE DEPOSITION:

The detection of particles was accomplished by collecting and filming 179 motoair filters, 60 frames, and 96 particle traps. The frame data is indicative of a slight increase in the number of particles falling within the separation areas whereas the motoair studies show that the collections at the various locations have remained about the same. Frame studies show that somewhat larger particles have been falling the past month when this data is compared to the month of June. The frames located on top of building 222-T and at the southwest end of the 271 building show particles with intensities of 0.1 muc.

Particle inhalation rates as calculated by filming filters and computing the air flow thru the filter in respect to a 7700 ft.³ inhalation rate for a man working a five day week are summarized for key outside locations in the following table:

<u>Location</u>	<u>Inhalation Rate In Particles Per Month</u>	
	<u>July</u>	<u>June</u>
2701-E Badhouse	0.16	0.2
2701-W Badhouse	0.02	0.08
B Plant Gatehouse	0.48	0.9
T Plant Gatehouse	0.45	0.4
222-B- East End	1.80	2.1
222-T- East End	2.40	1.5
Meteorology Tower 3'	0.15	0.4
Meteorology Tower 250'	0.17	0.1
Meteorology Tower 400'	0.07	0.08
100-B Changehouse	None	0.07
100-D Changehouse	None	None
100-F Changehouse	None	0.07
White Bluffs Fire Sta.	0.06	0.03

A similar tabulation of the inhalation rates based on that data obtained from the motoair filters located inside buildings is as follows:

3

of

4

<u>Location</u>	<u>Inhalation Rate In Particles Per Month</u>	
	<u>July</u>	<u>June</u>
2701-E Padgehouse,	0.11	0.1
2701-W Badghouse	0.02	0.8
221-B Operating Gallery	0.38	0.4
2704-E Building	0.06	0.4
222-B Lab, Rm. 7	8.40	-6.4 35.7
222-B Lab., East End Hall	27.5	35.7 6.4
272-W Maintenance Shop	0.17	0.2
224-W Air Cond. Room		0.08

The inhalation rates of the particles as tabulated for those locations at which units are installed off area, is tabulated separately in the following table, this data being based on an inhalation rate for a 24 hour day, assuming that those in these areas are continual residents thereof:

<u>Location</u>	<u>Total Ft.³ Sampled</u>	<u>Total Particles</u>	<u>Particles/Month Inhaled</u>
Richland	261,000	0	0
Benton City	388,000	0	0
Pasco	404,000	0	0
Boise, Idaho	140,000	1	0.16
Klamath Falls, Ore.	100,000	0	0
Spokane, Wn.	143,000	1	0.17
Lewiston, Idaho	133,000	0	0
Meacham, Wn.	139,000	0	0
Walla Walla, Wn.	105,000	0	0
Stampede Pass	146,000	2	0.33
Great Falls, Montana	106,000	3	0.72

In addition to the study of particle deposition rates and inhalation rates by the filtering program, frame studies made within the separation areas indicated the following deposition rates for the month of July as compared to the previous month:

<u>Area</u>	<u>Particles Per Month</u>	
	<u>June</u>	<u>July</u>
200 East	2.4×10^8	2.8×10^8
200 West	2.0×10^8	3.1×10^8

LAND AND VEGETATION CONTAMINATION:

Three hundred and ninety-seven routine vegetation samples were collected during July. Each of these samples were analyzed for I^{131} and for beta activity from non-volatile emitters. The results of the analysis for beta activity of these two sources in the vegetation are summarized for the nearby locations as follows:

Location	I^{131} as milli-microcuries/kg*			Non-volatile activity as muc/kg**		
	Maximum	Average	June - Average	Maximum	Average	June - Average
North of 200 Areas (64)	3	< 2	< 2	36	< 10	< 10
Near the 200 Areas (53)	3	< 2	2	54	< 10	10
Route 3 (8)	46	14	36	30	12	25
200-West Gate (4)	78	36	63	103	44	27
Meteorology Twr (4)	6	5	21	10	< 10	22
South of 200 Areas (91)	6	< 2	< 2	20	< 10	< 10
Richland (20)	2	< 2	< 2	26	10	< 10
Pasco (16)	5	< 2	< 2	15	< 10	< 10
Kennewick (16)	10	< 2	< 2	15	< 10	< 10
Benton City (12)	2	< 2	< 2	15	< 10	< 10
Richland 'Y' (4)	4	< 2	< 2	17	< 10	< 10
Hanford (8)	< 2	< 2	< 2	26	12	< 10

Parenthesis () indicate number of samples from locations.

* The limit of sensitivity for I^{131} determinations in a 5.0 gram sample of vegetation is 2 muc/kg.

** The limit of sensitivity for non-volatile emitters is best estimated at 10 muc/kg, this value including the natural beta activity from K^{40} .

The above summation indicates that the measurable I^{131} activity has decreased at the locations near the areas, and has continued to remain below the limits of sensitivity at the outer locations and residential areas. The non-volatile activity measurements average less than 10 muc/kg at most of the outer locations, those more adjacent to the separation areas showing activity above that of the natural emitters by a factor of two to three.

Figure___ summarizes the I^{131} activity deposition on an iso-activity map. It is of interest to note that nearly identical conditions are found in each of the 200 Areas, maximum activities occurring to the downwind southeast side of the area and minimum activity being found to the southwest of the areas. In the past, this pattern was symbolized by a concentrated deposition outside the West area, while very little activity was measured in the zone similarly located in respect to the East area.

Supplementing the routine vegetation sampling program, the following table summarizes the results obtained from samples collected off the site. The magnitude of the off-area program was reduced in this period due to the lack of available field and laboratory personnel.

Location	I^{131} as milli-microcuries /kg			Non-Volatile activity as muc/kg		
	Maximum	Average	June Average	Maximum	Average	June Average
Northwest Ranches	2	< 2	< 2	14	10	10
LP Posts (Rattlesnake)*	< 2	< 2	< 2	10	< 10	10
LP Posts (Rattlesnake)	3	< 2	-	19	10	-
Pasco-Eltopia	< 2	< 2	-	11	13	-
Yakima-Ellensburg	2	2	< 2	15	< 10	< 10

* Posts 30, 31, 33 only (these post located at base of mountain.)

The above tabulation shows that no significant changes or trends have occurred during the past month at the comparable locations.

Thirty-six samples were obtained from inside the separation areas, the activity deposition on the vegetation being in very good agreement when the areas are compared. The maximum I^{131} activity was found in the 200 East Area, a sample containing 68 muc/kg whereas the average was 9 muc/kg. I^{131} measurements in 200 West showed a maximum of 56 muc/kg and an average of 6 muc/kg. Non-volatile activity averaged 15 muc/kg and 10 muc/kg in 200 East and West respectively. The corresponding maximums were 46 muc/kg and 28 muc/kg.

HANFORD WASTES:100 Areas

Thirty-three samples were obtained from the effluent water in the 107 basins. A small decrease in beta activity is noted again this month, this decrease being a confirmation on a trend observed the last three months. The average beta-gamma activity detected in samples from the 107 basins at 100B, 100D, and 100F Areas was 249, 266, and 207 muc/liter respectively. The maximum activity measured at these same locations was 341, 319, and 350 muc/liter. These same samples were analyzed for alpha activity by ether extraction, all locations averaging less than 30 dis/min/liter. Further analysis for uranium and plutonium by the fluorophotometer and TTA process showed all samples to contain less than 4 ug U/liter and less than 6 dis/min/liter.

Basing the calculations on previous decay studies of the effluent, an estimated 130 curies of beta-gamma emitters were discharged into the river daily. Approximately 117 to 124 curies are calculated to be Na^{24} and 7 to 13 curies to be longer lived material.

One sample of 107 effluent from each Area was analyzed for polonium; all results indicating less than 6 dis/min/liter.

No samples were received for the special analysis, ie. total beta, sulfates, and calol.

200 AREAS:

Weekly portable instrument surveys of the 'T' Swamp ditch area in the 200 West area, indicated that the radiation level does not exceed 400 c/m above background in this vicinity.

Portable instrument surveys of the laundry ditch and surroundings indicate maximum readings to be around 400 c/m above background. This data being consistent with the past.

Supplementing the routine instrumentation, the following table summarizes activity measurements made by direct sampling of the 200 Waste Areas:

Location	Type Sample	Alpha - dis/min/kg*		Beta-Gamma - muc/kg*	
		Maximum	Average	Maximum	Average
T Swamp	Water	<30	<30	0.1	<0.1
T Swamp	Mud	4.3×10^5	2.5×10^5	120	60
U Swamp	Water	45	<30	<0.1	<0.1
Laundry Ditch	Water	<30	<30	0.4	.1
231 Ditch	Water	<30	<30	<0.1	<0.1
B Ditch	Mud	5.0×10^4	3.0×10^4	550	210
Retention Ponds:					
200-East	Water	<30	<30	<0.1	<0.1
200-West	No samples	-	-	-	-
Laundry Lint	Solid	6.7×10^5	3.5×10^5	250	90

* It is assumed that one liter of liquid sample weighs one kilogram.

One sample from the laundry ditch 600' location on 7/21/49 showed alpha activity of 1920 dis/min/liter. This sample is not included in the tabulation as it appears that the subsequent U analysis which was less than 4 ug/liter was confused with a sample from the inlet location. The sample from the inlet location showed no measurable alpha activity, however the U analysis showed 620 ug/liter. Definite mixup cannot be proven and thus the result is excluded from the tabulation.

All waste samples tabulated above were checked on the fluorophotometer, the only positive indications appearing in the U swamp and its contributing water. The 231 ditch showed samples containing 10 to 15 ug U per liter and the swamp showed samples containing 25 to 35 ug U liter.

300 AREA WASTES:

Weekly samples from the ponds indicate maximum alpha activity of 2300 and 1800 dis/min/liter for the old and new ponds respectively. The average of all samples shows the average to be 1000 dis/min/liter at each pond. Mud samples obtainable from the old pond show average alpha activity of 1200 dis/min/gram with a maximum of 3000 dis/min/gram. The activity in mud detected as uranium averaged 75 ug/gram, maximum uranium detected being 140 uc/gram. Uranium found in the liquid samples averages 250 to 300 ug/liter in each pond.

Beta activity in the ponds averages 0.29 and 0.37 muc/liter in the old and new pond respectively. Maximum activity detected was 0.46 muc/liter.

Table 8

Twenty samples were obtained directly from the waste line to the pond. Excluding two high results (2230 and 1100 uuc/l) the average beta activity was 77 uuc/liter. The more usual maximum result, was in the order of 150 uuc/liter. Alpha activity ranged from around 40 dis/min/liter to over 6000 dis/min/liter; the individual results being so widely spread that an average would be a poor approximation of the contamination level. All samples were analyzed by the TTA process, plutonium results being positive on two occasions when 250 and 194 d/m/liter were detected. All other results were less than 6 dis/min/liter. Uranium was confirmed each day, these results varying between 20 and 450 ug uranium per liter. The average uranium activity was around 160 ug per liter.

To: - J. M. Haly - W. Singlovich
From: H. J. Foss

SITE SURVEY MONTHLY REPORT FOR
THE MONTH OF AUGUST 1949

The attached report is compiled from the following number of surveys:

WATER SAMPLING PROGRAM

Drinking Water 500cc-----	263	
Drinking Water 11.7 liter -----	56	
Test Wells 500cc-----	70	
Test Wells 11.7 liter-----	12	
Raw Water 500cc-----	25	
River-----	79	
Waste-----	126	
Rain-----	1	
Total Water Samples		632

AIR SAMPLING PROGRAM

Particle Filter-----	183	
Particle Traps-----	52	
Particle Frames-----	71	
Air Filters-----	72	
Scrubbers-----	27	
Detachable Chambers-----	587	
Film Packets-----	160	
Total Air Samples		1152

LAND SAMPLING PROGRAM

On area Vegetation-----	628	
Off Area Vegetation-----	41	
Mud & Lint-----	113	
Total Land Samples		782

INSTRUMENT & MISC.

Portable Instrument (Land)-----	12	
Portable Instrument (Waste)-----	16	
Total Instrument		28

TOTAL SURVEYS FOR MONTH 2594

2

The above number of surveys were accomplished by traveling approximately 6,000 miles. One of the units, ID 2036 (Radio Car 72) broke down when the steering mechanism failed while traveling and upon submitting this unit for repair, it was found that parts were not available and it was recommended that the unit be exsessed and replaced with newer equipment. As a result, this unit is being exsessed, and the mobile equipment therefrom is being installed in an enclosed Power Wagon, said Power Wagon replacing the old unit.

One new employee was obtained during the month, when J. K. Soldat reported. In addition Bruce Anderson was returned from the operational group where he was on loan.

DISSOLVING DATA

The liberation of radioactive material from the 200 Area stacks showed a very slight decrease when compared to the month of July. This decrease was 7.3%, basing this calculation on the weight of metal dissolved in the 200 Areas. No material change in the cooling time was observed.

METEOROLOGICAL DATA

A summary of the wind direction data for the month of August shows that 93% of the wind during hours of metal dissolution, prevailed from the northwest and west, with a negligible amount of wind from all other directions. This fact is unusual as the usual prevalence of wind from these directions is on the order of 50% to 75%. The near complete absence of rain during the month is another unusuality for this period.

WATER MONITORING:

A total of three hundred and nineteen samples of drinking water were analyzed during the month. Of this total two hundred and sixty-three samples were 500 cc samples and fifty-six were 12 liter samples. The frequency of taking twelve liter samples was reduced somewhat at the end of the month due to the limited facilities in the 222-U laboratory at that time.

Supplementing the drinking water sampling, a total of eighty one samples were obtained from various test wells, seventy of these samples being 500 cc and eleven samples being 12 liters.

The following table includes a summation of the locations at which the drinking water samples averaged greater than six dis/min/liter for either the 500 ml. or 12 liter samples:

LOCATION	dis/min/liter					
	500 ml. Samples			12 liter Samples		
	No. Samples	Maximum	Average	No. Samples	Maximum	Average
Richland #2	5	13	9	3	<6	<6
4	2	16	9	2	6	<6
14	4	9	8	2	7	<6
15	4	11	7	2	9	8
18	4	<6	<6	3	11	8
Benton City Store	5	30	15	1	8	8
Benton City Water Company	5	38	33	3	17	8
3000 Area Well D	4	43	13	2	<6	<6

The above tabulation of locations is nearly identical to these locations listed in a similar table last month. The alpha activity is confined to the underground supplies of the Benton City and Richland areas, and is in general confirmed as uranium activity by the fluorophotometer. One sample from the 3000 Area system was unusually high in alpha activity, however this result was included as some previous samples have shown the presence of uranium in this supply. The listed sample was not confirmed by the resample, and the activity was not confirmed as uranium on the fluorophotometer.

Beta activity was detected in those samples which are located near the Columbia River or have the river as their source of water. The 500 ml. samples indicated beta activity averaging 60 uuc/liter in the Kennewick Highlands supply, this location being the only one which showed a positive average during the month. Positive beta activity was detected in individual samples taken from the Kennewick, Pasco, and White Bluffs supplies, this activity ranging from 50 uuc/liter to 70 uuc/liter.

The following two tables page 5 and page 6 include the results of the water sampling program for the 500 ml and 12 liter samples respectively. The 500 cc table includes a list of all locations which showed alpha activity in excess of 6 dis/min/liter in any one sample. The 12 liter table includes all locations which showed alpha activity in excess of one dis/min/liter for a single sample. The results of the fluorophotometer analysis for uranium are included in each table.

In addition to the routine samples, several samples were obtained from the sanitary supplies at nearby cities and communities. The analysis of these samples for alpha activity showed the following positive results for three gallon samples: Ellah, Washington, 4.3 dis/min/liter, Granger, Washington, 5.1 dis/min/liter, Sunnyside, Washington 2.0 dis/min/liter. No positive alpha activity was detected in the sanitary water obtained from Yakima, Washington, Moses City, Washington and Umatilla, Oregon.

Summary of results from 500 cc samples.

<u>Location</u>	<u>Number Samples</u>	<u>Alpha Activity</u> <u>3/2/1</u>		<u>U as ug U/liter</u>	
		Maximum	Average	Maximum	Average
Gerrick's Well	1	9.9	9.9		
Foster's Ranch	5	7.6	<6		
3000 Area Well A	4	12.8	<6	4.2	<4.0
3000 Area Well D	4	43.2	12.5	6.2	<4.0
Richland #13	19	10.1	<6	7.6	4.3
Richland #2	5	13.4	8.8	5.9	5.3
Richland #4	2	16.0	8.6	6.5	6.1
Richland #14	4	9.3	7.6	3.8	5.8
Richland #15	4	11.9	7.3	11.1	8.3
Benton City Store	5	30.2	14.7	13.4	9.3
Benton City H ₂ O Co. Well	5	37.6	33.4	21.3	16.9
Pasco	4	11.2	<6	<4.0	<4.0
Pistol Range	4	9.1	<6	<4.0	<4.0
300 Area Sanitary	21	73.9	<6	<4.0	<4.0
<u>Test Wells</u>					
300 Area Well #1	3 3	160.2	115.6	118.0	101.8
300 Area Well #2	17	255.6	38.9	<4.0	<4.0
300 Area Well #3	17	90.6	41.8	47.4	28.8
300 Area Well #4	3	279.7	185.7	250.9	133.4

Summary of results from 12 liter water samples.

<u>LOCATION</u>	Number Samples	<u>Alpha Activity</u> <u>d/n/l</u>		<u>U as ug U/liter</u>	
		Maximum	Average	Maximum	Average
100-H Raw Water	1	4.6	4.6	<4.0	<4.0
Columbia Camp	3	3.8	2.5	--	--
Headgate	3	1.1	1.2	--	--
Hanford #7 San. H ₂ O	1	5.4	4.5	<4	<4.0
3000 Area Well A	2	3.8	2.1	4.2	<4.0
3000 Area Well B	2	3.9	2.5	4.0	<4.0
3000 Area Well C	2	4.1	3.6	5.4	<4.0
3000 Area Well D	2	5.4	2.9	6.2	<4.0
3000 Area Durand #5	3	2.3	1.5	<4.0	--
3000 Area Pond Inlet	2	4.5	4.0	--	--
Richland Well #2	3	2.4	1.7	5.9	5.3
Richland Well #4	2	6.4	4.2	6.5	6.1
Richland Well #5	2	4.5	2.3	--	--
Richland Well #14	2	7.1	4.2	8.8	5.8
Richland Well #15	2	9.1	8.0	11.1	8.3
Richland Well #18	3	10.8	8.1	5.2	<4.0
Tract House K-748	2	4.0	3.0	<4.0	<4.0
Tract House J-685	2	3.5	2.4	<4.0	<4.0
Benton City Store	1	8.1	8.1	13.4	9.3
Benton City H ₂ O Co. Well	3	16.8	7.9	21.3	16.9
Cobb's Corner	3	4.2	4.0	<4.0	<4.0
Kennewick Highlands	1	1.9	1.9	--	--
Riverland	1	2.3	2.3	<4.0	<4.0
Midway	1	1.2	1.2	<4.0	<4.0
White Bluffs Ice House	2	5.3	2.6	--	--

Test Wells

300 Area Well #3	1	1.5	1.5	10	--
Rattlesnake Spring	1	1.7	1.7	10	--
200 H Well #5	1	3.5	3.5	10	--
Meeker Well	1	6.2	6.2	10	--
251 Building Raw H ₂ O	1	3.5	3.5	10	--

RADIOACTIVE CONTAMINATION IN THE COLUMBIA RIVER

August 1949

Location	Alpha-dis/min/liter		Beta-Gamma-uuc/liter	
	Maximum	Average	Maximum	Average
Above 100-B Area	< 6	< 6	< 50	< 50
181-E Area	< 6	< 6	< 50	< 50
181-D Area	< 6	< 6	230	150
181-F Area	6.0	< 6	560	395
Hanford South Bank	< 6	< 6	1520	1300
Hanford Middle	< 6	< 6	600	440
Hanford North Bank	< 6	< 6	205	185
300 Area	< 6	< 6	395	170
Richland	6.0	< 6	1100	470
Pasco Bridge (Kenn. Side)	< 6.0	< 6	185	240
Pasco Bridge (Pasco Side)	< 6.0	< 6	160	220

* Note: The reporting level for the minimum activity detected in river samples is currently established at 50 uuc/liter (5×10^{-5} uc/liter).

The above table summarizes the results obtained from the routine weekly samples taken at the listed locations. For the second consecutive month, a very noticeable increase in the measured beta activity is observed at all locations except those above 100-B Area. This increase is in the neighborhood of a factor of two, and is again directly in relation to the continually decreasing river flow. The flow rate of the Columbia River has decreased steadily throughout the month of August, the current flow rate being 675,000 g.p.s. as compared to a flow rate of 1,035,000 g.p.s. on July 27th. The maximum results listed above were all found at the end of the period when minimum flow occurred. The beta activity measured at Richland is again higher than at 300 Area, a fact attributable to the sampling location, the Richland samples being taken in the middle of the river and the 300 Area samples being taken on shore in rather dormant water. The magnitude of the one Richland sample which contained 1100 uuc/liter is unusual, and may possibly be due to a confined amount of algae or similar mass which had the concentrated activity in it.

Several indications of tracer alpha activity were found, the only locations showing a detectable amount of this activity being 181-F Area and Richland. Each of these locations showed the alpha activity to be at the limit of sensitivity of the instruments, i.e. 6 dis/min/liter.

Table II

Samples from Fosters Ranch, on the north side of the river showed the beta activity to average 145 uuc/liter with a maximum of 160 uuc/liter, the results on this side of the river not fluctuating as much as those on the south bank.

Samples from the Yakima, taken at the horn and at the mouth show no measurable beta or alpha activity. Similar samples taken from the irrigation ditch between the Yakima River and Lee Blvd., in Richland showed no measurable activity.

Several samples from nearby streams were obtained and analyzed for alpha activity to further the background studies. Samples from the Yakima River at Yakima and the Naches River at Yakima, showed the alpha activity to be less than 1 dis/min/liter for three gallon sample analysis.

COLUMBIA RIVER MUD SAMPLES

Total Beta-Gamma Activity - muc/kg (milli-microcurie per kilogram)

August 1949

Location	No. Samples	Beta Activity in milli-microcuries per kilogram			
		Onshore Samples		Five Feet From Shore	
		Maximum	Average	Maximum	Average
Near Mills Ranch	5	19	15	19	14
Allard Pump Station	5	20	16	20	16
At 100-H Area	5	16	12	16	11
Below 100-F Area	5	36	23	28	24
Richland Dock	5	21	16	31	20
At 300 Area	5	40	20	54	27
Pasco Bridge (Pasco Side)	5	22	16	19	17
Pasco Bridge (Kenn. Side)	5	23	16	23	18
Hanford Ferry	5	96	30	59	23

The results of the beta activity measurements in river mud show an increase at all locations during the month. This increase is the first noticeable trend observed in this data in several months, and is possibly attributed to the decrease in river flow, this fact causing the samples to be taken at locations which previously were underwater. This increase is indicative of the fact that there is some

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settling out of beta activity and also indicates that very little difference in the magnitude of increase on shore and off shore exists. The higher activity found at 300 Area could be due to either the more dormant water, this allowing a greater settling than in the fast water, or possibly due to a seepage from the ponds in this area. Several checks for seepage have been made since the first of the year and in no case was any evidence of seepage detected.

RAW WATER - RIVER EXPORT LINES

Twenty-five samples were taken from the export lines at the 183 and 283 buildings. The only location averageing greater than 50 uuc/liter was at 100-F area where the average beta activity detected was 94 uuc/liter. The maximum result obtained at 100-F was 130 uuc/liter. Alpha activity measurements were made on all samples, no location showing any positive active greater than 6 dis/min/liter.

AIR MONITORING:

A summary of the average dosage rates measured using detachable chambers is given in the following table:

RADIATION LEVELS IN AIR

Detachable Chambers

Location	Average mrep* per 24 Hours	
	August 1949	July 1949
<u>100 Areas and Environs</u>		
Route 1, Mile 8	0.39	0.44
Route 2N, Mile 10	0.34	0.37
Route 2N, Mile 5	0.38	0.34
White Bluffs	0.37	0.39
Route 11A, Mile 1	0.66	0.81
Hanford 614 Bldg.	< 0.48	0.48
Intersection Rt. 1 & 4 N	- -	0.55
Hanford 101 Area	0.34	0.38
100-H Area	0.37	0.37
<u>Within 5 Miles of 200 East</u>		
Route 4S, Mile 6	1.11	0.94
Batch Plant	0.47	0.54
Route 11A, Mile 6	0.54	0.58
Route 3, Mile 1	< 0.48	0.63
Meteorology 200'	0.48	0.94
234-235 Area	0.33	0.36
<u>Within 10 Miles of 200 East</u>		
Route 4S, Mile 10	1.02	1.17
Route 10, Mile 1	< 0.48	0.66
Route 10, Mile 3	< 0.48	0.78
Route 2S, Mile 4	< 0.48	0.94
<u>Near 300 Area</u>		
Route 4S, Mile 16	0.63	0.86
Route 4S, Mile 22	0.64	0.78
3000 Area North	< 0.48	0.48
3000 Area South	< 0.48	0.48
<u>Outlying</u>		
Richland	< 0.48	0.48
Benton City	< 0.48	0.48

* The above values included the background measurements of the instruments which vary from about 0.3 to 0.5 mrep per 24 hours.

Table IV

LOCATION	Average dose in mrep per 24 hrs.			
	Integrations		"C" Chambers	
	Aug.	July	Aug.	July
100-B Area	0.2	0.2	0.3	0.3
100-D Area	0.2	0.2	0.3	0.3
100-F Area	0.4	<0.1	0.3	0.3
200-West Area	0.4	0.2	0.2	0.3
200-East Area	0.2	0.2	0.4	0.5
Riverland	0.3	0.1	-	-
300 Area	0.5	0.7	0.4	0.5
700 Area	0.1	0.3	-	-
Pasco	0.5	0.3	-	-
Benton City	0.6	0.2	-	-
3000 Area North	0.7	0.5	-	-
3000 Area South	0.2	0.2	-	-

Table IV

See Survey Report

Table VII

LOCATION	Maximum Noted in 8 hr. period average on Filters	
	uc/liter	
200- East, SE Corner.		4.7×10^{-10}
200- West Tower #4	$<1.0 \times 10^{-7}$	
Gable Mountain	1.2×10^{-7}	1.5×10^{-10}
Richland	$<1.0 \times 10^{-7}$	3.0×10^{-11}
Pasco		2.0×10^{-11}
300 Area		8.0×10^{-11}
200-East, Tower #16		4.5×10^{-11}
100-D Area		5.0×10^{-11}
200-West Gate	1.2×10^{-7}	1.1×10^{-10}
Benton City		2.0×10^{-11}
Hanford 614 Bldg. <i>Building</i>		5.0×10^{-11}
105 DR Construction Zone		4.0×10^{-11}
Hanford 101 Pls. <i>Building</i>		4.0×10^{-11}
White Bluffs		3.0×10^{-11}
3000 Area North		7.0×10^{-11}
200- West Tower #15	4.0×10^{-7}	3.0×10^{-11}

Table VII

The above dosage rates as measured by chambers and integrators show no significant changes or trends occurring during the month of August. A slight downward trend in the dosage rates is again observed at random locations, this fact being consistent with a similar indication observed during the month of July.

Specific measurements for I^{131} by the use of caustic scrubber solutions connected behind, and in series with the filters are summarized in the following table which includes the activity detected on the accompanying filters:

AIR MONITORING DATA

August 1949

Location	Beta Activity on Filter	I^{131} in Scrubber Solution*
	uc/ liter air	uc/liter air
200 West Gate	1.1×10^{-10}	9.8×10^{-10}
Benton City	2.0×10^{-11}	3.0×10^{-11}
200-East S.E.	4.7×10^{-10}	8.2×10^{-10}
300 Area	8.0×10^{-11}	6.0×10^{-11}
Richland	3.0×10^{-11}	4.0×10^{-11}

*In general the activity collected in the scrubbers compares to that

found on the filters, all comparisons with the exception of 200 West Gate being within a factor of two. At the 200 West Gate location the activity in the scrubber was greater than that found on the filter, by a factor of nine, this fact being somewhat consistent with the increased pickup of beta activity noted in the scrubbers that are located near the separations areas.

RAIN SAMPLING:

The measurement of rainfall at the meteorology tower indicates that only trace amounts of precipitation were recorded during the month. Consequently, only one rain sample was collected, this sample coming from the Riverland location. This sample showed beta activity amounting to 0.7 nuc/liter, this result being consistent with the average activity observed in rain from this location in the past.

PARTICLE DEPOSITION:

Commencing with this months report, and continuing thereafter, the particle deposition rates will be reported in units of 'particles per cubic meter'. This departure from the past method of reporting in units based on the inhalation rate of man, or based on the number of cubic feet of air sampled is to more closely align our reporting nomenclature with that of other groups. In addition to the above change, the data will be broken down into four groupings, these groupings being, (1) within the vicinity of 200 East Area, (2) within the vicinity of 200 West Area, (3) project locations, and (4) off project locations. The following table summarizes this months results, and includes the volume of air as well as the number of particles found-results based on moto-aire studies.

VICINITY OF 200 EAST AREA:

Location	Ft. Air Sampled ³	Total Partciles	Particles/meter ³	
			Maximum Week (x 10 ⁻⁵)	Month Average (x 10 ⁻⁵)
2704 (In)	404,000	6	210	53
2704 (out)	403,000	5	64	42
EY-SE (out)	26,000	2	320	270
EY-NE (out)	140,000	2	100	49
E-Gate (out)	137,000	17	810	460
221-B (O.G)	141,000	5	290	130
222-B (Hall)	140,000	11	950	270
222-B (Lab)	140,000	198	67000	5000
222-B (out)	317,000	39	670	460
2701 (In)	141,000	5	320	130
2701 (out)	404,000	3	35	250

000210 x 10⁻⁵
00021 x 10⁻⁵

VICINITY OF 200 WEST AREA:

*Reference point 14
This is off by a factor
of 10-10-11*

Location	Ft. ³ Air Sampled	Total Particles	Particles/meter ³	
			Maximum Week (x 10-5)	Month Average (x 10-5)
2701 (out)	303,000	39	1300	460
2701 (in)	140,000	14	1100	350
272 (in)	140,000	7	490	180
2721 (out)	396,000	23	670	210
"T" Gate (out)	274,000	6	740	78
222-T (out)	140,000	29	1400	740
222-T (in)	106,000	68	3200	2400
231 (out)	404,000	5	100	42
So. G.T. (out)	404,000	5	100	42
"U" Gate (out)	361,000	14	420	140
W. G.T. (out)	363,000	0	35	100

VICINITY- OFF PROJECT :

Boise	141,000	0
Klamath Falls	107,000	0
Stampede	98,000	2
Great Falls	111,000	0
Walla Walla	105,000	0
Meacham	69,000	0
Lewiston	139,000	0
Spokane	125,000	0
Total	895,000	
<u>PROJECT:</u>		
100-B	233,000	0
100-D	400,000	0
White Bluffs	331,000	0
100-F	376,000	2
Benton City	403,000	0
Pasco	123,000	0
Richland	141,000	1
Total	2,007,000	3

The results of moto-air studies made at the meteorological tower near the 200 West Area shows that very little difference in the number of particles collected at various altitudes between three feet and four hundred feet exist. The data does indicate that fewer particles are found at the higher levels however comparative test do not show this difference to be significant. The following table summarizes the current months results:

Location	Ft 3 Air Sampled	Total Particles	Particles/meter ³	
			Maximum Week (x 10 ⁻⁵)	Month Average (x 10 ⁻⁵)
3'	404,000	16	280	140
50'	404,000	14	310	120
100'	404,000	9	140	71
150'	404,000	10	180	88
200'	404,000	7	200	64
250'	404,000	11	180	95
300'	303,000	10	140	120
350'	404,000	2	35	18
400'	404,000	4	140	35

Supplementing the moto-air studies, very meager data is available from our trap studies in this period, as one weeks data was lost within the group due to mislaying the code used in codeing the film, and two weeks data is currently held up in the 300 Area darkroom. The follwoing table summarizes the results of one weeks particle trap studies:

Location	Number Particles	Particles/ft ² / week
<u>200-East</u>		
H.I. Garden	4	3
BY- SE	0	--
BY- NE	1	1
222-B	47	33
2704-E	0	--
2701	0	--
"B" Gate	4	3

Location	Number Particles	Particles/ft ² /week
<u>200-West</u>		
2701	1	1
2722	1	1
"U" Gate	1	1
S-G Tower	2	1
W-G Tower	2	1
"T" Gate	6	4

Project

Benton City	0	-
100-F	1	1
White Bluffs	1	1
100-D	1	1
100-B	1	1
Pasco	0	-
700	1	1

PARTICLE STUDIES (special)

Several particles of unusual intensities were observed while surveying with a VGM meter on a routine land survey on August 18th. These particles were detected in an area immediately southeast and east of the stack, about twenty-five to one hundred feet from the roadway that parallels the east fence of the 'B' exclusion area. As the VGM readings indicated a radiation level approximately 20,000 c/m in the extreme cases, these particles were readily separated from the surrounding terrain. Close examination indicated that the material was not the minute particles previously detected, but rather a flake material, the edges very irregular in shape and about as thick as a chipped paint layer, in fact they closely resemble flaked paint. The prevalence of these was further investigated on August 22, and 24, and some larger specimens were located, these being larger in size but not greater in intensity. Roughly, 15 to 20 of these were located in approximately one hour of surveying in an area around 100' square. The roadways to the burial ground and diversion boxes were checked alongside, thinking that these particles may have flaked off transported material, but in no case were any pieces found in this vicinity. Radio-autographs and specimens are submitted with this report.

LAND AND VEGETATION CONTAMINATION:

Six hundred and sixty-five routine vegetation samples were collected during August. Each of these samples were analyzed for 8 day I^{131} and for beta activity from non-volatile emitters. The results of the analysis for beta activity of these two sources in the vegetation are summarized for the nearby locations as follows:

Log #1: in parentheses are no. samples taken.

Location	I^{131} - $\mu\text{uc/kg}$ *			Non-Volatiles - $\mu\text{uc/kg}$ **			
	I^{131} as milli microcuries/kg	Maximum	Average	July Average	Maximum	Average	July Average
North of 200 Areas (81)		7	< 2	< 2	31	10	< 10
Near the 200 Areas (66)		11	< 2	< 2	38	11	< 10
Route 3 (12)		31	10	14	40	17	12
200-West Gate (5)		51	29	36	68	45	44
Meteorology Twr. (5)		12	6	5	23	11	< 10
South of 200 Areas (112)		18	< 2	< 2	22	10	< 10
Richland (25)		< 2	< 2	< 2	19	10	< 10
Pasco (20)		3	< 2	< 2	28	13	< 10
Kennewick (20)		2	< 2	< 2	36	12	< 10
Benton City (15)		2	< 2	< 2	20	10	< 10
Richland 'Y' (5)		2	< 2	< 2	14	< 10	< 10
Hanford (10)		< 2	< 2	< 2	23	12	12

*Log - Table VIII
table 18*

~~Footnotes (2) indicate number of samples from locations.~~

*The limit of sensitivity for I^{131} determinations in a 5.0 gram sample of vegetation is 2 $\mu\text{uc/kg}$.

**The limit of sensitivity for non-volatile ~~emitters~~ ^{emitters} is best estimated at 10 $\mu\text{uc/kg}$, this value including the natural beta activity from K^{40} .

*Log -
used foot note
indicated in
HW-14000
p. 13.*

The above summation indicates very little trend in the deposition of I^{131} on vegetation at those locations which are routinely sampled. The I^{131} activity continues to average less than 2 $\mu\text{uc/kg}$ in all residential areas, with nearly all individual samples being nearly identical to the average. The deposition of the longer half life component seems to have increased slightly at nearly all locations, this increase is not significant in any case but is large enough to bring the average above the limits of sensitivity of the counters at many locations which previously showed negligible activity. Of the twelve zones routinely reported above, ten showed this slight increase in average long life

activity on vegetation. Maximum results obtained in all zones are within the normal expected range of fluctuation.

Figure 1 summarizes the I¹³¹ activity deposition on an iso activity map and includes the wind rose, as computed for the hours of retal dissolution during the month of August.

Thirty-six vegetation samples obtained inside the separation areas show I¹³¹ activity to average between 3 and 4 muc/kg, the maximum activity being found in the 200 West Area where 20 muc/kg were detected on a sample. Long life activity averages between 10 and 16 muc/kg in the 200 Areas, the maximum found on any one sample being 46 muc/kg. Figure 1 also includes insets of the areas, showing the pattern of deposition of I¹³¹ within the separation areas.

Nearly all of the nearby areas, and cross-section areas were survey during the month. The results obtained from these surveys are summarized in the following table:

VIII

OFF AREA SAMPLES :

Location	No. Samples	I ¹³¹ as milli-microcuries/kg*			Non-Volatile activity muc/kg**		
		Maximum	Average	July Average	Maximum	Average	July Average
Ranches							
H. W. Ranches (13)		<2	<2	<2	31	12	10
Pasco to Eltopia (5)		<2	<2	2	<10	<10	13
Yakima to Ellensburg (27)	3	<2	<2	<2	15	<10	<10
Rattlesnake IP Post (29)	12	2	2	<2	17	<10	10
Wahluke Slope (104)	7	<2	--	--	21	<10	--
Plymouth -Kenn.-Hover (12)	8	2	--	--	27	<10	--
Goose Egg (19)	13	3	--	--	15	<10	--
Pasco to Ringold (18)	2	<2	--	--	15	<10	--
Benton Gap (47)		<2	<2	--	14	<10	--

-- indicates no survey last month.

The results tabulated above show that the vegetation activity is at a minimum in all outer zones, and when compared to previous surveys no unusual trends or changes are indicated. Figure 2 portrays the results of the Ellensburg-Yakima and vicinity survey.

Table VIII continued

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WATFORD TESTS:

100 AREAS

Forty-five samples were obtained from the effluent water in the 107 basins. The average beta activity measured in these samples compares very favorably with that found last month. The average beta-gamma activity detected in the samples from the 107 basins at 100-B, 100-D, and 100-F Areas was 238, 278, and 261 muc/liter respectively. The maximum activity measured at these same locations was 382, 530, and 329 muc/liter. The only sample which showed unusual activity was the maximum result recorded at 100-D, this sample containing 530 muc/liter, and being about $1\frac{1}{2}$ times higher than the usual sample collected from this location.

These same samples were analyzed for alpha activity, all areas averaging less than 6 dis/min/liter with occasional individual samples showing an alpha content of between 30 and 50 dis/min/liter. Further analysis of this alpha activity showed that no sample contained any detectable amount of uranium, all individual analysis for uranium being less than 4 ug/liter as measured on the fluorophotometer. Only three samples were checked by the TTA process for plutonium, two samples showing no activity and one sample showing 46 dis/min/liter which apparently is a dubious figure as the yield on the TTA during the current period ran around 50%.

Basing the calculations on previous decay studies of the effluent, an estimated 137 curies of beta-gamma emitters were discharged into the river daily. Approximately 7 to 13 curies of this activity was long live material.

Eight of the 107 samples were analyzed for sulfate activity, the average activity found in these analysis being 2.0, 1.3, and 2.3 muc/liter for the 100-B, 100-D, and 100-F Areas effluent respectively. The maximum activity detected in these same locations was 2.1, 2.3, and 2.5 muc/liter.

Five samples from the effluent were analyzed for Polonium. The activity was less than six dis/min/liter in each sample analyzed.

Two samples from the 100-B dryer room condensate were analyzed, the sulfate activity averaging 0.45 uc/liter whereas the total beta activity was 0.59 uc/liter. No samples were received from the 100 Areas for calol analysis during the month of August.

200 AREAS:

The results obtained from the analysis of samples taken from the various waste areas in the 200 Areas are summarized in the following table:

Location	Type Sample	Alpha-dis/min/kg *		Beta-Gamma-muc/kg *	
		Maximum	Average	Maximum	Average
T Swamp	Water	< 30	< 30	0.1	< 0.1
T swamp	Mud	3.6×10^5	2.1×10^5	210	140
U Swamp	Water	< 30	30	< 0.1	< 0.1
Laundry Ditch	Water	37	30	< 0.1	< 0.1
Laundry Ditch	Mud	1.3×10^5	7.1×10^4	240	120
231 Ditch	Water	56	< 30	< 0.1	< 0.1
B Ditch	Water	< 30	< 30	< 0.1	< 0.1
B Ditch	Mud	1.2×10^4	3.8×10^3	1800	460
234-235 Ditch	Water	1.5 x 10³	< 30	< 0.1	< 0.1
234-235 Ditch	Mud	2.3×10^3	1.6×10^3	25	15
<u>Retention Ponds</u>					
200-East	Water	< 30	< 30	< 0.1	< 0.1
200-West	No samples	--	--	--	--
Laundry Lint	Solid	5.5×10^5	2.0×10^5	250	120

Table IX

Table IX

* It is assumed that one liter of liquid sample weighs 1 kilogram.
 ** Only result above sensitivity level not included in average. no uranium analysis was run on samples from this location.

Weekly portable instrument surveys of the waste zones inside the 200 West Area showed that the radiation level at the T Swamp did not exceed 200 c/m above background at the time of survey. The general radiation level at this location was around 100 c/m above background.

Similar surveys along the laundry ditch effluent, showed that the radiation level did not exceed 200 c/m above background at this location.

Surveys of the 200-E "E" ditch show that a higher radiation level exists in this vicinity than does at the comparable 200-W "T" Ditch. Maximum readings obtained at this location were in the neighborhood of 10,000 c/m. Many of the locations adjacent to this area are inaccessible by foot and it is believed that if access to the ditch were possible along its entire length, higher radiation levels would be found. The higher readings are continually found on the mud adjacent to the ditch which is indicative of the activity passing down the ditch at the time the basins are emptied, the water level at this time overflowing the normal banks of the ditch.

No instrument surveys of the 200 North Area were made during the month of August.

300 AREA WASTES:

Weekly samples were obtained from each of the two ponds. Alpha activity in the old pond averaged 5200 dis/min/liter with a maximum of 10,000 dis/min/liter. These samples were analyzed on the fluorophotometer and found to contain an average of 2500 ug U/liter with a maximum of 5700 ug U/liter. Similar analysis of the samples from the new pond showed the average alpha activity to be 4700 dis/min/liter with a maximum of 8600 dis/min/liter. The average activity due to uranium was identical to that in the old pond (2500 ug U/liter) with a maximum of 4800 ug U/liter. Beta activity measurements indicated the same average activity in each pond, 1.2 muc/liter, however the new pond showed a maximum beta activity about twice as great as that in the old pond, the maximums being 4.1 and 2.5 muc/liter respectively.

Lead samples were obtained from the inlet of the old pond. Alpha activity measurements showed that the average was 2000 dis/min/gram with a maximum of 5300 dis/min/gram. Each of these samples were checked for uranium activity, the average being 96 ug U/gram with a maximum of 220 ug U/gram. This confirmation as uranium is not near as positive as has been observed in the past,

possibly due to unsuccessful removal of the sample from the original plate, however this fact was not evidenced on the result sheets. Beta activity in the mud averaged 1.6 $\mu\text{C}/\text{kg}$ with a maximum of 6.2 $\mu\text{C}/\text{kg}$.

Only two TTA results on the liquid waste were obtained, these analysis showing plutonium activity of 30 and 6 dis/min/liter in the liquid waste in the pond.

A total of twenty samples were obtained directly from the 300 Area waste line, the alpha activity in these samples varying from 50 to 2500 dis/min/liter. Fluorophotometer analysis showed the uranium to vary between 40 $\mu\text{g}/\text{liter}$ to 650 $\mu\text{g}/\text{liter}$ in these same samples. Seven of these samples were checked for plutonium by the TTA process, all results being less than 6 dis/min/liter. The unbalance in the ratio of uranium activity to total alpha activity mentioned in the above discussion of the ponds, is again noticeable in the waste line data.

TO _____

FROM _____

	Total particles falling during Aug. 8	August July
200 W -	8.7×10^8	2.8×10^8
E -	2.8×10^8	3.0×10^8

"THINK SAFETY BEFORE EACH ACT"

TO: J.W.Healy-W. Singlevich
FROM: H.J. Paas

SITE SURVEY MONTHLY REPORT FOR
THE MONTH OF SEPTEMBER 1949

The attached report is compiled from the following number of surveys:

WATER SAMPLING PROGRAM

Drinking Water 500cc-----	233
Drinking Water 11.7 liter-----	57
Test Wells 500cc-----	88
Test Wells 11.7 liter-----	1
Raw Water 500cc-----	34
River-----	75
Waste-----	149
Rain-----	7
Total Water Samples	644

AIR SAMPLING PROGRAM

Particle Filter-----	220
Particle Traps-----	84
Particle Frames-----	71
Air Filters-----	56
Scrubbers-----	18
Detachable Chambers-----	617
Film Packets-----	112
Total Air Samples	1178

LAND SAMPLING PROGRAM

On Area Vegetation-----	506
Off Area Vegetation-----	30
Algae-----	5
Mud & Lint-----	112
Total Land Samples	653

INSTRUMENT & MISC.

Portable Instrument (Land)-----	12
Portable Instrument (waste)-----	16
Smears-----	41
Total	69

TOTAL SURVEYS FOR MONTH 2544

1

The above number of surveys were accomplished by traveling approximately 9,500 miles. The group is without the services of the mobile unit, which is currently being replaced and rebuilt.

Several personnel changes occurred during the month, J.H. Hemphill and E.D. McFall being transferred to the Aquatic Biology Division, and Operation Division respectively. D. D. Love and L. A. Bliss reported as replacements for the above. The vacations of J. H. Wolff, Ray Pierce, and Dorth Benham were completed this month.

DISSOLVING DATA

Basing the calculations on the weights of metal dissolved, the amount of radioactive iodine liberated in the dissolvers showed an increase of 118% in the 200 East Area, and a decrease of 6% in the 200 West Area. These figures represent a comparison to similar calculations for the month of August. These figures do not represent the amount of material admitted to the atmosphere, as the efficiency of the filters and scrubbers are not taken into account.

METEOROLOGICAL DATA

The wind prevailed from the Northwest 38% of the total dissolving hours. Wind direction data, in order of decreasing prevalence for the other directions was as follows: West 21%, Southwest 13%, North 13%, Southeast 5%, South 4%, East 4%, and Northeast 2%. This data is also summarized in a wind rose on the iso-activity map accompanying this report.

WATER MONITORING:

A total of two hundred and ninety samples of drinking water were analyzed during the month. Of this total two hundred and thirty-three were 500cc samples and fifty-seven were 12 liter samples. The frequency of taking twelve liter samples was reduced somewhat at intervals during the month due to the limited facilities in the 222-U laboratory at certain times.

Supplementing the drinking water sampling a total of eighty-nine samples were obtained from various test wells, eighty-eight samples being 500cc and one sample being 12 liter.

The following table includes a summation of the locations at which the drinking water samples averaged greater than six dis/min/liter for either the 500 ml. or 12 liter samples:

Alpha Activity in Drinking Water
DRINKING WATER SAMPLES THAT AVERAGED > 6 d/m/l

Location	500 ml. Samples			12 Liter Samples		
	No.	Max.	Ave.	No.	Max.	Ave.
Richland # 2	3	15	9	2	7	6
Richland # 4	5	20	14	3	13	8
Richland #13	21	15	6	3	10	6
Richland #14	4	15	11	3	9	8
Richland #15	2	9	7	1	8	8
Richland #18	5	12	9	2	9	6
Benton City Store	4	11	21	2	11	11
Benton City H. G. Co. W.	3	39	37	1	1	1
300 Area Sanitary	22	39	11	2	38	21
3000 Area Well B	4	8	<6	2	16	9
Lower Knob	5	44	10	-	-	-

The locations tabulated above, are again, nearly identical to those in a similar tabulations presented during the past several months. The average alpha activity found in the Richland system ranges between 6 and 15 dis/min/liter, for both the 500 ml. and 11.7 liter samples, this order of magnitude being consistent with previous activity measurements. The alpha activity at Benton City, also is in agreement with previous data, however the results of the large volume samples do not approach those of the 500 ml. samples. The alpha activity in and around Benton City seems to fluctuate much more than that of Richland Wells, and possibly the difference is due to sampling time.

The 300 Area Sanitary water shows positive alpha activity as a result of the volumes pumped from the 300 Area Wells into the system during this period. Currently, the highest uranium content in the wells on and adjacent to the site, is found in the 300 Area system.

Supplementing the above tabulation, a list of wells which showed alpha activity greater than 6 dis/min/liter at any one time is presented for the 500 ml. samples on page 5. A similar tabulation for the 11.7 liter samples, showing all locations at which the alpha activity exceeded 1.0 dis/min/liter at any one time, is presented on page 6. With the exception of those locations previously mentioned in the small table, the far majority of the tabulated locations represent low averages and possibly only one individual sample showing a positive alpha count.

Beta activity measurements were made on all 500 ml. samples. The average beta activity was less than 50 uuc/liter at all locations, however five locations showed positive results on individual samples. Two of these, Pasco and Kennewick draw their supplies from the Columbia, and maximum activity of 55 uuc/liter and 123 uuc/liter respectively, can be attributed to this source. White Bluffs, 100-F Sanitary, and 100-H Sanitary showed beta activity in individual samples of 70, 65, and 55 uuc/liter respectively. This activity is in direct relationship to that in the raw water at these locations, a summary of the raw water results being mentioned later in this report.

(Summary tables follow.)

500 cc DRINKING WATER SAMPLES

Location.	Number Samples	Alpha Activity d/r/l		U as ug U/liter	
		Maximum	Average	Maximum	Average
Headgate	5	3.5	< 6	---	---
Hanford Well # 4	1	6.2	6.2	---	---
Hanford San. # 7	14	17.4	< 6	6.8	1.5
3000 Area Well B	4	7.8	< 6	5.0	2.1
3000 Area Well C	4	6.7	< 6	3.7	1.9
3000 Area Well D	4	8.6	< 6	3.9	2.6
Richland Well #13	21	15.0	6.4	6.2	3.1
Richland Well # 2	3	14.9	9.2	7.1	4.0
Richland Well # 4	5	19.7	13.8	5.3	4.2
Richland Well # 5	4	7.4	< 6	2.5	2.4
Richland Well #14	4	15.0	11.4	5.3	4.9
Richland Well #15	2	9.3	6.8	5.8	3.7
Richland Well #18	5	12.1	9.1	8.4	4.8
Benton City Store	4	41.3	20.5	12.8	9.3
Benton City H ₂ O Co. Well	3	38.8	36.2	24.8	14.7
Kenn. Highlands	5	8.5	< 6	---	---
Kenn. Standard Sta.	4	7.5	< 6	2.7	1.9
Lower Knob	5	44.4	10.0	---	---
Pasco H & R	5	< 6	< 6	1.4	0.7
300 Area Sanitary	22	39.4	10.6	14.0	11.0
White Bluffs Ice House	3	< 6	< 6	1.0	1.0
100-F San. Water	4	< 6	< 6	0.7	0.2
100-H San. Water	12	9.2	< 6	5.9	1.4

Test Wells

300 Area Well #1	5	130.0	17 96.5	62.4	36.3
300 Area Well #2	30	309.8	21 210.7	149.8	95.4
300 Area Well #3	24	48.7	25 25.7	84.8	38.4
300 Area Well #4	6	132.4	27 87.0	99.7	60.8
B-Y Well	5	12.4	< 6	3.9	2.6
200 N # 5	5	7.2	< 6	---	---
100-H Raw Water	4	6.4	< 6	0.81	0.80

In excess of 1,000,000 gallons of water has been admitted to the 300 Sanitary system from the 300 Area #2 Well since August 30th. The pumping data indicates that the sanitary supply is supplemented with this water almost daily, currently the #2 Well is showing the highest activity and I believe it would be advisable to recommend that the supplementary water be taken from Well #3. Effective at once, and continuing until trends and measurements indicate otherwise.

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LARGE WATER SAMPLES

<u>Location</u>	<u>Number Samples</u>	<u>Alpha Activity</u> <u>d/m/l</u>		<u>U as ug U/liter</u>	
		<u>Maximum</u>	<u>Average</u>	<u>Maximum</u>	<u>Average</u>
Columbia Camp	3	5.92	3.6	--	--
Hanford San. Water #7	3	1.9	1.1	6.8	1.5
3000 Area Well A	3	4.0	2.3	2.1	1.8
3000 Area Well B	2	16.0	8.7	5.0	2.1
3000 Area Well B	3	3.5	1.7	3.7	1.9
3000 Area Well D	3	5.9	3.5	3.9	2.6
3000 Area Well E	2	3.0	1.6	1.5	1.5
3000 Durand #5	2	2.1	1.3	6.1	2.4
Richland #13	3	10.4	6.4	6.2	3.1
Richland # 2	2	6.7	5.6	7.1	4.0
Richland # 4	3	13.2	8.1	5.3	4.2
Richland # 5	2	7.5	5.6	2.5	2.4
Richland #14	3	9.0	8.3	5.3	4.9
Richland #15	1	8.0	8.0	5.8	3.7
Richland #16	3	1.3	0.7	2.0	1.0
Richland #18	2	9.3	6.4	8.4	4.8
Tract House K-748	2	3.4	2.4	2.1	1.6
Tract House J-685	2	2.9	1.6	6.7	2.5
Benton City Store	3	4.9	4.2	12.8	9.3
Cobb's Corner	2	2.6	1.5	2.6	2.0
300 Area Sanitary	2	38.2	20.8	14.0	11.0
White Bluff's Ice House	2	1.7	1.2	1.0	1.0

Test Wells

300 Area Well # 3	3	21.1	11.2	84.8	38.4
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RADIOACTIVE CONTAMINATION IN THE COLUMBIA RIVER

September 1949

Location	Alpha dis/min/liter		Beta-Gamma uuc/liter	
	Maximum	Average	Maximum	Average
Above 100-B Area	< 6	< 6	< 50	< 50
181-B Area	< 6	< 6	< 50	< 50
181-D Area	< 6	< 6	685	380
181-F Area	< 6	< 6	400	290
Hanford South Bank	< 6	< 6	2100	1700
Hanford Middle	< 6	< 6	1800	1300
Hanford North Bank	< 6	< 6	400	350
300 Area	< 6	< 6	480	350
Richland	< 6	< 6	530	510
Pasco Bridge (Kenn ^{ewick} Side)	22 **	10	390	340
Pasco Bridge (Pasco Side)	19 **	6	480	440

* Note: The reporting level for the minimum activity detected in river samples is currently established at 50 uuc/liter (5×10^{-5} uc/liter).

** Resamples from these locations indicated less than 6 dis/min/liter. The results of the weekly river sampling program are summarized above. The

data again indicates an increasing average of beta activity at nearly all of the listed locations, this being the third consecutive month in which an increase was observed. This increase approaches a factor of two, and in extreme cases (Hanford Middle) is a factor of three. The increase reflects the decreased river flow found during the month, the current level being very close to the low river stage. In general, the same ratios exist between locations, indicating that the dispersion of beta emitters is approximately the same as existed during the month of August.

All the samples were measured for alpha activity, the only locations exceeding six dis/min/liter being at the Pasco Bridge, where alpha activity of 22 and 19 dis/min/liter was detected on samples from the Kennewick and Pasco sides respectively. As this activity was found on both sides of the river on the same day, it is included in this report, however the possibility of laboratory contamination still exists, as the samples were run simultaneously and were subject to the same process conditions. These samples were taken on the same day that the 100-D effluent showed around 50 dis/min/liter, however neither the 107 or the river results were confirmed by the resamples.

Spot checks for uranium, showed that no sample contained greater than 4 ug/u/liter with the exception of the Pasco bridge samples, where 7.0 and 4.0 ug/u/

liter were found. These two samples being those mentioned in the alpha activity summary above.

Twelve samples from the Yakima River, taken at the mouth, the horn, and the irrigation ditch on Lee Blvd., showed beta activity to be less than 50 uuc/liter and alpha activity to average less than 6 dis/min/liter. Spot fluorophotometer checks showed no positive uranium in the Yakima River water.

COLUMBIA RIVER MUD SAMPLES

Total Beta-Gamma Activity-muc/kg (milli-microcurie per kilogram)

September 1949

Table IV

Location	No. Samples	Beta Activity in milli-microcuries per kilogram			
		Onshore Samples		Five Feet From Shore	
		Maximum	Average	Maximum	Average
Near Wills Ranch	4	22	13	17	14
Allard Pump Station	4	18	13	19	15
At 100-H Area	3	21	19	43	26
Below 100-F Area	4	99	38	34	22
Richland Dock	4	27	19	52	24
At 300 Area	3	58	29	56	23
Pasco Bridge (Pasco Side)	4	43	23	21	17
Pasco Bridge (Kennecott Side)	4	32	21	54	27
Hanford Ferry	4	45	27	43	29

Table IV

RIVER MUD

The results of the river mud sampling program show that the measured beta activity has increased slightly in the on-shore samples at nearly all listed locations. The small increase does not tend to be significant when compared to the month of August averages, but it does confirm the increase noted last month. As the river flow is low at the present, and during the month of August was decreasing steadily, it appears that the trends observed in river mud samples from the shore are directly associated with the decreasing river flow. As the off-shore samples remain about the same, it is also indicative that some beta activity settles out into the mud.

The mud samples were measured for alpha activity, all locations averaging less than 6 dis/min/liter, for both the on-shore, and off-shore samples. Many of the

8

samples were checked for uranium, in no case was an individual sample found to exceed 4 ug U/kilogram.

RAW WATER - RIVER EXPORT LINES

Thirty-four samples were obtained from the raw water supplies at the export lines in the 183 and 283 buildings. Alpha activity averaged less than 6 dis/min/liter at all locations, and specific checks for uranium showed no result to exceed 4 ug U per liter of water.

Beta activity measurements showed the average activity to be below 50 uuc/liter at all locations except 100-D, 100-F, and 100-H. Each of these supplies comes from location where the higher river activity is noted, and with the low water stage prevailing, it appears to get into the lines. The following maximum and average results were found at these locations: 100-D - 130 and 100 uuc/liter, 100-F 230 and 200 uuc/liter, 100-H 270 and 250 uuc/liter.

A sample containing 225 uuc/liter from 100-H was studied on decay curve, and it was found that the entire activity was short lived, decaying to within the error of the count in six days.

In late July, arrangements were made for occasional shipments of water, mud and algae from Bonneville Dam, these samples coming in about twice a month since that time. Some delay in reporting the results was due to the delayed lab analysis on these samples. This report summarizes the results received to date:

WATER

Four samples have been analyzed, the total beta activity detected being between 20 and 40 uuc/liter with the exception of one sample which contained 298 uuc/liter. Specific analysis indicates that the high sample showed positive iron, counting 3.0 c/m per 5.0 liters of water. This same sample showed negligible phosphate, and the analysis for Cr, Ca, and K is not complete at this writing. The chemical analysis on these samples seem to indicate that a positive count is

3.0
5
15 c/m

9
obtained on the iron in most cases, a negligible count on the Cr and PO₄, and no positive indications of Ca and K.

ALGAE

Four samples show total activity to average 32 muc/kg, the individual results from the samples being in very good agreement, ie. 34, 27, 27, and 39 muc/kg respectively. One of these samples were analyzed completely, the results showing that the moisture was around 75%. Taking 11.6 grams of dry algae, the following counting rates were obtained for the elements listed:

PO ₄ [≡]	4.8 ± 2.1 c/m	$\frac{5.0}{2.2} = 10.9 \times 10^{-6}$	18 μ mc/11.6 g dry
Fe ⁺⁺⁺	6.1 ± 1.0 c/m	30.5	14 μ mc
Cr ⁺⁺⁺	1.1 ± 0.9 c/m	2.2	< 3 μ mc
Ca ⁺⁺	0.1 ± 0.8 c/m		< 3 μ mc
K ⁺	0.4 ± 0.9 c/m		< 3 μ mc

Again, the iron activity seems to account for the major activity, with all other analysis showing negligible or negative results.

SILT:

Five samples of silt showed activity of 13.6, 9.8, 8.4, 7.1, and 9.1 muc/kg respectively. Hardly any work beyond the direct count has been completed on the silt samples, however indications of positive count in the Fe, Cr, and PO₄ group appear.

M McNARY DAM

A thirty gallon sample was taken from the Columbia River at McNary Dam, in an effort to determine if it were possible to detect long life beta activity at this location, and secondly to determine if the large volume method of sampling is feasible method of detecting long life activity in water. The results of this sample showed the total count to be 6.3, 1.9, which in terms of activity would be about 1.3 uuc/liter. The measured activity is less than that found in the Bonneville samples above, however this may be due to the increased river flow at the time the McNary sample was taken. The method of large volume detection seems to have worked

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satisfactorily from a handling and laboratory standpoint, it is quite drawn out and should only be used for these spot measurements and in those cases where small amounts of activity are accorded possible.

HANFORD WASTES

100 AREAS:

Forty-seven samples were obtained from the 107 basins. The average Beta activity measured in these samples is significantly higher than that found last month, at each of the 100 Areas. The current average is in agreement with that found earlier, in the year during the period January thru April. The last three months showed rather low average activity in the effluent water.

The average beta activity in the samples from the 107 basins at 100-B, 100-D and 100-F Areas was 330, 381, 379 muc/liter respectively. The maximum activity measured at these same locations was 427, 573, and 431 muc/liter.

The above samples were analyzed for alpha activity, all areas averaging less than 30 dis/min/liter. Further analysis of the alpha activity, showed that no sample contained average uranium activity greater than 4 ug/liter. Two flyer results were obtained, one showing alpha activity of 53 dis/min/liter at 100-D, and uranium activity of 133 ug/liter at 100-D, these analysis being for different samples. As there was no confirmation and no similarity with any other observations made at this location, these are regarded as outside contaminated, and not as a result of admitted activity.

Five effluent samples were checked on the TTA for plutonium, the only samples showing a measurable amount being from 100-B where each sample contained 8 dis/min/liter. The yields and the TTA process seemed to be valid and the results appear to be authentic. Further analysis of the water from this source is underway.

Basing the calculations on previous decay studies, an estimated $19\frac{1}{4}$ curies of beta-gamma emitters were discharged into the river daily. Roughly, between 10 and 24 curies of this activity was long lived material. 170-184

Two samples from each of the areas were analyzed for polonium, all results showing less than six dis/min/liter.

200 AREAS:

The results obtained from the analysis of samples taken from the various waste areas in the 200 Areas are summarized in the following table:

1 curve 1/

Table XI

Location	Type Sample	Alpha dis/min/kg**		Beta-Gamma muc/kg **	
		Maximum	Average	Maximum	Average
T Swamp	Water	725*	< 30	1.2	< 0.1
T Swamp	Mud	4.4 x 10 ⁵	1.5 x 10 ⁵	300	140
U Swamp	Water	270*	< 30	< 0.1	< 0.1
Laundry Ditch	Water	1.3 x 10 ⁴ *	< 30	5.3*	< 0.1
Laundry Ditch	Mud	7.3 x 10 ⁴	5.6 x 10 ⁴	120	85
231 Ditch	Water	55	< 30	0.1	< 0.1
B Ditch	Water	< 30	< 30	< 0.1	< 0.1
B Ditch	Mud	5.7 x 10 ³	1.8 x 10 ³	580	300
234-235 Ditch	Water	115*	< 30	< 0.1	< 0.1
234- 235 Ditch	Mud	5.0 x 10 ³	2.7 x 10 ³	19	11
<u>Retention Ponds</u>					
200-East	Water	< 30	< 30	< 0.1	< 0.1
200-West	No Samples	4.0	2.0	< 0.1	< 0.1
Laundry Lint	Solid	1.1 x 10 ⁵	6.4 x 10 ⁴	75	45

* Only result above sensitivity level, *which was not duplicated upon resampling.* not included in average.
** It is assumed that one liter of liquid sample weighs 1 kilogram.

The individual water samples collected from the laundry ditch on 9-16-1949 yielded the highest alpha activity noted from this location in three years. Also, only one beta result has exceeded the 5.3 muc/kg mentioned above in the past three years. This sample was checked on the fluorophotometer and yielded 10,600 uc uranium per liter. The result is not included in the average, as a large volume of rinse and low level activity water goes down the ditch and this figure would weight our average result. Daily accumulated samples from which aliquots will be taken are contemplated for the future and better estimates of the average at the laundry ditch will be forthcoming.

The maximum results from the U and T Swamps are very high for these locations but are not unprecedented. Fluorophotometer results on these samples do not confirm the activity as uranium.

No TTA results on the 200 West samples were obtained during the month.

Weekly portable instrument surveys of the waste zones in the 200 Areas, show that maximum VGM readings in the vicinity of the 'T' Ditch and Swamp, are about 300 c/m above background. Those in the vicinity of the laundry ditch are 400 c/m above background. The usual radiation level around the B Ditch is slightly above background, however readings as high as 2000 c/m were obtained on the mud adjacent to the 'B' Ditch.

Portable instrument surveys at the 200 North Ditches show maximum radiation levels of 900, 100,000, and 40,000 c/m at the N, P, and R Ditches respectively.

300 AREA WASTES:

Weekly samples were obtained from each of the two ponds. Alpha activity in the old pond averaged 1800 dis/min/liter with a maximum of 2700 dis/min/liter. These samples were analyzed on the fluorophotometer and found to contain an average of 315 ug U/liter with a maximum of 435 ug U/liter. Similar analysis of the samples from the new pond showed the average alpha activity to be 1500 dis/min/liter with a maximum of 3000 dis/min/liter. The average activity due to uranium was 410 ug U/liter with a maximum of 890 ug U/liter.

Beta activity measurements indicated an average of 0.6 muc/liter in the old pond and 0.5 muc/liter in the new pond. The respective maximums were 0.8 muc/liter and 0.9 muc/liter.

Mud samples were obtained from the inlet of the old pond. Alpha activity measurements showed that the average was 2600 dis/min/gram with a maximum of 5000 dis/min/gram. Each of these samples were checked for uranium activity, the average being 670 ug U/gram with a maximum of 1500 ug U/gram. Beta activity in the mud averaged 0.4 uc/kg with a maximum of 0.5 uc/kg.

No TTA results are available at this writing, and as soon as they come in they will be reported by phone.

1117

Table VII

LOCATION		Average dose in mrep per 24 hrs.			
		Integrations		"C" Chambers	
		Sept.	Aug.	Sept.	Aug.
100-B Area	(C)	0.3	0.2	0.3	0.3
100-D Area	(C)	0.3	0.2	0.4	0.3
100-F Area	(C)	0.4	0.4	0.6	0.3
200-West Area	(C)	0.1	0.4	0.4	0.2
200-East Area	(C&S)	0.3	0.2	0.6	0.4
Riverland		1.0	0.3	-	-
300 Area	(C)	0.7	0.5	0.5	0.4
700 Area		0.3	0.1	-	-
Pasco		0.4	0.5	-	-
Benton City		0.5	0.6	-	-
3000 Area North		0.7	0.7	-	-
3000 Area South		0.7	0.2	-	-

Table VII

(C and S indicates type of chamber at respective locations)

Table VII

LOCATION	Maximum noted in 8-hr. period - uc/liter	Average on Filters uc/liter
200-East, SE Corner		1.5×10^{-9}
200-West Tower #4	1.6×10^{-7}	5.1×10^{-10}
Gable Mountain	2.0×10^{-7}	5.0×10^{-10}
Richland	$< 1.0 \times 10^{-7}$	3.1×10^{-10}
Pasco		3.3×10^{-10}
300 Area		$(4) 7 \times 10^{-10}$
200-East, Tower #16		8.4×10^{-10}
100-D Area		4.1×10^{-10}
200-West Gate	1.2×10^{-7}	3.9×10^{-10}
Benton City		2.9×10^{-10}
Hanford 614 Bldg. <i>Building</i>		3.1×10^{-10}
105-DR Construction Zone		Discontinued
Hanford 101 Bldg. <i>Building</i>		Discontinued
White Bluffs		2.7×10^{-10}
3000 Area North		3.3×10^{-10}
200-West Tower #15	3.6×10^{-7}	4.8×10^{-10}

Table VII

AIR MONITORING -

A summary of the average dosage rates measured, using detachable chambers is given in the following table:

RADIATION LEVELS IN AIR

Detachable Chambers

Location	Average mrep* per 24 hours		
	September 1949	August 1949	
<u>100 Areas and Environs</u>			
Route 1, Mile 8	(M)	0.54	0.39
" 2N, Mile 10	(M)	0.43	0.34
" 2N, Mile 5	(M)	0.55	0.38
White Bluffs	(M)	0.60	0.37
Route 11A, Mile.1	(S)	0.56	0.66
Hanford 614 Bldg	(S)	< 0.48	< 0.48
Intersection Rt. 1 & 4 N.	(M)	0.95	- -
Hanford 101 Area	(M)	0.47	0.34
100-H Area	(M)	0.53	0.37
<u>Within 5 Miles of 200 East</u>			
Route 4S, Mile.6	(S)	1.00	1.11
Batch Plant	(M)	0.70	0.47
Route 11A, Mile 6	(S)	0.59	0.54
Route 3, Mile 1	(S)	0.71	< 0.48
Meteorology 200'	(S)	0.48	0.48
234-235 Area	(M)	- -	0.33
<u>Within 10 Miles of 200 East</u>			
Route 4S, Mile 10	(S)	0.93	1.02
Route 10, Mile 1	(S)	0.53	< 0.48
Route 10, Mile 3	(S)	1.16	< 0.48
Route 2S, Mile 4	(S)	0.93	< 0.48
<u>Near 300 Area</u>			
Route 4S, Mile 16	(S)	0.62	0.63
Route 4S, Mile 22	(S)	0.66	0.64
3000 Area North	(S)	< 0.48	< 0.48
3000 Area South	(S)	< 0.48	< 0.48

* * (M and S indicates the type of chamber at the respective location)

*The above values included the background measurements of the instruments, which vary from 0.3 to 0.5 mrep per 24 hours.

A review and comparison of the air monitoring data indicates that a general overall increase has occurred during the past month. This increase varies in magnitude at the various locations, and also varies in respect to the type of monitoring. The 'M' and 'S' chamber data shows that the average dosage rate has increased from 0.1 to 0.3 mrep/24 hours at nearly all listed locations, the latter weeks of the month accounting for the major portion of this increase. Increased ionization chamber readings by a factor of two were observed at some locations for the weeks that ended on Sept. 16th and Sept. 23rd. The 'C' chamber readings do not reflect the increase that the 'M' and 'S' chambers show, mainly due to the fact that they are located indoors in the various areas, and also they do not permit the transmission of the lower energy beta particles that the 'M' and 'S' do.

The air filter data also reflects the above increase, the increase being by a factor of ten at nearly all locations. Again, the increase is weighted by the measurements made the latter part of the month at which time many of the individual locations showed the beta activity deposition to be in the order of 10^{-9} uc/liter of air.

AIR MONITORING DATA

September 1949

Location	Beta Activity on Filter uc/liter air	I^{131} in Scrubbers Solution uc/liter air *
200 West Gate	3.9×10^{-10}	2.7×10^{-10}
Benton City	2.9×10^{-10}	6.0×10^{-11}
200 East S.E.	1.5×10^{-9}	1.1×10^{-9}
300 Area	4.7×10^{-10}	1.0×10^{-10}
Richland	3.1×10^{-10}	2.0×10^{-11}

Again, the beta activity collected in the scrubbers compares very well to that collected on the filters at those locations which are in the higher activity zones. The activity collected in the scrubbers shows some increase at all locations except Richland, when compared to last month.

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The advent of cooler weather, has eliminated the intermittent operation of the units due to evaporation, the above tabulation representing a near 100% scrubbing of the filtered air.

RAIN SAMPLING

Due to the small amount of rainfall during the month of September, only seven rain samples were collected. The average activity in these samples was less than 1.0 muc/liter at all locations with the exception of the 100-B Area where one sample contained 2.3 muc/liter.

17

AIRBORNE PARTICLE STUDIES:

The number of radioactive particles collected on air filters, showed a highly significant increase at nearly all locations during the month of September. This increase was first evidenced on the radio-autograph results from the filters which were in service between the period September 9th and September 16th. The filters which were removed the two weeks previous to this date did not show any increase in the particulate matter on them, whereas the studies made on the filters for the week following the noted increase confirms the observation. The number of particles found at the listed locations, tends to vary at random, with no definite concentration in any one locality.

The exact cause of this increase is not definitely established, and can only be determined after decay studies and chemical analysis are completed. These are underway at the present time.

It is interesting to note that the announcement of the Russian Bomb explosion followed about four days after we first noted the increased particle deposition, this announcement leaving a tendency to associate the two incidents as being related. An examination of the weekly data indicates that these particles were evidenced at the locations nearer the coast (Hanford, Klamath Falls, Walla Walla) one week before they were noted at the more inland locations (Boise, Great Falls). This fact would be in agreement with the prevailing winds from the ocean.

A summary of the months observation is presented, this summary including the weekly particle deposition, as well as the monthly totals as compared to the past month.

The symbols used in the following table are interpreted as follows:

* Unit operating intermittently.

** No data- unit not operating.

*** Sample not yet received.

SUMMARY OF PARTICLE DEPOSITION - MONTH OF SEPTEMBER 1949

LOCATION	NUMBER OF PARTICLES					TOTAL FOR MONTH	AVERAGE PARTICLES/METER ³	
	WEEK ENDING						UNITS of 10 10 ⁻³ particles/cubic meter	
	8/26	9/2	9/9	9/16	9/23		September	Last Month
<u>VICINITY of 200-East Area</u>								
2701 Outside	0	1	3	50	21	75	5.3	2.5
2704 Outside	0	15	2	14	7	38	2.8	0.4
222-B Outside	7	40	2*	113	46	208	17.6	4.6
B-Gate Outside	2	9	1	25	13	50	10.6	4.6
BY- SE Outside	1	2	1	29	30	63	4.6	2.7
By- NE Outside	0	1	0	0	0	1	.2	0.5
H.I. Garden	1	10	2	5	26	44	3.3	**
2701-Inside	0	1	0	4	7	12	2.7	1.3
2704-Inside	0	6	6	52	0	64	4.6	0.5
221-O. Gallery	2	0	3	0	21	26	6.0	1.3
222-B Hallway	5	3	1	10	7	26	6.0	2.7
222-B Laboratory	37	85	44	10	176	352	81.2	50.0
<u>VICINITY of 200-West</u>								
T Gate Outside	0	2	3	73	12	90	6.3	0.8
So. Guard Tower "	0	0*	1	46	38	85	7.0	0.4
U Gate Tower "	0	1	1	1*	2*	5	0.5	1.4
W. Guard Tower "	1	1	0	8	28	38	2.6	1.0
231-Sump Pit "	0	0*	0	194	6	200	17.6	0.4
2722 Paint Shop "	2	4	2	10	34	52	3.5	2.1
222-T-Outside	19	8	7	**	1*	35	10.9	7.4
2701 Outside	2	7	1	57	39	86	7.8	4.6
2701 Inside	1	0	**	7*	10	18	6.7	3.5
272 Maint. Inside	0	0	1	16	4	21	4.9	1.8
222-T-Hallway "	28	3	18	20	44	111	25.8	24.0
<u>METEOROLOGICAL Tower</u>								
3' Level	0	0	3	30	84	117	8.1	1.4
50' Level	1	0	1	20	175	197	13.8	1.2
100' Level	1	0	1	51	95	138	12.7	0.7
150' Level	4	3	3	61	83	154	15.2	0.9
200' Level	2	1	3	47	20	73	7.8	0.6
250' Level	3	1	1	54	**	59	7.8	1.0
300' Level	0	0	4	**	16	20	2.7	1.2
350' Level	2	0	1	**	**	3	0.6	0.2
400' Level	2	0	1	35	14	52	9.2	0.4
<u>ON AREA LOCATIONS</u>								
100-B	0	0	5	219	25	249	17.3	0
100-D	0	0	54	167	30	261	18.0	0
White Bluffs	0	0*	**	0*	0*	0	0	0
100-F	1	0	0*	62	43	105	8.5	0.2
<u>OFF AREA LOCATIONS</u>								
Benton City 614	0	0	0	27	24	51	3.9	0
Pasco "	0*	0	0*	1*	36	37	11.6	0
Richland "	0	1*	0	75*	82	157	19.0	0.1
Walla Walla	0	0	0	14	59	73	15.5	0
Boise	0	0	0	12	181	193		
Klamath Falls	0	0	0	150	***	150	25.1	0
Stampede Pass	0	0	0	10	2	12	2.4	0.8
Great Falls	0	0	0	2	107	109	23.3	0
Meacham	0	0	0	0	2	2	0.4	0
Lewiston	0	0	0	0	13	13	2.7	0
Spokane	0	0	0	25	153	178	36.3	0

LAND AND VEGETATION CONTAMINATION:

Five hundred and six routine vegetation samples were collected during September. Each of these samples were analyzed for eight day I^{131} and for beta activity from non-volatile emitters. The results of the analysis for beta activity of these two sources in the vegetation are summarized for the nearby locations as follows:

SEPTEMBER - 1949.

Table F

LOCATION		¹³¹ I as milli-microcuries/kg *			Non-Vol. Activity muc/kg **			
		Maximum	Average	Aug. Average	Maximum	Average	Aug. Average	
North of 200 Areas	(67)	4	<2	<2	51	16	10	
Near the 200 Areas	(53)	10	2	<2	68	21	11	
Route 3	(8)	32	9	10	51	28	17	
200 West Gate	(3)	19	17	29	51	40	45	
Meteorology Twr.	(4)	5	3	6	30	16	11	
So. of 200 Areas	(89)	5	<2	<2	53	14	10	
Richland	(20)	2	<2	<2	31	12	10	
Pasco	(16)	4	<2	<2	52	19	13	
Kennewick	(16)	2	<2	<2	30	16	12	
Benton City	(12)	<2	<2	<2	32	15	10	
Richland 'Y'	(4)	<2	<2	<2	27	19	<10	
Hanford	(8)	10	<2	<2	19	16	12	

Parenthesis () indicate number of samples from locations.

* The limit of sensitivity for I^{131} determinations in a 5.0 gram sample of vegetation is 2 muc/kg.

** The limit of sensitivity for non-volatile emitters is best estimated at 10 muc/kg, this value including the natural beta activity from K^{40} .

The above summary indicates very little trend in the average I^{131} deposition on the vegetation, the only noticeable changes occurring at locations between the separation areas. The iodine activity continues to be less than 2 muc/kg in all residential areas and in that region which is north of the 200 Areas.

The deposition of long half life activity shows increases in the averages at all listed locations, this average increase being the result of higher activity measurements detected toward the end of the month. Nearly all the maximum results included in the tabulation, were obtained during the last fifteen days of the month. This particular increase in long half life activity occurred at the same time that similar increases in the airborne activity measurements were observed.

The results of the surveys made at cross-section locations, and off are locations are summarized in the following table:

SEPTEMBER 1949

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LOCATION OFF AREA SAMPLES	I ¹³¹ as milli-microcuries/kg*			Non-Vol. Activity muc/kg**		
	Maximum	Average	Aug.Average	Maximum	Average	Aug.Aver.
Northwest Ranches (12)	3	< 2	< 2	38	18	12
Wahluke Slope (103)	4	< 2	< 2	28	10	< 10
Goose Egg (20)	8	3	3	27	15	< 10
Pasco to Ringold (18)	< 2	< 2	< 2	46	14	< 10
Pasco-Pendleton-Walla (28)	2	< 2	--	12	< 10	--

Again the I¹³¹ activity measured is nearly identical to that measured during the previous month. The long life activity shows an increase at all the listed locations, this increase being nearly negligible. It is assumed that as this increase in long life activity is not nearly as great as the similar increase noted at the nearby locations, The reason that this increase does not reach the magnitude of increase noted at the nearby locations is that the surveys were taken during the early part of the month.

Thirty-six vegetation samples obtained inside the separation areas show I¹³¹ activity to average about 3 muc/kg, the maximum activity being found in the 200 West Areas where 24 muc/kg were detected on a sample. Long life activity averaged 10 muc/kg in 200 West and 26 muc/kg in 200 East, the maximum found on any one sample being 53 muc/kg. The activity measured inside the separation areas, is indicative of no change or trend when compared to the previous month.

L. Schwerdtman:

Stack gas	microns in filter	microns/whi(F)	Sample mic/whi.	microns upstack
8-26 to 9-8	10 to 39	1-17	75-542	91-552
9-9	73	31	1068	1141
9-13	64	38	869	933
9-14	581	459	1600	2181
9-15	102	28	702	803
			etc.	

Location	Date	No. particles
✓ B. City	9-13	40
200 W Twn 15 - 1	9-13	26
200 E Twn 16 - 2	9-13	28
Cable Mt.	9-13	157
Hamp. Wks 614	9-12	27
✓ 700 Area	9-13	6
200 W Twn 43	9-12	32
200 W EC #1	9-14	37
3000 Area	9-13	75
200 E. & E	9-13	37
✓ 300 A	9-12	3

two weeks

RESTRICTED

-4-
(Revised - October 7, 1949)

H.I. Emergency Supervisory Staff

NAME	HOMG PHONE	PLANT PHONE	HOME ADDRESS
1. H. M. Parker		77301	
2. M. L. Mickelson		54171	
3. F. P. Seymour		81121	
4. C. M. Patterson		79341	
5. C. G. Gamertsfelder		3369	
6. W. A. McAdams		A-6669	
7. F. G. Tabb		A-8888	
8. J. W. Healy		A-7829	
9. W. J. Gandy W. Singlevich		52351	
10. H. J. Paas		A-7829	
11. P. L. Eisenacher		A-3369	
12. H. J. Paas		A-8894	
13. P. R. McMurray		A-6680	
14. A. R. Keene		A-7868 WB 5421	
15. P. C. Jerman		A-8893	
16. E. C. Roos		A-8841	
17. J. M. Smith		A-5533	
18. J. G. Myers		3376	
19. D. P. Shively		A-7281	
20. P. R. Nelson		3392	
21. G. H. Whipple		3375	
22. H. A. Kornberg			

22-3375

Name		Name	Phone	Phone	Home Address
23.	W. C. Berlin			6688	
24.	H. A. Meloeny			3367	
	J. K. Carmell			3366	
25.	T. G. Cartmel				
26.	K. E. Herde			A-7830	
27.	H. G. Ruppert			A-8864	

Walt:

21 samples were obtained from the 300 Area Waste Line during September. The average beta activity was ~~2~~ approximately 200 $\mu\text{mc/liter}$ with a maximum of 31000 $\mu\text{mc/liter}$. Alpha activity averaged approximately 350 dis/min/liter with a maximum of 21000 dis/min/liter, which occurred on the same day the high beta result was noted. Samples analyzed for uranium by fluorophotometer methods average approx. 300 $\mu\text{g/liter}$.

~~The~~ No fluorophotometer result for the previously mentioned high alpha result was available. No T.T.A. ^{results} ~~samples~~ were obtained from the lab.

Walt

TO: J.W. Healy-W. Singlevich
From: H.J. Paas

SITE SURVEY MONTHLY REPORT FOR
THE MONTH OF OCTOBER 1949

The attached report is compiled from the following number of surveys:

WATER SAMPLING PROGRAM

Drinking water 500cc-----	197	
Drinking water 11.7 liter-----	37	
Test Wells 500 cc-----	72	
Test Wells 11.7 liter-----	12	
Raw Water 500 cc-----	30	
River-----	68	
Waste-----	155	
Rain-----	10	
Total Water Samples		593

AIR SAMPLING PROGRAM

Particle Filter-----	186	
Particle Traps-----	92	
Particle Frames-----	164	
Air Filters-----	60	
Scrubbers-----	21	
Detachable Chambers-----	474	
Film Packets-----	115	
Total Air Samples		1112

LAND SAMPLING PROGRAM

On Area Vegetation-----	587	
Off Area Vegetation-----	75	
Mud & Lint-----	100	
Total Land Samples		762

INSTRUMENT & MISC.

Portable Instrument (Land)-----	12	
Portable Instrument (waste)-----	16	
Smears-----	41	
Total		69
TOTAL SURVEYS FOR MONTH	2536	

2

The above number of surveys were accomplished by traveling approximately 10,800 miles. The major addition to the program during the period, was the installation and operation of monitoring equipment in the 100-H Area. This was accomplished during the latter part of the month, and the initial data will be forthcoming next month.

Personnel changes included the addition of Frank Ranahan who replaced Elizabeth L. Keene as cartographer.

The vacations of H. J. Paas and R. P. Nebeker were completed during the month.

DISSOLVING DATA

Basing the calculations on weight of metal dissolved, and not including the effect of the filters and scrubbers, the amount of radioactive iodine liberated in the dissolvers showed an overall decrease of 1.0% in September. This figure represents a decrease of 14% in the 200 West Area and an increase of 13% in the 200 East Area.

METEOROLOGICAL DATA

The wind prevailed from the northwest direction, 33% of the time at 200' this level representing that of the top of the stack. This figure compares to a prevalence of 31% of wind from the NW at 100', and 40% from the NW at 400'. The second direction in order of prevalence is West, which prevailed 30% at 200', 33% at 100' and 28% at 400'. The amount of wind from all other directions was less than 10% for each of the remaining six compass points.

3

WATER MONITORING:

A total of two hundred and thirty four samples of drinking water were analyzed during the month. Of this total one hundred and ninety seven were 500cc samples and thirty seven were 12 liter samples. Again, the frequency of taking twelve liter samples was reduced somewhat at intervals during the month due to the limited facilities in the 222-U laboratory at certain times.

Supplementing the drinking water sampling a total of eighty-four samples were obtained from various test wells, seventy-two samples being 500cc and twelve samples being 12 liter.

The following table includes a summation of the locations at which the drinking water samples averaged greater than six dis/min/liter for either the 500 ml, or 12 liter samples:

Alpha Activity in Drinking water
DRINKING WATER SAMPLES THAT AVERAGED 6 dis/min/liter
October - 1945

HVP SEC P. 5
HW-14598
for form

Table I

Location	500 ml. Samples			11.2 Liter Samples		
	No.	Max.	Ave.	No.	Max.	Ave.
Richland #2	2	16	11	2	10	6
Richland #4	4	12	8	1	6	6
Richland #5	4	11	8	1	5	5
Richland #14	4	14	11	1	8	8
Richland #15	2	7	< 6	2	10	9
Richland #18	4	9	< 6	3	9	8
Benton City Sotre	4	18	9	3	11	6
Benton City Water Co.	3	35	28	3	20	11
300 Area Sanitary	19	43	7	2	6	6

Table I.

With the exception of the 300 Area Sanitary Water, the above tabulation is again confined to the Richland and Benton City locations. The results of the twelve liter samples show slightly lower average results than the 500cc samples, and can be regarded as more accurate as the larger volumes increase the accuracy of the analysis. In the excepted case, 300 Area, the alpha activity measurements are directly dependent upon the time of sampling as the source of the alpha activity in this water is the intermittent pumping from the 300 Area Wells-this fact explaining the difference noted in the comparative results from the 500 ml. and 12 liter samples.

4

Supplementing the above tabulation, a list of wells which showed alpha activity greater than 6 dis/min/liter at any one time is presented for the 500 ml. samples on page _____. A similar tabulation for the 11.7 liter samples, showing all locations at which the alpha activity exceeded 1.0 dis/min/liter at any one time, is presented on page _____. With the exception of those locations previously mentioned in the small table, the far majority of the tabulated locations represent low averages and possibly only one individual sample showing a positive alpha count.

500cc DRINKING WATER SAMPLES

<u>Location</u>	<u>Number Samples</u>	<u>Alpha Activity d/m/l</u>		<u>U as ug U/liter</u>	
		Maximum	Average	Maximum	Average
Fosters Ranch Well	4	14	<6	-	-
Columbia Camp	4	19	8	2	2
San. H ₂ O Hanford #7	12	6	<6	4	<2
Raw H ₂ O Hanford #7	5	8	<6	4	<2
3000 Area Well A	3	6	<6	4	<2
3000 Area Well B	4	11	<6	4	2
3000 Area Well C	5	7	<6	3	2
3000 Area Well D	4	6	<6	<2	<2
Richland Well #13	19	16	<6	7	4
Richland Well #2	2	16	11	8	8
Richland Well #4	4	12	8	7	5
Richland Well #5	4	11	8	4	3
Richland Well #14	4	14	11	8	6
Richland Well #15	2	7	<6	10	9
Richland Well #18	4	9	<6	8	6
Tract House J-685	4	8	<6	2	<2
Benton City Store	4	18	9	13	4
Benton City H ₂ O Well	3	35	28	19	15
Cobb's Corner	4	10	<6	3	2
Pistol Range	4	6	<6	4	4
300 Area Sanitary	19	43	7	17	4
San. H ₂ O 100-H	14	7	<6	4	<2
San. H ₂ O 200-W	4	10	<6	7	<2

Test Wells

300 Area Well #1	6	455	134	61	50
300 Area Well #2	24	176	48	197	42
300 Area Well #3	18	35	14	31	14
300 Area Well #4	4	115	107	94	60
B-Y Well.	4	8	<6	14	6

72-500 ml
12-12 liter

HVP

See p. 6, HW-14578
for table for

6 dis/min/liter
2000 samples

$$\frac{11.2}{0.5} = 22.4$$

$$\frac{6}{22.4} = 0.3$$

LARGE WATER SAMPLES

(12 Liter)

Location	No. Samples	d/m/1 Alpha Activity		U as ug U/liter	
		Max.	Ave.	Max.	Ave.
Hanford #7 San. H ₂ O	3	4	3	4	< 2
3000 Area Well A	2	2	1	4	< 2
3000 Area Well B	2	4	3	4	2
We00 Area Well C	2	2	1	3	2
3000 Area Well D	2	2	2	< 2	< 2
3000 Durand #5	3	4	1	4	3
3000 Area Pond Inlet	2	4	3	3	2
Richland #13	4	6	4	7	4
Richland #2	2	10	6	8	8
Richland #4	1	6	6	7	5
Richland #5	1	5	5	4	3
Richland #14	1	8	8	8	6
Richland #15	2	10	9	10	9
Richland #16	1	1	1	< 2	< 2
Richland #18	3	9	8	8	6
Tract House K-748	1	4	4	< 2	< 2
Tract House J-685	3	7	3	2	< 2
Benton City Store	3	11	6	13	4
Benton City H ₂ O Co. Well	3	21	11	19	15
Cobb's Corner	3	4	2	3	2
Kennewick Highlands	1	2	1	3	3
Kennewick Std. Station	1	1	1	< 2	< 2
Enterprise Well	2	3	2	< 2	< 2
Pasco H & R	1	1	1	< 2	< 2
Pistol Range	2	4	3	4	4

Test Wells

300 Area Well #2	1	6	6
300 Area Well #3	1	16	16
B-Y Well	2	7	5
200 N Well #5	1	4	4

In addition to the alpha results summarized above, all 500 ml. samples were analyzed for beta activity. Only two locations showed average beta activity to exceed 50 uuc/liter, these locations were the Kennewick Highlands and Kennewick Standard Stations, averaging 90, and 93 uuc/liter respectively. Occasional individual results above the sensitivity limits (50uuc/l) were obtained, these being summarized as follows: Pasco H&R Depot 87 uuc/liter, Richland Well #4 76 uuc/liter, 300 Area Sanitary 76 uuc/liter, 100-F Sanitary 88 uuc/liter and 100-H Sanitary 96 uuc/liter.

All locations showing this tracer beta activity are either taking their

supplies directly from the river or are located adjacent to the river. At low stage, tracer activity of this magnitude has been detected, and is currently expected.

Two test wells 300 Area #1 and McGee Well, showed individual positive results of 64 and 57 uuc/liter respectively.

Well samples were obtained from several cities in the Yakima Valley, all samples were analyzed for alpha activity and only one individual result exceeded 1.0 dis/min/liter. This sample from Sunnyside showed 4.3 dis/min/liter. Other cities sampled were Moxee City, Yakima, Ellensburg, Zillah and Granger.

RADIOACTIVE CONTAMINATION IN THE COLUMBIA RIVER

October 1949

Location	Alpha-dis/min/liter		Beta-Gamma-uuc/liter *	
	Maximum	Average	Maximum	Average
Wills Ranch	<6	<6	<50	<50
Above 100-B Area	8	<6	<50	<50
181-B Area	<6	<6	225 180	90 72
181-D Area	<6	<6	840 670	710 570
181-F Area	<6	<6	1200 960	890 710
Foster Ranch	<6	<6	530 420	480 380
Hanford South Bank	<6	<6	3650 2920	3060 2450
Hanford Middle	<6	<6	3510 2810	2615 2090
Hanford North Bank	<6	<6	1010 810	740 590
300 Area	<6	<6	540 430	480 380
Richland	7	<6	1060 850	890 710
Pasco Bridge (Kenn. Side)	<6	<6	300 240	250 200
Pasco Bridge-Pasco Side	<6	<6	390 310	330 260

* Note-The reporting level for the minimum activity detected in river samples is currently established at 50 uuc/liter (5×10^{-5} uuc/liter.)

The results of the weekly river sampling program are summarized above. The data again reflects the effects of the low stage of the river observed during this period, with the average beta activity increasing at all locations except the Pasco Kennewick bridge. In general, this increase approaches a factor of two, over the previous month. At the Pasco-Kennewick Bridge, samples taken on each side of the river show the average beta activity to be slightly less than that during the month of September. This decrease is attributed to two factors, the dilution of the Yakima, and secondly, the lower flow rates which result in a longer decay period currently existing between the 100 Areas and Pasco. This latter fact is apparent by a comparison of the averages of the last two months, which show that the magnitude of this difference decreases at the successive downstream locations.

All samples from the Columbia were measured for alpha activity, the results of all samples with the exception of one from 181-B, being less than six dis/min/liter. These same samples were measured for uranium, all results being less than 4 ug U/liter.

Twelve samples from the Yakima River show the average beta activity to be less than 50 uuc/liter at all locations except at the mouth of the river where 4 samples taken in the middle averaged 80 uuc/liter with a maximum of 300 uuc/liter. This is the first time in 1949, that this location showed positive activity, and is indicative of the low water currently flowing, as the activity is a backwater from the contaminated

8

Columbia. Upstream Yakima samples were in very good agreement with the past and showed no positive activity. No positive alpha or uranium results were obtained from the Yakima.

COLUMBIA RIVER MUD SAMPLES

Total Beta-Gamma Activity-muc/kg (milli-microcurie per kilogram)

October 1949

Table IV

Location	No. Samples	Beta Activity in milli-microcuries per kilogram			
		Onshore Samples		Five Feet From Shore	
		Max.	Ave.	Max.	Ave.
Near Wills Ranch	4	22 18	18 14	18 14	12 10
Allard Pump Station	4	22 18	13 10	14 11	12 10
At 100-H Area	2	15 12	14 11	11 9	8 6
Below 100-F Area	4	34 27	24 19	34 27	32 26
Richland Dock	4	40 32	21 17	73 58	38 30
At 300 Area	4	30 24	27 22	22 18	17 14
Pasco Bridge (Pasco Side)	4	39 31	24 19	19 15	16 13
Pasco Bridge (Kenn. Side)	4	29 22	19 15	33 26	22 18
Hanford Ferry	3	32 26	24 19	44 35	31 25

A total of sixty-six routine mud samples from the listed locations, indicates that the agreement in beta activity measured on the shore and off the shore is far better than during the previous month. The magnitude of the activity has decreased at the on shore locations, whereas it has remained about the same at the off shore locations.

All mud samples were measured for alpha activity, the averages at all locations being less than six dis/min/liter. Occasional positive alpha activity, ranging from 6 to 10 dis/min/liter was indicated in individual samples at random locations, however in no case was this activity confirmed by the following weeks samples.

RAW WATER-RIVER EXPORT LINES

Thirty samples were obtained from the raw water supplies at the 183 and 283 buildings in the areas. The alpha activity measurements averaged less than six dis/min/liter at all locations, with the occasional spot checks for uranium activity being less than 4 ug U/liter at all times.

Beta activity measurements, again reflect the low water and higher activity

currently found in the Columbia as the averages at 100D, 100F, and 100H were 164, 181, and 271 uuc/liter respectively. The maximums found at these locations were 256, 221, and 271 uuc/liter at 100D, 100F, and 100H. These results are very small increases over the previous month. The activity that is in the export lines is not reflected at the 283 buildings in the 200 Areas, these results averaging less than 50 uuc/liter. The absence of this activity in the 200 Areas is apparently due to the interval of time and subsequent decay period between the 100 and 200 Areas.

AIR MONITORING DATA

October 1949

Location	Beta Activity on Filter*	I ¹³¹ in Scrubbers Solution*
	uc/liter air	uc/liter air
200 West	2.1 2.6×10^{-10}	0.9 1.1×10^{-9}
Benton City	1.4 1.7×10^{-10}	5.0 6.3×10^{-10}
200 East SE	1.5 1.9×10^{-9}	6.1 7.6×10^{-10}
300 Area	2.2 2.7×10^{-10}	1.0 1.2×10^{-10}
Richland	0.9 1.1×10^{-10}	2.5 3.1×10^{-10}

The above summary is indicative of the positive activity pickup in the custic scrubbers, this activity being greater than that found on the filters at 200 West, and Benton City. Rather high beta activity was detected in the scrubber from Benton City during one week, this activity averaging 1.7×10^{-9} uc/liter for the week. The balance of the scrubber data is well in line with that found in recent months.

A scrubber unit was installed in the 100H Area, along with an air filter. This unit will be serviced on the same basis as the current locations, and data from this location will be presented in next months report.

STACK GAS MONITORING

The following table summarizes the results of the stack gas monitoring program:

DATE REMOVED	I131* mc/24 hrs.	% I131	OTHER FISSION PRODUCTS** mc/24 hrs.	TOTAL FISSION PROD. mc/24 hrs.
9/23/49	169	65	90	259
9/26/49	862	91	85	947
9/27/49	235	25	25	260
9/28/49	153	85	27	180
9/29/49	103	72	40	143
9/30/49	80.5	76	24.7	105.2
10/4/49	No Sample	--	17	--
10/5/49	841	83	173	1014
10/6/49	241	--	No Sample	--
10/7/49	1133	90	130	1263
10/8/49	486	95	24	510
10/12/49	217	84	41	258
10/13/49	500	96	19	519
10/14/49	1048	99	5	1053
10/15/49	318	95	19	337
10/19/49	180	93	13	193
10/20/49	357	93	29	386
10/21/49	843	98	18	861
10/25/49	560	96	25	585
10/26/49	918	98	23	941
Totals	11985 9245		828	Total → 9814

* All Beta activity found in scrubbing solution is expressed as "I 131."

** Activity found on filter expressed as "Other Fission Products."

$$\begin{array}{r} 11985 \\ 8828 \\ \hline 17813 \end{array}$$
$$\begin{array}{r} 9245 \\ 828 \\ \hline 10173 \end{array}$$

~9

~10 curies

~9-10 curies

~10-11 curies

Table VII

LOCATION.		Average dose in mrep per 24 hrs.			
		Integrations		"C" Chambers	
		October	September	October	September
100-B Area	XX (C)	0.5	0.3	0.3	0.3
100-D Area	(C)	0.2	0.3	0.4	0.4
100-F Area	(C)	0.6	0.4	0.3	0.6
200-West Area	(C)	0.4	0.1	0.3	0.4
200-East Area	(C & S)	0.4	0.3	0.6	0.6
Riverland		2.0	1.0	-	-
300 Area	(C)	1.1	0.7	0.5	0.5
700 Area		0.3	0.3	-	-
Pasco		0.7	0.4	-	-
Benton City		0.4	0.5	-	-
3000 Area North		0.4	0.7	-	-
3000 Area South		0.1	0.7	-	-
Hanford 614		0.7	0.7	-	-

XX (C) & (S) indicates type of chamber at respective locations.

Table VII

LOCATION	Maximum noted in 8 Hr.		Average on Filters
	period	uc/liter	
200 East, SE Corner			1.5 1.9 x 10 ⁻⁹
200 West Tower #4	1.3	1.6 x 10 ⁻⁷	2.0 2.5 x 10 ⁻¹⁰
Gable Mountain	2.9	3.6 x 10 ⁻⁷	3.5 4.4 x 10 ⁻¹⁰
Richland		< 1.0 x 10 ⁻⁷	< 1.0 1.1 x 10 ⁻¹⁰
Pasco			6.6 8.2 x 10 ⁻¹¹
300 Area			2.2 2.7 x 10 ⁻¹⁰
200 East, Tower #16			1.1 1.4 x 10 ⁻⁹
100-D Area			2.1 2.6 x 10 ⁻¹⁰
200 West Gate		< 1.0 x 10 ⁻⁷	2.1 2.6 x 10 ⁻¹⁰
Benton City			1.4 1.7 x 10 ⁻¹⁰
Hanford 614 Building			1.4 1.7 x 10 ⁻¹⁰
White Bluffs			< 1.0 1.1 x 10 ⁻¹⁰
3000 Area North			1.5 1.9 x 10 ⁻¹⁰
200 West Tower #15	3.2	4.0 x 10 ⁻⁷	1.3 1.6 x 10 ⁻¹⁰

AIR MONITORING:

A summary of the average dosage rates measured using detachable chambers is given in the following table:

RADIATION LEVELS IN AIR

Detachable Chambers

Average mrep* per 24 ^P hours

Location		October 1949	September 1949
<u>100 Areas and Environs</u>			
Route 1, Mile 8	(M)	0.59	0.54
Route 2N, Mile 10	(M)	0.49	0.43
Route 2N, Mile 5	(M)	0.37	0.55
White Bluffs	(M)	0.57	0.60
Route 11A, Mile 1	(S)	0.77	0.56
Hanford 614 Bldg.	(S)	0.44	0.48
Intersection Rt. 1, 4N	(M)	0.52	0.95
Hanford 101 Area	(M)	0.48	0.47
100-H Area	(M)	0.59	0.53
<u>Within 5 Miles of 200 East</u>			
Route 4S, Mile 6	(S)	0.94	1.00
Batch Plant	(M)	0.55	0.70
Route 11A, Mile 6	(S)	0.82	0.59
Route 3, Mile 1	(S)	1.40	0.71
Meteorology 200'	(S)	0.87	0.48
<u>Within 10 Miles of 200 East</u>			
Route 4S, Mile 10	(S)	0.66	0.93
Route 10, Mile 1	(S)	0.56	0.53
Route 10, Mile 3	(S)	0.58	1.16
Route 2S, Mile 4	(S)	0.83	0.93
<u>Near 300 Area</u>			
Route 4S, Mile 16	(S)	0.65	0.62
Route 4S, Mile 22	(S)	0.67	0.66
3000 Area North	(S)	< 0.48 0.37	< 0.48
3000 Area South	(S)	< 0.48 0.33	< 0.48
<u>Outlying</u>			
Richland	(S)	< 0.48 0.38	< 0.48
Benton City	(S)	< 0.48	< 0.48

(M and S indicates the type of chamber at the respective location.)

* *

*

Table D

A review of the chamber data indicates that with very few exceptions, the dosage rates are within the normal fluctuations expected. A twofold increase is noted at Route 3, Mile 1, and the Meteorology Tower, both of these locations being between the separation areas. The "C" Chamber data agrees very well with last months.

The air filter data, reflects the increased dissolving in the 200 East Area, the current airborne activity averageing 1.7×10^{-9} uc/liter, as computed from the two stations inside 200 East. Maximum activity, for one weekly period in the 200 East Area was 4.6×10^{-9} uc/liter, this level being higher by a factor of two when compared to the maximums measured during the past year.

The integron data is in good agreement with the past, except for Riverland. At this station the maintenance sheets are indicative of L & N trouble, however a conservative appraisal of the dosage rates measured by the integron, at this location show the average dosage to be 2.0 mrep/24 hrs. These readings are not confirmed by the film packs adjacent to the VI. Film packet data, shows that no location exceeded a dosage rate of 5.0 mrep/24 hrs. Packs have been placed in the 100-H Area stations, and data will be available next month.

A review of the airborne particle concentrations, as measured by air filters indicates that the influx of radioactive particles observed last month has decreased considerably. This decrease cannot be measured directly, as it is still possible that scattered particles from outside sources are being deposited on the filters along with HW Particles. The results from the off area locations tend to indicate that the particles from outside sources are at a minimum, only one location, Great Falls, Montana, indicating a deposition that was detected by radio-autograph. Along with this fact, the rate of collection at 100-D has not shown a decrease the last week. Evaluations of the Great Falls and 100-D data lend very little to deciding the source of the particles.

A summary of the airborne particle concentration rates, as detected by air filters follows-last months data included for comparison:

Location	Total Particles	Air Volume (ft. ³)	Collection Rate for Month P/ft. ³ (units 10 ⁻⁵)	P/m ³ (units 10 ⁻³)	Last Month Average P/M ³ x 10 ⁻⁵
<u>Project Locations:</u>					
100-R	3	400,000	0.75	.26	17.3
100-D	53	286,000	18.5	6.53	18.0
White Bluffs	1	57,000	1.75	.62	.10
100-F	0	395,000	< 0.10	< .10	8.5
Benton City	3	303,000	0.9	.35	3.9
Pasco	0	227,000	< 0.1	< 0.2	11.6
700 Area	0	377,000	< 0.1	< .10	19.0
<u>200-E & Vicinity</u>					
2701 (outside)	2	404,000	0.50	.18	5.3
2704 (outside)	8	276,000	2.90	1.02	2.8
222-B (outside)	9	232,000	3.88	1.37	17.6
B-Gate (outside)	3	101,000	2.97	1.05	10.6
H.I. Garden (outside)	18	404,000	4.46	1.57	3.3
BY-SE (outside)	10	404,000	2.48	.87	4.6
BY-NE (outside)	1	85,000	1.18	.42	.20
2701 (inside)	0	100,000	< 0.10	< 0.4	2.7
2704 (inside)	4	406,000	0.98	.35	4.6
221-(O.G.)inside	30	100,000	30.0	10.6	6.0
222-Hall (inside)	7	90,000	7.78	2.75	6.0
222-Lab (inside)	182	100,000	182.	64.2	81.2
<u>200-W & Vicinity</u>					
2701 (outside)	6	402,000	1.49	.53	7.8
T-Gate (outside)	8	398,000	2.01	.71	6.3
222 (outside)	15	100,000	15.0	5.30	10.9
2722 (outside)	11	398,000	2.76	.97	3.5
231 (outside)	15	401,000	3.74	1.32	17.6
So. Guard Twr.(outside)	4	402,000	1.00	.35	7.0
U-Gate (outside)	3	320,000	.94	.33	.5
W.Guard Twr.(outside)	2	401,000	.50	.18	2.6
2701 (inside)	1	101,000	.99	.35	6.7
272 (inside)	1	101,000	.99	.35	4.9
222 Hall (inside)	76	100,000	76.0	26.8	25.8
<u>Meteorological Tower</u>					
3'	7	401,000	1.75	.62	8.1
50'	6	401,000	1.50	.53	13.8
100'	8	321,000	2.49	.88	12.7
150'	15	281,000	5.34	1.90	15.2
200'	6	241,000	2.49	.88	7.8
250'	5	241,000	2.07	.73	7.8
300'	7	241,000	2.90	1.02	2.7
350'	1	230,000	0.43	.15	0.6
400'	2	159,000	1.26	.44	9.2
<u>Off Area Locations</u>					
Spokane	0	105,000	< .10	< 0.4	36.3
Lewiston	0	105,000	< .10	< 0.4	2.7
Boise	0	106,000	< .10	< 0.4	68.1
Klamath Falls	0	105,000	< .10	< 0.4	25.1
Stampede Pass	0	106,000	< .10	< 0.4	2.4
Great Falls	2	120,000	1.67	.59	23.3
Walla Walla	0	106,000	< .10	< 0.4	15.5
	0	70,000	< .10	< 0.6	0.4

LAND AND VEGETATION CONTAMINATION:

Five hundred and eighty-seven routine vegetation samples were collected during October. Each of these samples were analyzed for eight day I^{131} and for beta activity from non-volatile emitters. The results of the analysis for beta activity of these two sources in the vegetation are summarized for the nearby locations as follows:

Compare with table p. 16
Table XI

LOCATION	No. Samples	I^{131} as milli-microcuries/kg*			Non-Vol. Activity muc/kg**		
		Maximum	Average	Sept. Avg.	Maximum	Average	Sept. Avg.
North of 200 Areas	66	7	< 2	< 2	26	12	16
Near the 200 Areas	58	10	3	2	30	14	21
Route 3	8	50	13	9	31	18	28
200 West Gate	5	55	24	17	65	28	40
Meteorology Twr.	5	18	8	3	26	17	16
S. of 200 Areas	107	5	< 2	< 2	25	11	14
Richland	26	5	< 2	< 2	26	11	12
Pasco	15	3	< 2	< 2	24	11	19
Kennewick	15	4	< 2	< 2	40	13	16
Benton City	15	3	< 2	< 2	16	10	15
Richland 'Y'	4	4	< 2	< 2	20	12	19
Hanford	10	3	< 2	< 2	13	< 10	16

* The limit of sensitivity for I^{131} determinations in a 5.0 gram sample of vegetation is 2 muc/kg.

**The limit of sensitivity for non-volatile emitters is best estimated at 10 muc/kg, this value including the natural beta activity from K^{40} .

The above summary indicates that the I^{131} activity has increased noticeably, at those locations near the separation areas. This fact can be attributed to the seasonable trend expected at this time of the year, when the activity is more readily deposited on the ground due to the atmospheric conditions, such as fog and precipitation. The increase is not noted at the more remote locations.

The deposition of long life activity shows a very definite decrease at all locations, the current averages being in very good agreement with those found in August, 1949. The increase noted last period was apparently due to the same sources which caused the particle deposition rates to increase.

The measurement of I^{131} activity inside the separation areas shows an increase by a factor of two, the current average being 8 muc/kg, with a maximum result during the month being 44 muc/kg in the 200 West Area. Non-volatile activity in the areas averaged 19 muc/kg, the maximum being 37 muc/kg found in the 200 West Area.

The following table summarizes the results obtained from the off area vegetation samples:

Table XI

LOCATION-	No. Samples	I ¹³¹ as milli-microcuries/kg*			Non-Vol. Activity muc/kg**		
		Maximum	Average	Sept. Avg.	Maximum	Average	Sept. Avg.
Rattlesnake MP Posts	29	3	<2	- -	16	11	- -
Yakima-Ellensburg	27	3	<2	- -	17	<10	- -
Northwest Ranches	12	4	<2	<2	21	12	18
Wahluke Slope	104	3	<2	<2	40	13	10
Goose Egg	29	11	4	3	15	13	15
Pasco To Ringold	18	3	<2	<2	16	10	14
Kenn.-Finley-Hover	12	5	<2	- -	30	14	- -

There is very little change in the beta activity measured at the off area locations during the month. Statistical comparisons between the existing averages and those found during September, show that no trends or changes are significant, these test being made separately for both the I¹³¹ and the non-volatile activity.

Two maps are included covering the vegetation, Figure I is an iso-activity map showing the I¹³¹ deposition on the HW Environs, and Figure II portrays the individual results of a survey in the Yakima-Ellensburg Area.

A request for a special survey of the vegetation activity in a portion of Range 28E was received. Section 2 of Township 12 and Sections 34 and 26 of Township 13 were surveyed on October 14th. Seventy five vegetation samples were obtained and analyzed for I¹³¹ and non-volatile activity. The average I¹³¹ activity was less than 2 muc/kg in each section and the maximum activity was 4 muc/kg. Non-volatile activity average 14 muc/kg with a maximum of 47 muc/kg. The activity in general, compares favorably with that found in the surrounding region and in the residential areas of Pasco-Kennewick and Richland. The non-volatile results had a few higher than expected results, but the survey was conducted at a time when an unusual amount of activity of this type had been known to exist on the vegetation over the entire area. Seventy-three soil samples were analyzed by the same methods mentioned above, and the activity found in the soil was nearly identical to that found in the vegetation.

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HANFORD WASTES

100 AREAS:

Thirty-five samples were obtained from the 107 basins. The average beta activity measured in these samples is nearly identical to that found last month, with the possible exception of 100-B Area, where the activity averaged about 0.1 muc/liter higher than before.

The average beta activity in the samples from the 107 basins at 100-B, 100-D, and 100-F Areas was 438, 378, and 388 muc/liter respectively. The maximum activity measured at these same locations was 525, 493, and 559 muc/liter.

The above samples were measured for alpha activity, all results being less than 30 dis/min/liter. The sample volume for the alpha analysis was increased to 400 ml. during the month, which establishes the sensitivity limit of this analysis around 8 dis/min/liter. Commencing with the November data, this figure will be used these reports, however the old figure is used for this report inasmuch as the results of the major portion of the analysis were from 100 ml. samples.

Further analysis for alpha activity included measurements for uranium and plutonium. No location averaged greater than 4.0 uc U/liter, however two samples from 100-D and 100-F contained 4.3 and 7.1 uc U/liter respectively. Plutonium analysis by TTA process, showed the Pu to average less than 6 dis/min/liter in all areas. One unusual group of Pu results were obtained from the set of samples taken on 10-6-1949, and analyzed on 10-13-1949. In this set positive Pu results were obtained from each area, the 100-B, 100-D, and 100-F areas samples containing 54, 9, and 7 dis/min/liter respectively. Examination of the data indicated that the EE alpha results showed that no total alpha activity was present in these same samples and thus these three results were eliminated from the averages mentioned above. These results are attributed to lab contamination. No other positive results were obtained.

Two samples from each of the effluents were analyzed for Polonium, the results being less than 6 dis/min/liter for all samples.

No samples of dryer room condensate were submitted. No samples of calol were obtained during the month.

Basing the calculations on previous decay studies, an estimated 213 curies of beta gamma emitters were discharged into the river daily. Roughly, between 11 and 21 curies of this activity was long life material.

200 AREAS:

The results obtained from the analysis of samples taken from various waste areas in the 200 Areas are summarized in the following table:

Location	Type Sample	Alpha dis/min/kg**		Beta-Gamma muc/kg**	
		Maximum	Average	Maximum	Average
T Swamp	Water	36	< 30	0.7	< 0.1
T Swamp	Mud	5.8×10^5	2.2×10^5	94	38
U Swamp	Water	1700*	< 30	0.3	< 0.1
Laundry Ditch	Water	50	< 30	0.5	0.2
Laundry Ditch	Mud	8.0×10^4	6.4×10^4	230	100
231 Ditch	Water	35	< 30	0.1	< 0.1
B Ditch	Water	130	< 30	8.2*	0.5
B Ditch	Mud	3.8×10^4	6.0×10^3	2970	850
234-235 Ditch	Water	< 30	< 30	< 0.1	< 0.1
234-235 Ditch	Mud	4.9×10^4	2.6×10^4	10	8

Retention Ponds

200 East	Water	< 30	< 30	1.0	0.4
200 West	No Samples	-	-	< 0.1	< 0.1
Laundry Lint	Solid	1.2×10^5	7.7×10^4	74	45

* Only result above sensitivity level not included in average.

**It is assumed that one liter of liquid sample weighs 1 kilogram.

Table

17

The high alpha sample from the U Swamp was checked for plutonium, the results showing 46 dis/min/liter at the outlet and 15 dis/min/liter on the west side. A special mud sample from the 234-235 pipe outlet showed 23 d/m/gram due to plutonium.

In one other case, plutonium was detected in the T swamp, to the extent of 207 d/m/gram and 170 d/m/gram in the mud on the west and south sides respectively.

A special survey of the effluent water flowing into the 200-E retention pond was undertaken as a result of the high sample obtained in the B Ditch. The operations group took 32 samples over a 24 hour period these samples averaging 0.13 muc/liter with a maximum of 0.39 muc/liter.

Fluorophotometer analysis showed negligible uranium activity in the 200 Area Wastes. Three samples from the laundry ditch averaged 102 ug U/liter, an incident which appeared in error as the EE alpha extraction showed no activity on this date. Also, the result was not confirmed by resamples.

Continuous sampling of the laundry ditch was effected on September 27th, a one ounce sample being obtained from every batch of laundry wash water being sent down the ditch. To date only one result has been obtained and this shows that the total activity going down the ditch per week was 434 micro-curies of beta-gamma activity. The activity to volume corrections used in this appraisal are based on the water meter readings at the laundry. Alpha activity measurements show that 6.75×10^8 dis/min/week go down the ditch.

Weekly portable instrument surveys of the waste zones in the 200 Areas, show that maximum VGM readings in the vicinity of the 'T' Ditch and Swamp, are about 400 c/m above background. Those in the vicinity of the laundry ditch 2000 c/m above background on mud. Radiation level around the B Ditch is slightly above background, however readings as high as 4000 c/m were obtained on the mud adjacent to the 'B' Ditch.

Portable instrument surveys at the 200 North Ditches show maximum radiation levels of 2500, 20,000, and 50,000 c/m at the N,P, and R Ditches respectively.

300 AREA WASTES:

Weekly samples were obtained from each of the two ponds. Alpha activity

in the old pond averaged 3100 dis/min/liter with a maximum of 7100 dis/min/liter. These samples were analyzed on the fluorophotometer and found to contain an average of 670 uc U/liter with a maximum of 1060 ug U/liter. Similar analysis of the samples from the new pond showed the average alpha activity to be 2000 dis/min/liter with a maximum of 3200 dis/min/liter. The average activity due to uranium was 285 ug U/liter with a maximum of 570 uc U/liter.

Beta activity measurements indicated an average of 0.4 muc/liter in the old pond and 0.1 muc/liter in the new pond. The respective maximums were 0.45 muc/liter and 0.3 muc/liter. *0.45*

Mud samples were obtained from the inlet of the old pond. Alpha activity measurements showed that the average was 1100 dis/min/gram with a maximum of 2300 dis/min/gram. Each of these samples were checked for uranium activity, the average being 145 ug U/gram with a maximum of 370 ug U/gram. Beta activity in the mud averaged 0.4 uc/kg with a maximum of 0.6 uc/kg.

Sixteen samples from the 300 Area Waste line showed average beta activity to be 0.2 muc/liter and alpha activity to be 1000 d/m/l. Fluorophotometer analysis on these same samples show the average uranium to be around 400 ug/liter. TTA analysis for plutonium on each of these samples showed only two positive results these being 36 and 21 d/m/l.

Constant water samplers have been placed in the waste line and have been found to make successful collections, however extreme difficulty in maintaining the equipment seems to present a problem. The glass vessels used in this experiment do not withstand the sudden rush of water in the waste line and are found to be broken at the time the samples are obtained.

October 1949

SUPPLEMENT TO MONTHLY REPORT

A summary of the control data indicates that some of the current yield corrections now employed in the Site Survey Group are becoming more and more in error. This fact is especially true in the corrections that are applied to the vegetation program. Several months ago the I¹³¹ control data indicated that yields approached the 70% figure used here, whereas the yield this month is 37%. The non-volatile yield is 69%, whereas the correction factor used is 100%. The following table summarizes the yields for the month of October as compared to the yield corrections used here:

<u>Sample Type</u>	<u>No. Samples</u>	<u>Avg. Yield</u>	<u>Yield Used</u>	<u>Error</u>
Iodine I ¹³¹	20	37% 28	70%	+ 47%
Non-Volatile Beta	20	69% 59	100%	+ 31%
Air Control - Filter	8	58% 55	70%	+ 17%
Water 500cc Beta	42	56% 50	100%	+ 44%
Water 500 cc Alpha	20	46% 35	65%	+ 29%
Mud Alpha —	7	53% 35	65%	+ 18%

PM - 35
U - 75

No 3 gallon yields reported this month.

After reviewing the above, I feel that one of two suggestions are in order; (a) run one control with each set of data or with each days data, and then apply the corrections as such or (b) reevaluate the control factors employed, basing their value on the current and prevailing yields.

October 1947

283 W Retention Basin:

wash of filter bed $478 \pm [34]$ cfu/ml/liter

Sludge of filter bed 300 ± 20 cfu/g.

Sanitary thro ~ 10 cfu/500 ml, half-life ~ 2 days

Vegetation

50g veg. - 200 W Area - $\begin{matrix} 6.2 \\ 15.3 \\ 20.6 \\ 16.0 \end{matrix}$ α cfs/50g. veg.
ET 0.2

Veg K⁴⁰ - c/m, 1" plate 8.5, 7.1, 6.8, 1.8.
2.8, 2.3, 2.5, 3.4.

478

$$\frac{4.78 \times 10^2}{2.2 \times 10^6} =$$

2.18×10^{-4} uc/liter

0.22 m μ c/liter

300 000

$$\frac{3 \times 10^5}{2.2 \times 10^6} =$$

$$2.44 \times 10^{-1}$$

0.24 uc/kg. sludge

half-life 20-30. days

HAIRFORD "DEBS AND VICINITY (Weeks Ending 1-12- to 12-7)

WEEK ENDING

Not a child

Benton City	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	11.2	8.4	1.0	< 0.4	< 0.4
Pasco	< 29.4	< 10.4	< 7.4	< 0.5	< 66.7	50.8	38.5	< 0.4	< 0.4	
Richland	< 5.9	< 0.4	< 1.0	2.1	< 0.4	52.8	27.6	< 0.5	< 0.4	< 0.4

100-B	< 1.4	< 0.4	< 0.4	< 0.4	1.5	90.0	8.6	0.8	0.4	< 0.4
100-D	< 0.4	< 0.4	< 0.4	< 0.2	18.9	68.6	10.4	2.8	0.4	< 0.4
100-F	< 0.4	0.4	0.4	< 0.4	< 1.0	25.5	14.8	< 0.4	< 0.4	< 0.4
White Bluffs	< 1.2	< 0.4	< 0.4	< 1.7		< 3.6		< 17.7	< 7.1	< 1.0

2701 Bldg.	0.4	0.4	< 0.4	0.4	1.1	17.5	7.4	< 0.4	< 0.4	0.4
2704 Bldg.	0.7	< 0.4	< 0.4	5.2	0.7	5.7	2.9	3.2	< 0.5	< 0.5
222-B Plant	3.5	1.7	2.5	14.1	5.4	39.5	16.1	0.7	< 0.4	2.1

Particle Deposition (cont'd.)

Location	8/12	8/19	8/26	9/2	9/9	9/16	9/23	9/30	10/7	10/14
"B" Area Gate	2.1	6.4	2.1	9.4	1.0	35.3	18.4	2.8	< 1.5	< 1.5
EY-S		2.4	0.4	0.7	0.4	10.1	10.6	< 0.4	0.7	1.8
By-IE	1.0	1.0	< 1.1	1.0	< 1.1	< 1.5	< 1.5	1.2	< 11.8	< 1.5
H.I. Garden			0.4	3.5	0.7	2.2	10.7	< 0.4	1.4	3.5

200 East Area
(Inside Locations)

2701 Bldg.	< 1.1	1.0	< 1.1	1.0	< 1.1	5.7	9.9	< 1.4	< 1.5	< 1.5
2704 Bldg.	< 0.4	2.1	< 0.4	2.1	2.1	18.2	< 0.4	0.7	0.4	0.4
221 Operations- Gallery Section 11	< 1.1	2.1	2.4	< 0.9	3.0	< 1.5	29.7	1.5	1.5	34.0
222-B Hallway	1.0	1.0	5.1	3.0	1.0	14.1	9.9	4.2	2.8	4.7
222-B Lab	55.0	16.6	37.4	85.8	44.4	14.1	248.8	15.5	94.7	118.2

200 West Area
(Outside Locations)

"T" Area Gate	< 0.7	0.7	< 0.4	0.7	1.0	25.5	4.4	1.4	0.7	0.4
So. Guard Twr.	0.4	< 0.4	0.4	< 1.3	0.4	16.1	13.3	0.7	< 0.4	< 0.4
"U" Area Gate	< 0.7	0.4	< 0.4	0.4	0.4	2.4	14.1	0.6	1.2	< 0.4
West Guard Twr.	< 0.4	< 0.4	0.4	0.4	< 0.4	2.8	9.8	0.4	< 0.4	< 0.4
231 Sump Pit	1.0	< 0.4	< 0.5	< 1.2	< 0.5	67.9	2.1	0.4	< 0.4	1.4
2722 Paint Shop	0.4	< 0.4	0.7	1.4	0.7	3.5	12.4	1.7	0.7	1.0
222-T Plant	9.1	12.1	19.2	8.1	7.1		4.4	< 1.4	7.1	8.5
2701 Bldg.	0.4		0.8	2.4	0.4	19.9	13.8	< 0.4	0.7	1.4

200 West Area
(Inside Locations)

2701 Bldg.	< 1.1	1.0	1.0	< 1.5		22.5	14.1	1.4	< 1.5	< 1.5
272 Bldg. Maint.	< 1.1	1.0	< 1.1	< 1.1	1.0	22.6	5.9	1.4	< 1.5	< 1.5
222-T Hallway	30.4		28.3	3.0	18.2	28.3	62.2	4.1	14.1	50.9

TO: J.W. HEALY-W.SINGLEVICH
FROM: H.J. Paas

SITE SURVEY MONTHLY REPORT
FOR THE MONTH NOVEMBER 1949

The attached report is compiled from the following number of surveys:

WATER SAMPLING PROGRAM

Drinking water 500cc-----	180	
Drinking water 11.7 liter-----	66	
Test Wells 500cc-----	64	
Test Wells 11.7 liter-----	12	
Raw Water 500cc-----	30	
Waste-----	150	
Total water samples		593

AIR SAMPLING PROGRAM

Particle Filter-----	160	
Particle Traps-----	90	
Air Filters-----	60	
Scrubbers-----	24	
Detachable Chambers-----	528	
Film Packets-----	124	
Total Air Samples		986

LAND SAMPLING PROGRAM

On Area Vegetation-----	519	
Off Area Vegetation-----	130	
Mud & Lint-----	98	
Total Land Samples		747

INSTRUMENT & MISC.

Portable Instrument (Land)-----	4	
Portable Instrument (waste)-----	15	
TOTAL		19

TOTAL SURVEYS FOR MONTH 2310

GENERAL:

The indicated number of surveys were accomplished by traveling approximately 12,000 miles. Much of this mileage resulted from the off area surveys in preparation for the hot-run. Similarly, a considerable amount of the routine was suspended for short intervals during the month, as the entire group participated in hotrun preparations and background runs. This decrease does not show up too well in the survey summary because this monthly period would normally cover five weeks of data.

PERSONNEL:

L. J. Harmon joined
~~No personnel changes during the month.~~ The vacation of R. V. Gaines was completed, this vacation completing the vacation schedule for the year 1949.

DISSOLVING DATA:

This data is deleted from the report, because it is not up to date at present due to the change of assignment of the personnel involved. This data will be available after the calibration of the instruments is completed by J. H. Wolff.

METEOROLOGICAL:

This data is deleted from this report for reasons identical to above.

WATER MONITORING:

A total of two hundred and forty-six drinking water samples were analyzed during the month. Of this total one hundred and eighty were 500cc samples and sixty-six were 12 liter samples. The small samples were analyzed for the alpha and beta activity, whereas the large volume samples were confined to alpha measurements.

The following table includes a summation of the locations at which the drinking water samples averaged greater than six dis/min/liter, for either the 500cc or 12 liter samples:

TABLE I
ALPHA ACTIVITY IN DRINKING WATER
NOVEMBER 1949
Units ~~dis~~ dis/min/liter

Location - Well	No. Samples	500 cc Samples		No. Samples	12 Liter Samples	
		Maximum	Average		Maximum	Average
Hanford Well #1	3	10	6	1	4 2	4 1
Richland #2	3	12	8	3	12	9
Richland #4	2	15	11	—	—	—
Richland #14	3	19		1	4 3	4 3
Richland #15	2	13		1	8	8
Richland #18	3	11		2	4 2	4 1
Benton City Store	4	27	13	2	4 4	4 2
Benton City Water Co.	4	33	27	2	14	9
Cobbs Corner	4	25	9	2	4 4	4 4

The alpha results which are greater than six dis/min/liter, again are from those supplies in the Richland and Benton City Area. This activity is confirmed as uranium, the Richland Area showing uranium activity as high as 18 ug/liter, with a prevailing average of around 5 ug/liter for all samples analyzed during the month. Maximum uranium activity measured in samples from the Benton City region was 23 ug/liter, the average at the same location being 18 ug/liter.

Beta activity measurements indicated averages of 183 and 115 uuc/liter at Kennewick Std. Station and Kennewick Highlands respectively. Similar activity averaged 116 uuc/liter at Pasco. Tracer beta activity was measured in some of the plant sanitary water supplies, however the average beta activity exceeded 50 uuc/liter in only

the 100-F Area, this average being 78 uuc/liter.

Current decay studies show the above mentioned beta activity to be aligned with tracer activity found in the export line, this activity being identified as residual Na^{24} , with a very small amount of long life activity in the samples (5%).

In addition to the drinking water samples, seventy-eight samples were taken from test wells. Sixty-four of these samples were 500cc and fourteen were 12 liters. The far majority of these samples were taken from the 300 Area system Wells #2 and #3, which are subject to pumping into the sanitary supply. The test well supply was used once during the month, on November 21, when 91, 250 gallons were pumped into the system from Well #2. The following summary shows the test well locations at which alpha activity averaged greater than six dis/min/liter:

TABLE II
ALPHA ACTIVITY IN TEST WELL SAMPLES
November 1949
Units ~~of~~ dis/min/liter

Location	No.	500cc Samples		No.	12 Liter Samples	
	Samples	Maximum	Average	Samples	Maximum	Average
300 Area #1	3	124	105	-	-	-
300 Area #2	19	97	11	1	6	6
300 Area #3	19	24	14	1	16	16
300 Area #4	3	127	112	-	-	-

Fluorophotometer analysis indicates the presence of large quantities of uranium in this system, this activity averaging 57, 4, 13, and 44 ug/liter at Wells 1, 2, 3, and 4 respectively.

RIVER MONITORING:

No. river samples

The results of the weekly river samples as summarized in Table III indicates that a shift in the cross river activity dispersion has occurred during this period, the beta activity detected on the north bank at Hanford increasing by a factor of three, whereas the activity in the middle and south bank has decreased. It is worthy to mention, that due to excessive decay periods previous to counting, only one sample result was validated from the south bank location. As this activity was abnormally low for this location, investigation into the status of operation of the piles, showed that each area was at full power for the period 8 hours previous to the sampling. Flow data is not available at this writing, and a significant change

in same, would account for the activity dispersion shift.

The decreasing activity noted at the Pasco-Kennerick Bridge during the month of October, is not reflected in this months data, the current beta activity at his location being in good agreement with that which is normally expected.

All samples were measured for alpha activity, with no location showing average alpha activity greater than 6 dis/min/liter. Several individual samples did show alpha activity measurements at the sensitivity limit, however subsequent samples did not confirm any positive alpha activity in the river.

Twelve samples from the Yakima, at the mouth and at the horn, showed no positive alpha or beta activity. Tracer beta activity was detected at the mouth during month of October.

TABLE III
RADIOACTIVE CONTAMINATION IN THE COLUMBIA RIVER
NOVEMBER 1949

Location	Alpha-dis/min/liter		Beta-Gamma-uuc/liter * *	
	Maximum	Average	Maximum	Average
Wills Ranch	< 6	< 6	< 50	< 50
Above 100-B Area	< 6	< 6	< 50	< 50
181-B Area	< 6	< 6	< 50	< 50
181-D Area	< 6	< 6	825	820
181-H Area	< 6	< 6	1420	620
181-F Area	< 6	< 6	1120	770
Foster Ranch	7 *	< 6	520	490
Hanford South Bank	< 6	< 6	560	560
Hanford Middle	< 6	< 6	2070	1520
Hanford North Banks	6 *	< 6	3320	1670
300 Area	6 *	< 6	560	350
Richland	6 *	< 6	1020	915 (915) 1
Pasco Bridge-Kenn. Side	< 6	< 6	690	370
Pasco Bridge-Pasco Side	6 *	< 6	550	480

COLUMBIA RIVER MUD SAMPLING:

A total of 168 routine mud samples were obtained from the locations listed in Table IV. The beta activity measurements are in the normal expected order of magnitude, with the exception of those samples obtained from the 300 Area locations, where considerable fluctuation in the results is noted. The maximum activities of 156 and 171 uuc/kg were found on different dates, Also, the corresponding samples from the same date did not verify the high activity. This type of fluctuation has been observed at his location in the past, and upon several occasions we have made special surveys

in this region to try and duplicate the results and identify the activity and its source. In all these previous cases we were unable to duplicate the activity detected, and consequently no identification was possible. Currently, we are awaiting confirmation of these results by subsequent samples, and if confirmed, we shall instigate a special investigation at this location. It is my belief that the results quoted below are authentic measurements, and that pure chance sampling at this location results in occasional beta activity detection.

Alpha activity measurements in all mud samples averaged less than six dis/min/liter. One sample from Hanford (five feet out) had 75 dis/min/gram, however the fluorophotometer analysis on same sample was less than 4 ug U/gram. Another sample from the on shore location at Hanford showed positive fluorophotometer (38 ug U/gram), but did not exceed 6 dis/min/gram on the EE. Possible crossing of these samples in the lab exists, but in any event lab contamination was assumed as the occurrence has not been confirmed by subsequent samples, nor has it ever been preceded.

TABLE IV
COLUMBIA RIVER MUD SAMPLES
Total Beta-Gamma activity muc/kg (milli-microcurie per kilogram)

November 1949

Location	No. Samples	Beta Activity in milli-microcuries per kilogram			
		Onshore Samples		Five feet From Shore	
		Maximum	Average	Maximum	Average
Near Wills Ranch	4	17	14	20	16
Allard Pump Station	4	16	12	14	11
At 100-H Area	2	18	18	17	16
Below 100-F Area	4	38	26	39	26
Richland Dock	4	21	15	27	18
At 300 Area	4	156	88	171	64
Pasco Bridge (Pasco Side)	4	15	11	22	18
Pasco Bridge (Kenn. Side)	4	25	15	24	15
Hanford Ferry	4	23	15	28	18

Table IV

7

RAW WATER - RIVER EXPORT LINE :

Thirty samples were obtained from the 183 and 283 buildings, in the areas. Beta activity again appears in the samples from all areas except 100-B. The greater activity is found in the 100 Areas, and is reflected to a lesser extent in the 200 Areas. The difference is due to the pumping time, involved in transporting the water to the 200 Areas, this time averaging about 10½ hours normally. The actual periods of retention vary according to the consumption. Several decay studies are underway on these samples, and they are kept on decay to determine the long half life component. Current analysis indicates a decay rate of around 20 hours, this decay reflecting the presence of Na^{24} , in combination with longer life material. Upon completion of these studies we will be able to identify the residual activity that may possibly get into the sanitary supplies. The results of beta activity measurements follow:

TABLE - V
BETA ACTIVITY IN RAW WATER-River EXPORT LINE
November 1949

Location	Number Samples	<i>microcuries</i> Microcuries / liter	
		Maximum	Average
183 Bldg. 100-B	4	250	250
183 Bldg. 100-D	4	305	230
183 Bldg. 100-F	4	500	372
183 Bldg. 100-H	4	500	372
283 Bldg. 200-E	7	122	70
283 Bldg. 200-W	7	146	78

No positive alpha activity was detected in any raw water sample.

AIR MONITORING:

A review of the data presented in Table V, shows that the dosage rates as measured by detachable chambers, showed a unusual increase at the locations due southwest of the separation areas. Individual readings indicate that this increase occurred the first few days in November, a time when considerable fog was observed in this vicinity. The wind prevailed from the northwest during this time at velocities from 5 to 10 mph., this fact definitely influencing the increased readings. Dosage rates for individual days during this short period were as great as 4.0 and 6.0 mrep/24hours.

these figures including background measurements of approximately 0.3 to 0.5 mrep/24 hours. This dosage period existed for a period of approximately three days.

The balance of the detachable chamber readings are in good agreement with the past.

TABLE VI
RADIATION LEVELS IN AIR
Detachables Chambers

Location	Average mrep per 24 Hours	
	November 1949	October 1949
<u>100 Areas and Environs</u>		
Route 1, Mile 8 (M)*	**	0.59
Route 2N, Mile 10 (M)	**	0.49
Route 2N, Mile 5 (M)	0.56	0.37
White Bluffs (M)	0.61	0.57
Route 11A, Mile 1 (S)	0.79	0.77
Hanford 614 Bldg. (S)	0.39	0.44
Intersection Rt. 1, 4N (M)	**	0.52
Hanford 101 Area (M)	0.59	0.48
100-H Area (M)	0.51	0.59
<u>Within 5 Miles of 200 East</u>		
Route 4S, Mile 6	1.46	0.94
Batch Plant	0.68	0.55
Route 11A, Mile 6	1.01	0.82
Route 3, Mile 1	**	1.40
Meteorology 200'	**	0.87
<u>Within 10 Miles of 200 East</u>		
Route 4S, Mile 10	1.70	0.66
Route 10, Mile 1	1.51	0.56
Route 10, Mile 3	0.44	0.58
Route 2S, Mile 4	1.84	0.83
<u>Near 300 Area</u>		
Route 4S, Mile 16	1.47 0.64	0.65
Route 4S, Mile 22	1.39	0.67
3000 Area North	0.25	0.37
3000 Area South	0.37	0.33
<u>Outlying</u>		
Richland	0.50	0.38
Benton City	0.44	0.42

*(M) and (S) indicates the type of chamber at the respective locations. 3

* Includes normal background measurements.

** data insufficient to compute valid average.

*** The above values include the background measurements of all chambers which vary from 0.3 to 0.5 mrep/24 hours.

Table D

Table VI summarizes the average dosage rates, as measured by integrons and C chambers. The fluctuation in the average integron readings is regarded as within the range of normal expectancy, most of this fluctuation being due to instrumentation. Similarly, the C chamber readings show very little trend in dosage rates, when compared to past observations.

Integron units, using Brown recorders have been placed in service in the 100-H Area, however the calibration on these units was not completed until 11/23/49, thus the data now on file cannot be interpreted until said calibration figures become available from the calibration group.

TABLE VII
INTEGRON AND C CHAMBER DOSAGE RATES

Average dose in mrep per 24 hours.

LOCATION	Integrans		"C" Chambers	
	November	October	November	October
100-B Area (C)	0.5	0.5	0.4	0.3
100-D Area (C)	0.1	0.2	0.5	0.4
100-F Area (C)	0.3	0.6	0.4	0.3
200-West Area (C)	0.1	0.4	0.4	0.3
200-East Area (C & S)	0.2	0.4	0.6	0.6
Riverland	1.6	2.0	--	--
300 Area (C)	1.5	1.1	0.6	0.5
700 Area	0.4	0.3	--	--
Pasco	1.2	0.7	--	--
Benton City	0.2	0.4	--	--
3000 Area North	0.8	0.4	--	--
3000 Area South	0.3	0.1	--	--
Hanford 614	0.5	0.7	--	--

Table VII summarizes the results of the air monitoring program, as measured by air filters. In those instances where counting rate meters are employed, the maximum concentrations in any one eight hour period are presented. Airborne activity concentrations do not exceed 10^{-10} uc/liter at any location, this fact being indicative of minor decreases in airborne activity filtered in the separation areas.

TABLE VIII
AIR FILTER MONITORS
NOVEMBER 1949

LOCATION	Maximum noted in 8 Hr. period uc/liter	Average on Filters uc/liter
200 East, SE Corner		9.2×10^{-10}
200 West Tower #4	*	3.8×10^{-10}
Gable Mountain	3.2×10^{-7}	6.4×10^{-10}
Richland	$< 1.0 \times 10^{-7}$	5.0×10^{-11}
Pasco		1.5×10^{-11}
300 Area		1.8×10^{-10}
200 East, Tower #16		3.5×10^{-10}
100-D Area		3.4×10^{-10}
200 West Gate	$< 1.0 \times 10^{-7}$	3.4×10^{-10}
Benton City		1.5×10^{-10}
Hanford 614 Building		1.9×10^{-10}
White Bluffs		2.1×10^{-10}
3000 Area North		1.4×10^{-10}
200 West Tower #15	3.6×10^{-7}	3.7×10^{-10}

Table VIII

Table VIII

* Faulty operation during month.

The measurement of I^{131} activity in scrubbers, shows that only tracer amounts were detected at locations remote from the separation areas, whereas the two locations within the separation areas show positive activity. The concentrations of I^{131} are nearly identical to last month at 200 West and about one-half of that in the previous month at 200 East.

Table VIII summarizes the scrubber data, as compared to the activity detected on the filters which are in series and ahead of the scrubbers in the air stream. The data from the recently established station at 100-H is included.

TABLE VIII- IX

AIR MONITORING DATA
FILTERS AND SCRUBBERS
NOVEMBER 1949

LOCATION	Beta Activity on Filter*	¹³¹ I in Scrubbers Solution
	uc/liter air	uc/liter air
200 West	3.4×10^{-10}	1.6×10^{-9}
Benton City	1.5×10^{-10}	4.4×10^{-11}
200 East SE	9.2×10^{-10}	4.2×10^{-10}
300 Area	1.8×10^{-10}	5.2×10^{-11}
Richland	5.0×10^{-11}	1.5×10^{-11}
100-H Area	2.7×10^{-10}	3.0×10^{-11}

PARTICLE DETECTION:

A summary of the particle deposition rates for the locations in the vicinity of the separation areas for 168 hours, is presented in Table IX. The date for the previous month of October is included for comparative purposes. In general, the current deposition rates are in the normally expected frequency range, this months data comparing favorably to last months. Both of the last two months are considerably less than the month of September.

A similar tabulation, for the locations which are removed from the separation areas is presented in Table X. Again, the number of particles detected at these locations is at a minimum, and is in agreement with the most recent data. Only four locations showed particle deposition, two of these were on the site, and two were far removed from Hanford. These particles could be residual activity from the heavy influx of particles in September. It does not seem reasonable to attach their occurrence to Hanford, as the locations at which they occurred are widely separated and the frequency is at a minimum.

TABLE ~~IX~~ X

SUMMARY OF PARTICLE DEPOSITION

OCTOBER - NOVEMBER 1949

units of 10^{-3} particles/meter³

LOCATION	WEEK ENDINGS					11/4	11/11	11/18	November Average	October Average
	9/26	10/3	10/10	10/17	10/24					
<u>200 East Vicinity</u>										
2704 Outside					0.7	0.7	0.4	<0.1	0.4	
H.I. Garden Outside					0.7	2.1	<0.1	0.7	0.9	
BY-SE Outside					0.4	0.4	0.4	0.4	0.4	
BY-NE Outside					2.5	<0.1	<0.1	2.9	1.4	
'B' Gate Outside					1.4	9.9	<0.1	<0.1	2.9	
222-B Outside					1.1	8.8	0.4	<0.1	2.5	
2701 Outside					1.0	<0.1	<0.1	<0.1	0.4	
2704 Outside					0.4	1.4	1.0	<0.1	0.7	
221- O.G. Inside					4.1	2.8	<0.1	5.9	3.2	
222- Hall Inside					18.4	10.9	4.2	<0.1	7.7	
222-Lab Inside					42.8	65.7	140	38.2	65.9	
2701 Inside					<0.1	2.8	0.1	<0.1	0.7	
<u>200 West Vicinity</u>										
2701 Outside					0.4	1.8	<0.1	<0.1	0.5	
2722 Outside					2.1	2.5	0.7	1.1	1.6	
'T' Gate Outside					2.5	4.2	1.7	1.0	2.4	
222-T Outside					4.2	1.4	2.8	<0.1	2.5	
231 Pit Outside					3.5	9.4	0.4	<0.1	3.3	
So. G. T. Outside					1.9	0.4	0.4	0.3	0.7	
U Gate Outside					0.7	1.0	0.4	<0.1	0.5	
W.G.T. Outside					1.7	0.4	0.4	0.7	0.8	
2701 Inside					<0.1	<0.1	1.4	<0.1	0.4	
272 Inside					2.8	<0.1	1.4	<0.1	1.1	
222-T Inside					115	36.8	21.2	36.7	53.2	
<u>Meteoro-3' logy Tower</u>										
50'					*	0.6	0.6	*	0.7	
100'					*	<0.1	2.4	*	0.7	
150'					*	0.6	0.8	*	1.0	
200'					*	0.7	1.8	*	1.6	
250'					*	0.7	4.0	*	1.6	
300'					*	0.4	4.8	*	1.1	
350'					*	0.7	1.9	*	1.5	
400'					*	0.4	4.0	*	1.5	
					*	0.1	0.1	*	<0.1	

* Filters not removed due to inclement weather.

TABLE *XI

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SUMMARY OF PARTICLE DEPOSITIONON AREA AND OFF AREA LOCATIONSOCTOBER - NOVEMBER - 1949units of 10^{-3} particles/meter³

WEEK

ENDINGS

LOCATION	9/30	10/7	10/14	10/21	10/28	11/4	11/11	11/18	November Average	October Average
<u>Area Locations</u>										
100-B					*	0.4	*	0	0.2	
100-D					0	0	0	0	<0.1	
White Bluffs					0	0.8	0	0	0.1	
100-F					0	0	0	0	<0.1	
Benton City					*	0	0	0	<0.1	
Pasco					0	0	0	0	<0.2	
Richland					0	0	0	0	<0.1	
<u>OFF Area Locations</u>										
Boise					0	0	0	0	<0.3	
Elamath Falls					1.0	0	0	0	0.2	
Stampede Pass					0	0	1.0	0	0.3	
Great Falls					0	*	*	*	<1.0	
Walla Walla					0	0	0		<0.3	
Richland					0	0	0	0	<0.2	
Lewiston					0	0	0	0	<0.3	
Spokane					0	0	0	0	<0.3	

* Temporarily out of service.

In addition to the particle studies tabulated above, all the small little sucker type filters were radioautographed and examined for particles. This data is not presented in tabular form, as the deposition rates were at a minimum, the only locations showing positive particle deposition being those within the separation areas. In these instances, the total number of particles detected during the month ranged from 2 to 6, which is in good agreement with the data presented for the routine particle filters (Table IX).

LAND AND VEGETATION CONTAMINATION:

Five hundred and nineteen routine vegetation samples were collected during November. Each of these samples were analyzed for eight day I^{131} and for beta activity from non-volatile emitters. The results of the analysis for beta activity of these two sources in the vegetation are summarized for the various locations as follows:

TABLE VII

RADIOACTIVE CONTAMINATION ON VEGETATION

NOVEMBER 1949

Location	No. Samples	¹³¹ I muc/kg ^{muc/kg}			Non-Volatile Activity ^{muc/kg}		
		Maximum	Average	October Average	Maximum	Average	October Average
North of 200 Areas	65	5	< 2	< 2	30	13	12
Near the 200 Areas	48	12	3	3	42	15	14
Route 3	6	31	13	13	44	20	18
200 West Gate	3	21	13	24	39	26	28
Meteorology Tower	3	4	4	8	24	21	17
S. of 200 Areas	88	13	2	< 2	24	13	11
Richland	20	4	< 2	< 2	16	< 10	11
Pasco	16	< 2	< 2	< 2	15	< 10	11
Kennewick	14	2	< 2	< 2	12	< 10	13
Benton City	12	2	< 2	< 2	30	12	10
Richland 'Y'	3	2	< 2	< 2	13	< 10	12
Hanford	7	3	< 2	< 2	23	12	< 10
Rattlesnake MP Post	37	5	2	< 2	23	13	11
Yakima- Ellensburg	-	-	-	< 2	-	-	< 10
Northwest Ranches	12	2	< 2	< 2	25	11	11
Wahluke Slope	104	4	< 2	< 2	29	11	11
Goose Egg	20	11	3	3	57	15	15
Pasco to Ringold	18	4	< 2	< 2	27	16	16
Pasco to Eltopia	5	2	< 2	< 2	14	< 10	- -

The limit of sensitivity for ¹³¹I determinations in a 5.0 gram sample of vegetation is muc/kg.

** The limit of sensitivity for non-volatile emitters is best estimated at 10 muc/kg, this value including the natural beta activity from K⁴⁰.

The above summary shows very little trend in the beta activity measurements on vegetation, the current maximum results and the current averages being nearly identical to the previous month. The general deposition pattern seemed to shift somewhat in this period, this fact being hidden in the tabulated results, but becoming very apparent when comparing the iso-activity maps. It may be noted that the average on the Wahluke Slope is identical to last month, however a very definite ¹³¹I deposition is noted immediately across the river, and somewhat elongated to the northeast. Some indication of this deposition was apparent in the month of October, this indication being greatly magnified during this period. The more remote parts of the slope, and that region laying to the far northwest shows very little random activity.

Secondly, the October data indicated a small area, roughly a couple of miles square, to the north of Rt. 11-A, in the vicinity of White Bluffs, in which the ¹³¹I activity was less than 2 muc/kg. This area has been enlarged during this month, and it is apparent

that the activity normally settling on the vegetation in this region, is now passing over the river and settling on the vegetation on the slope.

Supplementing the above routine vegetation sampling, hot-run preparations prompted a survey of the area within a radius of 100-150 miles of the stacks. One hundred and thirty samples were obtained at approximately ten mile intervals, from an area bounded by Pendleton, Maryhill, Wenatchee, Spokane, and Lewiston. The overall I^{131} activity average was less than the sensitivity limit of 2 $\mu\text{c}/\text{kg}$, however a small region between Pendleton and Umatilla, and between Wenatchee and Moses Lake, showed consistent results ranging from two to four $\mu\text{c}/\text{kg}$. Except for these two areas, the tracer activity due to iodine was extremely spotty, the occurrence of results greater than two $\mu\text{c}/\text{kg}$ being somewhat less than I would normally expect, basing the reasoning on the occurrence of random positive results in non-contaminated regions in the past. It is doubtful whether a statistical comparison of these active low level regions is valid, when considering that the comparison must be made to results which are within the sensitivity of the counters; or possibly directly subject to the variation of the counter itself. These two populations seem to be basically entirely different and should invalidate the test. Significance tests were applied as a matter of pure interest, and it was found that these regions did not differ significantly from the balance of the particular trip in which they were included.

Two presentations accompany the vegetation data, Figure 1 portrays the iso-activity deposition of I^{131} on and adjacent to the Hanford Works, and Figure 2 portrays the results of the off area surveys in respect to the I^{131} measurements.

HANFORD WASTES:

100 AREAS

Sampling from the 107 basin and 1908 Bldg. in 100-H Area began during this reporting period, production beginning in that area on 20 October. A power level of 275 mega-watts was reached on 11-3-49.

Fifty-three samples were taken from the effluent waste water in the 107 basins in the 100 Areas. The average beta-gamma activity detected in these samples was 453, 368, 501, and 210 $\mu\text{c}/\text{liter}$ at the 100-B, 100-D, 100-F and 100-H Areas, respectively. Two samples

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from the 1904 Bldg. in 100-F Area and six from the 1908 Bldg. in 100-H Area yielded averages of 410 and 145 muc/liter, respectively. 1908-H samples will be obtained on a routine basis in the near future.

Samples from the 100 Areas which are analyzed for total alpha activity have been increased in volume from 100cc to 400cc. This effectively lowers the detection level from 30 dis/min/liter to 8 dis/min/liter. The average alpha activity detected in each of the 107 basins was less than 8 dis/min/liter with a maximum of 28 dis/min/liter. Fluorophotometer analysis of the above samples indicated less than 4 ug/U/liter for which total alpha activity detected was 9 dis/min/liter. Analyses for polonium content yielded no results above the reporting level of 6 dis/min/liter. No samples were analyzed for plutonium.

Based on known effluent flow rates and radiochemical analyses of the effluent, it was estimated that an average of 251-267 curies of 14.8 hour sodium (Na^{24}) (assuming that the Mn^{56} had decayed out) and about 13-29 curies of longer half-lived elements (Fe^{59} , P^{32} , etc.) were discharged each 24 hour day into the Columbia River during November 1949.

200 AREA WASTES:

The following table summarizes the results of radiochemical analyses of samples taken from the 200 Area Waste systems. Samples analyzed for total alpha activity were increased in volume from 100cc to 500cc, effectively lowering the detection limit to 6 dis/min/liter.

4 of 4

TABLE ~~XX~~ XV

Radioactive Contamination ~~ACTIVITY~~ IN 200 AREA WASTES

NOVEMBER — 1949

LOCATION	TYPE SAMPLE	ALPHA: dis/min/kg		Beta-Gamma ^{muc/kg} milli-ro/kg	
		Maximum	Average	Maximum	Average
T Swamp	water	12	< 6	0.4	< 0.1
T Swamp	mud	7.3×10^5	2.6×10^5	140	75
U Swamp	water	96	31	0.1	< 0.1
Laundry Ditch	water	440	72	0.3	0.1
Laundry Ditch	mud	1.1×10^5	6.3×10^4	110	60
231 Ditch	water	18	10	0.1	< 0.1
200 E "B" Ditch	mud	7.1×10^3	3.5×10^3	2200	1140
234-235 Ditch	water	73	36	< 0.1	< 0.1
234-235 Ditch	mud	5.2×10^4	2.6×10^4	15	12
200 E "B" Ditch	water	< 6	< 6	0.3	0.1
<u>RETENTION PONDS</u>					
200 East	water	30	< 6	9.6	1.4
200 West	water	7	< 6	< 0.1	< 0.1
Laundry Lint	solid	2.7×10^5	1.7×10^5	190	90

Beta-gamma results from the 200 East Retention Pond are significantly higher than found in the past. Results from 200 E "B" Ditch and water have indicated that during the past two months a significant amount of beta-gamma activity has passed thru the Retention Pond. Two samples each of mud and water were taken from the "B" Swamp into which drains the 200 E Retention pond via the "B" Ditch. Maximum beta-gamma results were 510 muc/kg and 0.1 muc/kg for mud and water respectively. Alpha activity was negligible.

Continuous sampling of laundry water during three weeks yielded average beta activity of 0.46 muc/kg and average alpha activity of 2850 d/m/l. No meter readings were obtained to the integrated activity over the period was not computed. The average fluorotphotometer result was 4300 ug/liter.

Portable instrument surveys (VGM'S) indicated maximum radiation levels of 500-600

counts per minute above background of the instrument in the vicinity of the "T" Ditch and Swamp and the Laundry Ditch. A reading over 2000 c/m above background was recorded in a survey of the 200 E"B" Ditch. 200 North Ditch surveys indicated maximum levels of 2500, 20,000 and 50 ,000 counts per minute above background in the N, P and R ditches, respectively .

300 AREA WASTES:

A summary of the radioactive contamination detected in samples from the 300 Area waste ponds during 1949 is presented below:

TABLE XVI

ACTIVITY DETECTED IN 300 AREA WASTES
NOVEMBER 1949

Location	Alpha Activity dis/min/liter		Beta-Gamma Activity muc/liter	
	Maximum	Average	Maximum	Average
Old Pond Inlet (liquid)	1000	600	0.2	0.1
New Pond Inlet (liquid)	700	400	0.2	0.1
	dis/min/kg		uc/kg	
	Maximum	Average	Maximum	Average
Old Pond Inlet (mud)	8.1×10^6	3.4×10^6	1450	900

Fluorophotometer analyses indicated that the bulk of the alpha activity in the 300 Area wastes was from uranium; no analyses for plutonium were made on 300 Area wastes this month.

Seventeen waste samples were taken directly from the principal waste line in the 300 Area. This line discharges the wastes directly into the 300 Area ponds. Beta-gamma activity averaged 330 uuc/liter with a maximum result of 2100 uuc/liter. Total alpha activity averaged 860 dis/min/liter with a maximum of 8900 dis/min/liter. Fluorophotometer analyses indicated that the alpha activity was primarily from uranium, the average result being 275 uc U/liter. Analyses for plutonium content yielded 8 results above the reporting level of 6 dis/min/liter with a maximum result of 310 dis/min/liter.

Vegetation:

1. avg. wt. residue on 1" plate; long half-life activity - avg 8 sples - 0.3873
2. K^{40} results

Location Sampled Type Vegetation Sple		wt. veg	wt. residue	cm K^{40}
Dry Sage } Pasco-Walla Walla }		5.0 g	.2691	19.4 ± 3
		5.0 g	.3322	20.0 ± 3
Dry Sage } Pasco-Walla Walla }		1.0 g	.248	17.2 ± 3
		1.0 g	.127	7.1 ± 3
		1.0 g	.072	5.1 ± 3
Pakisthaneh } 45 m 5 25 m 2		1.0 g	.391	23 cm } 19.0 ± 3
		1.0 g	.325	11 cm } 10. ± 3
Dry Sage - Pasco-Walla		1.0 g	.1459	7.0
		1.0 g	.1104	6.3
		1.0 g	.1257	8.8
		1.0 g	.1110	7.5

K^{40} obtained by $K_2 Na Co(NO_2) \cdot H_2O$ precipitation.

Nov. Report:

(2)

Vegetation and filter from 300 Rice field:

Vegetation - Size	Put. U (Ext)	
1.	307 d/mr/g.	197
2.	203	193
3.	390	361
4.	136	150
5.	232	178
6	147	159
7	<6	
8	<6	
9	<6	

(3)

Nov. Report:

Average moisture content of vegetation:

Sampled during 11-9, 11-10, and 11-22

Dry at $105-110^{\circ}\text{C}$ for 24 hrs. Heating 48 and 88 hrs. makes no additional difference

Russian-thistle

Cheat grass — 8-10 % loss due to fire

weeds (alfalfa) — 15-53 % ; average about 36 %

Sage 34-55 % ; avg. ~ 43 %

Rabbit Bush — 19-37 % ; avg. ~ 25 %

TO: J.W. HEaly- W. Singlevich
 FROM: H.J. Paas

HW-89075

SITE SURVEY MONTHLY REPORT
FOR THE MONTH DECEMBER 1949

The attached report is compiled from the following number of surveys:

WATER SAMPLING PROGRAM

Drinking water 500 cc-----	130	
Drinking water 11.7 liter-----	30	
Test Wells 500cc-----	26	
Test Wells 11.7 liter-----	4	
River-----	39	
Raw Water 500cc-----	29	
Waste-----	106	
Total water samples -----		364

AIR SAMPLING PROGRAM

Particle Filter-----	146	
Particle Traps-----	50	
Air Filters-----	60	
Scrubbers-----	118	
Detachable Chambers-----	660	
Film Packets-----	93	
Total Air Samples -----		1027

LAND SAMPLING PROGRAM

On Area Vegetation-----	243	
Off Area Vegetation-----	1122	
Mud & Lint-----	44	
Total Land Samples -----		1409

INSTRUMENT & MISC.

Portable Instrument -----	40	40
---------------------------	----	----

TOTAL SURVEYS FOR MONTH -----

2840 2945

Year 1949

WATER SAMPLING PROGRAM

Drinking water 500 cc-----	2587
Drinking water 11.7 liter-----	712
Test Wells 500 cc-----	545
Test Wells 11.7 liter-----	132
River-----	1252
Raw Water 500 cc -----	314
Waste -----	1619
Total water samples	<u>7161</u>

AIR SAMPLING PROGRAM

Particle Filter-----	1074
Particle Traps-----	464
Particle Frames-----	366
Air Filters-----	932
Rain-----	316
Scrubbers-----	286
Smears-----	122
Detachable Chambers-----	7419
Integrations-----	28,731
Film Packets-----	1711
Counting Rate Meters-----	6570
Total Air Samples	<u>47,991</u>

LAND SAMPLING PROGRAM

On Area Vegetation-----	6276
Off Area Vegetation-----	1551
Mud & Lint-----	1534
Total Land Samples	<u>9361</u>

INSTRUMENT & MISCELLANEOUS

Portable Instrument-----	314
Mobile Instrument-----	40
TOTAL	<u>354</u>

64,867

WATER MONITORING:

During December one hundred and thirty 500 ml. and thirty 12 liter samples of drinking water were analyzed for alpha emitting uranium and / or plutonium and for the beta-gamma emitters. Table I is a tabulation of sampling locations where drinking water samples indicated alpha activity exceeding the analytical sensitivity limit of 6 dis/min/liter;

TABLE I
ALPHA ACTIVITY IN DRINKING WATER
DECEMBER 1949
Units-dis/min/liter

Table I

<u>Location</u>	<u>No. Samples</u>	<u>500 ml. Samples</u>		<u>No. Samples</u>	<u>12 Liter Samples</u>	
		<u>Maximum</u>	<u>Average</u>		<u>Maximum</u>	<u>Average</u>
Richland Durand #13	7	15	8	2	8	4
Richland Durand #2	2	10	9	1	2	2
Richland Durand #4	1	9	9	1	6	6
Richland Durand #14	1	9	9	1	9	9
Richland Durand #15	1	7	7	1	8	8
Benton City Store	2	33	17	1	20	20
Benton City Water Co.	2	40	34	1	2	2
Pistol Range	2	8	7	1	4	4
Kennewick Highlands	1	15	15	2	2	2

Again, the alpha activity is confined to the Richland and Benton City supplies. This activity is confirmed as uranium by the fluorophotometer analysis which showed an average of 37 ug U/liter at the Benton City Water Company and an average of about 6 ug U/liter in the Richland system. The two indications of alpha activity at Pistol Range and Kennewick were not confirmed as uranium, however the minimum number of samples are not conclusive proof of this alpha activity. The small number of samples taken from the listed locations is due to the interrupting of the routine program at the time of the hot run monitoring.

Tracer beta activity was detected in several wells, each of these wells being located adjacent to the Columbia River which is offered as the source of this activity. Average beta activity exceeded 50 uuc/liter at Richland #14, Kennewick Standard Station, Pasco H & R Depot, and White Bluffs; the averages at these locations being 58, 142, 85, and 62 uuc/liter respectively.

Thirty-three samples of water were taken from test wells during December. Detectable alpha activity was found in the 300 Area wells which were not used for drinking purposes at any time during the month. Table II, summarizes the alpha activity detected in test wells:

TABLE II
ALPHA ACTIVITY IN TEST WELL SAMPLES
DECEMBER - 1949
Units-dis/min/liter

<u>Location</u>	<u>No. Samples</u>	<u>500cc Samples</u>		<u>No. Samples</u>	<u>12 Liter Samples</u>	
		<u>Maximum</u>	<u>Average</u>		<u>Maximum</u>	<u>Average</u>
300 Area Well #1	1	2310	2310	1	55	55
300 Area Well #2	4	1770	539	1	7	7
300 Area Well #3	3	336	117	1	2	1
300 Area Well #4	1	108	108	0	- -	- -

During the month of December, 39 samples of Columbia River water were taken from the listed locations. Table III, summarizes the results obtained from the river monitoring:

TABLE III
RADIOACTIVE CONTAMINATION IN THE COLUMBIA RIVER
DECEMBER 1949

<u>Location</u>	<u>Alpha - dis/min/liter</u>		<u>Beta-Gamma - uuc/liter*</u>	
	<u>Maximum</u>	<u>Average</u>	<u>Maximum</u>	<u>Average</u>
Wills Ranch (Above 100-B Area)	< 6	< 6	< 50	< 50
181-B Area	< 6	< 6	60	< 50
181-D Area	< 6	< 6	777	886
181-H Area	10	< 6	1593	1243
181-F Area	< 6	< 6	2211	1490
Foster Ranch (Below 100-F Area)	< 6	< 6	912	597
Hanford South Bank	< 6	< 6	3477	3312
Hanford Middle	< 6	< 6	3777	3203
Hanford North Bank	< 6	< 6	1542	1141
300 Area	< 6	< 6	890	826
Richland	< 6	< 6	1470	1140
Pasco Bridge (Kennewick Side)	< 6	< 6	592	462
Pasco Bridge (Pasco Side)	6	6	939	680

* The reporting level for the minimum activity detected in river samples is currently established at 50 uuc/liter (5×10^{-5} uc/liter.)

The average beta activity has apparently increased slightly during this period. The averages w samples obtained are not conclusive evidence of this fact. The current ~~maximums~~ ^{averages} compare favorably to the ~~averages~~ ^{maximums} obtained last month, which is indicative of the few samples taken.

Estimating the beta activity in the river on the basis of river flow would tend to indicate that a decrease would be expected in this month. The current flow rate is about 500,000 gallons per second as compared to 400,000 gallons per second last month.

The alpha activity reported at 181-H and Pasco are on the basis of individual samples. Resamples from these locations have not been taken.

Six samples were taken from the Yakima River at the mouth and at the Horn. The alpha activity in these samples was less than 6 dis/min/liter and the beta-gamma emitters less than 50 uuc/liter.

Twenty-three mud samples were taken from the banks of the Columbia River. The values tabulated in Table IV summarize the beta-gamma activity measured in the mud samples:

TABLE IV
COLUMBIA RIVER MUD SAMPLES
Total Beta-Gamma Activity- muc/kg
DECEMBER 1949

<u>Location</u>	<u>No. Samples</u>	<u>Beta Activity in milli-microcuries per kilogram</u>			
		<u>Onshore Samples</u>		<u>Five Feet From Shore</u>	
		<u>Maximum</u>	<u>Average</u>	<u>Maximum</u>	<u>Average</u>
Near Wills Ranch	2	8	8	5	5
Allard Pump Station	2	12	12	13	13
At 100-H Area	4	35	25	17	16
Below 100-F Area	2	19	19	18	18
Richland Dock	4	42	31	21	17
At 300 Area	3	31	17	22	18
Pasco Bridge (Pasco Side)	2	16	16	13	13
Pasco Bridge (Kennewick Side)	2	12	12	19	19
Hanford Ferry	2	15	15	21	21

The above results are slightly lower than those reported in November. The November averages were higher than usual and thus the current activity in the mud is comparable to the results obtained previous to November.

The alpha activity in mud samples was less than 6 dis/min/liter in all cases except for one sample from the 300 Area which contained 25 ^{gram} dis/min/liter. This sample along with the occurrence of higher than normal activity on some of the samples during the month of November prompted a special survey of the mud in the vicinity of the 100 Area.

Fourteen mud samples were taken along the shore at the 300 Area. These samples covered

16 KGM area down - more about 6 hrs of instrument. Transfers

approximately 200 yards of shoreline. The beta activity ranged from 5 muc/kg to 79 muc/kg with a predominance of results around the lower figure. The alpha activity on the same samples varied from less than 6 dis/min/gram to 2300 dis/min/gram. The wide range of each of these activities confirms the spotty high activities found at various times during the past several months. It was apparent that results would not easily be duplicated as adjacent samples did ^{give} not/confirming results. Each of the samples were analyzed for uranium, this activity ranging from less than 1.0 ug U/gram to 12 ug U/gram. The alpha activity was not confirmed by this analysis as the higher alpha results showed the smaller amounts of uranium. The source of the activity found at this location is still in question, the only conclusion from this survey being that a wide range of activity exists at this location and that the occasional high result obtained thru routine sampling is probably a valid figure. A survey similar to the above will be repeated in an effort to obtain a better estimation of this activity as well as a better evaluation of the validity of the laboratory results obtained on mud sampling.

Twenty-eight samples were taken from the raw water supplies at the 183 and 283 buildings in the 100 and 200 Areas. Analysis for the alpha emitters indicated less than 6 dis/min/liter in all samples; the beta-gamma activity measured is tabulated in Table V:

Gamma
TABLE V
BETA ACTIVITY IN RAW WATER-RIVER EXPORT LINE
DECEMBER 1949

<u>Location</u>	<u>Number Samples</u>	<u>uuc/liter</u>	
		<u>Maximum</u>	<u>Average</u>
183 Bldg. 100-B Area	3	< 50	< 50
183 Bldg. 100-D Area	3	194	125
183 Bldg. 100-F Area	3	1170	564
183 Bldg. 100-H Area	3	517	263
283 Bldg. 200-E Area	8	87	< 50
283 Bldg. 200-W Area	8	103	< 50

Table V
With the exception of the one result from 100-F, the beta-gamma activity measured in the raw water compares favorably to pass results. The 1170 uuc/liter found in the 100-F Area was not confirmed by subsequent resample.

Direct sampling from the retention ponds which hold the raw water in the 200 Areas was initiated in December. Four samples taken from the 200 East Retention Pond averaged 360 uuc/liter. Four samples from the 200 West Retention Pond averaged less than 50 uuc/li

The variation found in the beta activity in the pond and in the raw water is attributed to the length of time involved in the actual retention. This time period is dependent on the consumption as well as the pumping interval between the 100 and 200 Areas. Decay studies identify this activity as Ka^{24} .

AIR MONITORING:

The hot run on the weekend of December 3, caused an excessive range of fluctuation in the airborne beta activity levels around the site. Analysis of the data indicated that it would be advisable to divide the months data into two separate tabulations; these tabulations covering that data previous to the run and also that data collected after the run throughout the month of December. The only air data which was not treated in this manner was that pertaining to the chambers and the integrons as neither of these reflected the differences which were noted in the other types of monitoring.

A summary of the average dosage rates measured at respective locations using detachable ionization chambers is summarized in Table VI. (On following page for continuity of table.)

Table VII, summarizes the dosage rates obtained by means of integrons and "C" type ionization chambers. The data from the 100-H Area is included for the first time, although this unit has been operating since late October. The calibration was completed during this month.

TABLE VII
INTEGRON AND "C" CHAMBER DOSAGE RATES
(Average dose in mrep per 24 hours)

LOCATION		Integrons		"C" Chambers	
		December	November	December	November
100-B Area	(C)	0.5	0.5	0.3	0.4
100-D Area	(C)	0.2	0.1	0.4	0.5
100-F Area	(C)	0.5	0.3	0.4	0.4
100-H Area	(C)	0.3	0.2	-	-
200-West Area	(C)	0.2	0.1	0.3	0.4
200-East Area	(C. & S)	<0.1	0.2	0.6	0.6
Riverland		1.0	1.6	-	-
300 Area	(C)	0.4	1.5	0.5	0.6
700 Area		0.1	0.4	-	-
Pasco		0.3	1.2	-	-
Benton City		0.1	0.2	-	-
3000 Area North		1.1	0.8	-	-
3000 Area South		0.1	0.3	-	-
Hanford 614		0.4	0.5	-	-

TABLE VII

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TABLE VI
RADIATION LEVELS IN AIR
Detachable Chambers

Average mrep^A per 24 hours *

Location	December 1949	November 1949
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100 Areas and Environs

Route 1, Mile 8 (M)	0.49	* *
Route 2N, Mile 10 (M)	0.73	* *
Route 2N, Mile 5 (M)	0.59	0.56
White Bluffs (M)	0.62	0.61
Route 11A, Mile 1 (S)	* *	0.79
Hanford 614 Bldg. (S)	0.45	0.39
Intersection Rt.1, 4N (M)	0.60	* *
Hanford 101 Area (M)	0.56	0.59
100-H Area (M)	0.46	0.51

Within 5 Miles of 200 East

Route 4S, Mile 6 (S)	1.15	1.46
Batch Plant (M)	0.98	0.68
Route 11A, Mile 6 (S)	1.03	1.01
Route 3, Mile 1 (S)	* *	* *
Meteorology 200' (S)	* *	* *

Within 10 Miles of 200 East

Route 4S, Mile 10 (S)	0.58	1.70
Route 10, Mile 1 (S)	0.74	1.51
Route 10, Mile 3 (S)	0.66	0.44
Route 2S, Mile 4 (S)	* *	1.84

Near 300 Area

Route 4S, Mile 16 (S)	0.91	0.64
Route 4S, Mile 22 (S)	0.89	1.39
3000 Area North (S)	0.41	0.25
3000 Area South (S)	0.41	0.37

Outlying

Richland (S)	0.33	0.50
Benton City (S)	0.46	0.44

(M and S indicates the type of chamber at the respective locations.)

* Includes "normal background measurement. of the chambers used, this varies from 0.3 to 0.52

* * Data insufficient to compute valid average.

mrep/24h

Measurement of the filterable beta-gamma activity in the atmosphere at the representative air filter monitoring stations, indicate that the difference in activity after the "hotrun" is about a factor of ten higher in the vicinity of the 200 West Area. This factor diminishes with distance, the data showing very little difference in the vicinity of 300 Area, 3000 Area, and Pasco. Table VIII, portrays the data for the two periods during the month of December.

TABLE VIII
AIR FILTER MONITORS
DECEMBER 1949

<u>LOCATION</u>	<u>Average on Filters</u> <u>Before "Hotrun"</u> <u>uc/liter</u>	<u>Average on Filters</u> <u>After "Hotrun"</u> <u>uc/liter</u>
200 East, SE Corner	3.3×10^{-10}	3.1×10^{-9}
200 West, Tower #4	3.5×10^{-10}	1.2×10^{-9}
Gable Mountain	4.5×10^{-10}	9.7×10^{-10}
Richland	1.0×10^{-11}	1.8×10^{-10}
Pasco	2.0×10^{-11}	3.0×10^{-11}
300 Area	2.0×10^{-10}	1.1×10^{-10}
200 East, Tower 16	3.2×10^{-10}	6.4×10^{-10}
100-D Area	5.0×10^{-11}	4.9×10^{-10}
200 West Gate	1.9×10^{-10}	1.9×10^{-9}
Benton City	1.5×10^{-10}	2.8×10^{-10}
Hanford 614 Building	3.6×10^{-10}	6.6×10^{-10}
White Bluffs	2.1×10^{-10}	4.6×10^{-10}
3000 Area North	3.1×10^{-10}	3.0×10^{-10}
200 West Tower 15	3.6×10^{-10}	2.2×10^{-10}
100-H Area	2.4×10^{-10}	5.2×10^{-10}

Green Run

Green Run

The maximum concentrations for eight hour period which are usually expressed in the above table were omitted as the period in which these concentrations occurred was confined to the "hotrun" in every case. It was felt that the abnormal fluctuation

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in the amount of I^{131} measured at the CRM stations in any eight hour period during the hotrun would not present a true eight hour maximum condition. The data was examined and shorter intervals in which the maximum concentration occurred were used as a basis of measuring the maximum I^{131} activity. The following table presents this data and includes the time of occurrence, the peak concentration, and the duration of same.

TABLE VIII-A *Activity*
MAXIMUM FILTERABLE BETA-GAMMA CONCENTRATION
ON ~~IN~~ AIR FILTERS
DECEMBER 1949

LOCATION	Date And Time of Maximum	131 uc/liter	Duration of Maximum
200 West Tower #4	12-3, 0100	5.1×10^{-5}	15 minutes
200 West Tower #15	12-2, 2400	1.0×10^{-5}	45 minutes
200 West <i>West</i> , East Center	12-3, 0630	3.5×10^{-5}	15 minutes
Benton City	12-3, 1100	1.7×10^{-6}	20 minutes
Richland	12-3, 1200	9.5×10^{-7}	60 minutes

Supplementing the above monitoring, five CRM units were placed around the site. These units did not have a filter in series with an air stream, but rather consisted of an exposed GM tube protected only by light mesh. The following table includes the maximum I^{131} concentrations measured in this manner.

TABLE VIII-B
MAXIMUM BETA-GAMMA CONCENTRATION
IN AIR
VGM- CRM- MEASUREMENTS DEC.1949

LOCATION	Date and Time of Maximum	I^{131} as uc/liter	Duration of Maximum
2707EA <i>Building</i>	12-3, 0400	2.3×10^{-2}	4 hours
200 W. <i>Bad</i> house	12-5, 0400	7.0×10^{-3}	3 hours
100-H, NW	12-3, 2400	3.5×10^{-4}	2 hours
Riverland	12-4, 2000	$< 1 \times 10^{-4}$	2 hours
Pasco	12-3, 1600	$< 1 \times 10^{-4}$	2 hours

Conversion
 8.93×10^{-6}
 $4/m \times 8.93 \times 10^{-6}$ to uc/lit

Not Significant Above Background

The results from the caustic scrubbers which were operated routinely throughout the month are summarized in Table IX. The data again shows a difference by a factor of ten, in the I^{131} activity existing previous to and after the "hotrun".

TABLE IX
AIR MONITORING DATA
FILTERS AND SCRUBBERS
DECEMBER 1949

Location	Before "Hotrun" <i>Green Run</i>		After "Hotrun"	
	Beta Activity on Filter uc/liter air	I^{131} in Scrubber Solution uc/liter air	Beta Activity on Filter uc/liter air	I^{131} in Scrubber Solution uc/lit
200 West Area	1.9×10^{-10}	- - - -	1.9×10^{-9}	1.2×10^{-8}
Benton City	1.5×10^{-10}	1.0×10^{-11}	2.8×10^{-10}	4.1×10^{-10}
200 East SE	3.3×10^{-10}	7.0×10^{-11}	3.1×10^{-9}	4.6×10^{-9}
200 Area	2.0×10^{-10}	3.0×10^{-11}	1.1×10^{-10}	9.0×10^{-10}
Richland	1.0×10^{-11}	1.0×10^{-11}	1.8×10^{-10}	3.0×10^{-10}
100-H Area	2.4×10^{-10}	3.0×10^{-11}	5.2×10^{-10}	9.7×10^{-10}

In addition to the above scrubbers, units were installed at many locations to measure the I^{131} activity during, and immediately after the "hotrun". These units were located at routine stations where particle measurements were being made. The particle filters were removed from the units, thus the scrubbed air was not filtered previous to the actual scrubbing. Several of the scrubbers were maintained for a short time after the "hotrun" was completed, the remaining units being converted back to particle measurement at this time. Table IX-A, presents this data and includes the I^{131} activity as uc/liter and also the total activity that was found in the scrubber.

TABLE IX-A
AIR MONITORING DATA
 I^{131} ACTIVITY AS MEASURED DURING GREEN RUN
DURING "HOTRUN" BY LARGE
SCRUBBERS

Location	Collection Period	Dec 2-8-49 I^{131} Activity uc/liter $\times 10^9$ <i>units of 10^{-9} uc/liter</i>	Total I^{131} Activity <i>Scrubbed</i> Units in μ c
200 East Area			
2701 Building	12-2, 2000 to 12-3, 0440	2387.	53.2
	12-3, 0440 to 12-8 1045	81.	15-14.8
2704 Building	12-2, 2000 to 12-3, 0420	3032.	172.4 171.4
	12-3, 0420 to 12-8, 1045	110.	56.7 57

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Location	Collection Period	I ¹³¹ Activity uc/liter x 10 ⁹	Total I ¹³¹ Activity as muc
614 Building (SE)	12-2, 2000 to 12-3, 0430	449.	10.0
	12-3, 0430 to 12-13, 1400	8.0	1.4
Tower #16	12-3, 2000 to 12/3, 1430	941.	37.9
<u>200 West Area</u>			
200 FEC	12/2, 2000 to 12/3, 0550	346.	8.4
	12/3, 0550 to 12/7, 1450	148.	23.8
Tower #4	12/2, 2000 to 12/3, 0640	896.	38.4
Tower #15	12/2, 2000 to 12/3, 0610	843.	21.7
231 Building	12/2, 2000 to 12/3, 1420	774.	95.4
	12/3, 1420 to 12/8, 1400	29.	14.0
U Gatehouse	12/2, 2000 to 12/3, 1430	266.	27.4
<u>100 Area & Vicinity</u>			
100-B	12/2, 2000 to 12/3, 1240	0.3	0.03
100-D	12/2, 2000 to 12/3, 1130	66.	5.9
100-F	12/2, 2000 to 12/3, 1100	20.	1.6
	12/3, 1100 to 12/12, 0915	3.6 4	1.8
100-H	12/2, 2000 to 12/3, 1105	65.	1.9
	12/3, 1105 to 12/7, 1415	9.	1.4
	12/7, 1415 to 12/13, 1215	0.9	0.2
White Bluffs	12/2, 2000 to 12/3, 1115	7.8 8	0.2
	12/3, 1115 to 12/13, 1145	3.8 4	0.9
Hanford	12/2, 2000 to 12/3, 0500	37.	0.9
	12/3, 0500 to 12/13, 1100	7.4	1.8
Gable Mountain	12/2, 2000 to 12/3, 1020	925.	3.6
	12/3, 1020 to 12/7, 1000	26.	1.6
<u>Miscellaneous Locations</u>			
3000 Area	12/2, 2000 to 12/3, 0925	0.3	0.01
Riverland	12/2, 2000 to 12/3, 1255	0.6	0.02
300 Area	12/2, 2000 to 12/3, 0945	1.4	0.04
	12/3, 0945 to 12/7, 1235	8.2	1.25
Benton City	12/2, 2000 to 12/3, 0840	3.4	0.07
	12/3, 0840 to 12/7, 1310	34.4	5.2
Richland	12/2, 2000 to 12/3, 0910	1.0	5.03
	12/3, 0910, to 12/7, 1110	3.8 4	0.6
Boise, Idaho	12/2, 2000 to 12/7, 1200	0.25 .3	0.06
Spokane, Wn.	12/2, 2000 to 12/7, 1500	0.24 .2	0.06
Klamath Falls, Ore.	12/2, 2000 to 12/7, 1700	0.03 .1	0.01

Small portable scrubber samples were taken during the "hotrun". These samples represent ~~two cubic feet~~ ^{30 liters} of air which was passed thru a caustic solution using a handpump to propel the air stream. Table IX-B, portrays this data chronologically according to sample time and includes the location of the sample as well as any supplemental information which may influence the activity measured in the sample.

TABLE IX-B

HOT RUN

SCRUBBER DATA (SMALL)

Sensitivity *Big* *Small* *16" uc/line* *1.2 x 10⁻⁷ uc/line* *10⁻⁸* *10⁻⁷* *10⁻⁶*

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ate	Time	I ¹³¹ uuc/l	Location	Remarks
12/2/49	2140	1.450 177	1000 yds. N. of 200-W Gate	
	2150	.158 19	Rt. 3; Mile #1	edge of cloud
	2200	.027 3	Intersection 2-S and 4-S	
	2230	.185 23	@ Stake # 25	VGM = 3000 c/m
	2235	.039 5	Rt. 4-S; Mile 1	
	2300	.039 5	Rt. 4-S; Mile 3	
	2310	.102 12	250' So. of Stake #25	
12/3/49	0055	.022 3	2N; Mile 4	120 c/m
	0100	.021 3	2N; Mile 3	100
	0110	.026 3	2N; Mile 2	100
	0120	.025 3	2N; Mile 1	120
	0130	.036 4	2N; Mile 0	120
	0140	.074 9	2N; Mile 1	100
	0145	.035 4	2N; Mile 2	160
	0150	.016 2	2N; Mile 3	120
	0200	.022 3	2N; Mile 4	120
	0210	.017 2	2N; Mile 5	80
	0220	.026 3	2S, Mile 6	85
	0230	.019 2	2S, and 4-S	85
	0255	.019 2	2N; Mile 4	160
	0255	.187 23	@ 2701-W Building	2000
	0300	1.011 123	1/2 Mile So. Metro.; Grid F-9	3000
	0305	.500 61	2704 W. Building	1500
	0310	.632 77	284-W. Building	1500
	0315	1.260 154	E. Rd.; 100 yd. N. 2701-W	2200
	0400	.882 108	E. Rd.; 200 yd. N. 2701-W	3000
	0405	.705 86	E. Rd.; 300 yd. N. 2701-W	
	0405	1.321 161	E. Rd.; 400 yd. N. 2701-W	
	0405	.024 3	2-S; Mile 1	85
	0410	.020 2	2-S; Mile 2	120
	0445	.049 6	2-S and 4-S	85
	0512	.049 6	11-A; Mile 3	
	0520	.039 5	11-A; Mile 1	
	0545	.277 34		600
	0620	.046 6	S. Corner 200-W	
12/3/49	0620	.138 17	Grid G-9	650
	0635	.104 13	Grid F ¹ / ₂ -9	600
	0640	.048 6	200 yd. W. of Tower # 4	
	0640	.192 23	Grid D-7	200
	0645	.025 3	4-S ; 19	80
	0650	.176 12	Grid D-8	1100
	0655	.413 50	F ¹ / ₂ -9	400
	0655	.031 4	4-S; Mile 16	120
	0700	.148 18	Grid D-8	700
	0710	.072 9	Grid D-9	1000
	0715	.051 6	200 yd. E. of 231 Bldg.	
	0715	.302 37	Grid. F-9	400
	0725	.057 7	Grid E 3/4 -9	500
	0725	.025 3	4-S, Mile 4	120
	0735	.036 4	200 yd. SE of Stack	
	0740	.038 5	100 yd. SE of Stack	
	0745	.038 5	200 yd. SW of Stack	
	0745	.115 14	Grid F ¹ / ₂ -9	650

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TABLE X
SUMMARY OF PARTICLE DEPOSITION
NOVEMBER - DECEMBER 1949

units of 10^{-3} particles/meter³

LOCATION	FOR WEEK ENDINGS				December	November
	11/25	12/2	12/9	12/16	Average	Average
<u>200 East Vicinity</u>						
2704 (Outside)	0.6	0.4	***	1.4	0.8	0.4
H.I. Garden (Outside)	<0.1	**	***	1.	(0.8)	0.9
BY-Se (Outside)	0.3	<0.1	***	2.1	0.8	0.4
BY-NE (Outside)	<0.1	1.7	2.8	<0.1	1.0	1.4
"B" Gate (Outside)	1.2	1.7	*	7.2	(3.3)	2.9
222-B (Outside)	0.3	0.4	15.1	4.3	5.4	2.5
2701 (Outside)	<0.1	<0.1	*	1.1	(0.3)	0.4
2704 (Outside) ^{INSIDE}	0.8	<0.1	2.4	3.2	1.6	0.7
221- Outside Gallery	3.6	8.5	11.3	4.1	6.8	3.2
222-B Hallway	2.4	3.4	11.3	4.1	5.3	7.7
222-B Laboratory	2.4	10.0	34.2	80.8	31.2	65.9
2701 Inside	<0.1	0.2	***	0.1	0.1	0.7
<u>200 West Vicinity</u>						
2701 (Outside)	0.7	<0.1	*	22.5	(5.8)	0.5
2722 Paint Shop (Outside)	0.6	0.4	39.2	1.1	10.2	1.6
"T" Gate (Outside)	0.3	<0.1	*	<0.1	(0.1)	2.4
222-T (Outside)	<0.1	1.6	***	14.2	5.2	2.5
231 Sump Pit (Outside)	0.3	<0.1	***	0.7	0.4	3.3
So. Guard Tower (Outside)	<0.1	<0.1	2.1	0.7	0.7	0.7
U Gate (Outside)	<0.1	***	***	1.8	0.8	0.5
W. Guard Tower (Outside)	<0.1	<0.1	0.4	1.8	0.5	0.8
2701 (Inside)	<0.1	<0.1	2.8	16.9	5.0	0.4
272 (Inside)	69.4	134.6	7.7	7.7	58.5	53.2
222-T (Inside)	<0.1	<0.1	25.5	**	8.4	1.1

* I¹³¹ background too dense for particle estimation.

** Motor temporarily out of service.

*** Installation used for scrubber monitoring during this period.

****Current average based on incomplete data as indicated by parenthesis.

The particle deposition rates near the separation areas shows an increase in the particle concentration during the weeks ending 12/9 and 12/16. Also, many of the radioautographs show a heavy activity deposition which is uniformly spread over the entire filter surface, this deposition apparently being due to the I¹³¹ from the "hotrun". Analysis of these filters after the I¹³¹ has decayed will tend to influence the significance of the increase noted. Other than the slight increase mentioned, the balance of the particle data from on-site and off-site locations shows no trend whatsoever.

Table X, includes the data for the locations in the vicinity of the 200 Areas, and Table XI, includes the data from the site and the off area locations.

TABLE XI
SUMMARY OF PARTICLE DEPOSITION
ON AREA AND OFF AREA LOCATIONS
NOVEMBER - DECEMBER 1949

units of 10^{-3} particles/meter³

LOCATION	FOR WEEK ENDINGS				December Average	November Average
	11/25	12/2	12/9	12/16		
<u>Hanford Area Locations</u>						
100-B Area	< 0.1	***	***	< 0.1	< 0.1	0.2
100-D Area	< 0.1	***	***	< 0.1	< 0.1	< 0.1
White Bluffs	**	***	***	**		0.1
100-F Area	***	***	***	< 0.1	< 0.1	< 0.1
	11/18	11/25	12/2	12/9		
<u>Off Area Locations</u>						
Benton City	< 0.1	< 0.1	0.5	0.5	0.3	< 0.1
Pasco						
Richland	***	***	0.5	0.5	0.5	< 0.1
Boise	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.5
Klamath Falls, Oregon	< 0.1	< 0.1	*	*	< 0.1	0.2
Stampede, Pass,	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.3
Great Falls, Montana	**	**	**	**		< 0.1
Walla Walla, Wn.	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Meacham,	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Lewiston,	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Spokane, Washington	< 0.1	1.0	*	*	0.5	< 0.1

* I¹³¹ background to dense for particle estimation.

** Motor temporarily out of service.

*** Installation used for scrubber monitoring during this period.

**** Parentheses indicate current average based on incomplete data.

Ten filters from Arnette, Alaska were radio-autographed during December. No particles were detected on any of these filters.

Some calibration work on air flow through scrubbers was completed. It was found that the two cfm motors were reduced to 1.5 cfm by the addition of a scrubber. Similarly the ten cfm motors were reduced to 4.5 cfm. These corrections have been incorporated into the calculations effective with the December data.

WATER PAN MONITORING

Five shallow water pans containing about one liter of water and exposing about one square foot of surface, were placed at locations near the 200 West Area on December 3. These pans were collected immediately after the "hotrun" and the water was analyzed for I^{131} activity. Ten vegetation samples were taken near these pans at the time of collection, these samples were also measured for the I^{131} activity. The following table includes the results of these activity measurements:

TABLE XII - A

Location	Volume - ml.	WATER I^{131} muc/liter	VEGETATION I^{131} muc/kilogram	
			Average	Maximum
200 West, Tower 15	515	168	6584	10,908
200 West, Tower 4	1175	84	3378	4897
200 East, Tower 16	- -	784	3314	4644
200 East, SE	1000	23	3899	5266
Hanford	1170	10	445	1022

Forty rain and snow samples were collected directly after the "hotrun", these samples varying in volume from several ml to 400 ml. The following table summarizes the results of the I^{131} activity analysis.

TABLE - XII
 I^{131} ACTIVITY IN RAIN AND SNOW

Location	Number Samples	Collection Period	I^{131} muc/liter	
			Average	Maximum
Along Route 2, Hanford	8	12/3-12/5	921.	2120.
Highway - Toppenish-Goldendale	5	12/3-12/9	0.4	1.1
Spoakane Area	5	12/3-12/5	0.7	1.2
Highway - Walla Walla-Pendleton	4	12/3-12/5	0.5	0.8
Pasco	1	12/3-12/5	-	4.9
Washuckna	1	12/3-12/5	-	0.3
Highway - Ritzville-Davenport	4	12/3-12/5	0.3	0.4
Highway - Arlington-Pendleton	12	12/3-12/14	0.4	0.1

LAND AND VEGETATION CONTAMINATION:

Thirteen hundred and sixty five vegetation samples were taken during the month of December. Two-hundred and forty-three of these samples were from routine locations, balance of the samples were taken to directly evaluate the extent of the activity on the vegetation that resulted from the "hotrun".

The extent of the off-area survey after the hotrun was influenced by the results obtained on December 3, from the plane monitoring and by the trend of the initial vegetation activity measurements. In general, all main thoroughfares in an area bounded by Klamath Falls, Ellensburg, Kettle Falls, and Baker was covered.

Maximum activity was found inside the 200 West Area where a sample collected near the perimeter fence directly east of the stack contained 28.0 uc/kg. Activity exceeding 10 uc/kg was not uncommon inside the separation areas and along Route 3, between the areas. The vegetation activity decreased to between 5 and 10 uc/kg in the region adjacent to the areas, this range of activity being confined to within a radius of four miles of the 200 West Area.

The off area I^{131} is-dose pattern from the "hotrun" tends to elongate in a northeast and southwest direction, the greater deposition predominating to the south in the vicinity of the abrupt rise of the Horse Heaven Hills where the average activity on vegetation was greater than 1 uc I^{131} /kg. The maximum result obtained in this region was 4.3 uc/kg above Kiona. The fall-off to the north is much more rapid, the Wahluke Slope deposition being in the range of 0.1 to 0.5 μ c/kg, with the exception of two small isolated areas in which vegetation activity was between 0.5 and 1.0 uc/kg. These are the same areas which consistently show the higher I^{131} activity on the slope.

I^{131} activity on vegetation ranges between 0.1 and 0.5 uc/kg in a narrow NE-Southwest direction, roughly 40 miles wide and 200 miles long, this area including the communities of Goldendale, Arlington, Plymouth, Walla Walla, Odessa, and Moses Lake.

Surveys were extended to Mt. Hood, Klamath Falls, and Baker to the South and Kettle Falls, to the North. Vegetation samples showed background to predominate in each of these regions. I^{131} activity greater than 20 μ c/kg of vegetation included areas near Hood River

and Lexington to the south, and Davenport, and Epharata to the north. Beyond these points vegetation measurements were less than 20 muc/kg.

In the east-west direction, the greater than 20 muc/kg area extended from Zillah on the west, to include Dayton and Talla Talla on the east.

Two I¹³¹ iso-activity maps accompany this report, and show the location off and magnitude of the I¹³¹ beta activity measured on vegetation off area and on the site.

Tables XII and XII-A summarize the beta activity measured on vegetation samples from the routine sample locations, these tables portraying the data obtained previous to the "hotrun" and that data obtained after the "hotrun".

TABLE - XII
RADIOACTIVE CONTAMINATION ON VEGETATION
PREVIOUS TO "HOTRUN" → *Green Run*
DECEMBER 1949

Location	No. Samples	I ¹³¹ - muc/kg			Non-Volatile Activity- muc/kg		
		Maximum	Average	November Average	Maximum	Average	November Average
North of 200 Areas	16	5	3	<2	16	10	13
Near the 200 Areas	13	17	15	3	34	18	15
Route 3	2	109	54	13	64	40	20
West Gate	1	31	31	13	15	15	26
Meteorology Tower	1	3	3	4	17	17	21
South of 200 Areas	21	10	3	2	20	11	13
Richland	5	11	3	<2	16	11	<10
Pasco	4	5	3	<2	11	<10	<10
Kennewick	4	7	4	<2	12	<10	<10
Benton City	3	7	2	<2	<10	<10	12
Richland "Y"	1	<2	<2	<2	11	11	<10
Hanford	2	<2	<2	<2	13	<10	12

3mg ← place title here
TABLE XII-A
RADIOACTIVE CONTAMINATION ON VEGETATION
AFTER THE "HOTRUN"
DECEMBER 1949

North of 200 Areas	40	1244	395	<2	83	43	13
Near the 200 Areas	35	4856	1621	3	343	109	15
Route 3	6	27648	12246	13	525	511	20
200-West Gate	1	11340	11340	13	1326	1326	26
Meteorology Tower	1	2471	2471	4	174	174	21
South of 200 Areas	52	1044	265	2	254	58	13
Richland	10	426	104	<2	59	39	<10
Pasco	8	164	83	<2	20	16	<10
Kennewick	8	1073	245	<2	26	18	<10
Benton City	3	862	617	<2	97	71	12
Richland "Y"	2	345	205	<2	19	19	<10
ford	4	534	246	<2	69	40	12

Handwritten notes: "Need delay for low dose", "Green Run", "US"

HANFORD WASTE:

Thirty-three samples were taken from the 107 Basins in the 100 Areas and analyzed for alpha activity from plutonium and uranium and for the beta-gamma emitters; the results of these analysis are tabulated below:

TABLE XIV
RADIOACTIVE CONTAMINATION IN THE 107 BASINS
DECEMBER 1949

<u>Location</u>	<u>Average Alpha Activity</u> <u>dis/min/liter</u>	<u>Beta-Gamma Activity-muc/liter</u>	
		<u>Maximum</u>	<u>Average</u>
100-B Area	< 8	653	454
100-D Area	< 8	501	380
100-F Area	< 8	643	394
100-H Area	< 8	429	320

The above averages are in good agreement with the last month's data, the only exception being the beta activity at 100-H which has increased slightly. This increase is due to full power operation in December whereas the power level was less than 275 MW in early November.

The uranium activity in the 107 samples was less than 4 ug U/liter in all samples. There were no samples analyzed for plutonium in this period.

Based on the radiochemical analysis of the effluent and of the known flow rates, it was estimated that about 269 - 283 curies of 14.8 hr. sodium and about 15 - 29 curies of longer half lived emitters such as P, Fe, and Ca, were discharged into the Columbia River each day during the month of December.

200 AREA WASTE:

Three portable instrument surveys were completed in the vicinity of the 200 West ditches and swamps. The first survey, previous to the "hotrun" showed no readings above 100 c/m (VGM),; the two surveys after the "hotrun" showed readings ranging from 300 to 500 c/m above the normal background. The maximum reading of 600 c/m was found on mud on the shore of the Laundry Ditch. It is believed this activity was deposited from the air rather than from the water.

A land survey in the 200 West Area showed VGM readings from 600 to 1900 c/m above background on 12-13-1949. The maximum readings were found directly east of the stack. Readings around 1000 c/m were randomly distributed throughout the area.

Formerly readings above 100 c/m were unusual except in an area near the stack where readings as high as 500 c/m were obtained.

Portable instrument surveys of the 200 East 'B' Ditch showed readings of 1200 c/m on mud 35 feet from the inlet. Readings in this vicinity were also higher after the "hotrun"; ashes from a burned pile of vegetation showed readings as high as 16,000 counts/minute in this general area.

A land survey in the 200 East area showed instrument readings to range from 100 to 600 c/m above background after the "hotrun". Normally no readings are in excess of 100 c/m are found in this area.

Table XV is a tabulation of the results for assay of radioactive contamination in the 200 Area Waste System:

See - insert column for?

TABLE XV
RADIOACTIVE CONTAMINATION IN 200 AREA WASTES
DECEMBER 1949

Location	No. of Samples	Type Sample	Alpha - dis/min/kg		Beta-Gamma-muc/kg	
			Maximum	Average	Maximum	Average
T Swamp	(8)	water	19	8	0.2	< 0.1
T Swamp	(6)	mud	3.6×10^5	1.1×10^5	190	73
U Swamp	(6)	water	21	14	< 0.1	< 0.1
Laundry Ditch	(6)	water	6500	2000	0.3	0.1
Laundry Ditch	(3)	mud	1.2×10^5	7.2×10^4	50	50
231 Ditch	(6)	water	24	12	< 0.1	< 0.1
200 E "B" Ditch	(4)	water	41	13	0.2	0.1
200 E "B" Ditch	(4)	mud	3.6×10^4	1.5×10^4	330	250
234-235 Ditch	(3)	water	13	11	< 0.1	< 0.1
234-235 Ditch	(3)	mud	1.2×10^4	6.7×10^3	18	14
Retention Ponds						
200-East Area	(12)	water	11	< 6	1.1	0.3
200-West Area	8	water	124*	< 6	0.3	0.2
Laundry Lint	3	solid	1.0×10^6	6.1×10^5	330	160

* Only positive result from this location, not confirmed by subsequent sampling and not used to compute averages in computation for above average.

Fluorophotometer analysis showed the uranium activity to be less than 4 ug U/liter at all locations except the laundry ditch which averaged 260 ug U/liter with a maximum of 740 ug U/liter.

Integrated water samples from the rinse water at the 200 West Laundry averaged 0.8 muc/liter beta-gamma activity and approximately 6000 dis/min/liter total alpha activity. Fluorophotometer and T.T.A. results are not available at this writing.

300 AREA WASTE:

A summary of the radioactive contamination detected in samples from the 300 Area waste ponds during December 1949, is shown below:

TABLE XVI
ACTIVITY DETECTED IN 300 AREA WASTES
DECEMBER - 1949

<u>Location</u>	<u>No Samples</u>	<u>Alpha Activity-dis/min/liter</u>		<u>Beta-Gamma Activity muc/liter</u>	
		<u>Maximum</u>	<u>Average</u>	<u>Maximum</u>	<u>Average</u>
Old Pond Inlet (liquid)	(3)	7400	5300	2.1	1.0
New Pond Inlet (liquid)	(3)	7000	4300	1.7	0.8
		<u>dis/min/kg</u>		<u>muc/kg</u>	
		<u>Maximum</u>	<u>Average</u>	<u>Maximum</u>	<u>Average</u>
Old Pond Inlet (mud)	(2)	1.2×10^7	9.7×10^6	42	42

The above results are somewhat higher than those in November, however the small number of samples do not tend to indicate a significant increase.

Uranium activity in the liquid samples showed a maximum of 5700 ug U/liter and the mud contained 3.7×10^5 ug U/kg.

Ten samples taken directly from the 300 Area Waste Line averaged 250 uuc/liter beta-gamma activity and 140 dis/min/liter total alpha activity. The average uranium content was 150 ug U/ liter. Analysis for plutonium showed less than 6 dis/min/liter in all samples.

Progress Report on Hot Particles @ 'C' Tank Farm 12/30/49

To: H. J. Poes

From: B. Anderson

Immediately following a report that unusually hot particles had been found near 'C' Diversion Box site Survey took ~~steps were taken~~ to determine their extent and source.

Surveys made on 12/21 & 12/22 determined fairly conclusively that the particles are fairly well limited to areas near & adjacent to the Box. The area of highest activity existing about 200 feet due south east of the Box. VGM & C.P. surveys located particles on the ground that ~~were~~ gave readings off scale on V.G.M. ($> 100,000 \text{ y/m}$) and up to 3000 mrep/hr. (uncorr. for source size) in C.P. Particle-bearing samples of earth were removed and eight of the "pellets" isolated. These particles gave C.P. readings ranging from 300 to 7000 mrep/hr. (uncorr.). To the naked eye they resembled feces of mice. All pellets were

(Hot Particles)

(2)

sent to 222-U for chemical analysis, determination of energy of emissions, decays, and study under the microscope to determine if possible their true nature.

Chemical analysis gave the following:

Sr = 25.3 %
Re = 43.9
Ce = 1.5
Ru & Zr = 1.0
Unaccounted for = 29.3 %
100.0 %

Organic matter = 50% by wt.

Energy of emission = 1.5 mev (50%)

Decay curves for Sr build-up are currently in progress.

Destruction of pellets under x 200 glass showed that their content to be ~ 95% fibrous material resembling much the husks of seeds, and ~ 5% sand. One particle resembling the a piece of the "shell" of an insect with hair intact is being mounted for photographing under x 3000 scope to determine, if possible, its source.... Using a teaser, various particles from the pellets were held to a VG10 probe and without exception were hot. Sand and hair-like particles gave indications of activity but were not nearly so active as the "husks". Compar.

(hot particles). (3)

were ~~div~~ divided into four arbitrary groups and mounted on cards to facilitate subsequent study. One particle was placed in a drop of water and the result observed under a $\times 200$ scope. The outer surfaces ^{wetted} ~~wetted~~ rapidly, and the white crystalline surface ^{dissolved} ~~dissolving~~ in the process. As water soaked into the pellet it became quite spongy. When pulled apart the solid pieces seemed to be held together with a brownish, viscous, jelly-like substance that was also quite ^{soluble} ~~soluble~~ in water.

Discussion of Results:

Hot pellets seem to be pretty well confined to an area existing within 200 feet. of 'C' Divin. Box. The area of highest contamination is open country with sparse thistle cover, with ground mouse holes quite numerous. These facts, coupled with the shape, size and contents of the pellets, point quite conclusively to their being the feces of some small animal such as the mouse.

The extremely high level of radiation exhibited by

(Hot Particles)

(4)

the pellets may ^{the} fact that no ~~radioactive~~ ^{radiation} could be detected on the local vegetation leads ^{one} to ^{believe} the ~~conclusion~~ that the organic matter becomes contaminated after it has been ingested. If that happens to be the case it must mean that the animal ingested either radioactive food or drink. It is possible that mice ~~may~~ have access to the Diversion Box and ^{are} drinking ^{contaminated} water that has accumulated in its bottom.

Present status:

1. Particle of feces being magnified & photographed.
2. Decay curves for Strontium being run.
3. Traps have been set for mice and rabbits.
4. Feasibility of raising Box cover is being discussed.

Conclusions:

1. Hot pellets exist ~~in &~~ around 'C' Diversion Box reading up to 7000 mcp/hr. on a C.P.
2. These pellets are ~~undoubtedly~~ undoubtedly the feces of mice.
3. Mice must evidently have access to radioactive liquid in the Box or Tank Farm nearby.

B. J. R. 12/30/49

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