SEC Petition Evaluation Report
Petition SEC-00177 Addendum 1

Report Rev #: Addendum 1 Report Submittal Date: July 27, 2011

Subject Expert(s):	James Bogard, Monica Harrison-Maples
Site Expert(s):	N/A

Petition Administrative Summary

Petition Under Evaluation

Petition #	Petition Type	Petition Receipt Date	Qualification Date	DOE/AWE Facility Name
SEC-00177 (Addendum 1)	83.13	July 14, 2010	September 9, 2010	Vitro Manufacturing (Canonsburg)

Petitioner-Requested Class Definition

All employees who worked in any area at the Vitro Manufacturing facility in Canonsburg, Pennsylvania, during the time period from January 1, 1958 through April 30, 1960.

Class Evaluated by NIOSH

All employees who worked in any area at the Vitro Manufacturing facility in Canonsburg, Pennsylvania, during the time period from January 1, 1960 through September 30, 1965.

NIOSH-Proposed Class to be Added to the SEC

All Atomic Weapons Employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from January 1, 1960 through September 30, 1965, 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
SEC-00134	83.14	Vitro Manufacturing (Canonsburg)	Class added to the SEC for Aug. 13, 1942 through Dec. 31, 1957
SEC-00177	83.13	Vitro Manufacturing (Canonsburg)	Class added to the SEC for Jan. 1, 1958 through Dec. 31, 1959

Related Evaluation Report Information

Report Title	DOE/AWE Facility Name
SEC Petition Evaluation Report for Petition SEC-00134	Vitro Manufacturing (Canonsburg)
SEC Petition Evaluation Report for Petition SEC-00177	Vitro Manufacturing (Canonsburg)

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Peer Review Completed By:	[Signature on File] *Gregory Macievic*	7/27/2011 *Date*
SEC Petition Evaluation Reviewed By:	[Signature on File] *J. W. Neton*	7/28/2011 *Date*
SEC Evaluation Approved By:	[Signature on File] *Stuart L.Hinnefeld*	7/28/2011 *Date*

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Evaluation Report Summary: SEC-00177 Addendum 1, Vitro Manufacturing

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*.

Petitioner-Requested Class Definition

Petition SEC-00177 was received on July 14, 2010, and qualified on September 9, 2010. The petitioner requested that NIOSH consider the following class: *All employees who worked in any area at the Vitro Manufacturing facility in Canonsburg, Pennsylvania, during the time period from January 1, 1958 through April 30, 1960.*

Class Evaluated by NIOSH

Based on its preliminary research, NIOSH divided the petitioner-requested class into two periods to be separately evaluated. The first period, from January 1, 1958 through December 31, 1959, has been documented in the evaluation report SEC-00177, dated February 4, 2011. In the interest of timeliness, NIOSH reserved the feasibility evaluation for the residual radiation period beginning in January 1960. The evaluation of the period beginning on January 1, 1960 through September 30, 1965 is presented in this report, SEC-00177 Addendum 1.

NIOSH evaluated the following class: All employees who worked in any area at the Vitro Manufacturing facility in Canonsburg, Pennsylvania, during the time period from January 1, 1960 through September 30, 1965.

NIOSH-Proposed Class to be Added to the SEC

Based on its complete research of the class under evaluation, NIOSH has defined a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. The NIOSH-proposed class includes all Atomic Weapons Employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from January 1, 1960 through September 30, 1965, 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. The class under evaluation was recommended for inclusion in the SEC (see Section 3.0 below) because NIOSH lacks personnel monitoring data, air monitoring information, sufficient process information, and radiological source term information for the period under evaluation to allow it to estimate, with sufficient accuracy, the potential occupational exposures to uranium products and uranium progeny during remediation at Vitro Manufacturing (Canonsburg) during the proposed SEC period.

Feasibility of Dose Reconstruction

Per EEOICPA and 42 C.F.R. § 83.13(c)(1), NIOSH has established that it does not have access to sufficient information to: (1) estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred in plausible circumstances by any member of the class; or (2) estimate radiation doses of members of the class more precisely than an estimate of maximum dose. Information available from the site profile and additional resources is not sufficient to document or estimate the maximum internal and external potential exposure to members of the proposed class under plausible circumstances during the specified period.

The NIOSH dose reconstruction feasibility findings are based on the following:

- Principal sources of internal and external radiation for members of the proposed class included exposures to site contamination and residue piles containing uranium and uranium progeny, including radon.

- There is currently a class of Vitro Manufacturing (Canonsburg) workers associated with the previous NIOSH evaluation of SEC petition SEC-00134 for a portion of the site's Atomic Weapons Employer operations period (August 13, 1942 through December 31, 1957). The Secretary of the Department of Health and Human Services (DHHS) has designated the following class for inclusion in the Special Exposure Cohort:

  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.

  An additional class of Vitro Manufacturing (Canonsburg) workers for the period from1957 through 1959 has been designated for addition to the Special Exposure Cohort. This designation by DHHS followed the initial evaluation of petition SEC-00177 for Vitro Manufacturing (Canonsburg). The designation of the following class of employees as an addition to the SEC was effective May 29, 2011:

  All Atomic Weapons Employer employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from January 1, 1958 through December 31, 1959, 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.

- The proposed class period from January 1, 1960 through September 30, 1965, follows immediately after the already-designated SEC period for Vitro Manufacturing (Canonsburg). During this period, employees at the facility had potential for exposure to radiological source materials stored in open residue piles susceptible to contamination spread, and to radiological materials during decontamination and decommissioning activities including the eventual burial of the residue piles. NIOSH has documentation indicating that Vitro Manufacturing (Canonsburg) completed the transfer and burial of the residue storage piles onsite. The report describing the completed state of the burial work is dated September 30, 1965.

- NIOSH does not have access to personnel monitoring, workplace monitoring, or source term data to estimate unmonitored internal and external exposures for Vitro Manufacturing (Canonsburg) workers during the period of residue storage and site decommissioning and burial operations from January 1, 1960 through September 30, 1965.

- 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.

- Doses received from occupational medical X-rays are not part of the source term for the residual radiation period; therefore, medical doses were not evaluated.

- Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any 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 (Canonsburg) during the period from January 1, 1960 through September 30, 1965, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

Health Endangerment Determination

Per EEOICPA and 42 C.F.R. § 83.13(c)(3), a health endangerment determination is required because NIOSH has determined that it does not have sufficient information to estimate dose for the members of the proposed class.

NIOSH did not identify any evidence supplied by the petitioners or from other resources that would establish that the proposed 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 proposed class may have accumulated chronic exposures through intakes of radionuclides, combined with external exposures to beta and gamma radiation. 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, either 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 Addendum 1 for SEC-00177

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: Monica Harrison-Maples, Oak Ridge Associated Universities. 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 all employees who worked in any area at the Vitro Manufacturing facility in Canonsburg, Pennsylvania, during the time period from January 1, 1960 through September 30, 1965. It provides information and analyses 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. This report also does not contain the final determination as to whether the proposed class will be added to the SEC (see Section 2.0).

This evaluation was conducted in accordance with the requirements of EEOICPA, 42 C.F.R. pt. 83, and the guidance contained in the Division of Compensation Analysis and Support's (DCAS) *Internal Procedures for the Evaluation of Special Exposure Cohort Petitions*, DCAS-PR-004.[1]

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 (HHS) 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 class of employees through NIOSH dose reconstructions.[2]

42 C.F.R. § 83.13(c)(1) states: *Radiation doses can be estimated with sufficient accuracy if NIOSH has established that it has access to sufficient information to estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred in plausible circumstances by any member of the class, or if NIOSH has established that it has access to sufficient information to estimate the radiation doses of members of the class more precisely than an estimate of the maximum radiation dose.*

Under 42 C.F.R. § 83.13(c)(3), if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, then NIOSH must determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class. The regulation requires NIOSH to assume that any duration of unprotected exposure may have endangered the health of

[1] DCAS was formerly known as the Office of Compensation Analysis and Support (OCAS).
[2] 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.

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 at least 250 aggregated work days within the parameters established for the class or in combination with work days within the parameters established for one or more other SEC classes.

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 petitioner(s) and the Advisory Board on Radiation and Worker Health (Board). The Board will consider the NIOSH evaluation report, together with the petition, petitioner(s) comments, and other information the Board considers appropriate, in order 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 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 decision process, petitioners may seek a review of certain types of final decisions issued by the Secretary of HHS.[3]

3.0 SEC-00177 Addendum 1, Vitro Manufacturing Class Definitions

The following subsections address the evolution of the class definition for SEC-00177 Addendum 1, Vitro Manufacturing in Canonsburg, Pennsylvania. When a petition is submitted, the requested class definition is reviewed as submitted. Based on its review of the available site information and data, NIOSH will make a determination whether to qualify for full evaluation all, some, or no part of the petitioner-requested class. If some portion of the petitioner-requested class is qualified, NIOSH will specify that class along with a justification for any modification of the petitioner's class. After a full evaluation of the qualified class, NIOSH will determine whether to propose a class for addition to the SEC and will specify that proposed class definition.

Per the DOE Office of Health, Safety and Security, the time period currently associated with Atomic Weapons Employer (AWE) operations at the Vitro Manufacturing Canonsburg site is 1942 through 1959. Prior to January 2011, the period associated with AWE operations was defined as 1942 through 1957, with a residual radiation period designated for 1958 through 1985. In January 2011, based upon NIOSH research, the AWE operations period designation for the Vitro Manufacturing Canonsburg site was extended to include 1958 and 1959 (DOL, 2011a; DOL, 2011b). There is currently a class of Vitro Manufacturing workers associated with the previous NIOSH evaluation of SEC petition SEC-00134 for the site's previously-designated AWE operations period (1942 through 1957). The Secretary of the Department of Health and Human Services (DHHS) has designated the following class for inclusion in the Special Exposure Cohort:

> *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*

[3] 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.

> *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* (DHHS, 2009).

Detailed information associated with the worker class added to the SEC in 2009 can be found in the NIOSH evaluation report, *SEC Petition Evaluation Report for Petition SEC-00134, Vitro Manufacturing (Canonsburg)* (NIOSH, 2008).

A class for Vitro Manufacturing workers associated with NIOSH's initial evaluation of SEC petition SEC-00177, for the period of January 1, 1958 through December 31, 1959 (NIOSH, 2011) has been designated for addition to the Special Exposure Cohort (SEC):

> *All Atomic Weapons Employer employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from January 1, 1958 through December 31, 1959, 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* (DHHS, 2011).

Detailed information associated with this worker class can be reviewed in the NIOSH evaluation report, dated February 4, 2011, *SEC Petition Evaluation Report for Petition SEC-00177, Vitro Manufacturing (Canonsburg)* (NIOSH, 2011). The 1958-1959 SEC class proposed by NIOSH (NIOSH, 2011) was based on potential unmonitored exposure to uranium feed materials and progeny during the AWE operations period from 1958 through 1959, and on the lack of information relative to the disequilibrium between the uranium feed and it's progeny. NIOSH reserved the evaluation of residual radiation period exposures at Vitro Manufacturing starting in 1960. This report documents the evaluation of Vitro Manufacturing potential radiological exposures for the portion of the residual radiation period from January 1, 1960 through September 30, 1965. NIOSH ended its evaluation at the conclusion of significant remediation activities. The buildings were decommissioned and exposure due to the presence of the residue storage piles had been remediated through burial in 1965.

3.1 Petitioner-Requested Class Definition and Basis

Petition SEC-00177 was received on July 14, 2010, and qualified on September 9, 2010. The petitioner requested that NIOSH consider the following class: *All employees who worked in any area at the Vitro Manufacturing facility in Canonsburg, Pennsylvania, during the time period from January 1, 1958 through April 30, 1960.*

The petitioner provided information and affidavit statements in support of the petitioner's belief that accurate dose reconstruction over time is impossible for the Vitro Manufacturing workers in question. NIOSH deemed the following information and affidavit statements sufficient to qualify SEC-00177 for evaluation:

> The petitioner submitted an affidavit (Affidavit, 2010) stating that radiation exposures and therefore radiation doses potentially incurred by members of the proposed class were not monitored, either through personal or area monitoring. The petitioner also included information (Form B, 2010) on the Vitro Manufacturing site published by the United States Energy Information Administration and by NIOSH. The petitioner submitted two memoranda (Petition

Supplement, 2010). In the memoranda the petitioner questioned the 1957 end date for the previously-designated SEC class, and indicated that the same radiological conditions that resulted in the inability to reconstruct doses for the AWE operations period addressed in SEC-00134 (NIOSH, 2008) continued to exist after 1957.

Based on its Vitro Manufacturing research and data capture efforts, NIOSH has determined that it has access to very limited information regarding activities at the site beyond the processing of radiological materials. The available documents do not contain any survey data, personnel monitoring data, occupancy records, or other descriptive information from which to develop exposure scenarios for the period being evaluated.

3.2 Class Evaluated by NIOSH

Based on its preliminary research, NIOSH divided the petitioner-requested class for SEC-00177 into two periods to be separately evaluated. The first period, from January 1, 1958 through December 31, 1959, has been documented in the evaluation report SEC-00177, dated February 4, 2011. In the interest of timeliness, NIOSH reserved the feasibility evaluation for the residual radiation period beginning in January 1960. The evaluation of the period beginning on January 1, 1960 through September 30, 1965 is presented in this report, SEC-00177 Addendum 1.

Based on its research into the operations and exposure conditions at Vitro Manufacturing starting in 1960, NIOSH found no indication of continued radiological processing activities during the period from January through mid-1960[4] (encompassing the petitioned period). Remediation activities began in July 1965 and were complete by September 30, 1965. Workers performing the remediation transfer and burial of the residue piles had potential for both internal and external exposure to the radioactive components of the residue piles during this remediation activity.

NIOSH evaluated the following class: All employees who worked in any area at the Vitro Manufacturing facility in Canonsburg, Pennsylvania, during the time period from January 1, 1960 through September 30, 1965.

3.3 NIOSH-Proposed Class to be Added to the SEC

Based on its research of the class under evaluation, NIOSH has defined a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. The NIOSH-proposed class to be added to the SEC includes all Atomic Weapons Employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from January 1, 1960 through September 30, 1965, 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 the facility may have been exposed to radiological source materials stored onsite in open piles and to radiological materials during decontamination and decommissioning activities. Prior to the burial of the residue material,

[4] NIOSH located multiple references that agreed on the end of processing by year, but differed on the exact month. For example, a document within SRDB Ref ID: 10288, pdf p. 297 and SRDB Ref ID: 79085, pdf p. 2 stated that there were no workers after May 1960, while a document within SRDB Ref ID: 10288, pdf p. 297 indicates that the site was vacated by July 1960. NIOSH reviewed claimant files and found 3 individuals with work history at the site being reported up until June 30, 1960.

workers were potentially exposed to uncontrolled contamination resulting from environmental processes such as wind abrasion of the open piles.

4.0 Data Sources Reviewed by NIOSH to Evaluate the Class

As is standard practice, NIOSH completed an extensive database and Internet search for information regarding Vitro Manufacturing. The database search included the DOE Legacy Management Considered Sites database, the DOE Office of Scientific and Technical Information (OSTI) database, the Energy Citations database, the Atomic Energy Technical Report database, and the Hanford Declassified Document Retrieval System. In addition to general Internet searches, the NIOSH Internet search included OSTI OpenNet Advanced searches, OSTI Information Bridge Fielded searches, Nuclear Regulatory Commission (NRC) Agency-wide Documents Access and Management (ADAMS) web searches, the DOE Office of Human Radiation Experiments website, and the DOE-National Nuclear Security Administration-Nevada Site Office-search. Attachment One contains a summary of Vitro Manufacturing documents. The summary specifically identifies data capture details and general descriptions of the documents retrieved.

In addition to the database and Internet searches listed above, NIOSH identified and reviewed numerous data sources to determine information relevant to determining the feasibility of dose reconstruction for the class of employees under evaluation. This included determining the availability of information on personal monitoring, area monitoring, industrial processes, and radiation source materials. The following subsections summarize the data sources identified and reviewed by NIOSH.

4.1 Site Profile Technical Basis Documents (TBDs)

A Site Profile provides specific information concerning the documentation of historical practices at the specified site. Dose reconstructors can use the Site Profile to evaluate internal and external dosimetry data for monitored and unmonitored workers, and to supplement, or substitute for, individual monitoring data. A Site Profile consists of an Introduction and five Technical Basis Documents (TBDs) that provide process history information, information on personal and area monitoring, radiation source descriptions, and references to primary documents relevant to the radiological operations at the site. The Site Profile for a small site may consist of a single document. In the case of Vitro Manufacturing, a Site Profile document has not been written.

4.2 ORAU Technical Information Bulletins (OTIBs)

An ORAU Technical Information Bulletin (OTIB) is a general working document that provides guidance for preparing dose reconstructions at particular sites or categories of sites. NIOSH reviewed the following OTIBs as part of its evaluation:

- *OTIB: Estimating the Maximum Plausible Dose to Workers at Atomic Weapons Employer Facilities*, ORAUT-OTIB-0004, Rev. 03 PC-2; December 6, 2006; SRDB Ref ID: 36191

- *OTIB: Dose Reconstruction During Residual Radioactivity Periods at Atomic Weapons Employer Facilities*, ORAUT-OTIB-0070, Rev. 00; March 10, 2008; SRDB Ref ID: 41603

4.3 Facility Employees and Experts

To obtain additional information, NIOSH interviewed seven former Vitro Manufacturing employees for the previous SEC-00177 Evaluation Report dated February 4, 2011 (NIOSH, 2011). NIOSH selected individuals based on their known experience and likelihood that they would be knowledgeable about the operations and/or radiation monitoring practices at the Vitro Manufacturing site. All interviews were conducted by phone for the purpose of gaining additional information about any differences in work processes or health and safety procedures between the defined Atomic Energy Commission (AEC) operational period and the period under evaluation. Very limited information specific to the period from 1960 through 1965 was obtained from the interviews.

4.4 Previous Dose Reconstructions

NIOSH reviewed its NIOSH DCAS Claims Tracking System (referred to as NOCTS) to locate EEOICPA-related dose reconstructions that might provide information relevant to the petition evaluation. Table 4-1 summarizes the results of this review. (NOCTS data available as of June 1, 2011)

Table 4-1: No. of Vitro Manufacturing Claims Submitted Under the Dose Reconstruction Rule

Description	Totals
Total number of claims submitted for dose reconstruction	27
Total number of claims submitted for energy employees who worked during the period under evaluation (January 1, 1960 through September 30, 1965)	8
Number of dose reconstructions completed for energy employees who worked during the period under evaluation (i.e., the number of such claims completed by NIOSH and submitted to the Department of Labor for final approval)	7
Number of claims for which internal dosimetry records were obtained for employees who worked during the period under evaluation	0
Number of claims for which external dosimetry records were obtained for employees who worked during the period under evaluation	0

NIOSH reviewed each claim to determine whether internal and/or external personal monitoring records could be obtained for each claimant. Eight of the nine claims with work history within the period under evaluation had dose reconstructions completed; while the ninth was pulled for inclusion in a previously designated SEC class. NIOSH has not located any internal or external monitoring data associated the time period of this evaluation for any of the Vitro Manufacturing energy employees who had work experience during the period under evaluation.

4.5 NIOSH Site Research Database

NIOSH also examined its Site Research Database (SRDB) to locate documents supporting the assessment of the evaluated class. Seven hundred ninety-one documents in this database were identified as pertaining to Vitro Manufacturing in Canonsburg, Pennsylvania. These documents were evaluated for their relevance to this petition. The documents include personnel data, historical background on Vitro Manufacturing operations and materials, contractual information, maps and surveys from the residual radiation period, and air monitoring information (although limited).

4.6 Documentation and/or Affidavits Provided by Petitioners

In qualifying and evaluating the petition, NIOSH reviewed the following documents submitted by the petitioners:

- *Petition Form B for SEC-00177 with attached site summary documents*; received on July 14, 2010; OSA Ref ID: 112176, pdf pp. 2-9, 11-13 (Form B, 2010)

- *Affidavit from Laboratory Technician*; July 2, 2002; OSA Ref ID: 112176, pdf p. 10 (Affidavit, 2002)

- *Affidavit from Laboratory Technician*; July 6, 2010; OSA Ref ID: 112176, pdf p. 1 (Affidavit, 2010)

- *Supplemental Information for SEC-00177 Petition*; August 14, 2010; OSA Ref ID: 112455 (Petition Supplement, 2010)

These documents supported the petitioner's position that the SEC-00134 petition end date of December 31, 1957 should not define the end of the class for Vitro Manufacturing. The documents were reviewed for relevance to the time period under consideration for the initial SEC-00177 Evaluation Report (NIOSH, 2011) and this current evaluation, Addendum 1 of SEC-00177.

5.0 Radiological Operations Relevant to the Class Evaluated by NIOSH

The following subsections summarize radiological operations at Vitro Manufacturing that may have had a radiological impact on the facility during the AWE operational period, and thus would have contributed to worker exposure potential during the portion of the residual radiation period under evaluation from January 1, 1960 through September 30, 1965. From available sources, NIOSH has gathered process and source descriptions, information regarding the identity and quantities shipments of source materials of concern (to and from the site), inventory records, accountability surveys, contractual information, waste removal plans and reports, and information describing processes through which radiation exposures may have occurred and the physical environment in which they may have occurred. The information included within this evaluation report is intended only to be a summary of the available information.

5.1 Vitro Manufacturing Plant and Process Descriptions

Vitro Manufacturing was located on an l8-acre site on Strabane Avenue in Canonsburg, Pennsylvania. The plant was built by the Standard Chemical Company. The facility had a total of 22 buildings, including a guardhouse, and three chemical storage sheds. The facility was entering shutdown status in early 1960, with operational shutdown appearing to be complete in May 1960 (Inspection, 1963, pdf p. 3). Clear documentation specifying the size of the workforce during the shuttering period has not been located. Limited reports of how many personnel were employed in buildings after the release of the site for industrial use are available, but are unverifiable.

Domestic ores, African pitchblende, recoverable scrap materials, and Canadian residues were processed onsite throughout the history of Vitro Manufacturing. Because the feed materials were variable, there were many manual processes that would have resulted in high exposure potential during the processing.

On November 1, 1953, the AEC and Vitro Manufacturing contracted (contracts AT-(30-1)-1683 and AT-(30-1)-1241) to process government-owned materials at the Vitro Manufacturing site, thus obligating Vitro Manufacturing to store scrap materials and residues from those processes.

In 1955, the AEC issued Vitro Manufacturing a series of source material licenses to import by-product residue material from milling operations conducted at other sites. The milling by-product material contained 0.4% - 0.5% U_3O_8 from Canada (Zugschwerdt, 1981a, pdf p. 10). These residues were considered source material for operations at Vitro Manufacturing and are referenced in the internal government documentation as the "Port Hope Wastes". Contract No. AT(49-6)-1158 was awarded to Vitro Manufacturing for the recovery of the U_3O_8 from these Port Hope Wastes, but was terminated before all residues were processed by Vitro Manufacturing, leaving two stockpiles of residues remaining on the Canonsburg site after 1959. One pile consisted of 4,268 dry tons of 0.42% to 0.47% U_3O_8, and the second pile consisted of 85 tons of 1.17% U_3O_8 and 105 tons of 0.95% U_3O_8. The uranium in this material belonged to the AEC, but Vitro Manufacturing kept it stockpiled onsite in the absence of any guidance or instruction from AEC (Contract, 1957, pdf p. 163). Licensing and control of this source material was originally the sole responsibility of AEC, but the Pennsylvania Department of Health adopted regulations for radiation protection in August, 1961, and subsequently became aware of the radioactive residues on the Vitro Manufacturing site.

Disposition of the material then became problematic for Vitro Manufacturing, which had received approval from AEC for a plan to dispose of the material. This disposal was subsequently found to be unacceptable to the Commonwealth of Pennsylvania. The Port Hope Waste remained stored in open piles until August, 1965, when it was finally buried in a lagoon on the site (Zugschwerdt, 1981a; Murphy, 1964, pdf p. 36). The only mitigation of exposure to radiation or radioactive materials in the piles appears to have consisted of installation of a chain link fence around the piles, a guard service patrolling the area 24 hours a day, and indications of some wetting of the surfaces to prevent re-suspension of particles by wind. Reference documents cite several AEC inspections during this period (Zugschwerdt, 1981a; Price, 1963, pdf p. 38; Survey Data, 1963-1964, pdf pp. 62-63, 74), indicating the presence of radiation levels and radioactive effluents in excess of the applicable standards. NIOSH has been unable to locate the referenced inspection reports.

5.2 Radiological Exposure Sources from Vitro Manufacturing Operations

The following subsections provide an overview of the internal and external exposure sources for the Vitro Manufacturing class under evaluation.

5.2.1 Internal Radiological Exposure Sources from Vitro Manufacturing Operations

Sources of internal exposure included potential intakes of uranium and uranium decay chain radionuclides. Operations involved shuttering the process equipment used to separate and concentrate the uranium from feed material into U_3O_8 oxide, and storing and removing ore residues. This includes decontamination and decommissioning activities to shut down the building operations, and possible

exposure to particulates that might have been re-suspended from the residue piles by wind action during the months of 1960 when the facility was actively shutting down. The documentation located by NIOSH does not include a description of the shutdown activities or decontamination work performed to shutter the facility, nor were interviewees able to provide any detailed information about this cleanup period at Vitro Manufacturing.

The facility was quiescent from shutdown until 1965 when activities and operations to bury the residue piles began and ended. As best NIOSH can determine, the facility was unoccupied during this period and there should have been very little potential for internal exposure. However, it is possible that some limited security force may have been present at the facility to ensure access control. Such individuals would have had potential exposure to windborne particulate including radiological materials.

The project to bury the residue piles likely included survey work for both regulatory reasons and in preparation for the remediation work, as well as movement of the piles with heavy equipment including bulldozers, and the final burial in the lagoon area. This work would have caused significant disturbance of the residue materials, allowing re-suspension of particulates and freeing any trapped gasses. These activities would have allowed potential exposure to residual uranium and decay chain radionuclides that had been 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).

5.2.1.1 Natural Uranium

The principal source of internal exposure to radiological material at Vitro Manufacturing was from the inhalation or ingestion of particulates associated with the uranium-bearing residues that had been received during the operations period (Strod, Jan 1949, pdf p. 30). Thus, workers were potentially exposed to airborne dust from re-suspension of uranium contamination and from direct contact with bulk materials. NIOSH does not have enough information to accurately quantify the volume of natural uranium at Vitro Manufacturing.

5.2.1.2 Uranium Progeny

Since Vitro Manufacturing handled and processed uranium ore materials and residues, workers were potentially exposed to uranium progeny, which included thorium-230, thorium-232, thorium-238, radium-226, protactinium-231, actinium-227, and radon daughters. African ores containing significant radium concentrations were also processed at Vitro Manufacturing Canonsburg (NIOSH, 2008). NIOSH does not have enough information to quantify the uranium progeny.

5.2.2 External Radiological Exposure Sources from Vitro Manufacturing Operations

Based on a review of the documented activities and potential exposures to source materials, NIOSH believes there was the potential for occupational radiological exposures to photons and beta particles from radionuclides in the uranium decay chain at Vitro Manufacturing. There are no indications that Vitro Manufacturing personnel had any potential for significant exposure to neutrons.

5.2.2.1 Photon

Photons from uranium are primarily from the thorium-234 daughter of uranium-238 and are in the energy range of 30-250 KeV (ORAUT-OTIB-0004). There are higher-energy photons, up to 1.00

MeV, from another uranium-238 daughter, protactinium-234m, but the abundance of these photons is less than 1% (Rad Handbook, 1970).

5.2.2.2 Beta

The majority of the beta exposures at Vitro Manufacturing would have resulted from exposure to uranium and its decay products. For processed natural uranium, the dominant beta radiation was likely due to uranium-238 decay products. In the uranium-series decay scheme, beginning with uranium-238, the short-lived isotope protactinium-234 emits the most energetic beta particle (2.28 MeV). It is this beta particle that accounts for the shallow-dose hazard associated with handling uranium scrap and uranium residues.

5.2.2.3 Neutron

There is no indication of the use of fluorine as a reactant at Vitro Manufacturing, the use of which could lead to alpha-neutron reactions producing potential neutron exposure. While there is a possibility of neutrons resulting from spontaneous fission by uranium, NIOSH believes there was not significant neutron exposure at the site. When necessary, NIOSH utilizes ORAUT-OTIB-0024, which provides information normally associated with the expected neutron dose rates from various forms of uranium compounds.

6.0 Summary of Available Monitoring Data for the Class Evaluated by NIOSH

The following subsections provide an overview of the state of the available internal and external monitoring data for the Vitro Manufacturing facility. Although all of these results occur outside the evaluated period, NIOSH believes it is pertinent to show the data that are available.

6.1 Available Vitro Manufacturing Internal Monitoring Data

No bioassay results for the period 1960 through 1965 were expected or found by NIOSH for Vitro Manufacturing. Additionally, NIOSH has not located any air monitoring results, either particulate or radon gas monitoring, for the period under evaluation.

NIOSH has obtained documentation of radon monitoring performed by Oak Ridge National Laboratory in 1977 (Haywood, 1977) and in 1978 and 1979 by the Environmental Measurements Laboratory (Radon Results, 1979-1980).

6.2 Available Vitro Manufacturing External Monitoring Data

There are no external whole-body dosimetry data available to NIOSH for the Vitro Manufacturing period under evaluation, January 1, 1960 through September 30, 1965. Comprehensive whole-body dosimetry records end for Vitro Manufacturing workers in 1954.

NIOSH has limited radiation survey data taken at the facility in 1963 and 1964 (Survey Data, 1963-1964). Analytical results of soil, water, and vegetation samples collected in 1963 provide

concentrations of uranium-238, radium-226, and thorium-230 in microcuries/gram. A survey in 1964 yielded 328 beta/gamma survey results in Buildings 1, 2, 3, 9, 10, 12, 13, 15, 16, and the guard building (Survey Data, 1963-1964, pdf pp. 64-72). The maximum beta/gamma reading at 1 cm was 0.5 mr/hr and the average was 0.13 mr/hr (Harmon, 1966, pdf. p. 20). While NIOSH has not located any radiation survey data taken during the 1965 transfer and burial of the residue piles, NIOSH does have access to the 1965 "close-out" survey performed by Allied-Crossroads following the removal of the waste piles. The 1965 survey consisted of 475 survey points in the area of the burial of the residue piles with an average survey reading of 0.062 mr/hr and no points exceeding 0.5 mr/hr; and 701 survey points in the plant area with an average survey reading of 0.17 mr/hr (Allied-Crossroads, 1965, pdf p. 29).

7.0 Feasibility of Dose Reconstruction for the Class Evaluated by NIOSH

The feasibility determination for the class of employees under evaluation in this report is governed by both EEOICPA and 42 C.F.R. § 83.13(c)(1). Under that Act and rule, NIOSH must establish whether or not it has access to sufficient information either to 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 to estimate the radiation doses to members of the class more precisely than a maximum dose estimate. If NIOSH has access to sufficient information for either case, NIOSH would then determine that it would be feasible to conduct dose reconstructions.

In determining feasibility, NIOSH begins by evaluating whether current or completed NIOSH dose reconstructions demonstrate the feasibility of estimating with sufficient accuracy the potential radiation exposures of the class. If the conclusion is one of infeasibility, NIOSH systematically evaluates the sufficiency of different types of monitoring data, process and source or source term data, which together or individually might assure that NIOSH can estimate either the maximum doses that members of the class might have incurred, or more precise quantities that reflect the variability of exposures experienced by groups or individual members of the class. This approach is discussed in DCAS's SEC Petition Evaluation Internal Procedures which are available at http://www.cdc.gov/niosh/ocas. The next four major subsections of this Evaluation Report examine:

- The sufficiency and reliability of the available data. (Section 7.1)
- The feasibility of reconstructing internal radiation doses. (Section 7.2)
- The feasibility of reconstructing external radiation doses. (Section 7.3)
- The bases for petition SEC-00177 as submitted by the petitioner. (Section 7.4)

7.1 Pedigree of Vitro Manufacturing Data

This subsection answers questions that need to be asked before performing a feasibility evaluation. Data Pedigree addresses the background, history, and origin of the data. It requires looking at site methodologies that may have changed over time; primary versus secondary data sources and whether they match; and whether data are internally consistent. All these issues form the bedrock of the researcher's confidence and later conclusions about the data's quality, credibility, reliability, representativeness, and sufficiency for determining the feasibility of dose reconstruction. The feasibility evaluation presupposes that data pedigree issues have been settled.

7.1.1 Internal Monitoring Data Pedigree Review

NIOSH has been unable to locate internal monitoring data for Vitro Manufacturing workers for the period of this evaluation, January 1, 1960 through September 30, 1965. Neither bioassay monitoring results nor contamination survey results are available for Vitro Manufacturing during the evaluated period; therefore, an internal data sufficiency and pedigree evaluation is not possible for this data type.

7.1.2 External Monitoring Data Pedigree Review

NIOSH has been unable to locate personnel external monitoring records for Vitro Manufacturing workers for the period of this evaluation, January 1, 1960 through September 30, 1965. Neither film badge results nor area monitoring results are available for Vitro Manufacturing during the evaluated period; therefore, an external data sufficiency and pedigree evaluation is not possible for this data type.

7.2 Evaluation of Bounding Internal Radiation Doses at Vitro Manufacturing

The principal sources of internal radiation doses for members of the class under evaluation were from contamination due to uranium and uranium progeny. The following subsections address the ability to bound internal doses, methods for bounding doses, and the feasibility of internal dose reconstruction.

7.2.1 Evaluation of Bounding Residual Radiation Period Internal Doses

NIOSH has found no indications that bioassay measurements were collected for the period under evaluation. NIOSH has found no air monitoring data for the 1960 through 1965 period. The buildings of Vitro Manufacturing were decontaminated according to interviews with former workers, but the interviewees were unable to provide any detail regarding the decontamination procedures. However, it can be assumed that decontamination work would have created potential exposure to respirable uranium materials and progeny that had been entrained in equipment and deposited on surfaces. Without any further information regarding the decontamination efforts, NIOSH cannot make any assumptions regarding what workers may have been exposed to, or what degree they may have been exposed to airborne radiological materials during these operations.

The facility was reported to have no Vitro workers after the shutdown of Vitro operations in 1960. This statement is supported by a review of the claimant files, which shows eight workers with a work history in the period being evaluated. Of those eight former workers, none had any work history beyond June 30, 1960. From July 1960 until remediation activities began in 1965, the facility seems

to have been shuttered and unoccupied with only occasional access for regulatory reasons. A survey was performed in April 1964 (Survey Data, 1963-1964, pdf p. 62). The Pennsylvania Department of Health, Division of Occupational Health then released the buildings and grounds for occupancy (Lieban, 1964). There are no reports of any work being performed at the facility during this timeframe (July 1960 through 1965) and no indications of any disturbances that would impact any exposures until the work to transfer and bury the residue piles began.

Activities associated with the August 1965 transfer and burial of the residue piles are not well documented. These activities would likely have included survey and preparatory work. The actual burial of the residue piles would disturb the material and have a high potential for re-suspension of radiological materials in the residues. Without monitoring data and significantly more information about the parameters of potential exposure, NIOSH cannot verify that an upper limit for uranium and progeny concentrations during the period under review at the Vitro Manufacturing facilities could be determined. The remediation of the waste pile and lagoon areas was completed by September 30, 1965, per a health physics survey report from Allied-Crossroads (Allied-Crossroads, 1965).

NIOSH has not identified sufficient documentation to define and quantify the total internal source term for Vitro Manufacturing during the period under evaluation, January 1, 1960 through September 30, 1965. Without additional documentation, NIOSH cannot make assumptions about the relative amounts of materials that would have been encountered at the site during the evaluated period. Therefore, there is insufficient source term information available to NIOSH to bound internal exposures for the period from January 1, 1960 through September 30, 1965.

7.2.2 Methods for Bounding Internal Dose at Vitro Manufacturing

NIOSH has determined that it lacks sufficient bioassay, workplace monitoring, and source term data needed to bound internal doses that Vitro Manufacturing workers potentially received from natural uranium and uranium progeny. Therefore, NIOSH has not identified a method for bounding internal doses at Vitro Manufacturing for the period from January 1, 1960 through September 30, 1965.

For the period beginning October 1, 1965, following the burial of the residue piles, NIOSH has surveys from 1977 (ORNL, 1977; Leggett, 1977) providing air concentrations for particulates and radon. The air concentrations are used in conjunction with a derived source term decay rate to estimate internal exposures during the residual radiation period. Estimates of the isotopic ratios of the alpha mixture can be made using the radionuclide mix for the maximum total alpha air sample in 1977. Using these air concentrations rates, decay rate, and isotopic ratios, NIOSH has calculated exposure rates for the residual radiation period through 1985.

For periods after the burial of the residue piles, NIOSH calculates the ingestion intake rates for Vitro Manufacturing based on guidance in Technical Information Bulletin: *Estimation of Ingestion Intakes* (OCAS-TIB-009).

7.2.3 Internal Dose Reconstruction Feasibility Conclusion

NIOSH has established that it does not have access to sufficient information to bound internal doses that Vitro Manufacturing workers potentially received during the period from January 1, 1960 through September 30, 1965.

Although NIOSH found that it is not possible to completely reconstruct internal radiation doses for the period from January 1, 1960 through September 30, 1965, NIOSH intends to use any 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 (Canonsburg) during the period from January 1, 1960 through September 30, 1965, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

7.3 Evaluation of Bounding External Radiation Doses at Vitro Manufacturing

The principal source of external radiation doses for members of the evaluated class was uranium and uranium progeny found in the uranium-bearing residues and wastes located on the property. Contaminated facilities and equipment would pose an external exposure hazard inside the buildings, while exposure to the waste storage piles and the contaminated soil would contribute to radiation exposure outside the buildings. The following subsections address the ability to bound external doses, methods for bounding doses, and the feasibility of external dose reconstruction.

7.3.1 Evaluation of Bounding Residual Radiation Period External Doses

NIOSH has been unable to locate any individual external monitoring data for the period evaluated in this report, January 1, 1960 through September 30, 1965. NIOSH has access to limited radiological source term information associated with uranium bearing residues, but no specific information regarding the isotopic assay of the material. NIOSH has been unable to locate any records of radiological surveys done during the transfer and/or burial of the residues at Vitro Manufacturing.

7.3.2 Vitro Manufacturing Occupational X-Ray Examinations

Doses received from occupational medical X-rays are not considered part of the source term for the residual radiation period; therefore, medical doses were not evaluated.

7.3.3 Methods for Bounding External Dose at Vitro Manufacturing

NIOSH has determined that it lacks sufficient personnel monitoring data, area monitoring data, or source term data needed to characterize and bound external doses that Vitro Manufacturing workers potentially received from natural uranium and uranium progeny. Therefore, NIOSH has not identified a method for bounding external doses at Vitro Manufacturing for the period from January 1, 1960 through September 30, 1965, by which time the residues were buried onsite.

After the residue piles were buried, for the period beginning October 1, 1965, NIOSH can use surveys from 1964 (Allied-Crossroads, 1965, pdf p. 28; Survey Data, 1963-1964, pdf p. 62) and 1977 (ORNL, 1977; Leggett, 1977) to estimate external exposures during the residual radiation period. Interpolations are performed per guidance provided in the Technical Information Bulletin: *Dose Reconstruction During Residual Radioactivity Periods at Atomic Weapons Employer Facilities* (ORAUT-OTIB-0070) to estimate exposure rates. The maximum ambient waist-level exposure rates shown in the surveys are 0.5 mR/hour in 1964 and 0.31 mR/hour in 1977.

7.3.4 External Dose Reconstruction Feasibility Conclusion

NIOSH has established that it does not have access to sufficient information to bound external doses that Vitro Manufacturing workers potentially received during the period from January 1, 1960 through September 30, 1965.

Although NIOSH found that it is not possible to completely reconstruct external radiation doses for the period from January 1, 1960 through September 30, 1965, NIOSH intends to use any 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 (Canonsburg) during the period from January 1, 1960 through September 30, 1965, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

7.4 Evaluation of Petition Basis for SEC-00177 Addendum 1

The assertions made on behalf of petition SEC-00177 for Vitro Manufacturing were evaluated and responded to in the initial SEC-00177 Evaluation Report for the period from January 1, 1958 through December 31, 1959 (NIOSH, 2011). The following subsections evaluate the assertions made on behalf of petition SEC-00177 for Vitro Manufacturing relative to the period January 1, 1960 through September 30, 1965, being evaluated herein.

7.4.1 Monitoring Inadequacies

Assertion: The SEC-00177 petitioner stated that radiation exposures and therefore radiation doses potentially incurred by members of the proposed class that relate to this petition were not monitored, either through personal or area monitoring.

Response: Personal monitoring and/or area monitoring results are not always absolutely necessary to develop an exposure model for a given facility. However, if these monitoring data are not available NIOSH must have access to source term information and detailed process information in order to develop a sufficiently accurate exposure model. NIOSH has determined that, to date, it does not have adequate internal or external monitoring data for members of the proposed class, nor does it have enough source term or process information applicable to the class to develop a sufficiently accurate model for the Vitro Manufacturing facility during the evaluated time period from January 1, 1960 through September 30, 1965.

7.4.2 Working Conditions After 1957

Assertion: The SEC-00177 petitioner stated that the same working conditions that resulted in the inability to reconstruct doses for the AWE operations period existed after December 31, 1957.

Response: NIOSH conducted interviews with seven contemporaneous former workers in an attempt to understand the working conditions after 1957 at the Vitro Manufacturing site in Canonsburg, Pennsylvania. While most were unsure of specific contractual details regarding the purpose and scope of the work conducted after 1957, the interviews did present a consistent picture of unchanging operations under the AEC contract, which was terminated in 1959. No information specific to 1960

was recalled by the interviewees. With the termination of the AEC contract, it is likely that activities were aimed toward the imminent shutdown of the plant in 1960. NIOSH understands workers were not on site from May 1960 until remediation preparations began in 1965.

7.5 Summary of Feasibility Findings for Petition SEC-00177 Addendum 1

This report evaluates the feasibility for completing dose reconstructions for employees at Vitro Manufacturing from January 1, 1960 through September 30, 1965. NIOSH found that the available monitoring records, process descriptions and source term data available are not adequate to complete sufficiently accurate dose reconstructions for the evaluated class of employees.

Table 7-1 summarizes the results of the feasibility findings at Vitro Manufacturing for each exposure source during the time period from January 1, 1960 through September 30, 1965.

Table 7-1: Summary of Feasibility Findings for SEC-00177 Addendum 1
January 1, 1960 through September 30, 1965

Source of Exposure	Reconstruction Feasible	Reconstruction Not Feasible
Internal[1]		**X**
- Natural Uranium		X
- Uranium Progeny		X
External[2]		**X**
- Gamma		X
- Beta		X
- Neutron	N/A	N/A
- Occupational Medical X-ray	N/A	N/A

PARTIAL DOSE RECONSTRUCTION INFORMATION:

[1] INTERNAL: Only personal monitoring data should be used to reconstruct an individual's internal exposure at Vitro Manufacturing during these time periods because there are insufficient data to characterize the work to transfer and bury the residue piles or any other cleanup work. Unmonitored internal exposures during this time period cannot be reconstructed.

[2] EXTERNAL: Only personal monitoring data should be used to reconstruct an individual's external exposure at Vitro Manufacturing during these time periods because there are insufficient data to characterize the work to transfer and bury the residue piles or any other cleanup work. Unmonitored external exposures during this time period cannot be reconstructed.

As of June 1, 2011, a total of 8 claims have been submitted to NIOSH for individuals who worked at Vitro Manufacturing during the period under evaluation in this report. Dose reconstructions have been completed for 7 individuals, and 1 claim was pulled because of the SEC designation associated with SEC-00134.

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any 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 January 1, 1960 through September 30, 1965, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

8.0 Evaluation of Health Endangerment for Petition SEC-00177 Addendum 1

The health endangerment determination for the class of employees covered by this evaluation report is governed by both EEOICPA and 42 C.F.R. § 83.13(c)(3). Under these requirements, if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, NIOSH must also determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class. Section 83.13 requires 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's evaluation determined that it is not feasible to estimate radiation dose for members of the NIOSH-evaluated class with sufficient accuracy based on the sum of information available from available resources. Therefore, the resulting NIOSH-proposed SEC class must include a minimum required employment period as a basis for specifying that health was endangered. 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 progeny, as well as 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 Class Conclusion for Petition SEC-00177 Addendum 1

Based on its complete research of the class under evaluation, NIOSH has defined a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. The NIOSH-proposed class to be added to the SEC includes all Atomic Weapons Employees who worked at Vitro Manufacturing in Canonsburg, Pennsylvania, from January 1, 1960 through September 30, 1965, 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**.**

NIOSH has carefully reviewed all material sent in by the petitioner, including the specific assertions stated in the petition. NIOSH has also reviewed available technical resources and many other references, including the SRDB, for information relevant to SEC-00177. In addition, NIOSH reviewed its NOCTS dose reconstruction database to identify EEOICPA-related dose reconstructions that might provide information relevant to the petition evaluation.

These actions are based on existing, approved NIOSH processes used in dose reconstruction for claims under EEOICPA. NIOSH's guiding principle in conducting these dose reconstructions is to ensure that the assumptions used are fair, consistent, and well-grounded in the best available science. Simultaneously, uncertainties in the science and data must be handled to the advantage, rather than to the detriment, of the petitioners. When adequate personal dose monitoring information is not available, or is very limited, NIOSH may use the highest reasonably possible radiation dose, based on reliable science, documented experience, and relevant data to determine the feasibility of reconstructing the dose of an SEC petition class. NIOSH contends that it has complied with these standards of performance in determining the feasibility or infeasibility of reconstructing dose for the class under evaluation.

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Attachment One: Data Capture Synopsis

Table A1-1: Summary of Holdings in the SRDB for Vitro Manufacturing (Canonsburg)			
Data Capture Information	**Data Capture Description**	**Completed**	**Uploaded into SRDB**
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: [Name Redacted], [Phone Number Redacted]) 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 Physical size of the site: The Vitro Manufacturing site itself occupied 19 acres. The FUSRAP surveys of vicinity properties expanded the impacted area to 34 acres. Size of the workforce: Site worker population data are somewhat spotty. In January 1953 the company had 86 employees. A total of 161 people worked at Vitro Manufacturing during the Manhattan Engineer District period, although not all simultaneously. In February 1948, 60 film badges were issued to the company. In December 1955, 59 workers were monitored for radiation exposure. New York Operations Office surveys of Vitro Manufacturing noted	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

Table A1-1: Summary of Holdings in the SRDB for Vitro Manufacturing (Canonsburg)			
Data Capture Information	**Data Capture Description**	**Completed**	**Uploaded into SRDB**
55, 64, and 50 exposed employees in 1949, 1951, and 1959 respectively.			
State Contacted: PA Office Bureau of Radiation Protection	No relevant data identified.	02/22/2008	0
Department of Labor/Paragon	Lake Ontario Ordnance Works (LOOW) reports which identify Vitro residues, FUSRAP briefing material, a requirement to keep radiological support trailers out of elevated background areas, Tonawanda Sub-Office reports which discuss Vitro residues.	01/14/2011	25
DOE Environmental Measurements Laboratory/Health And Safety Laboratory	Site visits, annual report, thorium sampling and storage, and symposium V on aerosols.	03/08/2005	1
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, reports documenting Vitro as an AEC uranium supplier, miscellaneous letters, memos and lists, and an accident report.	01/11/2008	24
DOE Hanford	Scrap shipments to Vitro and 1953 and 1954 SF Material accountability reports.	11/05/2010	7
DOE Legacy Management - Grand Junction Office	Tonawanda area Sub-Office and Niagara Frontier Atomic Weapons Employer reports which discuss Vitro residues and scrap, shipments of scrap to Vitro, residue and scrap processing at Vitro, site visits, dose rate surveys, film badge results, air sample results, contract documents, process descriptions, radiological environmental surveys, Canonsburg litigation documents, radon monitoring, Cleveland area Vitro reports, 1953 site decontamination, monthly production reports, engineering assessments, vicinity property surveys, FUSRAP documents, radon mitigation, UMTRA reports, US NRC comments and reviews of remediation plans and reports, draft environmental impact statement and comments, public and project meeting notes, contract flow charts, documentation of uranium produced for sale to Britain, and remedial action plan documents.	03/25/2011	334
DOE Legacy Management - Grand Junction Office/SC&A	A 1947 summary of uranium producers and their processes.	01/18/2010	1
DOE Legacy Management - Morgantown	A 1951 summary of uranium production, LOOW surveys which mention ore received from Vitro, interim soil limits for D&D projects, a report of a contract for Vitro to process sodium diurante, and summary lists of uranium production sites.	02/03/2011	8
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, urinalysis results, radiological survey of the former Vitro Rare Metals Plant, NYOO health and safety field activities reports, production of uranium feed	05/13/2010	27

Table A1-1: Summary of Holdings in the SRDB for Vitro Manufacturing (Canonsburg)			
Data Capture Information	**Data Capture Description**	**Completed**	**Uploaded into SRDB**
	materials, project management plan for remedial action, designation of vicinity properties, and an annual report.		
DOE Oak Ridge Operations, Records Holdings Task Group Vault	1944-1945 work reports with exposure monitoring data, proposal to build an ore storage building, and a 2002 NIOSH reconnaissance report.	12/15/2010	3
DOE Oak Ridge Operations, Records Holdings Task Group Vault/SC&A	Film badge results for 1952.	12/08/2004	1
DOE Office of Scientific and Technical Information	Mallinckrodt reports which mentions the assays performed on Vitro ore for non-radioactive contaminants and the production of uranium metal form Vitro feeds.	02/04/2011	2
DOE Savannah River Site	1962 and 1963 thorium reports which discuss thorium metal received from Vitro.	08/06/2008	2
[Name Redacted] via NIOSH	A 1984 list of documents produced for litigation regarding Vitro.	01/24/2010	1
Federal Records Center - Kansas City	Weekly Manhattan Engineer District reports, late 1942 and 1946.	08/11/2008	1
Internet - Amazon.com	1st of a Kind WMD's etc, a history of Vitro and Kellex.	11/23/2010	1
Internet - Comprehensive Epidemiologic Data Resource (CEDR)	No relevant data identified.	03/27/2008	0
Internet - Division of Compensation and Analysis Support	Department of Health and Human Services notice documenting the addition of a class of Vitro workers to the Special Exposure Cohort.	11/19/2010	1
Internet - DOE Hanford Declassified Document Retrieval System (DDRS)	Trip report on uranium scrap processing at the Vitro Manufacturing Co., Canonsburg, PA.	09/24/2010	1
Internet - DOE Health Safety and Security Worker Advocacy Site	Site description.	01/16/2008	1
Internet - DOE Legacy Management Considered Sites	Canonsburg disposal site fact sheet, long-term site surveillance plans, and a Tonawanda area progress report which documents the shipment of a ball mill and dust collector to Vitro.	10/05/2010	4
Internet - DOE OpenNet	1949 NYOO monthly status and progress reports, the Manhattan District History, Book I, Volume 7, and Linking Legacies Appendix B.	01/03/2008	5
Internet - DOE OSTI Energy Citations	A 1949 Hanford monthly report that documents the shipment of 19 tons of uranium oxide to Vitro, a report on uranium extraction with organic solvents, and a report on the problems of leaching uraniferous slag. Note: 1 document was added by site association review and 1 document was added as part of the capture of formerly non-publicly available records.	02/17/2010	3
Internet - DOE OSTI Information Bridge	Monthly report, UMTRA Project water sampling plan, engineering feasibility analysis for in-situ stabilization of residues, proceedings of a decontamination conference, UMTRA annual reports to stakeholders, a risk assessment of ground water contamination, and reports on the problems of leaching uraniferous slag and refining uraniferous residues. Note: 21 documents were added as part of the capture of formerly non-publicly	12/02/2010	40

Table A1-1: Summary of Holdings in the SRDB for Vitro Manufacturing (Canonsburg)			
Data Capture Information	**Data Capture Description**	**Completed**	**Uploaded into SRDB**
	available records.		
Internet - Google	Poisoned workers and places: part 2/3, Canonsburg site descriptions and histories, an epidemiological study, news stories, and an analysis of institutional responsibilities for the long-term management of contaminant isolation facilities. Note: 1 document was added by site association review.	10/04/2010	22
Internet - HP Journal	No relevant data identified.	10/04/2010	0
Internet - Journal of Occupational and Environmental Health	No relevant data identified.	10/04/2010	0
Internet - National Academies Press (NAP)	No relevant data identified.	03/09/2008	0
Internet - National Archives	No relevant data identified.	01/03/2008	0
Internet - National Nuclear Security Administration (NNSA) - Nevada Site Office	No relevant data identified.	03/14/2008	0
Internet - NRC Agencywide Document Access and Management (ADAMS)	Canonsburg ground water concentrations, request for NRC approval to delete institutional controls, prelicensing and annual inspections, data validation packages, proposals for erosion control and stream bank stabilization, long term surveillance plans, ground water contaminant concentrations, a radiological release survey plan, and a final generic environmental impact statement for uranium mills. Note: 1 document was added by site association review.	01/11/2011	42
Internet - NRC Agencywide Document Access and Management (ADAMS) Public Library	A 1994 report which discusses the removal of residues, NRC comments on an erosion control plan, and a notice of the issuance of a license for long-term care of the Canonsburg site.	10/04/2010	3
Internet - Washington State University (United States Transuranium and Uranium Registries)	No relevant data identified.	03/27/2008	0
Missouri Department of Natural Resources	Historical storage of radioactive material and a final environmental impact statement.	10/03/2008	4
National Archives and Records Administration - Atlanta	Film badge results, radon breath measurements, air samples and radon data, gamma radiation at Vitro, Vitro contract AT(30-1)-1241 (1951), 1949 and1950 trip reports, reports and correspondence on uranium ore, receipts of scrap at Vitro, pitchblende processing, polonium production, and periodic progress reports.	06/20/2008	50
National Archives and Records Administration - College Park	1948 weekly film badge report, 1951 Kellex report which discusses recovery of uranium from process residues, 1948 memo regarding the markings on a new film badge design, flow chart of NYOO uranium operations, listings of records box contents, material balance summary reports, and a reviewer's notes from a College Park data capture.	09/24/2010	10
National Archives and Records Administration - Kansas City	Radiation surveys, waste disposal, solid waste treatment, disposal of uranium bearing residues, radiological survey plan, close out survey,	08/14/2008	27

Table A1-1: Summary of Holdings in the SRDB for Vitro Manufacturing (Canonsburg)			
Data Capture Information	**Data Capture Description**	**Completed**	**Uploaded into SRDB**
	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 an evaluation of radiation exposures.		
NIOSH	Department of Labor letters extending the covered period to 1959.	01/20/2011	2
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
Nuclear Regulatory Commission (NRC) Non-Publicly Available documents	No relevant data identified.	03/18/2011	0
ORAU Team	Project spreadsheet, monitoring data, a Mallinckrodt Technical Basis Document which refers to Vitro as a source of feeds and a processor of scrap, documented communications with process knowledge sources, and Petition SEC 0177 Evaluation Report.	05/02/2011	12
ORAU Vault	A 1959 letter which states that Vitro had 50 monitored employees, uranium dust exposure information, and radiation contamination data.	10/18/2005	3
SAIC	A 1967 AEC exposure summary.	09/02/2004	1
SC&A	A 1947 summary of uranium producers and their processes.	06/24/2010	1
Unknown	Air dust samples, film badge reports, medical records, monthly status and progress reports, NYOO Health and Safety Division monthly reports of field activities, radiological survey of the former Vitro Rare Metals Plant in Canonsburg, alpha smears, summary of Manhattan Project, uranium flow sheet, safety evaluations, Vitro correspondence, material transactions with other sites, NYOO Medical Division health hazards report, and urinalysis reports.	09/12/2004	80
Unknown/SC&A	Merits of keeping dosimetry badges on site, film badge reports and correspondence, and process and hazard descriptions.	06/23/2003	12
US Army Corps of Engineers, Buffalo District	A 1950 report with limits on unaccounted losses at Vitro and other facilities.	06/24/2010	1
US Army Corps of Engineers, St. Louis District	North County uranium residues historical synopsis, St. Louis, MO, which discusses the history behind Vitro residues in the St. Louis area.	03/18/2008	1
Total			**779**

Table A1-2: Database Searches for Vitro Manufacturing (Canonsburg)			
Database/Source	**Keywords**	**Hits**	**Uploaded into SRDB**
NOTE: Database search terms employed for each of the databases listed below are available in the Excel file called "Vitro Manufacturing Canonsburg Rev 05 (83.13) 05-10-11"			
CEDR http://cedr.lbl.gov/ COMPLETED 03/27/2008	See Note above	0	0
DOE Hanford DDRS http://www2.hanford.gov/declass/ COMPLETED 09/24/2010	See Note above	1	1
DOE Legacy Management Considered Sites http://csd.lm.doe.gov/ COMPLETED 10/05/2010	See Note above	10	4
DOE OpenNet http://www.osti.gov/opennet/advancedsearch.jsp COMPLETED 01/03/2008	See Note above	8	5
DOE Energy Citations http://www.osti.gov/energycitations/ COMPLETED 03/28/2008	See Note above	26	1
DOE OSTI Information Bridge http://www.osti.gov/bridge/advancedsearch.jsp COMPLETED 10/04/2010	See Note above	204	20
Google http://www.google.com COMPLETED 10/04/2010	See Note above	3,529	19
HP Journal http://journals.lww.com/health-physics/pages/default.aspx COMPLETED 10/04/2010	See Note above	1	0
Journal of Occupational and Environmental Health http://www.ijoeh.com/index.php/ijoeh COMPLETED 10/04/2010	See Note above	1	0
National Academies Press http://www.nap.edu/ COMPLETED 03/09/2008	See Note above	14	0
National Archives http://search.archives.gov/query.html COMPLETE 01/03/2008	See Note above	0	0
NNSA - Nevada Site Office	See Note above	0	0

Table A1-2: Database Searches for Vitro Manufacturing (Canonsburg)			
Database/Source	**Keywords**	**Hits**	**Uploaded into SRDB**
www.nv.doe.gov/main/search.htm COMPLETED 03/14/2008			
NRC ADAMS Public Legacy Library http://adamspublic.nrc.gov/FNOpenClient/FnLogin.aspx?Library=PL_ADAMS^PBNTAD08&Op=Logon&ReturnURL=%2fFNOpenClient%2fFnBrowsePage.aspx%3fLibrary%3dPL_ADAMS%5ePBNTAD08%26Op%3dBrowse&Error=10001 COMPLETED 10/04/2010	See Note above	17	1
NRC ADAMS Public Library http://adamspublic.nrc.gov/FNOpenClient/FnLogin.aspx?Library=PU_ADAMS^PBNTAD01&Op=Logon&ReturnURL=%2fFNOpenClient%2fFnBrowsePage.aspx%3fLibrary%3dPU_ADAMS%5ePBNTAD01%26Op%3dBrowse&Error=10001 COMPLETED 10/04/2010	See Note above	300	2
NRC ADAMS Reading Room http://www.nrc.gov/reading-rm/adams/web-based.html COMPLETED 09/24/2010	See Note above	564	41
U.S. Transuranium & Uranium Registries http://www.ustur.wsu.edu/ COMPLETED 03/27/2008	See Note above	0	0

Table A1-3: OSTI Documents Ordered			
Document Number	**Document Title**	**Requested Date**	**Received Date**
NA Ref ID: 90650	1st of a Kind by Richard Duda	10/25/2010	11/24/2010
OSTI ID: 4282427 Report Number(s): TID-5342;M-5482 Ref ID: 48604	Scrap Recovery At Vitro Manufacturing Company Canonsburg, Pennsylvania	03/28/2008	09/17/2008