H-DIVISION PROGRESS REPORT
April 20 - May 20, 1956

REF: H-236

I. ADMINISTRATION (Thomas L. Shipman, M.D., Leader)

A. General Remarks

At the request of the Engineering and Construction Branch of ALOO, members of H-Division and GMX-5 participated in a test detonation at Project Sugar. The purpose of this test, which was officially known as Operation Quick and Dirty, was to determine whether or not an appropriate cover of dirt would effectively scavenge radioactive material involved in a detonation in an assembly facility. The structure used was an ammunition storage igloo at the Pantex Ordnance Depot. The inside dimensions of this igloo were approximately 20 ft x 40 ft x 10 ft with concrete walls and earth embankment on three sides. As used in this test, the entire structure was covered with coarse, washed gravel to a minimum thickness of 10 ft. The assembly which was used was a spherical assembly of approximately 125 lbs of H.E. containing a capsule of 500 curies of RaLa. The assembly was detonated at approximately 3:00 p.m. on May 3, 1956. Photographs taken by members of Sandia Corporation indicated that the entire thickness of gravel over the roof rose in the air approximately 20 ft and then fell back inside the igloo. Save for one wisp, which apparently resulted from a venting at the weak point just above the entrance, no dust or smoke went above this level. The small amount of dust which remained in the air traveled to the northeast but practically no contamination could be found in its path. A zone of activity stretched out in a cigar shape directly east of the igloo in line with the entrance to the structure. It was felt that this principally represented the shine from the 500 curie source which was now distributed fairly evenly throughout the gravel inside, and which on the other three sides was shielded by the concrete walls and undisturbed earth outside.

It was our general conclusion that such a thickness of coarse gravel did, in fact, successfully scavenge the radioactive material and did also successfully prevent any thermal updraft which would have carried active material high into the air. It was felt that the experiment offered a reasonable starting point for the design of an assembly facility for plutonium-containing optimized weapons.

B. Personnel (May 1 - May 30)

1. New Hires

5/22	CARDELL, Jeanette M.	H-4	Administration	CASUAL
5/31	ALLISON, James T.	H-4	Biophysics	SUMMER
5/31	GARCIA, Maliton M.	H-5	Field	"
5/31	HUDSON, William A.	H-1	General Monitoring	"

2. Terminations

5/2	LARKINS, Louise M.	H-4	Biophysics
5/4	BEAN, Henrietta G.	H-1	CMR Bldg. Monitoring

3. Total Personnel

SM	59
Military	2
SCP	88
Military	1
ASC	43
TOTAL	193*

*Includes 4 casual, 2 Rehired, and 3 Summer Employees.

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II. GROUP H-1, MONITORING (Dean D. Moyer, Leader)

A. General

1. Ray Pederson returned from monitoring duty at PPG on May 5.

2. Glenn Vogt, Jim Schaeffer, Tony Garcia, and Carl Buckland were on a monitoring assignment at Pantex Ordnance Plant, Amarillo, Texas, between April 30 and May 4.

3. Virginia Jackson has assisted Group H-4 in the capacity of switchboard operator for the past ten days.

4. Special environmental air tests were started this period and taken on top of the Administration Building. The samples are counted for beta-gamma by H-1 with our new counting equipment.

5. The experiment of detonating 150 pounds of explosives containing a 500-curie RaLa source and enclosed within a concrete bunker was accomplished at Pantex on May 3. No person received an overexposure and the maximum contamination to skin was 8 mr/hr. The RaLa dispersal was measured in relation to a staked line from the bunker. An isodose map was drawn to scale indicating the swath of activity that extended eastward to about 1000 feet and having a width of approximately 60 feet.

6. With the aid of K-Stock, CMR personnel and the Glass Blowing Shop, glassware equipment was fabricated for two mercury distillation units. The overall cost was estimated at $50.00. Both units are currently operating and recovering

16 pounds a day, with a recovery value of $15.00 a pound. The mercury is bubble-washed twice with a 20% nitric acid solution, dried with a solvent and filtered. It is then distilled twice. The clean mercury will be given to K-Stock with a formal statement of its purity from radioactive contaminants.

B. Incidents

1. On May 1, it was suspected that [redacted] of the old CMR-10 Group received sufficient exposure to his fingers and palm to inflict a RaLa beta burn. Probable skin damage became visible on about May 8. It was estimated that [redacted] could have received several thousand rep of exposure at the surface of the skin. All of the exposure must have been received through rubber gloves inasmuch as no contamination was detected on the skin surface.

2. On May 3, Group H-7 reported a possible spill of Pu in the basement of the Waste Treatment Building. Spots on the floor up to 1000 were detected, the bench 5000, and the sinks over 20,000 c/m. H-7 readily reduced all of the levels to tolerance or less with no swipe, with the exception of one sink that read 3.5 K. This latter spot has since been reduced to tolerance.

III. GROUP H-3, SAFETY (Roy Reider)

A. Accident Record

Man-hours Worked	[illegible]	[illegible]
Number of Disabling Injuries	[illegible]	[illegible]
Number of Days Lost	84	3,056
Frequency (Accidents per 1,000,000 Man-hours)	2.6	2.6
Severity (Days Lost per 1,000,000 Man-hours)	43	551

B. Industrial Accident Experience

1. On May 8, [redacted] GMX-3, received an abrasion and contusion of his left lower leg with secondary infection when his leg was caught between an electric cart and the wall. Lost time: 5 days.

2. On or about April 30, [redacted] CMR-DO, received a beta burn on the middle finger of his left hand presumably during a clean-up operation following a barium-lanthanum run at Ten Site. It is believed that [redacted] handled a "hot" piece of equipment during the decontamination process. Estimated lost time: 13 days.

C. Fires

While the Laboratory did not suffer any fire loss for this report period, the Los Alamos Fire Department did suffer the loss of a 500 gallon tanker truck.

The truck was lost while the firemen were bringing under control a brush fire that had been started as a result of a shot fired at Bayo Canyon on April 26.

D. Motor Vehicle Accidents	January 1 to May 1, 1956	1955
Miles Driven	650,018	1,806,745
Number of Accidents	11	30
Rate (Accidents per 100,000 Miles)	1.7	1.66
Total Cost	$1,114.38	$3,731.36
Accident Cost per 100,000 Miles	$ 171.43	$ 206.00

There was one motor vehicle accident [redacted] which occurred when the driver of a Government vehicle backed into a parked [redacted] private vehicle: $27.09

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E. General Remarks

1. James Stearns returned from the [redacted] on April 25.
2. J. Robert Penland departed for the [redacted] on April 25.
3. C. Austin Burch is at the Pacific Proving Grounds.
4. Ellis L. Stout, on loan from CMR Division, departed for the Pacific Proving Grounds on May 14.
5. The Group Leader attended the President's Safety Conference May 15-16 and the 'Employ the Physically Handicapped' Conference May 17. Both conferences were held in Washington, D. C.
6. On May 1, a Los Alamos Civil Defense Test Evacuation was held. While the Laboratory cost and degree of participation is not yet tabulated by the Payroll Office, it is believed that this surprise test was a success within the Laboratory.

IV. GROUP H-4, BIOMEDICAL RESEARCH (Wright H. Langham)

A. General Remarks on Group Activities

J. Storer, I. U. Boone, J. Furchner, J. Sayeg, and K. T. Woodward attended the Radiation Research Society meeting in Chicago May 17-19. I. U. Boone presented a paper entitled "The Effect of Spleen or Marrow Shielding on the Incidence of Successful AK Leukemia Implants in Heterologous Strains of Irradiated Mice."

I. U. Boone also presented a paper on "The Increased Uptake of C^{14}-Isoniazid by Mycobacterium Tuberculosis in the Presence of Pyridoxal" at the Houston meeting of the Society of American Bacteriologists, April 29-May 3.

Ted Trujillo was at the Animal Husbandry Department of the University of Utah, May 14-15, to assist on a collaborative project.

[redacted]

Gordon Gould gave a talk to the Department of Medicine, New York University Postgraduate Medical School, in New York City on April 26 entitled "TheBiosynthesis of Sterols and Factors Controlling It". He also attended a meeting of the Cardiovascular Study Section, USPHS, at Atlantic City on April 27-29, and conferred with Dr. Tabern and his associates at Abbott Laboratories on April 30.

A seminar by Jean Sabine was given on clinical applications and radiation effects on May 25 to Group H-4.

The following personnel attended the annual meeting of the Southwestern and Rocky Mountain Divisions of the AAAS at State College, New Mexico, April 30-May 2. The indicated papers were presented at the Physical Sciences Section: F. N. Hayes, "The Liquid Scintillator Program of the Los Alamos Biomedical Research Group"; Vernon N. Kerr, "The Quenching of Liquid Solution Scintillators by Organic Molecules"; and D. G. Ott, "A Study of Recoil-Triton Labeling of Organic Compounds". The following papers were presented at the Zoological Sciences Section at the same meeting: C. C. Lushbaugh, "Somatic Death as a Mitotic Arrestor"; and K. T. Woodward, "The Correlation of Body Potassium with Body Water".

Wright Langham attended the meeting of the American Industrial Hygiene Association in Philadelphia April 26-27, where he presented a paper on "Application of Urine Assays to the Determination of Body Burden of Radioactive Materials". While in Philadelphia he talked to the staffs of Smith, Kline and French and Squibb Laboratories on the H-4 Biomedical Research prog[redacted]

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B. Group Publications

1. Manuscripts Completed

"The Relative Biological E[redacted] in Mammalian Systems", by J. B. Storer, P. S. Harris, J. E. Furchner, and W. H. Langham. Submitted for publication in [redacted]

"Effects of Total Body X-Irradiation and Plutonium Injection on the Cholinesterase of Erythrocytes and Brain", by Jean C. Sabine with the technical assistance of Helen M. Miller and Dorothy J. Nickolai. Submitted for publication in AMERICAN JOURNAL OF PHYSIOLOGY.

"The Inactivation of Cholinesterases by Gamma Radiation", by Jean C. Sabine, with the technical assistance of Dorothy J. Nickolai and Helen M. Miller. Submitted for publication in AMERICAN JOURNAL OF PHYSIOLOGY.

2. Papers Published

"Assay of Tritium Activity in Body Fluids with Use of a Liquid Scintillation System", by W. H. Langham, W. J. Eversole, F. N. Hayes, and T. T. Trujillo. J. Lab and Clin. Med. 47: 819-825, May 1956.

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"Relation between Bacteremia and Death in Mice Following X-ray and Thermal Column Exposures", by I. U. Boone, K. T. Woodward, and P. S. Harris. J. Bacteriol. 71: 188-195 (1956).

"Oxazole Quaternary Salts", by D. G. Ott, F. N. Hayes, and V. N. Kerr, J. Am. Chem. Soc. 78: 1941 (1956).

"The Production of Poikilothermia in Mice by Oxazole Quaternary Salts", by C. C. Lushbaugh, F. N. Hayes, W. H. Langham, D. G. Ott, and P. C. Sanders. J. of Pharm. and Expt. Therap. Vol. 116, No. 3, March (1956).

C. Major Areas of Progress in Sections

1. Biochemistry Section (R. Gordon Gould, Leader)

Nothing new to report.

2. Biophysics Section (Payne S. Harris, Leader)

Nothing new to report.

3. Organic Chemistry Section (Wright H. Langham, Leader)

a. Recoil-Triton Labeling of Organic Compounds (Ott). A study was made to determine the feasibility of labeling pyridoxine (Vitamin B_6) with tritium by means of recoil-tritons produced by the Li^6 (n,α) H^3 reaction. The organic compound was ground in a mortar with lithium carbonate; the mixture (total of two grams) was placed in a Teflon cylinder and irradiated in port W-4 in the thermal column of the Water Boiler. The samples, after decay of the quite noticeable fluorine-F^{18} activity (formed by $O^{16}(t,n)F^{18}$ reaction) had decayed, were then assayed by liquid scintillation counting for gross tritium content. The organic product was obtained by extraction of the reaction mixture with acetone followed by recrystallization of the organic product to constant specific activity. It appears that the method will be useful in producing labeled compounds for biological studies only when high activities are not required. The procedure should prove quite valuable, however, for the relatively easy synthesis of labeled compounds at levels of activity which would be quite satisfactory for such applications as isotope dilution analysis. Further studies in the direct labeling of organic compounds with tritium will involve a method which appears to be capable of producing the high specific activities desired for biomedical research (F. S. Rowland, Princeton University, private communication, on the use of accelerated tritons). Such investigations will depend on the availability of an accelerator for this purpose.

4. Radiobiology Section (John B. Storer, Leader)

a. Studies on Repair Rates in Mammals Exposed to Various Ionizing Radiations (Furchner, Storer). It has been postulated that radiation injury to

mammalian systems consists of two components, one reparable and the other irreparable. It has further been suggested that radiations producing a high lineal energy transfer (LET) in tissues produce proportionately more of the irreparable component than radiations with low LET. In an attempt to demonstrate whether two such components exist, the following experiments were performed using fractionated doses of X rays to mice. In the first series, mice were exposed to a single dose of 350 r. At various time intervals thereafter they were again irradiated and the dose required to produce 50% mortality in 30 days was determined. From these data it was then possible to determine the "percentage of initial dose" remaining at various times after this initial dose.

By plotting log of the per cent initial dose remaining as a function of time it was found that the resulting curve could be approximated by two expomentials, one with a $T_{1/2}$ of 1 to 1.5 days and the other with a $T_{1/2}$ in excess of 12 days. These two exponentials have been tentatively identified as expressions of two rates of repair, one fast (reparable) and the other slow (irreparable).

Since it seemed likely that different rates would be found with different biological systems, it was decided to use the same type of experimental design and determine repair rates for intestinal damage. Since the so-called "3-1/2-day death" in mice is generally believed to be a reflection of intestinal damage, it was decided to use the LD_{50} at 100 hours as the biological endpoint.

An analysis of a plot of log per cent against time again revealed that two exponentials adequately described the data. The fast component of repair in this case showed a $T_{1/2}$ of about 1 hour, while the slow component was very similar to that for 30-day lethality with a $T_{1/2}$ of somewhat more than 12 days. This latter component was displaced upward, however, indicating that there may be somewhat more residual damage to the system responsible for 100-hour death than the system for 30-day death.

All the above calculations are approximate and will be refined at a later time. There are certain reasonable inferences which require further investigation. Two obvious inferences are a) that the 100-hour death should show a degree of rate dependence for delivery of dose not seen for 30-day death, and b) that residual damage to the intestine should be greater at long times (weeks) than the residual damage to the marrow (believed responsible for 30-day death). It is anticipated that these studies will be extended to radiations with high LET (such as neutrons) to determine whether repair is influenced by LET.

5. Radiopathology Section (C. C. Lushbaugh, Leader)

Nothing new to report.

V. GROUP H-5, INDUSTRIAL HYGIENE (Harry F. Schulte, Leader)

A. Beryllium

A survey has been made at Pajarito Site during work with blocks of beryllium and uranium by Group H-2. Air concentrations of beryllium were found to be very low. The accompanying uranium concentrations were somewhat higher and indicated the need for precautions in handling this material. Swipe samples as well as air samples were collected and these also showed an insignificant amount of beryllium.

During this period, 103 air samples for beryllium were collected in the Beryllium Shop and in the Filter House. All of the air concentrations were found to be below permissible levels.

The use of a new reagent for the fluorescent determination of beryllium is now being investigated. This is needed because it is extremely difficult to obtain the Morin reagent having a high degree of purity as is required with the present method. Solubility studies on beryllium compounds are being continued and the hydroxides as well as oxides are now being stud[illegible]

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B. Uranium

A survey was made at Sigma Building to determine the effectiveness of the ventilation on the tuballoy break press [illegible] breathing zone of the operator during breaking and showed concentrations from 80 to 145 d/m/M^3. Since the operation is very infrequent, respirators [illegible] give adequate protection. However, the study served to show the need of improving local exhaust ventilation.

Two air samples were collected in Sigma Building where uranium oxide, pitch, and lamp black were being mixed and fired in the first stage of the firing cycle. Both samples showed concentrations of uranium well below permissible levels, even though considerable dust was generated during mixing.

C. Plutonium

Cascade impactor samples have been taken to measure the particle size of dust in the ducts from Room 201 at DP West. The median particle size downstream from the filter was much lower than that upstream, indicating that the material escaping the filter is of somewhat smaller particle size than that of the incident stream. A special test was made in this duct using an HV-70 paper followed by a glass paper. Assuming the glass paper to be 100 per cent efficient, the efficiency of the HV-70 paper ranged from 98 to 99.7 per cent. Since the Cambridge filters installed in the ducts are similar to the HV-70 paper, and they show efficiencies of only 90 per cent, it seems apparent that the duct filters are improperly sealed

[redacted]

and that there is a loss of material around the filter.

One member of the Group spent eight days during this period assisting in studies on plutonium fallout remaining from the one-point detonation test. Ground readings were made in the plutonium contaminated area and air samples were collected while driving through the area to determine the r[redacted]nt [redacted]tami-nation.

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D. Mercury

The first mercury spill in the new administration Building was reported by Group J-16. After the spill had been cleaned up, no detectable mercury vapor was found. Mercury vapor measurements were run by Group N-1; no mercury vapor was detected. Tests have been made repeatedly for mercury vapor in the air at the H-1 mercury still located in the decontamination laboratory. The results indicated that the operator is exposed to moderately heavy concentrations for short periods of time. Efforts are being made to improve the ventilation around this equipment. Consultation has also been given to Group H-3 on procedures to control mercury hazards at TA-33.

E. Trichloroethylene

During this period, a "boil over" occurred in the large degreasing tank located in the main shop building at TA-33. It was necessary to evacuate most of the shop for a period of one hour. It is believed that the accident occurred because of the accumulation of a small quantity of hydrochloric acid in the trichloroethylene which subsequently reacted with finely divided aluminum dust. After the accident, a sample of the remaining trichloroethylene was analyzed and found to contain 0.32 per cent HCl. Similar accidents have been reported elsewhere, where aluminum dust was present and the acid content ranged from 0.1 to 0.2 per cent. In the future, the acid content will be checked periodically and alkali added to neutralize any acid formed. Analyses for acid have also been made on the solvent in the degreasing tanks at S Site and TD Site. No acid was found in the former and 0.6 per cent HCl was found in the sample from TD Site. The large degreaser in the shop building was recently relocated to an area where cross-drafts from open doors will blow solvent vapors from the tank. Baffles to control this air flow have been recommended and have been installed.

F. Lead

Four additional air samples have been taken in Building 340 at S Site during mixing of lead oxide and plastics. All samples showed concentrations several times the permissible level. Respirators were worn during the periods of high dust

[redacted]

concentration which occurred during weighing and mixing of the lead powder. This study is being continued.

G. Gold

Group CMR-6 Plating Laboratory requested assistance during stripping and replating with gold of one of the K Division reactor parts. Since this was to be done at TD Site, which is a "cold" area, a pilot operation was set up by CMR-6 and H-5. This test indicated that no contamination was picked up or spread, and it was concluded that the TD Site Plating Laboratory could be used.

H. Carbon Monoxide

An SP-4 workman became ill during loading of a truck in C Shop in which a gasoline-powered fork lift was used. The operation was duplicated and a series of air samples were collected with both trucks running as they were during the incident. The air concentration of carbon monoxide was found to be 200 ppm, which is high enough to produce headache and nausea after several hours exposure. These facts were reported to Group H-2 and instructions were given to coordinate unnecessary idling of the motors.

I. Epon Resins

At the request of Group H-5, Mr. Fred Ingram of the University of California at Berkeley investigated precautions used at Livermore while working with Epon resins on certain new operations. A report was prepared by Mr. Ingram on their precautions and this report has been circulated to users in the various groups at Los Alamos. Experimental work by SD-1 with this material is being observed and no excessive exposures have been reported.

J. Fission Products

Stack sampling on J-2 Building has been started during their operations with filters from the current test shot. The purpose is to determine the total quantity of fission products volatilized during ashing; 21 such samples have been collected to date.

K. Thorium

Samples for ionium (Th^{230}) are still being analyzed for the Mallinckrodt Chemical Works. However, a request has been made to discontinue such analyses in the near future. All concentrations found have been quite low.

L. Antimony

The use of methyl fluorine is being investigated as a reagent for the determination of antimony.

M. Ventilation

Much of the time of the Field Section during this period has been devoted to final reviews of preliminary plans for ventilation in the new Sigma Building. This building will contain more complete and varied types of ventilation than any other building at Los Alamos.

Consultation has been given to N-Division on proper ventilation for a proposed metallurgical laboratory and also on the design features of the new N-Division facilities at the Nevada Test Site.

A check on a reported malfunctioning hood over a cyanide salt bath revealed a defect which was corrected by simple baffling. Assistance has also been given on the design of a chemical fume hood for Group H-6 in the new Administration Building. Modifications were recommended on the existing blower and filter system at the incinerator to enable their use on plutonium decontamination work.

An inspection was made and a conference held with Group SD-2 regarding proposed local exhaust ventilation in the Press Building [redacted] the machining of oralloy and graphite.

N. Noise

A survey was made of available rooms in the Administration Building to locate facilities for audiometric testing by Group H-2. A suitable room was found but will require some modification to lower the noise level by an acceptable factor.

O. Miscellaneous

Group H-5 is doing alpha monitoring during assembly operations of Redwing devices at S Site. High volume air samplers are being operated on the roof of HEL Building to determine whether there is any change in background due to fallout from Redwing. An acid detergent equipment used for cleaning was analyzed and found to contain 33 per cent hydrochloric acid. Adequate protective measures have been recommended.

A portable supplied-air apparatus has been loaned to GMX-2 for use in conjunction with operations involving tetranitromethane. Since this program appears to be a continuing one, similar equipment has now been ordered by GMX-2.

A proposed law by the State of New Mexico regarding radiation protection is being reviewed. A study has been made of possible health hazards from machining graphite which had been part of the old Clementine reactor. Results have indicated that the radioactive contamination during machining is negligible. Advice has been given to Group P-5 on possible ozone hazards during operation of their proposed new high voltage generator.

A paper on Incineration of Radioactive Waste has been prepared for Wright Langham in his capacity as a member of the NBS Committee on this subject. This paper has also been accepted for presentation at the meeting of the Health Physics Society in June.

Five members of the Group attended the meeting of the American Industrial Hygiene Association in Philadelphia. Doctor Harriet Hardy of MIT recently visited the Group for a discussion of beryllium problems.

P. Statistical Summary

1. Air samples collected or field tests made for:

Background sampling	31
Beryllium	105
Carbon monoxide	6
Fission products	21
Lead	4
Mercury (labs)	4
Normal uranium	8
Plutonium (cascade impactor)	4
TNT	10

2. Plans approved 5

3. Sanitation

Water samples collected 25

4. Analyses completed

Air

Antimony	10
Beryllium	30
Bismuth	52
Cadmium	8
Lead	5
Thallium	44
TNT	13
Uranium (fluorometric)	79

Biological (urine)

Americium	2
Ionium (Th^{230})	46
Plutonium	140
Polonium	9
Protactinium	3
Radium	9
Tritium	63
Uranium (fluorometric)	127
Uranium (radiometric)	58

Miscellaneous

HCl in trichloroethylene	2
Fission products in water	1
Beryllium swipes	9
Tritium in water	2
Uranium in tissue (fluorometric)	79

[redacted]

VI. GROUP H-6, RADIOLOGICAL PHYSICS (Harvey I. Israel, Leader)

A. General

Edwin Bemis left for Eniwetok on April 10. Simon Shlaer, Acting Group Leader, departed the following day for the same destination. William Johnson assumed responsibilities of Acting Group Leader.

B. Special Problems (Simon Shlaer, Leader)

No report available due to the absence overseas of the Section Leader.

C. Meteorology Section (Maj. Orin W. Stopinski, OIC)

1. General

Major Stopinski was on temporary duty overseas in connection with Operation Redwing during the report period.

Ralph S. Jones of the U. S. Weather Bureau visited Los Alamos on the 16th of May in regard to possibility of the Weather Bureau furnishing an additional instrument shelter and thermometers for installation south of SM-43 at ground level so that the daily records will be as representative as possible.

The Sante Fe district of the U. S. Forest Service was furnished with temperature, wind and precipitation data for Los Alamos for the past several [illegible] to assist in computing the local forest fire hazard. Arrangements have been made with the Los Alamos Fire Department to relay via radio [illegible] precipitation report to the Forest Servic[illegible]

2. Operations

Weather support for Bayo Opera[illegible] 26 April and 10 May.

D. Nuclear Field Test Section (W. S. Johnson, [illegible])

1. General

a. Project 56, NTS

William Johnson and Harry Jordan, H-5, completed a resurvey of Area 11, NTS, for information on the movement of alpha contamination since the last one-point detonation. Air samples of dust generated in the contaminated area were collected. Preliminary results indicate a decrease in alpha active material available for resuspension. Soil samples of the surface and to depths of three inches were collected also. These are being analyzed for plutonium by the Industrial Hygiene Laboratory, Sandia Corporation. Their initial results reflect the same loss in the soil concentration as the air samples.

The completed report on fallout activities has been postponed in order to incorporate the data obtained from these later samples.

[redacted]

[redacted]

The microscope slides collected for particle radioautography have been surveyed for the selection of those best suited for this study.

b. Redwing

W. R. Kennedy has been overseas for the entire report period.

Assistance was given to Group H-1 on the establishment of a sampling station at Los Alamos for the detection of debris from Redwing detonations.

c. Miscellaneous

The investigation of fallout from Teapot in the Black Lake, New Mexico, area was completed with the transmittal of a report on H-Division's participation to the Test Division, ALOO.

One day was spent in a meeting in ALOO at which time the latest results from Area 11, NTS, were reported.

Roscoe Goeke, Physical Sciences Advisor, Test Division, ALOO, spent one day discussing problems of mutual interest.

2. Laboratory Activities (A. O. Dodd, B. F. Schnap)

a. Approximately 200,000 gallons of chemical waste from CMR Building were sampled and assayed for alpha activity. All batches were released to H-7.

b. Cooling water and drinking water from CMR Building and DP West Site were sampled and assayed for alpha activity. No detectable activity was found in either source at the CMR Building nor in the drinking water at DP West. Cooling systems at DP West with previous histories of contamination continued to exhibit trace amounts of plutonium alpha activity.

c. A glass cylinder of a dissolving unit in Room 213 exploded. There was a possibility of contamination with Pu of the steam used in this operation. The steam condensate of a tank outside Bldg. #2, serving the dissolver room, was analyzed for Pu. No Pu was detectable. As reported above, the coolant water of Bldg. #2, which could also have been contaminated, was free of Pu. It may be noted that the steam condensate from the steam tank is eventually discarded at Bldg. #35.

d. A. O. Dodd was on loan to H-7 for th[illegible] are covered in the Progress Report of th[illegible]

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VII. GROUP H-7, INDUSTRIAL WASTE (C. W. Christensen, Leader)

A. Plant Operation

1. TA-45, Tech Area.

Operation has been routine throughout the period. Flow from both technical areas (TA-1, TA-3) contributing waste to the plant has increased but

[redacted]

overtime operation has not yet been required. Quality of raw waste has not substantially changed.

About 100 gallons of cadmium-cyanide waste has been received for treatment.

2. TA-21, DP West.

On May 16 a spill occurred in one of the DP operations. The material was cleaned up with large quantities of Tide and sodium citrate. The spilled material together with that cleaned out of the lines by the high concentration of detergents resulted in a waste concentration greater than one million counts per minute per liter. The high activity in the raw waste, together with the adverse effect of the detergent, resulted in an effluent considerably above the MPC for plutonium and necessitated the return for retreatment of some 35,000 gallons of effluent. The detergent contained in the effluent affected the treatment of the raw wastes with which it was mixed causing more trouble in treatment. However, this waste was all treated by the end of the period and operation is once again back to normal.

The line between the floculator and settling tank was cleaned very satisfactorily with acid. Treatment rate was increased from 45 to 65-70 gallons per minute.

A calcium chloride mixing tank has been installed to facilitate special treatment of a waste containing large amounts of fluor

3. TA-35, Ten Site.

The plant has not been operated during this period. Operation will be resumed in the near future.

B. Research and Development

1. Plant Operations

a. TA-45, Tech Area. Laboratory investigation of sludge recirculation as an aid to clarification and count removal was started. Results are as yet inconclusive and further work will be done. The effect of detergents on activity removal is also being investigated.

b. TA-21, DP West. Laboratory work on batch treatment methods for the caustic fluoride waste was continued. Results of treatment of the waste with calcium chloride have been very erratic (in small scale laboratory experiments) and further work will be necessary in order to develop a method which will adequately remove fluorides. This waste represents a substantial proportion of the special wastes received for batch treatment at the DP West plant and is one of the most difficult to treat adequately.

c. TA-35, Ten Site. The group recently procured a large, movable table to assist in the ion exchange studies. The table holds 72 acid bottles and is equipped with timers which move the table forward at the required time interval to allow the effluent from a column to be collected in successive bottles. This allows the columns to be operated at night over a 16-hour period and relieves the investigator of much routine work in controlling flows, changing sample bottles, etc.

The third series of the laboratory resin column studies has been completed. Results to date indicate that materials commonly used in decontamination operations (Versene, citric acid, Dreft, etc.) in concentrations of 100 ppm adversely affect the efficiency of the resin. Additional work will be done to determine more exactly the degree of this effect as well as to determine remedial measures. It is also noted that addition of calcium and magnesium to the extent of 40 or 50 ppm increases the retention of Sr^{90} by the resin.

Experimentation with use of cement as a means of fixing the activity in various wastes has been continued. Laboratory work, at present, is directed toward development of a satisfactory method of disposal of sludge from Ten Site waste treatment plant operations. One of the most pressing needs is a satisfactory method for properly stirring the cement sludge mixtures with the high proportion (about 2:1) cement to sludge ratio. Results to date indicate that relatively small amounts of activity are leached from the cement blocks prepared by mixing various proportions of cement and sludge. As expected the higher cement:sludge ratios produce blocks which are dense and apparently durable while the low cement:sludge ratios produce more porous and less durable blocks. The amount of activity leached is in inverse proportion to the amount of cement in the block. The study will be continued over a long period since the critical material in Ten Site sludge is relatively long-lived Sr^{90} and information concerning long-range effects of various leaching fluids is necessary in order to determine whether or not the procedure provides a satisfactory permanent disposal method. The effect of treatment of the blocks with commercial water repellent materials, both as admixtures to the cement sludge mixtures and as coatings, is being investigated.

2. Clay Fixation Studies

The effect of temperature of [illegible] containing Sr^{90} was determined and it was found that leaching of the activity is in inverse proportion to the temperature and the curve, above [illegible], plotted on log-log paper. Since temperatures above 1200°C are considered impractical, this figure has been chosen as the top temperature to which the clays are subjected.

[redacted]

At 1200°C there appears to be very little difference in leachability among the different clays used. This finding is in contrast to work done elsewhere which indicates that the activity must first be fixed to the clay by ion exchange mechanism and then fired. If this is true, clays of high ion exchange capacity only would be effective whereas our findings indicate that retention is similar in clays with capacities varying from 10 to 100 meq per 100 grams. This study is being expanded by adding stable Sr to the mixture in excess of the exchange capacity to determine its effect on leaching. Various glaze mixtures were obtained from CMR-6 and, although the glazing did decrease leachability to a certain degree, it is felt that the decrease is not of great enough magnitude to justify the additional glazing step.

It has been determined that the amount of activity leached from bricks is the same for solid blocks as well as for blocks that have been crushed to fine pieces. It was thought that leaching would be a function of surface area exposed but this is apparently not the case. Reasons for this anomaly are being investigated.

A proper method of leaching these samples, as well as the cement blocks is necessary to properly evaluate the conditions. Previous investigation has allowed the material to remain in contact with the leach water for varying periods of time. However, this does not allow for concentration of the leached material in the water and the leachability might well be a function of this concentration.

A series of leaching samples has been [redacted] to determine the effect of changing leach water at different time periods as well [redacted] leach water.

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3. Laboratory

Because of the large amount of routine work required, very little [redacted] was accomplished by the Laboratory Section during this period. A series of difficulties with the beta counters only increased the routine work load.

4. Environmental Studies

During the period 1 canyon sample, 3 river water samples, and 17 test well samples were received from USGS personnel and were analyzed for the required radioactive and mineral constituents. In general, the values obtained for these samples were in agreement with the results obtained from similar samples in the past.

Three soil samples from Acid Canyon were analyzed for gross alpha, gross beta, gross gamma, and uranium activity. The results were quite low and in agreement with previous samples from the same canyon.

[redacted]

In continuing the study of the results of the accidental discharge of water in Mortandad Canyon in February, eight more soil samples were collected and analyzed. Apparently more activity was discharged into the canyon because the activity levels in the samples nearest the discharge had increased considerably over the previous sample. This later discharge has, of course, thrown the study into a state of confusion. However, it is planned to continue the study to determine the movement and decay of radioactivity in this canyon and, barring any additional accidental discharges, some valuable data should be obtained.

CMR-6 has experienced no little difficulty in preparing the tuff cores described in last month's report and this has delayed the start of the study on movement of plutonium through local soils. However, some preliminary work has been accomplished in determining the capacity of finely divided tuff particles to adsorb plutonium at various pH values.

Mr. Abrahams of USGS, Albuquerque, spent a considerable amount of time rehabilitating the driven wells in and around Pueblo Canyon. These wells had sanded up and some of them had been washed away. They are being repaired with plastic pipe and are being reinforced so as to make them more permanent. Other new wells are being installed to measure ground water levels in the canyon.

C. Miscellaneous

A chapter on "Biological Methods for Treatment of Radioactive Wastes" has been prepared and submitted for inclusion in "Nuclear Engineering Handbook" to be published by Addison-Wesley, Inc.

Mr. Rex and Mr. Hutchinson attended the 11th Industrial Waste Conference at Purdue University May 15-17.

June 21, 1956

THOMAS L. SHIPMAN, M. D.,
Health Division Leader

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