# SEC Petition Evaluation Report

## Petition SEC-00253

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| **Report Rev Number:** | 0 |
| **Report Submittal Date:** | April 24, 2020 |
| **Subject Expert(s):** | Roger Halsey, Toshihide Ushino, Monica Harrison-Maples |
| **Site Expert(s):** | N/A |

# Petition Administrative Summary

### Petition Under Evaluation

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|---|---|
| **Petition Number:** | SEC-00253 |
| **Petition Type:** | 83.13 |
| **Petition Receipt Date:** | June 25, 2019 |
| **Qualification Date:** | December 13, 2019 |
| **DOE/AWE Facility Name:** | Reduction Pilot Plant |

### Petition Class

| | |
|---|---|
| **Petitioner-Requested Class Definition:** | All INCO security personnel who worked at any location within the Reduction Pilot Plant during the period from June 7, 1976 through November 26, 1978. |
| **Class Evaluated by NIOSH:** | All International Nickel Company (INCO) security personnel who worked at any location within the Reduction Pilot Plant during the period from June 7, 1976 through November 26, 1978. |
| **NIOSH-Proposed Class to be Added to the SEC:** | None |

### Related Petition Summary Information

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|---|---|
| **SEC Petition Tracking Number(s):** | N/A |
| **Petition Type:** | N/A |
| **DOE/AWE Facility Name:** | N/A |
| **Petition Status:** | N/A |

### Related Evaluation Report Information

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|---|---|
| **Report Title:** | N/A |
| **DOE/AWE Facility Name:** | N/A |

### ORAU Preparation and Review

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**DCAS Review and Approval**

| | |
|---|---|
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# Evaluation Report Summary: SEC-00253, Reduction Pilot Plant

The National Institute for Occupational Safety and Health (NIOSH) prepared this evaluation report in response to a petition to add a class of workers at the Reduction Pilot Plant to the Special Exposure Cohort (SEC). The *Energy Employees Occupational Illness Compensation Program Act of 2000*, as amended, (EEOICPA) and 42 CFR 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*, describe the process for adding new classes to the SEC.

## Petitioner-Requested Class Definition

NIOSH received petition SEC-00253 on June 25, 2019 and qualified it on December 13, 2019. The petitioner requested that NIOSH consider the following class: *All INCO security personnel who worked at any location within the Reduction Pilot Plant during the period from June 7, 1976 through November 26, 1978.*

## Class Evaluated by NIOSH

Based on its preliminary research, NIOSH accepted the petitioner-requested class. NIOSH evaluated the following class: All International Nickel Company (INCO) security personnel who worked at any location within the Reduction Pilot Plant during the period from June 7, 1976 through November 26, 1978.

## NIOSH Determination about the Proposed Class to be Added to the SEC

NIOSH has obtained descriptions of the plant processes, details of the preparations to place the plant in standby mode prior to the evaluated period, a radiological survey of the plant taken before the evaluated period, and surveys taken after the evaluated period that describe the radiological conditions at the Reduction Pilot Plant during the evaluated period. Based on its analysis of these available resources, NIOSH found no part of the class under evaluation for which it cannot estimate radiation doses with sufficient accuracy.

## Feasibility of Dose Reconstruction

Per EEOICPA and 42 CFR § 83.13(c) (1), NIOSH has established that it has 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 the maximum dose. Information available from the site profile and additional resources is sufficient to estimate the maximum internal and external potential exposure to members of the evaluated class under plausible circumstances during the specified period.

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

- NIOSH finds that it is feasible to reconstruct occupational medical dose for Reduction Pilot Plant employees with sufficient accuracy during the evaluated period.

- Principal sources of internal radiation for members of the proposed class included exposures to low-enriched uranium and fuel-reprocessing contaminants due to resuspension by activities during the plant's Standby Period.

- Principal sources of external radiation for members of the proposed class included exposures to the presence of low-enriched uranium and fuel-reprocessing contaminants during the plant's Standby Period.

- Pursuant to 42 CFR § 83.13(c)(1), NIOSH determined that there is sufficient 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.

Health Endangerment Determination

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

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# SEC Petition Evaluation Report for SEC-00253

*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: Roger Halsey, Oak Ridge Associated Universities (ORAU). 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 radiation doses for all International Nickel Company (INCO) security personnel who worked at any location within the Reduction Pilot Plant (RPP) (also referred to as Huntington Pilot Plant) during the period from June 7, 1976 through November 26, 1978. 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 CFR 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 [NIOSH 2011a].

## 2.0 Introduction

Both EEOICPA and 42 CFR pt. 83 require NIOSH to evaluate qualified petitions requesting that the Department of Health and Human Services (DHHS) 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.[1]

42 CFR § 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 CFR § 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] NIOSH dose reconstructions under EEOICPA are performed using the methods promulgated under 42 CFR pt. 82 and the detailed implementation guidelines available on the NIOSH Radiation Dose Reconstruction Program webpage.

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 employees 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 (Advisory Board). The Advisory Board will consider the NIOSH evaluation report, together with the petition, petitioner(s) comments, and other information the Advisory Board considers appropriate, in order to make recommendations to the Secretary of DHHS 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 Advisory Board, the Director of NIOSH will propose a decision on behalf of DHHS. The Secretary of DHHS will make the final decision, taking into account the NIOSH evaluation, the advice of the Advisory 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 DHHS.[2]

# 3.0 SEC-00253, RPP Class Definitions

The following subsections address the evolution of the class definition for SEC-00253, RPP. 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.

## 3.1 Petitioner-Requested Class Definition and Basis

NIOSH received petition SEC-00253 on June 25, 2019 and it qualified on December 13, 2019 [Redacted 2019]. The petitioner requested that NIOSH consider the following class: *All INCO security personnel who worked at any location within the Reduction Pilot Plant during the period from June 7, 1976 through November 26, 1978.*

The petitioner provided information and affidavit statements in support of the petitioner's belief that accurate dose reconstruction over time is impossible for the RPP employees in question. NIOSH deemed the following information sufficient to qualify SEC-00253 for evaluation:

[2] See 42 CFR pt. 83 for a full description of the procedures summarized here. Additional internal procedures are available on the NIOSH Radiation Dose Reconstruction Program webpage.

- The petition was submitted on the basis that radiation exposures and radiation doses potentially incurred by members of the proposed class were not monitored, either through personal monitoring or through area monitoring. No external radiation monitoring, internal radioactivity monitoring, or area monitoring were performed for the workers within the class.

At the time NIOSH received the petition, the petitioner-requested class was not within the Department of Labor's (DOL) covered period for the RPP. As a result of NIOSH's request for DOL to review the RPP covered period, in a November 15, 2019 letter to NIOSH, DOL indicated that they were revising the covered period dates [DOL 2019]. DOL changed the covered period for the RPP to include "…the entire period from 1951 through May 18, 1979, with the period from November 27, 1978 through May 18, 1979 for remediation only [DOL 2019, PDF p. 3]. DOL's revised covered period includes the petitioner-requested class.

NIOSH concluded that there is sufficient documentation to support the petition basis that internal and external radiation exposures and radiation doses were not adequately monitored at the Reduction Pilot Plant, either through personal monitoring or area monitoring. The information and statements provided by the petitioner qualified the petition for further consideration by NIOSH, the Advisory Board, and DHHS. The details of the petition basis are addressed in Section 7.4.

## 3.2 Class Evaluated by NIOSH

Based on its preliminary research, NIOSH accepted the petitioner-requested class. Therefore, NIOSH defined the following class for further evaluation: All INCO security personnel who worked at any location within the Reduction Pilot Plant during the period from June 7, 1976 through November 26, 1978.

## 3.3 NIOSH Determination about the Proposed Class to be Added to the SEC

NIOSH has obtained descriptions of the plant processes, details of the preparations to place the plant in standby mode prior to the evaluated period, a radiological survey of the plant taken before the evaluated period, and surveys taken after the evaluated period that describe the radiological conditions at the RPP during the evaluated period, June 7, 1976 through November 26, 1978. Based on its analysis of these available resources, NIOSH found no part of the class under evaluation for which it cannot estimate radiation doses with sufficient accuracy.

# 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 the RPP. The database search included the DOE (Department of Energy) Legacy Management Considered Sites database, the DOE Office of Scientific and Technical Information (OSTI) SciTech Connect database, and the Hanford Declassified Document Retrieval System. In addition to general Internet searches, the NIOSH Internet search included OSTI OpenNet Advanced searches, the Nuclear Regulatory Commission (NRC) Agency-wide Documents Access and Management (ADAMS) web searches, and the DOE-National Nuclear Security Administration-Nevada Site Office-search. Attachment One includes a summary of the RPP documents. The summary specifically includes 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 documented at the specified site. Dose reconstructors can use the Site Profile to evaluate internal and external dosimetry data for monitored and unmonitored employees, 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. As part of NIOSH's evaluation detailed herein, it examined the following TBDs for insights into RPP operations or related topics/operations at other sites:

- *Technical Basis Document for the Huntington Pilot Plant, Huntington, West Virginia*, DCAS-TKBS-0004, Rev. 2; effective November 5, 2018; SRDB Ref ID: 175109

- *Site Profiles for Atomic Weapons Employers that Worked Uranium Metals*, Battelle-TBD-6000, Rev. 1, effective June 17, 2011; SRDB Ref ID: 101251

- *K-25 Gaseous Diffusion Plant – Occupational Internal Dose*, ORAUT-TKBS-0009-5, Rev. 01 PC-1; effective October 4, 2006; SRDB Ref ID: 30010

## 4.2 ORAU Technical Information Bulletins (OTIBs) and Procedures

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. An ORAU Procedure provides specific requirements and guidance regarding EEOICPA project-level activities, including preparation of dose reconstructions at particular sites or categories of sites. NIOSH reviewed the following OTIB as part of its evaluation:

- *OTIB: Dose Reconstruction During Residual Radioactivity Periods at Atomic Weapons Employer Facilities*, ORAUT-OTIB-0070, Rev. 01; effective March 5, 2012; SRDB Ref ID: 108851

## 4.3 Facility Employees and Experts

To obtain more information in support of NIOSH's evaluation of petition SEC-00253, NIOSH reached out to several former RPP employees, including former security personnel. However, only one non-security individual agreed to be interviewed. The former INCO employee confirmed that he/she had worked within the RPP during the Standby Period and that there was no radiological monitoring for that activity [ORAUT 2020].

- Documented Communication, 2020, *Documented Communication SEC-00253 with* [Name Redacted] *on RPP*; Telephone Interview by ORAU Team; February 18, 2020; SRDB Ref ID: 179905

## 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 March 17, 2020)

**Table 4-1: No. of RPP Claims Submitted Under the Dose Reconstruction Rule**

| Description | Totals |
|---|---|
| Total number of claims submitted for dose reconstruction for employment at the RPP (92 submitted, 15 pulled by DOL) | 77 |
| Total number of dose reconstructions completed for the site (77 draft dose reconstructions completed with 76 final dose reconstructions submitted to DOL and 1 administratively closed). | 76 |
| Total number of claims submitted for energy employees who worked during the period under evaluation (June 7, 1976 through November 26, 1978) | 42 |
| Total number of claims submitted for energy employees who started their employment during the period under evaluation (June 7, 1976 through November 26, 1978) | 4 |
| Number of claims for which internal dosimetry records were obtained for the time period in the evaluated class definition | 0 |
| Number of claims for which external dosimetry records were obtained for the time period in the evaluated class definition | 0 |

NIOSH has completed dose reconstructions for all cases received from DOL. However, DOL recently expanded the RPP's covered period to include the Standby Period of 1963 through 1978, which was not previously considered covered under EEOICPA. The data in Table 4-1 do not consider dose reconstruction revisions that may be needed for the expanded covered period. NIOSH reviewed each claim to determine whether internal and/or external personal monitoring records could be obtained for the employee. No monitoring records were provided for any of the claimants.

## 4.5 NIOSH Site Research Database

NIOSH also examined its Site Research Database (SRDB) to locate documents supporting the assessment of the evaluated class. Two hundred seventy-eight documents in this database were identified as pertaining to the RPP. These documents were evaluated for their relevance to this petition. The documents include historical background on the plant operations and processes, including the preparations for and activities taken during the Standby Period—the period that includes the class under evaluation.

## 4.6 Documentation and/or Affidavits Provided by Petitioners

In qualifying and evaluating the petition, NIOSH received a Form B petition with supporting attachments on June 25, 2019 [Redacted 2019]. The attachments consisted of:

- Form B Appendix Continuation Page - a typewritten statement from the petitioner, a survivor of a worker formerly employed at INCO, that describes Exhibits A – C,

- Exhibit A - a November 16, 2018 letter to the Department of Labor from the worker's former supervisor at INCO stating that the worker had been employed at INCO,

- Exhibit B - an employment history affidavit stating that worker that had been a security guard employed by INCO,

- Exhibit C - a January 11, 1982 letter from INCO to DOE, Oak Ridge Operations, asking for clearances to be terminated and listing all remaining employees with Q and L clearances,

- Exhibit D - a January 11, 1982 internal INCO memo stating that an employee file on the INCO employees with clearances was to be destroyed, and

- Exhibit E - a December 14, 2018 letter to the DOL Office of Compensation from Huntington Alloys Corporation stating that the security force made routine checks of the RPP.

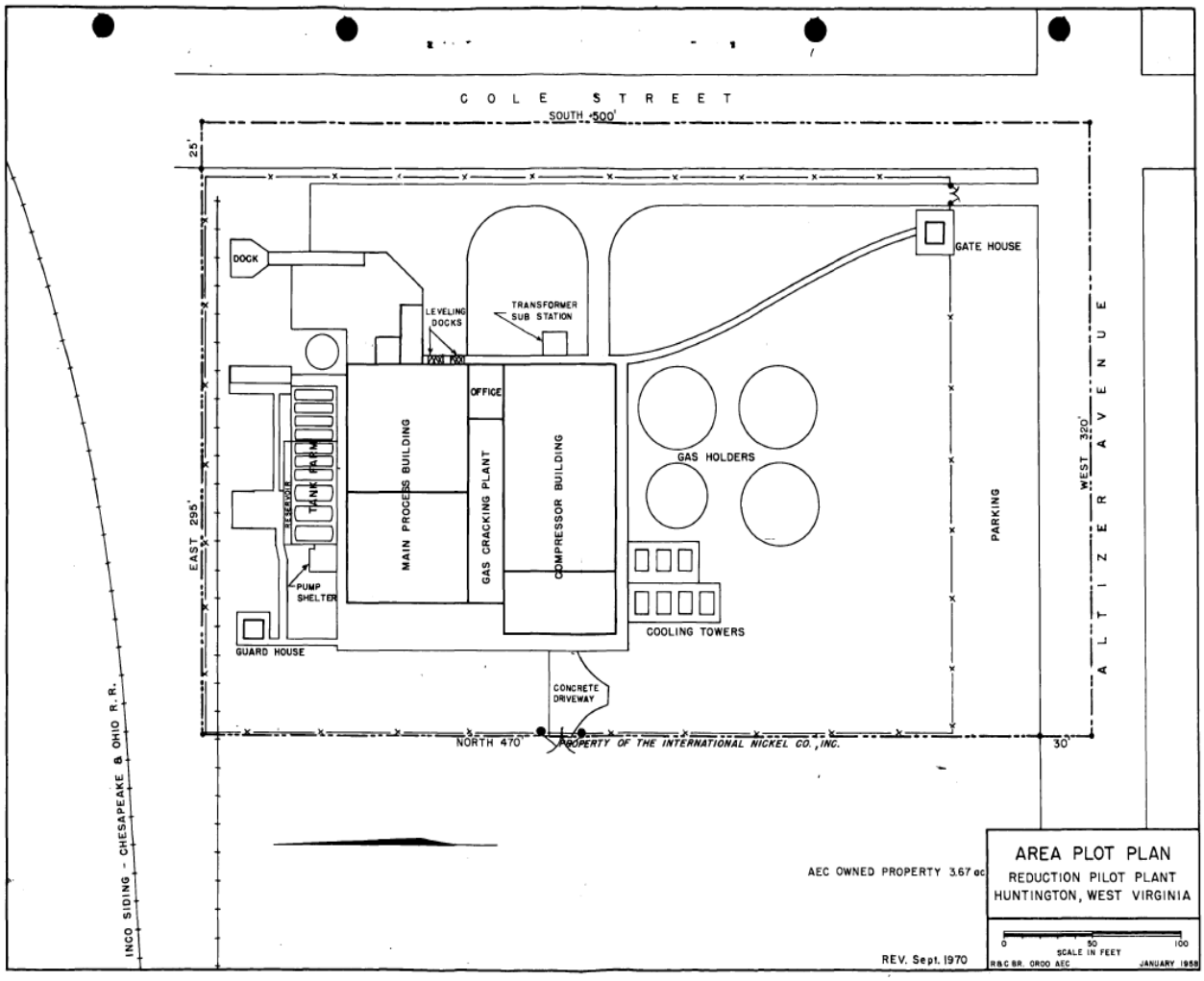
# 5.0 Radiological Operations Relevant to the Class Evaluated by NIOSH

The following subsections summarize both radiological operations at the RPP and the information available to NIOSH to characterize particular processes and radioactive source materials. From available sources NIOSH has gathered process and source descriptions that describe the radiological conditions during the evaluated period and the physical environment in which radiation exposures may have occurred during this period. The information included within this evaluation report is intended only to be a summary of the available information.

## 5.1 RPP Site and Process Descriptions

The RPP was located in Huntington, West Virginia, on a 3.67 acre property owned by the Atomic Energy Commission (AEC) and adjacent to INCO [General layout map 1958]. The RPP was constructed in 1951 and then operated by INCO under contract to the AEC. Q clearances were required for all personnel working in the RPP building and the workforce consisted of approximately 20 to 25 employees [Hungerford 1951, PDF p. 3].

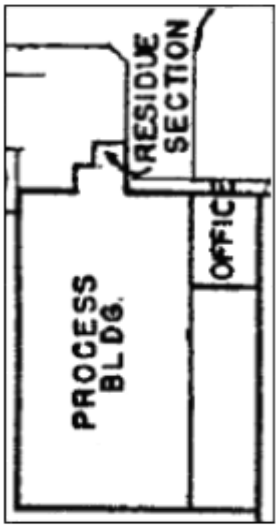
Figure 5-1 is a map of the AEC-owned property showing the two main buildings, the main Process Building and the Compressor Building. No contaminated materials were used in the Compressor Building. The Process Building was approximately 130 feet by 60 feet by 68 feet high. It was a structural steel building with a corrugated steel roof and siding, having five floors, with the upper four floors constructed with steel subway grating [Description of shutdown no date, PDF p. 9]. Materials were shipped to and from the facility by truck and by rail.




Source: [Site description no date, PDF p.3]

**Figure 5-1: Map of the RPP**

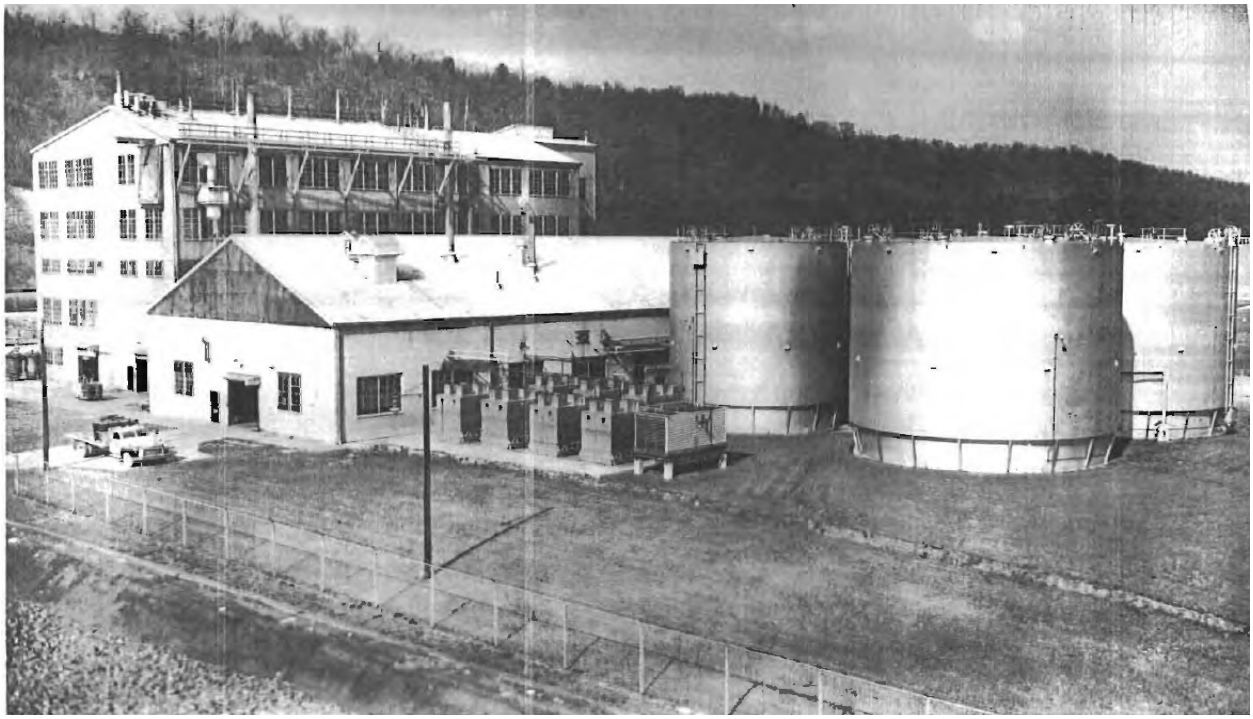
Figure 5-2 is the section of the map in Figure 5-1 showing this building extension; it is aligned in the same direction as Figure 5-1 (i.e., east is toward the top of both Figure 5-1 and Figure 5-2).




Source: [General layout map 1958, PDF p. 2]

**Figure 5-2: Map Showing Location of Residue Section within the Process Building**

Figure 5-3 is a photograph of the RPP buildings, with the Process Building on the far left, the Compressor Building in the middle, and the gas holding tanks on the far right, dated April 17, 1963.



Source: [Description of shutdown no date, PDF p. 40]

**Figure 5-3: Process Building, Compressor Building, and Gas Holding Tanks (left to right)**

The RPP produced nickel-barrier material starting in 1951, entered a Standby Period beginning on May 1, 1963, and was demolished between November 27, 1978 and May 18, 1979. Although the time between May 1, 1963 and November 27, 1978, was contemporaneously called a “Standby Period” by INCO and DOE, it falls within the period of operations as defined by DOL. INCO was performing

maintenance and security within the RPP during this time under contract with DOE. DOL defined the covered period as the entire time between 1951 and May 18, 1979 [DOL 2019].

A timeline of these periods along with the dates that radioactivity was introduced to the site and the dates of the radiological surveys performed at the RPP site are shown in Figure 5-4. Although the class being evaluated falls with the Standby Period, the Production Period and the Demolition Period are described to provide the history of the radiological conditions during the Standby Period and the context for the radiological surveys that were performed both during the Standby Period and after the Demolition Period.

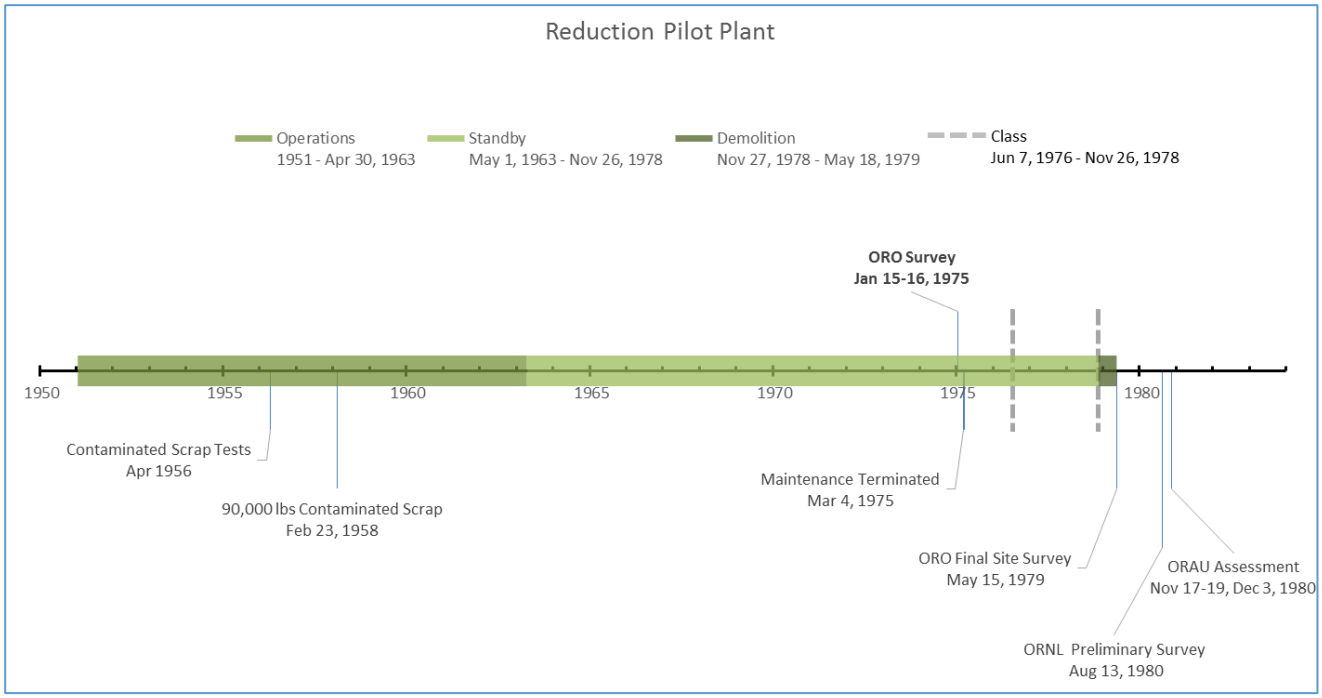



**Figure 5-4: Timeline of the RPP**

### 5.1.1 Production Period, 1951 through March 1963

INCO supplied the nickel oxide, also called “sinter,” which was used as source material [Williams 1960, PDF p.3]. The nickel was refined using the Mond process, as described below [Kirby 1961, PDF p. 19].

Nickel oxide is combined with hydrogen gas to produce nickel metal and water.

$$NiO + H_2 => Ni + H_2O$$

The metal is then combined with carbon monoxide to produce nickel carbonyl gas.

$$Ni + 4*CO => Ni(CO)_4$$

Finally, the nickel carbonyl gas is distilled to separate it from any metal contaminants such as iron carbonyl. It is then heated, causing it to decompose into pure nickel and carbon monoxide.

$$Ni(CO)_4 => Ni + 4*CO$$

A government memo from 1951 describes the process at the RPP:

> "The feed material is entered as nickel oxide, which is put into a reduction vessel, which, at controlled temperature in a hydrogen atmosphere, reduces the material to nickel. The nickel is then volatized by combining it with carbon monoxide in a pressure vessel at approximately 300 lbs. PSI, thus forming a gaseous nickel carbonyl. This gaseous carbonyl is passed through a condenser to change it to a liquid status. The liquid carbonyl is then purified by selective distillation, removing the iron oxide and other impurities. The purified carbonyl then passes through the decomposer (a vertical vessel approximately 5' in diameter x 13' high) and, by controlled temperature, the pure carbonyl is broken down, dropping out the bottom of the vessel as metal powder. The metal powder then passes over screens to remove lumps, etc. After screening operations are completed, the metal powder is packed and ready for shipment" [Hungerford 1951, PDF p. 6].

Beginning in 1956, the RPP's source material changed from uncontaminated nickel oxides to scrap barrier material supplied from the three gaseous diffusion plants: Portsmouth, Paducah, and K-25 [Williams 1956; Excerpts from OROO no date]. The scrap barrier material included barrier that had been used for the isotopic separation of uranium hexafluoride and was contaminated with low-enriched uranium. Specifications for the material stated that the scrap barrier was to contain a minimum nickel content of 98.0% and no more than 0.0875 grams per pound of U-235 and no more than 500 ppm total uranium with the average content expected to be substantially less [Specifications for starting no date, PDF p. 2; Keller 1958a, PDF p. 2].

A government memo described the changes to the process when the RPP began using the contaminated barrier scrap as the source material:

> "Since the starting material contains but a small per cent of oxide, the first step consists principally of activating the material with hydrogen rather than a reduction of the oxide. This is carried out in 4000 lb. batches in two kilns on the top level which traverse the top of the reactor columns on double tracks. Upon completion of the activation step the material is dumped through an air-tight seal into what were formerly used as reduction and activation reactors, but which now will be used for storage of the activated material. From this point on the process is basically unchanged, with the material proceeding to the reactors for conversion to crude carbonyl, distillation and purification of the crude carbonyl, and decomposition and preparation of specification grade powder" [McAlduff 1958, PDF p. 3].

The July 2–3, 1957, *Final Report of Annual Fire Survey of Reduction Pilot Plant Huntington, West Virginia* by Oak Ridge Operations personnel stated:

> "The plant operates continuously. There are two foremen, eight operators, and two Security guards on each shift. On the day shift only, this regular force is augmented by the Engineer in charge, Assistant Engineer in charge, one Utility Foreman and seven (7) service personnel" [Smith 1957, PDF p. 7].

INCO determined that during the nickel purification "virtually all of the uranium collects as a fine dust in the ash receivers at the bottom of the reactors" [Houser 1956, PDF p. 3]. These ash receivers were initially cleaned manually and on a weekly basis [Houser 1956, PDF p. 3].

Modifications to the RPP in 1957 included the addition of "a vacuum system for handling contaminated residues including, blower with motor, separator, filters, and duct work" [Wende 1957, PDF p. 3]. The ash was vacuum transferred into the residue system and passed through a series of three filters: a cyclone filter, a metallic filter, and then a bag filter with the ash deposited into a drum. The drummed material was shipped to Oak Ridge, Tennessee [Travis 1980, PDF p. 2] [Smith 1979a].

In an undated, post-shutdown report listing all plant equipment, the residue system was listed as including the following [Description of shutdown no date, PDF p. 96]:

- U.S. Hoffman 6-stage exhauster with 40 HP motor,
- Haffco-Veyor cyclone separator,
- 1 Hoffman-Veyor bag filter,
- Dracco separator with metallic filters,
- 2-Vezin samplers with 1/2 HP motors,
- 6 Syntron electric vibrating feeders, and
- 1 Dracco discharge hopper.

In 1958, INCO was notified by Oak Ridge Operations that "minute quantities" of Pu-239, Pu-240, Pu-241, U-236, Th-232, Np-237, and U-237 were present in the barrier scrap due to the fact that "a portion of the $UF_6$ fed to the cascades of the diffuser plants [had] been produced from reprocessed fuel elements" [Sapirie 1958, PDF p. 2]. This included barrier scrap already processed at the RPP and future barrier scrap [Sapirie 1958].

By 1960, over 9,000,000 pounds of barrier scrap had been processed [Sapirie 1960, PDF p. 4] and a total of 401,181 pounds of nickel residue had been shipped to K-25 in Oak Ridge [UCC 1960, PDF p. 33]. These residues were then shipped to the Oak Ridge Processing Company, Inc. (ORPC) to be smelted into ingots [UCC 1960, PDF p. 33]. ORPC was contracted to smelt metal scrap from the Oak Ridge facilities in order to separate uranium contamination from the metal [McLendon 1958].

### 5.1.2 Standby Period, May 1, 1963 through November 26, 1978

Production of the barrier material ceased at the RPP on December 11, 1962, and steps were taken to prepare the plant to be placed in a standby condition [Description of shutdown no date, PDF p. 6], with May 1, 1963, being "effective date of the beginning of the Standby Period" [Description of shutdown no date, PDF p. 9]. A May 3, 1962, letter from INCO to Oak Ridge Operations described the steps for placing the equipment in standby condition and the maintenance necessary for eventual restart. The procedures listed steps to remove all barrier scrap from all systems. In this letter the barrier scrap was described as "starting material" or S.M.

The planned steps for the Residue Section included the following [Carter 1962, PDF p. 7]:

1. Inert purge;
2. Air purge;
3. Clean completely, watching particularly for S.M.; and
4. Open to air.

In the post shut-down report, the entire residue system was described as having been "carefully cleaned and lubricated" with the cloth filter bags removed [Description of shutdown no date, PDF p. 96].

INCO provided Oak Ridge Operations with a list of the security and maintenance tasks along with their frequencies while the RPP was to be in a standby condition. Table 5-1 lists the tasks and the workers who performed each task, as well as the frequency. Note that this table contains all workers performing routine tasks within the RPP and that only the guards, as the security personnel, are members of the petition class.

**Table 5-1: Tasks and Frequencies Proposed by INCO for the RPP Standby Period**

| Workers | Task | Frequency |
|---|---|---|
| Guards | Check process room and compressor room | Once a shift (three times a day) |
| Maintenance mechanic and helper | Check that dry air system and the emergency inert system are functional | Once a week |
| Maintenance mechanic, helper, and craft workers | Perform maintenance as needed, lubricate equipment, clean and inspect equipment for corrosion, run equipment as needed | Monthly |
| Yard department | Grass cutting | Monthly |
| Responsible person from the Engineering Department and representative from paint contractor | Inspection | Twice a year |
| Supervisor with experience during Production Period | Thorough inspection | Yearly |

Source: [Carter 1962, PDF p. 8]

A radiation survey and a security inspection of the RPP was made on January 15–16, 1975 [Smith 1979a]. An April 1980 letter from the Director of the Safety and Environmental Control Division to the Director of the Research Division of Oak Ridge Operations described the radiological status of the RPP based on the results of the January 15-16, 1975 survey. The letter stated that with the exception of "the housing the residue system and the residue system itself," the building was at a level low enough to comply with the unrestricted release criteria of NRC Regulatory Guide 1.86 [Travis 1980, PDF p. 2].

After determining that the RPP "no longer plays a role in either planning or back-up for future operations," Oak Ridge Operations notified INCO to terminate all maintenance work needed to maintain operational capability as of March 4, 1975 [Anderson 1975, PDF p. 2]. The plant remained in standby mode until demolition began on November 27, 1978 [ORO 1977, PDF p. 4]. Although inspection walkthroughs may have continued after maintenance was halted, none of the inspections would have placed a worker inside the plant for more than two days per year. The only workers entering the RPP more often than that would have been security personnel.

### 5.1.3 Demolition Period, November 27, 1978 through May 18, 1979

Following the January 15–16, 1975 survey, DOE decided to dispose of the RPP. Authorization to proceed was received on June 10, 1977 [ORO 1977, PDF p. 4]. Demolition began on November 27, 1978, and was completed by May 18, 1979 [ORO 1977, PDF p. 5]. Under the supervision of INCO, the Cleveland Wrecking Company performed the RPP demolition [Smith 1979a, PDF pp. 2–3]. For this effort, INCO hired several retired workers to provide health and safety supervision due to the presence of the nickel carbonyl [Skeletal plan for disposal no date, PDF p. 2].

Three specific hazards with health protection requirements were listed in a March 29, 1978, Specifications for Demolition document: asbestos, uranium, and nickel carbonyl [Specifications for demolition 1978, PDF p. 3]. Asbestos was present in the building as insulation. Uranium and nickel carbonyl locations were marked with white and red "X"s, respectively, based on process knowledge and the results of a 1975 survey. Half-face respirators were required for cutting and any dust-generation activities involving uranium areas. Supplied-air respirators were required for nickel carbonyl areas or for areas marked with both uranium and nickel carbonyl [Specifications for demolition 1978, PDF p. 17]. All systems containing classified material were marked with at least a white or red "X" [Smith 1979a, PDF p. 3].

The decision to dispose of the demolition materials at a DOE facility was made for regulatory reasons rather than health protection:

> "…[A]t the time the demolition were [sic] made, there was no de minimis quantity for enriched uranium and the NRC Regulatory Guide 1.86 was considered inappropriate by DOE, Legal, for application to contamination involving enriched uranium. The decision was made in part for regulatory reasons rather than health protection reasons to dispose of the contaminated equipment at a DOE facility. Overriding considerations on this decision included the possible presence of classified material and possible presence of nickel carbonyl" [Travis 1980, PDF p. 2].

There were 59 truckloads and four (4) railcar loads of scrap transported from the RPP to the classified buria1 ground at the Portsmouth Gaseous Diffusion Plant. At the same time, 138 truckloads of clean scrap were removed from the RPP site. A "final site radiation survey" was conducted on May 15, 1978, certifying that the site could be released for unrestricted use [Smith 1979, PDF pp. 2–3].

## 5.2 Radiological Exposure Sources from the RPP Standby Period

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

### 5.2.1 Internal Radiological Exposure Sources from the RPP Standby Period

During the Standby Period, the radiological condition of the Process Building would have remained static. There was no introduction of new radioactivity to the site. Any radioactivity remaining from earlier processing would have been inside the Process Building. The January 15–16, 1975, survey conducted by Oak Ridge Operations personnel confirmed that there was very little removable radioactivity within the Process Building and the greatest amounts of fixed radioactivity were found on the residue system equipment [Smith 1979]. This survey is taken to represent the conditions within

the RPP Process Building during the entire class period under evaluation, June 7, 1976 through November 26, 1978.

#### 5.2.1.1 Enriched Uranium

Low-enriched uranium was present in some of the source barrier scrap used in the RPP starting in 1956 and ending in April 1963. The average enrichment level of the uranium was planned to be between 1% and 2% [Armstrong 1957]. An Oak Ridge Operations internal letter stated that after processing over 9,000,000 pounds of the scrap barrier, the average enrichment was found to be 0.9% [Sapirie 1960]. Reports also stated that nickel scrap from the K-25 Plant was contaminated with uranium with a maximum enrichment of 4% by weight [Clark and Cottrell no date; Berger et al. 1981].

The uranium was concentrated in the residues which were drummed and shipped to Oak Ridge, Tennessee, along with the final product, the nickel powder barrier material. The barrier scrap and residues were handled exclusively within the RPP Process Building.

Enriched uranium within the RPP during the Standby Period may be estimated using the alpha-contamination results from the January 15–16, 1975 survey and assuming the alpha activity was solely due to uranium.

#### 5.2.1.2 Contaminants from Reprocessed Fuel

In addition to uranium, radioactive contaminants from reprocessed fuel was present in the scrap barrier as a result of it having been used to enrich uranium obtained from reprocessed fuel. INCO was notified in a 1958 letter from Oak Ridge Operations of the presence of “minute quantities” of Pu-239, Pu-240, Pu-241, U-236, Th-232, Np-237, and U-237 contaminants present in the barrier material from reprocessed fuel [Sapirie 1958, PDF p. 2].

An estimate of contaminants from reprocessed fuel in scrap barrier material may be made following the methods used in DCAS-TKBS-0004. A discussion of reprocess fuel contaminants in K-25 barrier materials is found in the TBD, *K-25 Gaseous Diffusion Plant-Occupational Internal Dose*, ORAUT-TKBS-0009-5. Table 5-6 from the TBD is recreated in this document as Table 5-2 with the values converted to dpm. This table is for low-enriched uranium and is based on a default enrichment of 2%. The scrap barrier material was contaminated with low-enriched uranium with a maximum enrichment of 4% by weight [Clark and Cottrell no date; Berger et al. 1981] and had an average enrichment of 0.9% [Sapirie 1960].

The table is intended to provide a default isotopic distribution of reprocessed fuel contaminants when only total uranium results are available. In the context of RPP measurements, all alpha activity can be assumed to be uranium, and the amounts of contaminants from reprocessed fuel may be estimated by their relative activity to uranium.

**Table 5-2: Default Isotopic Distributions**

| Radionuclide | dpm/g U |
|---|---|
| Pu-239 | 150,000 |
| Am-241 | 150,000 |
| U-236 | 2067 |
| U-235 | 97,555 |
| U-234 | 1,560,000 |
| U-238 | 750,000 |
| Np-237 | 142,000 |
| Th-230 | 42,000 |
| Tc-99 | 267 |

[ORAUT-TKBS-0009-5, PDF p. 13]

The list of radionuclides in the 1958 letter from Oak Ridge Operations differs from the list in Table 5-2. The list of radioisotopes in this table are taken to be a better description of the contaminants present from reprocessed fuel.

All of the radionuclides in Table 5-3 are alpha emitters with the exception of Tc-99.

The activities of the contaminants that would have been present in the contamination remaining at the RPP during the Standby Period may be estimated by developing ratios of their activities to the activity of the enriched uranium. The ratios are calculated from the data from Table 5-2 above and listed in Table 5-3 below.

**Table 5-3: Activity Ratios for Alpha-emitting Contaminants from Reprocessed Fuel**

| Radionuclide | Activity relative to total Enriched Uranium Activity |
|---|---|
| Pu-239 | 0.0623 |
| Am-241 | 0.0623 |
| Np-237 | 0.00498 |
| Th-230 | 0.0174 |
| Tc-99 | 0.00011 |

It is assumed that all activity remained in the residues. As almost all of the uranium remained in the residues, these ratios may be used to estimate the amounts of these contaminants where the uranium concentration is known.

### 5.2.2 External Radiological Exposure Sources from RPP Standby Period

During the period evaluated in this report, the radiological conditions at the RPP Process Building would have been static. The January 15–16, 1975, survey by Oak Ridge Operations personnel is taken to represent the conditions within the building during the entire Standby Period.

#### 5.2.2.1 Photon

Although the low-enriched uranium and trace contaminants from fuel reprocessing do provide some low-energy photons, they would not have been a significant source of external exposure.

#### 5.2.2.2 Beta

Low-enriched uranium and most of the trace contaminants from fuel reprocessing emit alpha radiation when they decay and are not sources of beta radiation. The only radioisotope in Table 5-3 that is a beta emitter is Tc-99. Table 5-4 lists the activity ratio for Tc-99 relative to the total uranium measured.

**Table 5-4: Activity Ratio for Beta-emitting Contaminant from Reprocessed Fuel**

| Radionuclide | Activity relative to total Enriched Uranium |
|---|---|
| Tc-99 | 0.00011 |

#### 5.2.2.3 Neutron

Although low-enriched uranium was present in the barrier scrap and some of the uranium may have been in an oxide form, Battelle-TBD-6000 states that for uranium oxides “the neutron dose rate is about 0.07% of the beta/photon dose rate and need not be included in dose rate calculations. For uranium metal, the neutron dose rate is even less important” [NIOSH 2011b, PDF p. 25]. Because low-enriched uranium is the major radionuclide of concern at the RPP site, neutron exposures were not a significant hazard during the Standby Period.

# 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 RPP class under evaluation.

Although no personal monitoring data have been located for INCO workers, four radiation surveys were performed at the RPP. One survey was done during the Standby Period prior to the class dates evaluated in this petition, and three were done after the demolition of the RPP Process Building. The survey reports for all except the May 15, 1979 post-demolition survey have been found and reviewed. The cover letter for the May 15, 1979 survey included the statement “It is certified that as of May 15, 1979, the site radiation level is as described and the property can be released for unrestricted use” [Smith 1979, PDF p. 3].

A technical review of the "Final Site Radiation Survey," dated May 15, 1979, resulted in recommendations for direct radiation levels to be measured at the ground surface and sampling for residual uranium in soil samples. The Oak Ridge National Laboratory (ORNL) conducted a preliminary survey on August 13, 1980 [Clark and Cottrell no date]. Their survey report recommended that a detailed formal survey be performed prior to public release of the site [Clark and Cottrell no date, PDF pp. 5–6]. ORAU performed the recommended surveys on November 17–19, 1980 and December 3, 1980. Their conclusions were that the radiation levels were within guidelines for unrestricted release of the site [Berger et al. 1981].

**Table 6-1. Radiological Surveys of the RPP**

| Survey | Performed by | Date(s) Performed |
|---|---|---|
| Radiation Survey and Security Inspection [Smith 1979, PDF pp. 5–48] | Oak Ridge Operations | January 15–16, 1975 |
| Final Site Radiation Survey [Smith 1979, PDF pp. 3, 49–50] | Oak Ridge Operations | May 15, 1979 |
| Preliminary Radiological Survey [Clark and Cottrell no date] | ORNL | August 13, 1980 |
| Radiological Assessment [Berger et al. 1981] | ORAU | November 17–19 and December 3, 1980 |

The post-demolition surveys by ORNL and ORAU identified higher gamma levels than the January 15-16, 1975 survey by Oak Ridge Operations. The ORNL and the ORAU surveys included readings from both inside and outside of the buildings. Both reported gamma levels from readings made at contact with the surface. The ORAU report included gamma readings made at 3-feet above the surface.

## 6.1 Available RPP Internal Monitoring Data

No internal monitoring or air sampling data for radioactivity have been found for the RPP for the class under evaluation. NOCTS claim files have been reviewed and none contain bioassay results or air sampling data.

Area monitoring data from the Standby period have been found for the RPP. On January 15–16, 1975, a radiation survey was made of the RPP [Smith 1979, PDF p. 5]. This survey included direct alpha measurements made with an alpha scintillation counter. Swipes of removable alpha activity were made and analyzed afterward in Oak Ridge, Tennessee.

Direct alpha levels and smears were taken at 68 points on all five levels in the RPP Process Building, with most in the area of the residue system. The highest direct alpha measurement on the floor was 960 dpm/100 $cm^2$ and the highest smear from the floor was 19 dpm/100 $cm^2$, both in the vicinity of the residue system. Alpha measurements and smears were also taken on 23 points on selected process equipment. The highest direct alpha measurement on the equipment was 3,400 dpm/100 $cm^2$ and the highest smear from the equipment was 16 dpm/100 $cm^2$, both on residue system equipment.

**Table 6-2: Survey Results for Fixed and Removable Alpha Activity on the Residue System**

| Residue System Equipment | Survey Meter dpm/100 $cm^2$ | Smear dpm/100 $cm^2$ |
|---|---|---|
| Bag filter | 3,400 | 10 |
| Metallic filter | 800 | None Detected |
| Sample line | Not measured | 16 |
| Sample splitter | 1,200 | 5 |
| Drumming station | 800 | 5 |

## 6.2 Available RPP External Monitoring Data

No personal external monitoring data have been located in data capture efforts, including record searches at the K-25 site and at the Portsmouth site. No personnel dosimetry records have been identified in NOCTS records. There is no indication in the documents available to NIOSH of any personal dosimetry performed at the RPP.

The January 15–16, 1975 radiation survey conducted during the Standby Period by Oak Ridge Operations states that gamma levels were measured by scintillation probe at 3-feet above the ground and contact beta-gamma levels were measured by a thin-window probe. The report states that the gamma levels showed "no difference from normal background, 8–10 μr/hr" [Smith 1979, PDF p. 5]. None of the points measured on the floors or the equipment had any detectable removable beta-gamma activity.

The highest beta-gamma level reported using the thin-window probe at contact was 0.25 mr/hr. The value was reported for three locations on process equipment: (1) the West Residue Discharge Flange for Reactor #2; (2) the East Residue Discharge Flange for Reactor #2; and (3) on material from Tank #2. The report stated that no measurements were taken at outside locations due to snow cover.

A survey conducted on August 13, 1980, by ORNL after the demolition of the Process Building, reported an average of 10 μR/hr and a maximum of 45 μR/hr measured on contact with a driveway between the railroad tracks and the tank farm using a gamma scintillation probe [Clark and Cottrell no date, PDF p. 8]. The survey conducted by ORAU on November 17–19 and December 3, 1980, also indicated a maximum of 45 μR/hr measured in approximately the same area as the driveway as referenced by ORNL, also measured in contact using a gamma scintillation probe [Berger et al. 1981, PDF p. 22]. The ORAU report included analyses of gravel that had been used as fill for the concrete driveway. The gravel had elevated levels of Ra-226, indicating a natural origin for the material as no Ra-226 was used at the RPP [Clark and Cottrell no date, PDF p. 8]. The ORAU report did say, however, that this pad was the location used by the demolition contractor to store contaminated equipment after removal from the RPP Processing Building [Berger et al. 1981, PDF p. 12].

The ORAU survey also measured up to 35 μR/hr in "small rooms and enclosed spaces of the change room, stairwell, and second floor office area" within the Compressor Building. Through sampling of the concrete block in the building, it was determined that the source was primarily naturally occurring Ra-226 [Berger et al. 1981, PDF p. 11].

The January 15–16, 1975 radiation survey included beta-gamma results on swipes taken at 41 points on the floors from all five levels; all beta-gamma swipe results were listed in the report as "None

Detectable" [Smith 1979, PDF pp. 13–14]. The survey report also included 16 results from measurements using a thin-window probe made on contact with plant equipment [Smith 1979, PDF p. 5]. Although the purpose was to measure low-energy gamma radiation from any remaining uranium, the probe would have also measured any beta radiation. The results ranged from "None Detected" to a maximum of 0.25 mr/hr, a level found on three pieces of equipment, including the reduction kiln, Reactor #2, and measuring tank #2.

# 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 CFR § 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 NIOSH's SEC Petition Evaluation Internal Procedures which are available on the NIOSH Radiation Dose Reconstruction Program webpage. 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-00253 as submitted by the petitioner. (Section 7.4)

## 7.1 Pedigree of RPP 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 not located any internal radiation monitoring data nor any radiation air sampling data for the period under evaluation (June 7, 1976 through November 26, 1978).

NIOSH has located the results of a survey conducted during the Standby Period [Smith 1979]. This report described the January 15–16, 1975 RPP survey and was acquired as an attachment to a November 14, 1979 internal Oak Ridge Operations letter [Smith 1979]. This survey report includes surface contamination results for removable alpha contamination on process equipment. This survey report appears to be primary source data and allows for resuspension analysis during the Standby Period of the plant history. Data pedigree evaluation is not necessary for primary source data, which is the only data type available for this period.

### 7.1.2 External Monitoring Data Pedigree Review

NIOSH has not located any external dosimetry data for the period under evaluation (June 7, 1976 through November 26, 1978), or any documentation to indicate that personal dosimetry was performed at the RPP. Therefore, a data pedigree evaluation is not possible for this data type.

The January 15–16, 1975, survey by Oak Ridge Operations provides monitoring results that describe the radiological conditions during the Standby Period. All of the documentation available indicates that conditions were static within the building during the Standby Period. The survey document appears to be a primary source document, and as such will be used to represent the conditions at the facility over the period under evaluation. Therefore, a data pedigree evaluation is not necessary for this data type.

The November 17–19 and December 3, 1980 survey by ORAU provides monitoring results that describe the radiological conditions after the demolition of the Process Building. It includes measurements of ambient gamma levels primarily due to naturally occurring radioactivity found within the RPP site. The areas monitored were from materials not affected by the demolition and would reflect conditions prior to demolition during the Standby Period. The survey document appears to be a primary source document, and as such will be used to represent the conditions at the facility over the period under evaluation. Therefore, a data pedigree evaluation is not necessary for this data type.

## 7.2 Evaluation of Bounding Internal Radiation Doses at the RPP

The principal source of internal radiation doses for members of the class under evaluation was contamination from low-enriched uranium, including reprocessed fuel contaminants [NIOSH 2018]. 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 Process-Related Internal Doses

There was no known air monitoring for radioactivity at the RPP. There is no indication that bioassay samples were collected during the Standby Period.

A radiological survey of the RPP Process Building conducted on January 15–16, 1975, included alpha measurements of removable and fixed activity at a variety of points on the floors and on process equipment, particularly in the area of the residue handling system and its equipment [Smith 1979,

PDF pp. 13, 17]. This survey was conducted prior to the evaluated class period. As the site had been placed in a standby mode and there was no new introduction of radioactivity occurring, the survey results can be used to describe the radiological condition of the RPP to allow bounding of internal dose.

### 7.2.2 Evaluation of Bounding Ambient Environmental Internal Doses

The ambient environmental dose does not need to be reconstructed because ambient dose is accounted for in the assignment of doses from process materials. The radiological conditions at the RPP used to estimate internal and external doses were measured during the Standby Period prior to the NIOSH-evaluated class period and would have included the influence of both process-related materials and any residual materials.

### 7.2.3 Methods for Bounding Internal Dose at the RPP

The following subsections summarize the methods for bounding internal dose at the RPP site.

#### 7.2.3.1 Methods for Bounding Standby Period Internal Dose

Internal exposures may be assessed using survey results obtained during the January 15–16, 1975, radiological survey of the RPP. This survey predates the NIOSH-evaluated class and it is assumed that there was no depletion of the contamination through cleaning or other removal; cleaning was not a listed task charged to the government by INCO during the RPP's Standby Period [Listing of data no date, PDF p. 4].

The highest removable alpha result, 19 dpm/100 $cm^2$, is assumed to be uranium and assumed to apply uniformly to the entire floor area walked by INCO security guards. Air concentrations are estimated using a resuspension factor of $10^{-6}$ $m^{-1}$ [ORAUT 2012] and a breathing rate of 1.2 $m^3$ per hour [ICRP 1994, PDF p. 107].

Security guards performed a walk-through of the RPP Process Building once per shift. Using a typical walking speed of 3 miles per hour or 4.4 feet per second, a person could walk the length of the Process Building in about 34 seconds. Allowing for deviations and stops, NIOSH assumed that no single walk-through would take more than five minutes. For estimating the length of time at the RPP, a factor of three is applied, giving fifteen minutes as the time that any security guard was in the RPP Process Building, the Compressor Building, and the grounds during their walk-through.

The time in the Process Building for any individual security guard is assumed 0.25 hours per day or 91.3 hours per year. This provides an upper bound on the annual inhalation of total uranium as:

19 dpm/100 $cm^2$ * 10000 $cm^2/m^2$ * $10^{-6}$ $m^{-1}$ * 1.2 $m^3$/hr * 91.3 hr/yr = 0.208 dpm/yr

The contaminants from reprocessed fuel may be estimated using the factors listed in Table 5-3. The inhalation rates per year for reprocessed-fuel contaminants are listed in Table 7-1. These may be applied for any year or fraction of a year the worker was at the RPP.

**Table 7-1. Annual Inhalation Rates of Uranium and Reprocessed Fuel Contaminants**

| Radionuclide | Annual inhalation (dpm/year) |
|---|---|
| Uranium | 0.209 |
| Pu-239 | 0.0130 |
| Am-241 | 0.0130 |
| Np-237 | 0.00104 |
| Th-230 | 0.00363 |
| Tc-99 | 0.000023 |

#### 7.2.3.2 Methods for Bounding Ambient Environmental Internal Dose

As stated in Section 7.2.2 above, the ambient environmental dose does not need to be reconstructed because ambient dose is accounted for in the assignment of process-related dose in the Standby Period.

### 7.2.4 Internal Dose Reconstruction Feasibility Conclusion

NIOSH has found that it is feasible to reconstruct internal dose to INCO security guards at the RPP for the period between June 7, 1976 and November 26, 1978 using the available survey data from Smith [1979]. Worker dose may be estimated by using the annual inhalation values listed in Table 7-1 for any year between 1976 and 1978.

## 7.3 Evaluation of Bounding External Radiation Doses at the RPP

The principal source of external radiation doses for members of the evaluated class was to contamination from low-enriched uranium and processed fuel contaminants [NIOSH 2018].

The following subsections address the ability to bound external doses, methods for bounding doses, and the feasibility of external radiation dose reconstruction.

### 7.3.1 Evaluation of Bounding Process-Related External Doses

NIOSH is not aware of any worker monitoring for external exposure for work at the RPP. In the January 15–16, 1975, radiological survey, ambient gamma levels were measured with a gamma scintillation probe and wipes from floor locations and from equipment were counted using a thin-window beta-gamma probe. Several locations on plant equipment were also measured directly with the beta-gamma probe.

The 1975 survey report stated that the "survey results inside all the buildings using the scintillation gamma ratemeter showed no difference from normal background, 8-10 μr/hr" [Smith 1979, PDF p. 5]. None of the points measured on the floors or the equipment had any detectable removable beta-gamma activity.

The highest direct reading for beta-gamma was 0.25 mR/hour and was found at several locations; on the reduction kiln, reactor #2, and measuring tank #2. Note that these measurements were taken at contact with process equipment and the results did not indicate separate beta and gamma levels.

The post-demolition ORAU survey measured 35 µR/hr within the Compressor Building and through sampling of the concrete block in the building, determined the source to be primarily naturally occurring Ra-226 [Berger et al. 1981, PDF p. 11].

The external photon exposure may be bound using the highest gamma scintillation results for measurements made at 3-feet above the surface at the RPP, 35 µR/hour. This was measured in the post-demolition survey by ORAU of the Compressor Building, and although including photons from natural radioactivity, encompasses all photon dose that may have come from the uranium and enriched fuel contaminants.

The external beta exposure may be bound using the highest beta-gamma result from the January 15–16, 1975 survey during the Standby Period, 0.25 mR/hour. As the measurement includes exposure from both low-energy gamma and beta, it is bounding for beta exposure.

### 7.3.2 Evaluation of Bounding Ambient Environmental External Doses

The ambient environmental dose does not need to be reconstructed because ambient dose is accounted for in the assignment of process-related dose. The radiological conditions at the RPP used to estimate external doses were measured during the Standby Period and would have included the influence of both process-related dose and any residual materials.

### 7.3.3 RPP Occupational X-Ray Examinations

No information regarding medical X-rays for RPP workers were found in the available records.

The Site Profile for the RPP [NIOSH 2018] provides instructions for assignment of annual medical X-ray dose in 1951 through 1963 and 1978 through 1979. The DOL recently changed the covered period to be continuous from 1951 through May 18, 1979, such that the Standby Period evaluated in this report is covered under EEOICPA. Therefore, the methods for reconstruction of medical X-ray dose specified in the Site Profile also apply to the Standby Period being evaluated in this report.

### 7.3.4 Methods for Bounding External Dose at the RPP Site

NIOSH has an established protocol for assessing external exposure when performing dose reconstructions (these protocol steps are discussed in the following subsections):

- Photon Dose
- Beta Dose
- Neutron Dose

#### 7.3.4.1 Methods for Bounding Standby Period External Dose

Photon Dose

Although the highest gamma result in the RPP radiological surveys was 45 µR/hour, this was measured on contact with the ground surface. The highest reading made at 3-feet above the floor was 35 µR/hour (0.035 mR/hour). An upper-bound dose estimate may be established by using 0.035 mR/hour. The time in the RPP for any individual security guard is assumed to be 0.25 hours per day or 91.3 hours per year. Using these values gives:

0.035 mR/hour * 91.3 hours per year = 3.2 mR/year

This results in an upper-bounding estimate as it assumes that the walk-through was performed by the same person throughout the year, and that the person was exposed continuously to the highest ambient photon exposure level measured in any of the surveys conducted within the RPP, and that the exposure measurement which was representative of the average exposure at the RPP.

Beta Dose

An upper-bound estimate of beta dose may be established by using the highest direct beta-gamma results from the January 15–16, 1975, survey, 0.25 mR/hour. The beta-gamma rate was reported in units of exposure; it is assumed the reported mR/hour exposure rate is reasonably equivalent to mrad/hour beta dose rate. The time in the RPP Process Building for any individual security guard is assumed to be 0.25 hours per day or 91.3 hours per year. Using these values gives:

0.25 mrad/hour * 91.3 hours per year = 23 mrad/year

This is an upper-bounding estimate of the dose result as it assumes that the walk-through was performed by the same person throughout the year, and that the person was exposed to the highest beta-gamma result within the Process Building. This result also assumes that the measurement the dose is based on was pure beta with no gamma component.

Neutron Dose

As stated in Section 5.2.2.3 of this report, neutron dose was not a significant hazard during the Standby Period and does not require a bounding method.

#### 7.3.4.2 Methods for Bounding Ambient Environmental External Doses

As stated in Section 7.3.2, the ambient environmental dose does not need to be reconstructed because ambient dose is accounted for in the assignment of doses from process-related materials.

### 7.3.5 External Dose Reconstruction Feasibility Conclusion

NIOSH has found that it is feasible to reconstruct external dose to INCO security guards at the RPP for the period from June 7, 1976 through November 26, 1978, using the available survey data. Worker dose may be estimated by using an annual exposure rate of 3.2 mR per year for photon and 23 mrad per year for beta.

## 7.4 Evaluation of Petition Basis for SEC-00253

The following subsections evaluate the assertions made on behalf of petition SEC-00253 for the RPP.

### 7.4.1 Exposure Incidents

Issue: The petition is based on one or more unmonitored, unrecorded, or inadequately monitored or recorded exposure incidents.

Response: In the context of qualifying a petition using the E.5 basis, 42 CFR 83.13 (c)(3)(i) refers to "…discrete incidents likely to have involved exceptionally high level exposures, such as nuclear criticality incidents or other events involving similarly high levels of exposures resulting from the

failure of radiation protection controls..." [Procedures for designating 2018, PDF p. 11].Statements, such as those provided under Section E.5 in Form B, about workers entering the RPP building without protective equipment do not address the basis of unmonitored, unrecorded, or inadequately monitored or recorded exposure incidents.

### 7.4.2 No Worker Monitoring

Issue: *Radiation exposures and radiation doses potentially incurred by members of the proposed class were not monitored either through personal monitoring or through area monitoring.*

Response: NIOSH has been unable to locate area monitoring records or personal radiation records. However, NIOSH was able to locate a radiological survey of the RPP made prior to the evaluated period and surveys made after the demolition that measured alpha, beta-gamma, and gamma radiation levels along with INCO and government reports describing the status of the facility during this period. These documents provide sufficient information to allow NIOSH to establish upper bounds on worker exposures for the class under evaluation.

### 7.4.3 Monitoring Records were Destroyed

Issue: *Documents or statements provided by affidavit that indicate that radiation monitoring records for members of the proposed class have been lost, falsified, or destroyed; or that there is no information regarding monitoring, source, source term, or process from the site where the energy employees worked.*

Response: Although evidence provided by the petitioner indicates that security records for RPP workers were destroyed, there is no evidence that the destroyed records included radiation monitoring records. NIOSH has not located any radiation monitoring records for INCO workers and does not have evidence that any monitoring occurred. However, NIOSH was able to locate a radiological survey of the RPP made prior to the class period and surveys made after the demolition that measured alpha, beta-gamma, and gamma radiation levels along with INCO and government reports describing the status of the facility during this period. These documents provide sufficient information to allow NIOSH to establish upper bounds on worker exposures for the class under evaluation.

## 7.5 Summary of Feasibility Findings for Petition SEC-00253

This report evaluates the feasibility for completing dose reconstructions for employees at the RPP from June 7, 1976 through November 26, 1978. NIOSH found that the available monitoring records, process descriptions, and source term data available are sufficient to complete dose reconstructions for the evaluated class of employees.

**Table 7-2: Summary of Feasibility Findings for SEC-00253**
June 7, 1976 through November 26, 1978

| Source of Exposure | Reconstruction-Feasible (Yes or No) |
|---|---|
| Internal (Enriched uranium) | Yes |
| Internal (Contaminants from reprocessed fuel) | Yes |
| External (Gamma, Beta, Neutron) | Yes |
| External (Beta) | Yes |
| External (Neutron) | N/A |
| External (Occupational Medical X-ray) | N/A |

# 8.0 Evaluation of Health Endangerment for Petition SEC-00253

The health endangerment determination for the class of employees covered by this evaluation report is governed by both EEOICPA and 42 CFR § 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 employees 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 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, a health endangerment determination is not required.

# 9.0 Class Conclusion for Petition SEC-00253

Based on its full research of the class under evaluation, NIOSH found no part of said class for which it cannot estimate radiation doses with sufficient accuracy. This class includes all INCO security personnel who worked at any location within the RPP during the period from June 7, 1976 through November 26, 1978.

NIOSH has carefully reviewed all material sent in by the petitioner, including the specific assertions stated in the petition, and has responded herein (see Section 7.4). NIOSH has also reviewed available technical resources and many other references, including the SRDB, for information relevant to SEC-00253. 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 radiation dose for the class under evaluation.

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# 10.0 References

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# Attachment One: Data Capture Synopsis

**Table A1-1: Summary of Holdings in the SRDB for the RPP, Huntington, West Virginia**

| Data Capture Information | Data Capture Description | Date Completed | No. Uploaded into SRDB |
|---|---|---|---|
| Primary Site / Company Name: Reduction Pilot Plant<br>DOE 1951-May 18, 1979; DOE (Remediation) November 27, 1978- May 18, 1979<br>Alternate Site Names: RPP, Huntington Pilot Plant, HPP, International Nickel Company, INCO, Huntington Alloys<br>Physical Size of the Site: The site occupied 3.67 acres. The three major buildings on site were the Compressor Building, Gas Cracking Plant, and the Main Process Building.<br>Site Population: Demolition contract documents indicate that 78 persons were employed during the site remediation. | No relevant documents identified. | 12/17/2019 | 0 |
| State Contacted: NA | Since the Reduction Pilot Plant was a DOE facility the State of West Virginia was not contacted. | NA | 0 |
| Albany Research Center | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| Ames Laboratory | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| Argonne National Laboratory - East | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| Battelle Memorial Institute - King Avenue | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Brookhaven National Laboratory | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| Colorado Mesa University, Tomlinson Library | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Department of Labor / Paragon | Reduction Pilot Plant correspondence, INCO meeting notes, security reports, reports of Department of Labor Site Exposure Matrices roundtable meetings, the need for additional powder capacity, and an estimate of maximum damage from a plant accident. | 04/06/2010 | 19 |

| Data Capture Information | Data Capture Description | Date Completed | No. Uploaded into SRDB |
|---|---|---|---|
| DOE Germantown | Requests for nickel carbonyl detection equipment, a report of a conference with the International Nickel Company, a press release, contract correspondence, the 1956 agreement to process Government-owned nickel scrap, and Records Holding Area search procedures. | 03/07/2011 | 10 |
| DOE Legacy Management - Grand Junction Office | A site description, radiological surveys, radiation contamination clearance reports and comments, and elimination of the Reduction Pilot Plant from the Formerly Utilized Sites Remedial Action Program (FUSRAP). | 08/15/2010 | 13 |
| DOE Legacy Management - Morgantown Office | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| DOE Legacy Management - MoundView Office (Fernald Holdings, includes Fernald Legal Database) | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| DOE Legacy Management - Westminster Office | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| DOE Oak Ridge Operations Office - Records Holding Task Group (RHTG) | A discussion of uranium contained in nickel scrap, change in the classification level of shipments to K-25, the directive to expand the Reduction Pilot Plant, and correspondence on increasing the stocks of nickel powder. Awaiting the release of additional documents from classification review. | OPEN | 5 |
| DOE Office of Scientific and Technical Information (OSTI) | A request was submitted for a search for RPP documents in the OSTI non-publicly available holdings. | OPEN | 0 |
| DOE Portsmouth/Paducah Project Office (PPPO) | Sample analyses, disposal of the RPP, disposal of personal property, appraisal of the RPP and its condition, the RPP contract and associated documents, the Cleveland Wrecking Company contract and associated documents, photographs of the RPP, uranium and nickel carbonyl contamination, guidelines for the dismantling process, costs of the RPP dismantling, disposal of contaminated equipment, RPP processing equipment sketches with dimensions, an RPP contamination clearance report, health protection requirements for the RPP dismantling, radiological assessments of the RPP, DOE officials' diary entries, RPP demolition staffing, demolition scrap burial at Portsmouth, radiological surveys, and questions concerning the health of a demolition worker. | 02/20/2020 | 108 |
| East Tennessee Technology Park (ETTP) Records Center | Page extracted from Oak Ridge Gaseous Diffusion Plant report K-1907. | 06/02/2020 | 1 |
| Energy Technology Engineering Center (ETEC) | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Environmental Measurements Laboratory (EML) | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |

| Data Capture Information | Data Capture Description | Date Completed | No. Uploaded into SRDB |
|---|---|---|---|
| Federal Records Center (FRC) - Atlanta | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Federal Records Center (FRC) - Chicago | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| Federal Records Center (FRC) - Dayton | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| Federal Records Center (FRC) - Denver | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| Federal Records Center (FRC) - Kansas City | Detailed finding aid record descriptions indicate records are duplicates of records released by the DOE PPPO | 03/06/2020 | 0 |
| Federal Records Center (FRC) - Lee's Summit | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| Federal Records Center (FRC) - San Bruno | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| General Atomics | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Hagley Museum and Library | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Hanford | DOE Office of Hearings and Appeals petitions for redress. | 12/04/2019 | 1 |
| Idaho National Laboratory | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Internet - Defense Technical Information Center (DTIC) | No relevant data identified. | 01/17/2020 | 0 |
| Internet - DOE Hanford Declassified Document Retrieval System (DDRS) | No relevant data identified. | 07/12/2019 | 0 |
| Internet - DOE Idaho Reading Room | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Internet - DOE Legacy Management Considered Sites | No relevant data identified. | 07/12/2019 | 0 |
| Internet - DOE National Nuclear Security Administration (NNSA) - Nevada Site Office | No relevant data identified. | 01/17/2020 | 0 |
| Internet - DOE Noncompliance Tracking System (NTS) | May 18, 1979 remediation completion predates NTS. | 01/17/2020 | 0 |
| Internet - DOE Occurrence Reporting Processing System (ORPS) | May 18, 1979 remediation completion predates ORPS. | 01/17/2020 | 0 |
| Internet - DOE OpenNet | No relevant data identified. | 07/22/2019 | 0 |

| Data Capture Information | Data Capture Description | Date Completed | No. Uploaded into SRDB |
|---|---|---|---|
| Internet - DOE OSTI | No relevant data identified. | 07/12/2019 | 0 |
| Internet - DOE OSTI Information Bridge | Former worker medical screening program 2010 annual report. | 03/27/2012 | 1 |
| Internet - Energy Employees Claimant Assistance Project (EECAP) | No relevant data identified. | 01/17/2020 | 0 |
| Internet - Google | Federal Register notices concerning the Reduction Pilot Plant, The Traveler's Guide to Nuclear Weapons, EEOICPA bulletins, news stories, Advisory Board on Radiation and Worker Health meeting minutes, nuclear weapons production history, a nickel carcinogenesis report, specification for demolition and removal, a site exposure matrix review, a meeting between NIOSH and SC&A, SC&A reviews of the Reduction Pilot Plant Site Profile and NIOSH Program Evaluation Reports, denial of DOE request to permit salvaging of contaminated smelt alloys, site and company histories, and minutes of the 130th meeting of the Advisory Board on Radiation and Worker Health. | 12/19/2019 | 34 |
| Internet - HathiTrust | No relevant Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Internet - Health Physics Journal | No relevant data identified. | 01/17/2020 | 0 |
| Internet - Journal of Occupational and Environmental Hygiene | No relevant data identified. | 01/17/2020 | 0 |
| Internet - National Academies Press (NAP) | No relevant data identified. | 07/12/2020 | 0 |
| Internet - National Institute for Occupational Safety and Health (NIOSH) | Reduction Pilot Plant Technical Basis Document. | 11/30/2018 | 1 |
| Internet - National Service Center for Environmental Publications (NSCEP), US EPA | No relevant data identified. | 07/12/2019 | 0 |
| Internet - NRC Agencywide Document Access and Management (ADAMS) | Mention of the Reduction Pilot Plant in a petitioner's motion to transfer rulemaking proceedings to a District Court, and an NRC response to a Freedom of Information Act request. | 09/28/2017 | 2 |
| Internet - US Army Corps of Engineers (USACE) | No relevant data identified. | 07/12/2019 | 0 |
| Internet - US Transuranium and Uranium Registries | No relevant data identified. | 07/12/2019 | 0 |
| Lawrence Berkeley National Laboratory | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Lawrence Livermore National Laboratory | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |

| Data Capture Information | Data Capture Description | Date Completed | No. Uploaded into SRDB |
|---|---|---|---|
| Los Alamos National Laboratory | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Mound Museum | No Reduction Pilot Plant documents identified in the MLM index. | 03/09/2020 | 0 |
| National Archives and Records Administration (NARA) - Atlanta | No relevant Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| National Archives and Records Administration (NARA) - Chicago | No Reduction Pilot Plant documents identified in the finding aid. | 03/06/2020 | 0 |
| National Archives and Records Administration (NARA) - College Park | Layout of the plant, studies of radiation hazards, fire protection surveys, trip reports, meetings with INCO personnel, contract documents, procurement of xenon probes, construction photographs, determination of nickel in urine, uranium urinalysis, plant expansion and upgrade plans, required security safeguards for plant expansion, and requests for approvals for plant modifications. | 11/15/2005 | 41 |
| National Archives and Records Administration (NARA) - Kansas City | The 1973 report on decontamination and decommissioning of facilities. | 11/10/2004 | 1 |
| National Archives and Records Administration (NARA) - Seattle | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| National Institute for Occupational Safety and Health (NIOSH) | Specifications for nickel-containing barrier material, metallic nickel specifications, security of shipments, classification changes of material, estimates for an updated gamma alarm system, equipment and systems replacements, worker outreach meeting confirmation letters, sign-in sheets, annual reports to congress, and the updated EEOICPA listing for the plant. | 05/04/2015 | 25 |
| Nevada Test Site | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Nuclear Regulatory Commission Non-Public Holdings | No relevant data identified. | 03/10/2020 | 0 |
| Nuclear Regulatory Commission Public Document Room | A list of facilities that processed radioactive materials. | 06/07/2007 | 1 |
| Oak Ridge Library for Dose Reconstruction | An Oak Ridge Gaseous Diffusion Plant quarterly report for 10/01/1959 through 12/31/1959. | 04/06/2011 | 1 |
| Oak Ridge National Laboratory (ORNL) | No relevant Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| ORAU Team | Technical basis documents and revisions, the RPP project spreadsheet communications with UF6 chemistry subject matter experts, a NIOSH program evaluation report, the Jessop Steel site profile mentioning the RPP, and guidance for assigning occupational x-ray dose. | 06/16/2017 | 11 |
| Paducah Gaseous Diffusion Plant | Health physics and hygiene inspection reports 1959-1961. | 09/13/2006 | 1 |

| Data Capture Information | Data Capture Description | Date Completed | No. Uploaded into SRDB |
|---|---|---|---|
| Pantex | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Radiation Exposure Information and Reporting System (REIRS) | No exposure records for RPP, International Nickel, or Cleveland Wrecking were located. | 01/22/2020 | 0 |
| Radiation Exposure Monitoring System (REMS) | No exposure records for RPP, International Nickel, or Cleveland Wrecking were located. | 01/22/2020 | 0 |
| Reactive Metals, Inc. | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| S. Cohen & Associates (SC&A) | Audit of a Reduction Pilot Plant claim under EEOICPA. | 04/04/2007 | 1 |
| Sandia National Laboratory - Albuquerque, New Mexico | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Santa Susana Field Laboratory | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Savannah River Site | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| University of Rochester | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| University of Tennessee | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| Unknown | Radiological assessments of the Reduction Pilot Plant including biological effects of nickel contamination. | 09/11/2002 | 1 |
| West Valley Demonstration Project (WVDP) | No Reduction Pilot Plant documents identified in the finding aid. | 03/09/2020 | 0 |
| **TOTAL** | **N/A** | **N/A** | **278** |

**Table A1-2: Internet Database Searches for the RPP Site**

| Database/Source | Keywords | No. of Hits | No. Uploaded into SRDB |
|---|---|---|---|
| Defense Technical Information Center (DTIC)<br>COMPLETED 01/17/2020 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 111,335 | 0 |
| DOE Hanford Declassified Document Retrieval System (DDRS) and Public Reading Room<br>COMPLETED 07/12/2019 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 0 | 0 |
| DOE Legacy Management Considered Sites<br>COMPLETED 07/12/2019 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 3 | 3 |
| DOE National Nuclear Security Administration (NNSA) - Nevada Site Office<br>COMPLETED 01/17/2020 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 76,694 | 0 |
| DOE OpenNet<br>COMPLETED 07/22/2019 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 12,111 | 0 |
| DOE Office of Scientific and Technical Information<br>COMPLETED 07/12/2019 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 26 | 0 |
| Energy Employees Claimant Assistance Project (EECAP)<br>COMPLETED 01/17/2020 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 14 | 0 |
| Google<br>COMPLETED 07/24/2019 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 495,641 | 22 |
| Health Physics Journal<br>COMPLETED 01/17/2020 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 30 | 0 |
| Journal of Occupational and Environmental Health (Taylor Francis Group)<br>COMPLETED 01/17/2020 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 58 | 0 |
| National Academies Press<br>COMPLETED 07/12/2019 | Database search terms and Internet URL are available in the Excel file called "Reduction Pilot Plant Rev 00 (83.13) 03-11-20." | 6,947 | 0 |

| Database/Source | Keywords | No. of Hits | No. Uploaded into SRDB |
|---|---|---|---|
| National Service Center for Environmental Publications (NSCEP)<br>COMPLETED 07/12/2019 | Database search terms and Internet URL are available in the Excel file called “Reduction Pilot Plant Rev 00 (83.13) 03-11-20.” | 16,710 | 0 |
| NRC ADAMS Reading Room<br>COMPLETED 07/12/2019 | Database search terms and Internet URL are available in the Excel file called “Reduction Pilot Plant Rev 00 (83.13) 03-11-20.” | 7 | 1 |
| United States Army Corps of Engineers (USACE)<br>COMPLETED 07/12/2019 | Database search terms and Internet URL are available in the Excel file called “Reduction Pilot Plant Rev 00 (83.13) 03-11-20.” | 0 | 0 |
| U.S. Transuranium & Uranium Registries<br>COMPLETED 07/12/2019 | Database search terms and Internet URL are available in the Excel file called “Reduction Pilot Plant Rev 00 (83.13) 03-11-20.” | 0 | 0 |