ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION Calendar Year 1959 and 1st Quarter of 1960

A prime charter responsibility of the Atomic Energy Commission is protecting people against potential radiation hazards emanating from activities within the atomic energy program. At the National Reactor Testing Station the Idaho Operations Office, through its Health and Safety Division, is responsible for constant monitoring of the environs to insure that any abnormalities in radiation levels are promptly detected, identified and evaluated. This monitoring disclosed that all radiation emanating from NRTS operations during 1959 and the first quarter of 1960 totaled less than 7 per cent of maximum permissible concentration.

The remoteness of National Reactor Testing Station facilities practically eliminates the possibility of any significant direct radiation exposures to the neighboring populace. However, trace amounts, well below the maximum permissible limits for the various isotopes[1], are dispersed into the natural environment. Both liquid and gaseous wastes containing a very low level of radioactivity are disposed of daily at the National Reactor Testing Station.

The Health and Safety Division collects and analyzes a large number of water, air, milk, and rabbit bone samples as part of their constant monitoring program. The attached table presents the data collected for 1959 and the first quarter of 1960.

In many cases it can be seen that the data has to be presented as being less than a certain value. This is very important in that many times it is not economically feasible or practical to develop analytical procedures beyond their ability to adequately determine that the amount being analyzed is insignificant. The value that is stated in these cases represents the present detection limit for that particular measurement.

An example of our interpretation of environmental water values is as follows:

The activity is measured at equal to or less than 1.5×10^{-7} micro curies of beta activity per cubic centimeter of water (analytical detection limit). Knowing that Strontium-90 will contribute less than 25% of any total fission product activity if detected, the 1.5×10^{-7} detection limit assures us that any Sr^{90} contribution would be less than 4.5×10^{-8} micro curies per cubic centimeter, or well below the maximum permissible concentration for this isotope. Further efforts to quantize the activity contribution from natural radioactive elements (i.e., Uranium and Thorium) have not been necessary since our detection limit is sufficiently low to allow adequate evaluation of the radioactivity in potable water supplies.

The monitoring of the environs for airborne radioactivity has been qualitative with a back-up capability of activating additional samplers by radio signal to collect quantitative data. Although the back-up stations

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[1]Ref: National Bureau of Standards Handbooks 59 and 69.

have been activated on occasion when on-site releases were known to have occurred, no significant values were recorded.

Rabbit bones are sampled and analyzed as an evaluation of the up-take and concentration of Sr^{90} in a biological system. Since the jack rabbit lives completely on the open environment as opposed to man who eats washed and prepared food and since his metabolic function may be entirely different, the amount of Sr^{90} concentrated in the bones is ten to twenty times higher than that found in human bones. The amount of Sr^{90} found in control rabbits taken from an area under minimum influence of any activity originating on the National Reactor Testing Station is seen to be very near that of rabbits on the perimeter of the site and predominantly down wind from the National Reactor Testing Station facilities. The amount of Sr^{90} detected in all off-site samples to date is due to fallout from past weapons tests in locations remote from the NRTS.

Iodine-131 (I^{131}) being a gaseous fission product and highly mobile lends itself to being a most sensitive indicator for environmental monitoring. Milk samples from environmental cows are routinely analyzed for the presence of this isotope. Again, the values in Table 1 are lower than the detection limit which is suitable for detecting any biologically significant amount of I^{131} in the sample.

The off-site monitoring film data for 1959 consists of intermittent testing in preparation for a continuous program which has been put into effect to provide data starting the second quarter of 1960. Two high values were recorded, but since a duplicate film at the same location read less than 20 mrem, these were concluded to be invalid since both films should agree within the limits of experimental error if the exposure had been real.

Table 1

Environmental Monitoring Data for the National Reactor Testing Station
1959 and 1st Quarter 1960*

Sample	No. of Stas.	Approx. Freq.	Total No. of Samples	Maximum Activity		Average Activity/Sample		Relation to M.P.C.
Off-Site Under-Ground Water	27	2 mos.	110 (39)	$<1.5\times10^{-7}$ uc/ccβ ($<1.5\times10^{-7}$ uc/ccβ)	$<3\times10^{-9}$ uc/ccα (4.5×10^{-9} uc/ccα)	$<1.5\times10^{-7}$ uc/ccβ ($<1.5\times10^{-7}$ uc/ccβ)	$<3\times10^{-9}$ uc/ccα ($<3\times10^{-9}$ uc/ccα)	β is <1.5% of MPC for Sr^{90}
On-Site Production Well Water	16	Wkly	607 (162)	** 39×10^{-7} uc/ccβ ($<1.5\times10^{-7}$ uc/ccβ)	$<3\times10^{-9}$ uc/ccα (5×10^{-8} uc/ccα)	3.0×10^{-7} uc/ccβ ($<1.5\times10^{-7}$ uc/ccβ)	$<3\times10^{-9}$ uc/ccα (3.1×10^{-9} uc/ccα)	β is <1.5% of MPC for Sr^{90}
Off-Site Air	20	2 Wks				Qualitative Only		
Perimeter Rabbit Bones (Jack Rabbit)	5	Quarterly	10 (10)	22 uuc/g Ca		20 uuc/g Ca (20.1 uuc/g Ca)***		No MPC determined for this biological system
Off-Site Control Rabbit Bones (Jack Rabbit)	1	Monthly	17 (4)	24 uuc/g Ca		17 uuc/g Ca (20.3 uuc/g Ca)***		No MPC determined for this biological system
Off-Site Milk (I^{131})	24	Monthly	237 (70)	$<1\times10^{-6}$ uc/ccγ ($<1\times10^{-6}$ uc/ccγ		$<1\times10^{-6}$ uc/ccγ ($<1\times10^{-6}$ uc/ccγ		<5% of MPC
Off-Site Monitoring Badges	19	Inter.	95	60 mrem/27 days β (<20 mrem/90 days)	120 mrem/97 days γ (20 mrem/90 days)	<20 mrem/90 days β (<20 mrem/90 days)	<20 mrem/90 days γ (<20 mrem/90 days)	<7% of MPE

* ( ) data for 1st quarter 1960.

** One well-isotope identified as Ru^{106} and corrective action taken to eliminate the contamination although the above value only represents about 4% of MPC for that isotope.

** Analyses for Sr^{90} in rabbit bones will lag by one calendar quarter and the ( ) data is for 4th Quarter 1959.

Health and Safety Division - Idaho Operations Office
Environmental Monitoring Data
For the National Reactor Testing Station
April through June 1960

The Environmental Monitoring Data report on the National Reactor Testing Station for the second quarter, 1960, discloses that release of radioactive materials from NRTS operations during April, May, and June was well below guide values recently adopted by the Federal Radiation Council.

The second quarter report is issued by the Atomic Energy Commission's Idaho Operations Office in accordance with previously stated policy that public statements will be issued regularly regarding radioactive materials released to the environment from major atomic energy installations.

In this report the terms "Maximum Permissible Concentration (M.P.C.)" and "Maximum Permissible Exposure (M.P.E.)" have been replaced by "Radioactivity Concentration Guides (R.C.G.)" and "Radiation Protection Guides (R.P.G.)" respectively. This change results from recommendations of the Federal Radiation Council which were incorporated into the Federal Register under Docket 60-4539, May 17, 1960.

The term "Radiation Protection Guide" is defined as the radiation dose which should not be exceeded without careful consideration of the reasons for doing so. The term "Radioactivity Concentration Guide" is defined as the concentration of radioactivity in the environment which is determined to result in whole body or organ doses equal to the Radiation Protection Guide.

The second quarter data provide quantitative values for off-site air samples. These samples are derived from fixed locations covering areas of neighboring populace. Analysis is performed for gross non-volatile beta emitters, and iodine-131, which is the significant volatile isotope of concern. The measured air concentration showed the radioactive components to be one percent of the Radioactivity Concentration Guide value for the general population.

Environmental Monitoring Data for the National Reactor Testing Station

2nd Quarter 1960

Type of Sample	Number of Stations	Approximate Frequency	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	29	2 Months	34	β $<1.5\times10^{-7}$ uc/cc α $<3\times10^{-9}$ uc/cc	β $<1.5\times10^{-7}$ uc/cc α $<3\times10^{-9}$ uc/cc	β 30×10^{-7} uc/cc *** α 10×10^{-9} uc/cc
On-Site Production Well Water	22	Weekly	209	β 3.2×10^{-7} uc/cc α 10×10^{-9} uc/cc	β $<1.5\times10^{-7}$ uc/cc α $<3\times10^{-9}$ uc/cc	β 300×10^{-7} uc/cc α 100×10^{-9} uc/cc
Off-Site Air Filters	10	Weekly	124	β 9.5×10^{-12} uc/cc	β 1.0×10^{-12} uc/cc	β 100×10^{-12} uc/cc
Perimeter Jack Rabbit Bones *	10	Quarterly	15	26 uuc of Sr^{90}/g Calcium	17 uuc of Sr^{90}/g Calcium	No Radiation Protection Guide is established for this biologic system.
Off-Site Jack Rabbit Bones *	10	Quarterly	19	36 uuc of Sr^{90}/g Calcium	21 uuc of Sr^{90}/g Calcium	
Off-Site Milk	30	Monthly	60	$<1\times10^{-6}$ uc/cc I^{131}	$<1\times10^{-8}$ uc/cc I^{131}	2×10^{-6} uc/cc I^{131}
Off-Site Area Monitoring Badges	118	Monthly	354	β <20 mrem γ 40 mrem	β <20 mrem γ <20 mrem	β 3000 mrem/yr. γ 500 mrem/yr.

* Analysis for Strontium-90 in jack rabbit bones is for previous quarter year.

** Radioactivity Concentration Guides replace Maximum Permissible Concentrations and Radiation Protection Guides replace Maximum Permissible Exposures (Ref: Federal Register. Doc. 60-4539, May 17, 1960.)

*** NBS Handbook 69, Table 3; R.C.G. when Strontium-90 is known to be "not present."

HEALTH AND SAFETY DIVISION - IDAHO OPERATIONS OFFICE
ENVIRONMENTAL MONITORING DATA
FOR THE NATIONAL REACTOR TESTING STATION
JULY THROUGH SEPTEMBER 1960

The Environmental Monitoring Data Report on the National Reactor Testing Station for the third quarter of 1960 discloses that release of radioactive materials from NRTS operations during July, August, and September was well below the guide values recommended by the Federal Radiation Council.

This report is issued by the Atomic Energy Commission's Idaho Operations Office in accordance with previously stated policy that public statements will be issued regularly regarding radioactive materials released to the environment from major atomic energy installations.

It should be noted that the detection limit used in connection with iodine-131 in milk is now 2×10^{-7} where formerly these were 10^{-6}. This reflects an improvement in the analytical method, which increases the sensitivity of this procedure by a factor of 5 over that previously used.

As an attachment to this report appears a map of the area of surveillance under the NRTS program. All monitoring locations routinely covered for reporting purposes are indicated by a legend, which identifies the type of sample collected at the various locations. It will be noted that air monitoring is concentrated to the northeast, and water monitoring is to the southwest. This is in accordance with the prevailing wind direction and the local underground water gradient for this region. Periodic evaluations of the program are made, and adjustments in location and sampling frequency will be made on subsequent reports.

Environmental Monitoring Data for the National Reactor Testing Station

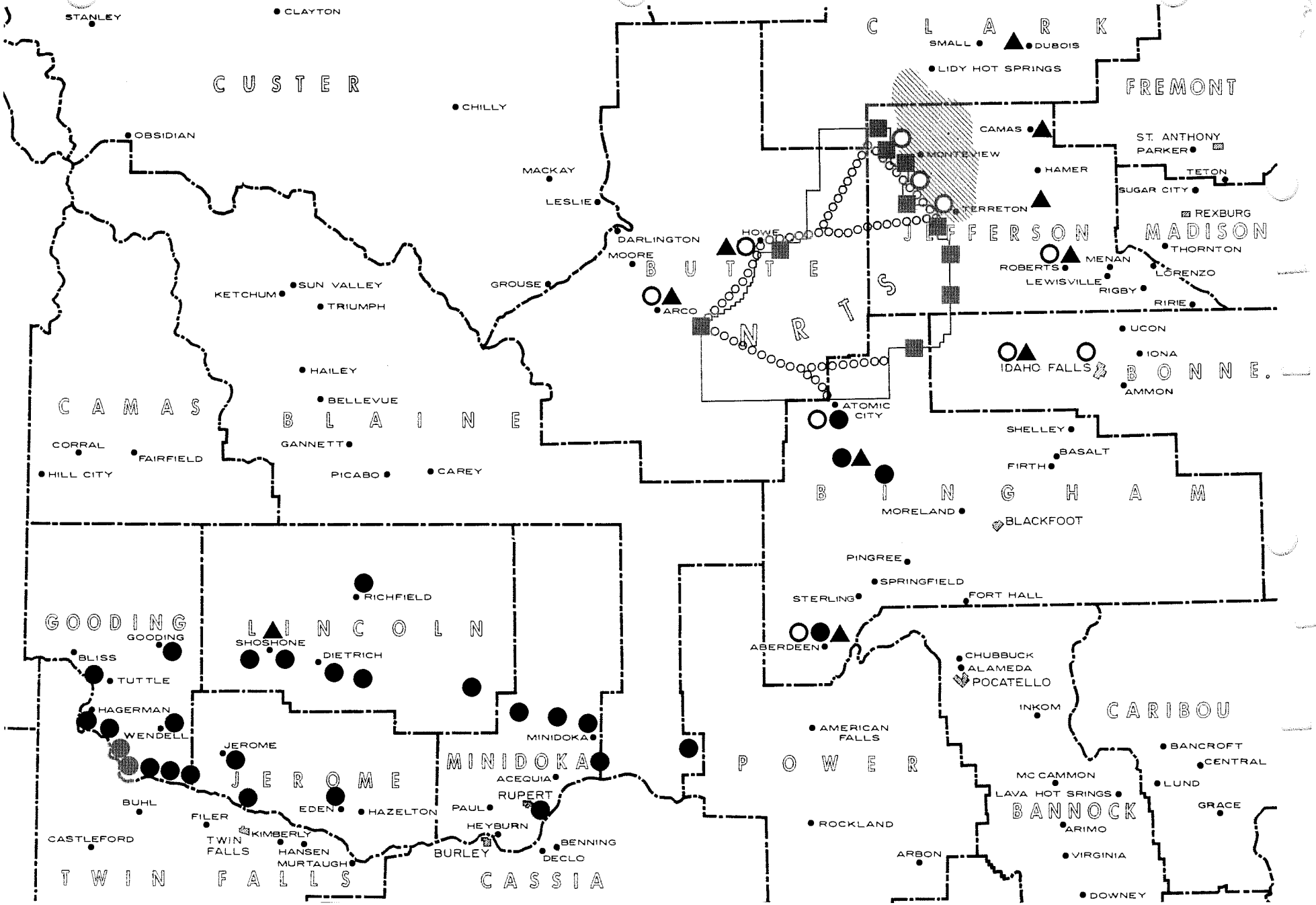
3rd Quarter 1960

Type of Sample	Number of Stations	Approximate Frequency	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	29	2 Months	50	α 5×10^{-9} uc/cc β $<1.5\times10^{-7}$ uc/cc	α $<3.1\times10^{-9}$ uc/cc β $<1.5\times10^{-7}$ uc/cc	α 10×10^{-9} uc/cc β 30×10^{-7} uc/cc
On-Site Production Well Water	22	Weekly	200	α 4×10^{-9} uc/cc β 8.6×10^{-7} uc/cc	α $<3\times10^{-9}$ uc/cc β $<1.6\times10^{-7}$ uc/cc	α 100×10^{-9} uc/cc β 300×10^{-7} uc/cc
Off-Site Air Filters	10	Weekly	138	β 6.5×10^{-12} uc/cc	β 1.3×10^{-12} uc/cc	β 100×10^{-12} uc/cc
Perimeter Jack Rabbit Bones *	10	Quarterly	9	31 uuc of Sr^{90}/g Calcium	16 uuc of Sr^{90}/g Calcium	No Radiation Protection Guide is established for this biological system.
Off-Site Jack Rabbit Bones *	10	Quarterly	25	28 uuc of Sr^{90}/g Calcium	15 uuc of Sr^{90}/g Calcium	
Off-Site Milk	30	Monthly	317	$<2\times10^{-7}$ uc/cc I^{131}	$<2\times10^{-7}$ uc/cc I^{131}	2×10^{-6} uc/cc I^{131}
Area Monitoring Badges **	118	Monthly	108	γ <10 mrem β <10 mrem	γ <10 mrem β <10 mrem	γ 500 mrem/yr. β 3000 mrem/yr.

* Analysis for Strontium-90 in jack rabbit bones is for previous quarter year.

** Data not available for July and August as a result of defective film.

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM



LEGEND

- PERIMETER JACK-RABBIT BONES
- OFF-SITE JACK-RABBIT BONES
- MILK SAMPLING AREA
- OFF-SITE UNDERGROUND WATER
- OFF-SITE AIR FILTERS
- AREA MONITORING BADGES

HEALTH AND SAFETY DIVISION - IDAHO OPERATIONS OFFICE
ENVIRONMENTAL MONITORING DATA
FOR THE NATIONAL REACTOR TESTING STATION
OCTOBER THROUGH DECEMBER 1960

The Environmental Monitoring Data Report on the National Reactor Testing Station for the fourth quarter of 1960 discloses that release of radioactive materials from NRTS operations during October, November, and December was well below the guide values recommended by the Federal Radiation Council.

This report is issued by the Atomic Energy Commission's Idaho Operations Office in accordance with previously stated policy that public statements will be issued regularly regarding radioactive materials released to the environment from major atomic energy installations.

The maximum concentrations in offsite air filters and in milk indicate a slight increase over the previous quarter. These increases resulted from special operational tests conducted under controlled conditions. As these tests were of only short duration, very little increase is reflected in the quarterly average.

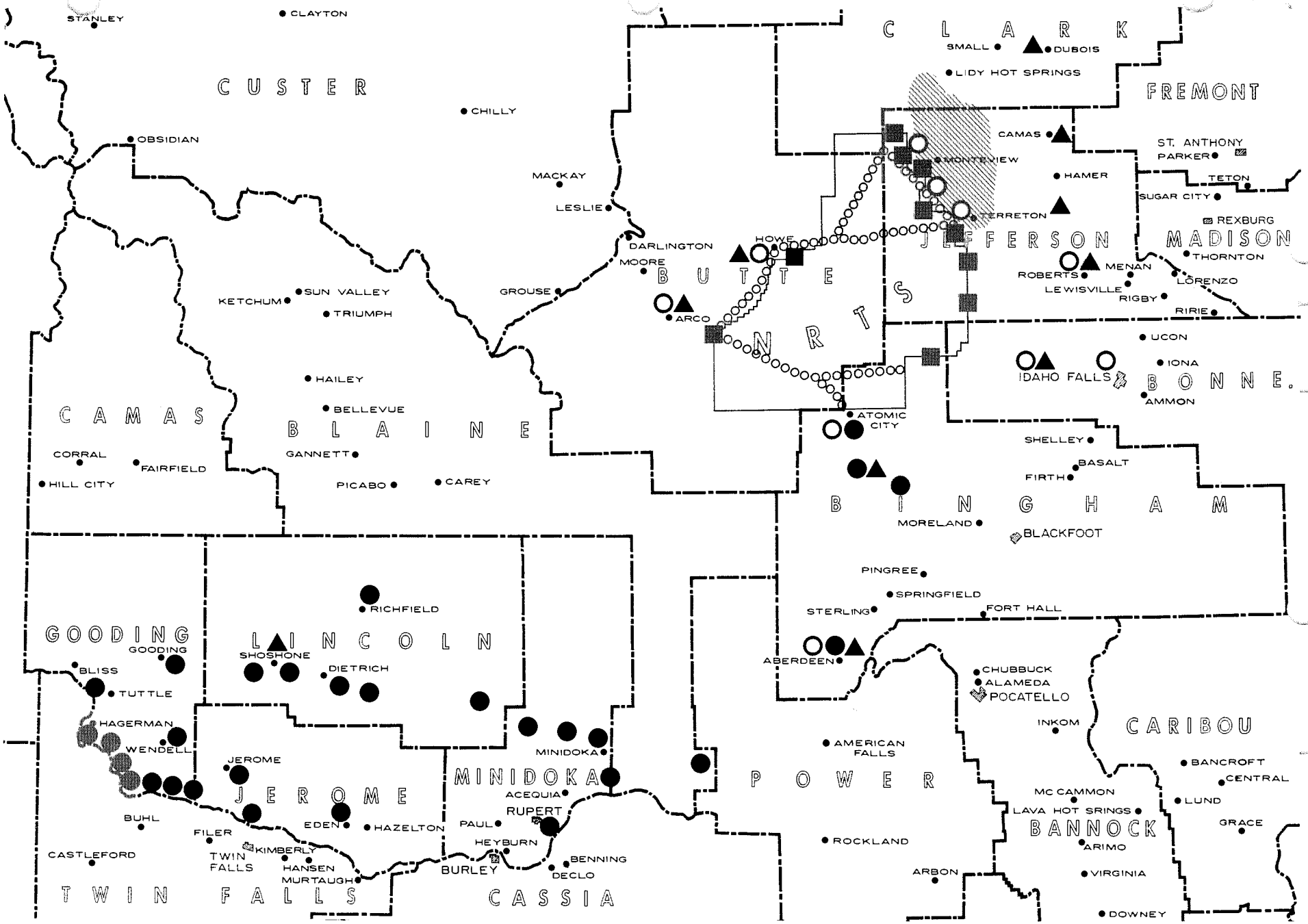
Environmental Monitoring Data for the National Reactor Testing Station

4th Quarter 1960

Type of Sample	Number of Stations	Approximate Frequency	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	29	2 Months	28	α 4×10^{-9} uc/cc β $< 1.5 \times 10^{-7}$ uc/cc	α $< 3.1 \times 10^{-9}$ uc/cc β $< 1.5 \times 10^{-7}$ uc/cc	α 10×10^{-9} uc/cc β 30×10^{-7} uc/cc
On-Site Production Well Water	22	Weekly	208	α 4×10^{-9} uc/cc β 4.3×10^{-7} uc/cc	α $< 3 \times 10^{-9}$ uc/cc β $< 1.5 \times 10^{-7}$ uc/cc	α 100×10^{-9} uc/cc β 300×10^{-7} uc/cc
Off-Site Air Filters	10	Weekly	117	β 11.2×10^{-12} uc/cc	β 1.4×10^{-12} uc/cc	β 100×10^{-12} uc/cc
Perimeter Jack Rabbit Bones *	10	Quarterly	11	17 uuc of Sr^{90}/g Calcium	9 uuc of Sr^{90}/g Calcium	No Radiation Protection Guide is established for this biological system.
Off-Site Jack Rabbit Bones *	10	Quarterly	20	27 uuc of Sr^{90}/g Calcium	13 uuc of Sr^{90}/g Calcium	
Off-Site Milk	30	Monthly	343	8.1×10^{-7} uc/cc I^{131}	$< 2.1 \times 10^{-7}$ uc/cc I^{131}	2×10^{-6} uc/cc I^{131}
Area Monitoring Badges	118	Monthly	340	γ 40 mrem β 20 mrem	γ <20 mrem β <10 mrem	γ 500 mrem/yr. β 3000 mrem/yr.

* Analysis for Strontium-90 in jack rabbit bones is for previous quarter year.

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM



LEGEND

- PERIMETER JACK-RABBIT BONES
- OFF-SITE JACK-RABBIT BONES
- MILK SAMPLING AREA
- OFF-SITE UNDERGROUND WATER
- OFF-SITE AIR FILTERS
- AREA MONITORING BADGES

U. S. ATOMIC ENERGY COMMISSION

HEALTH AND SAFETY DIVISION - IDAHO OPERATIONS OFFICE

ENVIRONMENTAL MONITORING DATA

ANNUAL SUMMARY FOR THE NATIONAL REACTOR TESTING STATION

1960

The environmental monitoring program conducted at the National Reactor Testing Station is accomplished by means of a network of monitoring stations and sampling locations which have been established in the communities and throughout the farm lands surrounding the NRTS. This network encompasses an area of approximately 9,000 square miles.

The purposes of this program are to determine the magnitude of radioactivity, its origin, and its effect on the environment.

Releases of radioactivity from NRTS operations are normally controlled at the source through monitoring and operational controls to insure that any radioactive materials released to the off-site environment as a result of plant operations do not exceed the Radiation Protection Guides recommended by the Federal Radiation Council.

"Radiation Protection Guide" is defined as the radiation dose which should not be exceeded without careful consideration of the reason for doing so; every effort is made to encourage the maintenance of radiation doses as far below this guide as practicable.

"Radioactivity Concentration Guide" is defined as the concentration of radioactivity in the environment which is determined to result in whole body or organ doses equal to the Radiation Protection Guide.

The Federal Radiation Council recommends that the Radiation Protection Guides be applied with judgment and discretion, to assure that reasonable probability is achieved in the attainment of the desired goal of protecting man from the undesirable effects of radiation.

The "Guides" presently in use at the NRTS are (1) those recommended by the National Committee on Radiation Protection, which are published in National Bureau of Standards Handbook 69, and (2) those recommended by the Federal Radiation Council in the Federal Register, Doc. 60-4539, dated May 18, 1960.

During calendar year 1960, low-level radioactivity which could be attributed to NRTS operations was frequently detected in the environs through the medium of air samples. In all instances the levels detected were well below Guide values. During one month, analysis of milk samples collected from dairy cows grazing in a sector near the NRTS indicated low level iodine 131. This occurred during October as a result of special tests conducted under controlled conditions at the NRTS. In all instances, levels were below Guide values for this type of sample.

Underground Water (Off-Site)

The National Reactor Testing Station is situated over a large underground water table accumulated from drainage of the Lost River Plains and streams which drain the mountains to the north of the NRTS. The general flow of the underground water is in a southerly direction at an approximate rate of 35 feet a day.

Liquid wastes from NRTS operations are monitored before release to the soil, or the water table, and levels of radioactivity are maintained below the Guide levels at all points of re-use both on or off the station.

During 1960, 151 samples were collected on a bimonthly basis from 29 off-site underground water sources which may be supplied from the Lost River underground reservoir. Analysis of these samples proved that levels of radioactivity were usually below the detection level of the analytical procedures being utilized, and in all cases considerably less than the Guide levels.

Underground Water (On-Site)

In addition to the off site sampling program, water samples are collected on the NRTS from production wells which are located in close proximity to plant sites.

During 1960, 779 samples were collected from 19 locations on the NRTS in connection with the Environmental Monitoring Program. Analysis indicated the presence of slightly higher levels of radioactivity in a few on-site samples than in samples taken from off-site locations. However, all on-site samples were considerably below the Guide levels and in the majority of cases were also below the detection level of the analytical procedures.

Atmospheric Monitoring

Radioactivity in air is determined by analysis of filters through which air is continuously drawn to remove gaseous and particulate material. Ten off-site locations provide these samples which are normally collected and analyzed on a weekly basis. In addition to sample collection at these locations, a telemetering network provides a warning alarm in a control center at the NRTS should the radioactivity collected exceed a pre-determined level. Also, additional stand-by air monitoring stations can be activated from the control center by a radio signal.

During 1960, 379 air filters were collected from the 10 primary locations. Analysis of these samples indicated levels of airborne gaseous and particulate radioactivity considerably below the Guide levels.

Jack Rabbit Bones

Jack rabbits are routinely sacrificed from selected locations of natural habitat on the periphery of the NRTS, and also from more distant populated agricultural areas. The bones of these animals are analyzed for strontium 90 in order to evaluate any variation of that isotope in the environmental vegetation.

During the last quarter of 1959 and the first three quarters of 1960, 113 jack rabbits were collected from the environs of the NRTS and analysis of their bones revealed low levels of strontium 90. Results were about the same from rabbits which had grazed near or at a distance from the NRTS. No contribution of radioactivity from NRTS operations over that from other sources was observable in any of these samples.

As no Guides have been established for the biological system of the rabbit and its habits are not comparable to man, establishing a relationship of strontium 90 in rabbits to that in the human is not possible at this time. However, the use of the jack rabbit as a medium for sampling and comparison is of value since the rabbit concentrates large quantities of vegetation through grazing and makes detection of strontium 90 much simpler than by conventional sampling methods.

Milk

Milk samples were routinely collected for iodine 131 analysis from dairy cows in the farming area in the predominant down-wind direction with respect to the NRTS. Analytical methods in use during the early part of the year were improved during the latter months which increased the detection limit from 1×10^{-6} µc/cc to 2×10^{-7} µc/cc.

During the year, analysis was performed on 790 samples, all of which were below Guide values.

Area Monitoring Badges

Film badges were used to determine levels of radiation at locations along highways traversing the NRTS, and at various agricultural areas in the surrounding perimeter. These badges are normally collected each month and new ones substituted. During the first and third quarters, results were not complete over the entire period due to defective film. However, data were derived from 897 badges in 118 locations.

The maximum radiation from all sources indicated by this method at any location during the year was 40 mrem/month gamma and 20 mrem/month beta; the total averaged over all stations was less than 160 mrem/year gamma and less than 125 mrem/year beta. These results are well below the Guide recommendations.

As the sensitivity of the film reading technique is approximately 10-20 mrem per film and the derived results reflect all sources of radiation, it is not possible to define any contribution from NRTS operations by this method over the period.

Environmental Monitoring Data Summary

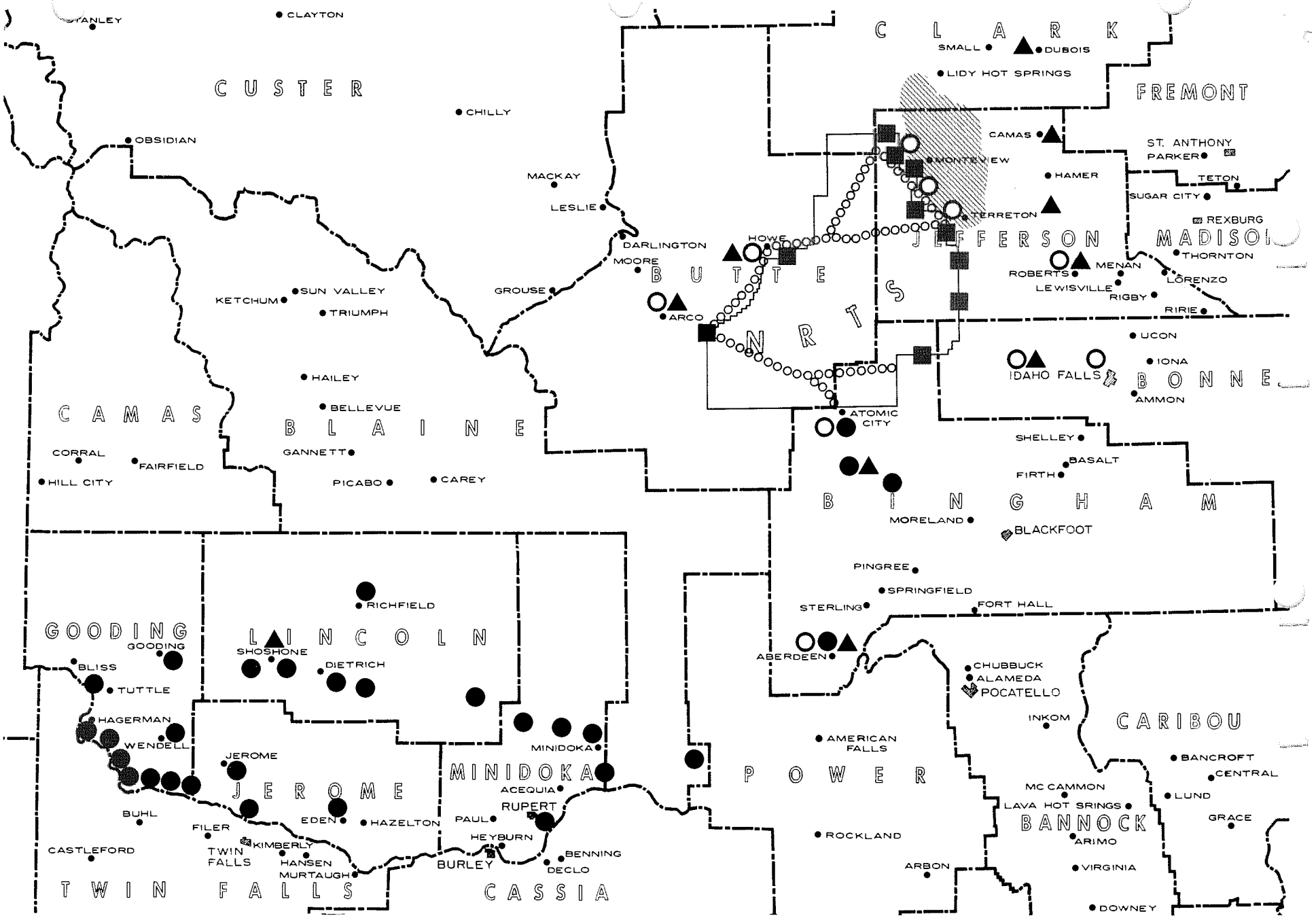
1960

Type of Sample	Total Number of Samples	Maximum Activity of Single Sample	Average Activity for Year	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	151	α 5×10^{-9} uc/cc $\beta < 1.5 \times 10^{-7}$ uc/cc	$\alpha < 3.1 \times 10^{-9}$ $\beta < 1.5 \times 10^{-7}$	α 10×10^{-9} uc/cc β 30×10^{-7} uc/cc
On-Site Production Well Water	779	α 10×10^{-9} uc/cc β 8.6×10^{-7} uc/cc	$\alpha < 3.1 \times 10^{-9}$ $\beta < 1.5 \times 10^{-7}$	α 100×10^{-9} uc/cc β 300×10^{-7} uc/cc
Off-Site Air Filters	379	β 11×10^{-12} uc/cc	$\beta < 1.4 \times 10^{-12}$	β 100×10^{-12} uc/cc
Perimeter Jack Rabbit Bones *	45	31 uuc of Sr^{90}/g Calcium	<16 uuc of Sr^{90}/g Calcium	No Radioactivity Concentration Guide is established for this biological system.
Off-Site Jack Rabbit Bones *	68	36 uuc Sr^{90}/g Calcium	<18 uuc Sr^{90}/g Calcium	
Off-Site Milk **	790	8.1×10^{-7} uc/cc I^{131}	$< 6 \times 10^{-7}$ uc/cc I^{131}	2×10^{-6} uc/cc I^{131}
Area Monitoring Badges	897	(Maximum/month) γ 40 mrem β 20 mrem	(Total for Year) $\gamma < 160$ mrem $\beta < 125$ mrem	γ 500 mrem/yr β 3000 mrem/yr

* Analysis for Strontium 90 in jack rabbit bones is for last quarter of 1959 and first three quarters of 1960.

** Sensitivity of analytical procedure increased from $< 1 \times 10^{-6}$ uc/cc to 2.1×10^{-7} uc/cc for the last two quarters of 1960.

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM



LEGEND

- ■ PERIMETER JACK-RABBIT BONES
- ▲ OFF-SITE JACK-RABBIT BONES
- ▨ MILK SAMPLING AREA
- ● OFF-SITE UNDERGROUND WATER
- ○ OFF-SITE AIR FILTERS
- ooo AREA MONITORING BADGES

Reports for first three quarters of 1961 are missing.

U. S. ATOMIC ENERGY COMMISSION

HEALTH AND SAFETY DIVISION - IDAHO OPERATIONS OFFICE

ENVIRONMENTAL MONITORING DATA (Report No. 9)

4th QUARTER of 1961 and ANNUAL SUMMARY

FOR THE NATIONAL REACTOR TESTING STATION

Due to the interest of the general public in levels of radioactivity in the environment, periodic statements are released to the public indicating the levels of radioactivity in the vicinity of the Atomic Energy Commission's installations. The monitoring program of the Health and Safety Division of the Idaho Operations Office is designed to detect any increases in environmental radiation due to the operations at the National Reactor Testing Station (NRTS). This report summarizes the data from this program for the fourth quarter of 1961 along with the annual summary for 1961. In the future, environmental reports will be presented semi-annually instead of quarterly. The monitoring program consists of fixed stations around the NRTS where routine samples of air, water and milk are collected and analyzed for radioactivity. This program is supplemented by a film badge program and Strontium 90 analysis in jack rabbit bones.

The NRTS is located in a very remote area which, in a large measure, permits controlled releases of radioactivity from the projects with a minimum risk to the environs. The AEC is responsible for holding environmental radioactivity levels below the Radiation Protection Guides (RPG) recommended by the Federal Radiation Council (FRC). The monitoring program is one of the safeguards employed.

As shown in previous reports, the level of radioactivity during the first three quarters of 1961 in this area has remained well below RPG values. Following the Russian atmospheric nuclear testing in September of 1961, radiation levels at the NRTS started to increase due to world-wide fallout, corroborating similar trends in other parts of the country. Iodine 131 was observed in the off-site milk samples due to the presence of this fallout. An air-sampling station was set up in Idaho Falls as a control location to determine the amount of fallout in that area. As can be seen from Figure 1, the radioactive content of the air increased gradually shortly after the Russian Tests began.

The increase in radioactivity was of concern only in the resulting level of Iodine 131 in milk. Detailed surveillance and analysis was undertaken for this particular isotope. However, the results of analyses indicated that all values were below the Radioactivity Concentration Guide (RCG) levels.

Off-Site Underground Water

Although liquid wastes are monitored at the NRTS before release to the soil or the underground water table, for monitoring purposes off-site samples are taken from locations around the NRTS. As can be seen from the map (Figure 2), most of the samples are taken from an area southwest of the site. This is believed to be the prevalent direction of flow of the ground water. Samples are taken in other directions around the site as a control as well as to check the possibility of contamination from localized deflections in the regional pattern.

During 1961, 177 samples were collected on a bi-monthly basis from 31 sampling stations. All results were very close to the detection limit of 4×10^{-9} uc/cc for alpha activity and 2×10^{-7} uc/cc for beta activity. These indicated results are well below the RCG levels. All of the 88 off-site water samples monitored for tritium were below the detection limit.

On-Site Production Well Water

On-site samples were taken from production wells near the plant sites in order to monitor potable water for personnel consumption and to define possible sources of contamination if it occurred. A separate research of test wells around two plants indicated the presence of tritium (H^3) contamination so separate analyses for tritium as well as gross beta and alpha were started in the third quarter of this year for on-site and off-site samples.

For the entire year, 789 samples were analyzed from 22 sampling stations on a weekly basis. Only a few samples were above the detection limits. The tritium analyses indicated low level contamination which was well below the suggested RPG limits. The tritium detection limit for the method of analysis used is now 4×10^{-6} uc/cc.

Off-Site Air Filters

The off-site air samples are collected with a filter on a low-volume vacuum pump. In addition a network of high volume air samplers can be manually activated to monitor air activity levels in cases of planned or accidental releases of radioactivity.

During the year, 653 air samples were collected from 14 permanent stations and analyzed for radioactivity. Although no appreciable increase was noted in the first three quarters, a three-fold increase was observed in the fourth quarter due to the fallout from the atmospheric tests. All results indicating air concentrations of radioactive materials were still well below the RPG limits.

Jack Rabbit Bones

The analysis of Strontium 90 in the bones of jack rabbits, both on-site and off-site, is used as another guide in monitoring radioactivity in the area. There is no RPG value provided for this biological system since it is very difficult to correlate data for the jack rabbit and the human. The jack rabbit, however, is a good biological indicator of environmental Strontium 90 contamination in this arid section of the country and can be used as a guide for general levels of environmental contamination and for other types of sampling programs.

No noticeable changes of Strontium 90 were seen in the fourth quarter of 1961 or for the whole year to indicate significant contamination in on-site and off-site samples.

Off-Site Milk

During 1961 the RPG value for Iodine 131 in milk was lowered from 20 x 10^{-7} uc/cc to 1 x 10^{-7} uc/cc. This necessitated lowering the analytical detection limit from 2 x 10^{-7} uc/cc to 0.5 x 10^{-7} uc/cc in this period. As mentioned before, the Iodine 131 in milk did increase considerably due to fallout from the atmospheric tests. Levels did decrease gradually, however, from a high in September to less than the detection limit in December.

The 117 samples processed from 12 sampling stations in 1961 disclosed that the average level of radioactivity did approach the RPG value.

Film Monitoring Badges

Film badge stations are located around the perimeter of the NRTS site at the same locations as the air sampling equipment. Data were obtained from 118 samples in 14 different locations. For the first two quarters, badges were changed on a monthly basis, while for the last two quarters changes were made on a six-week schedule.

The sensitivity of this method of radiation detection is 10 mrem for beta or gamma radiation. The data indicate the maximum level per badge and the total activity for that station for the sampling interval. The only indication of levels above background was in the first quarter of the year. As pointed out in the report for that quarter (Report No. 6), this was probably caused by the SL-1 accident on January 3, 1961.

The total exposure for the year is well below the suggested guide value and reflects the general background from natural radiation at this general elevation.

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

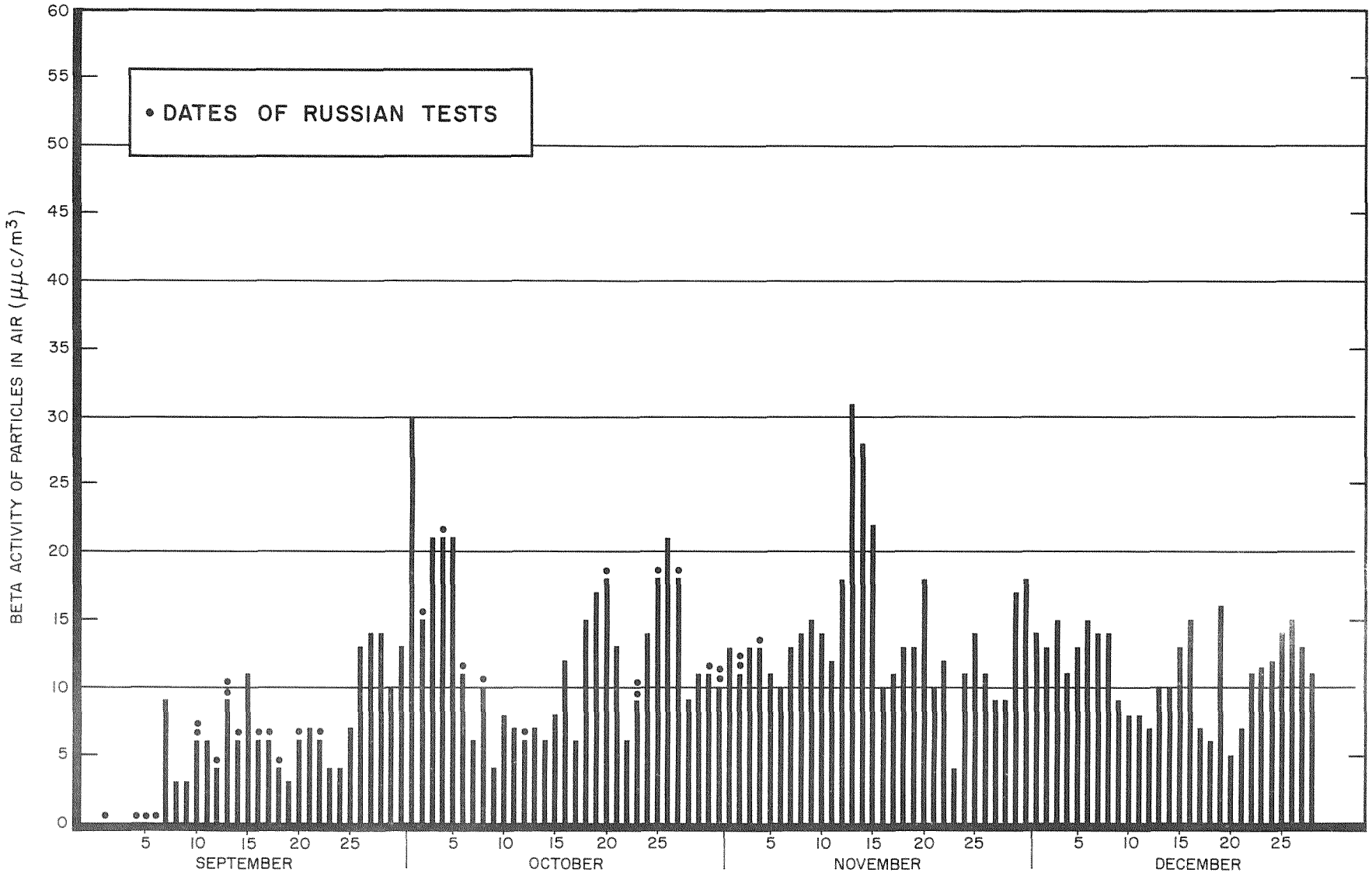
4th Quarter 1961

Type of Sample	Number of Stations	Approximate Frequency	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	31	Two Months	33	α 6.6×10^{-9} uc/ml β 2.2×10^{-7} uc/ml	α $<4\times10^{-9}$ uc/ml β $<2\times10^{-7}$ uc/ml	α 10×10^{-9} uc/ml β 30×10^{-7} uc/ml
			32	H^3 $<4\times10^{-6}$ uc/ml	H^3 $<4\times10^{-6}$ uc/ml	H^3 1000×10^{-6} uc/ml
On-Site Production Well Water	22	Weekly	198	α 11×10^{-9} uc/ml β 4.3×10^{-7} uc/ml	α $<4\times10^{-9}$ uc/ml β $<2\times10^{-7}$ uc/ml	α 100×10^{-9} uc/ml β 300×10^{-7} uc/ml
			180	H^3 62×10^{-6} uc/ml	H^3 $<5\times10^{-6}$ uc/ml	H^3 $30{,}000\times10^{-6}$ uc/ml
Off-Site Air Filters	14	Weekly	163	β 66×10^{-12} uc/cc	β 23×10^{-12} uc/cc	β 100×10^{-12} uc/cc
Perimeter Jack Rabbit Bones	8	Quarterly	11	18 uuc of Sr^{90}/g Calcium	9 uuc of Sr^{90}/g Calcium	No Radioactivity Concentration Guide is established for this biological system
Off-Site Jack Rabbit Bones	12	Quarterly	24	25 uuc of Sr^{90}/g Calcium	12 uuc of Sr^{90}/g Calcium	
Off-Site Milk	12	Monthly	33	Iodine 131 4.5×10^{-7} uc/ml	Iodine 131 $<0.7\times10^{-7}$ uc/ml	Iodine 131 1×10^{-7} uc/ml
Area Monitoring Badges	14	Six Weeks	25	Maximum/Period γ <10 mrem β <10 mrem	Total for Quarter γ <20 mrem β <20 mrem	γ 500 mrem/yr β 3000 mrem/yr

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

Annual Summary 1961

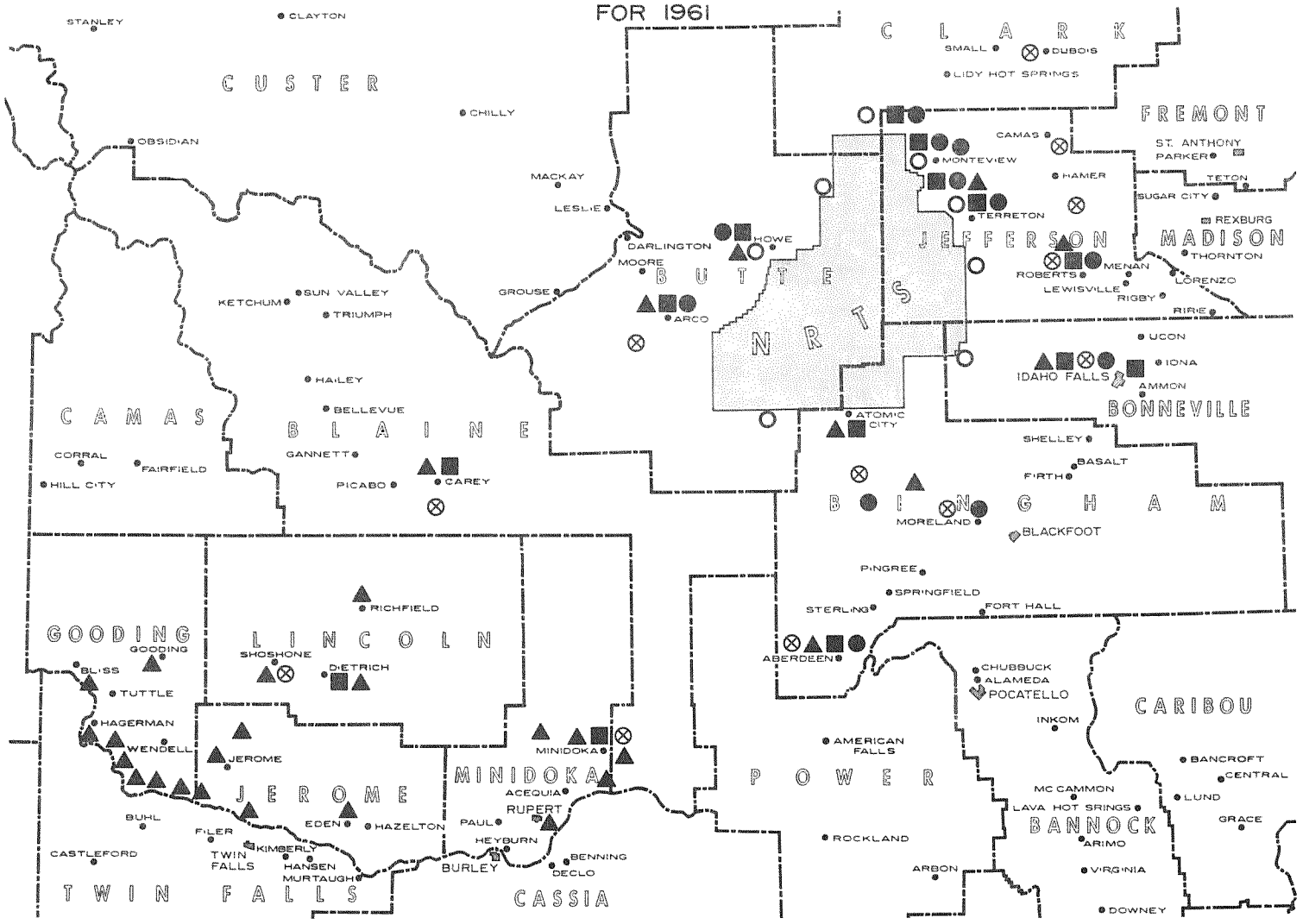
Type of Sample	Number of Stations	Approximate Frequency	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	31	Two Months	177 88	α 6.6×10^{-9} uc/ml β 2.2×10^{-7} uc/ml H^3 $<6\times10^{-6}$ uc/ml	α $<4\times10^{-9}$ uc/ml β $<2\times10^{-7}$ uc/ml H^3 $<6\times10^{-6}$ uc/ml	α 10×10^{-9} uc/ml β 30×10^{-7} uc/ml H^3 1000×10^{-6} uc/ml
On-Site Production Well Water	22	Weekly	789 273	α 11×10^{-9} uc/ml β 4.3×10^{-7} uc/ml H^3 62×10^{-6} uc/ml	α $<3.5\times10^{-9}$ uc/ml β $<2\times10^{-7}$ uc/ml H^3 $<5\times10^{-6}$ uc/ml	α 100×10^{-9} uc/ml β 300×10^{-7} uc/ml H^3 $30{,}000\times10^{-6}$ uc/ml
Off-Site Air Filters	14	Weekly	653	β 66×10^{-12} uc/cc	β 7.1×10^{-12} uc/cc	β 100×10^{-12} uc/cc
Perimeter Jack Rabbit Bones	8	Quarterly	45	37 uuc of Sr^{90}/g Calcium	11 uuc of Sr^{90}/g Calcium	No Radioactivity Concentration Guide is established for this biological system
Off-Site Jack Rabbit Bones	12	Quarterly	85	25 uuc of Sr^{90}/g Calcium	10 uuc of Sr^{90}/g Calcium	
Off-Site Milk	12	Monthly	117	Iodine 131 11×10^{-7} uc/ml	Iodine 131 $<1\times10^{-7}$ uc/ml	Iodine 131 1×10^{-7} uc/ml
Area Monitoring Badges	14	Five Weeks	118	<u>Maximum/Period</u> γ 40 mrem β<10 mrem	<u>Total for Year</u> γ<130 mrem β<100 mrem	γ 500 mrem/yr β 3000 mrem/yr



HIGH VOLUME AIR SAMPLING DATA FOR
IDAHO FALLS, IDAHO

FIG. 1

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM
FOR 1961



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U. S. ATOMIC ENERGY COMMISSION

HEALTH AND SAFETY DIVISION - IDAHO OPERATIONS OFFICE

ENVIRONMENTAL MONITORING DATA (REPORT No. 10) FOR THE NATIONAL REACTOR TESTING STATION FIRST AND SECOND QUARTER 1962

INTRODUCTION

Continuous surveillance and analysis of air, water and food are important elements in radiological protection of the public. Due to the interest of the general public in levels of radioactivity in the environment, periodic statements are released to the public indicating the levels of radioactivity in the vicinity of the Atomic Energy Commission's installation. These reports are now issued semiannually.

The Environmental Monitoring Data Report on the National Reactor Testing Station (NRTS) for the first and second quarter of 1962 discloses that the amount of radioactive materials in the environs of the NRTS during these months was below the guide values recommended by the Federal Radiation Council. There are three sources of radioactivity in the environment. These are listed in order of their contribution to human exposure: natural, weapons testing, and NRTS operations.

CHANGES IN ENVIRONMENTAL MONITORING PROGRAM

Following the annual appraisal of the Environmental Monitoring Program several modifications of the program were made at the beginning of the year to increase the surveillance of the area for better efficiency and economy.

The modifications undertaken in 1962 were as follows:

1. The frequency of collection of off-site water samples was changed from two months to three months.

2. The frequency of collection of on-site water samples was changed from one to two weeks. From previous data of on-site and off-site water samples, the sampling frequency could be lowered and still give adequate coverage.

3. The detection limit of beta activity in water samples was lowered in June of 1962 from 1.5×10^{-7} microcuries per milliliter (uc/ml) to 0.5×10^{-7} microcuries per milliliter (uc/ml). This was due to a lowering of the natural radiation background by improved shielding in a new instrument.

4. A revised sampling program for milk was begun. To get a broader coverage of farms, samples were collected from dairies in the area around Idaho Falls, Blackfoot, and Aberdeen. In more isolated locations individual farms were still sampled.

5. Strontium 90 analysis of milk samples was begun this year. One of the main sources of Strontium 90 in the diet is through milk products. Thus this program will give a good estimate of current levels of Strontium 90 in the diet in Southeastern Idaho.

6. Due to the uncertainty of correlation between Strontium 90 data for jack rabbits to human exposure, the analytical results of Strontium 90 in the jack rabbits have been deleted from this report. The data will still be used elsewhere as an indication of radioactivity in the area.

The sampling locations in the Environmental Monitoring Program are shown on the map included in this report.

ANALYTICAL LIMITS

The analytical limits are given in the following table:

Type of Sample	Isotope or Radiation Type	Detection Limit
Water	Alpha	3×10^{-9} uc/ml
	Beta	0.5×10^{-7} uc/ml
	Tritium	4×10^{-6} uc/ml
Milk	Iodine-131	50 uuc/liter
	Strontium 90	1.5 uuc/liter
Film Badges	Gamma	10 mrem
	Beta	10 mrem

AIR SAMPLING DATA

Operation of the high volume air sampling station in Idaho Falls was continued in view of the decision by the United States to resume atmospheric nuclear weapons testing starting April 25, 1962. As of April 25, samples were changed daily. The data are presented in graphical form at the end of the report. There was no significant rise in the airborne radioactivity concentration due to fallout. The highest value obtained was 23 micromicrocuries per cubic meter of air or 23×10^{-12} microcuries per cubic centimeter (23 uuc/m^3 or 23×10^{-12} uc/cc), while the average level was 10 micromicrocuries per cubic meter or 10×10^{-12} microcuries per cubic centimeter (10 uuc/m^3 or 10×10^{-12} uc/cc).

DATA INTERPRETATION

The Public Health Service has reported in their statement to the public dated October 26, 1961, that when fallout detected in any particular area reaches an "alert" level of 100 micromicrocuries of gross beta activity per cubic meter of air, and is sustained at or near this figure

for five to ten days, further action is indicated. This consists of Federal, State, and local Governments cooperating to determine the amounts of radioactive substances present in the fallout of the area.

After these determinations have been made the next necessary step is to interpret the levels found in air, water, or particular items of food, in the light of the guidelines for human exposure recommended by the Federal Radiation Council for normal peace-time operations and accepted by the President on September 1961 . . . . . Each range is the average daily amount of the specific radioactive substance that might be taken in through air, water or food by the average individual . . . . . as actually measured or closely estimated for an entire year . . . . . If it became necessary to reduce the Iodine 131 intake of the population in a particular area, certain steps could be taken. However, such actions are not in prospect in view of the levels of activity currently being found.

The data for the environmental sampling network is presented in tabular form on the following two pages of this report.

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

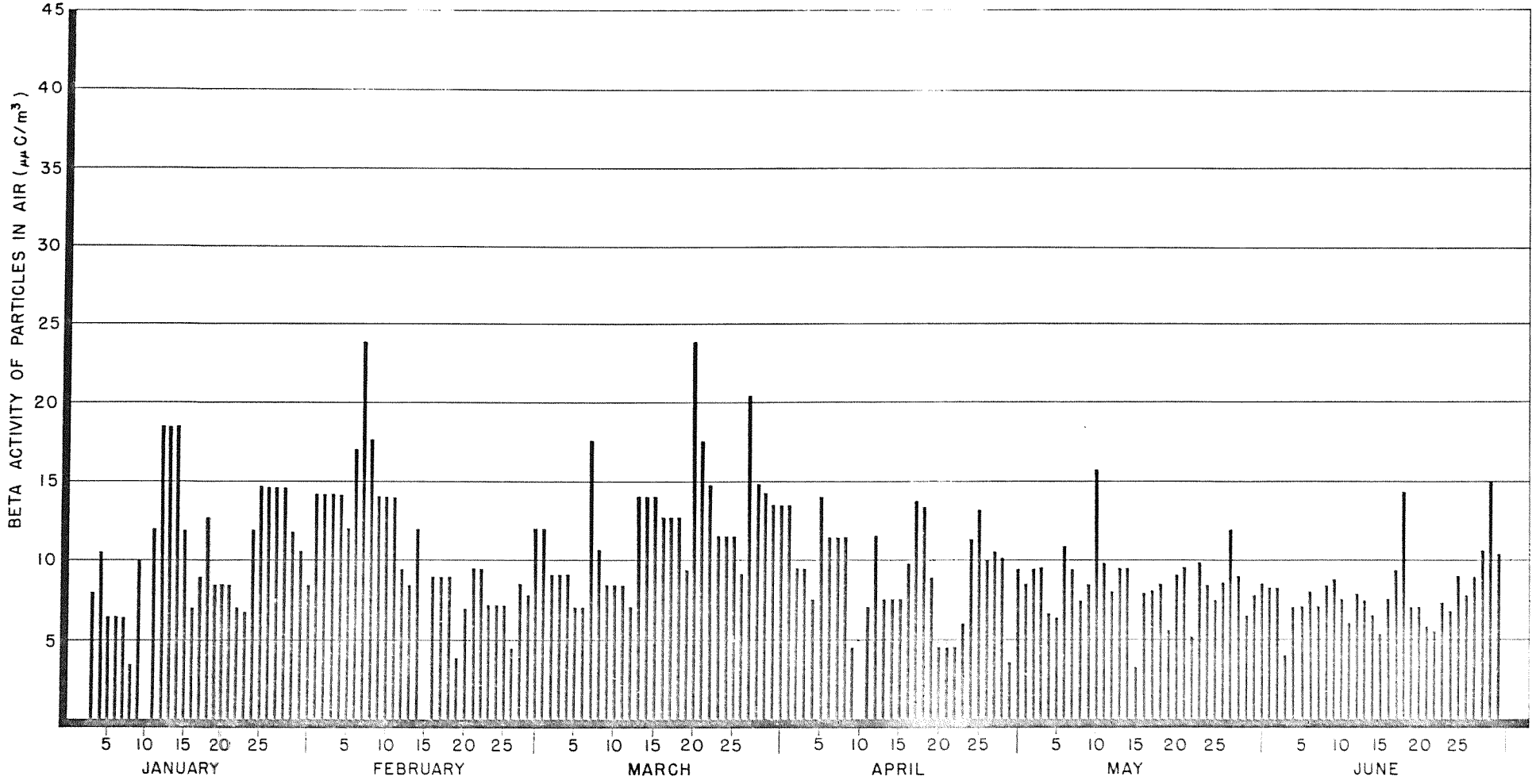
First Quarter 1962

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	30	Three Months	30	α 3.0×10^{-9} uc/ml β 1.5×10^{-7} uc/ml H^3 4.0×10^{-6} uc/ml	α $<3.0\times10^{-9}$ uc/ml β $<1.5\times10^{-7}$ uc/ml H^3 $<4.0\times10^{-6}$ uc/ml	α 10×10^{-9} uc/ml β 30×10^{-7} uc/ml H^3 3000×10^{-6} uc/ml
On-Site Production Well Water	21	Two Weeks	111 98	α 4.2×10^{-9} uc/ml β 4.3×10^{-7} uc/ml H^3 55×10^{-6} uc/ml	α $<3.1\times10^{-9}$ uc/ml β $<1.5\times10^{-7}$ uc/ml H^3 $<5.9\times10^{-6}$ uc/ml	α 100×10^{-9} uc/ml β 300×10^{-7} uc/ml H^3 30000×10^{-6} uc/ml
Off-Site Air Filters	14	Weekly	148	β 28×10^{-12} uc/cc	β 13×10^{-12} uc/cc	β 100×10^{-12} uc/cc
Off-Site Milk	10	Monthly	Iodine 131 27	Iodine 131 50 uuc/liter	Iodine 131 <50 uuc/liter	Iodine 131 100 uuc/liter
	8	Two Months	Strontium 90 7	Strontium 90 17 uuc/liter	Strontium 90 7 uuc/liter	Strontium 90 200 uuc/liter
Off-Site Area Monitoring Badges	14	Six Weeks	70	Maximum/Period γ 10 mrem β 10 mrem	Total for Quarter γ <20 mrem β <20 mrem	 γ 500 mrem/yr β 3000 mrem/yr

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

Second Quarter 1961

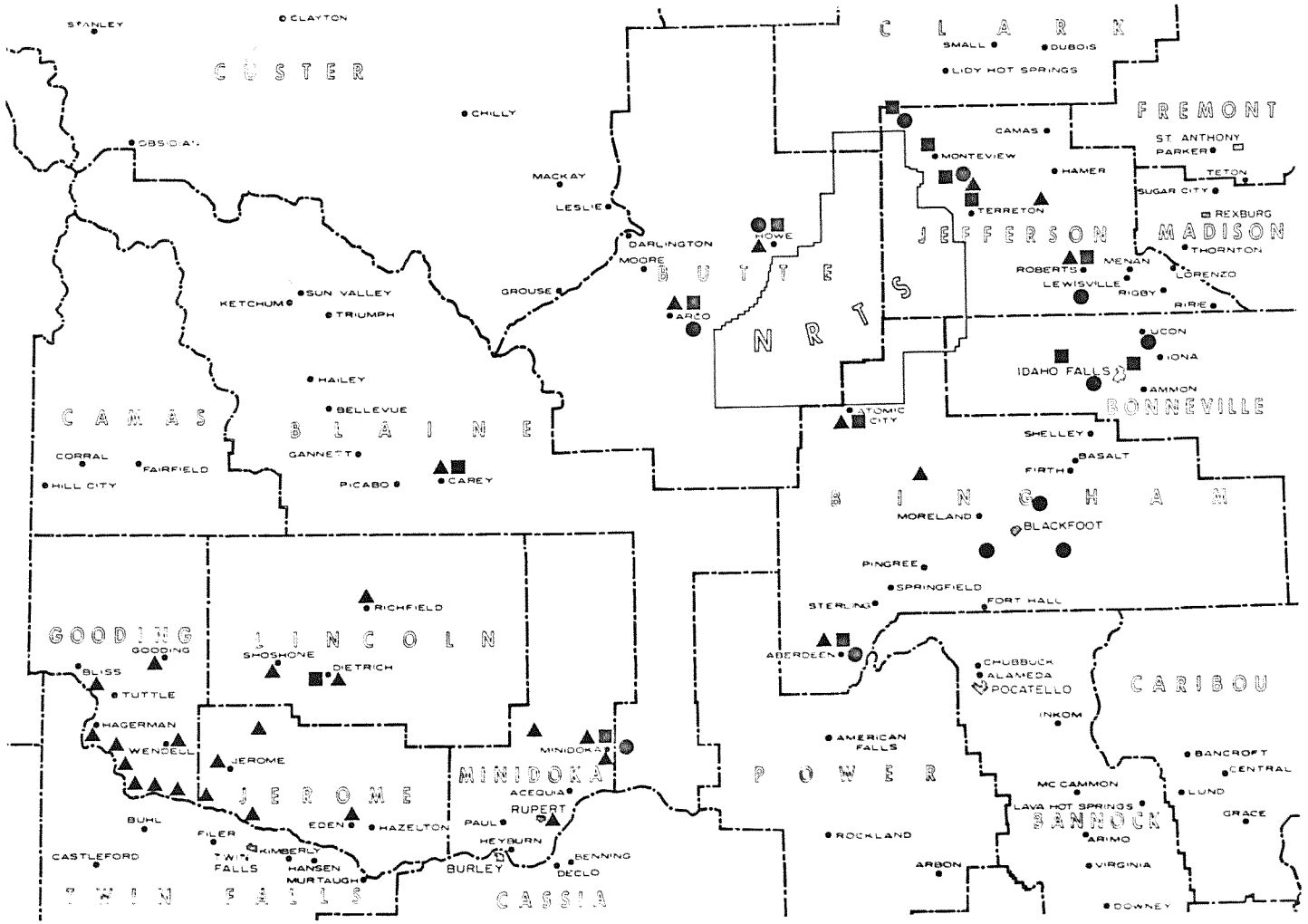
Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	30	Three Months	30	α 4.5×10^{-9} uc/ml β 0.5×10^{-7} uc/ml H^3 4.0×10^{-3} uc/ml	α $<3.1\times10^{-9}$ uc/ml β $<0.5\times10^{-7}$ uc/ml H^3 $<4.0\times10^{-3}$ uc/ml	α 10×10^{-9} uc/ml β 30×10^{-7} uc/ml H^3 3000×10^{-3} uc/ml
On-Site Production Well Water	21	Two Weeks	67 60	α 5.0×10^{-9} uc/ml β 4.0×10^{-7} uc/ml H^3 55×10^{-6} uc/ml	α $<3.1\times10^{-9}$ uc/ml β $<1.3\times10^{-7}$ uc/ml H^3 $<5.6\times10^{-6}$ uc/ml	α 100×10^{-9} uc/ml β 300×10^{-7} uc/ml H^3 30000×10^{-6} uc/ml
Off-Site Air Filters	14	Weekly	180	β 27×10^{-12}uc/cc	β 13×10^{-12}uc/cc	β 100×10^{-12}uc/cc
Off-Site Milk	10	Monthly	Iodine 131 29	Iodine 131 50 uuc/liter	Iodine 131 <50 uuc/liter	Iodine 131 100 uuc/liter
	8	Two Months	Strontium 90 16	Strontium 90 18 uuc/liter	Strontium 90 8 uuc/liter	Strontium 90 200 uuc/liter
Off-Site Area Monitoring Badges	14	Six Weeks	70	Maximum/Period γ 10 mrem β 35 mrem	Total for Quarter γ <20 mrem β <45 mrem	γ 500 mrem/yr β 3000 mrem/yr



HIGH VOLUME AIR SAMPLING DATA FOR IDAHO FALLS, IDAHO

JANUARY – JUNE, 1962

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM
FOR 1962



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SCALE IN MILES

LEGEND

▲ OFF-SITE UNDERGROUND WATER

■ OFF-SITE AIR MONITORING AND FILM BADGE LOCATIONS

● MILK SAMPLING AREAS

U. S. ATOMIC ENERGY COMMISSION

HEALTH AND SAFETY DIVISION - IDAHO OPERATIONS OFFICE

ENVIRONMENTAL MONITORING DATA (REPORT No. 11) FOR THE NATIONAL REACTOR TESTING STATION THIRD AND FOURTH QUARTER - 1962 AND ANNUAL SUMMARY

Continuous radiological surveillance of air, water, and food is conducted in the vicinity of Atomic Energy Commission installations throughout the country. The data gained through such studies enable responsible persons to determine what radiological effect the installations have on the environment. Periodically, summary reports of the results of radiological surveillance are released to the public.

The Environmental Monitoring Data Report for the National Reactor Testing Station (NRTS) for the year of 1962 discloses that the amount of radioactive materials in the environs of the NRTS during these months was below the Radiation Protection Guide (RPG) values recommended by the Federal Radiation Council as a threshold of concern. The environmental radioactivity reported represents activity from all sources. No attempt has been made to separate activity contributed by NRTS operations and that contributed by world-wide fallout from weapon debris.

The locations of the fixed stations around the NRTS where routine samples of air, water, and milk are collected to be analyzed for radioactivity are shown on the map at the end of this report.

ANALYTICAL LIMITS

The detection limits of the analytical methods used are given in the following table:

Type of Sample	Isotope or Radiation Limit	Detection Limit
Water	Alpha	3×10^{-9} uc/ml
	Beta	6×10^{-9} uc/ml*
	Tritium	4×10^{-6} uc/ml
Milk	Iodine-131	10 uuc/liter**
	Strontium-90	1.5 uuc/liter
Film Badges	Gamma	10 mrem
	Beta	10 mrem

* Reduced in October of 1962 from 1.5×10^{-7} uc/ml.
** Reduced in September of 1962 from 50 uuc/liter.

OFF-SITE UNDERGROUND WATER

Low-level activity liquid waste is introduced to the ground water by means of disposal wells and ponds located near the various facilities. These wastes are monitored before disposal. In addition, off-site ground water samples are collected at regular intervals for monitoring purposes. Most of these samples are taken from an area southwest of the site since this is the prevalent direction of ground water flow.

A total of 119 samples were collected on a three-month basis from 30 sampling stations. The analyses of these samples showed that alpha, beta, and tritium activities were well below Radiation Concentration Guide (RCG) values.

ON-SITE PRODUCTION WELL WATER

On-site samples were taken from production wells near the plant sites in order to monitor water used for personnel consumption.

For the entire year, 396 samples were collected from 21 sampling stations on a bi-weekly basis. Analyses of these samples showed that alpha, beta, and tritium activities were well below RCG values.

OFF-SITE AIR FILTERS

The off-site air samples are collected through use of a dual filter and a low-volume vacuum pump. The dual filter consists of a paper filter backed by a tube of activated charcoal. This filter is capable of entrapping both particulate and gaseous forms of radioactive material. A high-volume air sampler is also operated in Idaho Falls to furnish information specifically related to weapons testing. The data from the high-volume sampler is presented in graphical form at the end of the report. Beginning in August, 1962, week-end samples read on Monday reflect a three-day sampling period. The highest value obtained from the high volume station was 57 micromicrocuries per cubic meter of air (57 uuc/m^3). A total of 675 air samples were collected from the 14 permanent stations and analyzed for radioactivity. Although no appreciable increase was noted during the first three quarters of the year, a slight increase was noted in the fourth quarter. This increase is attributed to weapons testing. All results obtained during the year were below RCG values.

OFF-SITE MILK

As was expected, an increase of iodine in milk was noted throughout the country. During the year 113 milk samples were collected on a monthly basis from 10 stations and analyzed for iodine-131. In addition, 46 of these samples were analyzed for strontium-90. As can be seen in the attached data sheets, the average iodine-131 levels have remained below the RCG values. There was no significant change in the strontium-90 concentration in the milk sampled.

While reviewing the attached data sheets, the reader should keep in mind that the guidelines established by the Federal Radiation Council point out radiation levels above which positive control measures should be considered. The levels specified must be maintained for some length of time before any hazard results. As can be seen in the data, the RCG number for iodine-131 in milk was exceeded. However, these were individual situations of short duration. The quarterly and yearly averages show that the RCG's have in fact not been exceeded.

AREA MONITORING BADGES

Film badge stations are located around the perimeter of the NRTS site at the same locations as the air sampling equipment. Badges were changed on a six-week basis. The attached data sheets show no film data for the third quarter. This was due to the inadvertent use of a defective lot of film which yielded undependable data. Analyses of other environmental monitoring data give no reason to believe that there was any appreciable change in direct radiation levels from those recorded for the other three quarters of the year.

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

THIRD QUARTER 1962

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	30	Three Months	29	α 5×10^{-9} uc/ml β 8×10^{-8} uc/ml H^3 $<4 \times 10^{-6}$ uc/ml	α $<4 \times 10^{-9}$ uc/ml β $<3 \times 10^{-8}$ uc/ml H^3 $<4 \times 10^{-6}$ uc/ml	α 10×10^{-9} uc/ml β 300×10^{-8} uc/ml H^3 $3{,}000 \times 10^{-6}$ uc/ml
On-Site Production Well Water	21	Two Weeks	115 103	α 5×10^{-9} uc/ml β 2×10^{-7} uc/ml H^3 63×10^{-6} uc/ml	α $<3 \times 10^{-9}$ uc/ml β 0.5×10^{-7} uc/ml H^3 $<6 \times 10^{-6}$ uc/ml	α 100×10^{-9} uc/ml β 300×10^{-7} uc/ml H^3 $30{,}000 \times 10^{-6}$ uc/ml
Off-Site Air Filters	14	Weekly	180	β 63×10^{-12} uc/cc	β 13×10^{-12} uc/cc	β 100×10^{-12} uc/cc
Off-Site Milk	10	Monthly	Iodine 131 29	Iodine 131 163 uuc/liter	Iodine 131 <65 uuc/liter	Iodine 131 100 uuc/liter
	8	Two Months	Strontium 90 15	Strontium 90 19 uuc/liter	Strontium 90 13 uuc/liter	Strontium 90 200 uuc/liter
Off-Site Area Monitoring Badges	14	Six Weeks	Film badge data not available for Third-Quarter due to defective film.			

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

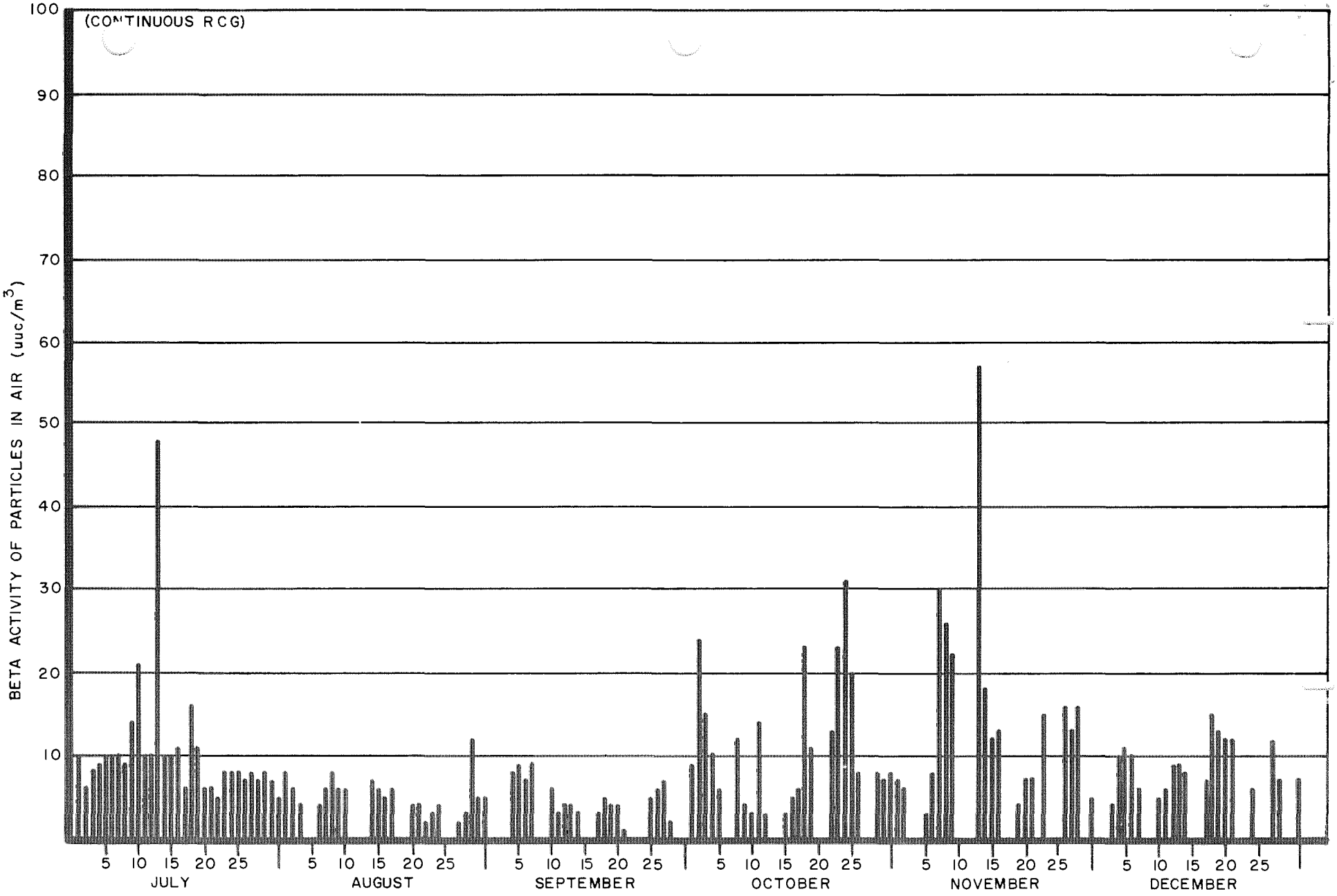
FOURTH QUARTER 1962

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	30	Three Months	30	α 5 x 10^{-9} uc/ml β 18 x 10^{-8} uc/ml H^3 <4 x 10^{-6} uc/ml	α <3 x 10^{-9} uc/ml β <2 x 10^{-8} uc/ml H^3 <4 x 10^{-6} uc/ml	α 10 x 10^{-9} uc/ml β 300 x 10^{-8} uc/ml H^3 3,000 x 10^{-6} uc/ml
On-Site Production Well Water	21	Two Weeks	103	α 12 x 10^{-9} uc/ml β 2 x 10^{-7} uc/ml H^3 55 x 10^{-6} uc/ml	α <4 x 10^{-9} uc/ml β <0.2x 10^{-7} uc/ml H^3 <6 x 10^{-6} uc/ml	α 100 x 10^{-9} uc/ml β 300 x 10^{-7} uc/ml H^3 30,000 x 10^{-6} uc/ml
Off-Site Air Filters	14	Weekly	167	β 99 x 10^{-12}uc/cc	β 26 x 10^{-12}uc/cc	β 100 x 10^{-12}uc/cc
Off-Site Milk	10	Monthly	Iodine 131 28	Iodine 131 320 uuc/liter	Iodine 131 <70 uuc/liter	Iodine 131 100 uuc/liter
	8	Two Months	Strontium 90 8	Strontium 90 11 uuc/liter	Strontium 90 8 uuc/liter	Strontium 90 200 uuc/liter
Off-Site Area Monitoring Badges	14	Six Weeks	24	Maximum Period α <10 mrem β <10 mrem	Total Per Quarter α <20 mrem β <20 mrem	α 500 mrem/yr β 3000 mrem/yr

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

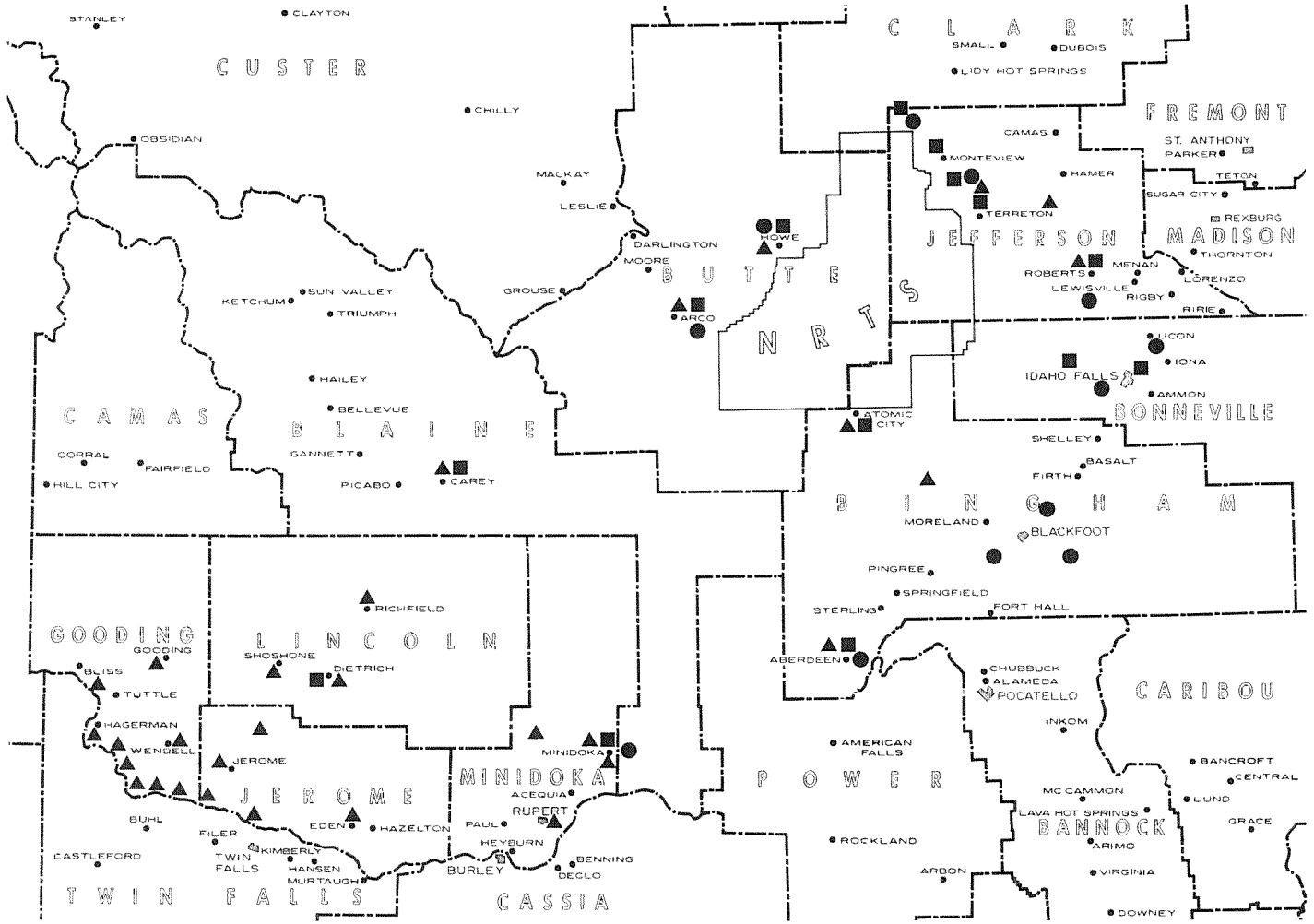
ANNUAL SUMMARY 1962

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	30	Three Months	119	α 5×10^{-9} uc/ml β 20×10^{-8} uc/ml H^3 $<4 \times 10^{-6}$ uc/ml	α $<4 \times 10^{-9}$ uc/ml β $<10 \times 10^{-8}$ uc/ml H^3 $<4 \times 10^{-6}$ uc/ml	α 10×10^{-9} uc/ml β 300×10^{-8} uc/ml H^3 $3{,}000 \times 10^{-6}$ uc/ml
On-Site Production Well Water	21	Two Weeks	396 363	α 12×10^{-9} uc/ml β 4×10^{-7} uc/ml H^3 63×10^{-6} uc/ml	α $<3 \times 10^{-9}$ uc/ml β $<1 \times 10^{-7}$ uc/ml H^3 $<6 \times 10^{-6}$ uc/ml	α 100×10^{-9} uc/ml β 300×10^{-7} uc/ml H^3 $30{,}000 \times 10^{-6}$ uc/ml
Off-Site Air Filters	14	Weekly	675	β 99×10^{-12}uc/cc	β 16×10^{-12}uc/cc	β 100×10^{-12}uc/cc
Off-Site Milk	10	Monthly	Iodine 131 113	Iodine 131 320 uuc/liter	Iodine 131 <60 uuc/liter	Iodine 131 100 uuc/liter
	8	Two Months	Strontium90 46	Strontium 90 19 uuc/liter	Strontium 90 9 uuc/liter	Strontium 90 200 uuc/liter
Off-Site Area Monitoring Badges	14	Six Weeks	164	Maximum Period α 10 mrem β 35 mrem	Total for 1st, 2nd and 4th Qtr. α <60 mrem β <85 mrem	α 500 mrem/yr β 3,000 mrem/yr



HIGH VOLUME AIR SAMPLING DATA FOR IDAHO FALLS, IDAHO July — December, 1962

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM
FOR 1962



U. S. ATOMIC ENERGY COMMISSION

HEALTH AND SAFETY DIVISION - IDAHO OPERATIONS OFFICE

ENVIRONMENTAL MONITORING DATA (REPORT NO. 12) FOR THE FIRST AND SECOND QUARTERS, 1963

Continuous radiological surveillance of air, water, and food is conducted in the vicinity of Atomic Energy Commission installations throughout the country. The data gained through such studies enable a determination of what effect the installations have on the environment. Periodically, summary reports of the result of radiological surveillance are issued to the public.

The Environmental Monitoring Data Report for the National Reactor Testing Station (NRTS) for the first half of 1963 discloses that the amount of radioactive materials in the environs of NRTS during these months was below Radiation Protection Guide (RPG) values recommended by the Federal Radiation Council (FRC) as a threshold of concern. The environmental radioactivity reported represents activity from all sources. No attempt has been made to separate activity contributed by NRTS operations (if any) and that contributed by fallout from weapons debris.

The locations of the fixed stations around the NRTS where routine samples of air, water, and milk are collected to be analyzed for radioactivity are shown on the map at the end of this report.

ANALYTICAL LIMITS

The detection limits resulting from the sampling and analytical methods used are given in the following table:

Type of Sample	Isotope or Radiation Type	Detection Limit
Water	Alpha	3×10^{-9} uc/ml
	Beta	6×10^{-9} uc/ml
	Tritium	4×10^{-6} uc/ml
Milk	Iodine-131	10 uuc/liter
	Strontium-90	1.5 uuc/liter
Film Badges	Gamma	10 mrem
	Beta	10 mrem
Low Volume Air	Gross	1×10^{-16} uc/ml

OFF-SITE UNDERGROUND WATER

Low-level activity liquid wastes are introduced to the ground water by means of disposal wells and ponds located near the various facilities. These wastes are monitored before disposal. In addition, off-site underground water samples are collected at regular intervals for monitoring purposes. Most of these samples are taken from an area southwest of the site since this is the most prevalent direction of underground water flow.

Two surface water sampling locations were added early in the year. The added samples are taken from the Snake River near Idaho Falls, Idaho and Twin Falls, Idaho, and are used for comparison purposes.

A total of 63 samples were collected on a three-month basis from the 32 sampling stations. The analysis of these samples showed that alpha, beta, and tritium activities were no more than 40%, 0.7%, and 0.2% of the respective Radioactivity Concentration Guide (RCG) values.

ON-SITE PRODUCTION WELL WATER

On-site samples were taken from production wells in and near the plant sites in order to monitor water used for NRTS personnel consumption.

For the first half of 1963, 236 samples were collected from 22 sampling stations on a bi-weekly basis. Analyses of these samples showed that alpha, beta, and tritium concentrations were no more than 4%, 0.07%, and 0.02% of their respective RCG values.

(Note: The reader is reminded that the RCG values are ten times more restrictive for water which may be consumed by people living off-site than those applied to the water which may be consumed by "radiation-workers" during the course of their on-site work. It will be noted that the on-site percentages are 10% of the off-site percentages which shows that there is little difference between the radioactivity in on-site and off-site water).

OFF-SITE AIR FILTERS

The off-site air samples are collected through the use of a dual filter and a low-volume vacuum pump. The dual filter consists of a paper filter backed by a tube of activated charcoal. This filter is capable of entrapping both particulate and gaseous forms of radioactive material.

A total of 355 low-volume air samples were collected from the 14 permanent off-site stations. Results of analyses of these samples showed the concentrations to be 22% of the RCG values.

OFF-SITE MILK

During this half-year, the milk sampling from Roberts was combined with

that of New Sweden, one station near Blackfoot was discontinued, and stations were added in Dietrich, Tabor, and two near Idaho Falls. From the resulting 13 stations, 74 samples were collected and analyzed for iodine-131. The resulting half-year average was no more than 11 uuc/l. The average for the entire year of 1962 was no more than 60 uuc/l. This indicates a significant drop in iodine-131 concentrations in milk so far this year.

During 1962, strontium-90 analyses were run on milk from eight of the sampling stations, on a two-month basis. It was decided that this sampling period and number of samples were not adequate to reflect the changes in strontium concentrations which are caused by seasonal changes in dairy feeding practices. Therefore, strontium-90 analyses are now being made on milk from ten of the stations on a monthly basis. The situation with respect to strontium-90 is the reverse of that of iodine, discussed above. The 1962 average concentration was 9 uuc/l, whereas the first-half concentrations during 1963 show a concentration of 23 uuc/l. This average concentration is 12% of RCG values. The reader will note, when reviewing the attached data sheets, that the maximum activity of strontium-90 in one of the samples collected was greater than the listed RCG number. It should be kept in mind that the guidelines established by the FRC point out radiation levels above which positive control measures should be considered. The levels specified must be maintained for years before any known hazard could result. The 12% quoted above shows that the RCG values have in fact not been exceeded.

AREA MONITORING BADGES

Off-site area film badges were collected on a monthly, rather than a six-weeks basis, through the first half of the year. Eighty-three badges were used at 14 fixed stations, and indicated exposures well below those recommended by the FRC.

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

FIRST QUARTER 1963

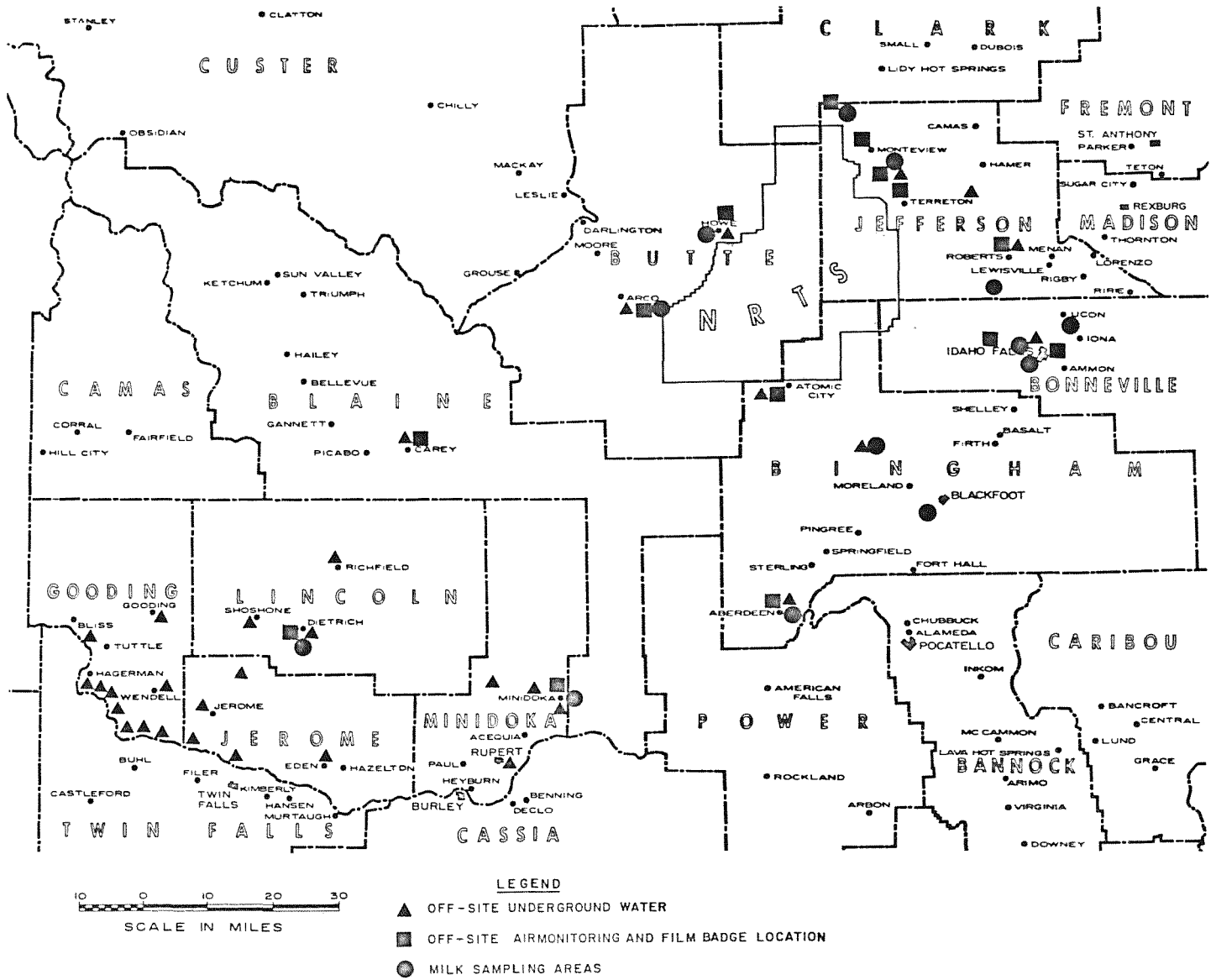
Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity	Average Activity	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	32	Three Months	31	α 4×10^{-9} µc/ml β 6×10^{-8} µc/ml H^3 $< 4 \times 10^{-6}$ µc/ml	$\alpha < 4 \times 10^{-9}$ µc/ml $\beta < 2 \times 10^{-8}$ µc/ml $H^3 < 4 \times 10^{-6}$ µc/ml	α 10×10^{-9} µc/ml β 300×10^{-8} µc/ml H^3 $3{,}000 \times 10^{-6}$ µc/ml
On-Site Production Well Water	22	Two Weeks	128	α 9×10^{-9} µc/ml β 5×10^{-8} µc/ml H^3 72×10^{-6} µc/ml	$\alpha < 4 \times 10^{-9}$ µc/ml $\beta < 2 \times 10^{-8}$ µc/ml $H^3 < 7 \times 10^{-6}$ µc/ml	α 100×10^{-9} µc/ml β $3{,}000 \times 10^{-8}$ µc/ml H^3 $30{,}000 \times 10^{-6}$ µc/ml
Off-Site Air Filters	14	Weekly	181	β 43×10^{-12} µc/ml	β 20×10^{-12} µc/cc	β 100×10^{-12} µc/cc
Off-Site Milk	13	Monthly	Iodine 131 39	Iodine 131 30 µµc/liter	Iodine 131 12 µµc/liter	Iodine 131 100 µµc/liter
	10	Monthly	Strontium 90 27	Strontium 90 19 µµc/liter	Strontium 90 10 µµc/liter	Strontium 90 200 µµc/liter
Off-Site Area Monitoring Badges	14	Monthly	41	Maximum/Period $\gamma < 10$ mrem $\beta < 10$ mrem	Total per quarter $\gamma < 30$ mrem $\beta < 30$ mrem	γ 500 mrem/yr β 3,000 mrem/yr

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

SECOND QUARTER 1963

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity	Average Activity	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	32	Three Months	32	$\alpha < 3 \times 10^{-9}$ µc/ml β 9×10^{-8} µc/ml $H^3 < 4 \times 10^{-6}$ µc/ml	$\alpha < 3 \times 10^{-9}$ µc/ml $\beta < 3 \times 10^{-8}$ µc/ml $H^3 < 4 \times 10^{-6}$ µc/ml	α 10×10^{-9} µc/ml β 300×10^{-8} µc/ml H^3 $3{,}000 \times 10^{-6}$ µc/ml
On-Site Production Well Water	22	Two Weeks	108 90	α 10×10^{-9} µc/ml β 7×10^{-8} µc/ml H^3 84×10^{-6} µc/ml	$\alpha < 4 \times 10^{-9}$ µc/ml $\beta < 2 \times 10^{-8}$ µc/ml $H^3 < 7 \times 10^{-6}$ µc/ml	α 100×10^{-9} µc/ml β $3{,}000 \times 10^{-8}$ µc/ml H^3 $30{,}000 \times 10^{-6}$ µc/ml
Off-Site Air Filters	14	Weekly	174	β 55×10^{-12} µc/cc	β 23×10^{-12} µc/cc	β 100×10^{-12} µc/cc
Off-Site Milk	13	Monthly	Iodine 131 36	Iodine 131 $<$ 10 µµc/liter	Iodine 131 $<$ 10 µµc/liter	Iodine 131 100 µµc/liter
	10	Monthly	Strontium 90 30	Strontium 90 230 µµc/liter	Strontium 90 36 µµc/liter	Strontium 90 200 µµc/liter
Off-Site Area Monitoring Badges	14	Monthly	42	Maximum Period γ 25 mrem $\beta <$ 10 mrem	Total per quarter $\gamma <$ 40 mrem $\beta <$ 30 mrem	γ 500 mrem/yr β 3,000 mrem/yr

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM
1963



U. S. ATOMIC ENERGY COMMISSION

HEALTH AND SAFETY DIVISION - IDAHO OPERATIONS OFFICE

ENVIRONMENTAL MONITORING REPORT (REPORT NO. 13)

FOR THE NATIONAL REACTOR TESTING STATION

THIRD AND FOURTH QUARTER

AND

ANNUAL SUMMARY - 1963

Continuous radiological surveillance of air, water, and food is conducted in the vicinity of Atomic Energy Commission installations throughout the country. The data gained through such studies enable a determination of what effect the installations have on the environment. Periodically, summary reports of the results of radiological surveillance are issued to the public.

The Environmental Monitoring Data Report for the National Reactor Testing Station (NRTS) for the last half of 1963 discloses that the amount of radioactive materials in the environs of NRTS during these months was below Radiation Protection Guide (RPG) values recommended by the Federal Radiation Council (FRC) as a threshold of concern. The environmental radioactivity reported represents activity from all sources. No attempt has been made to separate activity contributed by NRTS operations (if any) and that contributed by fallout from weapons debris.

The locations of the fixed stations around the NRTS where routine samples of air, water, milk, and wheat are collected to be analyzed for radioactivity are shown on the map at the end of this report.

ANALYTICAL LIMITS

The detection limits resulting from the sampling and analytical methods used are given in the following table:

Type of Sample	Isotope or Radiation Type	Detection Limit
Water	Alpha	3×10^{-9} μc/ml
	Beta	6×10^{-9} μc/ml
	Tritium	4×10^{-6} μc/ml
Milk	Iodine-131	20 μμc/liter*
	Strontium-90	1.5 μμc/liter
Film Badges	Gamma	10 mrem
	Beta	10 mrem
Low Volume Air	Gross	1×10^{-16} μc/ml
Wheat	Strontium-90	6×10^{-8} μc/gm
	Cesium-137	1×10^{-7} μc/gm

* Due to the changing percentage of iodine-131 relative to other fission products from weapons testing, the detection limit for iodine-131 in milk was changed from 10 μμc/liter to 20 μμc/liter in August of 1963.

OFF-SITE UNDERGROUND WATER

Low-level activity liquid wastes are introduced to the ground water by means of disposal wells and ponds located near the various facilities. These wastes are monitored before disposal. In addition, off-site underground water samples are collected at regular intervals for monitoring purposes. Most of these samples are taken from an area southwest of the site since this is the most prevalent direction of underground water flow.

A year's total of 127 samples were collected on a three-month basis from the 32 sampling stations. The analysis of these samples showed that alpha, beta, and tritium activities were no more than 40%, 1.0% and 0.2% of the respective Radioactivity Concentration Guide (RCG) values. Beginning in January of 1964, tritium analyses will be discontinued.

ON-SITE PRODUCTION WELL WATER

On-site samples were taken from production wells in and near the plant sites in order to monitor water used for NRTS personnel consumption.

During 1963, 459 samples were collected from 22 sampling stations on a bi-weekly basis. Analyses of these samples showed that alpha, beta, and tritium

concentrations were no more than 4%, 0.07% and 0.02% of their respective RCG values.

(Note: The reader is reminded that the RCG values are ten times more restrictive for water which may be consumed by people living off-site than those applied to the water which may be consumed by "radiation-workers" during the course of their on-site work. It will be noted that the on-site percentages are about 10% of the off-site percentages which shows that there is little difference between the radioactivity in on-site and off-site water).

OFF-SITE AIR FILTERS

The off-site air samples are collected through the use of a dual filter and a low-volume vacuum pump. The dual filter consists of a paper filter backed by a tube of activated charcoal. This filter is capable of entrapping both particulate and gaseous forms of radioactive material.

Beginning in January of 1964, this system will be replaced by a radiation monitoring telemetry system, which will be described in more detail in subsequent reports.

A total of 704 low-volume air samples were collected from the 14 permanent off-site stations. Results of analyses of these samples showed the concentration to be no more than 15% of the RCG values.

OFF-SITE MILK

During the year, 199 samples were collected and analyzed for iodine-131. The resulting yearly average was no more than 20 μμc/l. The average for the entire year of 1962 was no more than 60 μμc/l. This indicates a significant drop in iodine-131 concentrations in milk during 1963.

During 1962, strontium-90 analyses were run on milk from eight of the sampling stations, on a two-month basis. It was decided that this sampling period and number of samples were not adequate to reflect the changes in strontium concentrations which are caused by seasonal changes in dairy feeding practices. Therefore, strontium-90 analyses during 1963 were made on milk from ten of the stations on a monthly basis. The situation with respect to strontium-90 is the reverse of that of iodine, discussed above. The 1962 average concentration was 9 μμc/l, whereas the 1963 concentrations show an average of 25 μμc/l. This average concentration is about 13% of RCG values. The reader will note, when reviewing the attached data sheets, that the maximum activity of strontium-90 in one of the samples collected during 1963 was greater than the listed RCG number. Subsequent sampling showed levels to be less than the RCG number. It should be kept in mind that the guidelines established by the FRC point out radiation levels above which positive control measures should be considered. The levels specified must be maintained for years before any known hazard could result. The 13% quoted above shows that the RCG values have in fact not been exceeded.

AREA MONITORING BADGES

Off-site area film badges were collected on a monthly, rather than a six-weeks basis throughout the year. Eighty-three badges were issued at 14 fixed stations, and indicated exposures well below those recommended by the FRC. The results of data analysis show no signficant direct radiation above normal backgrounds.

WHEAT MONITORING

The analysis of strontium-90 and cesium-137 in wheat was started in 1963, as another aspect of monitoring radioactivity in the NRTS area. Strontium-90 in wheat was determined by chemical separation of the strontium from a 25 gm sample and a subsequent 30 minute count in a low background beta counter. Of the 16 samples analyzed, 10 were less than the detection limit of 60 μμc/kgm with the high observed value being 170 μμc/kgm.

Cesium-137 activity levels in wheat were determined by gamma spectrum analysis of 3 liters (approximately 2200 gms) of wheat in a Marinelli-type container. Cesium-137 levels in wheat were from 100 to 800 μμc/kgm with an average of 450 μμc/kgm. From the gamma spectra made during the cesium-137 analysis, the presence of a gamma emitter with an energy of 0.84 Mev was observed. This energy was identified as being emitted by manganese-54 and later substantiated by chemical analysis. Manganese-54 values ranged from 100 to 560 μμc/kgm with an average of 410 μμc/kgm.

Although no RCGs pertaining to wheat have been established, consideration of the above data leads one to believe that the wheat is not a significant contributor to the radiation dose to the local population.

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

ANNUAL SUMMARY 1963

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	32	Three Months	127	α 5×10^{-9} µc/ml β 12×10^{-8} µc/ml H^3 5×10^{-6} µc/ml	$\alpha < 4 \times 10^{-9}$ µc/ml $\beta < 3 \times 10^{-8}$ µc/ml $H^3 < 4 \times 10^{-6}$ µc/ml	α 10×10^{-9} µc/ml β 300×10^{-8} µc/ml H^3 $3{,}000 \times 10^{-6}$ µc/ml
On-Site Production Well Water	22	Two Weeks	459 441	α 10×10^{-9} µc/ml β 8×10^{-8} µc/ml H^3 94×10^{-6} µc/ml	$\alpha < 4 \times 10^{-9}$ µc/ml $\beta < 2 \times 10^{-8}$ µc/ml $H^3 < 7 \times 10^{-6}$ µc/ml	α 100×10^{-9} µc/ml β $3{,}000 \times 10^{-8}$ µc/ml H^3 $30{,}000 \times 10^{-6}$ µc/ml
Off-Site Air Filters	14	Weekly	704	β 55×10^{-12} µc/cc	β 15×10^{-12} µc/cc	β 100×10^{-12} µc/cc
Off-Site Milk	13	Monthly	Iodine-131 149	Iodine-131 30 µµc/liter	Iodine-131 $<$ 20 µµc/liter	Iodine-131 100 µµc/liter
	10	Monthly	Strontium-90 115	Stronitum-90 230 µµc/liter	Strontium-90 25 µµc/liter	Strontium-90 200 µµc/liter
Off-Site Area Monitoring Badges	14	Monthly	166	Maximum/month γ 25 mrem β $<$ 10 mrem	Total for year γ $<$ 140 mrem β $<$ 120 mrem	γ 500 mrem/yr β 3,000 mrem/yr

ENVIRONMENTAL MONITORING DATA FOR THE ...IONAL REACTOR TESTING STATION

FOURTH QUARTER 1963

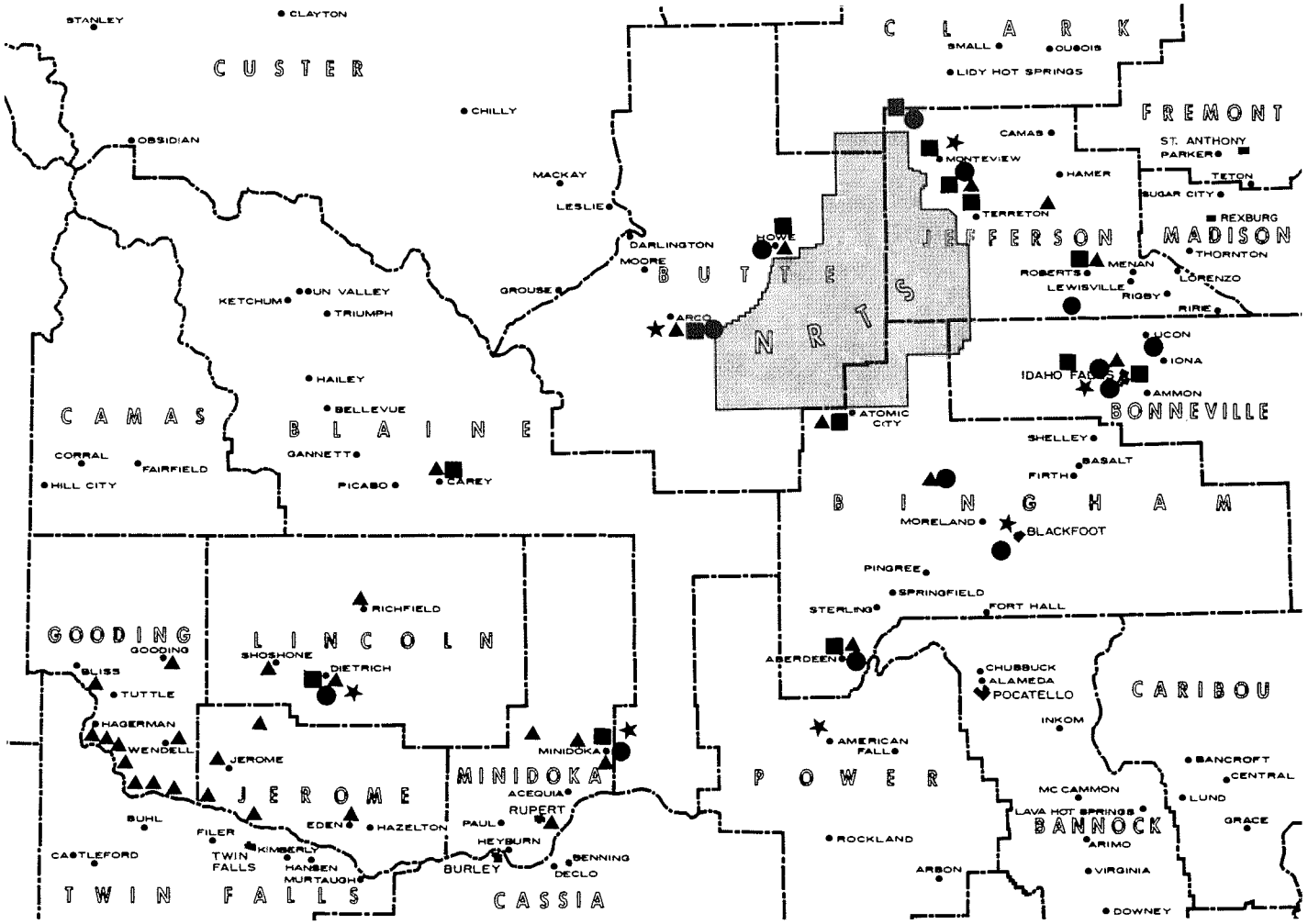
Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	32	Three Months	32	α 5×10^{-9} µc/ml β 3×10^{-8} µc/ml H^3 5×10^{-6} µc/ml	$\alpha < 4 \times 10^{-9}$ µc/ml $\beta < 2 \times 10^{-8}$ µc/ml $H^3 < 4 \times 10^{-6}$ µc/ml	α 10×10^{-9} µc/ml β 300×10^{-8} µc/ml H^3 $3{,}000 \times 10^{-6}$ µc/ml
On-Site Production Well Water	22	Two Weeks	98	α 5×10^{-9} µc/ml β 7×10^{-8} µc/ml H^3 94×10^{-6} µc/ml	$\alpha < 4 \times 10^{-9}$ µc/ml $\beta < 2 \times 10^{-8}$ µc/ml $H^3 < 8 \times 10^{-6}$ µc/ml	α 100×10^{-9} µc/ml β $3{,}000 \times 10^{-8}$ µc/ml H^3 $30{,}000 \times 10^{-6}$ µc/ml
Off-Site Air Filters	14	Weekly	174	β 25×10^{-12} µc/cc	β 5×10^{-12} µc/cc	β 100×10^{-12} µc/cc
Off-Site Milk	13	Monthly	Iodine-131 37	Iodine-131 $<$ 20 µµc/liter	Iodine-131 $<$ 20 µµc/liter	Iodine-131 100 µµc/liter
	10	Monthly	Strontium-90 29	Strontium-90 35 µµc/liter	Strontium-90 23 µµc/liter	Strontium-90 200 µµc/liter
Off-Site Area Monitoring Badges	14	Monthly	41	Maximum/month γ $<$ 10 mrem β $<$ 10 mrem	Total per quarter γ $<$ 30 mrem β $<$ 30 mrem	γ 500 mrem/yr β 3,000 mrem/yr

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

THIRD QUARTER 1963

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	32	Three Months	32	α 5×10^{-9} µc/ml β 12×10^{-8} µc/ml H^3 $< 4 \times 10^{-6}$ µc/ml	$\alpha < 4 \times 10^{-9}$ µc/ml $\beta < 4 \times 10^{-8}$ µc/ml $H^3 < 4 \times 10^{-6}$ µc/ml	α 10×10^{-9} µc/ml β 300×10^{-8} µc/ml H^3 $3{,}000 \times 10^{-6}$ µc/ml
On-Site Production Well Water	22	Two Weeks	125	$\alpha < 3 \times 10^{-9}$ µc/ml β 8×10^{-8} µc/ml H^3 90×10^{-6} µc/ml	$\alpha < 3 \times 10^{-9}$ µc/ml $\beta < 2 \times 10^{-8}$ µc/ml $H^3 < 8 \times 10^{-6}$ µc/ml	α 100×10^{-9} µc/ml β $3{,}000 \times 10^{-8}$ µc/ml H^3 $30{,}000 \times 10^{-6}$ µc/ml
Off-Site Air Filters	14	Weekly	175	β 42×10^{-12} µc/cc	β 12×10^{-12} µc/cc	β 100×10^{-12} µc/cc
Off-Site Milk	13	Monthly	Iodine-131 37	Iodine-131 $<$ 20 µµc/liter	Iodine-131 $<$ 20 µµc/liter	Iodine-131 100 µµc/liter
	10	Monthly	Strontium-90 29	Strontium-90 53 µµc/liter	Strontium-90 30 µµc/liter	Strontium-90 200 µµc/liter
Off-Site Area Monitoring Badges	14	Monthly	42	Maximum/month γ 10 mrem β $<$ 10 mrem	Total per quarter γ $<$ 30 mrem β $<$ 30 mrem	γ 500 mrem/yr β 3,000 mrem/yr

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM
1963



U. S. ATOMIC ENERGY COMMISSION

HEALTH AND SAFETY DIVISION - IDAHO OPERATIONS OFFICE

ENVIRONMENTAL MONITORING REPORT (REPORT NO. 14)

FOR THE NATIONAL REACTOR TESTING STATION

FIRST AND SECOND QUARTER

1964

Concentrations of radioactivity in air, water, and foodstuffs are monitored continuously in the vicinity of Atomic Energy Commission installations. The data gained through such studies enable an evaluation of the effect on the environment of releases from these installations. Periodically, summary reports of the results of radiological surveillance are issued to the public.

The Environmental Monitoring Data Report for the National Reactor Testing Station (NRTS) for the first half of 1964 discloses that the concentrations of radioactive materials in the environs of NRTS during these months were below Radiation Concentration Guide (RCG) values recommended by the Federal Radiation Council (FRC) as a threshold of concern. The amounts of radioactivity reported includes the contributions from all sources. No attempt has been made to separate activity contributed by NRTS operations (if any) from that contributed by fallout from weapons debris and by natural sources.

The locations of the fixed stations around the NRTS where routine samples of air, water, and milk, are collected to be analyzed for radioactivity are shown on the map at the end of this report.

ANALYTICAL LIMITS

The detection limits resulting from the sampling and analytical methods used are given in the following table:

Type of Sample	Isotope or Radiation Type	Detection Limit
Water	Alpha	3×10^{-9} µCi/ml
	Beta	6×10^{-9} µCi/ml
Milk	Iodine-131	20 pCi/liter
	Strontium-90	1.5 pCi/liter
Film Badges	Gamma	10 mrem
	Beta	10 mrem
Low Volume Air (Carbon Cartridge)	Gross Beta-Gamma	1×10^{-16} µCi/cc
Low Volume Air - Telemetry	Gross Beta-Gamma	1.6×10^{-12} µCi/cc
	Iodine-131	3.6×10^{-12} µCi/cc

OFF-SITE UNDERGROUND WATER

Low-level activity liquid wastes are introduced to the ground water by means of disposal wells and ponds located near the various facilities. These wastes are monitored before disposal. In addition, on-site and off-site underground water samples are collected at regular intervals for monitoring purposes. Most of these samples are taken from an area southwest of the NRTS since this is the predominant direction of underground water flow.

A total of 32 samples were collected on a semi-annual basis from the 32 stations. The analysis of these samples showed that average alpha and beta activities were no more than 40% and 0.3% of the respective Radioactivity Concentration Guide (RCG) values. Natural background accounted for the measured alpha activity.

ON-SITE PRODUCTION WELL WATER

On-site samples were taken from production wells in and near the plant sites in order to evaluate contaminants in potable water at the NRTS.

During the first half of 1964, 215 samples were collected from 22 sampling stations on a biweekly basis. Analyses of these samples showed that average alpha and beta concentrations were no more than 4% and 0.1% of their respective RCG values.

OFF-SITE AIR FILTERS

Beginning in January 1964, reported data from the radiation monitoring telemetry system replaced data previously derived from the off-site air samples collected

through the use of a dual filter and a low-volume vacuum pump. Collection of these samples continued until June 1964, to provide comparative data needed for a smooth transition from one system to another.

The telemetry system has many operating capabilities not available in the other system. Normal operations call for hourly reports by each station. These reports include information from:

Ion Chambers: These instruments record ambient radiation levels in mr/hr.

GM Counters: HV-70 filter paper is cycled to a GM tube once a day. One GM tube records the buildup of activity over the day and another records the decay of activity collected the previous day.

Scintillation Counter: Air previously passing through the HV-70 passes through a carbon cartridge (with no paper prefilter). The activity recorded is assumed to be iodine-131. This cartridge remains in place for periods up to six (6) weeks.

Results of the reported data from the 15 telemetry stations showed the average concentrations of radioactive particulate matter in the atmosphere to be no more than 1.6% of the RCG value of 100×10^{-12} µCi/cc. Average concentrations of gaseous iodine were no more than 1.2%.

The average activity recorded from the low volume system was 3.5% of RCG for all radioactive particulates and less than 0.1% of RCG for gaseous radioiodine.

OFF-SITE MILK

Analyses of the levels of iodine-131 and strontium-90 concentrations were conducted on a monthly basis. Of the 110 radioiodine analyses, no sample was found to have a concentration greater than 20 pCi/liter or 20% of the RCG value.

Of the 55 milk samples analyzed for strontium-90, the maximum activity on a single sample was found to be 44 pCi/liter. This is about 25% of the 200 pCi/liter RCG value. The average was 14% of the RCG.

AREA MONITORING BADGES

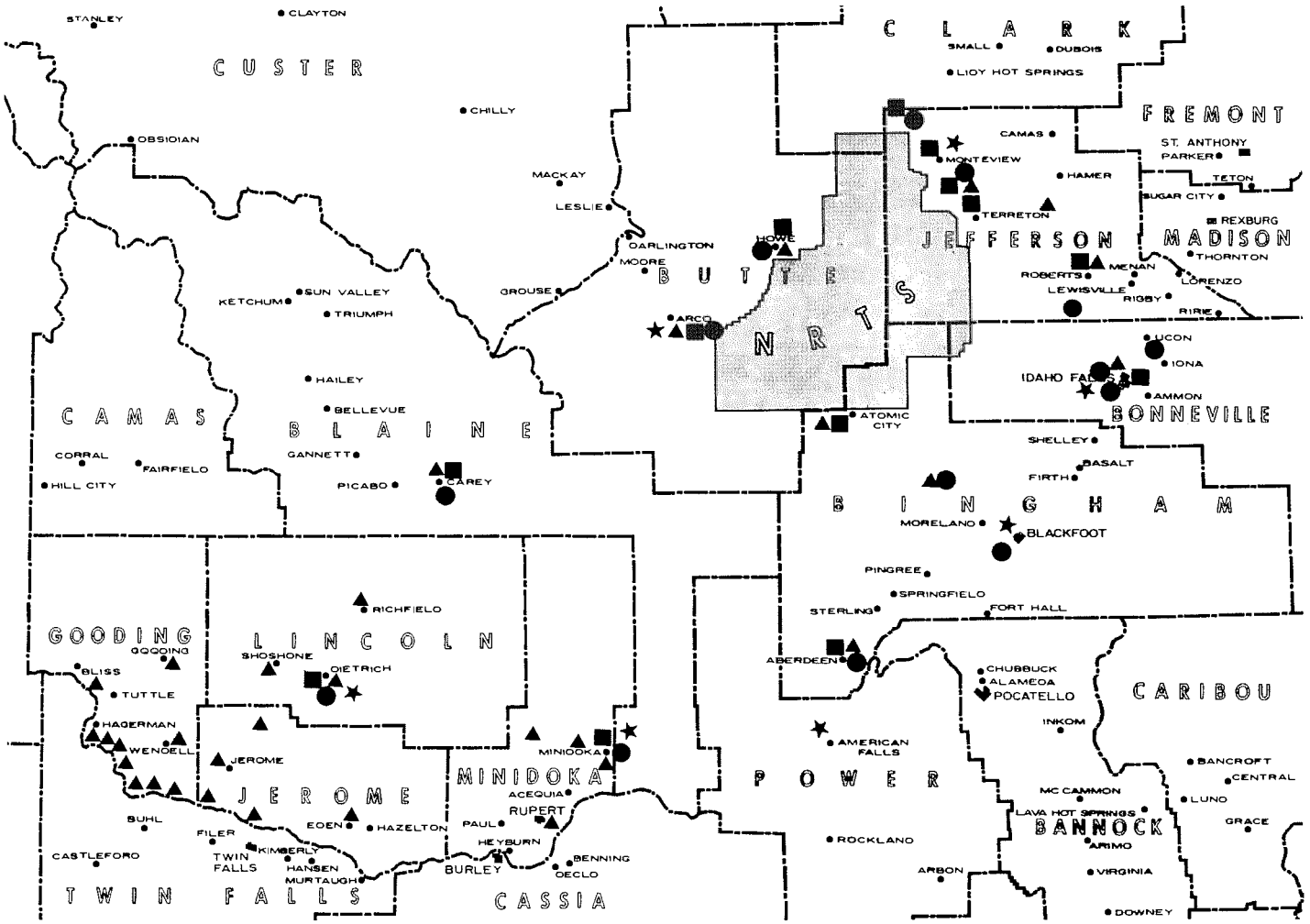
Off-site area film badges were collected on a monthly basis, as during 1963. Eighty-one badges at 14 fixed stations indicated exposures well below those recommended by the FRC. The results of data analyses showed no significant direct radiation above normal background.

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

FIRST SEMI-ANNUM 1964

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guide
Off-Site Underground Water	32	Semi-Annual	32	α 9×10^{-9} μCi/ml β 2×10^{-8} μCi/ml	$\alpha < 4 \times 10^{-9}$ μCi/ml $\beta < 1 \times 10^{-8}$ μCi/ml	α 10×10^{-9} μCi/ml β 300×10^{-8} μCi/ml
On-Site Production Well Water	22	Two Weeks	215	α 7×10^{-9} μCi/ml β 10×10^{-8} μCi/ml	$\alpha < 4 \times 10^{-9}$ μCi/ml $\beta < 2 \times 10^{-8}$ μCi/ml	α 100×10^{-9} μCi/ml β 3000×10^{-8} μCi/ml
Off-Site Air Filters		Continuous	Particulate	β-γ 19×10^{-12} μCi/cc	β-$\gamma < 1.6 \times 10^{-12}$ μCi/cc	β-γ 100×10^{-12} μCi/cc
			Gaseous Iodine	40×10^{-12} μCi/cc	$< 3.6 \times 10^{-12}$ μCi/cc	300×10^{-12} μCi/cc
Off-Site Milk	14	Monthly	Iodine-131 110	Iodine-131 $<$ 20 pCi/liter	Iodine-131 $<$ 20 pCi/liter	Iodine-131 100 pCi/liter
	11	Monthly	Strontium-90 55	Strontium-90 44 pCi/liter	Strontium-90 28 pCi/liter	Strontium-90 200 pCi/liter
Off-Site Area Monitoring Badges	14	Monthly	81	Max. one month dose γ 25 mrem β 10 mrem	Average Total Dose γ $<$ 60 mrem β $<$ 60 mrem	 γ 500 mrem/yr β 3000 mrem/yr

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM
1964



U. S. ATOMIC ENERGY COMMISSION
Idaho Operations Office - Health and Safety Division
National Reactor Testing Station

ENVIRONMENTAL MONITORING REPORT NO. 15
Third and Fourth Quarter
and
Annual Summary
1964

To evaluate the continued impact of operation of AEC installations on the general levels of radioactivity in the environment, concentrations of radioactivity in air, water, and foodstuffs have been monitored continuously. Periodically, reports are issued to the public which describe and evaluate data gained from this radiological surveillance. Environmental monitoring data for the National Reactor Testing Station (NRTS) for 1964 reveal that concentrations of radioactivity in this period were below Radiation Protection Guide (RPG) values recommended by the Federal Radiation Council (FRC). The concentrations of radioactivity reported include contributions from all sources. No attempt has been made to separate any activity contributed by NRTS operations from that contributed by natural sources of radioactivity and by fallout from weapons debris.

The locations of the stations where samples of air, water, milk, and wheat are collected routinely are shown on the map at the end of this report. For the sake of uniformity, the picocurie (pCi) has been chosen as the standard unit of radioactivity in this report. One picocurie is equal to one trillionth of a curie, or 10^{-12} Ci. The symbol Ci, recommended by the International Union of Pure and Applied Physics for the curie, was adopted by the Idaho Operations Office, USAEC, in 1964.

ANALYTICAL LIMITS

The detection limits resulting from the current sampling and analytical methods are as follows:

Type of Sample	Type of Analysis	Detection Limit
Water	Gross Alpha	3×10^{-3} pCi/ml
	Gross Beta	6×10^{-3} pCi/ml
Milk	Iodine-131	20 pCi/liter
	Strontium-90	1.5 pCi/liter
Film Badges	Gamma	10 mr
	Beta	10 mrad
Low Volume Air-Telemetry	Gross Beta-Gamma	1.6×10^{-6} pCi/cc
	Iodine-131	3.6×10^{-6} pCi/cc
Wheat	Strontium-90	1 pCi/kg
	Cesium-137	11 pCi/kg
	Manganese-54	100 pCi/kg

OFF-SITE UNDERGROUND WATER

Low-level liquid wastes resulting from operation of the various facilities at the NRTS are released to the ground-water table through disposal wells and ponds located near each facility. Although liquid wastes are monitored at the NRTS before disposal, off-site underground samples are collected regularly. Most of these samples are taken from an area southwest of the NRTS since this is the prevalent direction of underground water flow. During 1964, 64 samples were collected on a semi-annual basis from 32 sampling stations. The analytical results indicated that there was no significant change from concentrations reported for 1963. The average concentrations of alpha and beta emitters were no more than 40% and 0.3% of the respective Radioactivity Concentration Guide (RCG) values. The alpha activity is attributed primarily to radioactive elements which are naturally present in the environment.

ON-SITE PRODUCTION WELL WATER

On-site samples were taken from the plant production wells in order to monitor potable water for detection and definition of possible sources of contamination. During 1964, 452 samples were collected from 22 sampling stations, most on a bi-weekly basis. Analyses of these samples showed that average concentrations of alpha and beta emitters were no more than 4% and 0.1% of their respective RCG values, again reflecting no change from the previous year.

OFF-SITE AIR FILTERS

During the year, data reported electronically from the radiation monitoring telemetry system replaced data previously derived manually from off-site air samples collected by means of a dual filter and a low-volume vacuum pump. The telemetry system has many operating capabilities not available in the previous system. Normal operations call for hourly reports by each station. These reports include information from:

Ion Chambers: These instruments measure ambient radiation levels in mr/hr.

GM Counters: HV-70 filter paper is cycled to a GM tube once a day. One GM tube measures the buildup of particulate activity over the day and another measures the decay of the activity collected the previous day.

Scintillation Counter: Air which has previously passed through the HV 70 particulate filter then passes through a carbon cartridge. For surveillance purposes, the activity measured is assumed to be iodine 131. This cartridge remains in place for periods up to 6 weeks.

Results of the data reported from the 15 telemetry stations indicate that the sum of the average concentration of gaseous iodine 131 and particulate activity in the atmosphere was no greater than 8% of the RCG value of 100 x 10^{-6} pCi/cc. This is about half of that observed the previous year.

OFF-SITE MILK

Analyses of iodine-131 and strontium-90 concentrations in milk were made on a monthly basis. Of the 160 radioiodine analyses, no sample was found to have a concentration greater than 20 pCi/liter or 20% of the RCG value. Of the 128 milk samples analyzed for strontium 90, the maximum activity was found to be 44 pCi/liter, or 22% of the RCG value of 200 pCi/liter. The average was 10% of the RCG. This reflects a slight reduction in iodine-131 levels from the previous year and a factor of 2.5 to 5 reduction in strontium-90 levels.

AREA MONITORING BADGES

Off-site film badges were collected on a monthly basis during the first half of the year and quarterly during the last half. The maximum radiation dose at a single location for the entire year, as measured by film, was 140 mr of gamma and 80 mrad of beta radiation. The minimum detection limit for this period was 80 mr of gamma and 80 mrad of beta, based on 8 film changes and a detection limit of 10 mr gamma and 10 mrad beta on each film. For the purpose of calculating the maximum dose, each statistically zero result was assumed to be at the detection limit. The reported maximum is therefore conservatively estimated to be the upper limit of the true dose at that location. Nevertheless, this dose is well below the RPG of 500 mr/year for an individual residing in the vicinity of an atomic energy installation.

WHEAT MONITORING

Monitoring of wheat for radionuclides continued in 1964. In the 6 samples analyzed, strontium-90 levels ranged from 7 to 30 pCi/kg with an average of 11 pCi/kg. Cesium-137 levels varied from 95 to 200 pCi/kg with an average of 155 pCi/kg. Manganese-54 concentrations varied from 500 to 1200 pCi/kg with an average of 790 pCi/kg. The presence of these radionuclides in wheat is attributed to worldwide fallout resulting from the atmospheric testing of nuclear weapons. A comparison of data from 1964 with that from the previous years indicates that while the levels of strontium 90 and cesium 137 decreased by a factor of 3 to 5, the manganese-54 content almost doubled. Although there is no ready explanation for this increase, selective uptake of manganese from the soil might be responsible. Although no RCG's pertaining to wheat have been established, the data indicate that wheat is not a significant contributor to the radiation dose received by the local population.

Error in Report Number 14

The RCG for airborne gaseous iodine 131 off-site is 100×10^{-12} $\mu c/cc$.

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION
THIRD AND FOURTH QUARTER 1964

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Production Well Water	32	Semi Annual	32	α 4×10^{-3} pCi/ml β 2×10^{-2} pCi/ml	$\alpha < 4 \times 10^{-3}$ pCi/ml $\beta < 1 \times 10^{-2}$ pCi/ml	α 10×10^{-3} pCi/ml β 300×10^{-2} pCi/ml
On-Site Production Well Water	22	Two Weeks	237	α 5×10^{-3} pCi/ml β 8×10^{-2} pCi/ml	$\alpha < 4 \times 10^{-3}$ pCi/ml $\beta < 1 \times 10^{-2}$ pCi/ml	α 100×10^{-3} pCi/ml β 3000×10^{-2} pCi/ml
Off-Site Air Filters	15	Continuous	Particulate	β-γ 37×10^{-6} pCi/cc	β-$\gamma < 5 \times 10^{-6}$ pCi/cc	β-γ 100×10^{-6} pCi/cc
			Gaseous Iodine	5×10^{-6} pCi/cc	$< 4 \times 10^{-6}$ pCi/cc	100×10^{-6} pCi/cc
Off-Site Milk	14	Monthly	Iodine-131 80	Iodine-131 $<$ 20 pCi/liter	Iodine-131 $<$ 20 pCi/liter	Iodine-131 100 pCi/liter
	11	Monthly	Strontium-90 73*	Strontium-90 26 pCi/liter	Strontium-90 16 pCi/liter	Strontium-90 200 pCi/liter
Off-Site Area Monitoring Badges	14	Quarterly	27	Maximum Dose/6 months γ 75 mr $\beta < 20$ mrad	Average Dose/6 months $\gamma < 40$ mr $\beta < 20$ mrad	γ 500 mr/yr β 3000 mrad/yr

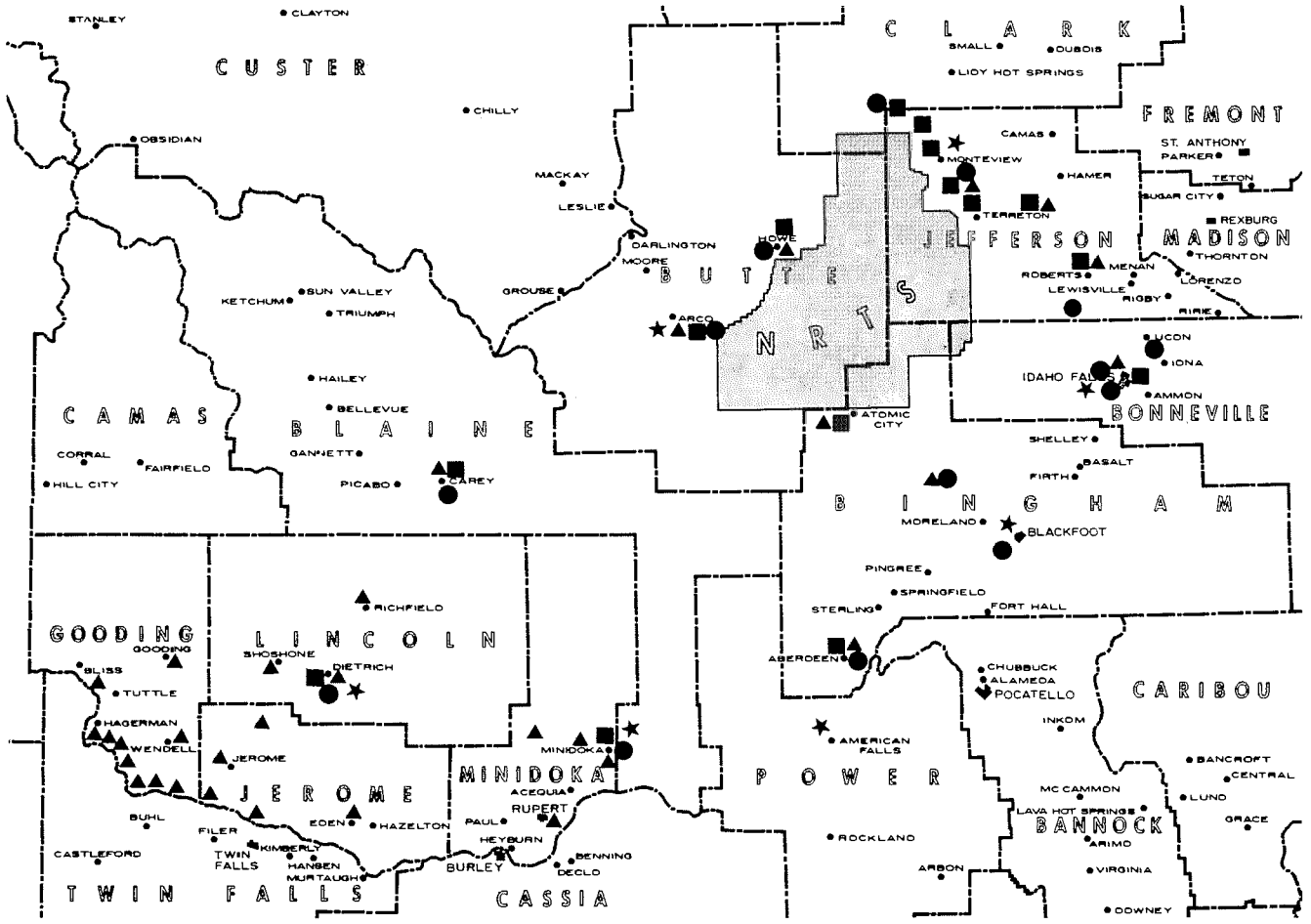
* Total samples analyzed for strontium-90 includes month of June 1964

ENVIRONMENTAL MONITORING DATA FOR THE NATIONAL REACTOR TESTING STATION

ANNUAL SUMMARY 1964

Type of Sample	Number of Stations	Approximate Frequency of Collection	Total Number of Samples	Maximum Activity	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water	32	Semi Annual	64	α 9×10^{-3} pCi/ml β 2×10^{-2} pCi/ml	$\alpha < 4 \times 10^{-3}$ pCi/ml $\beta < 1 \times 10^{-2}$ pCi/ml	α 10×10^{-3} pCi/ml β 300×10^{-2} pCi/ml
On-Site Production Well Water	22	Two Weeks	452	α 7×10^{-3} pCi/ml β 10×10^{-2} pCi/ml	$\alpha < 4 \times 10^{-3}$ pCi/ml $\beta < 2 \times 10^{-2}$ pCi/ml	α 100×10^{-3} pCi/ml β 3000×10^{-2} pCi/ml
Off-Site Air Filters	15	Continuous	Particulate	β-γ 37×10^{-6} pCi/cc	β-$\gamma < 4 \times 10^{-6}$ pCi/cc	β-γ 100×10^{-6} pCi/cc
			Gaseous Iodine	40×10^{-6} pCi/cc	$< 4 \times 10^{-6}$ pCi/cc	100×10^{-6} pCi/cc
Off-Site Milk	14	Monthly	Iodine-131 160	Iodine-131 < 20 pCi/liter	Iodine-131 < 20 pCi/liter	Iodine-131 100 pCi/liter
	11	Monthly	Strontium-90 128	Strontium-90 44 pCi/liter	Strontium-90 21 pCi/liter	Strontium-90 200 pCi/liter
Off-Site Area Monitoring Badges	14	Monthly & Quarterly	108	Max. Dose/year γ 140 mr β < 80 mrad	Average Dose/year γ < 105 mr β < 80 mrad	 γ 500 mr/yr β 3000 mrad/yr

NATIONAL REACTOR TESTING STATION
ENVIRONMENTAL MONITORING PROGRAM
1964



U. S. ATOMIC ENERGY COMMISSION
Idaho Operations Office - Health and Safety Division
National Reactor Testing Station

ENVIRONMENTAL MONITORING REPORT NO. 16
First & Second Quarter
1965

To evaluate the continued impact of operation of AEC installations on the general levels of radioactivity in the environment, concentrations of radioactivity in air, water, and foodstuffs have been monitored on a continuing basis. Periodically, reports are issued to the public which describe and evaluate data gained from this radiological surveillance. Environmental monitoring data for the National Reactor Testing Station (NRTS) for the first half of 1965 reveal that concentrations of radioactivity in this period were below Radiation Protection Guide (RPG) values recommended by the Federal Radiation Council (FRC). In actual practice, the values used at the NRTS are those listed in AEC Manual Chapter 0524. In choosing applicable standards for drinking water, credit has been taken for the fact that no significant amounts of radium 226 and radium 228 have been released to the NRTS environs. The concentrations of radioactivity reported include contributions from all sources. No attempt has been made to separate any activity contributed by NRTS operations from that contributed by natural sources of radioactivity and by fallout from weapons debris. The locations of the stations where samples of air, water, milk and wheat are collected routinely are shown in Figure 1.

For the sake of uniformity, the picocurie (pCi) has been chosen as the standard unit of radioactivity of this report. One picocurie is equal to one trillionth of a curie, or 10^{-12}Ci. The symbol Ci, recommended by the International Union of Pure and Applied Physics for the curie, was adopted by the Idaho Operations Office, USAEC, in 1964.

OFF-SITE UNDERGROUND WATER

Low-level liquid wastes resulting from operation of the various facilities at the NRTS are released to the ground-water table through disposal wells & ponds located near the facilities. Although liquid wastes are monitored at the NRTS before disposal, off-site underground samples are collected regularly. Most of these samples are taken from an area southwest of the NRTS since this is the prevalent direction of underground water flow. During the first half of 1965, 32 samples were collected on a semi-annual basis from 32 sampling stations. The average concentrations of alpha and beta emitters were less than 4% and 9% of the respective Radioactivity Concentration Guide (RCG) values. The alpha activity is attributed primarily to radioactive elements which are naturally present in the environment.

ON-SITE PRODUCTION WELL WATER

Samples were taken from the plant production wells on the NRTS in order to monitor potable water for detection and definition of contamination. Two hundred and one samples were collected from 22 sampling stations during the first half of 1965, most on a bi-weekly basis. Analyses of these samples showed that average concentrations of alpha and beta emitters were less than 0.2% and 0.4% of their respective RCG values.

OFF-SITE AIR FILTERS

Results of the data reported from the 15 radiation telemetry stations indicate that the sum of the average concentrations of gaseous iodine 131 and particulate activity in the atmosphere was less than 6% of the RCG value.

Normal operations of the present radio telemetry system calls for hourly reports by each station. These reports include information from:

Ion Chamber: These instruments measure ambient radiation levels in mr/hr.

GM Counters: HV-70 filter paper is cycled to a GM tube once a day. One GM tube measures the buildup of particulate activity over the day and another measures the decay of the activity collected the previous day.

Scintillation Counter: Air which has previously passed through the HV-70 particulate filter then passes through a carbon cartridge. For surveillance purposes, the activity which is measured hourly is assumed to be iodine 131. This cartridge remains in place for periods up to 6 weeks.

OFF-SITE MILK

Routine analyses of iodine 131 and strontium 90 concentrations in milk continued on a monthly basis during the first half of 1965. However, during the latter part of May, significant concentrations of iodine 131 were detected in the Idaho Falls area Grade A milk. An intensive milk sampling program was initiated during the period May 25 through June 20, 1965. The highest concentration measured during this period was 310 pCi/liter. This increase in radioactivity was attributed to fallout from the Chinese nuclear test on May 14.

Of the 72 routine radioiodine analyses, only 8 samples were found to have concentrations greater than 20 pCi/liter. As indicated in Table 1, the average iodine 131 levels, including the May-June samples, do not exceed 23% of the RCG values. Strontium 90 concentrations in the same 72 samples showed the maximum activity to be 24 pCi/liter or 12% of the RCG value with an average value of only 7%.

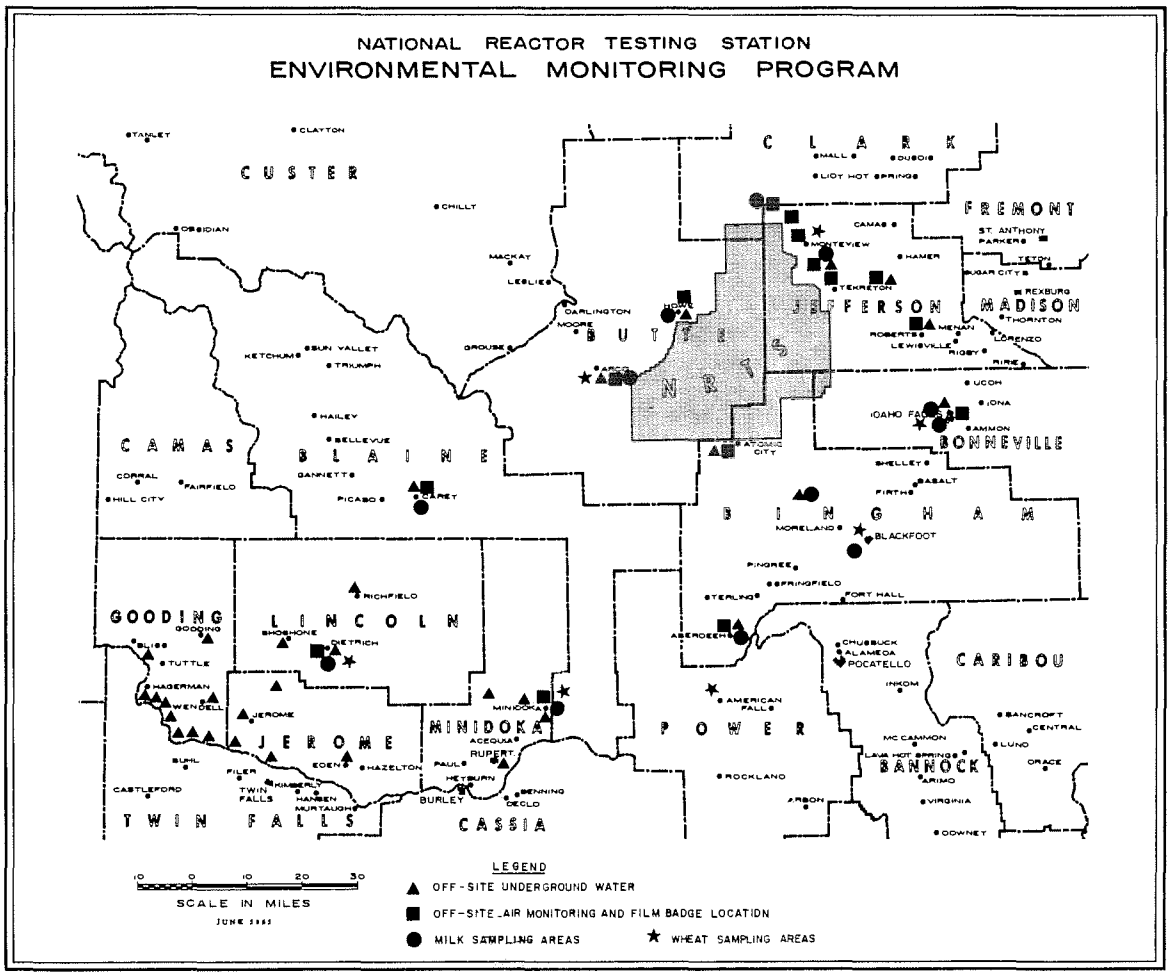
AREA MONITORING BADGES

Off-site film badges were collected on a monthly basis during the first half of the year. The maximum radiation dose at a single location for any month as measured by film, was <10 mr of gamma radiation. The minimum detection limit for the six months was 60 mr of gamma, based on 6 film changes and a detection limit of 10 mr gamma on each film. For the purpose of calculating the maximum dose, each statistically zero result was assumed to be at the detection limit. The reported maximum is therefore conservatively estimated to be the upper limit of the true dose at that location. Natural background radiation levels at film badge locations vary, but studies made prior to nuclear operations at the NRTS showed that normal background levels were of the order of 100 - 150 mr/yr. This indicates that NRTS operations add no significant radiation to surrounding areas.

TABLE 1 ENVIRONMENTAL MONITORING PROGRAM DATA JANUARY - JUNE 1965

Type of Sample and Units	Number of Stations	Approximate Frequency of Collection	Type of Analysis	Minimum Level of Detection	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water (pCi/liter)	32	Semi-Annual	Alpha Beta	3 6	4 20	< 4 9	100 100
On-Site Production Well Water (pCi/liter)	22	Two Weeks	Alpha Beta	3 6	4 100	< 4 < 10	3,000 3,000
Off-Site Air (pCi/m^3)	15[a]	Continuous	Beta-Gamma Iodine-131	1.6 3.6	6 6	< 2 < 4	100 100
Off-Site Milk (pCi/liter)	12	Monthly	Iodine-131 Strontium-90	20 1.5	63 24	< 23 13	100 200
Off-Site Area Monitoring Badges (mr)	15[a]	Monthly	Gamma	10	< 10	< 10	170/yr.

a. Changed from 15 stations to 12 in April of 1965



U. S. Atomic Energy Commission
Idaho Operations Office - Health and Safety Division
National Reactor Testing Station

Environmental Monitoring Report No. 17*
Third and Fourth Quarter
and
Annual Summary 1965

Data from the environmental monitoring network on and around the National Reactor Testing Station (NRTS) revealed that NRTS operations did not significantly contribute to the environmental radiation levels in 1965. Radiation levels and radioactivity concentration measurements were well below levels recommended as a threshold of concern by the Federal Radiation Council (FRC). The Radiation Protection Guides (RPG) and Radioactivity Concentration Guides (RCG) used at the NRTS, which are established in AEC Manual Chapter 0524, are based on FRC recommendations. In choosing applicable standards for drinking water, credit has been taken for the fact that no significant quantities of radium-226 or radium-228 have been released to the NRTS environs. The concentrations of radioactivity reported include contributions from all sources. No attempt has been made to separate activity contributed by NRTS operations from that contributed by natural sources of radioactivity or by fallout from weapons debris. Samples of air, water, milk and wheat are collected routinely at stations shown in Figure 1.

For uniformity, all radioactivity measurements in this report are in picocuries (pCi). One picocurie equals one trillionth of a curie, or 10^{-12}Ci. A curie is that quantity of radioactive material that disintegrates at the rate of 3.7×10^{10} atoms per second (approximately the disintegration rate of one gram of radium).

OFF-SITE UNDERGROUND WATER

Low-level liquid wastes from various operating facilities at the NRTS are released to the ground-water table from disposal wells and ponds near each facility. Before disposal the liquid wastes are carefully monitored at the NRTS and, as an added safeguard, off-site underground water samples are collected and analyzed regularly. Most samples are collected from the area southwest of the NRTS, the prevalent direction of underground water flow.

*To evaluate the continued effect, if any, of AEC installations on general levels of radioactivity in the environment, the radioactivity in air, water and foodstuffs is regularly monitored by the Atomic Energy Commission. Public reports are issued periodically describing and evaluating the data gained from this radiological surveillance.

During 1965, 64 samples were collected at 6-month intervals from 32 sampling stations. The analytical results indicated no significant change from concentrations recorded during 1964. Average concentrations of alpha and beta emitters were no more than 4% and 9% respectively of the Radioactivity Concentration Guide (RCG) values. The alpha activity is attributed primarily to radioactive elements naturally present in the environment.

ON-SITE WELL WATER

On-site samples were taken from the plant production wells in order to detect and define possible sources of contamination. During 1965, 435 samples were collected from 22 sampling stations, most on a biweekly basis. Analyses of these samples showed that average concentrations of alpha and beta emitters were no more than 0.2% and 0.4% of their respective RCG values, again reflecting no change from the previous year.

OFF-SITE AIR

Results of the data from 15 radiation telemetry stations indicates that the sum of the average concentrations of gaseous iodine-131 and particulate activity in the atmosphere was less than 8% of the RCG value during 1965.

Normal operations of the present radio telemetry system calls for hourly reports by each station. The reporting instruments and functions are as follows:

Ion Chamber - These instruments measure ambient radiation levels in mr/hr.

GM Counters - HV-70 filter paper which collects airborne particles is cycled to a GM tube once a day. One GM tube measures the day's buildup of particulate activity and another GM tube measures decay of activity collected the previous day.

Scintillation Counter - Next, the filtered air passes through a carbon cartridge. For surveillance purposes, the activity collected by the carbon cartridge is measured hourly by the scintillation counter and is assumed to be iodine-131. This cartridge remains in place for periods up to 6 weeks.

OFF-SITE MILK

Routine monthly analyses for iodine-131 and strontium-90 concentration in milk were conducted during 1965. During the latter part of May, significant concentrations of iodine-131 were detected in Idaho Falls Area Grade A milk. Consequently an intensive milk sampling program was initiated during the period May 25 through June 20, 1965. The highest concentration measured during this period was 310 pCi/liter, attributed to fallout from the Chinese nuclear test on May 14, 1965. The RCG value for iodine-131 in milk is 100 pCi/liter.

Of the 144 routine radioiodine analyses, only 10 samples were found to have concentrations greater than 20 pCi/liter. As indicated in Table 2, the average iodine-131 levels, including the May-June samples, do not exceed 23% of the RCG values. Strontium-90 activity in the same 144 samples showed a maximum concentration of 24 pCi/liter, or 12% of the RCG value, with an average value of only 13 pCi/liter or 7% of the RCG value.

AREA MONITORING BADGES

Off-site film badges were collected montly in 1965. The maximum radiation dose measured by film at a single location for the entire year was < 120 mr of gamma radiation, based on 12 film changes and a detection limit of 10 mr gamma on each film. For the purpose of calculating the maximum dose, each statistcally zero result was assumed to be at the detection limit. The reported maximum is therefore conservatively estimated to be the upper limit of the true dose at that location. Evaluation of the airborne effluent data from reactor operations in 1965 indicates that the actual off-site gamma dose from NRTS operations was less than 2 mr. This is less than two percent of natural background radiation. Natural background radiation levels at film badge locations vary, but studies made prior to nuclear operations at the NRTS showed that normal background levels were of the order of 100-150 mr/yr.

WHEAT MONITORING

Monitoring of wheat for radionuclides continued in 1965. In the 8 samples analyzed, strontium-90 levels ranged from 11 to 37 pCi/kg with an average of 26 pCi/kg. Cesium-137 levels varied from 60 to 118 pCi/kg with an average of 88 pCi/kg. Analyses for manganese-54 in 8 wheat samples collected in the fall of 1965 showed no activity above the detection limit of 100 pCi/kg. The average concentration of manganese-54 in 1964 wheat samples was 790 pCi/kg. This decrease may possibly be attributed to different weather conditions and fallout patterns during the two years under consideration. Although no RCG's pertaining to wheat have been established, the data indicated that local wheat could not be a significant contributor to the radiation dose received by local consumers.

TABLE 1 ENVIRONMENTAL MONITORING PROGRAM DATA July --December 1965

Type of Sample and Units	Number of Stations	Approximate Frequency of Collection	Type of Analysis	Minimum Level of Detection	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
OFF-Site Underground Water (pCi/liter)	32	Semi-Annuel	Alpha Beta	3 6	4 17	< 4 8	100 100
ON-Site Production Well Water (pCi/liter)	22	Two Weeks	Alpha Beta	3 6	7 52	3 8	3,000 3,000
OFF-Site Air (pCi/m^3)	12	Continuous	Beta-Gamma Iodine-131	1.6 3.6	56 12	< 6 < 4	100 100
OFF-Site Milk (pCi/liter)	12	Monthly	Iodine-131 Strontium-90	20 1.5	50 22	< 21 < 11	100 200
OFF-Site Area Monitoring Badges (mr)	12	Monthly	Gamma	10	< 10	< 10	170/yr.

TABLE 2 ENVIRONMENTAL MONITORING PROGRAM DATA--Annual Summary 1965

Type of Samples and Units	Number of Stations	Approximate Frequency of Collection	Type of Analysis	Minimum Level of Detection	Maximum Activity of Single Sample	Average Activity Per Sample	Radioactivity Concentration or Radiation Protection Guides
Off-Site Underground Water (pCi/liter)	32	Semi-Annual	Alpha Beta	3 6	4 20	< 4 < 9	100 100
ON-Site Production Well Water (pCi/liter)	22	Two Weeks	Alpha Beta	3 6	7 100	< 4 < 10	3,000 3,000
Off-Site Air (pCi/m^3)	15*	Continuous	Beta-Gamma Iodine-131	1.6 3.6	56 12	< 4 < 4	100 100
Off-Site Milk (pCi/liter)	12	Monthly	Iodine-131 Strontium-90	20 1.5	63** 24	< 23 < 13	100 200
Off-Site Area Monitoring Badges (mr)	15*	Monthly	Gamma	10	< 10	< 10	170/yr.

* Changed from 15 stations to 12 in April 1965
** This was the highest concentration measured at routine bulk sampling points.
A concentration of 310 pCi/liter was the highest level observed in raw milk collected at individual farms (see text).

Figure 1