SEC Petition Evaluation Report
Petition SEC-00134

Report Rev #: 0 Report Submittal Date: December 9, 2008

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Site Expert(s):	N/A

Petitioner Administrative Summary			
Petition Under Evaluation			
Petition #	Petition Type	Petition A Receipt Date	DOE/AWE Facility Name
SEC-00134	83.14	November 20, 2008	Vitro Manufacturing (Canonsburg)

NIOSH-Proposed Class Definition
All AWE employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from August 13, 1942 through December 31, 1957, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort.

Related Petition Summary Information			
SEC Petition Tracking #(s)	Petition Type	DOE/AWE Facility Name	Petition Status
None	None	None	None

Related Evaluation Report Information	
Report Title	DOE/AWE Facility Name
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Evaluation Report Summary: SEC-00134, Vitro Manufacturing (Canonsburg)

This evaluation report by the National Institute for Occupational Safety and Health (NIOSH) addresses a class of employees proposed for addition to the Special Exposure Cohort (SEC) per the *Energy Employees Occupational Illness Compensation Program Act of 2000*, as amended, 42 U.S.C. § 7384 *et seq.* (EEOICPA) and 42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort Under the Energy Employees Occupational Illness Compensation Program Act of 2000*.

NIOSH-Proposed Class Definition

All AWE employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from August 13, 1942 through December 31, 1957, for a number of work days aggregating at least 250 work days, occurring either solely under this employment, or in combination with work days within the parameters established for one or more other classes of employees included in the SEC.

Feasibility of Dose Reconstruction Findings

NIOSH lacks sufficient information, which includes specific biological monitoring data, sufficient air monitoring information, or sufficient process and radiological source information that would allow it to estimate with sufficient accuracy the potential internal exposures to non-uranium radionuclides in disequilibrium with uranium to which the proposed class may have been subjected. NIOSH finds that reconstruction of external dose for individuals for whom personal monitoring records are not available is also not feasible.

NIOSH finds that it is likely feasible to reconstruct occupational medical dose for Vitro Manufacturing workers with sufficient accuracy.

- Principal sources of internal radiation for members of the proposed class included exposures to uranium and uranium progeny. Vitro Manufacturing processed uranium ores, concentrates, scrap, and residues that resulted in generation of airborne dust, surface contamination, and direct contact with bulk materials.

- NIOSH has insufficient documentation to adequately define the degree of disequilibrium between uranium and uranium progeny. NIOSH therefore has insufficient information to bound internal exposures to non-uranium radionuclides in disequilibrium with uranium during the AWE operations period.

- NIOSH has obtained bioassay urinalysis results for the period between 1950 and 1954. Due to process separation of uranium and uranium progeny radionuclides throughout the AWE operations period, the available uranium urinalysis results cannot be used to quantify intakes of non-uranium radionuclides.

- NIOSH has obtained area air sampling and limited breathing zone air monitoring results for the period from 1949 through 1953. The data are highly variable and there is insufficient information available to NIOSH to apply the data to specific individual breathing zones.

- Principal sources of external radiation for members of the proposed class included exposures to uranium and uranium progeny. NIOSH has obtained external dosimeter results for monitored individuals for the period from December 1943 through March 1954. NIOSH has determined that reconstruction of the external dose for monitored workers is feasible. However, NIOSH has not made a determination at this time whether reconstruction of external dose for unmonitored workers is feasible. This lack of determination has no effect on individuals who are in the SEC class, but a determination will have to be made in order to complete dose reconstructions for individuals who have non-presumptive cancers or who do not meet other criteria of the SEC class.

- Pursuant to 42 C.F.R. § 83.13(c)(1), NIOSH determined that there is insufficient information to either: (1) estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred under plausible circumstances by any member of the class; or (2) estimate the radiation doses of members of the class more precisely than a maximum dose estimate.

- Although NIOSH found that it is not possible to completely reconstruct radiation doses for Vitro Manufacturing (Canonsburg) employees, NIOSH intends to use any available internal and external monitoring data that may be available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Furthermore, NIOSH has determined that occupational medical dose for all workers can be reconstructed. Therefore, dose reconstructions may be performed using these data, as appropriate, for individuals with non-presumptive cancers or fewer than 250 days employment during the class period.

Health Endangerment Determination

The NIOSH evaluation did not identify any evidence supplied by the petitioners or from other resources that would establish that the class was exposed to radiation during a discrete incident likely to have involved exceptionally high-level exposures, such as nuclear criticality incidents or other events involving similarly high levels of exposures. However, the evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of uranium and uranium progeny and from direct exposure to radioactive materials. Therefore, 42 C.F.R. § 83.13(c)(3)(ii) requires NIOSH to specify that health may have been endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

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SEC Petition Evaluation Report for SEC-00134

ATTRIBUTION AND ANNOTATION: This is a single-author document. All conclusions drawn from the data presented in this evaluation were made by the ORAU Team Lead Technical Evaluator: James Mahathy, Oak Ridge Associated Universities. These conclusions were peer-reviewed by the individuals listed on the cover page. The rationales for all conclusions in this document are explained in the associated text.

1.0 Purpose and Scope

This report evaluates the feasibility of reconstructing doses for employees who worked at Vitro Manufacturing during a specified time. It provides information and analysis germane to considering a petition for adding a class of employees to the Congressionally-created SEC.

This report does not make any determinations concerning the feasibility of dose reconstruction that necessarily apply to any individual energy employee who might require a dose reconstruction from NIOSH, with the exception of the employee whose dose reconstruction could not be completed, and whose claim consequently led to this petition evaluation. The finding in this report is not the final determination as to whether or not the proposed class will be added to the SEC. This report will be considered by the Advisory Board on Radiation and Worker Health (the Board) and by the Secretary of Health and Human Services (HHS). The Secretary of HHS will make final decisions concerning whether or not to add one or more classes to the SEC in response to the petition addressed by this report.

This evaluation, in which NIOSH provides its findings both on the feasibility of estimating radiation doses of members of this class with sufficient accuracy and on health endangerment, was conducted in accordance with the requirements of EEOICPA and 42 C.F.R. § 83.14.

2.0 Introduction

Both EEOICPA and 42 C.F.R. pt. 83 require NIOSH to evaluate qualified petitions requesting that the Department of Health and Human Services add a class of employees to the SEC. The evaluation is intended to provide a fair, science-based determination of whether it is feasible to estimate, with sufficient accuracy, the radiation doses of the proposed class of employees through NIOSH dose reconstructions.[1]

NIOSH is required to document its evaluation in a report, and to do so, relies upon both its own dose reconstruction expertise as well as technical support from its contractor, Oak Ridge Associated Universities (ORAU). Once completed, NIOSH provides the report to both the petitioners and the Advisory Board on Radiation and Worker Health. The Board will consider the NIOSH evaluation report, together with the petition, comments of the petitioner(s) and such other information as the Board considers appropriate, to make recommendations to the Secretary of HHS on whether or not to add one or more classes of employees to the SEC. Once NIOSH has received and considered the

[1] NIOSH dose reconstructions under EEOICPA are performed using the methods promulgated under 42 C.F.R. pt. 82 and the detailed implementation guidelines available at http://www.cdc.gov/niosh/ocas.

advice of the Board, the Director of NIOSH will propose a decision on behalf of HHS. The Secretary of HHS will make the final decision, taking into account the NIOSH evaluation, the advice of the Board, and the proposed decision issued by NIOSH. As part of this final decision process, the petitioner(s) may seek a review of certain types of final decisions issued by the Secretary of HHS.[2]

3.0 NIOSH-Proposed Class Definition and Petition Basis

The NIOSH-proposed class includes all AWE employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from August 13, 1942 through December 31, 1957, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort. During this period, employees at this facility were involved in processing of uranium ores and uranium concentrates to produce a feed concentrate in the form of U_3O_8. Beginning in 1947, Vitro Manufacturing began processing scrap and uranium-bearing residues from other AEC contractor sites to extract uranium. Removal of waste residues from the Vitro site began in 1956, and the last AEC contract with Vitro for Atomic Weapons Employer operations was terminated in 1957.

The evaluation responds to Petition SEC-00134 which was submitted by an EEOICPA claimant whose dose reconstruction could not be completed by NIOSH due to a lack of sufficient dosimetry-related information. This claimant was employed as a Chemist from 1952 through 1956. NIOSH's determination that it is unable to complete a dose reconstruction for an EEOICPA claimant is a qualified basis for submitting an SEC petition pursuant to 42 C.F.R. § 83.9(b).

4.0 Radiological Operations Relevant to the Proposed Class

The following subsections summarize the radiological operations at Vitro Manufacturing from August 13, 1942 through December 31, 1957 and the information available to NIOSH to characterize particular processes and radioactive source materials. Using available sources, NIOSH has attempted to gather process and source descriptions, information regarding the identity and quantities of radionuclides of concern, and information describing processes through which the radiation exposures of concern may have occurred and the physical environment in which they may have occurred. The information included within this evaluation report is meant only to be a summary of the available information.

4.1 Operations Description

Vitro Manufacturing was located on an l8-acre site on Strabane Avenue in Canonsburg, Pennsylvania. From 1930 to 1942, the company extracted radium and uranium salts from carnotite ore and residues for commercial purposes (OROO, 1978; ORNL, 1978). Site buildings were contaminated before AEC operations started (Snapp, 1951, pdf p. 53). Beginning in 1942, Vitro Manufacturing began processing African uranium ores and uranium concentrates for the Manhattan Engineer District

[2] See 42 C.F.R. pt. 83 for a full description of the procedures summarized here. Additional internal procedures are available at http://www.cdc.gov/niosh/ocas.

(MED), the predecessor agency of the Atomic Energy Commission (AEC), to produce a feed concentrate in the form of U_3O_8 (Whitman, 1978). Slimes (45% U_3O_8) resulting from refining of Canadian ores by the Vanadium Corporation were further processed at Vitro (Whitman, 1978). Vitro also further processed high-grade domestic carnotite (potassium uranium vanadate mineral) ores received from other MED sites to sodium salts (Whitman, 1978; Strod, Dec1949).

Starting in 1947, under AEC contract, Vitro Manufacturing processed scrap and uranium-bearing residues from other AEC contractor sites to extract uranium (Strod, Jan1949, pdf p. 30). Vitro received uranium materials from Department of Energy (DOE) sites including, but not limited to, Hanford, Mallinckrodt, MIT, Middlesex, Tyson Valley Powder Farm, Y-12, and ORNL. Uranium processing, except for small-scale activities, was terminated in 1955. Removal of waste residues from the Vitro site began in 1956; the last AEC contract with Vitro for Atomic Weapons Employer (AWE) operations was terminated in 1957. The period of such AWE operations at Vitro Manufacturing is assumed to begin on August 13, 1942, when the MED came into existence, and is assumed to end on December 31, 1957.

4.2 Radiation Exposure Potential from Operations

The potential for external radiation dose existed at Vitro Manufacturing. Domestic ore concentrates contained mainly U-234, U-235, and U-238 with their short-lived progeny that had grown in after the extraction process. The primary radiological hazard from the domestic ore was alpha and beta emissions. African ores processed at the Canonsburg site were not pre-processed and contained significant radium concentrations. Radium and its progeny would produce significant gamma radiation and elevated levels of radon. Several tasks would have provided potential for internal radiological exposures. Among such tasks were the opening and unloading of railcars containing ore, storage of the African ore, and the sampling and material handling of the African ore. Elevated air concentrations of radium dust were also likely during the initial processing of dry ore. The highest external radiological exposures would have occurred from the gamma rays emitted by radium and radium progeny.

Sources of internal exposure included potential intakes of uranium and uranium decay chain radionuclides. External (photon and electron) doses from those radionuclides existed at all locations where radioactive materials were handled or stored. A HASL survey conducted in October 1949 showed 49 workers to be substantially overexposed with several approaching 100 MACs. Snapp shows that the degree of airborne exposure by job title; even clerks were exposed (Snapp, 1951, pdf p. 57).

Operations involved processing these ores to separate and concentrate the uranium into primarily U_3O_8 oxide. These processing activities involved uranium and decay chain radionuclides being chemically separated from each other and re-concentrated so that they were frequently not in equilibrium; the degree of disequilibrium is not identifiable from site records.

It is apparent that Vitro Manufacturing worked with natural uranium and uranium decay chain radionuclides throughout the entire AWE operations period. However, without additional documentation, NIOSH can make no assumptions about the relative amounts of these materials that would have been encountered at the site during the period from August 13, 1942 through December 31, 1957.

4.3 Time Period Associated with Radiological Operations

Per the DOE Office of Health, Safety and Security, the time period associated with AWE operations at Vitro Manufacturing is from 1942 through 1957 (DOE, 2008). NIOSH has discovered no additional data to support more specific dates for the start and stop of AWE operations. Therefore, AWE work at Vitro is assumed to have started with the creation of the Manhattan Engineer District on August 13, 1942, and to have continued through December 31, 1957.

4.4 Site Locations Associated with Radiological Operations

While some buildings are specifically noted for the use of radiological materials, available documentation does not indicate any definite boundaries between radiological and non-radiological areas. Given the lack of information needed to completely describe the diverse source term and operational processes, NIOSH must assume that the potential for exposure to radioactive materials existed in all Vitro Manufacturing buildings and areas.

4.5 Job Descriptions Affected by Radiological Operations

NIOSH has found only limited documentation associating job titles and/or job assignments with specific radiological operations or conditions. AEC documentation supports the conclusion that all occupations were exposed to airborne contamination in 1949 (Snapp, 1951; Morgan, 1950). Without more thorough information, NIOSH is unable to define potential radiation exposure conditions based on worker job descriptions.

5.0 Summary of Available Monitoring Data for the Proposed Class

The primary data used for determining internal exposures are derived from personal monitoring data, such as urinalyses, fecal samples, and whole-body counting results. If these are unavailable, the air monitoring data from breathing zone and general area monitoring are used to estimate the potential internal exposure. If personal monitoring and breathing zone area monitoring are unavailable, internal exposures can sometimes be estimated using more general area monitoring, process information, and information characterizing and quantifying the source term.

This same hierarchy is used for determining the external exposures to the cancer site. Personal monitoring data from film badges or thermoluminescent dosimeters (TLDs) are the primary data used to determine such external exposures. If there are no personal monitoring data, exposure rate surveys, process knowledge, and source term modeling can sometimes be used to reconstruct the potential exposure.

A more detailed discussion of the information required for dose reconstruction can be found in OCAS-IG-001, *External Dose Reconstruction Implementation Guideline,* and OCAS-IG-002, *Internal Dose Reconstruction Implementation Guideline*. These documents are available at: http://www.cdc.gov/niosh/ocas/ocasdose.html.

5.1 Data Capture Efforts and Sources Reviewed

In addition to examining its Site Research Database (SRDB) to locate documents supporting the evaluation of the proposed class, NIOSH identified and reviewed data sources to locate information relevant to determining the feasibility of dose reconstruction for the class of employees proposed for this petition. This included determining the availability of information on personnel monitoring, workplace monitoring, and radiological source term data.

NIOSH data capture efforts for Vitro Manufacturing focused on successor companies, the Nuclear Regulatory Commission (including the ADAMS electronic records repository), the DOE (including OpenNet repository; and Office of Scientific and Technical Information [OSTI]), the State of Pennsylvania, and the National Archives record centers. Attachment 1 contains a summary of Vitro Manufacturing documents. The summary identifies specific data capture details for each document retrieved.

Bioassay and film badge data were found in the records for monitored individuals, as described in more detail below. Records of airborne dust monitoring and surface contamination also exist for various periods during the AWE operational period. Surface contamination results could not be correlated to worker intakes from the available data. Air samples were primarily analyzed for total alpha activity, which was assumed to be uranium, with results typically reported in units of disintegrations per minute per cubic meter of air. Records of air sampling during the operational period have only been found for the years 1949 through 1953. Many air sampling records could not be correlated to exact locations or time periods due to incomplete descriptions in the records or illegibility.

5.2 Worker Interviews

NIOSH has reviewed the computer-assisted telephone interviews conducted for claims filed with NIOSH for energy employees who worked at the Vitro Manufacturing during the period from 1942 through 1957. These interviews provided no information to change NIOSH's feasibility determination.

NIOSH determined that additional worker interviews would not affect the feasibility determination nor would it potentially allow NIOSH to limit the locations defined in the class definition. NIOSH made this determination because worker interviews would not provide the specific data necessary to determine the degree of disequilibrium between uranium and uranium progeny for the various site locations. In order to make this determination, NIOSH needs specific monitoring data. Therefore, no additional interviews were pursued.

5.3 Internal Personnel Monitoring Data

NIOSH has obtained bioassay urinalysis results for the period between 1950 and 1954 (AEC, Mar1950; AEC, 1949-1958; AEC, 1950-1954; ACE, Jun1950; AEC, 1950-1951). These samples were analyzed for uranium by fluorimetry, which yielded the total amount of uranium (by mass) in urine. Some records could not be correlated to individuals or specific time periods due to illegibility. Limited bioassay sample results for radon in breath were located for a small number of individuals for 1944 (Howland, 1944; NIOSH, 2002, pdf p. 9) and 1950 (AEC, 1949-1958; AEC, Jun1950). There

was no detailed information that would allow these results to be correlated to radium intakes, and according to the record, those results were deemed questionable at the time of collection.

5.4 External Personnel Monitoring Data

NIOSH has obtained external dosimeter results for monitored individuals beginning December 1943 (National Lead, 1954-1955; Tybout, 1944; Hayes, 1945-1947; Various Results, 1948-1951; Summary, 1954; Vitro, 1953a; Vitro, 1954a; Vitro, 1954b; NYDO, 1950a; NYDO, 1951; NYDO, 1952a; NYDO, 1953; NYDO, 1954; MED, 1946; Mears, 1945; NYDO, 1950b; MED, 1945; NYDO, 1948; NYDO, 1952b; Fernald, 1955; MED, 1944; Ferry, 1955). External dose records appear comprehensive through March 9, 1954, at which time the record indicated that the contract was ended. It is assumed that the cessation of monitoring was in response to reduced operational activities after that time. Records are generally legible and appeared to include gamma and beta doses for all monitored individuals.

5.5 Workplace Monitoring Data

NIOSH has obtained air monitoring results (daily weighted area and breathing zone air sampling) for monitoring conducted at approximately semiannual intervals for 1949 through 1953 (MED, 1952c, pdf pp. 6-13; NYDO, 1952d; AEC, 1949-1958; Klevin, 1949a; Klevin, 1951a; Klevin, 1952a; Klevin, 1952b; Klevin, 1953; IHB, 1953; Vitro, 1951; Klevin, 1949b; Vitro, unknown date; Vitro, 1953b; Klevin, 1951b, pdf pp. 1 and 5; ORNL, 1978).

NIOSH has obtained radiation survey data for some Vitro processes measured in 1950 (Piccot, 1950; Klevein, 1951b, pdf pp. 2-5) and 1953 (Peterson, 1953; Vitro, 1953c). NIOSH has obtained radiological survey data of equipment measured in 1954 and 1955 during and after decontamination (Klevin, 1955, pdf pp. 1-5 and 13-24). A 1966 Commonwealth of Pennsylvania radiological survey revealed that two of the Vitro Manufacturing buildings were contaminated with uranium progeny above limits for release to the general public (Hammer, 1966).

5.6 Radiological Source Term Data

NIOSH has obtained information detailing some of materials maintained on site though the list is not considered complete by NIOSH (Snapp, 1951, pdf p. 42; Strod, Jan1949, pdf pp. 20-26; Strod, 1950; Strod, 1949; Fleck, 1949; Voucher, 1943). Available information includes annual inventories compiled by the AEC for their annual reports. Available records indicate a wide variety of material forms, including uranium and pitchblende ores, uranium concentrates and oxides, and uranium scrap materials obtained from other sites. However, NIOSH has not identified sufficient documentation to define and quantify the total source term. Available documentation indicates that Vitro Manufacturing worked with natural uranium and uranium decay chain radionuclides throughout the entire AWE operations period. However, without additional documentation, NIOSH can make no assumptions about the relative amounts of these materials that would have been encountered at the site during the period from August 13, 1942 through December 31, 1957.

6.0 Feasibility of Dose Reconstruction for the Proposed Class

42 C.F.R. § 83.14(b) states that HHS will consider a NIOSH determination that there was insufficient information to complete a dose reconstruction, as indicated in this present case, to be sufficient, without further consideration, to conclude that it is not feasible to estimate the levels of radiation doses of individual members of the class with sufficient accuracy.

In the case of a petition submitted to NIOSH under 42 C.F.R. § 83.9(b), NIOSH has already determined that a dose reconstruction cannot be completed for an employee at the DOE or AWE facility. This determination by NIOSH provides the basis for the petition by the affected claimant. Per § 83.14(a), the NIOSH-proposed class defines those employees who, based on completed research, are similarly affected and for whom, as a class, dose reconstruction is similarly not feasible.

In accordance with § 83.14(a), NIOSH may establish a second class of co-workers at the facility for whom NIOSH believes that dose reconstruction is similarly infeasible, but for whom additional research and analysis is required. If so identified, NIOSH would address this second class in a separate SEC evaluation rather than delay consideration of the claim currently under evaluation (see Section 10). This would allow NIOSH, the Board, and HHS to complete, without delay, their consideration of the class that includes a claimant for whom NIOSH has already determined a dose reconstruction cannot be completed, and whose only possible remedy under EEOICPA is the addition of a class of employees to the SEC.

This section of the report summarizes research findings by which NIOSH determined that it lacked sufficient information to complete the relevant dose reconstruction and on which basis it has defined the class of employees for which dose reconstruction is not feasible. NIOSH's determination relies on the same statutory and regulatory criteria that govern consideration of all SEC petitions.

6.1 Feasibility of Estimating Internal Exposures

NIOSH has evaluated the available personnel and workplace monitoring data and source term information and has determined that there are insufficient data for estimating internal exposures, as described below.

NIOSH has obtained bioassay urinalysis results only for the period between 1950 and 1954. Due to process separation of uranium and uranium progeny radionuclides throughout the AWE operations period, the available uranium urinalysis results cannot be used to quantify intakes of non-uranium radionuclides. The degree of disequilibrium, and therefore the potential for unmonitored intakes, cannot be determined with the documentation available to NIOSH.

While NIOSH has obtained area air sampling results for the period from 1949 through 1953, these results are inadequate to bound internal intakes from uranium progeny. These samples were analyzed for gross alpha activity only. The data are highly variable and there is insufficient information available to allow NIOSH to apply the general area air concentrations to specific individual breathing zones. Additionally, no useable information exists to assess air concentrations during the earlier period of operations (1942-1948) when emission controls had not been implemented and releases were likely higher than during the monitored interval.

NIOSH has not identified sufficient documentation to define and quantify the total source term for Vitro Manufacturing during the AWE operations period. Available documentation indicates that Vitro worked with natural uranium and uranium decay chain radionuclides throughout the entire AWE operations period. Without additional documentation, NIOSH can make no assumptions about the relative amounts of these materials that would have been encountered at the site during the period from August 13, 1942 through December 31, 1957. There is therefore insufficient source term information available to NIOSH to bound internal exposures to non-uranium radionuclides in disequilibrium with uranium for the period from August 13, 1942 through December 31, 1957.

NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to estimate potential internal exposures to non-uranium radionuclides in disequilibrium with uranium during the period of AWE operations from August 13, 1942, through December 31, 1957. Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, total internal exposures and resulting doses for the class of employees covered by this evaluation.

Although NIOSH found that it is not possible to completely reconstruct internal radiation doses for the period from August 13, 1942 through December 31, 1957, NIOSH intends to use any available internal monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at Vitro Manufacturing during the period from August 13, 1942 through December 31, 1957, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

6.2 Feasibility of Estimating External Exposures

This evaluation responds to a petition based on NIOSH determining that internal radiation exposures to non-uranium radionuclides in disequilibrium with uranium could not be reconstructed for a dose reconstruction referred to NIOSH by the Department of Labor (DOL). As noted above, HHS will consider this determination to be sufficient without further consideration to determine that it is not feasible to estimate the levels of radiation doses of individual members of the class with sufficient accuracy. Consequently, it is not necessary for NIOSH to fully evaluate the feasibility of reconstructing external radiation exposures for the class of workers covered by this report.

NIOSH has obtained external dosimeter results for monitored individuals from December 1943 through March 1954. NIOSH has determined that reconstruction of the external dose for monitored workers is feasible. However, NIOSH has not made a determination at this time whether reconstruction of the external dose for unmonitored workers is feasible. This lack of determination has no effect on individuals who are in the SEC class, but a determination will have to be made in order to complete dose reconstructions for individuals who have non-presumptive cancers or who do not meet other criteria of the SEC class. Adequate reconstruction of medical dose for Vitro Manufacturing workers is likely to be feasible by using claimant-favorable assumptions in the complex-wide Technical Information Bulletin, *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures* (ORAUT-OTIB-0006).

Although NIOSH found that it may not be possible to completely reconstruct external radiation doses for all workers for the period from August 13, 1942 through December 31, 1957, NIOSH intends to use any available external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at Vitro Manufacturing during the period from August 13, 1942 through December 31, 1957, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

6.3 Class Parameters Associated with Infeasibility

This report evaluates the feasibility for completing dose reconstructions for employees at Vitro Manufacturing from August 13, 1942 through December 31, 1957. NIOSH found that the available monitoring records, process descriptions, and source term data available are not sufficient to complete dose reconstructions for the proposed class of employees. NIOSH therefore recommends that the proposed class include the entire AWE-covered period of August 13, 1942 through December 31, 1957.

As discussed in Section 4.4, NIOSH has no documentation to demonstrate that radioactive materials were restricted to specific areas or that contamination was adequately controlled. NIOSH therefore assumes that the potential for exposure to radioactive materials existed in all Vitro Manufacturing buildings and areas. NIOSH recommends that the proposed class definition include all Vitro Manufacturing buildings and areas during the specified time period.

NIOSH has found insufficient documentation associating job titles and/or job assignments with specific radiological operations or conditions. Without such information, NIOSH is unable to define the proposed SEC class based on worker job descriptions. NIOSH therefore recommends that the proposed class definition include all AWE period employees who worked at Vitro Manufacturing during the specified time period.

7.0 Summary of Feasibility Findings for Petition SEC-00134

This report evaluates the feasibility for completing dose reconstructions for employees at Vitro Manufacturing from August 13, 1942 through December 31, 1957. NIOSH determined that members of this class may have received radiation exposures from of non-uranium radionuclides in disequilibrium with uranium. NIOSH lacks sufficient information, which includes specific biological monitoring data, sufficient air monitoring information, or sufficient process and radiological source information that would allow it to estimate the potential internal exposure to which the proposed class may have been exposed. Reconstruction of external dose for individuals for whom personal monitoring records are not available is also not feasible. NIOSH considers the adequate reconstruction of medical dose for Vitro Manufacturing workers to be likely feasible.

NIOSH has documented herein that it cannot complete the dose reconstruction related to this petition. The basis of this finding demonstrates that NIOSH does not have access to sufficient information to estimate either the maximum radiation dose incurred by any member of the class or to estimate such radiation doses more precisely than a maximum dose estimate.

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any available internal and external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Therefore, dose reconstructions for individuals employed at Vitro Manufacturing during the period from August 13, 1942 through December 31, 1957, but who not qualifying for inclusion in the SEC, may be performed using these data as appropriate.

8.0 Evaluation of Health Endangerment for Petition SEC-00134

The health endangerment determination for the class of employees covered by this evaluation report is governed by EEOICPA and 42 C.F.R. § 83.14(b) and § 83.13(c)(3). Pursuant to these requirements, if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, NIOSH must determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class. The regulations require NIOSH to assume that any duration of unprotected exposure may have endangered the health of members of a class when it has been established that the class may have been exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. If the occurrence of such an exceptionally high-level exposure has not been established, then NIOSH is required to specify that health was endangered for those workers who were employed for a number of work days aggregating at least 250 work days within the parameters established for the class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

NIOSH has determined that members of the class were not exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. However, the evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of uranium and uranium progeny and from direct exposure to radioactive materials. Consequently, NIOSH is specifying that health was endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

9.0 NIOSH-Proposed Class for Petition SEC-00134

The evaluation defines a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. This class includes all AWE employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from August 13, 1942 through December 31, 1957, for a number of work days aggregating at least 250 work days, occurring either solely under this employment, or in combination with work days within the parameters established for one or more other classes of employees included in the SEC.

10.0 Evaluation of Second Similar Class

In accordance with § 83.14(a), NIOSH may establish a second class of co-workers at the facility, similar to the class defined in Section 9.0, for whom NIOSH believes that dose reconstruction may not be feasible, and for whom additional research and analyses is required. If a second class is identified, it would require additional research and analyses. Such a class would be addressed in a separate SEC evaluation rather than delay consideration of the current claim. At this time, NIOSH has not identified a second similar class of employees at the Vitro Manufacturing for whom dose reconstruction may not be feasible.

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11.0 References

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42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 28, 2004; SRDB Ref ID: 22001

42 U.S.C. §§ 7384-7385 [EEOICPA], *Energy Employees Occupational Illness Compensation Program Act of 2000*; as amended; OCAS website

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Attachment 1: Data Capture Synopses

Table A1-1: DATA CAPTURE SYNOPSIS FOR VITRO MANUFACTURING

Data Capture Information	Data Captured Description	Completed	Uploaded
Primary Site/Company Name: Vitro Manufacturing Other Site Names: Vitro Rare Metals Co. Successor History: GEC merged with British Aerospace to form BAE Systems in 1999 (Contact: Gregory Hayken, Legal Counsel, 301-738-4166) General Electric Company - 1998 Merged with TAS formed Tracor Systems Technologies -1993 Tracor Applied Sciences - 1993 Penn Central Corporation - 1981 Renamed to GK Technologies - 1978 General Cable Corporation - 1978 Automation Industries - 1968 Vitro Manufacturing Company	BAE Systems, successor company, Legal Counsel confirmed that a search of records and archives had been performed and that no information relating to any Vitro site had been found. No relevant data located.	02/25/2008	0
State Contacted: PA Office Bureau of Radiation Protection (Contact: David Allard, Director PA Dept. of Environmental Protection, 717-787-2480)	No relevant data identified.	02/22/2008	0
Comprehensive Epidemiologic Data Resource (CEDR)	No relevant data identified.	03/27/2008	0
DOE Energy Citations	No relevant data identified.	03/28/2008	0
DOE Germantown	NYOO uranium operations flow chart, monthly field report, radiological surveys, air sampling and radon in breath exposure data, biological effects of radioactivity near plant, miscellaneous letters, memos and lists, and an accident report.	04/20/2004	18
DOE Hanford Declassified Document Retrieval System (DDRS)	Trip report on uranium scrap processing at the Vitro Manufacturing Co., Canonsburg, PA.	01/03/2008	1

Table A1-1: DATA CAPTURE SYNOPSIS FOR VITRO MANUFACTURING			
Data Capture Information	**Data Captured Description**	**Completed**	**Uploaded**
DOE Legacy Management Considered Sites	Canonsburg disposal fact sheet and Tonawanda area progress report.	10/04/2007	2
DOE Legacy Management - Grand Junction Office	Health Physics activities and authorization to ship scrap.		
DOE Legacy Management - MoundView (Fernald Holdings, includes Fernald Legal Database)	Radon monitoring plan and results, film badge correspondence, HP and operating procedures, Th-230 air samples, environmental TLD's, and urinalysis results, radiological survey of the former Vitro Rare Metals Plant, NYOO health and safety field activities monthly report, production of uranium feed materials, and an annual report.	03/14/2008	18
DOE Office of Scientific & Technical Information (OSTI) Information Bridge	Hanford Works monthly report, UMTRA Project water sampling plan, engineering feasibility analysis for in-situ stabilization of residues, and a risk assessment of ground water contamination.	01/03/2008	8
DOE OpenNet	Monthly status and progress reports.	01/03/2008	4
EML/HASL	Site visits, annual report, thorium sampling and storage, and symposium V on aerosols.	03/08/2005	1
Google	Poisoned workers and places: part 2/3, Canonsburg history, and analysis of institutional responsibilities for the long-term management of contaminant isolation facilities.	03/09/2008	9
HSS Advocacy Site	Site description.	01/16/2008	1
Missouri Department of Natural Resources	Historical storage of radioactive material, and a final environmental impact statement.	10/03/2008	3
NARA - Atlanta	Film badge results, radon breath measurements, air samples and radon data, gamma radiation at Vitro, Vitro contract AT(30-1)-1241 (1951), and weekly reports.	02/28/2007	45

Table A1-1: DATA CAPTURE SYNOPSIS FOR VITRO MANUFACTURING			
Data Capture Information	**Data Captured Description**	**Completed**	**Uploaded**
NARA - Kansas City	Health and Safety Program, radiation surveys, waste disposal, solid waste treatment, disposal of uranium bearing residues and radiological survey plan, close out survey, survey of buildings #14 and #16, environmental radiation surveys, radon monitoring data, phase II radiological survey, radiological survey of the former Vitro Rare Metals Plant, and evaluation of radiation exposures.	04/01/2005	28
National Academies Press (NAP)	No relevant data identified.	03/09/2008	0
National Archives	No relevant data identified.	01/03/2008	0
National Nuclear Security Administration (NNSA) - Nevada Site Office	No relevant data identified.	03/14/2008	0
NOCTS	Claim file CATI extracts with: brief job/process description for filter press operator, ore process, Belgium Congo material process, Canadian ore processing description, site date information, list of most hazardous positions, cubic yards of onsite uranium, newspaper clippings and site timeline, DOE radiological survey memo, newspaper clipping with amount of contaminated waste buried onsite, and other claimant documents to support Vitro work post-1957.	01/17/2008	15
NRC Agencywide Document Access and Management (ADAMS)	Canonsburg ground water concentrations, request for NRC approval to delete institutional controls and radiological release survey plan.	01/03/2008	3
ORAU Team	Project spreadsheet and monitoring data.	02/04/2004	2
ORO Vault	Film badge results and uranium dust exposure information, exposure monitoring data, and uranium dust exposure summaries for various plants.	10/25/2005	3

Table A1-1: DATA CAPTURE SYNOPSIS FOR VITRO MANUFACTURING			
Data Capture Information	**Data Captured Description**	**Completed**	**Uploaded**
Unknown	Air dust samples, film badge reports, medical records, monthly status and progress reports, NYOO Health and Safety Division monthly report of field activities, radiological survey of the former Vitro Rare Metals Plant Canonsburg, Pennsylvania, smears samples, summary of Manhattan Project uranium flow sheet, and urine reports.	11/04/2003	63
US Army Corps of Engineers, Missouri	North County uranium residues historical synopsis, St. Louis, MO.	03/18/2008	1
Washington State University (United States Transuranium and Uranium Registries)	No relevant data identified.	03/27/2008	0
TOTAL			**227**

Table A1-2: DATABASE SEARCHES FOR VITRO MANUFACTURING			
Database/Source	**Keywords**	**Hits**	**Uploaded**
Legacy Management Considered Sites http://csd.lm.doe.gov/ COMPLETED 10/04/2007	N/A	2	2
DOE OSTI Information Bridge http://www.osti.gov/bridge/advancedsearch.jsp COMPLETED 01/03/2008	Vitro Manufacturing	20	8
	Vitro Rare Metals		
DOE OpenNet http://www.osti.gov/opennet/advancedsearch.jsp COMPLETED 01/03/2008	Vitro Manufacturing	8	4
	Vitro Rare Metals		

Table A1-2: DATABASE SEARCHES FOR VITRO MANUFACTURING			
Database/Source	**Keywords**	**Hits**	**Uploaded**
NRC ADAMS Reading Room http://www.nrc.gov/reading-rm/adams/web-based.html COMPLETED 01/03/2008	Vitro Manufacturing	12	3
	Vitro Rare Metals		
	Vitro, Canonsburg		
DOE Hanford DDRS http://www2.hanford.gov/declass/ COMPLETED 01/03/2008	Vitro Manufacturing	1	1
National Archives http://search.archives.gov/query.html COMPLETE 01/03/2008	Vitro Manufacturing	0	0
	Vitro Rare Metals		
National Academies Press http://www.nap.edu/ COMPLETED 03/09/2008	Vitro Manufacturing - NTS	14	0
	Vitro Manufacturing - NAP		
Google http://www.google.com COMPLETED 03/09/2008	ionium, OR Th230, OR Th-230, OR "Th 230" Vitro Manufacturing, Canonsburg	895	9
	thorium, OR Th232, OR Th-232, OR "Th 232" Vitro Manufacturing, Canonsburg		
	uranium, OR U233, OR U-233, OR "U 233", OR U234, OR "U 234", OR U-234 Vitro Manufacturing, Canonsburg		
	U235, OR "U 235", OR U-235, OR U238, OR "U 238", OR U-238 Vitro Manufacturing, Canonsburg		
	U308, OR "U 308", OR U-308, OR 308-U, OR 308U, OR "308 U", OR "uranium extraction", OR "black oxide", OR "brown oxide" Vitro Manufacturing, Canonsburg		

Table A1-2: DATABASE SEARCHES FOR VITRO MANUFACTURING			
Database/Source	**Keywords**	**Hits**	**Uploaded**
	green salt, OR "orange oxide", OR "yellow cake", OR UO2, OR UO3, OR UF4, OR UF6 OR U3O8 Vitro Manufacturing, Canonsburg		
	radium, OR Ra-226, OR Ra226, OR "Ra 226", OR Ra-228, OR Ra228, OR "Ra 228" Vitro Manufacturing, Canonsburg		
	radon, OR Rn-222, OR Rn222, OR "Rn 222", OR 222Rn Vitro Manufacturing, Canonsburg		
	thoron, OR Rn-220, OR Rn220, OR "Rn 220", OR 220Rn Vitro Manufacturing, Canonsburg		
	oralloy, OR postum, OR tuballoy, OR "uranyl nitrate hexahydrate" OR "sump cake" Vitro Manufacturing, Canonsburg		
	uranium dioxide, OR "uranium tetrafluoride", OR "uranium trioxide" Vitro Manufacturing, Canonsburg		
	uranium hexafluoride, OR accident, OR "air count" Vitro Manufacturing, Canonsburg		
	air dust, OR "air filter", OR "airborne test" Vitro Manufacturing, Canonsburg		
	alpha, OR "belgian congo ore", OR bioassay, OR bio-assay Vitro Manufacturing, Canonsburg		
	breath, OR "breathing zone", OR BZ, OR calibration, OR columnation Vitro Manufacturing, Canonsburg		
	contamination, OR curie, OR derby, OR dose OR dosimeter Vitro Manufacturing, Canonsburg		
	dosimetric, OR dosimetry, OR electron, OR environment Vitro Manufacturing, Canonsburg		
	exposure, OR "exposure investigation", OR "radiation exposure" OR "feed material", Vitro Manufacturing, Canonsburg		
	Formerly Utilized Sites Remedial Action Program, OR FUSRAP, OR gamma-ray, OR "gas proportional" Vitro Manufacturing, Canonsburg		

Table A1-2: DATABASE SEARCHES FOR VITRO MANUFACTURING			
Database/Source	**Keywords**	**Hits**	**Uploaded**
	health, OR "health instrument", OR "health physics", OR "H.I.", OR HI, OR HP, OR "highly enriched uranium", OR HEU Vitro Manufacturing, Canonsburg		
	hydrofluorination, OR "in vitro", OR "in vivo", OR incident, OR ingestion, OR inhalation, OR internal Vitro Manufacturing, Canonsburg		
	investigation, OR isotope, OR isotopic, OR "isotopic enrichment", OR Landauer, OR "liquid scintillation" Vitro Manufacturing, Canonsburg		
	log, "log sheet", "log book", "low enriched uranium", LEU Vitro Manufacturing, Canonsburg		
	maximum permissible concentration, OR MPC, OR metallurgy, OR microcurie, OR millicurie Vitro Manufacturing, Canonsburg		
	monitor, OR "air monitoring", OR nanocurie, OR "nasal wipe", OR neutron, OR "nose wipe" Vitro Manufacturing, Canonsburg		
	nuclear, OR Chicago-Nuclear, OR "nuclear fuels", OR "nuclear track emulsion", OR "type A" Vitro Manufacturing, Canonsburg		
	"occupational radiation exposure", OR occurrence, OR "ore concentrate" Vitro Manufacturing, Canonsburg		
	permit, OR "radiation work permit", OR "safe work permit", OR "special work permit", OR RWP, OR SWP Vitro Manufacturing, Canonsburg		
	picocurie, OR pitchblende, OR "pocket ion chamber" Vitro Manufacturing, Canonsburg		
	radiation, OR radioactive, OR radioactivity, OR radiological Vitro Manufacturing, Canonsburg		
	Radiological Survey Data Sheet, OR RSDS, OR radionuclide, OR raffinate, OR reactor Vitro Manufacturing, Canonsburg		

Table A1-2: DATABASE SEARCHES FOR VITRO MANUFACTURING			
Database/Source	**Keywords**	**Hits**	**Uploaded**
	respiratory, OR "retention schedules", OR roentgen Vitro Manufacturing, Canonsburg		
	sample, OR "air sample", OR "dust sample", OR "general area air sample" Vitro Manufacturing, Canonsburg		
	survey, OR "building survey", OR "routine survey", OR "special survey", OR "technical basis" Vitro Manufacturing, Canonsburg		
	"thermoluminescent dosimeter", OR TLD, OR "Tiger Team" Vitro Manufacturing, Canonsburg		
	tolerance dose, OR urinalysis, OR urine, OR "whole body count", OR WBC, OR "working level", OR WL, OR X-ray, OR "X ray", OR Xray Vitro Manufacturing, Canonsburg		
	"Vitro Rare Metals" Canonsburg Vitro Manufacturing, Canonsburg		
NNSA - Nevada Site Office www.nv.doe.gov/main/search.htm COMPLETED 03/14/2008	Vitro Manufacturing	0	0
	Vitro Rare Metals		
CEDR http://cedr.lbl.gov/ COMPLETED 03/27/2008	Vitro	0	0
U.S. Transuranium & Uranium Registries http://www.ustur.wsu.edu/ COMPLETED 03/27/2008	"Vitro Manufacturing"	0	0
	"Vitro Rare Metals"		
	Vitro Manufacturing		
DOE Energy Citations http://www.osti.gov/energycitations/ COMPLETED 03/28/2008	Vitro Manufacturing	26	0
	Vitro Rare Metals		

Table A1-3: OSTI DOCUMENTS ORDERED FO VITRO MANUFACTURING			
DOCUMENT NUMBER	**DOCUMENT TITLE**	**REQUESTED DATE**	**RECEIVED DATE**
OSTI ID: 4282427 Report Number(s): TID-5342;M-5482	Scrap Recovery At Vitro Manufacturing Company Canonsburg, Pennsylvania	03/28/2008	09/17/2008