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H-DIVISION PROGRESS REPORT

January 20 - February 20, 1957

REF: H-255

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

A. General

The incident of February 12 in which the Godiva assembly passed criticality so far as to blow itself apart carries a very worthwhile object lesson from the point of view of health and safety. Following the two fatal accidents of 1945 and 1946, the Pajarito Site was constructed at considerable expense for critical assembly work. The majority of the expense was determined by safety considerations. It would appear that the recent incident is ample justification of the extensive safety factors which were built into the Site.

The proposed program for studying chronic effects of low doses of radiation in mice has come to an abrupt halt because of the development of an epidemic of Salmonella in our mouse colony. This has necessitated killing off our entire mouse colony (12.000 animals), canceling our orders to the breeder, and preparing to make an entirely new start. This may necessitate canceling out plans to participate in Operation PLUMBBOB (Project 39.7). The apparent cause of the epidemic was the receipt of infected animals from the breeder and the inadequacy of our present animal quarters to care for the large number of animals which must be kept on hand for long term experiments.

Very real progress is being made in the development of a Marinelli-type whole body crystal counter. Excavation of a subbasement room has been started and the crystal has been ordered. One hundred ten tons of prewar steel is being obtained from Arco. The only costs involved in obtaining this steel, which is to be used as shielding, will be that of cutting and transporting. All design work for the counter is complete.

All urines to be assayed for plutonium are now being routinely counted by means of nuclear track plates. This method, which was copied from our friends at Hanford, gives considerable increase in sensitivity over the chemical method utilizing coprecipitation with bismuth phosphate.

Interesting results have been obtained from a study to determine the ability of Sr^{90} and Cs^{137} to penetrate the volcanic tufa which is so prevalent in this region. The strontium penetrates more readily than the cesium but a solution of strontium at a concentration of 1000 cpm/ml would require 1700 years or about 80 half-lives to penetrate to a depth of 100 ft. The Cs^{137} with a comparable half-life penetrates very much more slowly.

[redacted]

The Division Leader, while attending one of the regular meetings of the Biomedical Program Directors in Washington, was given an opportunity to confer with General Starbird and place before him the problem of arranging for training of military personnel to do alpha monitoring in the event of an accident involving extensive or high level plutonium contamination. It is felt that by the first of next month it will be possible to report real progress along this line. It is felt here that some one military organization, possibly the Explosives Ordnance Demolition Groups of the Air Materiel Command, should be designated to carry out emergency monitoring at any place in the country should a serious accident of this sort occur. There are nine such groups in existence at the present time and it is assumed that they would, of course, receive advice and support from AEC and its contractors and from the Air Research and Development Command. It is obvious that of the AEC contractors, LASL has had the widest experience with high level and extensive alpha contamination and the greatest familiarity with the problems involved.

B. Personnel (2/1/57 - 3/1/57)

1. New Hires

2/1	HARMESON, Robert H.	H-7	Engineering
2/11	DUMMER, Jerome E.	H-1	General Monitoring
2/25	BOYD, Richard Lee	H-5	Field
2/27	RAMSEY, Olus G.	H-5	Laboratory

2. Terminations

2/8	BARTHELL, Janet Sue	H-1	General Monitoring

3. Total Personnel

SM 67
Military 1
SCP .....
Military 1
ASC 49
225*

*Includes 5 casual employees.

[redacted]

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

A. Incidents

1. On the afternoon of January 21, H-7 reported a possible spill of sludge containing Pu within the parking lot area south of TA-45. It was found that a special tank type trailer had started leaking in the parking area. The trailer was moved into the decontamination pit. No contamination could be detected at the time since the suspected areas were so wet; however, the area was roped off for a

later survey. Sand was spread over the visible track marks. A few days later the tracks were found to read in excess of 20,000 c/m. For this reason, H-1 supervised the removal to a depth of 1 1/2 feet of a big zig-zag strip of asphalt and a layer of dirt near the settling tanks. The tank was eventually removed from the trailer and placed in the contaminated dump. The trailer was then decontaminated by H-1.

2. Following the routine pickup of Pajarito film badges, it was found that [redacted] had received an exposure of 13.5 r to the body and 18 r or more to the wrist. Subsequent investigation indicated that [redacted] had reamed the glory hole of Godiva and had been working with fissioned components from the assembly for rather long periods of time while fabricating some fission counters. [redacted] and [redacted] were also overexposed while assisting [redacted] The floor area immediately under Godiva was surveyed and found to have in excess of 20,000 c/m swipe. The actual exposures were thought to have taken place in the latter part of January.

3. At 3:00 p.m. on February 12, the Godiva assembly went supercritical with such force that components were thrown about the Kiva. When H-1 arrived on the scene, as much as 7 r/hr was detected 12 feet from the nearest component. Fortunately, no personnel were at close range and the film badges, including the blank within the Main Administration Building, indicated zero exposure from the burst. The actual cleanup of the area was not started until the 15th in order to allow the fission products to decay to a lower level. Once the parts of 235 were removed, the external radiation problem was nil and the cleanup could progress with only the alpha contamination as the problem. Gross quantities of U^{235} in excess of 20,000 c/m were detected on at least 1/3 of the Kiva area. Air samples taken immediately after the accident and during the cleanup were of no significance with the exception of the air count taken on February 18 that read 361 d/m/m^3 while the floor areas were being cleaned. Final decontamination was completed on February 20. Up to 1500 c/m still remain on a few inaccessible places such as the crane and catwalk.

B. Special Monitoring

1. Air samples were continued during the early part of the period in the vicinity of Godiva during and immediately following shutdown. The air samples indicated over tolerance air concentrations for the standard fission products tolerance of 2.22 x 10^3 d/m/m^3. However, since the actual tolerance that should be utilized is based on a sliding scale in relation to the age of the fission products, the air samples were not above tolerance. None of these samples registered significant alpha activity.

2. An activated corroded copper septum removed from the P-12 cyclotron was ground by P-12 under the supervision of H-1. It read 15 rep/hr at contact, 1.2 rep/hr at 8 inches, and about 200 mrep/hr at chest level, allowing all the way from approximately 5 minute tolerance time to the hands to 5 hours per 2 weeks at chest level. The work was accomplished by carrying the septum to TA-42 in a plastic bag, with the grinding being done in a well ventilated hood. [redacted] of P-12 received 160 mr to the wrist and 55 mr to the body.

3. The 200 curie Co^{60} source belonging to J-16 was moved temporarily to a trailer east of the Administration Building. Up to 9 mr/hr was measured 400 feet away along the main road. Further use of the source in this location was discouraged; therefore, J-16 moved it to our source vault area and pointed the source radiation out over the canyon. It was still necessary to post a short distance south of the fence.

4. On February 7, H-1 surveyed the landscape surrounding the present Kiva #2 at Pajarito while Godiva was producing a steady level of radiation. The purpose was to determine the environmental radiation levels from the present Godiva as a basis for the construction of a new Kiva within the canyon. A large number of intermediate neutrons were present and 9 points were found to be in excess of the tolerance rate. A tolerance time of only 1.3 hours per week was calculated at a distance of 450 feet. One of the proposed locations near the main road to Kappa would produce 230 mrem/hr on the road. The policy, of course, is not to exceed 1 mrem/hr, although the present Kiva can produce as much as 3 mrem/hr at the roadway at this time. H-1 proposed another location northwest of Kiva #1.

5. White Sands sent 10 men to Pajarito to study the effects of radiation from Godiva upon their equipment. Due to the high radiation levels that had been present and the contamination under Godiva, it was thought advisable to have the personnel covered by H-1. They, in turn, contaminated their shoes up to 1000 c/m during their work but the shoes were readily decontaminated. The highest exposures were 410 mr to the body and 560 mr to the wrist. H-1 assisted in the decontamination of some of their equipment and they were advised as to the induced radiation of up to 16 mr/hr on some of their equipment.

6. H-1 covered the dismantling of tritium equipment in one of the GMF-9 hoods. The majority of the glassware was cut into small pieces by a glass blower, placed in plastic bags and boxes, and then buried by H-1. Later the hood itself was decontaminated by H-1.

[redacted]

C. Special Work

1. Following completion of the annual film badge exposure report, it was found that a total of 26 people in 1956 exceeded 5 rem.

2. Decontamination

a. The experiments were completed on producing a [redacted] efficient cleanup of platinum. Tests indicated a 6% cleanup. Twenty-two per cent more metal in 65% of the time was cleaned with the new method than was previously accomplished. By cleaning 2 kilos of material our cost was $165. as compared to $533 for a commercial vendor.

b. Representative pieces of decontaminated precious metal previously contaminated with over 20,000 c/m alpha were counted in a nose swipe counter and found not to exceed an average count of 2.4 c/m as compared with no detectable count using a standard alpha counter with a PeeWee probe. The highest piece found registered 5.6 c/m ± 1. In other words, a more sensitive instrument does not appear to dispute the validity of our post decontamination measurements.

c. A mild explosion occurred in the CMB-8 area of CM Building involving U^{233}. The group attempted to clean the area without too much success and called in H-1 Decontamination on February 11. After the first week the conditions looked favorable for re-occupancy; however, on February 18 the levels were found to be high again. It is thought to be caused by an air drop over the face of the hoods or leaks in the duct work. During the process of cleaning the floors again, some liquid leaked through the floor into the room below producing 1500 c/m, so that the downstairs area also had to be cleaned.

3. The position of a chart coordinator or environmental study man was established. His duties are to collect data from Esterline-Angus charts, summarize and report his findings so that the data can be referred to at a later date.

4. The total exposures received by LASL personnel at Redwing and NTS for 1956 were compiled. Thirteen persons exceeded the 5 rem/yr from a total of test exposures alone. However, their exposures within LASL had been [redacted]

5. The work of revamping the Monitor's [redacted]

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

A. Accident Record

	[redacted]	1956
Manhours Worked	[redacted]	5,717,855
Number of Disabling Injuries	7	17
Number of Days Lost	4.4	6,355
Frequency (Accidents per 1,000,000 Manhours)	15	3.0
Severity (Days Lost per 1,000,000 Manhours)		1.110

[redacted]

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B. Industrial Accident Experience

1. On January 14, [redacted] H-4, received ultraviolet burns of the eyes when he cleaned the ultraviolet lights of the animal rooms at HRL Building while the lights were burning. Lost time was 4 days.

2. On January 22, [redacted] GMX-3, received burns of the left foot when he spilled hot water on his shoe. Lost time was 3 days.

C. Fires

There were no Laboratory fires during the report period.

D. Motor Vehicle Accidents	Jan. 1, 1957 to Feb. 1, 1957	1956
Miles Driven	123,563	1,829,960
Number of Accidents	2	22
Rate (Accidents per 100,000 Miles)	1.62	1.20
Total Cost	$ 92.29	$2,310.69
Accident Cost per 100,000 Miles	$ 74.50	$ 126.00

There were two motor vehicle accidents during January involving Laboratory personnel. One was a backing accident and the other [illegible] hit a stop sign.

E. General

1. Charles Dalziel, Professor of Electrical Engineering, University of California, visited the Laboratory on February 4 and 5. While here he consulted with several P-Division Groups on electrical safety, held a Seminar on "Hazards of Impulse Currents". and spoke at Colloquium on "Effects of Electricity on Man." Professor Dalziel has specialized in electrical risk for many years and his visit was a valuable contribution to the Laboratory.

2. An indoctrination tour of Security and Fire Protection personnel was given at TA-46 (main Laboratory and point facilities) on February 13.

3. Austin Burch visited the Nevada Test Site on February 12-16 to observe the testing of the balloons in connection with preliminary studies for Operation Plumbobb.

4. The following meetings were attended by a member of the Group:

a. P-Diviision - Liquid Hydrogen Bubble Chamber progress.

b. CMF-9 and CMB-6 - Uranium hydride program involving high pressures and temperatures at Cryogenics Building.

c. Engineering - representatives from the AEC and LASL met to formulate a standard code for the identification of pipe contents (color and labeling).

d. Two Los Alamos Traffic Board meetings.

e. K-Division - problems arising in the disposal of large amounts of sodium, both clean and contaminated were discussed.

[redacted]

f. Discussions were held with Engineering with respect to the parking problems at the Administration Building.

5. Roy Reider gave a report of the meeting of the Executive Committee of the ASSE to the New Mexico Chapter of the American Society of Safety Engineers in Albuquerque on January 25.

6. Roy Reider was Guest Speaker at a [redacted] Albuquerque on February 6, on the subject "Effects of Atomic Energy on Risk to Civilization."

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

A. General

Group H-4 has not issued a monthly report since November 1956 for the following reasons:

1. Cessation of reporting was considered desirable in order to work out a more satisfactory form. Reports in the past have been too long to fit adequately into the Monthly Report of the Division and too much detail to satisfy the requirements of the Director's Office. Beginning with this month, an attempt will be made to be more consistent with the above needs. Hereafter, it will consist only of a section on general remarks and a section on research progress. The latter will consist of one-paragraph summaries of only those research projects in which some definitive results were obtained. Brevity will be the watchword.

2. During the past three months Group H-4's research program suffered a serious setback as a result of a Salmonella epidemic in the mouse colony. This epidemic resulted in the loss of all chronic experiments of the Radiobiology Section. It was necessary to kill off the entire mouse colony, cancel all orders of animals from the breeder, and start making plans to reorganize completely the approach to our studies of chronic RBE. From the point of view of lost time and effort, this unfortunate occurrence was extremely expensive. It was necessary to kill off approximately 12,000 animals (a large number of which had already been exposed several times to various radiation sources over the Project), and to cancel our immediate plans to participate in Operation Plumbbob. The apparent causes of this incident were the receipt of infected animals from the breeder and the inadequacy of our present animal quarters for conducting chronic experiments on large numbers of animals. The inevitable result of this situation will be a serious drop in the research progress of the Radiobiology Section and the expenditure of considerable funds to revise the animal quarters, re-establish the mouse population, and re-institute the chronic experimental program.

[redacted]

During the next several months the research program of Group H-4 will be as follows:

1. Development of the Marinelli-type low background gamma spectrometer. Considerable progress on this project has already been made.

a. Excavation of a room in the subbasement to house the apparatus is already under way.

b. Procurement of the crystal and associated equipment has been started.

c. One hundred ten tons of steel for the [illegible] are being procured from Arco, Idaho. [illegible] and transportation.

d. Design of the shield and other [illegible] installation are completed.

2. Increase and emphasize monitoring [illegible] foodstuffs:

a. Arrangements have been made through the American Dry Milk Institute to obtain approximately forty 100-lb samples per month of powdered dried milk from the various milk-producing areas of the United States. A sampling ring has been put around the Nevada Test Site.

b. A dried blood sampling program has been arranged through the American Meat Institute to obtain routine samples for Cs^{137} analysis of meat products from approximately six of the major packing-house areas.

c. Monitoring of Cs^{137} content of local foodstuffs is being continued in cooperation with a local supermarket.

3. Development of low-level strontium counting capability. The role of strontium in the world-wide fallout problem makes it desirable to develop a very low-level Sr^{90} counting capability. No progress has been made on this project.

4. Chronic toxicological studies with Cs^{137}. Experiments were already under way on this project but were discontinued because of the destruction of the animal colony to control the Salmonella epidemic.

B. Research Progress

1. Biochemistry Section (Harry Foreman, Acting Section Leader)

Nothing to report.

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

a. Transmission Measurements in Concrete. Fission neutron transmission characteristics of normal concrete, Magnetite, concrete containing Colemanite, and an aluminum-containing concrete were measured. Measurements with tissue-equivalent ionization chambers of actual dose transmission indicated that all of these

materials (with the exception of Magnetite) had a 1/10th value layer of approximately one foot. The 1/10th value layer for Magnetite was approximately 8-1/2 inches.

b. Cs^{137} Monitoring. For progress see Section 2 under General.

3. Organic Chemistry (Wright Langham, Section Leader)

Nothing to report.

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

a. Early Biochemical Effects of Ionizing Radiations. Measurement of serum glutamic-oxaloacetic transaminase activity of rabbits exposed either to total body or localized X irradiation of 550 r showed a 300% increase over that of non-irradiated controls 24 hours after exposure.

Two rapid colorimetric methods for the measurement of transaminase activity in blood and tissues have been developed.

b. Retention and Excretion of Alkali Metal Radioisotopes. Using the whole body Human Counter, the rates of turnover of Na^{22}, Rb^{86}, and Cs^{137} in man have been measured. These turnover rates are approximately 12, 80 and 150 days, respectively.

c. Effect of Neutrons on Fertility of Male Mice. Studies of the effect of fractionated doses of neutrons (14 Mev and fission energies) and gamma rays on fertility of male mice showed that 320 rads of gamma rays delivered over a 10-week period did not produce complete sterility, while a total dose of only 44 rads of fission neutrons delivered in two weeks produced a complete sterility lasting for 17 to 21 weeks. Fourteen Mev neutrons were less effective than fission neutrons but more effective than X rays.

d. Chronic Effects of Ionizing Radiation. Ninety per cent of these experiments were wiped out because of the Salmonella infection.

5. Radiopathology Section (C. C. Lushbaugh, [illegible])

Nothing to report.

V. GROUP H-5, INDUSTRIAL HYGIENE (Harry [illegible])

A. Evaluation and Control Work

1. Routine Exposures.

During this period routine air sampling was carried out for beryllium, cadmium, hydrogen cyanide, lead, ozone, trichloroethylene, and TNT. A total of 101 air samples were collected and no significant overexposures were found.

2. New Materials

Since February 1, H-5 has provided indicating paper for the use of CMB-2 and CMB-4 personnel during the preparation and loading of arsine gas. To date,

there have been no accidental gas leakages and the results on the paper have been negative. This work will be continued and the arsine exposures will be followed during future work at W Division.

3. Ventilation

Laboratory tests have been completed on the ring hoods designed for use in the new Radiochemistry Building by J-11. After testing, the best design was selected and submitted to J-11. Further checks will be made when they are installed in the new building.

A set of new filter bags for the large vacuum cleaner system in TU Building has been coated with zinc oxide fume by the Field Section. This should greatly increase their filtering efficiency and prevent the escape of uranium oxide dust. The filters have now been installed but no tests have been made as yet. In the same area, recommendations have been made for a local exhaust system for Delta Building. The Fabrication Section of CMB-6 has installed a welding area and such miscellaneous equipment as a swaging machine in this building.

A survey has been completed of the exhaust ventilation requirements at DP East. This survey was made in cooperation with Eng-2 and recommendations have

[redacted]

C. Miscellaneous

At the request of Eng-2, Group H-5 cooperated in a study of the effluent from the Zia hot mix asphalt plant on South Mesa. The air co[redacted]ion and particle size of dust being carried in the exhaust stack was [redacted] and reported to Eng-2 and to the Zia Company.

A noise survey was made of the ventilation system for the tool grinding shop. Recommendations for corrective action have been submitted to the Shops Department and to the Engineering Department.

Work has continued at the old Graphic Arts location. The ventilation recently installed now appears to be adequate and there have been no further complaints from operators. Both the air sampling results for trichloroethylene and the urine results for trichloroacetic acid confirm the improvement provided by the new ventilation. Ventilation plans for Graphic Arts in the new Administration Building have been reviewed and additional recommendations were submitted to Eng-2.

The Field Section Leader presented a lecture on the "Industrial Hygiene Aspects of Radiation Hazards" at the Johns Hopkins School of Hygiene and Public Health.

Mr. Herbert Walworth, Director of Industrial Hygiene for the Lumbermen's Mutual Insurance Company, spent a week with Group H-5. During this period, he was shown many aspects of control of radiation hazards and conferred with the Group on industrial hygiene problems.

More than 1000 high school students toured HRL Building during a special "Open House". Among the features of this visit was a brief demonstration and lecture on industrial hygiene and an exhibit and lecture of radiation counting in the H-5 count room.

D. Statistical Summary

1. Air samples collected or field tests made for:

Beryllium	26
Cadmium	1
Hydrogen cyanide	12
Lead	[redacted]
Ozone	[redacted]
Silica dust	3
Trichloroethylene	[redacted]
TNT	[redacted]

2. Plans approved [redacted]

3. Sanitation

Water samples [redacted]

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4. Analyses completed

Air	
Beryllium	29
Chlorinated hydrocarbons	144
Lead	5
Ozone	5
TNT	5
Biological (urine)	
Americium	4
Chlorinated hydrocarbons	10
Fission products	13
Mercury	12
Plutonium	213
Thallium	3
Thorium (radiometric)	[illegible]
Trichloroacetic acid	104
Tritium	70
Uranium (fluorometric)	125
Uranium (radiometric)	29
Miscellaneous	
Beryllium on swipes	7
Plutonium in soil	28
Uranium in soil	47

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

A. Special Problems (S. Shlaer)

1. Work in Progress

a. The radon source has been connected into the thoron apparatus. It has been set up in such a manner as to offer no health hazard.

b. Tests of drying columns for drying thoron containing air show that silica gel absorbs about 20% of the thoron while both calcium chloride and Dririte absorb only about 0.1% of the thoron.

c. The neutron scattering equations assuming the cosine reradiation function has been programmed for the 704 machine and is being debugged.

d. By interpolation and some extrapolation of White's values, the photoelectric coefficients of all elements have been determined for the energies used by White. These values have been plotted against Z and energy yielding smooth curves. With the use of these curves it is possible to determine the coefficient for all elements at all energies except in the region of the L edges.

e. The method of obtaining the Compton and pair production coefficients for all elements has been coded for the 704 machine and is now being debugged.

f. Some preliminary comparison data on the converted Pee Wee and the Rudolph have been collected at the Water Boiler and DP West. These suggest the need

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for more such data. A great deal of difficulty was experienced in keeping the Rudolph operating. This may argue against the adoption of this instrument for general monitoring use.

It is now planned to build a scintillation type instrument like one designed by Hornyak at Brookhaven. Although this detector would probably not have an energy dependence as desirable as that of the Rudolph, it would have several advantages over it in other ways. It would be easier to maintain and could easily be converted to measure other radiations.

g. Several scintillation type alpha detecting plates of the GE probe have been ordered. These will be mounted on 5 inch diameter photomultipliers rather than the 2 inch ones in an attempt to improve their geometry across the entire scintillator plate surface.

h. The review of the translation of the [redacted] document on precise dosimetry for X rays has been completed and the translation is being retyped.

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2. Work completed

Control for the X-ray equipment partially on hand have been completed, installed, and checked in their operation.

B. Meteorology Section (Orin W. Stopinski)

1. Work Completed

a. Bayo Canyon. Field support for Bayo Canyon activities was provided on Feb. 15. A field study of the feasibility of using captive balloons for upper level winds at Bayo was conducted. The study demonstrated that there was a variety of conditions under which the plan was not feasible. An order has since been placed for a supply of 30 gram balloons which will be used for determining these winds.

b. R Site. Field support of H-5 activities at R Site was provided on Feb. 6.

c. Airport Wind Study. A final report of the wind study at the airport was forwarded to H-3. The final conclusion was that no significant space variability of the wind was detectable at the airport.

2. Work in Progress

a. Instrumentation. The wind equipment at Point Weather has been dismantled and returned to the manufacturer for overhaul.

One of the sets of wind equipment at SM-43 was found to have too much friction in the bearings. A request has been forwarded to Engineering for dismantling and overhaul.

[redacted]

A request for installation of facsimile equipment in the Section has been forwarded through the Group Office to the Division Office.

b. Data Reduction. The wind data for DP West has been reduced to hourly observations back through 1956. Work is continuing on this project.

c. Cloud Height Prediction. A fresh start was made on the old problem of atomic cloud rise. The preliminary results indicate no improvement over other schemes which have been tried.

d. Wind Study - NTS. Work has been continued on the study of the wind data for NTS.

C. Nuclear Field Test Section (W. R. Kennedy, J. W. Aeby)

1. General

a. Minor additions of trails and test areas were made to the NTS map following suggestions of users. Certain possible [redacted] decided that the area covered was not great enough for their purposes and are planning on making up their own maps for their individual use.

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b. A lecture schedule for training of monitors for Plumbbob has been set up for the second week in March. (Attendance will be part of security personnel as monitors for the Operation.

c. A rough draft of work done some years ago on glove decontamination when contaminated with plutonium was prepared. A final report will be released next month.

2. Laboratory (B. F. Schnap)

a. Routine analysis of chemical waste from CM Building was made. All batches were released to H-7.

b. Drinking water and circulating water in CM Bldg. and DP West were analyzed for alpha activity. Activity was found in circulating systems at DP West which have a past history of contamination. No other activities were detected. One closed system at DP West was found to contain much more activity than had previously been present. The information was passed on to the operating group concerned, and the cause has been logically explained by work done of the system. Contamination levels will be checked routinely to see if further increases occur.

c. Snow water and rain water samples were concentrated and counted for gross alpha and gross beta activity. No activity above background was detected. The larger rain gauge mentioned last month will be installed within the next week.

[redacted]

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

A. Plant Operation

1. TA-45, Tech Area

Installation of new equipment designed to [redacted] capacity of the TA-45 plant was completed during the period. During [redacted] of the larger drain lines between the flocculators and settling basins [redacted] necessary to take one or the other of the flocculator-settling basin units out of service. For that reason the plant was operated at less-than-normal flow rates for almost the entire period. Operations since the installation was completed have not covered a sufficient period to estimate accurately the maximum increase in capacity resulting from equipment revisions. However, it is obvious that waste can now be processed at a substantially increased rate. It is believed that any reasonable increase or variation in waste flow can be treated without excessive overtime operation.

Observations of sludge levels and rate of accumulation indicate that the vacuum filter is now capable of dewatering current sludge production and substantially reducing past accumulation with routine operation.

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Effluent quality has been good throughout the period. Effluent activity due to plutonium has been unusually low.

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2. TA-21, DP West

Flows to the DP West plant have remained at unusually high levels. Daily operation has been required throughout the period. Effluent quality was satisfactory and no recirculation was required.

The vacuum filter operated satisfactorily but the very fine filter aid used seriously decreases filter rates. Experimental work with sludge conditioning and possible use of coarser precoat material is under way.

3. TA-35, Ten Site

Two runs were completed during the period. A total of 25,000 gallons was treated. This volume provided sufficient storage for raw plant waste and the unit was shut down to permit completion of construction on the revised waste treatment plant.

It has not been possible to operate the new unit for highest quality effluent (series operation of two resin columns) because of [redacted] to receive essential equipment. However, all equipment is now available [redacted] to be installed February 25. It is hoped that operation can be started immed[redacted] after installation of the transfer pump and two solenoid valves.

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[redacted]

B. Research and Development

1. Plant Operation

a. TA-21, DP West. It has been observed that the quality of DP West sludge is such that vacuum filter rates are much lower than for the sludge produced at TA-45 and DP West sludge has a greater tendency to penetrate the filter aid precoat. Since treatment methods are essentially the same at both plants, the probable reason for variation in quality is mixture of sludge resulting from batch treatment of special wastes at DP West with sludge resulting from routine operation. Experimental work will be designed to find a practical means to condition the mixed sludge to reduce its penetration into the precoat.

b. TA-35, Ten Site. Plant research and development has been limited to design of treatment and control equipment for use in the new plant because the plant has been out of operation for most of the period. However, laboratory work involving series operation of two resin columns has been continued. Current laboratory work clearly indicates that series operation will produce effluent of satisfactory quality for much longer runs than has been possible [redacted]

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2. Clay Fixation Studies

Most of the laboratory data has been completed for the final draft of a portion of the over-all fixation problem on "Leaching Studies of Radionuclides Fixation in Fired Clays." Slides and tables have been prepared by Graphic Arts to be included with this report.

Additional studies on the clay fixation problem were started in this period which include the following:

a. The percentage of Sr^{90} and Y^{90} that is leached from previously fired brick spiked with Sr^{90}. This is carried out by changing leach water daily and chemically separating Sr and Y from the leach water. Additional samples will be taken at longer leaching intervals. From the work done to date it is apparent that these two nuclides leach or go into resolution at different rates, thus upsetting the parent-daughter equilibrium. The early trends indicate Sr^{90} is leaching more readily than Y^{90} at 77-87% Sr^{90} to 23-13% Y^{90}.

b. This same inequilibrium of Sr^{90} - Y^{90} may be caused by another factor, that of driving off volatile gases at various firing temperatures at different rates. To study this, freshly fired brick of the same type as used in 1 above were cooled and started leaching on the same day. From the few experiments to date there does not appear to be any great effect by firing on this parent-daughter balance. This is at 1000°C - 1200°C and 1300°C temperatures.

[redacted]

c. Some work was done on the disposal of air cleaning filters of the glass fiber type, one of foam glass and a paper press type. Samples of these filters were spiked with Sr^{90} and heated to melting in a muffle furnace. Complete melts occurred on the two types at 800°C and 1100° - 1200°C, respectively. The activity retention recorded from 3 - 1 day leaches and projected to 30 days is in the order of 92%. This is lower than is desirable, but may be entirely satisfactory when the contaminant is mixed with finely divided clay particles, which would be expected for a normal air cleaning operation.

d. A 25-lb sample of calcined synthetic Arco waste (no activity) was received, which is the main product of their research "Fluidized Bed". This waste is granular to fine powder and is primarily an aluminum oxide. This waste was mixed with varying proportions of a ball clay ranging from 100 to 50% and taken to CMB-6 where S. D. Stoddard, Ceramics Engineer, mixed these dry samples with a resin binder and compressed into 1 inch diameter by 1 inch cylinders at 10,000 psi. All samples were returned and fired to 1000°C - 1200°C, and 1300°C. Tabulations were made on general appearance, shrinkage, weight reduction, bulk density, and imperviousness.

This type of waste will be encountered where aluminum-clad, and a similar type for zirconium-clad elements are re[redacted] in considerable quantities. It is felt that for ultimate fixation or disposal, some type of [redacted] will be necessary.

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3. Laboratory

A comparison of the cupferron extraction for plutonium and the bismuth nitrate method is being made. Although the cupferron method has been successful it is felt that a re-evaluation should be made to determine whether precision may be improved.

Counter efficiencies have been reassessed by a comparison with counts obtained from 4 pi counting done at J-11. The plates are being followed for a period of time to determine the purity of compounds obtained from the separations.

4. Environmental

Thirty USGS water samples have been run during the period. The results are fairly representative of those obtained in the past.

Acid Canyon soil samples from the last half of the period showed decrease in gross alpha but an increase in gross gamma at the surface and six inch levels. Results from other soil samples were similar to those obtained in the past.

Radiochemical analysis of laundry wastes did not vary from those obtained previously.

[redacted]

A preliminary study of recovery of nuclides from soils has been completed. Continuous reflux of the soil with nitric acid followed by appropriate yields recoveries from 81% to 89% of the applied activity. Cesium recoveries are lowest, strontium recoveries highest. However, extractions of [redacted] amounts of soil are not as efficient and the extractor will [redacted]. It is felt that continuous extraction is necessary to remove [redacted] the soil surface.

A comparison of the analytical procedure proposed will be made with that used by the group at Harwell. The English group has [illegible] success with their analysis when applied to low counts as found in soils.

5. Tuff Core Studies

Three cores receiving a Sr^{90} - Y^{90} spike at concentrations of 1×10^3 cpm/ml have broken through after receiving volumes of water ranging from 27 to 92 liters; the core lengths varied by a factor of 2. The rate of leaching of Sr^{90} - Y^{90} through one inch of core depth is equivalent to that resulting from 12.8 in. to 26.8 in. of rain. Converted to years of rainfall, these figures are 0.85 years and 1.79 years, the average of the three cores representing 1.39 years of rainfall. That is to say, about 1.4 years of rainfall containing 1000 cpm/ml would carry the activity to a depth of only one inch. A 100 foot depth of tuff above water table would require about 1700 years continuous application at the above level of activity to carry Sr^{90} - Y^{90} to the water table. This represents about 80 half-lives of Sr^{90}.

The effect of higher and lower levels of activity is being investigated; concentrations of Cs at 10 and 1/10 times those above are being used. In the case of high level activity feed the effluent from one 7-inch core receiving application of Cs at an activity of 1×10^4 cpm/ml shows no activity in the effluent after passage of 54 inches of spike.

One 6-inch core which received Cs at an activity level of 1000 cpm/ml showed no appreciable activity in the effluent after passage of 225 inches of spike. In this case 6.7×10^7 cpm or about 3.2×10^3 μc had been held by the tuff. It is possible that more activity might have been held, however, since most of the activity appeared in the upper 2 inches of core, the core was sacrificed so that vertical distribution might be determined by autoradiography.

Recent investigations on leaching have shown much higher rates of leaching with tap water from those obtained when distilled water is the leach. This observation has suggested an investigation of the effects of ions such as calcium, Mg, etc., on the rate of leaching. Such an investigation has been started.

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Small cores, two inches in diameter, have been ordered for a study of ion exchange using the CsCl - $Cs^{137}Cl$ method as outlined by Frysinger and Thomas. The effect of particle size on ion exchange capacity will be studied.

Fluctuation of rate of flow through a core and variation of rates among cores has been observed. A more nearly complete chemical analysis on core effluents is being made in an attempt to determine whether mineral content also fluctuates. It is possible that solution and redisposition of minerals cause the observed variations.

The voids in three sections of one tuff core were determined to be about 65% of the total volume. This was determined on a core that had been allowed to dry out completely and may be quite different from that on samples at lower depths.

C. Laundry Section

The necessary steps were taken during the past month to supply drybox gloves through regular channels rather than through the H-7 dispensaries. Supplies were on hand at SM-30 and the laundry stock of the five types of 30" drybox gloves were allowed to vanish. The transition was accomplished without disruption or inconvenience to the consumers. Consumption of the above items ran about 500 pairs per year at $15 per pair.

Arrangements have also been made to supply from SM-30 the 21" long obstetrical gloves. Consumption of this item was about 144 pairs per year at about $3 per pair, almost entirely to CMB-F Divisions.

During the month 6 hampers were repaired by mechanical maintenance and 13 hampers which were surplus were monitored by H-1 and sent to salvage.

D. Meetings

C. W. Christenson and R. G. Thomas spent four days at Idaho Falls conferring with Mr. Charles Stevenson, Mr. Dave Paige, Mr. Earl Grimmett, and others on the waste treatment of that operation and primarily on the research and development of Fluidizing and pertinent problems thereto.

On the return trip a days was spent at Golden, Colorado, conferring in part with Mr. L. E. Ferreira, Director of Research and Development with Coors Pottery Division, on general clay firing and equipment.

Dr. E. H. Crabtree, Director of the Research [redacted] of Mines, Golden, Colorado, was contacted on his work with pelletizing, [redacted] and fluidization.

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E. Visitors

C. V. Theis and Clyde Conover of the Albuquerque office of the U. S. Geological

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Survey and Mr. Edwin Roedder of the Washington office of the U. S. Geological Survey, visited the Group on January 31 to discuss various aspects of the environmental studies as well as the tuff core studies.

March 11, 1957

[redacted]
T. L. SHIPMAN, M.D.,
Health Division Leader

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