DOCUMENT# 50A2000 5528 000C

This document consists of 39 pages.
No. 12 of 19 copies, series A.

1776

[redacted]

* 19940002[redacted] *

[redacted]

CONFIDENTIAL

MONTHLY STATUS AND PROGRESS REPORT

FOR JULY 1949

727207

REPOSITORY Oak Ridge Opr. Records Holding area

COLLECTION Doc. 1944-94

BOX No. Folder #3 Bldg. 2714-H

FOLDER 4NN-326-87-8 8 of 45

A Report Submitted

by the

New York Operations Office

Extracted copy of cover, page 22, and pages 25-35 were declassified by NN-52 on 2-6-95.

Special Rereview
Final Determination
Unclassified
By: 4-9-84
Date: P. F. Brown

this page only

RESTRICTED [redacted] restricted data [redacted] of [redacted] subject [redacted] to Administrative [redacted] Criminal Sanctions.

August 10, 1949

W. E. Kelley, Manager

Extracted copy cover page, page 22 and pages 25-35 only

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
1ST REVIEW-DATE: 2-3-95	DETERMINATION [CIRCLE NUMBER(S)]
AUTHORITY: ☐AOC ☐ADC ☑ADD	1. CLASSIFICATION RETAINED
NAME:	2. CLASSIFICATION CHANGED TO:
2ND REVIEW-DATE: 2-3-95	3. CONTAINS NO DOE CLASSIFIED INFO
AUTHORITY: ADD	4. COORDINATE WITH:
NAME:	5. CLASSIFICATION CANCELLED
	6. CLASSIFIED INFO BRACKETED
	7. OTHER (SPECIFY):

[redacted]

CONFIDENTIAL

1188782

94SA20B00617

IV. RESEARCH AND DEVELOPMENT

Geophysical methods of detecting uranium ore bodies are being studied. Radiation physics calculations have been made, a handbook prepared, and lectures given to NYOO medical personnel on the interaction of radiation with matter and on the shielding of radiation.

Negotiations are under way toward the preparation of a contract with Power Weld Process Company for research and development of a process for making coatings on concrete surfaces which will be resistant to mechanical wear and impervious to acids and caustic solutions and at the same time removable with minimum difficulty.

Contracts with H. K. Ferguson Company (Contract No. AT-(30-1)-614) and The Kellex Corporation (Contract No. AT-30-1-GEN -169) are in the process of being closed.

Ten research reports have been received from basic research contractors.

Detection of Ore Bodies

NYOO technical personnel are continuing to give assistance to the New York Raw Materials Exploration Branch in its program of locating ore bodies. To date methods of using helium gas measurements and alpha particle counts for the geophysical detection of uranium-bearing ore bodies have been considered and experimentation upon certain of these methods has been carried on at Massachusetts Institute of Technology. Preliminary results of these experiments and studies are encouraging.

Radiation Physics Calculations

During the past few months numerous calculations in radiation physics have been made at NYOO. Many of these have been concerned with shielding. Members of the technical staff have also delivered lectures on the interaction of radiation with matter and the shielding of radiation to Medical Division personnel.

As a result of these lectures, a shielding handbook for the use of NYOO has been prepared. The handbook reviews the work which has been done in shielding calculations, including considerations of simple exponential absorption of the primary beam and multiple scattering. Besides a collection of formulae covering radiation from sources of various geometries, it has an introduction describing the different ways in which gamma radiation interacts with matter, sections covering sources of data for shielding calculations, a discussion of computations ~~that~~ associated with shielding problems, and a bibliography. It is intended to reproduce this handbook for wider distribution after further editing..

V. BROOKHAVEN NATIONAL LABORATORY

The Brookhaven Chemistry Department is conducting a research program concerning four major subjects: (1) Properties of Heavy Elements, (2) Chemical Effects of Radiations and of Nuclear Transformations, (3) The Chemical Uses and Properties of Isotopes and (4) Study of Various Nuclear Problems by Radiochemical Methods. The laboratory is also conducting an economic crop survey and results of the first findings are summarized in this report. During the month, work was begun, after contract approval, of a building to house the cosmotron.

Chemistry Department

There are now 40 persons in the Chemistry Department, of which 30 are members of the scientific staff. Four of the six wings of the laboratory complex are now in use. The department is sponsoring a series of informal conferences; the third of these, on "Nuclear Fission and Radiochemistry" was held on June 14 and 15; it was attended by approximately 100 persons other than BNL staff members.

Apart from some studies in organic chemistry, some service analyses for other laboratory units, and considerable instrumentation work, the research program itself is divided into investigations in the following four major subjects:

1. The Properties of the Heavy Elements.
2. The Chemical Effects of Radiations and of Nuclear Transformations.
3. The Chemical Uses and Properties of Isotopes.
4. The Study of Various Nuclear Problems by Radiochemical Methods.

In addition, research will be conducted in problems involving the use of the various nuclear machines which are now being installed at Brookhaven, such as the nuclear reactor, the 60-inch cyclotron and the electrostatic accelerator. Such problems include neutron diffraction, determination of the excitation functions of proton, deuteron, alpha-particle, and neutron reactions; and measurement of neutron capture cross sections of radioactive isotopes.

Properties of the Heavy Elements. Spectrographic studies of the electronic states of the heavy elements, in crystals and in solution, with special emphasis on the spectra at low temperatures, are to be taken.

Measurements have been made of the magnetic susceptibilities of tetravalent uranium fluorides, and the results are being published. Further magnetic studies are to be made of representative compounds of thorium and plutonium, in various oxidation states. An experiment is under way to investigate the cause of the large Weiss temperatures in tetravalent uranium compounds; it is believed that it arises from an exchange interaction between the paramagnetic ions.

Radiation Chemistry. The study of the photolysis of methyl iodide, 2537 Angstrom units, in the presence of silver, has been completed. The recording infra-red spectrophotometer was used to analyze the gaseous reaction products, methane and ethane. It was found that the yield of methane was almost independent of the presence or absence of silver. The experiments provided strong evidence for the importance of "hot" radical reactions in photochemistry.

The 2 MEV electron accelerator, which is expected to be in operation by next January, will be used in connection with the study of the chemical reactions produced by ionizing radiations. At first attention will be concentrated on the kinetics and mechanism of radiation reactions in water and aqueous solutions. These experiments are of great interest in regard to the chemical mechanism of biological radiation effects. It is hoped they will provide a quantitative basis for the studies of free radical chemistry in water and chemical origins of radiobiological effects. Other studies using the electron accelerator will be on the processes involved in the coloration of salts and oxides by radiation; the effect of radiation on the oxidation of metals, reactions produced in gases by fast electrons and x-rays; and reactions of organic compounds and plastics under radiation.

Chemical Studies with Isotopes. A number of investigations are under way in which isotopes are used as tracers in studying the mechanisms and kinetics of chemical reactions, the effects of isotopic substitution on the spectroscopic properties of molecules, and the effects of isotopic substitution on the rates and equilibria of chemical reactions. Some of the most important of these investigations are as follows:

A study of the mechanism of the deuterated hydrocarbon synthesis, with deuterium as the tracer.

A study of the properties of deuterium substituted toluenes.

A study of the interaction between CO_2 and charcoal, and the processes of gasification of carbon with a study of the reaction between water and charcoal, using deuterium and O^{18} as tracers.

The reduction of acetone to propane on a platinum-charcoal catalyst, at temperatures from -70 to 0 degrees C.

A study of the kinetics of the gas phase exchange between HBr and Br_2.

A study of kinetics of the exchange reaction between anhydrous bromide and ethyl bromide.

The continuation of work on the exchange reaction between cerous and ceric cerium in aqueous solution.

Nuclear Problems. The separation of Se,79 and I 129 from reactor irradiated uranium is under study, and milligram amounts have been obtained in test runs by dissolving the metal in hydrochloric acid, bubbling the evolved hydrogen through bromine water to remove H_2Se, and extracting iodine from the uranium solution with carbon tetrachloride after oxidation of the uranium to the hexavalent state with hydrogen peroxide.

A search for radioactive fission products of U 235, which are outside the known mass range, has been instituted. Already, new physical measurements have been reported on the ratio of ternary to binary fission. Separation procedures are being devised for titanium, cobalt, and manganese.

A search for new cases of nuclear isomerism has been started, in the belief that many more may exist in which a second state of a known radioactive nucleus has a half-life within an observable range of about 10^{-9} seconds to 108 years.

A study was made of separated nickel isotopes Ni58 and Ni62, irradiated at the Oak Ridge reactor.

Work has begun on the compilation of nuclear data for a loose-leaf type handbook, arranged according to elements and isotopes. It is planned to bring this up to date from time to time by the issuance of supplementary sheets and corrections. This project is jointly sponsored by the National Bureau of Standards and Brookhaven.

Economic Crop Survey

A survey is being conducted by the laboratory of the significant economic crops of the region, before operation of the reactor begins. The broad aspects of the survey will afford basic crop yield data over a five year period, within an area extending from Riverhead, 13 miles east of the reactor, to Sayville, about the same distance west, and including the entire width of Long Island.

So far, the survey has yielded the following information: There are 629 farms, with a total of 29,000 acres, devoted to potatoes, within 13 miles of the laboratory. The next most important crop, cauliflower, is raised on only 3,400 acres in the same area. The average potato yield from the comparatively poor soil immediately surrounding the laboratory site was 284 bushels per acre in 1948, in comparison to yields of 312 bushels per acre 10 miles away. During a year with reduced precipitation and high temperatures in the spring and early summer, the yields per acre may be halved.

In addition to date obtained from the U. S. Department of Agriculture, further yield data is being procured from the New York State Department of Agriculture and Markets, and from local surveys made by the Suffolk County Agricultural Extension Service and the Department of Agricultural Economics of the New York State College of Agriculture. In addition, continuous crop yield estimates will be obtained from selected farms throughout the area under survey.

[redacted]

Cosmotron

On July 13, 1949, AUI subcontract S-170 with the Roberts Nash Construction Corporation was approved by NYOO. This contract provides for the construction of a building to house the cosmotron. The building will be a steel frame structure, the lower half of the walls to be concrete and the upper half of a pre-fabricated insulated wall panels. Two overhead bridge cranes, control and power wiring, and a water cooling system for the cosmotron are also included in the scope of this agreement. Construction work has begun on this project and satisfactory progress is being made.

[redacted]

VI. MEDICAL

A report on the relationship of Harshaw uranium and effluent fluorides to air pollution in the West Cleveland area was prepared during the past month. Radiation measurements for K-65 and UX_1 - UX_2 ash have been made and plans for the disposal of wastes from the Luckey, Ohio, beryllium plant have been formulated, Informal notes have been prepared on disposal of liquid and solid radioactive wastes.

Decontamination of the Vulcan Crucible Steel Company plant is being checked, and installation of Medical Division recommendations at the Norton Company has been extraordinarily effective. Radon apparatus constructed by NYOO is in operation. A problem in connection with condensers for the alpha survey meter being developed by the General Electric Company has been solved. Five summer students are at work in temporary positions in the Medical Division.

Relationship of Harshaw Effluents to Air Pollution in Cleveland

Background. During the past few years, a great many communities have shown increasing intolerance toward air pollution associated with the operation of their industries. In most cities, the efforts for air pollution abatement has been initiated by civic organizations. The disastrous Donora episode of last winter provided considerable impetus to these campaigns.

Several years ago, the city of Cleveland established an Air Pollution Division in the City Health Department under the direction of Mr. Herbert Dyctor. During the past year there has been local dissatisfaction with the progress being made by that Division, and recently, the Southwest Civic Association retained Dr. C. A. Mills of the University of Cincinnati and Dr. Sadtler of Philadelphia to survey the problem and assist in the campaign to reduce the air contamination.

The air pollution problems of Cleveland are centered in the valley of the Cuyahoga River, a highly industrialized area in southwest Cleveland. The complaints, to the best of our knowledge, have been non-specific insofar as no one component of the heterogeneous air pollution originating from this valley has been mentioned as being of prime significance.

"Area C" of Harshaw Chemical Co., operating under contract with this office, discharges both uranium and fluorides in its atmospheric wastes. The principal effluent from the main Harshaw plant, located adjacent to Area C, is hydrofluoric acid.

The main Harshaw plant is not engaged in work for the Commission except as it serves to supply Area C with HF. Although the complaints from the civic organizations have been concerned with general atmospheric pollution, and neither fluoride nor uranium have been mentioned specifically, it is likely that as time progresses, the extent of air pollution by fluorides will receive attention.

NYOO Investigation. In view of the attention which air pollution in west Cleveland is currently receiving in the local press, it was considered advisable to obtain information as to the relationship of the various Harshaw operations to the general air pollution problem. An investigation was therefore initiated to determine (1) the levels of fluoride contamination which exist in the atmosphere within approximately 4,000 feet of the Harshaw plant, and the extent to which Harshaw Chemical Company and Area C each contribute to this contamination, and (2) the extent of atmospheric contamination by uranium.

In view of the fact that the main Harshaw plant was scheduled to shut down for vacation on June 6, it was decided that this study should be conducted with and without this unit in operation for the purposes of obtaining comparative data. It was further decided that worthwhile additional data would be obtained by shutting down Area C to coincide with part of the period during which the main Harshaw plant was not in operation. Fluoride and uranium measurements in the vicinity were therefore made (1) with both Area C and the main Harshaw plant in operation, (2) with the main Harshaw plant shut down, and (3) with both the main Harshaw plant and Area C shut down.

It should be noted that it was not possible to obtain data with the main Harshaw plant in full operation because the bi-fluoride unit was shut down prior to the time this study was planned. It is our understanding that the bi-fluoride unit probably will not operate for at least another three months, and then not in its original form. Harshaw is making extensive alterations in order to reduce atmospheric emissions from this unit.

It was decided to devote the study to the area within 4,000 feet of the Harshaw plant. By so doing, it would be possible to obtain more than adequate coverage of the area in which effluent from the Harshaw plants would be of maximum significance and studies beyond this distance would not be necessary unless it could be shown that air pollution originating from these units was significant at the perimeter of this area.

Data were collected simultaneously from 3 mobile and 4 fixed sampling stations; and from the eight Area C stacks.

In order to determine the extent to which Area C was contributing to air pollution by uranium and fluorides, the following 4 criteria were established:

1. If data is corrected for variations in wind velocity, the measured effluents should correlate with downwind concentration.

2. The concentrations measured downwind of the plant should diminish with distance.

3. The measurements downwind of the plant should agree, at least in order of magnifute, with the concentrations predictable by theory, from the knowledge of the rate at which the pollution is being emitted from the plant.

4. With Area C shut down, there should be a marked reduction, if not complete elimination of the air pollution.

Results. As expected, the uranium data satisfied all 4 criteria. The atmospheric concentrations of uranium were lower than the maximum permissible level recommended by the Commission. The fluoride data however satisfied none of the criteria. Of particular significance was the finding of high fluoride concentrations when both Harshaw plants were shut down. It was further concluded that the fluoride contamination in west Cleveland within 3,500 feet of the Harshaw plants originated from sources other than Area C or the HF plant. As noted previously, the Harshaw bi-fluoride plant was not in operation at any time during these tests. It is therefore impossible to draw any conclusions regarding the extent to which the full Harshaw operations contribute to the fluoride contamination. However, the HF plant was in operation during Period 1 of this study, but did not appear to be contributing significantly to the air pollution.

Complete data and detailed analyses are given in a report which has just been issued by the NYOO Medical Division.

K-65 Measurements

Kellex Report KLX-015 on storage of K-65 was issued and copies were submitted to this office for critical evaluation. To check the theoretical figures arrived at by Kellex and also independently by the NYOO technical personnel, arrangements were made to stack drums of K-65 in a large cylindrical conformation in order to simulate a section of a tank car. The drums were set up in the storage area at Middlesex and radiation measurements made. Results were compared with figures based on theoretical considerations at a meeting with representatives of

Kellex and the NYOO technical personnel. It was agreed that a good figure to use was 50 mr/hr. at 12 ft. from the tank car site.

UX_1 - UX_2 Ash

Review of the proposed plans for the new Harshaw semi-continuous hexafluoride plant indicated that some shielding would be required on the paddle-stirred reactors. Accordingly, measurements were made at Harshaw on the radiation from the pilot reactor at the beginning of a run. A week later, additional measurements were made to check accumulation of ash and build-up of radiation. Samples were brought to the NYOO Laboratory where further measurements were made to determine specifications and absorption characteristics. A report, now in progress, will include recommendations for adequate shielding of the large reactors.

Industrial Waste Disposal at Luckey, Ohio

Before operations are begun at the new Beryllium plant in Luckey, Ohio, it is necessary to work out a method for disposing of the chemical wastes. The Ohio law and the Federal policy on stream pollution abatement make it necessary that the method adopted be satisfactory to the Ohio State Department of Health. This consideration and the necessity for satisfying our own requirements eliminate some of the possible methods such as dumping the wastes in the river, Lake Erie or a nearby stream. The situation is complicated by the fact that plant wastes will contain beryllium and we do not yet know enough about the ingestion toxicity of beryllium. Requests from the Ohio State Department of Health concerning the nature and effects of beryllium and its compounds have been referred to Mr. Gorman of the Washington Office to NYOO.

The NYOO Sanitary Engineer visited Luckey to study the problem first hand and has concluded that the best method is open storage on the site of the insoluble wastes and purification of the slum and sodium sulfate for sale. Purification will remove the beryllium which will be returned to the processing chain. Storage of all wastes on the site is also acceptable provided that it can be demonstrated that ground and surface water is not contaminated.

A report on disposal of waste at Luckey is now under study. It is expected that a disposal plan will be worked out with the Brush Beryllium Company and then submitted to the Ohio State Department of Health for approval.

Literature Survey of Waste Disposal

In order to gather together the bulk of information on radioactive liquid and solid wastes, NYOO has initiated a literature survey. A set of notes, which are not exhaustive but which contain most of the applicable information, has been drawn up to compare and summarize the more important results of research and experience on disposal standards and treatment methods. These notes incorporate suggestions for further research where it is evident from the literature or from NYOO experience with problems that further work would be profitable.

Decontamination at Vulcan Steel Company

With the termination of AEC work at Vulcan Crucible Steel a decontamination program was outlined and during the month of July, the progress in this respect has been inspected. A thorough radiation survey was made including radiation readings, dust samples and water samples. The results indicated that, in general, decontamination procedures instituted through July had been quite effective. Further steps were indicated and specific recommendations were made in order to finish the job.

Ventilation Changes at Norton Company

On May 25, a field visit was made to the Norton Company, Chippewa, Ontario to determine what measures were necessary before the contractor could proceed with the production of beryllia shapes. All the recommendations made as a result of this visit were instituted by the Norton Company and a follow-up visit was made on June 30 to inspect the new hoods and observe the loading operations with modified controls in use. The analysis of air samples collected on June 30 as compared with those taken on May 25, are as follows:

	May 25	June 30
Maximum airborne beryllium concentration in ug/m^3 of air.	2800	4.5
Daily weighted average beryllium concentration for mold leaders in ug/m^3 of air.	30.0	0.2

The improved ventilation controls have reduced the maximum airborne concentration by a factor of 610 and have reduced the average daily exposure to the loading room personnel by a factor of 150.

Approval was thereupon given the Norton Company to proceed. This is an excellent example of the improvement that can be brought about by installation of properly designed ventilation, even for operations which require rigid control.

Radon Measuring Equipment

Equipment to measure environmental air and breath samples for radon was required because similar facilities were available only at considerable cost and only at two other places. Furthermore, our requirements exceeded the combined capacity of the available facilities. Accordingly, the NYOO Health Instruments Laboratory designed radon counting equipment. In view of certain electrical problems it was necessary to design the units carefully in order to avoid spurious counting due to transient phenomena on a power line and radiated disturbance from business machines, motors, and other power appliances. These problems were successfully overcome and 2 units are in operation for routine work. Three additional units will be placed in operation within the next two weeks and within approximately 6 months, it is expected that most of the more difficult operational problems will be solved.

The radon equipment is unique in that it uses an all metal vacuum system, a catalytic dioxidizer and a readily demountable stainless steel ionization chamber and electrode assembly. The circuitry represents a marked advance in view of its unusually high signal to noise ratio. The operational quality of the equipment has been checked carefully and it is certain that it can conveniently be run with backgrounds less than 50 counts per hour. With virgin chambers and electrodes (uncontaminated by radon or other radium daughters), chambers having backgrounds less than 25 counts per hour have been found. These low backgrounds assure the possibility of measuring radon quantities in the order of 10^{-13} curies with considerable precision. Although the equipment was specifically built for low count operation, designs of a modified commercial scaler to permit samples with activities greater than 10^{-12} curies have been completed.

Development of Condensers for Alpha Survey Meter

During the latter part of June, the General Electric Company, Syracuse, New York, informed this office that the alpha proportional counter unit in development under NYOO contract AT-(30-1)-430 could not be completed immediately due to difficulties with the energy storage capacitor under high humidity conditions. This capacitor provides polarizing voltage to the proportional counter probe and must maintain a predetermined voltage for a minimum of 24 hours. The condenser is normally charged to about 2200 volts and cannot leak off more than 100 volts in 24 hours. NYOO communicated with the Condenser Products Corporation, Chicago, which agreed to undertake production of 25 sets of condensers to meet our specifications. Each set consists of 2 condensers, one of .02 mfd. and the other of .005 mfd. Each condenser had to have an inherent resistance of at least 2×10^{14} ohms.

The development work of these condensers was added to the contract with General Electric who placed the order with the Condenser Products Corporation.

On July 22, this office was notified by the C.P.C. that the condenser problem had been completely solved and that they were prepared to offer their product on a commercial basis to all users. The condensers they had produced had resistances on the order of 2×10^{14} to 2×10^{15} ohms at a humidity of 95%. The condenser dielectric is fluorethene.

Summer Students

During the latter part of May, five positions were established for temporary work during the summer in the NYOO Medical Division Laboratories for students in chemistry and electronics. It was expected that these students would assist in cutting down or eliminating the backlog of routine work that had accumulated. Such a program appeared desirable also because it would foster good relations with universities in this area, and would support training activities of the Commission.

Recruitment was begun immediately and clearances were completed on five students, the last entering on duty August 1. Two students have been assigned to the Chemistry Laboratory for routine analyses. Two have been assigned to the Health Instruments Laboratory for work on the construction of laboratory apparatus. The fifth has been assigned to the Industrial Hygiene Section to assist on the construction of a fume chamber for the distribution of uniform plant atmospheres to test equipment.