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Authority Review
The Former Horizons, Inc. Site
Cleveland, Ohio

INTRODUCTION

One of the principal objectives of records searches and analyses of documentation is to provide the information necessary to determine DOE's authority to conduct remedial action at sites that have been identified as potential candidates for cleanup under the Formerly Utilized Sites Remedial Action Program (FUSRAP).

The purpose of this review is to assemble and present information pertaining to work performed under the sponsorship of the Atomic Energy Commission (AEC) and the facts and circumstances surrounding activities/events that resulted in the radioactive contamination that remains on the site formerly occupied by Horizons, Incorporated.

The principal sources of information/documentation assembled for this review were as follows:

a. MED/AEC records in the custody of DOE's Oak Ridge and Savannah River Operations Offices and the Atlanta and New York Federal Achives and Records Centers.

b. Technical reports obtained through the Remedial Action Program Information Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

c. Telephone interviews with former AEC employees who had personal knowledge of AEC sponsored activities at the Horizons facility.

BACKGROUND

The facilities owned and operated by the former Horizons, Incorporated, are located at 2909 East 79th Street in Cleveland, Ohio. Two of the three buildings on the site were used in the performance of work by Horizons for the AEC and other government agencies during the late 1940's to the early 1960's. There are indications that the buildings may have been consolidated into one large facility. The site is currently owned by the Rexham Corporation and occupied by Lamonite, Inc.

Horizons research and development work in support of AEC programs spanned over a decade that continued into the early 1960's. A computer

literature search conducted by the Technical Information Center of the Oak Ridge National Laboratory indicates that Horizons was also under contract during this period with other government agencies, principally the Department of Defense (U.S. Army, Navy and Air Force).

Horizons was active in the field of high-temperature fused salt electro-chemistry as early as 1948. Most of the research work was with titanium and zirconium metal. By early 1949, Horizons was under contract with the AEC New York Operations Office, Contract No. AT(30-1)-696, to determine the feasibility of producing ductile zirconium in coherent form by electrolysis.

CONTRACTS--THORIUM AND URANIUM

Three additional contracts between Horizons, Inc. and the AEC have been identified: AT(30-1)-1144, AT(30-1)-1335 and AT(30-1)-1895. Although little documentation has been found to describe the first contract, it is believed to be a continuation of earlier research work related to the production of zirconium metal. Under the second contract, AT(30-1)-1335, Horizons conducted a research and development program from April 1952 through June 1956 to determine the most economic method for production of thorium metal. The third contract apparently involved research and development associated with the preparation of high purity niobium metal by an electrolytic process. Record copies of these contracts were destroyed in accordance with appropriate records management schedules. Records of destruction are on file in the Atlanta Federal Records Center and the Savannah River Operations Office.

Contract No. AT(30-1)-1335 was apparently the principal contract of concern in terms of intensity or priority of effort and longevity or period of performance; and apparently the only contract involving work with thorium, the principal constituent of radioactive contamination at the former Horizons facility. The history of this contract, described in Horizons' final report dated June 30, 1956, indicates that the first two years (April 1952 to April 1954) were devoted to an examination of all possible systems or methods for production of thorium metal. Electrolytic operations were conducted in research size laboratory cells originally designed and constructed for titanium and zirconium metal research and production.

In the spring of 1954, administration of this contract was transferred from AEC's New York Operations Office to its Fernald Area Office in Cincinnati, Ohio. The period from May to October 1954 is significant in terms of activities and events which probably were the origin or contributed most to the current radiological conditions on the site. During this period, AEC's priority toward the development of a second source and/or improved and more economical process for production of thorium metal resulted in a "crash" program at the Horizons facility. Activities were escalated from production of research quantities of the metal to scale pilot plant operations for the production of several

hundred pounds. According to Horizons' final report, this scale-up was done with little regard for suitability of the process for preparation of feed material from thorium nitrate tetrahydrate and availability of suitable equipment. As previously indicated, record copies of the contract have apparently been destroyed. However, a Memorandum to Files prepared by the Chief of the Fernald Area Operations Office was located that contains the scope of work of the contract as changed, effective May 17, 1954. This change required Horizons' best efforts to modify equipment, "... to an extent calculated to demonstrate ..., the feasibility of producing high purity thorium metal on a production basis." This task was to be accomplished with a period of less than 6 months. This document also indicates that a member of the AEC New York Operations Office Health and Safety group was asked to make a trip to the Horizons facility to specify what precautions should be taken in order to safely handle thorium-bearing materials in large quantities. A copy of Modification No. 4 to the contract implementing this change was also found. By the end of July 1954, 2000 pounds of thorium nitrate tetrahydrate was delivered to the Horizons facility under this contract.

In October 1954, the contract was transferred to the AEC Savannah River Operations Office for supervision for the remaining life of the contract. Again, according to Horizons' final report, emphasis during this period was placed on the development of a more feasible process rather than attempting to produce quantities of metal expeditiously. A research program was set up to evaluate various methods of cell feed preparation along with a concurrent cell development program.

Horizons, Incorporated did conduct research and development work with uranium metal. A Horizons semi-annual report to AEC concerning research issuance material, dated June 25, 1953, indicates receipt of eight bars of uranium metal (total weight of 8290.8 grams). An AEC memorandum dated May 14, 1954, indicates that Horizons had 39.8 pounds of uranium in its possession in March 1954. The only indications found to date that the work with uranium was under AEC contract is a reference to roll cladding experimentation with uranium in a Horizons progress report entitled, "Final Report--Cladding of Uranium with Zirconium," dated May 27, 1954.

Oak Ridge Operations Office correspondence for the period June through August 1955 indicates that Horizons proposed to conduct research on electrolytic production of uranium. AEC rejected the proposal (contained in Horizons' report, "The Electrolytic Preparation of Uranium and Uranium Alloys"), but indicated that:

> "If Horizons should desire to conduct the ... program ... on their own initiative and at their own expense, the AEC will be pleased to offer other than financial assistance to such programs."

The assistance offered was access to classified information, AEC facilities and personnel performing related work, and licensing to

possess and use necessary source materials. Furthermore, evidence that Horizons was issued a source materials license (No. C-3496) in April 1956, and did make application for 300 pounds of uranium magnesium scrap under AEC's Magnesium Fluoride Industrial Participation Program, would indicate that Horizons did conduct some uranium research work on its own initiative and at its own expense. However, the extent of such work is unknown.

RESIDUAL RADIOACTIVE CONTAMINATION

The principal constituent of radioactive contamination identified by Oak Ridge National Laboratory during its 1977 survey of this site was thorium (Th-232) and its decay products. Some soil samples and other materials taken from the site showed elevated concentration of Th-232, Ra-228, Th-228 and Th-230. Concentrations of Th-232 (up to 4890 pCi/g) and Th-230 (up to 752 pCi/g) were found in dirt and other materials taken from drains and surfaces inside both buildings (identified as Buildings B and C in the survey report). Soil beneath the old storage room in Building C was found to be contaminated to a depth of six feet. This area was apparently used originally for storage of thorium-bearing feed materials. A new floor was built in this area since the early thorium operations. Alpha and beta-gamma contamination levels in some areas of both buildings exceeded applicable guidelines. Elevated levels of external gamma radiation levels, were measured at isolated points in and near Building B. Most of the evaluated radiation levels were found indoors--in areas presently used for storage, in drains and under floors.

No information has been found to indicate that Horizons, Inc. worked with thorium other than the work performed under AEC contracts during the period 1952 through June 1956. Therefore, the apparent source of the thorium contamination is the thorium nitrate tetrahydrate feed material provided to Horizons by AEC and by-products of the process used to produce the thorium metal delivered to AEC.

Other events and circumstances described in AEC general correspondence and reports and by former AEC employees that probably contributed to the radioactive contamination at the site are as follows.

a. Although contract information cited above indicates the Horizons work with thorium began in April 1952, actual receipt of thorium nitrate tetrahydrate probably began after May 1, 1952. Work done by Horizons began as a research effort that expanded in scope approaching moderate-scale pilot plant operations. Quantities of thorium-bearing feed materials furnished by AEC increased from pounds to tons (up to 5 tons, the maximum amount that could be stored at any one time) by the summer of 1955. It is significant to note that, upon delivery of the first 500 pound shipment in early July, an accidental spill occurred when several drums, apparently improperly packaged by the shipper, collapsed, resulting in the loss of 20 to 25 pounds of thorium nitrate tetrahydrate at the Horizons facility. This spill created an extreme nuisance and a health hazard.

b. Poor housekeeping at the Horizons facility described by former AEC employees recently interviewed was confirmed through review of the results of a radiological survey conducted at the facility by AEC's Health and Safety Laboratory in December 1954. This survey covered exposures to airborne thorium and radiation during the refining and processing operations. Major deficiencies identified in the report included inadequate ventilation or non-existence of control at certain operations and improper work habits in violation of accepted housekeeping procedures. These conditions contributed both to overexposure of personnel and radioactive contamination of the work place. The sudden increase in scope of work and the "crash" program directed by AEC beginning in May 1954 probably contributed to these conditions.

c. No documentation has been found to describe the procedures used or the results of decontamination activities to clean up the facility before termination of the contracts. However, Modification No. 4 to the contract (Attachment 1) provided for payment of expenses for medical examinations of employees and expenses in decontaminating contractor and Government-owned property on the contractor's premises. Typically, the last modification to AEC contracts prescribed and funded decontamination of the contractor's facility. The actual work was usually performed by the contractor. Since contracts have been destroyed, one can only assume the level of AEC concern for health and safety and involvement in cleanup of the facilities was the same as normally afforded other contractors doing similar work during the period.

d. Section VIII (Acknowledgements), Volume II of Horizons' final report on Contract AT(30-1)-1335, recognizes the work of a unit (staff of 12) responsible for pilot production of thorium cell feed, S-F materials accountability, and management of radioactive waste disposal. Thus, indicating some degree of health physics capability on the Horizons staff.

HEALTH AND SAFETY

Indications of AEC responsibility or involvement in health and safety at the Horizons facility are: (1) an expression of intent to provide information on precautions required to safely handle thorium-bearing materials in large quantities; (2) the fact that AEC conducted a radiological survey of the facility in December 1954; and (3) provisions included in Modifications No. 4 of the contract identifying the cost of medical examinations of employees and the cost of decontamination of property as allowable expenses under the contract. Copies of the survey report were provided to Horizons' management. There are indications that AEC-furnished equipment probably included ventilation and other health and safety equipment, particularly in light of the results of the December 1954 survey and, again, normal practices followed by AEC with other contractors during the period.

Information provided by former AEC employees that visited the facility indicates that there was no resident AEC representative assigned to the Horizons facility. They indicated that AEC presence and/or representation was through periodic visits to the facility by AEC employees. Article I, paragraph 3 of Modification No. 4 of the contract addressing AEC control of contractor operations states as follows:

> "The work called for in this contract shall be subject to the general supervision of the Commission and to the Commission authorizations and approvals provided for in this contract. The Contractor shall place emphasis on various aspects of such work as and to the extent requested in writing by the Commission from time to time, and shall keep the Commission fully advised of its progress hereunder and of the difficulties, if any, which it experiences."

Horizons' final report on Contract AT(30-1)-1335 also contains indications in Section VI, Operational Hazards and Safety, that Horizons was aware of AEC publications (Bullentins) pertaining to radiation and fire hazards associated with handling thorium metal and thorium-bearing feed materials and the storage and shipment of thorium metals, and had some knowledge of procedures for decontamination of equipment and work areas. However, based upon the results of the December 1954 survey, it was apparent that such knowledge and procedures were not being applied during the initial period of rapid increase in scope of contractor activities.

Based solely on a brief comparison of the results of the two surveys discussed above, it is apparent that the residual radioactive contamination at the site was a result of the work done by Horizons for AEC under Contract No. AT(30-1)-1335, and that some level of decontamination was accomplished after termination of the work under this contract.

AUTHORITY ANALYSIS

The determination of authority for remedial action at a candidate FUSRAP site is based upon an evaluation of the specific terms of the contract or contracts between MED/AEC and their contractors; confirmation that the residual radioactive contamination at the site did occur during the performance of work sponsored by the MED/AEC; and the working relationship between MED/AEC and their contractors. The latter considerations specifically address ownership of facilities and equipment, control of contractor operations, and MED/AEC involvement in matters pertaining to health and safety at the facilities.

The results of this review of available documentation and evaluation of factors cited above to determine DOE's authority for remedial action at the Horizons facility are addressed in responses to the questions that follow:

a. Was the site/operation owned by a DOE predecessor or did a DOE predecessor have significant control over the operations on the site?

Response: No, the site/operation was owned and operated by Horizons, Inc. The AEC did provide, but retained title to, some special equipment required by the contractor to perform the work specified in this research and development contract. The AEC also provided all the feed materials, thorium nitrate tetrahydrate, used by Horizons to produce thorium metals. Horizons was an accountable station for SF materials. Title to the feed materials and the final product remained with the AEC throughout the process.

Several factors obtained from available documentation, and interviews with former AEC employees knowledgeable of the operation at the Horizons facility, indicate limited control by AEC over operations at the facility. The most significant factors contributing to this assessment are as follows:

1. AEC was seeking a more economical method for production of thorium metal. Horizons was experienced in the field of high-temperature fused salt electro-chemistry, the process used in the conversion of thorium nitrate tetrahydrate into thorium metal.

2. The nature of the contract (research and development) and the addition of provisions providing for general supervision by the Commission in May 1954 indicate that, prior to that time, there was no provision for AEC supervision of contractor operations aside from monitoring the contractor's progress through reports and periodic visits to the facility.

3. Recollection of a former AEC employee who had visited the facility were that there was no AEC representative assigned to the Horizon facility.

b. Was a DOE predecessor agency responsible for maintaining or ensuring the environmental integrity of the site (i.e., were they responsible for clean up)?

Response: No document has been found that specifically stipulates DOE predecessor responsibility for ensuring the environmental integrity of the site. Articles pertaining to health and safety were standard in AEC contracts. These articles placed the responsibility for health and safety in the work place on the contractor--to protect health and minimize danger from all hazards to life and property, to make reports and permit inspections required by the Commission, and to conform to all health and safety regulations and requirements of the Commission. Assistance in the area of health physics was provided by AEC to the contractor.

It is apparent that Horizons had a health physics capability. Knowledge of measures required for radiation protection in the handling of thorium and the decontamination of equipment and the work place is reflected in Volume II of their final report under Contract No. AT(30-1)-1335.

Reimbursement for costs incurred by the contractor in the decontamination of contractor and government-owned property on the contractor premises was provided in Modification No. 4 of the contract.

c. Is the waste, residue, or radioactive material on the site the result of DOE procedessor related operation?

Response: Yes.

d. Is the site in need of further cleanup and was the site left in non-acceptable condition as a result of DOE predecessor related activity?

Response: The results of the 1977 survey by ORNL indicate that the Horizons' site is contaminated with residues containing naturally occurring thorium and its daughters. Under the use conditions in effect at the time the survey was conducted, radiation exposures to employees working at the site were slightly greater than background exposures, but well below guidelines. However, transferrable alpha and beta contamination and beta-gamma dose rates measured, particularly in Building B, exceeded NRC guidelines.

By DOE letter dated July 25, 1979 (Attachment 2), the owner, Clecon, Inc., was advised that some remedial action will eventually be needed to restore the property to a condition that will not restrict its use in the future.

e. Did the present owner accept responsibility for the site with knowledge of its contaminated condition and that additional remedial measures would be needed to make the site acceptable for unrestricted use by the general public?

Response: Documents reflecting the radiological conditions of the site when the AEC contract was terminated have not been found. As indicated in (d.) above, Clecon, Inc. was advised of the presence of residual radioactive materials at the site and that some remedial action will eventually be necessary. However, their knowledge of the presence of such materials on the site prior to July 1979 is unknown. Knowledge of the presence of residual radioactive materials on the site and of the need for remedial action by the current owner is unknown.

REFERENCES

Horizons, Inc., letter from Paul S. Maybaum, Jr., to Manager of Operations, U.S. AEC, New York; Subject: Semi-Annual Report for Research Issuance Material; June 25, 1953.

AEC Memorandum from D. F. Musser, Division of Production, Washington to S.R. Gustavsen, New York Operations Office; Subject: Horizons, Inc., 2891-2905 E. 79th Street, New York (Sic); May 14, 1954.

Modification No. 4 to AEC Contract No. AT (30-1)-1335 with Horizons, Inc., Effective May 17, 1954.

AEC Memorandum to Files; Trip Report - Horizons, Inc., May 14, 1954; by W.A. Oppold, Chief Operations Branch, Fernald Area; May 17, 1954.

AEC Memorandum from R.L. Faulkner, Division of Raw Materials, Washington, to S.R. Sapirie, Oak Ridge Operations; Subject: Rare Earths TNT shipment to Horizons, Inc.; September 7, 1954.

HASL - Horizons - 1; Horizons, Inc., Cleveland, Ohio; Occupational Exposure to Airborne Contaminants; prepared by AEC's Health and Safety Laboratory; February 21, 1955.

Horizons, Inc., Letter from James L. Wyatt to U.S. AEC Savannah River Operations Office; June 10, 1955.

AEC Letter from S.R. Sapirie, Oak Ridge Operations, to Horizons, Inc.; Subject: Horizons Proposal for Research in Electrolytic Production of Uranium; August 15, 1955.

Horizons, Inc., Letter from Paul S. Maybaum, Jr., to Division of Civilian Applications, AEC; Subject: Magnesium Fluoride Industrial Participation Program; June 6, 1956.

HZ-99; Final Report, Research and Development in the Field of Thorium Chemistry and Metallurgy; Volume II; Pilot Scale Production of Thorium Metal by Fused Salt Electrolysis (From: Horizons, Inc., to Manager, U.S. AEC Savannah River Operations Office); June 30, 1956.

SRO-11; Final Report, Research and Development in the Field of Thorium Chemistry and Metallurgy; Volume I; Preparation of Electrolytic Cell Feed for Production of Thorium Metal; prepared by Horizons, Inc.; June 30, 1956.

DOE/EV-005/10, Radiological Survey of the Former Horizons, Inc., Metal Handling Facility, Cleveland, Ohio; prepared for the U.S. Department of Energy Assistant Secretary for Environment, Division of Environmental Control Technology; Final Report; February 1979.

Department of Energy Letter from William E. Mott, Director of Environmental Control Technology Division, to Robert S. Stone, Clecon Incorporated; dated July 26, 1979.

Aerospace Letter from C. Young to A. Whitman, Division of Facility and Site Decommissioning Projects, DOE; Subject: Owner of the Former Horizons, Inc., Facility in Cleveland, Ohio; November 26, 1985.