Y-12 and Oak Ridge National Laboratory Medical Surveillance Program

Phase I: Needs Assessment

Queens College, City University of New York
Atomic Trades & Labor Council
PACE International Union
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EXECUTIVE SUMMARY

Purpose We report the results and analysis of a one year needs assessment study evaluating whether a medical monitoring and risk communication program is justified for former and current workers at the Y-12 and Oak Ridge National Laboratory (ORNL).

Methods To complete this study, we used available exposure assessment data from paper records and electronic databases and reviewed all studies that have been completed at the plants. We also gathered "expert" former and current workers to conduct risk mapping sessions and focus groups to obtain in-depth information about the plants. We collected and analyzed responses to a questionnaire that was sent to a stratified random sample of 500 former Y-12 and ORNL workers. We obtained employee rosters and basic employment data, to the extent available, from the contractors and other institutions.

Findings Former and current Y-12 and ORNL workers have had significant exposure to pulmonary toxins (nickel, asbestos, beryllium, and acids), carcinogens (external and internal radiation, asbestos, beryllium, and cadmium), renal toxins (chlorinated solvents and lead), neurotoxins (mercury, solvents and lead), hepatotoxins (carbon tetrachloride and other solvents) and noise. Epidemiologic studies at Y-12 and ORNL show excess rates of selected diseases, including cancer and selected neurologic effects. Workers are concerned about the effects of previous exposures on their health and are very interested in a medical screening and education program. Former workers have good access to health care and engage in periodic health examinations. However, most do not believe that their primary care providers know much about the exposures that they had at Y-12 and ORNL. The focus groups and questionnaire responses also provided useful guidance about how to establish effective risk communication and medical surveillance programs.

The target population for a medical screening program among former and current Y-12 and ORNL workers is conservatively estimated to range from 12,000 to 20,000. This range requires refinement, but the roster with names and addresses that would allow initiation of screening is currently available.

Conclusion The findings of this needs assessment study support a targeted medical and cancer surveillance and education program. This conclusion is based on 1) the evidence that large numbers of workers have had significant exposures to detrimental agents, 2) the demonstration among Y-12 and ORNL workers of excess risk of cancer, selected neurologic effects and beryllium-related outcomes in epidemiologic studies, and 3) the need and desire expressed by former and current workers for a credible targeted program of medical surveillance and education. A health protection and risk communication program should center on workers at risk for 1) cancer, 2) chronic respiratory disease, including chronic obstructive lung disease and the pneumoconioses, 3) kidney, liver and neurologic disease, and 4) hearing loss. These conditions are amenable to early intervention, amelioration, and/or primary prevention. A risk communication delivered by a credible source will reduce uncertainty and distrust. After participation in the proposed screening program, former and current Y-12 and ORNL workers will have increased real knowledge about their personal health status, what is known about their risks, and how they can promote their own health. We believe that mounting such a program in Phase II will make a tangible contribution to the health of former and current Y-12 and ORNL workers.

PART I: OVERVIEW

I. INTRODUCTION

In January 2003, a consortium led by the Queens College of the City University of New York, the Atomic Trades & Labor Council, the Paper Allied-Industrial Chemical and Energy (PACE) Workers International Union, and CPS, Inc. initiated a needs assessment study to evaluate whether former Department of Energy (DOE) workers at the Y-12 and Oak Ridge National Laboratory (ORNL) would benefit from the establishment of a program of medical surveillance under Section 3162 of the 1993 Defense Re-Authorization Act. This assessment was conducted under a contract from and with the guidance of the Department of Energy. The needs assessment at the Y-12 and ORNL facilities benefited from the experience that PACE, Queens College, and CPS, Inc. gained by conducted similar needs assessments at the three DOE gaseous diffusion plants in 1996-1997 and at INEEL in 1998, and by the conduct of medical surveillance by this consortium at these four facilities from 1997 to the present.

To conduct this needs assessment, the Queens College/ATLC/PACE/CPS, Inc. consortium identified the need for four domains of information. These include:

- Exposure characterization for the workforce at Y-12 and ORNL
- Epidemiologic and other health studies, to the extent available
- Educational and health care needs and expressed interest in medical surveillance program
- Demographic profile of target population

These domains correspond to the criteria established by the DOE in its document, *Guidance for Phase I Reports and Phase II Applications.*

Through a focused 12 month effort organized in these domains, we have addressed the specific issues raised by the Department of Energy in determining whether a medical surveillance program is needed and would benefit the targeted populations. These specific issues include characterizing the type and degree of relevant detrimental exposures; defining essential health impacts; defining the size of the target populations, and finally, documenting the need for establishing a program that will combine medical monitoring with risk communication.

To provide answers to these questions was an ambitious task. Y-12 and ORNL are large complex facilities that have been in operation and evolution for 60 years. Much of the current work at Y-12 is classified. Information on exposures, both radiologic and chemical, are diverse and inexactly related to known information on health outcomes in the Y-12 and ORNL workforces. The limited period of the needs assessment required that we use secondary data sources and published studies. Nonetheless, given the goals of the expected medical surveillance program, sufficient information was available to allow a description of the rationale for such screening and to provide the information that is needed to conduct such medical surveillance.

The study team had the great advantage of having excellent access to and high credibility with many members of the workforce that have operated and continue to operate Y-12 and ORNL and excellent cooperation of the DOE, NNSA, and BWXT personnel at the sites. The needs assessment has also benefited from previous in-depth epidemiologic and exposure assessment studies. Our challenge during the past 12 months has been to combine current study-based knowledge of these sites with the collective knowledge possessed by the Y-12 and ORNL workforce in order to gain a sufficient understanding of cumulative exposures at these facilities and how they might impact current health. This report provides a snapshot of this combined knowledge. It is anticipated that understanding how exposures impact workers' health at these facilities will be an ongoing task during the medical surveillance phase.

Throughout the needs assessment process, the Queens College/ATLC/PACE/CPS consortium has abided by a central principle of the project: to maximize involvement of workers and scientists from Y-12 and ORNL in all aspects of the conduct of the needs assessment process and the planning of the medical surveillance and risk communication program. We have used this method for several essential reasons. The most obvious is that the workforce of these facilities represents an excellent source of information for identifying the hazards that have existed at Y-12 and ORNL over the past 60 years. This knowledge complements and vivifies the knowledge that we have gained from the many reports and studies that have been conducted at these facilities over the past decades. Second, the study consortium understands that the effectiveness of a program planning process will be enormously enhanced if all participants in the program are involved. Finally, health protection, the ultimate goal of the DOE Worker Medical Surveillance Program, requires workers acting on their own behalf. Beginning to overcome the many years of uncertainty, distrust, and ignorance that some workers at DOE facilities have requires an open and participatory process from the inception of a medical surveillance program.

This report does not contain an exhaustive list of all of the medical needs that workers at Y-12 and ORNL might have as a result of their occupational exposures. Creating such a complete inventory of all health risks that Y-12 and ORNL workers have or might have was beyond the scope, the mandate and the resources available to the Queens College/ATLC/PACE/CPS consortium in the past 12 months. We recognize that the DOE former worker medical surveillance program is limited in nature and will have limited resources over the next several years.

Hence, we concentrated on exposures and possible health outcomes that best meet the criteria that DOE has established for this program as reflected in Section 3162 that created the program. Specifically, we have attempted to identify significant exposures, as supported by available qualitative and quantitative data, that have or are likely to produce health impacts that might be alleviated by early detection and/or by communication with the potentially affected workers. There are likely to be other exposure-disease relationships of relevance to Y-12 and ORNL workers that deserve the attention of the Department of Energy. This would include possible health impacts that have not yet been fully investigated in the workforce; exposures for which data are insufficient to allow judgment about the likelihood of their significance; health impacts that had been demonstrated to exist but may or may not be occupational in etiology; and health outcomes that are not amenable to screening or for which early detection does not lead to fruitful intervention. Pursuing these possibilities, however important, was not part of the mandate that we received from the Department of Energy. Nor could we take responsibility for following up these potential occupational risks, given the limited time and resources available to us during this 12 month needs assessment.

This report is organized into two parts to satisfy the competing goals of being succinct and of being substantive. Part I (Introduction, Methods, and Principal Findings) is intended as an overview in order to communicate the principal methods used and the results thereby obtained. This overview distills the more detailed collections and summaries of data which are presented in Part II (Sections 5 through 8). Section 5 provides details about the type and levels of exposures experienced by former workers at Y-12 and ORNL as identified in available industrial hygiene and health physics data and through risk-mapping sessions. Section 6 presents the results of focus groups of former and current Y-12 and ORNL workers in assessing health concerns, evaluating the level of knowledge and perceived risks, and eliciting opinions about how to conduct a medical surveillance program. Section 7 provides a summary of available epidemiologic studies that have been conducted at Y-12 and ORNL. Section 8 provides the results of a questionnaire sent to 500 former Y-12 and ORNL workers to collect information on exposures and current health care. Readers are encouraged to read Part II in detail to gain a full understanding of study methodology and the types of information that underlie the summaries presented in Part I.

II. METHODOLOGY

We employed a number of methods of study during this 12 month needs assessment. These methods were chosen based on the ability to obtain reliable data within a limited time period, the desire to include rank and file workers in the data-gathering process, and the need to acquire information that would allow us to plan the risk communication and health service component of a medical surveillance program.

Descriptions included in this report that derive from project activities that address exposures, work processes, and site activities have been reviewed and cleared by the DOE security office in Oak Ridge. This includes the information that was collected through direct discussions with Y-12 and ORNL workers during the risk mapping and focus groups.

A. Review of Existing Exposure Records

The primary focus of this component of the exposure assessment was to determine, to the extent possible, the nature and intensity of major exposures as a function of building, area, department, and/or job classification. Another primary need was to determine whether we could establish an approach for linking the building, department and exposure data to individuals within the worker cohort.

A full listing of the major sources of health physics and industrial hygiene data that we used from Y-12 and ORNL is provided in Section 5.

B. Risk mapping

Risk Mapping is an approach that has been used extensively at industrial facilities as a tool to assist workers and/or joint health and safety committees in determining high risk areas within their facilities. Traditionally, the technique is used to identify current problem areas with a facility and to assist in developing an intervention strategy for resolving the problem areas. CPS, Inc. and PACE performed extensive risk mapping as part of the DOE-supported medical surveillance program at the gaseous diffusion plants and INEEL. In the current project, CPS, Inc. worked closely with ATLC, using the risk mapping approach to map past exposure conditions at Y-12 and ORNL.

In addition to using the mapping process for locating past exposure conditions within the buildings of interest, the method was modified to allow the field researchers to collect semi-quantitative exposure data for each identified exposure of concern. Field researchers also collected data regarding other building and process characteristics (i.e., description of major processes, number of workers in the building of interest, and years of operation).

Several steps were necessary to develop the risk mapping activity at Y-12 and ORNL. We customized the risk mapping method for use in retrospective exposure assessment. We used the following tools, which we had previously developed at the DOE gaseous diffusion plants and INEEL, for field use:

- *Job Exposure Information Sheet* to collect job/process/exposure information for each chemical agent identified on the risk map.

- *Building Characteristics Report Form* to allow field researchers to collect descriptive information on the buildings of interest over time (i.e., description of major process, number of workers, and years of operation).

- *Risk Mapping Training Guidebook* to train the field researchers in the risk-mapping technique.

The risk mapping study group, led by Mark Griffon of CPS, Inc., conducted a one day train-the-trainer session for the field researchers. The field researchers included ATLC union health and safety representatives, and an experienced PACE risk map leader from the PACE/Queens College/CPS, Inc project participated as well.

"Experts" were then selected for the initial risk mapping session from each of the two sites. The ATLC, CPS, Inc, and PACE worked together to identify and to assemble an "expert" team of former workers for the initial risk mapping sessions. The "experts" selected for the initial sessions consisted primarily of hourly workers with extensive experience at the sites. Several line supervisors were also included in these sessions. "Experts" were not selected at random, but based on their vast amount of site experience and the broad array of job classifications and process buildings where they worked.

The initial risk mapping session focused on the entire Y-12 and ORNL facilities and was conducted to assist in determining priority areas for future, more specific, risk mapping sessions. As a product of this session, the expert group produced a list of primary facilities of highest concern regarding retrospective exposures. This list, along with information obtained through review of other monitoring data, was used to identify areas for subsequent risk mapping sessions.

The second round of risk-mapping sessions were conducted to learn more about the priority buildings at each of the facilities that were identified in the initial session. Information was systematically collected utilizing the tools noted above, including the Job Exposure Information Sheet and the Building Characteristics Report Form.

All of the information obtained for risk-mapping sessions was compiled into a database to allow for assessment of the data.

To date, a total of 20 risk mapping sessions have been conducted. These risk-mapping activities have included approximately 60-70 retirees. In each session, an attempt was made to obtain the participation of representatives from a variety of job titles who worked in the building in question. We succeeded in that we were able to include representatives from supervision, scientists/engineers, HPs, operators, and maintenance crafts.

The findings of the risk mapping sessions are summarized within Section III of Part I of this report and the database report of the data collected from the individual sessions is included in Section V. A breakdown of exposures by building is included within an appendix of Section V.

C. Focus groups

Focus groups of former workers were conducted in order to obtain in-depth information about a variety of issues, including exposures, perceptions of risk, health concerns, health care, and receptivity to a health screening program. The overall design, recruitment strategy, training, and analysis were led by Sylvia Kieding of PACE International Union in consultation with Carl Scarbrough, ATLC President, and health and safety representatives of ATLC. The actual implementation of the focus groups was led by former or current workers from Y-12 and ORNL with assistance of Tom Moser of PACE.

Established ATLC health and safety representatives at Y-12 and ORNL were recruited to serve as moderators for the focus group sessions. They were trained using a Moderator Guide specifically developed for this project (available upon request). To prepare, moderators participated in a day long training seminar and role-play. Another OCAW member was recruited and trained to serve as the scribe for each focus group session.

Two focus groups were held at Y-12 and ORNL on July 8 and August 5, 2003 (four in total). A total of 33 people participated in the four focus groups. The sessions were held in a secured room in the Y-12 Security Building. All participants received a participant information sheet and signed informed consent forms that had been read aloud to the group before the session. The sessions were audiotaped with the full knowledge and unanimous consent of participants.

All focus groups at both sites were comprised of "experts," both retirees and active workers, who were selected by the local union officers and ATLC health and safety staff due to their knowledge of the plant and familiarity with plant operations.

In a preliminary analysis of the transcripts of focus group sessions, an initial coding scheme of important themes was developed. Ms. Kieding undertook a basic coding and sorting of themes and provided illustrative quotes from the transcriptions. These are presented in detail in Part II, Section 6 of this report.

D. Questionnaire Survey

In order to obtain exposure and limited health information from a broad cross-section of the former workforce at Y-12 and ORNL, a questionnaire was developed and sent to a random sample of 500 retired and terminated Y-12 and ORNL workers. The base population from which this sample was drawn includes a total of 7,118 workers, consisting of 3,891 Y-12 retirees and 3,227 ORNL retirees. This group of 7,118 workers represents the total number of living retirees receiving a pension through BWXT. We randomly selected 250 employees from each facility to obtain the total of 500. Note that the questionnaire was returned anonymously. We requested that the responder's name not be written on the returned questionnaire to avoid any potential problems with confidentiality.

A six page questionnaire was developed (Part II: Section VIII, Appendix A) that requested information on demographic status; history of job title, exposures, and plants of employment; health concerns; current health care; and interest in screening and education. A check list of 63 specific exposures was included in the questionnaire for Y-12 and ORNL employment separately. The questionnaire was approved by the Institutional Review Boards of Oak Ridge Associated Universities and Queens College of the City University of New York. A copy of the questionnaire was sent to the selected 500 individuals with a cover letter co-signed by Carl Scarbrough, ATLC President; and Steven Markowitz, MD, project director. The questionnaires were sent by first class U.S. mail in order that the letters with incorrect addresses would be returned to the project office. We report here the findings from the returned completed questionnaires

E. Review of Epidemiologic Studies

We obtained all published epidemiologic and health studies that are available for Y-12 and ORNL.

G. Demographic Profile of Target Population

Rosters of Y-12 and ORNL employees who currently receive pensions were obtained from BWXT. Available data on these retirees include name, current address, home telephone number, date of birth, date first employed by the company, and last date of employment.

III. PRINCIPAL FINDINGS

A. Hazards and Exposure Levels of Former Y-12 and ORNL Workers: Results of Records Review and Risk-Mapping

For the purposes of planning a medical surveillance program, it is most useful to organize the large numbers of diverse exposures encountered at the Y-12 and ORNL facilities by principal human organ or organ systems affected. In cases where a health effect has been identified by job operation (e.g. -welding) rather than by single exposure, then job title or operation becomes the tool used to organize health effects. Employing this means of considering hazardous exposures yields Table I-I.

Our knowledge about the magnitude of the exposures cited above derives from several sources: external radiation monitoring, industrial hygiene data, risk mapping sessions, focus groups, and questionnaire results. All of these methods have limitations, as detailed in Part II of this report. A brief summary of data for the most important exposures is provided in the section: the reader is urged to see the additional description in Part II.

Table I-I
Important Classes of Exposures at Y-12 and ORNL by Target Organ

Target Organ/Disease	Exposure Class	Important Examples
Lung		
Chronic obstructive lung disease	Irritants	Hydrofluoric acid Hydrochloric acid
		Sulfuric acid Nitric acid
		Cadmium
		Welding fumes
Pneumoconioses	Fibrogenic dusts	Asbestos
		Beryllium
Lung cancer	Carcinogens	Asbestos
		Chromium
		Welding
		Radiation
Genitourinary system		
Renal toxicity	Renal toxins	Lead
		Chlorinated solvents
Endocrine Thyroid cancer	Ionizing radiation	Ionizing radiation
Hematopoietic system Leukemia	Ionizing radiation Benzene	Ionizing radiation Benzene
Nervous System Cognitive dysfunction Peripheral neuropathy	Nervous system toxins	Mercury Lead
		Chlorinated solvents e.g.-trichloroethylene
Gastrointestinal system Hepatitis	Hepatoxicity	Chlorinated Solvents e.g.-carbon tetrachloride
Hearing	Noise	Noise
Cardiovascular system	Hypertension	Lead

A.1 Radiation

A.1.1 Monitoring Policies at the Facilities

Historically, the main purpose of the radiation monitoring programs was to assure that each worker's exposure to radiation was kept below the current annual prescribed occupational exposure limit. In view of this aim, data collection in the early years was very limited for workers who were considered to have low potential for exposure. Also, at the time of this report, limited information is available concerning the rationale used to decide which workers to monitor, implementation of these decisions, and the methods used for assessing reliability, variability, and lower limits of detection. At each facility, the radiation safety personnel were responsible for the monitoring program, making the programs essentially independent of each other.

Because internal monitoring programs were begun at ORNL in 1951 and at Y-12 in 1950, the definition of "not monitored" varies by plant and by year. By the early 1950s, a worker who was not monitored for internal exposure was judged to have low potential for exposure. Because of policies in effect, external monitoring data are available for most workers from Y-12 only beginning in 1961. ORNL began monitoring for external radiation in 1943 (Watkins, 1993).

A.1.2 External Radiation Exposure

Before November 1951, only those workers entering areas of potential external radiation exposure were monitored for external dose. In 1947, all workers entering a radiation area more than three times a week were assigned permanent film badges. By 1949, permanent film badges were issued to all workers who entered these restricted areas at least once a week. In November 1951, all workers entering the main X-10 area were required to have a film badge, and by September 1953, the film badge and security badge needed for entry were combined into one badge (Watkins, 1993). Risk mapping participants reported that they often worked using a self reading dosimeter (SRD) and not wearing a film badge. They mentioned that the SRD readings were recorded in HP logs but they were uncertain if this information was included in their personal dose record. (Risk Mapping Interviews, 2003)

According to site records, X-10 only used daily SRDs from 1943 until about 1945. In 1945, they began to use weekly film badges and continued until the late 1950s, when they changed to quarterly film badges. In 1975, they began to use either quarterly or annual TLDs. At the Y-12 facility, they also started with SRDs, progressing to weekly film badges in 1950, monthly film badges in 1959-1960, and quarterly film badges from 1960 until 1980. After 1980, they used either quarterly or annual TLDs. From 1961-1974, badges used by workers in areas of low potential exposure were not always read. Rather, a sample of the badges issued was read to verify that the areas were being properly defined. For early film badges, the minimum detectable dose was approximately 25 mrem. The sensitivity of film badges in later years was improved (Watkins, 1993).

After extensive error checking procedures, annual external doses were calculated by summing all credible gamma and neutron film badge readings taken during the year. Because of the variability in dosimeter types, reading frequencies, and monitoring policies over time and facilities, annual doses obtained from the simple summation of readings during the year may not be comparable at all times, and a recorded dose may not always accurately represent the true amount of a worker's radiation exposure. A summary of the recorded annual doses by year and by department is included in Appendix F. This appendix contains a compilation of dose data from three sources: H&S reports, CEDR CER data files, and CEDR Mortality study data files. The mortality study data files included some extrapolation of doses for times when data were missing and, therefore, the results are different than the other data sets. A summary of the external dose data (annual doses greater than 500 mrem) versus department is included in Appendix B.

A.1.3 Internal Radiation Exposure

Film badges measure external exposure over a given period of time. In contrast, monitoring for internal exposure is performed at specific points in time and, hence, yield results that are estimates of the body or organ burden at the time of measurement. The primary methods of internal monitoring used were urinalysis and *in vivo* gamma spectrometry, but fecal analysis was also performed in some instances. The dosimetry associated with analysis of urine for radioisotopes of concern depends on relating the amount of an isotope in a reference volume of urine to the amount contained in the body or in specific organs. The relationship between these two amounts is affected by many variables, such as the radioisotope, time since exposure, the chemical and physical form of the isotope, and biological variation among individuals.

In general, workers were monitored only if they worked in locations or administrative groups that were judged by supervisors or radiation safety organizations to have had potential for internal exposure. Periodically after 1950, individual samples from usually unmonitored workers were randomly selected and monitored by ORNL to confirm that such workers were indeed unexposed to internal radiation. The policy at Y-12 was to increase monitoring frequency as the potential for internal exposure increased. (Watkins, 1993, Patterson, 1957, West, 1977)

Workers at TEC had a high potential for internal contamination due to the processes performed at the facility. However, personal monitoring data were not available because no bioassay or whole body counting programs were established during the years when it was in operation.

A.1.4 Review of External and Internal Data from Databases and HP Reports

There is an increasing trend in external doses at ORNL until the late 1950s and a steady decrease afterwards, while there is greater variability in the total recorded annual external doses at Y-12. A Y-12 peak in 1958 was due to a criticality accident involving eight workers and did not represent a general increase in external dose (Appendix F).

The percentage of individuals monitored for external exposures at X-10 remained at about 85% to 90% from 1950-1985 while the percentage at Y-12 was at about 20% until 1960 when it was raised to 85% to 90%. Generally, the percentage of workers monitored for internal exposures was between 20% and 40% each year with the highest percentages for both plants occurring around 1963 to 1965.

A summary of the annual radiation dose ranges for the X-10 site is included in Appendix F. It is interesting to note that in 1960 there is a sharp drop off in the number of individuals with annual doses in excess of 2 rem and also a sharp increase in the number of individuals being monitored.

A 1958 HP report indicated that, among the ten highest cumulative doses due to penetrating radiation, nine individuals were from the Radioisotope Production Division. The cumulative doses were received over 7 to 15 years and ranged from 42.5 – 64.8 rem. (Hart, 1958)

HP risk mapping participants thought that the worst areas for internal exposures were Buildings 3038, 3517 and 3019.

Recorded external doses at Y-12 were generally lower than doses at X-10. The only significant internal monitoring was uranium urinalysis and *in vivo* testing (uranium-235 and thorium). Over the years it was assumed that monitoring for uranium would be satisfactory as a surrogate measure of other contaminants in the uranium (i.e., transuranics, such as neptunium and plutonium, or fission products in recycled fuel). Data were unavailable to determine whether there were processes or areas where these transuranic materials may have concentrated and therefore represented a greater potential hazard. Additionally, a recent report discussing the current Y-12 internal dose program (Eckerman, 1999) stated that "following the recent re-start of operations at the Y-12 Plant, the Radiological Control Organization (RCO) observed that enriched uranium exposures appeared to involve insoluble rather than soluble uranium that presumably characterized most earlier Y-12 operations." Based on this finding, the bioassay program was modified, particularly specifying the need for routine fecal sampling. This raises questions with regard to potential missed doses.

A.2 Beryllium

Data from the Y-12 Beryllium Worker Enhanced Medical Surveillance Program, funded by DOE, indicated that the buildings associated with CBD cases or sensitized workers included: Alpha-5, 9202, Butler Building, Beta-4, Beta-2, 9212, 9766, 9995 and 9998. (Bingham, 1997)

Additionally, a 1973 Y-12 document (DOE, 1973) identified Alpha-5, Alpha-3, 9202, and 9995 as "Beryllium Control Areas." H&S summary reports from 1953-1960 indicate that beryllium air sampling was frequently conducted in Building 9766 and, to a lesser extent, in Building 9212 (Appendix D).

A broad-based approach to defining groups potentially exposed to beryllium is recommended since published data demonstrate that individuals with low-level exposure can be affected (Newman 1989, Kreiss 1996). For this reason, a two-tiered approach is recommended based on exposure groups.

A.3 Mercury

The mercury concentration in the workplace air was monitored frequently at the Y-12 facility. For example, in 1956, over 200,000 air mercury readings were taken (Appendix D). In the 1955 cascade start-up, many readings of mercury concentrations in the workplace air were higher than the 0.1 mg/m^3 then recommended. (The current recommended permissible exposure level for mercury is 0.05 mg/m^3). A urinalysis program started in 1953 was expanded to provide a check on the worker mercury exposures. During 1955 and into 1956, approximately 200 to 300 workers had readings that exceeded the recommended limit of 0.3 mg/liter of urine. When a worker's urinary mercury remained elevated for several specimens, the workers were re-assigned. Approximately 70 workers were involved in temporary re-assignments of this nature. In addition to the air sampling and urine program, there was a special medical surveillance program involving clinical examinations of mercury workers being performed every six months. Persons with a history of albuminuria, kidney problems, or hypertension were screened out and not allowed to work with mercury. (Mercury Task Force, 1983(a), 1983(b))

During the latter part of the Colex start-up during 1955, AEC and Y-12 management undertook a crash program to bring the workplace mercury vapor levels down to acceptable levels. Air sampling results seem to suggest that airborne concentrations were reduced after 1955, as indicated by the drop in the percentage of air samples in excess of the 0.1 mg/m^3 limit (see Appendix D).

According to a 1977 report, *Mercury Inventory at Y-12 Plant, 1950 through 1977*, 2.4 million pounds of mercury at Y-12 had been 'lost' or 'unaccounted for' (Mercury Task Force, 1983(a), 1983(b)).

A Emory University study conducted in 2000 as a follow-up to University of Michigan study of the mercury workers at Y-12 showed that 'neurological effects of relatively heavy exposure were still detectable more than 30 years after cessation of that exposure'. The study concluded that the exposure measure with the strongest association with the outcome was cumulative exposure (cases were selected by cumulative exposure of $\geq$ 2000 ug of Hg/liter-quarter, or a one-time urine value of greater than 600 ug of Hg/liter). The department numbers identified as "High Exposure Potential" in the Emory report included: 2025, 2026, 2681, 2682, 2683, 2685, and 2690. (Emory University)

Priority buildings (buildings where frequent sampling for mercury was conducted and/or a high percentage of samples were identified in excess of the site MPC levels), based on company IH records (Appendix D), included: Beta-4, Alpha-2, 9202, Alpha-5 and Alpha-4. According to a 1957 Health Physics Program Report (Y-1186) (Patterson, 1957) "a routine mercury vapor sampling program is maintained in Buildings 9201-2, 9201-4, 9201-5, 81-10, and 9204-2; buildings in which a potentially serious mercury vapor problem may exist". During 1955 through 1956, the percentage of mercury urine samples which exceeded the MPC (0.3mg/m^3) ranged from 10% to 30%. A further breakdown of these data indicates that machinists were exposed to the highest levels while chemical operators were lower and electricians still lower. The machinists reported concentrations ranged from 0.5 to 0.3 mg Hg/liter, the chemical operators ranged from 0.46 to 0.3, and reported concentrations for electricians exposures ranged from 0.12 to 0.2 ug Hg/liter (Mercury Task Force, 1983(a), 1983(b).)

At X-10, Building 4501 housed the Orex pilot project, which was reported to have had a lot of mercury during risk mapping sessions. Other uses of mercury at the X-10 site appear to be on a smaller scale (instruments, labs, etc.). It should however, be pointed out that many X-10 workers began working at the Y-12 site (as X-10 employees) after the calutron operations were shut down.

A.4 Caustics

Nitric acid and hydrofluoric acid were used extensively in isotope separation and purification operations. Specifically, Buildings 3019, 9212, 9215, 3505, Alpha-5, 9203, 9206, 9929, and 9401-2 were involved in uranium or other isotope recovery, processing, separation or purification. Steps within these processes involved many caustic materials including two of the primary acids used, hydrofluoric acid and nitric acid (in some cases, fuming nitric acid).

H&S summary reports indicate that air sampling for lithium was conducted at the Y-12 site. Risk mapping participants mentioned that lithium at the site caused strong lung irritation and sometimes frequent sneezing. Also, there were frequent skin burns from working with this material.

Additionally, tetramethyl ammonium borohydrate (TMAB) was present at the Y-12 site and is a strong irritant, similar in toxic properties to other boron compounds.

A.5 Solvents

Chlorinated solvents were used extensively at both the Y-12 and X-10 facilities over the history of the sites. Generally, the use of carbon tetrachloride was only prevalent during the early years of operation. TCE and perchloroethylene were used extensively throughout the history of the sites. The areas with maximal potential exposures included the pilot separation or processing buildings and the machine shops. Participants in the risk mapping sessions indicated that the machinists would "use perc to put out chip fires while machining uranium". They indicated they would 'use it for everything'.

In addition to the common chlorinated solvents mentioned above and used for cleaning and degreasing, acetonitrile was used at the Y-12 site.

A.6 Noise

Noise exposure was reported as a problem associated with production operations at both the X-10 and Y-12 sites. The type of operations conducted at the sites over the history (e.g. separations operations, calutrons, lithium separation operations, machining) would be consistent with elevated noise exposures. Risk mapping participants also indicated that hearing protection requirements, or the adherence to the requirements, was fairly lax in the early years.

A.7 Asbestos

As in many of the DOE facilities, asbestos use was prevalent at both X-10 and Y-12. Asbestos was common in all building materials; other reported uses included asbestos blankets, asbestos covering on piping, and asbestos gloves. Highest exposures to asbestos would likely have occurred among maintenance workers.

B. Questionnaire Results

The above-cited agent-specific analysis is principally the results of the risk-mapping sessions in combination with limited industrial hygiene and radiation monitoring data. We also sent a questionnaire to a broad cross-section of retirees and terminated workers (n = 500) and have, to date, received nearly a 50% response rate.

A six page questionnaire was developed that requested information on demographic status; history of job title, exposures, and job locations at Y-12 and ORNL; health concerns; current health care; and interest in screening and education. A check list of 63 specific exposures was included in the questionnaire. A copy of the questionnaire was sent to the 500 individuals that represented a random sample of retirees and terminated workers from Y-12 and ORNL

Of the 500 questionnaires sent, we received 247 (49.4%) completed questionnaires. We received this response after a single mailing, which is an excellent result. We did not send reminders, because we did not know who responded and did not want to send reminders to people who had responded.

Most respondents first worked for DOE in the 1940's (15%), 1950's (40%) or 1960's (22%). Most retired from DOE work in the 1980's (32%) or 1990's (52%). The mean age was 73 (s.d. = 8.6) years, with 44% being age 75 or older. Only 1% was less than the age of 55 years.

A majority of respondents (136, or 55%) did not list union membership, probably because they were not members of unions. Among the unions most commonly mentioned were IAM Local 480– machinists (n=30, 12.1% of total), IBEW Local 760– electrical workers (n=24, 9.7% of total), ATLC (n=15, 6.1% of total) or Plumbers/Pipefitters Local 718 (n=10, 4.0% of total). Other unions cited were boilermakers, guards, chemical workers, laborers, sheet metal workers, services employees, and Teamsters. There were 87 job titles represented among the first job cited by respondents. The most common jobs were engineer, machinist, electrician, chemical operator, secretary, and technician. Job titles listed as the second job showed a similar pattern.

Table I-2 lists the exposures and their reported frequencies on the completed questionnaires at X-10. The number of people responding to this question varied; percentages reported include only affirmative or negative responses For all but a few exposures, over one-half of respondents reported exposure. Especially common was reported exposure to metals (>60%); solvents (>60%); external and internal radiation (>95%); irritants (>60%); and asbestos dust (>90%). Beryllium exposure was reported by 88% of respondents.

Table I-3 lists the exposures and their reported frequencies on the completed questionnaires at Y-12. The number of people responding to this question varied; percentages reported include only affirmative or negative responses For all but a few exposures, mostly radioactive species, over one-half of respondents reported exposure. Exposures among Y-12 workers were reported more commonly than among X-10 workers. Especially common was reported exposure to metals (>60%); solvents (>70%); external and internal radiation (>95%); irritants (>80%); and asbestos dust (>95%). Beryllium exposure was reported by 96% of respondents.

We also obtained information about job titles that respondents had over their careers at Y-12 AND ORNL). Over 300 job titles have been cited. We are currently aggregating these job titles in order to better characterize common exposures among similar job titles.

Table I-2
Prevalence of Reported Exposures at X-10

Chemical or Agent	% (No.) Reporting Exposure	Chemical or Agent	% (No.) Reporting Exposure
Metals		Thorium	87.5%(35)
Aluminum	93.7%(59)	Californium	63.6%(21)
Arsenic	63.0%(17)	Protactinium	45.0%(9)
Beryllium	87.7%(50)	Lanthanum	58.3%(14)
Cadmium	85.7%(42)	Cobalt	88.1%(37)
Chromium	81.4%(35)	Cesium	85.4%(35)
Copper	93.8%(60)	Strontium	89.5%(34)
Lead	93.9%(61)	Technetium	79.2%(19)
Lithium or Lithium Compounds	79.4%(27)	Iodine	77.1%(27)
Mercury	93.6%(58)	Xenon	63.3%(19)
Nickel	86.0%(43)	Tritium	89.2%(33)
Solvents		***Acids / Caustics***	
Acetone	97.2%(70)	Ammonium Hydroxide	93.5%(43)
Acetonitrile	52.2%(12)	Chlorine	88.9%(40)
Benzene	85.1%(40)	Chromic Acid	86.1%(31)
Carbon Tetrachloride	93.1%(54)	Fluorine or Hydrofluoric Acid (HF)	90.2%(46)
Chlorinated Solvents	85.4%(35)	Hydrochloric Acid (HCl)	94.8%(55)
Cutting Fluids ("Trimsol", Dag, etc.)	75.6%(31)	Nitric Acid	95.3%(61)
Freon	85.0%(34)	Perchloric Acid	72% (18)
Hexone (Methyl Isobtuyl Ketone)	60.9%(14)	Sodium Hydroxide	90.5%(38)
Kerosene	87.8%(36)	Sulfuric Acid	95.1%(58)
Methyl Ethyl Ketone (MEK)	76.3%(29)	Tetramethylammonium Borohydride (TMAB)	33.3%(6)
Paint or Paint Thinners	75.8%(25)	***Other Agents***	
Perchloroethylene (PERC)	76.7%(23)	Asbestos	95.2%(60)
Tributylphosphate (TBP)	55.0%(11)	Cyanide Compounds	59.1%(13)
Trichloroethylene (TCE)	93.62%(44)	Dusts (wood, coal, fibers)	89.3%(50)
Polychlorinated Biphenyls (PCBs)	75.0%(21)	Fiberglass	89.6%(43)
Radioactive Materials		Heat	85.7%(42)
External Radiation (Gamma, Neutron, X-ray)	96.3%(78)	Herbicides / Pesticides	47.8%(11)
Internal Radiation Exposure	81.8%(27)	Noise	95.8%(68)
Uranium	93.7%(59)	Phosgene	38.9%(7)
Neptunium	57.1%(16)	Repetitive Motion	73.7%(28)
Plutonium	90.7%(39)	Silica	61.5%(16)
Curium	65.5%(19)	Welding Fumes	85.2%(46)

Table I-3
Prevalence of Reported Exposures at Y-12

Chemical or Agent	**% (No.) Reporting Exposure**	**Chemical or Agent**	**% (No.) Reporting Exposure**
Metals		Thorium	87.5%(42)
Aluminum	95.7%(89)	**Californium**	46.4%(13)
Arsenic	64.1%(25)	Protactinium	39.1%(9)
Beryllium	95.6%(109)	Lanthanum	45.5%(10)
Cadmium	89.1%(49)	Cobalt	82.1%(32)
Chromium	88.1%(52)	Cesium	73.5%(25)
Copper	96.3%(79)	Strontium	75.0%(21)
Lead	96.6%(85)	Technetium	47.6%(10)
Lithium or Lithium Compounds	93.3%(70)	Iodine	75.8%(25)
Mercury	96.3%(104)	Xenon	40.0%(8)
Nickel	92.3%(72)	Tritium	78.8%(26)
Solvents		***Acids / Caustics***	
Acetone	97.9%(92)	Ammonium Hydroxide	94.0%(47)
Acetonitrile	77.4%(24)	Chlorine	93.1%(54)
Benzene	93.6%(58)	Chromic Acid	83.8%(31)
Carbon Tetrachloride	97.5%(78)	Fluorine or Hydrofluoric Acid (HF)	92.7%(51)
Chlorinated Solvents	90.4%(47)	Hydrochloric Acid (HCl)	92.3%(60)
Cutting Fluids ("Trimsol", Dag, etc.)	92.3%(72)	Nitric Acid	94.3%(66)
Freon	92.8%(64)	Perchloric Acid	69.0%(20)
Hexone (Methyl Isobtuyl Ketone)	73.3%(22)	Sodium Hydroxide	91.7%(44)
Kerosene	85.1%(40)	Sulfuric Acid	92.1%(58)
Methyl Ethyl Ketone (MEK)	83.3%(35)	Tetramethylammonium Borohydride (TMAB)	60.0%(15)
Paint or Paint Thinners	90.7%(49)	***Other Agents***	
Perchloroethylene (PERC)	93.9%(77)	Asbestos	97.6%(82)
Tributylphosphate (TBP)	60.0%(15)	Cyanide Compounds	72.2%(26)
Trichloroethylene (TCE)	95.2%(60)	Dusts (wood, coal, fibers)	95.2%(79)
Polychlorinated Biphenyls (PCBs)	84.8%(39)	Fiberglass	94.1%(64)
Radioactive materials		Heat	94.2%(65)
External Radiation (Gamma, Neutron, X-ray)	96.1%(73)	Herbicides / Pesticides	63.2%(24)
Internal radiation exposure	87.8%(43)	Noise	96.9%(95)
Uranium	99.2%(116)	Phosgene	45.5%(10)
Neptunium	44.4%(12)	Repetitive Motion	87.5%(35)
Plutonium	93.0%(39)	Silica	75.0%(24)
Curium	43.5%(10)	Welding Fumes	91.9%(68)

C. Nature and Extent of Health Impacts Experienced by Y-12 and ORNL Workers

The review of epidemiological studies is succinct, and the reader is referred to Part II: Section 7. Epidemiologic studies at Y-12 and ORNL show excess rates of selected diseases, including cancer, especially lung cancer, beryllium-related sensitivity and disease, asbestos-related disease, and selected neurologic effects.

D. Educational Needs and Health Concerns of Former Workers

We have two sources of information on the health concerns, health care, and educational needs of former Y-12 and ORNL workers: the focus groups and the questionnaire results.

D.1 Focus Group Results

The focus groups were invaluable in providing insight about how former workers viewed the "significance" of their prior exposures, and their current state of knowledge, health concerns, and health care. Inclusion of 23 workers, most of whom had more than 25 to 30 years of employment at Y-12 and ORNL), provided a broad spectrum of opinion. A wide range of job titles were represented in the groups.

The following themes and recommendations arose during the focus group sessions:

1. The need exists for an occupational medical surveillance program.

   Focus group participants felt that an occupational medical program was necessary because of their primary care physicians' lack of knowledge of the impact of occupational exposures.

2. Independent physicians without any ties to DOE or the contractors should administer the medical testing program in cooperation with ATLC.

   Participants cited trust and credibility as the most important components of any medical testing program or there would be lack of interest and participation. They discouraged Oak Ridge as a testing site because of its close ties with DOE and the contractors. Local clinics should be used but they should be within driving distance.

3. The testing program should incorporate plant medical records.

   Participants stressed their desire to include plant medical records, if feasible, in the evaluation.

4. Participants favored directly mailed invitations to inform workers of the program.

   The workers felt that the best way to reach X-10 and Y-12 workers is through direct mail, perhaps having the contractors send a notice with the pension and pay checks.

5. The testing program should be ongoing rather than a one-time evaluation.

Participants repeatedly stressed the need for periodic testing because a clean bill of health at one time is no guarantee against future disease.

6. Current as well as former workers should participate in the testing program.

   The focus group members felt that the program should begin with the retirees but should include current workers because of the mistrust of the site clinic.

7. All of the participants expressed a desire that early detection of lung cancer through the CT scan should be implemented as part of their program.

Additional detail regarding these issues is provided the complete analysis by Sylvia Kieding in Section VI of Part II of this report.

D.2 Questionnaire Results

Over three-quarters of the respondents reported that they had seen a physician during the 12 months prior to completing the questionnaire (87%). Nearly all (98%) of respondents reported having a personal physician. Over three-quarters of respondents (n=199, 83%) reported that they have periodic checkups when they are not ill. The vast majority of respondents have health insurance (n=235, or 97%).

When asked whether they were concerned that their health might have been affected by working at Y-12 and ORNL, 62% (n=144) reported that they believed that their current or future health might be so affected. On the other hand, the majority of the respondents were interested in participating in a medical screening if offered. Nearly 60% of respondents (n=242, or 59%) stated that they were somewhat to very interested in participating in a screening.

The majority of respondents (176, or 76%) reported that their personal physician knew that they had worked at Y-12 and ORNL. However, when asked if their personal physicians were aware of their specific exposures that they had had at Y-12 and ORNL, the vast majority (156, or 67%) reported that they did not believe that their physician was aware of the specific exposures that they had had at Y-12 and ORNL.

E. Size of the Target Population

Estimating the size of the target population naturally requires defining what the target population is. In the following section, we provide the rationale for a targeted medical surveillance program that meets the criteria established by the Department of Energy. We will submit a full plan for Phase II, which will describe in detail the rationale and design of a medical surveillance and risk communication program.

To fulfill the mandate for medical surveillance established by the DOE, we will propose a medical monitoring program designed to detect and to reduce the burden of chronic lung disease, cancer, kidney and liver disease, and hearing loss.

- **Preventive Pulmonary Health** Workers at Y-12 and ORNL are likely to be at increased risk of a variety of lung diseases, including chronic obstructive lung disease, pneumoconioses, and lung cancer. They worked with a variety of irritants, fibrogenic dusts and lung carcinogens (asbestos and beryllium, at a minimum). It is justified to include all workers with significant exposures to lung irritants, asbestos and other lung carcinogens, mercury and beryllium in a medical screening and risk communication program. Since these agents were in widespread use at Y-12 and ORNL, large numbers of Y-12 and ORNL workers were likely to have experienced these exposures.

- **Cancer Detection program** Significant exposure to a variety of carcinogens occurred at Y-12 and ORNL over the life of these facilities. Former and current X-10 and Y-12 workers would benefit from a targeted cancer detection and education program. Lung cancer is the single most important cancer among Y-12 and ORNL, because it is common and has been found to occur in excessive rates among workers at these facilities.

- **Hearing Loss** Excessive noise exposure likely occurred at selected parts of the Y-12 and ORNL complex, leaving nearby workers at risk for hearing loss. For workers who were in those areas, a hearing testing program would be justified and beneficial.

- **Diseases of Other Organs** Exposure to metals and solvents was common at Y-12 and ORNL. Screening for kidney, liver, and relevant neurologic disease would be appropriate for such workers.

These screening program elements and targeted conditions are entirely consistent with the currently-funded DOE former worker medical surveillance programs at other sites and with the national medical screening protocol established by DOE for this program.

Results of the risk-mapping exercises yield observation on which facilities, buildings and job titles appear to be associated with the greatest likelihood of significant levels of specific exposures. The details were provided in a previous section and also in Section V of Part II of this report.

Estimation of the numbers of workers who are alive and at risk for occupational disease must be approximate. The roster of currently pensioned alive workers from Y-12 and ORNL includes a total of 7,118 workers, consisting of 3,891 Y-12 retirees and 3,227 ORNL retirees. This group of retirees currently receive a pension through BWXT, and we have current addresses for them.

Terminated workers who did not work long enough to receive a pension are more difficult to estimate. In the mortality studies at Y-12 (Loomis and Wolf) and ORNL (Richardson and Wing), mortality follow-up of workers who were first hired between 1947 and 1972 (ORNL) or 1974 (Y-12) was completed through 1990. Of the 14,095 ORNL workers in the study, 3,269 (23%) had died through 1990. Of the 10,620 Y-12 workers in the study, 8,119 had only worked at Y-12 and 1,861 (23%) of these workers had died through 1990. A minimum of 16,000 Y-12 and ORNL workers first employed between 1947 and 1974 were alive in 1990. Assuming and additional 25% have died since 1990, approximately 11,550 workers first hired between 1947 and 1974 at Y-12 and ORNL should still be alive. This figure doesn't include ex-workers first hired after 1974 but not employed long enough to be pensioned. This number is not known.

Given these data, a reasonable provisional range of the numbers of living ex-workers from Y-12 and X-10 is 12,000 to 20,000. Given the incompleteness of information available at present, the estimate of the size of the population at risk must be regarded as approximate. It is, however, sufficient for planning purposes.

IV. NEED FOR MEDICAL SURVEILLANCE AND RISK COMMUNICATION

The results of the 12 month needs assessment study support the need for a medical monitoring and risk communication program. This conclusion is based on the evidence that large numbers of workers had exposures to detrimental agents, the strong need expressed by former workers for a credible targeted program of medical surveillance and education, and specific epidemiologic studies at Y-12 and ORNL that document excess risk of selected diseases.

In Phase II, we propose to develop and implement a health protection and risk communication program for Y-12 and ORNL workers centered on the workers at risk for 1) chronic respiratory disease, including chronic obstructive lung disease (COPD) and the pneumoconioses, 2) cancer, including lung cancer 3) kidney, liver and neurologic disease, and 4) hearing loss. We select these conditions, because they meet the criteria established by the DOE for medical monitoring and risk communication. Our logic is two-fold. First, these diseases are caused by exposures that have occurred at Y-12 and ORNL. Second, a medical monitoring program framed around these conditions can provide tangible benefits. It can lead to early detection of cancer, which can increase survival and quality of life. A well-designed program can identify COPD and the pneumoconioses for which advice about proper treatment (COPD), vaccinations, and prompt treatment of superimposed infections will be highly beneficial. Lung cancer is amenable to early detection through rational screening, and can be complemented by smoking cessation programs, thereby reducing both occupational and non-occupational risks. The severity of kidney, liver, and neurologic disease can be reduced by control of other risk factors (e.g. – hypertension and alcohol consumption).

The risk communication will be a centerpiece of a health protection/medical monitoring program. While there remains considerable uncertainty about the health risks experienced as a result of working at Y-12 and ORNL, this uncertainty must be openly communicated by credible sources. In combination with a medical surveillance program designed to protect health, accurate information about risks will be itself health promoting. We propose the hard outcomes noted above for medical monitoring, in part, because they can be identified with certainty. The health outcomes that we seek to include a monitoring program are highly amenable to screening on a population basis. After participation in the screening program, former and current Y-12 and ORNL workers will have increased real knowledge about their personal health status, what is known about their risks, and how they can promote their own health. In conclusion, mounting such a program in Phase II should make a tangible improvement in people's lives.

Section V. Exposure Assessment

1.0 Introduction

The purpose of this one-year study was to identify primary worker exposures that occurred over time at the X-10 and Y-12 facilities in Oak Ridge. These exposures were characterized, to the extent possible, to allow for a means of determination of worker populations at greatest risk. A central part of the exposure assessment included the use of building specific risk mapping. This approach allowed for input directly from those involved historically at each building or area of interest. This risk mapping process also allowed the researchers to gain a great deal of insight on day-to-day operations and exposures that took place at these sites through time.

2.0 Description of the Sites

X-10

The original X- 10 facility consisted of the air-cooled graphite pile or reactor for producing plutonium, a pilot plant for isolating plutonium, and some support facilities. The chemical separations pilot plant construction started in March, and the reactor went critical and began operation November 4,1943. The site was initially challenged with several major goals including:

1. Conduct the necessary studies and develop a workable and dependable method for chemically separating and isolating plutonium from uranium metal and from fission products.
2. Develop a process for recovering the partially depleted uranium metal that had been irradiated and used in the development work at the pilot plant.
3. Develop methods for producing certain other radioisotopes such as barium and lanthanum for use at other Manhattan project sites.

The first major facility constructed at Clinton Laboratories, X-10 site, was the graphite reactor for irradiating uranium and producing plutonium. The second major facility constructed was the pilot plant (now Building 3019 but formerly Building 205) where the process for separating and purifying plutonium was to be tested

After the original mission X-10 continued to do research, pilot plant work and production work in the areas of isotope production, isotope separation and purification, and reactor research. Detailed descriptions of the primary buildings and operations for the X-10 site are outlined in Section 5.0 of this report.

Y-12 Site

The Oak Ridge Y-12 Plant was built for the US Army Corps of Engineers in 1943 as part of the Manhattan Project under the name Clinton Engineer Works. Tennessee Eastman, a subsidiary of the Eastman Kodak Company, was the original Y-12 site contractor under the agreement with the Army Corps of Engineers. In 1947 the oversight of the operations were turned over to the Atomic Energy Commission (AEC) and Tennessee Eastman

Company was replaced as the primary contractor by Carbide and Carbon Chemical Corporation. Union Carbide took over in 1957 and Martin Marietta Energy Systems (MMES) and Lockheed Martin took over in 1984 until 1999. The current contractor BWXT took over in 1999.

The Y-12 plant had five principal responsibilities: 1) Development of the electromagnetic separation process for uranium, 2) Production of nuclear weapon components, 3) Fabrication support to nuclear weapon design agencies, 4) Support for the ORNL, and 5) Support to other government agencies and facilities. The major programs and activities at the Y-12 site are listed in Table 1.

Table 1. Major Programs at the Y-12 Site

Electromagnetic Separation of U-235	1943-1948
Electromagnetic Separation of Stable Isotopes	1947 – 1990
Production of Uranium Weapon Components	1948 – 1992
ELEX Separation of Lithium Isotopes	1950 – 1956
Production of Thorium Weapons Components	1950s – 1975
Waste Disposal in S-3 Ponds	1951 – 1990
Production of Lithium and Beryllium Weapon Components	1950s – 1992
COLEX Separation of Lithium Isotopes	1956 – 1963
Waste Disposal in New Hope Pond	1963 – 1990

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Detailed descriptions of the primary buildings and operations for the X-10 site are outlined in Section 6.0 of this report.

3.0 METHODOLOGY

To best summarize the exposures at the X-10 and Y-12 facilities three basic approaches were initiated: 1) Risk Mapping of Priority Facilities and Buildings, 2) Exposures Records Review and Assessment, and 3) Development and Dissemination of a Questionnaire to former workers. The approach to each of these items is detailed within this section.

3.1 Risk Mapping

Risk Mapping is an approach that has been used extensively at industrial facilities as a tool to assist workers and/or joint health and safety committees in determining high-risk areas within their facilities. Traditionally the technique is used to identify current problem areas within a facility and to assist in developing an intervention strategy for resolving the problem areas. (Parker-Brown, 1995, LOSH, 1996) For this project the risk mapping approach was used to map past exposure conditions at the identified priority facilities and the priority buildings within those facilities.

In addition to using the mapping process for mapping past exposure conditions within the buildings of interest, the method was also modified to allow the field researchers to collect semi-quantitative exposure data for each identified exposure of concern. In addition, the field researchers were also tasked with collecting data regarding building/process characteristics (i.e., description of major processes, number of workers in the building of interest, years of operation, etc.).

Several steps were necessary in developing and running the risk mapping sessions. The steps were as follows:

1) CPS, Inc. customized the risk mapping method for use in retrospective exposure assessment. Part of customizing the risk-mapping tool included the development of a "job exposure information sheet" which was used to collect job/process/exposure information for each chemical / agent identified on the risk map. (see Attachment 1) In addition, a "Building Characteristics Report Form" was developed to allow the field researchers to collect descriptive information on the building of interest (i.e., description of major processes, number of workers, years of operation, etc.). (see Attachment 2)

2) CPS, Inc. in conjunction with the PACE International Union staff developed a training guidebook for use in training the field researchers in the technique. The guidebook was constructed to include baseline information regarding the project as well as basic information regarding medical surveillance.

3) CPS, Inc. in conjunction with the PACE International Union conducted a train the trainer for the field researchers. The field researchers for this project included ATLC Health and Safety representatives. The train the trainer session was a four hour

session to familiarize the field research team with the risk mapping methodology and focus group techniques.

4) Selection of "experts" for initial risk mapping session for the X-10 and Y-12 facilities was done by CPS, Inc. in coordination with the PACE International along with the ATLC Local Union research teams. The "experts" selected for the initial session consisted of hourly workers as well as salary workers (including line supervisors) with extensive experience at the site. While the group did not consist of a typical expert panel which might be assembled by researchers in order to characterize past exposures at an industrial site, the group had a vast amount of site experience and was selected to encompass a broad array of job classifications, facilities, and process buildings of interest.

5) The initial risk mapping session focused on the entire site (X-10 and Y-12 separately) and was conducted to assist in determining priority areas for future, more specific, risk mapping sessions. As a product from each of these sessions, the expert group produced a listing of the primary facilities of concern with respect to occupational exposures at Y-12 and X-10. These lists, along with information obtained through review of previous research studies, were used to identify areas for future risk mapping sessions.

6) Building specific risk mapping sessions were conducted for priority buildings at each of the facilities. These risk mapping sessions allowed for the collection of the aforementioned data sheets: Job Exposure Information Sheet and the Building Characteristics Report.

7) The Job Exposure Information Sheet data along with information from the Building Characteristics Reports were compiled into a database to allow for assessment of the data. Appendix A includes a summary of the results collected during the risk mapping sessions. The data sheets indicate exposures by building and by job title.

3.2 <u>Exposure Records Review and Assessment</u>

The primary focus of this preliminary exposure assessment was to determine major exposures as a function of building / area, department, or job classification. Another primary need is to establish an approach for linking the building / exposure data to an individual within the former worker roster.

The major types of information used in the development of this report include:

1. X-10 and Y-12 External and Internal Radiation Databases (requested from the sites; not yet received)

2. X-10 and Y-12 IH Air Sampling Data (requested; not yet received); including Y12 Beryllium, Thorium, Mercury and Uranium data

3. X-10 and Y-12 External and Internal Radiation CEDR Databases (Cragle, 1996)

a. Y-12 Film Data (1950 – 1988)

b. Y-12 Uranium Urinalysis Data (1960 – 1985)

c. Y-12 Whole Body Counting Data (1960 – 1985)

d. X-10 External Exposure Data (1943 – 1985)

e. X-10 Urinalysis Data (1950 – 1985)

f. X-10 Whole Body Counting Data (1950 – 1985)

4. CEDR Multiple Site Study – X-10 databases regarding building history, department history, and IH exposures by division (Wolf, 1998)

5. X-10 University of North Carolina Health Study analytical files (Richardson, 1998)

    a. X-10 Adjusted External Radiation Data

6. X-10 Health Physics Quarterly / Annual Reports (Davis, Hart, Snyder, and Turner, 1958 – 1983)

7. Y-12 Health and Safety Quarterly Reports (1952 – 1962) (Y-12, 1952-1962)

8. Oak Ridge Health Studies Phase I/II Reports -- Off-Site Dose Reconstruction Project and cited documents related to Buildings and Operations (ChemRisk, 1993)

9. University of Cincinnati Medical Surveillance Phase I Report and supporting database (with building exposure information and process information) (Bingham, 1997)

10. Oak Ridge Y-12 Mercury Task Force Documentation (Mercury Task Force, 1983a,b)

11. Site and Division History Documents

12. Environmental Remediation reports

13. Site Audit References (e.g. Tiger Team Report, Recycled Uranium Mass Balance Study Report, etc.)

For the two sites there is a fair amount of information regarding the radiation exposures that allowed for at least a preliminary assessment of priority departments. The available databases related to external and internal exposures were analyzed to determine those departments with a greater potential for external and internal radiation exposures. Generally, the data was reviewed to determine the departments with the greatest percentage of positive values. This analysis is detailed in Appendix B. Also included in this appendix are the query files used to make the assessments.

There are several notable limitations of the radiation data available including: there is no external data available for Y-12 workers prior to 1960, available data is based on site policy of who was potentially exposed which therefore greatly limits this analysis, the data in the database is annual summary data for individuals (not individual film badge exposure period readings and no hard copy records were reviewed), the data usually did not indicate building (only listing department or division), department numbers may not necessarily be associated with a work location therefore complicating the analysis, etc.

Other data files which were reviewed preliminarily to assist in the interpretation of the radiation dose records and H&S report references include: Site Specific Job Classification database, X-10 Building Number and Building Names Database, and X-10 Department Number, Department Name, and Division Names (see Appendix C).

Another key source that was used to supplement the risk mapping data with regard to exposures other than radiation was the H&S summary reports. These reports, while varying in usefulness over time, included very useful summary information with regard to the following: IH monitoring data, occurrence frequency (sometimes by building), and radiation dose summary information which was to some extent used to validate the database records. A summary of some of the data (air sampling, urine, and occurrence report data) from the available H&S reports is included in Appendix D.

3.3 Questionnaire for Former Workers

A questionnaire was developed by CPS, Inc. and Queens College to survey former workers regarding health status, health care needs, work history, and exposure information. A pilot questionnaire regarding the exposure information was used during the risk mapping activities. Approximately 70 individuals completed a questionnaire (which did not include any personal identifiers – name, SSN, badge number). Analysis of the preliminary data is included in Appendix E. The individuals represented the following job titles for Y-12: Machinists (12), Outside Machinists (2), Chemical Operators (5), Electroplaters (3), Pipefitters (2), Boiler Maker (2), Painter (2), Insulator (2), Welder (1), Electrician (3), Utility Operator (3), Carpenter (1), Supervisors (2), and no job title (1). The individuals represented the following job titles for X-10: Chemical Technicians (7), Machinists (5), Laboratory Technicians (3), Laboratory Supervisors (2), Electroplater (1), Health Physicist (1), Tank Farm Operator (1), Group Leader (1), Pipefitter (1), Electrician (1), Millwright (2), Welder (1) and no job title (1).

4.0 Results

The primary objective of this investigation was to identify the primary exposures that took place over the site history at the two sites. The results of the risk mapping work are incorporated into the following section which outlines both the major operations at the sites, and where possible, at the buildings along with the primary exposures. The listing of the primary exposures is based primarily on the risk mapping results but is supplemented with information from database, past study results or document reviews.

The CEDR database files for the Oak Ridge site (the Center for Epidemiological Research – CER data files (Cragle, 1996) were used to assess the relationship of external and internal exposures as a function of time and department number. The assessment of priority departments with regard to various types of radiation exposure described is, for the most part, based on the CER data files. In some cases, and where data was available, other sources were referenced to verify the prioritization approach. These other data sources include the Annual Health Physics Reports (available for X-10 for years from 1952 – 1983 and for Y-12 for the years from 1950 – 1962 (Davis, Hart, Snyder, and Turner and Y-12 (50-62), and the CEDR Mortality study data files (Richardson, 1998).

For X-10 departments with greater potential for internal radiation exposure were assessed based on the urinalysis data along with the in-vivo monitoring records. Selected radionuclides included in the urinalysis data were assessed to determine areas (departments) most likely to be monitored for the selected radionuclide of interest. Again, it must be stressed that this analysis is limited since it does not address those individuals that were not monitored and assumes that the site selection of those most at risk for potential internal exposures was appropriate throughout the site history. Departments with greater than approximately 10% of the total samples of selected radionuclides of interest are noted in the table below.

Radionuclide	Department Number
Strontium-90	3370, 3078, 3390
Plutonium-239 (Pu0 and Pu9)	3370, 3390, 3602
Gross Alpha	3370, 3290
Uranium-234	3370, 3470, 3290
Curium-244	3370, 3602
Tritium	3602, 3369
Aggregate of selected radionuclides	3604, 3079, 3193, 3405, 3325, 3675, 3078, 3390, 3003, 3470, 3650

Reviewing the In-vivo records, which are associated with type of in-vivo monitoring, division, and HP Area (Building). The priority divisions and buildings based on the review of this data are as follows: Buildings: 2016, 3001, 3019, 3038, 3517, 3550, 4500, 5500, 7900, and 7920 and Divisions: Analytical Chemistry, Chemical Technology, Health Physics, Isotopes, Operations, and Plant and Equipment.

Reviewing the External dose records for X-10 to determine departments with greater potential for exposure was done by determining the departments with more than 10% of total records for annual doses greater than 500 mrem. Using this approach the following departments were identified: 3650, 3390, 3370, 3363, 3360, 3193, 3078, 3X, and 3C

For Y-12 the greater potential for radiation exposure was based on External Dose (including analysis of gamma, beta and neutron dose summary data) greater than 500 mrem and analysis of the urinalysis data to determine the departments with greater than 10% of total samples. The priority departments based on review of the external dose data (penetrating, skin, and neutron) include: 2018, 2617, 2619, 2703, 2618, and 2702.

For Y-12 urine data the highest 5% of all samples were reviewed and departments with greater than 10% of the total were selected as high potential for internal exposures. Based on this criteria the following departments were identified: 2014, 2015, 2077, 2158, 2230, 2301, 2617, 2618, 2619, 2638, 2687, 2702, 2776, 2791, 2793, and 5001. Of these departments it appears that 2617, 2618 and 2619 are the departments with the highest potential. This was deduced by reviewing the top 2% of all samples and noticing that these three departments accounted for 35%, 17% and 9% of the samples respectively.

Other exposures of interest that were used to prioritize locations, departments, divisions, or jobs to be prioritized for screening included: Beryllium, Mercury, Caustics (Nitric Acid, HF, Lithium compounds), Solvents (Carbon Tetrachloride, perchloroethylene, Acetonitrile, TCE), Asbestos, and Noise. Each of these chemicals or classes is discussed in detail in Section 7.0. The table below summarizes the departments, divisions, buildings or job classifications that likely had high potential for exposure to each of these agents.

Chemical / Agent or Class	Department, Building, Division, or job
Beryllium	Machinists, Buildings (Alpha-5, 9202, Alpha-3, 9995, 9766, 9998, Beta-4, 9733, and 9215 and 3019, ORNL Reactor Buildings, and 3012?)
Mercury	Buildings (Alpha-2,4,5, Beta-4, 9202, 4501, 81-10) and Departments (2025, 2026, 2681, 2682, 2683, 2685, and 2690)
Caustics (Nitric Acid, HF, Lithium Compounds)	Buildings (3019, 9212, 9215, 3505, Beta-2,4, Alpha-5, 9292, 9203, 9206, and 9401-2)
Solvents (Carbon Tetrachloride, TCE, Acetonitrile, Perchloroethylene)	Buildings (9202, 9203, Beta-2, 9205, 9212, 9215, 3019, 3505, 3508 and all machine shops)
Asbestos	Maintenance departments
Noise	Maintenance and Operations departments

5.0 X-10 Buildings

5.1 2026 Radioactive Materials Analytical Labs (RMAL) (1964 -

Building Description

The Radioactive Materials Analytical Laboratory (RMAL) receives, stores, assays and disposes of a wide variety of radioactive materials. Assay operations included dissolutions, dilutions, separations, followed by physical, chemical and radiochemical examinations of individual samples.

The RMAL facility was constructed in 1964 (with additions in 1966 and 1985) for the purpose of providing a laboratory for general analytical chemistry for radioactive materials and specifically to support the processing and examination of spent reactor fuel.

This building housed general radioactive material analytical laboratories and six hot cells with an unloading cell in the center of the building. The building also had two labs with glovebox operations for high level alpha work. (ORNL, 1997(a))

Primary Exposures

The primary exposures reported during risk mapping sessions included: fission products, tritium. Other potential exposures of interest include: Carbon-14, Cobolt-60, Nickel-63, Srontium-90, Cesium-134,137, Europium-152,154,155, Thorium-228,229,232, Uranium-233,234,235,238, Neptunium-237, Plutonium-238,239,240,241,242, Americium-241,243, Curium-243,244,245,246 and Californium-249,251.

5.2 2525 Research Shops ("Green Door Machine Shop") (1957)

Building Description

Ultrasonic Machining, Electrical Discharge Machining, Metal Evaporation, Grinding, Plastics and Rubber work, a Welding Shop and a Plating shop. Also machined transite.

Primary Exposures

Primary exposures reported include: Beryllium, asbestos, welding fumes, and acids.

5.3 3001 Pile Building (including Graphite Reactor) (1943 – 1963)

Building Description

The Clinton Pile has been known by various names, including the X-Pile and the ORNL Graphite Reactor. The term 'pile' was used to describe the reactor because it was assembled by piling up blocks of graphite with pieces of uranium interspersed. In the pile the graphite served as the neutron moderator, slowing the neutrons to allow further reaction with the fissionable Uranium-235 to produce a chain reaction. The pile was a 24 foot graphite block with holes or channels for the fuel or for experiment ports. The entire cube was surrounded by a 7 foot thick concrete shield. The reactor was air cooled and originally the exhaust was not filtered. The reactor first went critical in the fall of 1943. (ChemRisk, 1993)

Primary Exposures

Primary exposures reported during risk mapping sessions included: Plutonium, Internal radiation, External Radiation, Iodine-131, Strontium-90, Colbalt-60, Curium-244, and asbestos. It was mentioned that the Building 3019 1959 Plutonium incident contaminated building 3001 (which is situated across the road from building 3019).

5.4 3005 LITR (1952 – 1968)

Building Description

The LITR was originally built to be a small mock-up or training facility to test the design of the controls and hydraulics of the MTR reactor. This facility served as a training ground for the operators of the full scale facility (Phillips Petroleum personnel from MTR in INEL were trained in this facility). This facility was used as an experimental reactor until 1968. (ChemRisk, 1997) (Stapleton, 1993)

Primary Exposures

The primary exposures noted for this building during risk mapping sessions included: External radiation, internal radiation, and neutron exposures.

5.5 MTR Materials Test Reactor (1946 – 1948)

The MTR was a high flux reactor that had the chief function of intense neutron bombardment for testing materials to be used in future reactors. The main features of the reactor were parallel uranium fuel plates between aluminum plates, with water used as the moderator and the coolant and with beryllium used as a reflector. After a short testing period the MTR design and function was moved to Idaho (INEL).

5.6 Daniels Pile (1946 – 1948)

A reactor designed with a bed of enriched uranium 'pebbles' moderated by beryllium oxide and cooled by helium gas. This experimental 'pebble bed' reactor was only in operation until 1948. Further research in this area was shifted to Argonne National Labs.

5.7 3010 Bulk Shielding Building (1950 – 1991)

Building Description

The Bulk Shielding Reactor was originally built to support the Aircraft Nuclear Propulsion (ANP) project. Much of the focus of the project was to develop effective but lightweight shielding which would protect both the flight crew and the equipment. The BSR was a swimming pool reactor in which the enriched uranium core was submerged in water for both cooling and neutron moderation, and could be moved around in the concrete pool to test bulk shielding materials in various configurations.

The BSR was upgraded (BSF-II reactor – 1960-1991) to include a forced cooling system and took over the function of the general purpose research reactor for the facility (replaced the graphite reactor which was shut down at the same time). (Stapleton, 1993)

Primary Exposures

The primary exposures noted for this building during risk mapping sessions included: External radiation, internal radiation, and neutron exposures.

5.8 3012Rolling Mill (1947 – late 70s)

Building Description

This was the primary production plant for the fuel elements for all reactors. The facility also performed work for SRS and the Navy as well as fuel tubes for the HFIR in the late 70s.

Primary Exposures

Primary exposures reported included: Uranium, beryllium, aluminum, zirconium, solvents, External Radiation, and Internal Radiation.

5.9 3019 Separations Building (1943 - 1991) (originally Building 205)

Building Description

The original purpose of Building 3019 (the Pilot Plant) was to test processes for plutonium separation, determine needs for full scale production level separation, and provide plutonium for other sites to use for evaluation purposes. When it was constructed it included 6 large underground cells. (Brooksbank, 1994) One of the most significant incidents involving an explosion in an evaporator cell in Building

3019 occurred in 1959. The explosion resulted in a release of plutonium out of the building and into building 3001 (across the street). Risk mapping participants reported that subsequent to this accident health physics practices were improved. (Parrot, 1961, and Morgan, 1959)

Significant Processes or Pilot Operations in the 3019 Complex

Bismuth Phosphate Process (1943 – 1945)

The first process selected for separation was the Bismuth phosphate co-precipitation process. The fuel slugs came directly from the Graphite reactor (3001) through a canal that ran between the buildings. The fuel was allowed to cool (decay of the short lived fission products) prior to being brought into the Pilot plant. The process was conducted in six hot cells within Building 205 (later Building 3019). The slugs were first dissolved in a solution of nitric acid with a mercury catalyst (to remove the aluminum casing). The uranium was dissolved in a heated nitric acid bath. By the end of January 1944, 113 ton per day of irradiated fuel from the reactor was going through the pilot plant, although the low pile power level and short operating time had not allowed the plutonium concentration to build up to the planned levels. (Genung, 1993) Eventually the plutonium was separated by adding bismuth nitrate and phosphoric acid creating bismuth phosphate which carried the plutonium out of solution. The fission product decontamination factors for the plutonium separations were terrible resulting in high levels of fission products in the product.

Redox 25 Process (1946 – 1948)

The Redox process was a solvent extraction process for separation and purification of plutonium and uranium. Solvent extraction methods take advantage of the fact that nitrates of plutonium and uranium are readily soluble in certain organic liquids, while the nitrates of fission products are generally insoluble in these liquids. The Redox process, which used methyl isobutyl ketone (hexone) as the organic solvent and aluminum nitrate in the aqueous phase to improve separation, was anticipated to be simpler and more economical than the bismuth phosphate precipitation process, but at first it yielded uranium of insufficient purity.

The "25" Process was designed to recover the highly enriched uranium from used uranium aluminum alloy fuel elements from the MTR in Idaho. This process was the predecessor to the Idaho chemical plant process.

Purex Process (1949 – 1960)

The PUREX process (Plutonium Uranium Reduction Extraction Process) was developed on a pilot scale starting in 1949. The Purex process used solvent extraction with tributyl phosphate (TBP) in Varsol (organic diluent) and nitric acid as a salting agent. They also experimented with TBP in Amsco 123-15 hydrocarbon diluent (kerosene). The uranium was isolated as UNH and after an ion exchange process the Plutonium was isolated as Plutonium nitrate (Pu(NO3)4). In addition to isolating plutonium and uranium, the Purex process also isolated fission product isotopes of zirconium, niobium, and ruthenium (by distilling off the nitric acid for re-use).

In addition to the purex process ORNL also developed an ion-exchange plutonium isolation method and a process for recovering plutonium from metallurgical wastes.

In 1951-1953 the Purex process was conducted on a continuous process (rather than batch processing) with a total of 34 runs being conducted (each run with approximately 140 slugs (~250 kg)). The Purex process was subsequently run in full-scale operation at the Hanford facility.

From 1950 through 1960 the Purex process was used on varying feed materials including: Uranium slugs, NRX reactor fuel, SRP fuel, BNL reactor fuel, SRP Uranium slugs, and CP-2 reactor fuel. The materials recovered included: Uranium-233, Uranium-235, Plutonium-239, and Plutonium-240. Among the fission products, cerium, zirconium, niobium, ruthenium, and iodine tend to be extracted along with the products and are most difficult to separate from uranium, plutonium and thorium. (Bruce, 1956)

Prior to using the TBP based solvent extraction processes other solvents had been investigated including: pentaether, diisopropyl ether, tertiary alcohols, dibutyl cellosolve, theonyl trifluoroacetone, and dibutyl carbitol. (Genung, 1993)

Thorex Process (1954 – 1960 and 1969 – 1976)

Thorex process is similar to the Purex process and is used for separating thorium and uranium. Used diethylbenzene instead of kerosene and a different solvent replacing TBP. The early runs were performed on Thorium slugs and later the process was used to recover U-233 from U-233O2-ThO2 hard scrap. Significant forms of radioactive material encountered in the Thorex processing were Protactinium-233 and Ruthenium. Ruthenium was observed to be a limiting fission product contaminant in the Thorex process, with levels higher during short decay runs. The separation of Protactinium-233, while unsuccessful, was a significant contributor to radiation levels and particulate releases. Because of concerns with personnel exposures in the facility, the short-decay runs were terminated (around 1957). (Genung, 1993, ChemRisk, 1997) A 1958 Health and Safety report indicated airborne levels up to 1.7E-8 microcuries per cubic centimeter beta and gamma radioactivity was measured at a laboratory area air monitoring station during a short decay run. This value was approximately 2000 times higher than the annual average of weekly data from the perimeter monitors during 1957. (Hart, 1958)

Interim-23 Process (1954 – 1958)

The Interim-23 Process (INT-23) was developed to isolate Uranium-233 alone from thorium and associated fission products. INT-23 was used to isolate kilogram quantities of Uranium-233 for weapons applications from Hanford irradiated slugs. The goal of the process was to recover U-233 with very little U-232 (<.5ppm). (ChemRisk, 1997)

Fluoride Volatility Process (1958 – 1968)

The fluoride volatility process was developed to take advantage of the high volatility of UF_6 to separate uranium from less volatile fluoride salts. The process was developed to recover Uranium-235 from molten salt reactor fuels and from other fuels soluble in molten salt. The process was used from 1949 – 1968 in Building 3019, including the reprocessing of molten salt reactor experiment fuel and uranium-zirconium alloy fuels containing highly enriched uranium.

Kilorod Process (1960 – 1964)

The Kilorod facility was constructed within Building 3019 in the early 1960s to do development work on the reprocessing and fabrication of fuels containing Thorium and Uranium-233. This process development work was performed in Cell 4 of Building 3019. The processing of the fuel in the Kilorod facility involved two distinct phases – bulk oxide preparation by the sol-gel process and fuel rod fabrication. The fuel rod fabrication included the following steps: 1) sizing the bulk UO_2-ThO_2 into an optimum particle size distribution (using crushing operations, ball mill operations and classifiers) for vibratory compaction, 2) vibratory compaction, 3) welding of the final end closure, 4) fuel rod decontamination, and 5) fuel rod inspection. Mockups of various parts of the process were designed in Building 4508. Cold runs using depleted Uranium were conducted to determine the adequacy of the process. A total of 37 kilograms of Uranium-233 was recovered during the Kilorod program. 1100 fuels rods charged with 3% Uranium-233O_2- 97% ThO_2. (Sease, 1964)

Head End Processes (1955 – 1976) (ChemRisk, 1997)

Shear Leach Process

The Shear Leach Process consists of shearing stainless steel or Zircaloy clad tubular UO_2 bearing fuel elements and leaching the UO_2 from the sheared fuel tube with nitric acid in preparation for solvent extraction.

Darex Process

The Darex process was developed for stainless steel-jacketed fuels and used a mixture of boiling hydrochloric and nitric acid (aqua regia) to dissolve the stainless steel jacket.

Sulfex Process

An alternate process for stainless steel-jacketed fuels was the Sulfex process that dissolved the stainless steel jacket in sulfuric acid and the fuel materials in nitric acid. This was only run on a pilot scale at ORNL.

Zirflex Process

Zirflex was a similar process as Sulfex for Zirconium jacketed fuel using ammonium fluorideammonium nitrate solution to dissolve the zirconium jacket followed by nitric acid dissolution of the core. Such procedures were especially applicable to fuels with uranium and thorium oxide cores.

Feed Materials Processing (1953 – 1959)

Excer Process

The uranyl nitrate product of solvent extraction processes (Redox, Purex) is converted to UF4 in preparation for gaseous diffusion recycle as UF6. This was usually accomplished by costly reduction with hydrogen and HF. The Excer process involved aqueous phase hydrofluorination of uranium to UF4. A modification, the Excer Moving Bed Process, for converting uranyl nitrate to UF4 consisted of denitration of the uranyl nitrate to UO3, reduction to UO2, and hydrofluorination to UF4.

Fluorox Process

The Fluorox process involved reaction of UF4 with oxygen to produce UF6 and uranyl fluoride.

Metallex Process

The Metallex process for conversion of thorium tetrachloride to thorium metal ingots involves dissolving thorium tetrachloride in anhydrous propylene diamine (PDA) and reducing the thorium by contact with sodium or lithium amalgam. A button of thorium metal is formed by filtering, cold pressing, and melting the metallic product.

Raw materials Processing

The discovery that certain solvents and reagents could extract uranium from the sulfate solutions that were used to leach uranium from ores was an important technological achievement. The Dapex process used dialkyl phosphoric acid for both uranium and vanadium recovery. The Amex process uses a long-chain alkyl amine for uranium recovery. The Monex process used TBP to extract thorium from process sludge and leach. The Slurrex process was developed in 1950 when the AEC requested ORNL to make a preliminary evaluation of various solvents for recovery and purification of uranium from ore concentrates. Ethyl ether had been used for this process in the past. The Slurrex process using TBP was developed by ORNL in collaboration with Mallinckrodt Chemical Works and the Catalytic Construction Company. The process consisted of extraction of nitric acid slurries of uranium ore with 30% TBP, scrubbing with hot water, and stripping the uranium with equal volumes of hot water. This process was used on a production level at Fernald.

3019 Primary Exposures

The primary exposures for this building included: Hydraulic fluids, Internal radiation, External Radiation, Fluorides, UF6, HF, Beryllium, Heat, Asbestos, PCBs, Nitric Acid, Aluminum Nitrate, TBP, Amsco (Kerosene), Plutonium, Thorium, HEU, and Uranium-233.

According to risk mapping participants in 1959 three of the worst accidents at ORNL were in 3019: explosion, Ruthenium exposure, and explosion resulting in release of plutonium. Additionally, H&S reports reviewed indicate that Building 3019 had the majority of the reported occurrences on the X-10 site for the years from 1960 – 1964 (see Appendix D).

5.10 Central Machine Shop ("Bee Bee Shop") (1947 – 1961)

Building Description

Building 3024 was the general machine shop before building 2525 was built. The building was intended to be a clean shop but reportedly got more and more contaminated over the years. It was nicknamed the "Bee Bee" shop because of the work done with lead shot. At the height of operations the shop had about 50 people working there.

Primary Exposures

Primary exposures reported for the building included: Lead, internal radiation, external radiation, Noise, welding fumes, mercury, solvents, and beryllium (small amount). (Risk Mapping and Bingham, 1997)

5.11 3026 C By-product Process Building and Chemistry Separation Lab (1943

Building Description

One primary process that was conducted in Building 3026 was the separation of radioactive lanthanum from irradiated fuel. Radioactive Lanthanum-140 was used in weapons test devices in order to characterize the movements of parts after the explosion through the monitoring of the very intense gamma radiation from the Lanthanum. The Radioactive Lanthanum (RaLa) process involved large quantities of irradiated fuel in which radioactive fission products had been allowed to decay for only a short period of time. The processing also initially took place at a time when radioactive gases that were released were not efficiently trapped.

The irradiated uranium slugs would be transferred to the 706-D (later 3026) dissolver approximately 1-5 days after irradiation. Based on 150 pounds of slugs in a dissolving batch, one reference indicates that 2500 curies of Xenon-133, 1300 curies of Iodine-131, and less than 1 curie of Krypton-85 were released within the dissolver. RaLa runs typically involved batches of approximately 50 slugs at a time with production runs up to 1500 slugs. A production process was developed and put into place in Building 706-C where existing lab facilities were converted to the RaLa production process. In all, nine shipments to Los Alamos were made by 1945, totaling 3852 curies produced with the 706-C equipment which was designed for only small-scale (1-10 curies) separation. (Thompson, 1949)

Building 706-D was expanded to allow for increased production requirements. Separation operations in 706-D started in May of 1945 and by 1949 shipment to Los Alamos included over 62,000 curies of Barium-140. Production levels steadily increased from 1949 to 1954 with batch runs in 1954 resulting in as high as 64,000 curies of Barium-140. Over the approximate 12 years of operation ONRL workers dissolved at least 30,000 slugs in the process of separating over 500,000 curies of radioactive barium-lanthanum for Los Alamos weapons development and research projects. In 1954, after an incident at ORNL resulted in an airborne release, the RaLa operation was re-established in Idaho Falls, Idaho.

The RaLa process was very unpredictable. Because of inherent uncertainties in the operating procedure it was impossible to maintain a fixed production schedule or even to determine in advance exactly what materials would be required in the processing of a run. (Thompson, 1949)

In addition to the RaLa process this building was the primary building for fission product separation work.

Primary Exposures

The primary exposures identified for this building include: short decay fission products, external radiation, internal radiation, coolant, NaK, Sodium Hydroxide, and asbestos.

5.12 3028 Alpha Powder Facility (Curium Source Fabrication Facility) (3028E) and Short Lived Fission Product Facility (3028W)

Building 3028 was constructed in 1950 to separate the short-lived fission products from irradiated uranium-aluminum targets, using a concrete shielded manipulator cell on the ground floor. Labs were provided on the 2nd, 3rd and 4th floors. The building was later expanded by the addition of a single-story wing on the east side to house the alpha powder handling operations. The building was used to process curie quantities of short lived fission products and to package and distribute gram quantities of alpha materials such as oxides of Americium-241 and 243, Curium-244, Neptunium-237 and Plutonium-238. 3028-E Hot Cells (1-4) were highly contaminated with alpha contamination with levels reported to be 1E6 - > 1E7 dpm/100 cm2 (Schaich, 1964).

Primary exposures

Primary exposures reported during risk mapping sessions included: Curium-244, Strontium-90, Cesium-137, and Cobalt-60. Other radionuclides of interest include: Short Lived Fission Products (Xenon-133, Iodine-131, Molybdenum-99, Zirconium-95, Tellurium-132, Ruthenium-103), Americium-241,243, Curium-242, Neptunium-237, Plutonium-238, 239, 240, 241, 242, Uranium-232, 233, 235, 236. (Schaich, 1964, 1970)

5.13 3029-3038 Radioisotope Area (1951) (Goldsmith, 1987, 1988)

3029 Source Development Laboratory

Building 3029 was constructed to perform the chemical and mechanical processing of numerous radioisotopes into radiation sources. The SDL was used to prepare sources of Strontium-90, Cesium-137, Promethium-147, Cobalt-60, Iridium-192, Iodine-131, Technetium-99, Calcium-47 and short lived radioisotopes. A subterranean Cobalt-60 storage and irradiation facility (Cobalt-60 Garden) is used to store Cobalt-60 and to irradiate specimens with high gamma fluxes. Chemical, physical, and mechanical processing of radioactive materials is conducted in four manipulator hot cells, two laboratory hoods used as glove boxes and small glove boxes.

3030, 3031, 3032 Radioisotope Development Lab

The RDL are located in three separate single-story buildings (3030, 3031, 3032). The labs were constructed to perform limited production and development work with radioisotope materials used for industrial, medical and research applications.

The hot cell in Building 3030 is used to process irradiated cyclotron and reactor targets to produce numerous unique radioisotopes, such as: 1) Cobalt-56 recovery from an iron target, 2) Cobalt-57 from a Nickel cyclotron target, 3) preparation of purified Gold-198 solution, 4) separation of Neptunium-234 from a uranium target, 5) preparation of purified Strontium-90 nitrate, and purification of Uranium-237.

The hot cell in Building 3031 is used in the final separation of gadolinium from contaminated Europium targets. The Gadolinium-153 is used for nuclear medicine.

Building 3032 was a hooded laboratory operation where only low-level radioisotope production technology research and development activities were conducted.

Building 3033A Actinide Fabrication Laboratory (AFL)

Building 3033 Annex was constructed in 1960 by bridging the space between Buildings 3033 and 3034. Until 1973 a portion of the building was used in the production of Carbon-14. The facility was later used to produce, load, weld, and decontaminate neutron dosimeters and to weigh and package milligram to gram quantities of actinide materials. The facility was also used to fabricate ceramic oxide wire.

3036 Decontamination Building (1951)

Building Description

One of the primary tasks performed in this building was the decontamination of lead which was subsequently sent it to lead shop (building 7005). Decontaminated lead bricks by dipping in nitric acid. Risk mapping participants mentioned that the "HPs were coming up with high lead levels in their medical montirong".

Primary Exposures

Primary exposures reported include: Lead, Nitric Acid, external radiation, internal radiation.

3038 Alpha Handling Facility (AHF) and Isotope Research Materials Lab (IRML)

The Isotopes Alpha Handling Facility was used for studying the physical and chemical characteristics of transuranium elements, fabrication of alpha and neutron emitting targets and sources, and fabrication of beta and low-energy gamma sources.

Building 3038 was constructed in 1948 to house all the radioisotope shipping activities for ORNL. In the original configuration, the entire facility was dedicated to packaging, testing, shipping and receiving of all radioactive materials handled at ORNL. The east portion of the building was used as an analytical lab to perform local analysis of short-lived radioisotopes prior to shipment. The central portion of the building contained the concrete barricade for the storage of liquid and solid radioactive materials, a pipetting station for the transfer of liquids, the canning station, a material transfer system, a remote manipulator, and overhead mirrors to provide observation behind the barricade. The west area was used for packaging, labeling, and inspection.

By the late 1960s the volume of isotope shipping had decreased and the west portion was converted to the Alpha Handling Facility. The AHF used five water shielded, manipulator cells to handle alpha and neutron emitters and three glove boxes used to fabricate alpha targets and sources. A separate glove box room (AHF annex) was used to weigh, package and weld capsules of actinide materials. (Schaich, 1970)

Primary Exposures

Primary exposures of concern for the Isotope Circle facilities reported during risk mapping sessions included: Internal radiation, External radiation, Iodine-131, Technetium-99m, Strontium-90, Cesium-137, Molybdenum, Ruthenium-106, and tritium. Other sources indicated other radionuclides of interest including: Californium-252, Curium-242, 244, Plutronium-238, Americium-241, 243, Uranium-232.

5.14 3042 ORR (1958 – 1987)

Building Description

The Oak Ridge Research Reactor (ORRR) combined the features of the MTR and the swimming pool reactor. It was cooled and moderated by water, with beryllium and water providing the necessary neutron reflection. It used uranium aluminum alloy fuel in a core that was cooled with high velocity water. The entire core tank was immersed in a water pool. The ORRR had beam ports extending through the concrete pool and also had the ability to do experiments in the water in close proximity to the core to attain high neutron fluxes. In addition to materials and solid state physics experiments the ORRR was used for radionuclide production to produce radionuclides for use in research or medical applications. (ChemRisk, 1997)

Primary Exposures

Primary exposures reported included: External radiation, internal radiation, fission products, and beryllium.

5.15 3044 Special Materials Machine Shop ("Hot" Machine Shop) (1955)

Building Description

Made fuel elements at this facility. Worked with uranium, beryllium, thorium, fiberglass and lots of graphite. This building reportedly had more restrictive PPE requirements than the 2525 machine shop. Risk mapping participants reported that they did "time controlled" machining to control doses. Helpers were part of the regular workforce and did the cleaning of the machines. The workforce consisted of approximately 25-30 machinists and helpers.

Primary Exposures

Primary exposures reported during risk mapping included: External radiation, skin/hand radiation exposures, internal radiation, beryllium, thorium, uranium, and fiberglass.

5.16 3047 Radioisotope Development Laboratory (RDL)

Building Description

Building 3047 was constructed in 1962 to conduct research and development and to produce radioisotope materials. The facility had the following entities: several general-purpose labs for the handling of low-level radioactive materials, four shielded manipulator hot cells for high-level beta-gamma activity processing, three alpha-handling labs with one decontamination room, ten offices, a change room and storage and service areas.

The four manipulator cells (Cells A, B, C, and D) located in the center of the first floor were used for high-level beta/gamma activities processing. These hot cells are equipped with dual, parallel HEPA filters in the rear of each cell. Access to change these filters exposed personnel to about 600 mr/hour fields (with filter changes taking approximately 20-30 minutes). (Goldsmith, 1987) It should be noted that for the most part manipulators used in hot cells throughout the ORNL were worked on in the Manipulator shop (Building 3074).

Primary Exposures

Primary exposures reported during risk mapping sessions included: Irridium, Strontium, Cesium, Cobalt, Tritium, Curium, External Radiation, and Internal Radiation.

5.17 3503 High Radiation Level Chemical Laboratory (1948 (originally 706-HB,-HD)

In the 1950s this lab was used for chemical engineering studies of radiochemical processes involving evaporation, solvent extraction and ion-exchange and continued unit operation scale studies of the TBP process and the RaLa process.

Research work on the Interim-23 Process (INT-23), developed to isolate Uranium-233 alone from thorium and associated fission products, was also performed in this building. INT-23 was used to isolate kilogram quantities of Uranium-233 for weapons applications from Hanford irradiated slugs.

Primary Exposures

Primary exposures reported include: Mercury (support work for Y-12 operations), TBP, Thorium, chlorinated solvents, Uranium-233, Plutonium, Strontium-90, Cesium-137, and Cobalt-60.

5.18 3505 Reactor Fuels Processing Plant, Metals Plant (1951)

Process Description

The facility consists of seven process cells (A thru G), a canal, a dissolver room, a dissolver pit, an office, locker room, storage area, control room, electrical gallery, shop, and makeup area.

The Tributyl phosphate (TBP) process was developed in 1949 for the recovery and purification of uranium from the metal-bearing wastes that had accumulated in the ORNL tank farm from wartime processing efforts. The process used TBP as a solvent for extracting uranium and was later modified to also recover plutonium. A Metal Recovery Facility (Building 3505) was constructed at ORNL to use the TBP process to recover uranium and plutonium from fission product waste solutions collected in the tank farm system at the ORNL. In operation since 1953 the Metals Recovery Facility also recovered uranium and plutonium from fuel from the Chalk River reactor, Hanford metallurgical waste, the Brookhaven National Laboratory reactor, Argonne Labs CP-2 and CP-3 reactors, and 7.8 tons of sand contaminated by weapons tests in Nevada. (Thompson, 1963, ChemRisk, 1997)

Metal recovery processing of Hanford metallurgical wastes for recovery of plutonium and americium began in 1954. In the first quarter of operation the process yielded over 18 kg of plutonium. (Brooksbank)

Metal recovery also recovered 127 grams of Neptunium-237 and 6.7 tons of uranium from 11.2 tons of the nonvolatile fluoride 'ash' resulting from fluorination of UO3 to UF6 at Paducah. (Brooksbank)

In 1958 the Metal Recovery Plant was linked by underground piping to the Pilot Plant (Building 3019) to form what became known as the Power Reactor Fuel Processing (PRFP) complex.

The PUREX process (Plutonium Uranium Reduction Extraction Process) was developed on a pilot scale starting in 1949. The Purex process used solvent extraction with tributyl phosphate (TBP) in Varsol (organic diluent) and nitric acid as a salting agent. They also experimented with TBP in Amsco 123-15 hydrocarbon diluent (kerosene). The uranium was isolated as UNH and after an ion exchange process the Plutonium was isolated as Plutonium nitrate (Pu(NO3)4). In addition to isolating plutonium and uranium, the Purex process also isolated fission product isotopes of zirconium, niobium, and ruthenium (by distilling off the nitric acid for re-use).

In addition to the purex process ORNL also developed an ion-exchange plutonium isolation method and a process for recovering plutonium from metallurgical wastes.

In 1951-1953 the Purex process was conducted on a continuous process (rather than batch processing) with a total of 34 runs being conducted (each run with approximately 140 slugs (~250 kg)). The Purex process was subsequently run in full-scale operation at the Hanford facility.

Risk mapping participants indicated that building 3505 and 3019 were 'direct maintenance' facilities indicating that the cells were not designed to be maintained remotely. This was also discussed in a technical presentation. (Bruce, 1960)

According to health and safety reports the exposure of maintenance men to radioactivity in 7 years of operation averaged 60 mrem/week (approximately 3 Rem/year). (Genung, 1993, ORNL-6846)

Primary Exposures

Primary exposures reported included: Uranium-238, Plutonium-239, Neptunium-237, Americium-241, Internal radiation, External radiation, heat, Nitric acid, Aluminum Nitrate, TBP, Amsco (kerosene), U-233, and U-235.

5.19 3508 Chemical Technology Alpha Lab

Building Description

The building was designed for high level alpha materials and low level beta and gamma materials and acted as both a development and service lab. First floor facilities included: Lab 1 – Low level alpha development lab, Lab 2 – High level alpha development lab, Lab 3 – Low level analytical lab, and Lab 4 – High level alpha lab. One process performed in the labs was the purification of different alpha-emitting radioactive materials including: Americium-241, Neptunium-237, and Plutonium.

Primary Exposures

Primary exposures reported included: Americium-241, Neptunium-237, Plutonium, Uranium-233, Curium-242, solvents and chlorinated solvents.

5.20 3515 Fission Product Pilot Plant

Building Description

This building was built in 1948 and was modified throughout its operational life. The original facility consisted of a concrete pad with tanks and a tent surrounding the shield blocks. In 1950 a hot cell was added. Lean-to buildings contained the operating areas and a small valve pit was on the north side of the building. This building was used to extract radioisotopes of ruthenium, strontium, cesium, cerium, and other elements from the ORNL liquid wastes and the Chalk River Canada cleanup wastes. Past operations in this facility resulted in severe contamination of the interior surfaces due primarily to a practice of intentionally overflowing the piping and vessels with purge liquids for decontamination to allow entry for work. This building was shut down in 1976 but required continued surveillance and maintenance until eventual D&D in 2003. (ORNL 1995)

According to risk mapping participants management had tried to decontaminate this building in the past and the result was "burning out a bunch of people just trying to start the cleanup operations".

Primary Exposures

Primary exposures reported include: External Radiation, fission products, and Internal radiation.

5.21 3517 Fission Product Development Laboratory (1958 – 1988)

Building Description

Building 3517 is a concrete block and corrugated aluminum sided structure. The building includes 15 cells shielded with concrete walls. In addition, there are four cells, outside the main cell block, shielded with steel or concrete.

Aqueous feed materials containing mixed fission products is concentrated by evaporation, and the fission products are then separated into groups of chemically related elements by inorganic precipitation. These purified fission products are converted to a dried powder, which is pressed into pellets for insertion into containers. The containers are sealed by welding and shipped to the customer for use as a source of radiation or heat.

This lab worked primarily on the concentration, isolation and separation of fission products from aqueous waste streams. The building houses large quantities of Sr-90 and Cs-137. Risk mapping participants reported that there was an accident resulting in a severe hand dose from Strontium-90. The workforce consisted of four shifts through the 1970s and then cut back to 3 shifts in the 80's.

Primary Exposures

Primary exposures reported included: Transuranics, Cesium-137, Cerium-144, and Strontium-90. Other sources indicated other exposures of interest including: Fission Products, Cerium-144, Strontium-90 (200,000 Ci/campaign), Promithium-147, Cesium-137 (200,000 Ci/campaign), Ruthenium-106, Zirconium-95, Niobium-95, Plutonium-239, Uranium-235,238, and Americium-241. (Schaich, 1964)

5.22 3525 High Radiation Level Examination Laboratory (1963 –

Building Description

This facility contained both Hot cells and radiation laboratories.

Primary Exposures

Primary exposures reported include: Strontium-90, Cesium-137, Cobalt-60, HEU, Uranium-233 and asbestos.

5.23 3550 Chemistry Laboratory (1943) (originally 706-A)

Building Description

This building housed some of the early research and bench scale work on fluoride volatility process (40s to early 50s). In addition to bench scale and pilot level research activities the facility all had a small machine shop.

Primary Exposures

The primary exposures reported include: External radiation, Internal radiation, Plutonium, Curium, beryllium, HF, acids and solvents.

5.24 4500N & S Central Research Building (North 1951) (South 1962)

Building Description

These facilities performed general research including radiation research, fuel reprocessing work, research for the Molten salt reactor, research work on fluoride volatility process, etc.

Primary Exposures

Primary exposures reported include: Uranium, Transuranics, fission products, acids, solvents

5.25 4501 High Level Radiochemical Laboratory (1951)

Building Description

Research in this facility included: early fission product release test work and OREX research. Building 4501 had unpleasant odor in late 50's and early 60's related to the use of propylene diamine (PDA) used in the OREX process. According to a group interview with Division Safety Officers "Mercury was used in large quantities in this building". Similar work was reported in building 3592.

Primary Exposures

Primary exposures reported include: Mercury, Propylene Diamine (PDA), Iodine, Cesium, HEU, Uranium-233, plutonium, and transuranics.

5.26 4507 High Radiation Level Chemical Development Lab (1958

Building Description

Processed irradiated pellets of Americium Oxide and aluminum to recover a purified solution of americium and curium. U-232 was prepared by irradiating Pa-231. The irradiated material was processed in Building 4507 to produce various products containing known amounts of U-232, U-233, and U-235.

The building was also named the Curium Recovery Facility recovering both Cm-244 and Cm-242. Other research in the lab included: pilot studies of the fluoride volatility process (4507 cell 4), Head End unit level studies on several processes including: Darex, Zircex, Zirflex, and Sulfex.

The Building closed down operations in the 70s and was decontaminated in the 80s. According to risk mapping attendees "over the years had several good sized contamination accidents".

Primary Exposures

Primary exposures reported included: Plutonium, Americium, Uranium, Curium, Thorium, Tramax, Krypton, Iodine, Nitric acid, and Sulfuric acid.

5.27 7012 Central Machine Shop (1953)

This machine shop was reportedly a "clean" shop (not receiving contaminated parts or radioactive metals). In addition to machining the building housed sheet metal work, and pipefitters. This was a High Bay facility that allowed for fairly large- scale fabrication for mock-up pilot equipment.

5.28 7500 Homogeneous Reactor Experiment Building (1951)

Building Description

Homogenous Reactor Experiment (1951 – 1954)

The homogeneous reactor was called such because it combined fuel, moderator, and coolant in one water-based solution. Homogeneous reactors had been tried earlier but had been stopped due to technical problems including problems with corrosion. The HRE building was completed in 1951 and achieved a one megawatt power level in

1953. High-pressure steam from the reactor was fed to a turbine/generator to generate electricity. (Genung, 1993)

Homogenous Reactor Test (HRE-II) (1954 – 1961)

The HRE-II reactor was designed as a two-region homogenous reactor core. The aim was not only to produce electrical power but also to irradiate thorium surrounding the core to produce fissionable Uranium-233. The reactor had many technical problems during its short pilot period with the longest continuous running period of approximately 100 days achieved in 1958.

Primary Exposures

Primary exposures reported include: External radiation, neutron exposure,

5.29 7503 Reactor Experiments Building (ARE) (1952 – 1957)

Building Description

Molten Salt Reactor (1960)

Based on the success of the molten-salt ANP reactor (which was a small, high temperature reactor engine that used circulating molten uranium salts as fuel) the ORNL began to further investigate the usefulness of the technology. The Molten Salt Reactor (MSR) was built as a thermal breeder reactor with a molten salt Uranium-235 reactor surrounded with a blanket of 'fertile' (materials that can be transformed by neutron absorption to fissionable materials) Thorium-232 contained in a molten mixture. The Thorium-232 was transformed by neutron absorption to fissionable Uranium-233. The fuel for this type of reactor was Uranium-233F4 dissolved in a molten mixture (solution) of Lithium Fluoride (Li-7) and Beryllium Fluoride (BeF2). The fertile material was ThF4 dissolved in the same salt or in a separate salt of similar composition. (Genung, 1993, Stapleton, 1993)

Primary Exposures

Primary exposures reported include: Beryllium, uranium, thorium, external radiation, and internal radiation.

5.30 7702 Tower Shielding Facility (includes TSR-1 and TSR-II reactor (1954-1993)

Building Description

The Tower Shielding Facility was designed to allow operating reactors to be hoisted nearly 200 feet in the air to enable studies of the behavior of radiations from airborne reactors without the scattering that took place on the ground. The facility had four different reactor assemblies over its period of operation.

5.31 7709 Health Physics Research Reactor (HPRR) (1960 – 1987)

Building Description

The HPPR was designed to be a fast burst reactor. It was a small, unmoderated, unshielded reactor that released short bursts of neutrons ideal for health physics and biomedical research. The small HPPR, housed in the Dosimetry Applications Research Facility (DOSAR), was contained in a steel structure, aluminum sided building which is supported by a large, track mounted positioning device. The reactor building is located in a hollow and is surrounded by hills at least 50 feet high to provide natural shielding and to prevent 'line of sight' viewing of the reactor in any direction. The support building was located behind the hill approximately 900 feet from the reactor. The reactor had been operated 3000 times in the steady state mode and 1000 times in the pulse mode.

5.32 7852 Hydrofracture Facility

Building Description

This facility was constructed as a pilot plant to demonstrate the feasibility of permanent disposal of liquid radioactive waste in impermeable shale formations by hydrofracture methods. This facility was used from 1964 to 1979 with a total of 26 waste injections made during that time period.

Primary Exposures

Primary exposures reported included: External radiation and Internal radiation.

5.33 7860 New Hydrofracture Facility

Building Description

This facility began operations in 1982. It was designed to inject 140,000 gallons of grout per injection. Injections were terminated in 1984 when questions arose about possible leaching to deep groundwater.

5.34 7900 High Flux Isotope Reactor (HFIR) (1961)

Building Description

The HFIR was a 100 megawatt flux-trap type reactor in which neutrons are 'trapped' in a five inch diameter hole in the center of the highly-enriched Uranium-235 HFIR fuel region. Targets, including Curium-244 and other transuranic radionuclides, were placed in the trap region for intense thermal (moderated) neutron bombardment in order to form transurnaic radionuclides including Berkelium-249, Californium-252, Einsteinium-253, and Fermium-257. In addition to production of transuranic radionculides, the HFIR has been used for many irradiation experiments using facilities that allow insertion of samples into the flux trap region, into the region of the beryllium reflector, and using beam tubes that allow neutrons to be beamed out to experimental facilities outside the reactor shielding. (Genung, 1993, Stapelton, 1993)

Primary Exposures

Primary exposures reported included: External radiation, neutron exposure, transuranics,

5.35 7920 Transuranium Processing Plant (TRU)

Building Description

Came about due to the need for transuranic isotopes such as berkelium, californium, and einsteinium. The first hot processing was completed in the TRU facility (now REDC) in November 1966. 10's to 100's or milligrams of Californium-252 were recovered during each campaign (this material was sent to ANL and SRS). The building included 12 hot cells and 12 laboratories. The facility fabricated targets for the HFIR and processed targets after irradiation in HFIR to recover the isotope of interest. Also did research on the Purex process to help determine the effectiveness of this process on very high burnup fuels. The Solvent Extraction Test facility (Purex testing) was located in Cell 5 and Tank pit 5.

Primary Exposures

Primary exposures reported included: Pu-240, Pu-242, Am-243, Cm-244,245,246,248, Cf-252, Bk-249, Es-253, and Fm-257, external radiation, and internal radiation.

5.36 7930 Thorium-Uranium Recycle Facility (TURF)

Building Description

Designed to process fuels from advanced reactors. One process which was designed to take graphite coated microshperes from pebble bed reactors and recover fuel however, the process was never built. Eventually used for some transuranic work (Plutonium, Curium, and Americium). Risk mapping participants incidcated that the cells were "generally clean" because the facility had limited use.

There was a tunnel between 7920 and 7930 with a conveyor system which the risk mapping participants indicated was highly contaminated with Curium.

Primary Exposures

Primary exposures reported included: Plutonium, Curium, and Americium.

5.37 ORNL Buildings at Y-12

Several Y-12 Buildings were transferred to ORNL after the original work on Uranium separation. Some of the primary work conducted in these facilities included stable isotope production work. The ORNL buildings at Y-12 of interest with regard to worker exposure included: 9201-2 Thermonuclear (from Y-12 1951), 9201-3 Reactor Design and Engineer Development (from Y-12 1950), 9204-1 Reactor Experimental Engineering (from Y-12 1950), 9204-3 Electronuclear Building (from Y-12 in 1951), 9213 Criticality Lab, 9207,9210 Biology Research Facilities (from Y-12 in 1947), 9731 Stable Isotope Separation (from Y-12 in 1951), and the 9995 Lab (risk mapping participants felt that this facility had high chemical exposures).

5.38 Other X-10 Buildings

Other buildings on the site which were not included in the Risk Mapping activities but which may be of interest with regard to potential exposures include: Interim Low Level Facility (907), Metallurgy Labs (2000), Health Physics Labs (2003), Physics Laboratory (2005), Health Physics Test Building (2007), Health Physics Low Level Analysis Lab (2008), Medical and Biological Building (2013), Metallurgy Laboratory Annex (2024), Instrument Shop (2506), Decontamination Laundry (2523),

6.0 Y-12 Major Operations and Buildings

6.1 Primary Processes in Alpha and Beta Buildings

<u>The Electromagnetic Separation Process</u>

The initial mission of the Y-12 facility was the separation and enrichment of Uranium-235. This was done in cyclotron like equipment that operated much like a mass spectrometer, using electromagnetic separation to isolate isotopes of interest. The units were called calutrons. The calutrons operating principals are basically as follows: atoms or groups of atoms are ionized and accelerated to a given electrical potential, the acceleration is stopped and then introduced into a magnetic field through which they move at a velocity which is a function of their mass and charge. Ions are then collected at locations that can be predicted on the basis of their size and charge.

The calutron separation operation was done in two primary type of calutrons: Alpha calutrons and Beta calutrons. The alpha calutrons were the larger units and used for the initital enrichment and the beta calutrons were the units used for "topping" or bringing a slightly enriched feed material to an enrichment suitable for the end use.

The electromagnetic plant itself was a major instillation. At its peak it employed 24,000 (50,000 indicated in abstract of same reference) workers. Eventually the plant came to contain five alpha enrichment buildings (20% U-235) and four Beta buildings (90+% U-235). Calutrons were generally arranged in continuous, oval or rectangular, arrangements, called "racetracks". Each alpha track consisted of 96 calutron tanks with electromagnets between, arranged in an oval (alpha-1) or rectangle (alpha-2). The center area of the alpha-1 racetracks was large enough to be used as office space by a number of staff members. The beta tracks consisted of 36 units each, in the form of an rectangle with a large metal "magnet keeper" across the ends. The beta units were considerably smaller than the alpha units since they were designed as a second stage to utilize the smaller amount of product from the alpha units as a pre-enriched feed.

Each group of calutrons was used as a pilot plant for succeeding generations. The alpha calutrons were primarily in two models, the alpha-1 units and alpha-2 units. The alpha-1 unit had two ion sources, and the alpha-2 unit, four ion sources, permitting much greater throughput. These are also referred to as two and four arc machines. The beta calutrons had two ion sources.

The 24,000 employees consisted of the following job groups: administrative staff, support staff, calutron operators, calutron chemical recycle operators, machinists, construction staff, and scientific research staff. It was noted that "a small fraction of Electromagnetic Plant staff, mostly restricted to the scientific staff, knew that the Clinton Engineer Works was producing material for use in weapons until after the actual Hiroshima explosion" (Compere, 1991)

The Electromagnetic Plant Uranium-235 operations were very short lived. In late 1944 the Thermal Diffusion Plant (S-50) began supplying low level enriched feed for alpha calutron enrichment. By the summer of 1945, the Gaseous Diffusion process began to be effective enough to gradually replace the alpha separations, resulting in the closure of the alpha stage separation in September 1945. Thermal diffusion, like alpha separations, was also discontinued. The Beta stage of the Electromagnetic Plant was operated as a topping operation for the Gaseous Diffusion Plant through the end of 1946. In December of 1946 all enrichment was moved to the Gaseous Diffusion Plant and all the calutron operations were closed with the exception of one track of 36 beta calutrons and the two experimental calutrons (XAX and XBX in Building 9731). (Compere, 1991)

Uranium recovery from Calutrons

Enriched uranium salvage and recycle chemistry was essentially a small batch operation, for reasons of criticality. Operations were divided into several phases, which included calutron dismantling and washing, calutron component salvage, housekeeping salvage, uranium purification, chlorination, and hexafluoride conversion.

In alpha recycle, peroxide precipitation, followed by filtration, was the major method of purification. In the calutron process for uranium enrichment, at best only 20% of the charge material reached the receiver; the rest of the ionized uranium halide vapor had to be recovered from wherever it settled and condensed in whatever chemical form it eventually took.

The calutron liner ("L" unit), ion source ("M" unit), and receiver ("E" unit) contained a variety of uranium compounds, including tetrachloride, oxychloride, carbides and oxides, as well as the metal. These materials were in the forms of loose powder, hard surface deposits, and deposits in relatively inaccessible areas, such as filament holders and porous graphite surfaces. Operations to recover uranium from the liner included vacuum cleaning and concentrated nitric acid leaching along with physical methods (brushing, grinding, scraping, etc.) and high velocity high volume spray washing. The nitrate solutions generated from these collection operations together with salvage and reclamation from laundry, plant cleanup operations, and floor drains, were a significant uranium stream. Compere, et al note that "Laundry pre-washing was an important uranium salvage operation". (Compere, 1991)

Uranium Concentration and Purification

A variety of processes were used to purify and concentrate the material recovered from the calutron process so that it could be oxidized, chlorinated, and returned to the calutrons. Almost all operations were batch or semi-batch due to concerns over criticality. This did, however, allow continuous modification of the chemical purification methods. Generally the methods were as follows: evaporation, extraction preparation, solvent extraction (solvents included ether and dibutoxy-diethylene glycol – 'carbitol'), peroxide precipitation, calcinations, reduction to the U+4 valence state using alcohol vapor, and chlorination with carbon tetrachloride. At the end of the chlorination stage the carbon tetrachloride was turned off and nitrogen was passed through the reaction vessel to purge the phosgene. The workforce and primary chemical exposures for various processes are identified within the table below. (Compere, 1991)

Workforce for Uranium Concentration and Purification

Process	Avg. # of Workers	Primary Chemical Exposures
UF6 Feed	7	Ammonium Hydroxide, Aluminum Nitrate, Hydrogen Peroxide, Aerosol OT, Uranium
Recycle Oxide Preparation	20	Lime, Nitric Acid, Hydrogen Peroxide
Chlorination	38	Alcohol, Carbon Tetrachloride, Sodium Hydroxide
Cleaning Operations		Nitric Acid, Steam
Solution Processing	56	Hydrogen Peroxide, Lime, Nitric Acid
Carbon Burning and Furnacing	15	Heat
Uranium Leaching	30	Nitric Acid
HF Treatment	9	HF, Aluminum Nitrate, Nitric Acid,
Laundry	7	Sodium Carbonate, Hydrogen Peroxide,
Evaporation	6	
Extraction	23	Lime, Nitric Acid, Aluminum Nitrate, Carbitol,
Isotope Separation	34	
Nitrate Preparation	18	Nitric Acid
Oxide Preparation	54	Ammonium Hydroxide, Aluminum Nitrate, Nitric Acid, Hydrogen Peroxide,
Salvage Processing	13	Nitric Acid
Hydrofluorination	18	HF, Hydrogen,

Lithium Separation Operations

The separation of lithium isotopes on an industrial scale is based on the fact that, under certain conditions, the Li-6 isotope will dissolve more readily in mercury than will the Li-7 isotope. Lithium dissolved in mercury solvent is referred to as the lithium amalgam and will remain in a stable state in contact with an aqueous solution only if an electric current is applied to the mixture. If this current is removed, the amalgam will decompose and the lithium will react with the water.

If lithium amalgam is allowed to flow in contact with a fluid containing another lithium compound, the Li-6 atoms will migrate to the amalgam and the Li-7 atoms to the lithium compound in the fluid. This is "two phase, countercurrent, liquid-liquid exchange". The most productive compound and fluid used in this isotope separation process is lithium hydroxide dissolved in water.

In the lithium separation plant, the cascade section provided for countercurrent flow and intimate contact between the aqueous lithium hydroxide and lithium amalgam. Two distinct types of cascade systems were used at the Y-12 plant, the Elex process and the Colex process. The Elex process was the first lithium separation process used on a production scale (Building 9204-4 – Beta 4). This was followed by the Colex process which was conducted in 9201-4 (Alpha-4) and 9201-5 (Alpha-5). The production period took place between August 1953 and May 1963.

The Alpha 5 Colex process incorporated vertical columns, replacing the horizontal trays of the Elex system. The Li-6 isotope migrated in the direction of the amalgam flow, and the Li-7 isotope migrated with the aqueous flow. The Alpha-4 Colex plant was brought on-line in June 1955, soon after the Alpha-5 Colex plant.

Some work was done by the ORNL in 1951-1952 on an organic solvent (DPA) to take the place of water. This was known as the organic exchange (OREX) process. This was not pursued past the pilot phase. The Orex pilot plant, Building 9733-1 was located at Y-12 but operated by ORNL during 1951 and 1952. Building 9202 was also used as a pilot plant for the Orex process in 1953 – 1954. (Reference: Mercury at Y-12: A study of Mercury use at the Y-12 Plant, Accountability, and Impacts on Y-12 Workers and the Environment – 1950 to 1983, The 1983 Mercury Task Force, August, 18, 1983, Y/EX-24.)

Subsequent to separation the lithium was taken through several fabrication steps to produce the desired product.

Primary buildings for lithium separation included: Beta-4 (Elex process, 1955-1956), Alpha-5 (Colex, 1955-1959), Alpha-4 (Colex, 1955-1962), 9733-1 (Orex, 1951-1952), 9733-2 (Elex, 1950-1951), 9202 (Orex Pilot Plant, 1953-1954), Alpha-2 (Elex and Colex Pilot plants, 1951-1955). Two other important support buildings were 9720-26 (Mercury Wharehouse) and 81-10 (Roasting Furnace – for recovery of mercury). (Mercury Task Force, 1983(a), 1983(b)

Beryllium Operations

Beryllium machining took place in several buildings over time at the Y-12 facility. Two of the primary buildings that included a great deal of beryllium machining were Alpha-5 and building 9766. Other buildings which have been identified as either being beryllium controlled areas or areas with beryllium storage or contamination include: Alpha-1, Alpha-3, 9202, 9733-2, 9215 Third Mill, Beta-4, 9995, and 9998. (DOE, 1973)

According to a 1952 trade journal, 'the material ordinarily processed was hot-pressed QMV beryllium. Castings were received rough machined with excess stock on plane surfaces. Operations included surfacing, grooving, deep-hole drilling, facing, and boring.' (Case, 1955)

The 1952 trade journal also indicated that the IH monitoring included 'twelve permanent air samplers were installed, one in the locker room, seven in the machining area, one in the room housing the work-pieces, one in the tool-grinding area, and two in the filter house on the influent and effluent sides of the finishing filter.' (Case, 1955) An annual HP program report (Patterson, 1957) also outlines the air sampling and wipe sampling performed on a routine basis in Building 9766.

6.2 9201-1 Alpha 1

Building Description

The primary processes conducted in the Alpha 1 Building included Track 1 and 2, Alpha-1 Calutron operations. Calutron operations are detailed in the above section. After the calutron operations were terminated the building was converted into a machine and tool design shop.

Primary Exposures

Primary exposures reported included: Enriched uranium, EMF, graphite, beryllium, external radiation, chlorinated solvents, machining fluids, mercury, and welding fumes.

6.3 9201-2 Alpha 2

Building Description

The primary processes conducted in the Alpha 2 Building included Track 3 and 4, Alpha-1 Calutron operations. Calutron operations are detailed in the above section. The Alpha-2 building housed the pilot plant facilities for the Colex and Elex processes between 1951 to 1955.

Primary Exposures

Primary exposures reported included: EU, EMF, external radiation, mercury, HF, alcohol, and PCBs.

Participants reported that sulfur was used in the basement to keep down the mercury.

6.4 9201-3 Alpha 3

Building Description

The primary processes conducted in the Alpha-3 Building included Track 5, Alpha-1/5 Calutron operations. This building also was used for research on the Aircraft Nuclear Propulsion (ANP) program.

Primary Exposures

Primary exposures reported included: EU, EMF, mercury and beryllium.

6.5 9201-4 Alpha 4

Building Description

The primary processes conducted in the Alpha-4 Building included Track 6 and 7, Alpha-2 Calutron operations. The Alpha-4 building also housed the Colex production process from 1955 through 1962.

Primary Exposures

The primary exposures reported included: EU, EMF, Mercury, Alcohol, asbestos, and external radiation.

Risk mapping participants reported that this building was among the worst areas for mercury exposures indicating that "you would even see it on the roof".

6.6 9201-5 Alpha 5 (E, N, W wings)

Building Description

The primary processes conducted in the Alpha-5 Building included Track 8 and 9, Alpha-2 Calutron operations. This facility later housed enriched uranium processing and weapons parts fabrication (including beryllium, lithium, and thorium parts).

The enriched uranium operations included: 1) reduction of UF_6 to UF_4, 2) reduction of UF_4 to metal, 3) casting or forging, 4) rolling and forming in mill operations, 5) machining of metals, 6) wet chemistry purification, recycle, and salvage, and 7) UF_4

extraction. Enriched uranium from retired weapons was recovered, usually remelted in an induction furnace, made into a casted part and sent to machining. Sometimes, however, the material was cast into long semi-cylindrical or cylindrical shapes and sent to a rolling/pressing mill and then on to a machining shop to be turned and cut to the desired design specifications.

The 9201-5 Machine Shop among other materials machined DU, EU, and Beryllium. This building also had a plating shop. The machine shop had four bays (A-D) and participants estimated that there were more than 100 machining tools.

According to Risk mapping participants, 9201-5N had an incinerator in which much of the cyanide waste from plating operations was burned.

Primary Exposures

Primary exposures reported included: Beryllium, Thorium, Mercury, Lithium, EU, EMF, cyanide, copper, nickel, cadmium, chrome, NaK, alcohol, mineral oil, heat, uranium, plutonium, freon, perchloroethylene, TCE, noise, lead, Nitric Acid, Sulfuric Acid, Aqua Regia, and asbestos.

Participants mentioned that machinists were required to eat at their machines through the 1980s. They also mentioned that it was very common to have 'chip' fires from machining uranium and they would just put the fire out (some mentioned using perchloroethylene to extinguish the fire) and continue to work. The A-wing was mentioned as the worst area because the low ceilings would not allow for as effective ventilation.

Participants also mentioned that several people in the plating shop had "cyanide poisoning" and that operators would often have their "eyes swell shut" from working over the plating tanks.

6.7 9202 Chemical Building or Development Lab

Building Description

The starting material for the uranium enrichment process was natural uranium in the form of UO3. The UO3 was converted to UCl4 which was then loaded into charge bottles and sent to the calutrons for electromagnetic separation. These buildings (9202, 9203, and 9205) were also used for processing the recycled material. This initial processing used large quantities of carbon tetrachloride and tons of natural uranium. Building 9202 also worked on development of the Orex process and included other beryllium operations (machining and processing).

Primary Exposures

The primary exposures reported included: uranium, carbon tetrachloride, mercury, beryllium, and perchloroethylene.

6.8 9203 Laboratory

Building Description

The starting material for the uranium enrichment process was natural uranium in the form of UO_3. The UO_3 was converted to UCl_4 which was then loaded into charge bottles and sent to the calutrons for electromagnetic separation. These buildings (9202, 9203, and 9205) were also used for processing the recycled material. This initial processing used large quantities of carbon tetrachloride and tons of natural uranium. Other operations included: Uranium-235 analysis (mass spec), control analyses, and initial product processing.

Primary Exposures

The primary exposures reported included: Uranium, Carbon Tetrachloride, mercury, beryllium, and Perchloroethylene.

6.9 9204-1 Beta 1

Building Description

The primary processes conducted in the Beta-1 Building included Track 1 and 2, Beta Calutron operations.

Primary Exposures

Primary Exposures reported included: external radiation, internal radiation and beryllium.

6.10 9204-2 Beta 2

Building Description

The primary processes conducted in the Beta-2 Building included Track 3 and 4, Beta Calutron operations. This facility also housed enriched uranium processing and weapons parts fabrication (including beryllium, lithium, and thorium parts).

The enriched uranium operations included: 1) reduction of UF_6 to UF_4, 2) reduction of UF_4 to metal, 3) casting or forging, 4) rolling and forming in mill operations, 5) machining of metals, 6) wet chemistry purification, recycle, and salvage, and 7) UF_4 extraction. Enriched uranium from retired weapons was recovered, usually remelted in an induction furnace, made into a casted part and sent to machining. Sometimes, however, the material was cast into long semi-cylindrical or cylindrical shapes and sent to a rolling/pressing mill and then on to a machining shop to be turned and cut to the desired design specifications.

Primary Exposures

Primary exposures reported included: external radiation, internal radiation, beryllium, alloy, HEU, Nitric Acid, Mercury, alcohol, and PCBs.

A 1955 air sampling memorandum for the Beta-2 building indicates elevated levels of alloy with the maximum values of 2,000 – 6,000 ug Alloy/m^3 in the Evaporator area, the Bird Bath area, and the Knock Out area. The plant maximum permissible level was set at 35 ug/m^3 based reportedly on 'comfort level' rather than toxicity.

Risk mapping participants mentioned this building as an area that caused strong lung irritation and sometimes frequent sneezing. Also, frequently had skin burns from working in this building.

6.11 9204-2E Beta 2 East

Building Description

This facility housed enriched uranium processing and weapons parts fabrication (including beryllium, lithium, and thorium parts) and assembly and disassembly work.

The enriched uranium operations included: 1) reduction of UF6 to UF4, 2) reduction of UF4 to metal, 3) casting or forging, 4) rolling and forming in mill operations, 5) machining of metals, 6) wet chemistry purification, recycle, and salvage, and 7) UF4 extraction. Enriched uranium from retired weapons was recovered, usually remelted in an induction furnace, made into a casted part and sent to machining. Sometimes, however, the material was cast into long semi-cylindrical or cylindrical shapes and sent to a rolling/pressing mill and then on to a machining shop to be turned and cut to the desired design specifications.

Primary Exposures

Primary exposures reported included: beryllium and HEU.

6.12 9204-3 Beta 3

Building Description

The primary processes conducted in the Beta-3 Building included Track 5 and 6, Beta Calutron operations. The building also conducted laboratory operations and plutonium separation work.

Primary Exposures

Primary exposures reported included: EU, external radiation, polonium and plutonium.

6.13 9204-4 Beta 4

Building Description

The primary processes conducted in the Beta-4 Building included Track 7 and 8, Beta Calutron operations. Beta 4 housed the Elex pilot plant in 1955-1956. Other operations conducted in this building included: Depleted Uranium Forming, Thorium operations, plating, lead arc melting, forging, rolling, and milling and machining.

Primary Exposures

Primary exposures reported included: external radiation, internal radiation, EU, Mercury, lithium, beryllium, lead, boric acid, stainless steel, Nitric Acid, Sulfuric acid, Sodium Hydroxide, Nickel Sulfamate, Cadmium, and copper.

6.14 9205 Lab

Building Description

The starting material for the uranium enrichment process was natural uranium in the form of UO3. The UO3 was converted to UCl4 which was then loaded into charge bottles and sent to the calutrons for electromagnetic separation. These buildings (9202, 9203, and 9205) were also used for processing the recycled material. This initial processing used large quantities of carbon tetrachloride and tons of natural uranium. This facility also conducted Uranium isotope analysis and Beryllium oxide machining.

Primary Exposures

Primary exposures reported included: Uranium, Carbon Tetrachloride, mercury, beryllium, and Perchloroethylene.

6.15 9206 HEU Chemical Operations

Building Description

This facility was used for Beta chemical recycle and product processing in support of the calutron operations. This facility housed enriched uranium processing and weapons parts fabrication (including beryllium, lithium, and thorium parts).

The enriched uranium operations included: 1) reduction of UF6 to UF4, 2) reduction of UF4 to metal, 3) casting or forging, 4) rolling and forming in mill operations, 5) machining of metals, 6) wet chemistry purification, recycle, and salvage, and 7) UF4

extraction. Enriched uranium from retired weapons was recovered, usually remelted in an induction furnace, made into a casted part and sent to machining. Sometimes, however, the material was cast into long semi-cylindrical or cylindrical shapes and sent to a rolling/pressing mill and then on to a machining shop to be turned and cut to the desired design specifications.

Enriched Uranium recovery, purification and recycle operations were performed primarily in buildings 9206 and 9212. These operations consisted of the following: 1) burning combustibles, 2) dissolving and leaching solids, and 3) purifying the uranium bearing solutions by chemical extraction. Generally, purified uranyl nitrate hexahydrate (UNH) solutions were produced from these operations and then denitrated to uranium trioxide (UO3), which was then reduced to uranium dioxide (UO2). The UO2 was then converted to uranium tetrafluoride (UF4) by reaction with gaseous anhydrous hydrogen fluoride. The UF4 was then reduced under high temperatures to yield uranium metal, which was cast into the desired form.

Recycled highly enriched uranium (contaminated with fission products and transuranics) was received from Savannah River, INEEL ICPP and Hanford and processed in buildings 9212 and 9206. Receipt of this material occurred as early as 1953. (DOE, 2001)

Primary Exposures

Primary exposures reported included: external radiation, beryllium, EU, and uranium metal alloys.

6.16 9207 Shops, 9208 Maintenance, 9210, 9211, 9220, 9224, and 9769

Building Description

All of these buildings were former ORNL Biology lab buildings.

Primary Exposures

Primary exposures reported included: Radiation, lead, PCBs, beryllium and asbestos.

6.17 9212 HEU Chemical and Metallurgical Building

Building Description

This building was used for the calutron operations Beta Product Processing. This facility housed enriched uranium processing and weapons parts fabrication (including beryllium, lithium, and thorium parts).

The enriched uranium operations included: 1) reduction of UF6 to UF4, 2) reduction of UF4 to metal, 3) casting or forging, 4) rolling and forming in mill operations, 5) machining of metals, 6) wet chemistry purification, recycle, and salvage, and 7) UF4

extraction. Enriched uranium from retired weapons was recovered, usually remelted in an induction furnace, made into a casted part and sent to machining. Sometimes, however, the material was cast into long semi-cylindrical or cylindrical shapes and sent to a rolling/pressing mill and then on to a machining shop to be turned and cut to the desired design specifications.

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Recycled highly enriched uranium (contaminated with fission products and transuranics) was received from Savannah River, INEEL ICPP and Hanford and processed in buildings 9212 and 9206. Receipt of this material occurred as early as 1953. (ref: Y-12 Mass Balance Report)

In 1958 an accidental nuclear fission excursion occurred in Building 9212 due to a 93% enriched uranium solution being pumped into a nuclear "un-safe" container. (ChemRisk, 196) This incident resulted in a spike in the external radiation data for that year due primarily to exposures of approximately 300 rad to 5 individuals and less than 100 rad to 3 individuals. (Dixon, 1959, McLendon, 1959, Hurst, 1959, Andrews, 1959)

Primary Exposures

Primary exposures reported included: Uranium, U-238, EU, HEU, UF4, External radiation, internal radiation, perchloroethylene, graphite, cadmium, tungsten, magnesium, alcohol, trimsol, noise, fuming nitric acid, sodium hydroxide, lithium, neutron exposures, freon and DAG.

6.18 9215 HEU Metal Forming and Machine Shops

Building Description

This facility housed enriched uranium processing and weapons parts fabrication (including beryllium, lithium, and thorium parts).

The enriched uranium operations included: 1) reduction of UF6 to UF4, 2) reduction of UF4 to metal, 3) casting or forging, 4) rolling and forming in mill operations, 5) machining of metals, 6) wet chemistry purification, recycle, and salvage, and 7) UF4 extraction. Enriched uranium from retired weapons was recovered, usually remelted in an induction furnace, made into a casted part and sent to machining. Sometimes, however, the material was cast into long semi-cylindrical or cylindrical shapes and sent to a rolling/pressing mill and then on to a machining shop to be turned and cut to the desired design specifications.

Building 9215 had the following primary operational areas: M-Wing, O-Wing, P-Wing, M-Wing Blister Area, H2 Machine Shop (Building 9998 – connected with 9215), Metallurgical Lab, and the Third Mill.

The O-Wing included Salt Baths, Oil Baths and Lead Baths that were used to heat up uranium materials so that they could be rolled. The Salt Baths contained Potassium Carbonate, Lithium, and Sodium Hydroxide and were operated at high temperatures. The Oil Baths used DAG, Perchloroethylene, and Freon as lubricants and the process was used for hydroforming. The Lead Baths (80% Lead and 20% Bismuth) were used for slow heat-treating ("aging"). The material came to the O-Wing out of the casting furnace (9212 E Wing Furnace) and at the O-Wing that would form into a billet (using the baths) and roll into a plate. Risk Mapping participants identified the O-Wing as the most highly contaminated are within 9215.

Primary Exposures

Primary exposures reported included: Uranium (enriched and depleted), uranium alloys, black oxide (U3O8), plutonium, perchloroethylene, ethylene glycol, beryllium, TCE, Lead, asbestos, heat, noise, PCBs, lithium, DAG, freon, acetone, alcohol, dykam, carbon tetrachloride, lead, aluminum, fiberglass, and noise.

Risk Mapping participants mentioned that there were a lot of skin rash problems in M-Wing and O-Wing and that prior to 1990 there was "no industrial hygiene or health physics". They also mentioned that uranium "chip" fires were very common and that you would just "hold your breath and put them out".

6.19 9401-2 Plating Shop

Building Description

This building was reportedly a plate shop that was formerly the steam plant. The building became a plating shop in the late 50s or early 60s. Risk mapping participants also indicated that they did a fair amount of "Work for Others" in this building including work from University of California, X-10, K-25 Barrier Plant.

Primary Exposures

Primary exposures reported included: Uranium, Black Oxide (UO2),Nickel, Cyanide, copper, gold, chromium, sulfuric acid, HF, Nitric acid, Sulfuric acid, HCl, Allodine, heat and coal dust, fly ash and phosphates during steam plant operations.

6.20 9766 Machine Shop

Building Description

Machining operations including beryllium machining.

Primary Exposures

Primary exposures reported included: Beryllium, thorium, radiation and asbestos.

Health and Safety quarterly reports from 1953-1956 indicate that building 9766 was regularly sampled for airborne beryllium.

6.21 9733 Stable Isotope Production Facility (1945 – 1990)

Building Description

Originally this building housed both alpha and beta calutron operations. After the decision was made to abandon use of most of the early calutron tracks in 1945, the remaining staff turned their focus on using a pilot facility with both alpha and beta calutrons for stable isotope separation and enrichment research. By 1950, 173 isotopes of 43 elements had been collected. Each year the range and purity of isotopes separated was increased as chemical techniques and equipment improved. (Compere, 1991)

Stable isotope runs were primarily on the XAX and the XBX calutrons. Other units which were used included TR-1 thru TR-6 and SG-1 thru SG-4 which we believe were the beta calutrons in building 9204-3.

This building also was used for the Orex pilot process development (9733-1 in 1951-1952) and the Elex process (9733-2 in 1950-1951).

Primary Exposures

Primary exposures reported included: External radiation, internal radiation, mercury, uranium, lithium, and various stable isotopes.

6.22 9996 Manufacturing

Building Description

This building had crucible machining operations which by the mid 60s were moved to the Alpha-1 facility.

Primary Exposures

Primary exposures reported included: Uranium, U-238

6.23 9998 DU Metal Operations

Building Description

This building was connected to the building 9212. It included the H-2 Machine Shop, the H-1 Foundry and Maintenance shops. The building provided maintenance and machining support for building 9212. The H-2 Machine shop and M-Wing Shop were renovated in 1988. The facility also did carbon foam and epoxy production operations.

Primary Exposures

Primary exposures reported included: Black Oxide (UO2), DU, Stainless steel, and Uranium with metal alloys, beryllium, and epoxy.

7.0 DISCUSSION OF PRIMARY EXPOSURES

7.1 Radiation

Monitoring Policies at the Facilities

Historically, the main purpose of the radiation monitoring programs has been to assure that each worker's exposure to radiation was kept below the current annual prescribed occupational exposure limit. Because of this aim, data collection in the early years was very limited for workers who were considered to have low potential for exposure. Also, at the time of this report, limited information is available concerning the rationale used to decide which workers to monitor, implementation of these decisions, and the methods used for assessing reliability, variability, and lower limits of detection. At each facility the radiation safety personnel were responsible for the monitoring program, making the programs essentially independent of each other.

Because internal monitoring programs were begun in 1951 by ORNL and in 1950 by Y-12 the definition of "not monitored" varies by plant and by year. By the early 1950s a worker who was not monitored for internal exposure was judged to have low potential for exposure. Because of policies in effect, external monitoring data are available for most workers from Y-12 only since 1961. ORNL began monitoring for external radiation in 1943. (Watkins, 1993)

External Radiation Exposure

Before November 1951 only those workers entering areas of potential external radiation exposure were monitored for external dose. In 1947 all workers entering a radiation area more than three times a week were assigned permanent film badges, but by 1949 permanent film badges were issued to all workers entering these restricted areas at least once a week. In November of 1951 all workers entering the main X-10 area were required to have a film badge, and by September of 1953 the film badge and security badge needed for entry were combined into one (Watkins, 1993). Risk mapping participants reported that they would often do work using a self reading dosimeter (SRD) and would not wear their film badge. They mentioned that the SRD readings were recorded in HP logs but they were not sure if this information was included in their personal dose record. (Risk Mapping Interviews, 2003)

According to site records X-10 used only daily SRDs from 1943 until about 1945, in 1945 they began to use weekly film badges until the late 50s when they changed to quarterly film badges and in about 1975 they began to use either quarterly or annual TLDs. At the Y-12 facility they also started with SRDs and in about 1950 they began to use weekly film badges, in about 1959-1960 they used monthly film badges and after 1960 until about 1980 they used quarterly film badges. After 1980 they used either quarterly or annual TLDs. From 1961-1974 badges for low potential exposure work were not always read, rather a sample of the badges issued would be read to verify that the areas were being properly defined. For early film badges the minimum detectable dose was approximately 25 mrem. The sensitivity of film badges in later years was improved over that of earlier years. (Watkins, 1993)

After extensive error checking procedures, annual external doses were calculated by summing all credible gamma and neutron film badge readings taken during the year. Because of the variability in dosimeter types, reading frequencies, and monitoring policies over time and facilities, annual doses obtained from the simple summing of readings during the year may not be comparable at all times, and a recorded dose may not always accurately represent the true amount of a worker's radiation exposure. A summary of the recorded annual doses by year and by department is included in Appendix F. This appendix contains a compilation of dose data from three sources: H&S reports, CEDR CER data files, and CEDR Mortality study data files. The mortality study data files included some extrapolation of doses for times when data was missing and therefore the results are different than the other data sets. A summary of the external dose data (annual doses greater than 500 mrem) versus department is included in Appendix B.

Internal Radiation Exposure

Film badges measure external exposure over a given period of time; monitoring for internal exposure is performed at specific points in time; therefore, the results are estimates of the body or organ burden at the time of measurement. The primary methods of internal monitoring used were urinalysis and in vivo gamma spectrometry, but fecal analysis was also performed in some instances. The dosimetry associated with analysis of urine for radioisotopes of concern depends on relating the amount of an isotope in a reference volume of urine to the amount contained in the body or in specific organs. The relationship between these two amounts is affected by many variables, such as the radioisotope, time since exposure, the chemical and physical form of the isotope, and biological variation among individuals.

In general, workers were monitored only if they worked in locations or administrative groups that were judged by supervisors or radiation safety organizations to have internal exposure potential. Periodically, after about 1950 individuals from the unmonitored workers were randomly selected and monitored by ORNL to confirm that unmonitored workers were indeed unexposed to internal radiation. The policy at Y-12 was to increase monitoring frequency as internal exposure potential increased. (Watkins, 1993, Patterson, 1957, West, 1977)

Workers at TEC had a high potential for internal contamination because of the process performed at the facility. However, personal monitoring data were not available because no bioassay or whole body counting programs were established when it was in operation.

Review of External and Internal Data from Databases and HP Reports

There is an increasing trend in external doses at ORNL until the late 1950s and a steady decrease afterwards, while at Y-12 there is greater variability in the total recorded annual external dose. The Y-12 peak in 1958 is due to a criticality accident involving eight workers and does not represent a general increase in external dose. (Appendix F)

The percentage of individuals monitored for external exposures at X-10 remained at about 85-90% from 1950-1985 while the percentage at Y-12 was at about 20% until 1960 when it was raised to 85-90%. Generally the percentage of workers monitored for internal exposures was between 20- 40% each year with the highest percentages for both plants occurring around 1963-1965.

A summary of the annual radiation dose ranges for the X-10 site is included in Appendix F. It is interesting to note that in 1960 there is a sharp drop off in the number of individuals with annual doses in excess of 2 rem and also a sharp increase in the number of individuals being monitored.

A 1958 HP report indicated that of the 10 highest cumulative dose due to penetrating radiation 9 individuals were from the Radioisotope Production Division. The cumulative doses were received over 7 – 15 years and ranged from 42.5 – 64.8 rem. (Hart, 1958)

HP risk mapping participants thought that the worst areas for internal exposures would have been Buildings 3038, 3517 and 3019.

Recorded external doses at Y-12 were generally lower than doses at X-10. The only significant internal monitoring was uranium urinalysis and in-vivo testing (uranium-235 and thorium). Over the years it was assumed that monitoring for uranium would be satisfactory as a surrogate measure of other contaminants in the uranium (i.e., transuranics (such as neptunium and plutonium) or fission products in recycled fuel). Data was unavailable to determine whether there were processes or areas where these transuranics may have concentrated and therefore been a greater potential hazard. Additionally, a recent report discussing the current Y-12 Internal dose program (Eckerman, 1999) stated that "following the recent restart of operations at the Y-12 Plant, the Radiological Control Organization (RCO) observed that the enriched uranium exposures appeared to involve insoluble rather than soluble uranium that presumably characterized most earlier Y-12 operations." Based on this finding the bioassay program was modified, particularly specifying the need for routine fecal sampling. This raises questions with regard to potential missed doses.

7.2 Beryllium

Data from the Y-12 Beryllium Worker Enhanced Medical Surveillance Program, funded by DOE, indicated that the buildings associated with CBD cases or sensitized workers included: Alpha-5, 9202, Butler Building, Beta-4, Beta-2, 9212, 9766, 9995 and 9998. (Bingham, 1997)

Additionally, a 1973 Y-12 document (DOE, 1973) identified Alpha-5, Alpha-3, 9202, and 9995 as "Beryllium Control Areas". Additionally, H&S summary reports from 1953-1960 indicate that Beryllium air sampling was frequently conducted in Building 9766 and to a less extent in Building 9212 (Appendix D).

A broad based approach to defining the group potentially exposed to beryllium is recommended since published data (Newman 1989, Kreiss 1996) demonstrate that while there are job related and exposure related elevated risks for chronic beryllium disease (CBD), individuals with low-level exposure can be affected. For this reason a two-tiered approach is recommended based on exposure groupings.

7.3 Mercury

The mercury concentration in the workplace air was monitored frequently at the Y-12 facility (In 1956, over 200,000 air readings were taken – see Appendix D). In the 1955 cascade start-up, many readings of mercury concentrations in the workplace air were higher than the 0.1 mg/m^3 then recommended (current recommendation is 0.05 mg/m^3). A urinalysis program started in 1953 was expanded to provide a check on the worker mercury exposures. During 1955 and into 1956 approximately 200 – 300 workers had readings that exceeded the 0.3 mg/liter of urine recommended limit. When a workers' urinary mercury remained elevated for several specimens the workers were re-assigned. Approximately 70 workers were involved in temporary re-assignments of this nature. In addition to the air sampling and urine program, there was a special medical surveillance program involving clinical examinations of mercury workers being performed every six months. Persons with a history of albumin uria, kidney problems, or hypertension were screened out and not allowed to work with mercury. (Mercury Task Force, 1983(a), 1983(b))

During the latter part of the Colex start-up during 1955, AEC and Y-12 management undertook a crash program to bring the workplace mercury vapor levels down to acceptable levels. Air sampling results seem to suggest that airborne concentrations were reduced after 1955 as is indicated by the drop in the percentage of air samples in excess of the 0.1 mg/m^3 limit (see Appendix D).

A Y-12 1977 report, Mercury Inventory at Y-12 Plant, 1950 through 1977, indicated that 2.4 million pounds of mercury has been 'lost' or 'unaccounted for'. (Mercury Task Force, 1983(a), 1983(b))

A Emory University study conducted in 199x as a follow-up to University of Michigan study of the mercury workers at Y-12 showed that 'neurological effects of relatively heavy exposure were still detectable more than 30 years after cessation of that exposure'. The study concluded that the exposure measure with the strongest association with the outcome was cumulative exposure (cases were selected by cumulative exposure of >= 2000 ugHg/liter-quareter or a one time urine value of greater than 600 ugHg/liter). The department numbers identified as "High Exposure Potential" in the NIOSH report included: 2025, 2026, 2681, 2682, 2683, 2685, and 2690. (Emory University)

Priority buildings (buildings where frequent sampling for mercury was conducted and/or a high percentage of samples were identified in excess of the site MPC levels), based on company IH records (Appendix D), include: Beta-4, Alpha-2, 9202, Alpha-5 and Alpha-4. According to a 1957 Health Physics Program Report (Y-1186) (Patterson, 1957) "a routine mercury vapor sampling program is maintained in buildings 9201-2, 9201-4, 9201-5, 81-10, and 9204-2; buildings in which a potentially serious mercury vapor problem may exist". During 1955 through 1956 the percent of mercury urine samples which exceeded the MPC (0.3mg/m^3) ranged from 10% to 30%. A further breakdown of this data indicates that Machinists were exposed to the highest levels while chemical operators were lower and electrician still lower than that. The Machinists reported concentrations ranged from 0.5 to 0.3 mgHg/liter, the chemical operators ranged from 0.46 to 0.3, and fially the reported concentrations related to Electricians exposures ranged from 0.12 to 0.2 ugHg/liter. (Mercury Task Force, 1983(a), 1983(b)

At X-10, Building 4501 housed the Orex pilot project and during risk mapping sessions was reported to have had a lot of mercury. Other uses of mercury at the X-10 site appear to be on a smaller scale (instruments, labs, etc.). It should however, be pointed out that many X-10 workers began working at the Y-12 site (as X-10 employees) after the calutron operations were shut down.

7.4 Caustics

Nitric acid and Hydrofluoric acid were used extensively in isotope separation and purification operations. Specifically buildings 3019, 9212, 9215, 3505, Alpha-5, 9203, 9206, 9929, and 9401-2 were involved in uranium or other isotope recovery, processing, separation or purification. Steps within these processes involved many caustic materials including two of the primary acids used, Hydrofluoric acid and Nitric acid (in some cases fuming nitric acid).

H&S summary reports indicate that air sampling for lithium was conducted at the Y-12 site. Risk mapping participants mentioned that lithium at the site caused strong lung irritation and sometimes frequent sneezing. Also, frequently had skin burns from working with this material.

Additionally, Tetramethyl ammonium borohydrate (TMAB) was present at the Y-12 site and is, according to toxicology references (Holland) a strong irritant and is considered to have similar toxic properties as other boron compounds.

7.5 Solvents

Chlorinated solvents were used extensively at both the Y-12 and X-10 facilities over the history of the sites. Generally the use of carbon tetrachloride was only prevalent during the early years of operation. TCE and perchloroethylene were used extensively throughout the history of the sites. The areas where potential exposures were the greatest included the pilot separation or processing buildings and the machine shops. Participants in the risk mapping sessions indicated that the machinists would "use perc to put out chip fires while machining uranium". They indicated they would 'use it for everything'.

In addition to the common chlorinated solvents mentioned above and used for cleaning and degreasing, acetonitrile was used at the Y-12 site.

7.6 Noise

Noise exposure was reported as a problem associated with production operations at both the X-10 and Y-12 sites. The type of operations conducted at the sites over the history (e.g. separations operations, calutrons, lithium separation operations, machining) would be consistent with elevated noise exposures. Risk mapping participants also indicated that hearing protection requirements, or the adherence to the requirements, was fairly lax in the early years.

7.7 Asbestos

As in many of the DOE facilities, asbestos use was prevalent at both X-10 and Y-12. Asbestos was common in all building materials and additionally other uses including asbestos blankets, asbestos covering on piping, and asbestos gloves were reported. Highest exposures to asbestos would likely have been maintenance workers due to the more intrusive nature of their jobs.

8.0 References

Andrews, GA, Sitterson, BW, Kretchmar, AL, and Bruger, M, 1959. Accidental radiation Excursions at the Oak Ridge Y-12 Plant, IV Preliminary Report on Clinical and Laboratory Effects in the Irradiated Employees, HP, 1959, Volume 2, 134-138.

Bingham, E, 1997. Surveillance of Former Construction Workers at Oak Ridge Reservation: A Revised Needs Assessment, University of Cincinnati, December, 1997.

Breslin, A.J. and Harris, W.B. Health Protection in Beryllium Facilities Summary of Ten Years of Experience. OROO14820. US Atomic Energy Commission. May 1, 1958

Burch, W.D. Organization of the Interventions on 'Hot' Facilities mishaps, maintenance, and dismantling . AEA-SM-125/44.

Brooksbank,Sr. R.E., Patton, B.D., and Krichinsky, A. M. Historical Programmatic Overview of Building 3019. ORNL/TM-12720. August 1994.

Bruce, F. 1956. Behavior of Fission Products in Solvent Extraction Processes, Progress in Nuclear Energy, Series III, Process Chemistry, McGraw Hill, 1956.

Bruce, F, and Ferguson, D. 1960. Two directly maintained pilot plants", Geneva Conference, 1960.

Caplan, Knowlton J., Edwards Richard M., Fellows John A., Harrington Charles D., Kuhlman Carl W., Philoon Wallace C., Ruehle Archie E., and Shepardson John U. Uranium Production Technology. 1959.

Case, J.M. and Watkins, E.R. How Oak Ridge Machines Beryllium. American Machinist. Y-FC-50. December 22, 1955.

Checkoway, H, Mathew, RM, Watson, JE, Tankersley, WG, Wolf, SH, Sith, JC, and Fry, SA. 1985. Radiation work experience and cause specific mortality among workers at an energy research laboratory. British Journal of Industrial Medicine, 42: 525-533, 1985.

Checkoway, H, Pearce, N, Crawford-Brown, DJ, and Cragle, DL. 1988. Radiation doses and cause-specific mortality among workers at a nuclear materials fabrication plant. American Journal of Epidemiology, 127 (2): 255-266, 1988.

ChemRisk. 1993. Bruce, GM, Buddenbaum, JE, Lamb, JK, and Widner, TE. Oak Ridge Health Study, Phase I and II Reports, 1993.

ChemRisk. 1993(a), Y-12 Enriched Uranium Process flow diagrams, report excerpts, Accession No. 466.

Compere, A.L. and Griffith, W.L. The U.S. Calutron Program for Uranium Enrichment: History, Technology, Operations, and Production. ORNL-5928. October 1991.

Cragle, DL, McLain, R, Qualters, J, Hickey, JLS, Wilkinson, G, Tankersley, WG, Lushbaugh, CC. 1988. Mortality among workers at a nuclear fuels production facility. American Journal of Industrial Medicine, 14: 379-401, 1988.

Cragle, DL, 1996. CEDR ORISE Working Data File Set, CER ORISE, 1996.

Davis, D.M., and Morgan, K.Z. Health Physics Division Applied Health Physics Annual Report for 1964. ORNL-3820.

Davis, D.M., and Auxier, J.A. Applied Health Physics And Safety Annual Report for 1976. ORNL-5310.

Davis, D.M., and Auxier, J.A. Industrial Safety Applied Health Physics Annual Report for 1977. ORNL-5420.

Davis, D.M., and Auxier, J.A. Industrial Safety Applied Health Physics Annual Report for 1978. ORNL-5543.

Davis, D.M., and Auxier, J.A. Industrial Safety Applied Health Physics Annual Report for 1979. ORNL-5663.

Davis, D.M., and Auxier, J.A. Industrial Safety Applied Health Physics Annual Report for 1980. ORNL-5821.

Dean, O.C., Messing, A.F., and Forsberg, H.C. The Use of mercury in Reprocessing Nuclear Fuels. February, 1960.

Dixon, C and Thomas, J. 1959. Accidental Radiation Excursion at the Oak Ridge Y-12 Plant – I Description and Physics of the Accident, HP, 1959, 363-372.

DOE, 1973. Beryllium Control Areas (Y-12 facility), Be-USA02571, OR0007705.

DOE, 2001, DOE Recycled Fuel Mass Balance Report for the Y-12 Complex, 2001.

Dupree, EA, Watkins, JP, JN Ingle, Wallace, PW, West, CM, and Tankersley, WG. 1995. Uranium Dust Exposure and Lung Cancer Risk in Four Uranium Processing Operations. Journal of Epidemiology.

Eckerman, K.F. and Kerr, G.D. Y-12 Uranium Exposure Study. ORNL/TM-1999-114. August 5, 1999.

Emory University and Center for Epidemiological Research division of Oak Ridge Associated Universities, Final Report for A Study of the Health Effects of Exposure to

Elemental Mercury: A Follow-up of Mercury Exposed Workers at the Y-12 Plant in Oak Ridge. HE#94-181, 19xx.

Frome, EL, Cragle, DL, Watkins, JP, Wing, SB, Shy, CM, Tankersley, WG and West, CM. 1997. Oak Ridge Mortality Study, ORNL-6785, 1997.

Frome, EL, Cragle, DL, and McLain, RW, 1990. Poisson regression of the mortality among a cohort of World War II nuclear industry workers (TEC workers). Radiation Research 123: 138-152, 1990.

Genung, Richard, Jolley, Robert, and Mrochek, John. A Brief History of the Chemical Technology Division. ORNL/M-2733. May 1993.

Goldsmith, W.A., Ellis, W.B., Rhyne, W.R., and Ragan, C.C. Isotopes White Paper: Assessment of Selected Isotopes Circle Facilities, Evaluation of Isotope Processing Alternatives, and Funding Justification for LLW-CAT System for Isotopes Area. Lee Wan & Associates, Inc. December 1987.

Goldsmith, W.A., Ellis, W.B., Rhyne, W.R., and Ragan, C.C. Isotopes White Paper: Volume II: Appendices Lee Wan & Associates, Inc. January 1988.

Harris, William B. The Industrial Hygiene of Uranium Fabrication. U.S. Atomic Energy Commission. June 6, 1958.

Hart, J.C. Health Physics Division Applied Health Physics Annual Report for 1958. ORNL-2777.

Hart, J.C. Health Physics Division Applied Health Physics Annual Report for 1959. ORNL-3073.

Hart, J.C., and Morgan, K.Z. Health Physics Division Applied Health Physics Annual Report for 1960. ORNL-3159.

Hart, J.C., and Morgan, K.Z. Health Physics Division Applied Health Physics Annual Report for 1961. ORNL-3284.

Hart, J.C., Davis, D.M., and Morgan, K.Z. Health Physics Division Applied Health Physics Annual Report for 1962. ORNL-3490

Hart, J.C., Davis, D.M., and Morgan, K.Z.. Health Physics Division Applied Health Physics Annual Report for 1963. ORNL-3665.

Holland, J.M. and Epler, J.L. Toxicity and Mutagenic Evaluation: Tetramethylammonium Borohydride (TMAB) ORNL-5576.

Hurst, GS, Ritchie, RH, and Emerson, LC, 1959. Accidental radiation Excursions at the Oak Ridge Y-12 Plant, III Determination of Radiation Doses, HP, 1959, Volume 2, 121-133.

Kreiss, K, Mroz, MM, Newman, LS, Martyny, J and Zhen, B, 1996. Machining risk of beryllium disease and sensitizatin with median exposures below 2 mg/m^3. American Journal of Industrial Medicine. 30: 16-25, 1996.

Lincoln, Thomas, MD. Health Division Annual Report Covering Period: July 1955- June 1956. ORNL-2190. February 13, 1957.

Lippman, M., Ong, L.D.Y., and Harris, W.B.. The Significance of Urine Uranium Excretion Data. Health and Safety Laboratory. HASL-120. June 15, 1962.

Labor Occupational Safety and Health Program (LOSH) of the UCLA Center for Occupational and Environmental Health, Risk Mapping: A Group Method for Improving Workplace Health and Safety, UCLA, 1996.

McLendon, JD, 1959. Accidental radiation Excursions at the Oak Ridge Y-12 Plant, II Health Physics Aspects of the Accident, HP, 1959, volume 2, 21-29.

McMillan, Edwin M. The Transuranium Elements: Early History. Nobel Lecture, December 12, 1951.

McRee, P.C., West, C.M., and Mclendon, J.D. Y-12 Radiation Safety Manuel. Y-1401. March 24, 1965.

Mercury Task Force, 1983(a). A Study of Mercury at the Y-12 Plant, Accountability, and Impacts on Y-12 Workers and the Environment-1950 to 1983. Y/EX-24.

Mercury Task Force, 1983(b), Mercury at the Y-12 Plant. Y/EX-23. November 1983.

Morgan, KZ. 1959. Preliminary Report of Action Taken by the Health Physics Division following the Explosion at ORNL on November, 20, 1959, December, 1959.

Morgan, KZ. 1961. Health Physics Problems Associated with Recent Accidents at ORNL. August 11, 1961.

Newman, LS, Kreiss, K, Mroz, MM, and Campbell, PA, 1989. Screening blood test identifies subclinical beryllium disease. Journal of Occupational Medicine. 31: 603-608, 1989.

ORNL, 1982. Industrial Safety Applied Health Physics Annual Report for 1982. ORNL-5962.

ORNL, 1989. ORNL Releases During 1948 and 1949. ORNL/FPO-89/121. December 15, 1989.

ORNL, 1997. ORNL Isotopes Facilities Deactivation Project. Final Deactivation Porjest Report on the Alpha Powder Facility, Building 3028, at ORNL, Oak Ridge, Tn. ORNL/ER-399. April 1997.

ORNL, 1995, Level 3 Baseline Risk Assessments for Building 3515 at ORNL, ORNL/ER-311. September 13, 1995

ORNL, 1997(a), ORNL Safety Analysis Report for the Radioactive Materials Analytical Laboratory (RMAL) (Building 2026), ORNL/CASD/2026/SAR/R0, 1997.

Owings, Edward. Historical Review of Accountable Nuclear Materials at the Y-12 Plant. Y/EXT-00153/DEL Rev. July 28, 1995.

Parker-Brown, Marianne, 1995. Worker Risk Mapping: An Education for Action Approach, New Solutions, 1995.

Parrott, J.R. Decontamination of Cells 6 and 7, Building 3019, Following Plutonium – Release Incident. ORNL-3100. August 25, 1961

Patterson, G.R., West, C.M., and McLendon, J.D. The Y-12 Health Physics Program. Y-1186. November 1, 1957

Quist, Arvin S. OSCA (Oak Ridge Classificaton Associates). A History of Classified Activities At Oak Ridge National Laboratory. ORCA-7. September 29, 2000.

Richardson, David, 1998. Expanded ORNL Cohort Study (CEDR, orx10a05).

Rimshaw, S.J., and Ketchen, E.E. Curium Data Sheets. ORNL-4357. January 1969.

Rimshaw, S.J., and Ketchen, E.E. Compatibility Data Sheets for Cesium-144, Cesium-137, Curium, and Strontium-90. ORNL-4189. November 1967.

Risk Mapping, Risk Mapping Interviews with former Y-12 and X-10 workers, CPS, Inc. June – August, 2003.

Rupp, A.F. A Description of the Isotopes Development Center. September 30, 1963.

Schaich, R.W. Isotopes Development Center. Hazards Report For Building 3028-E. ORNL-TM-768. March 1964

Schaich, R.W. Safety Analysis of Building 3028. ORNL-TM-3192. December 1970.

Schaich, R.W. Isotopes Development Center. Hazards Report for Building 3028-E. ORNL-TM-768. March 1964.

Schaich, R.W., Hunter, H.G., and Setaro, J.A. Safety Analysis of Isotopes Alpha Handling Facility. ORNL-TM-2845. March 1970.

Schaich, R.W., Butler, T.A., Beauchamp, E.E., and Lamb, E. Hazard Report for Building 3517. ORNL-TM-852. May 4, 1964.

Sease, J.D., Lotts, A.L., and Davis, F.C. Thorium-Uranium-233 Oxide (kilorod) Facility-Rod Fabrication Process and Equipment. ORNL-3539. April 1964.

Sims, T.M. Personnel-Exposure and Containment Control in the Routine Operation of the ORNL Research Reactors. ORNL-TM-278.

Snyder, W.S., Davis, D.M., and Morgan, K.Z. Health Physics And Safety Annual Report for 1965. ORNL-3969.

Snyder, W.S., Davis, D.M., and Morgan, K.Z. Health Physics And Safety Annual Report for 1966. ORNL-4146.

Snyder, W.S., Davis, D.M., and Morgan, K.Z. Health Physics And Safety Annual Report for 1967. ORNL-4286.

Snyder, W.S., Davis, D.M., and Morgan, K.Z. Applied Health Physics And Safety Annual Report for 1968. ORNL-4423.

Snyder, W.S., Davis, D.M., and Morgan, K.Z. Applied Health Physics And Safety Annual Report for 1969. ORNL-4563.

Snyder, W.S., Davis, D.M., and Morgan, K.Z. Applied Health Physics And Safety Annual Report for 1970. ORNL-4690.

Snyder, W.S., Davis, D.M., and Morgan, K.Z. Applied Health Physics And Safety Annual Report for 1971. ORNL-4795.

Snyder, W.S., Davis, D.M., and Auxier, J.A. Applied Health Physics And Safety Annual Report for 1972. ORNL-4894.

Soman, S.D. Personnel Protection in Hot Facilities. IAEA-SM-125/3

Stapleton, D.R. A Brief History of the Research Reactors Division of ORNL, ORNUM-2342, 1993.

Thompson, W.E. History of the Oak Ridge National Laboratory 1943-1963. August 23, 1963

Thompson, W.E. A History of the Radioactive Barium-Lanthanum Process and Production. ORNL-246 Special. June 22, 1949.

Turner, J.E., Davis, D.M., and Auxier, J.A. Applied Health Physics And Safety Annual Report for 1973. ORNL-4974 .

Turner, J.E., Davis, D.M., and Auxier, J.A. Applied Health Physics And Safety Annual Report for 1974. ORNL-5055.

Turner, J.E., Davis, D.M., and Auxier, J.A. Applied Health Physics And Safety Annual Report for 1975. ORNL-5169.

Turner, R.R. Review of Available Information for Mercury at Building 9201-2. Y/TS-626. February 1990.

USAEC (US Atomic Energy Commission). Symposium on Occupational Health Experience and Practices in the Uranium Industry. HASL-58. October 15-17, 1958

U.S. Atomic Energy Commission. Historical Regulations. Chapter 0524 Permissible Levels of Radiation Exposure. AEC 0524-01. January 9, 1958.

Vance, J.E. and Warner, J.C. Uranium Technology. General Survey. 1951.

Watkins, JP, Reagan, JL, Cragle, DL, Frome, EL, West, CM, Crawford-Brown, D, and Tankersley, WG, 1993. Collection, Validation, and Description of Data for Oak Ridge Nuclear Facility Mortality Study, Technical Report J42, ORISE, 1993.

Watkins, JP, Cragle, DL, Frome, EL, West, CM, Crawford-Brown, D, and Tankersley, WG, Adjusting External Doses from ORNL and Y-12 facilities for the Oak Ridge Nuclear Facility Mortality Study, Technical Report G-34, ORISE, 1994.

West, C.M., Scott, L.M., and Schultz, N.B. Sixteen Years of Uranium Personnel Monitoring Experience in Retrospect. Y/DD-225. July 3-8, 1977.

Wing, S, Shy, CM, Wood, J, Wolf, S, Cragle, DL, and Frome, EL. 1991. Mortality among workers at Oak Ridge National Laboratory. JAMA 265 (11): 1397-1402, 1991.

Wing, S, Shy, CM, Wood, J, Wolf, S, Cragle, DL, Tankersley, WG, and Frome, EL. 1993. Job factors, radiation and cancer mortality at Oak Ridge National Laboratory: follow-up through 1984. American Journal of Industrial Medicine, 23: 265-279, 1993.

Wolf, B.S. M.D. Progress Report of Field Investigations Pertinent to the Problem of Maximum Acceptable Levels for Uranium Exposure. U.S. Atomic Energy Commission. September 26, 1949.

Wolf, Susanne, 1996. Oak Ridge Y-12 Mortality Study, (CEDR-ory12a05).

Wolf, Susanne, 1998, CEDR Chemical and Physical Hazard Assessment Working Data Files Set, 1998.

Wolf, Sussane, 1998(a). CEDR Detailed External Radiation Mortality working data file set, 1998.

Wolf, Sussane, 1998(b). CEDR Detailed Internal Raddiation Mortality working data file set, 1998.

Y-12, 1952-1962. Y-12 Quarterly Reports Health and Safety Section.

Section VI. Focus Groups

Introduction

Description of Focus Groups

In conducting the Needs Assessment of the X-10 and Y-12 workers at Oak Ridge, it was necessary to find out directly from the workers what they would like in an occupational medical screening program. While his was partially accomplished through questionnaires, talking to workers in person in an organized setting was essential to developing the program most responsive to their needs. Thus, four focus group sessions with former and current workers were conducted to gauge their occupational health concerns, how they perceive their occupational health risks, their desire for and expectations of medical surveillance and high risk notification, their current access to health care, and potential issues concerning outreach.

Two focus groups were held on July 8, one for X-10 and one for Y-12. On August 5, two additional sessions took place with different participants from the two facilities.

Because of classification issues, the four sessions were held in a secured room in the Security Building at the site and were restricted to those workers with L or Q clearances (for Y-12). Temporary clearances were granted for retired workers. The Focus Group Moderator for all four sessions was Tom Moser, local coordinator for the WHPP program at K-25, a current worker at K-25 and a long-time health and safety training coordinator for the local. Mr. Moser has a Q clearance. The health and safety representatives for the respective plants assisted him in the sessions: Jeff Hill, David Barncord and Jim Blankenship for X-10, and Larry Jones, Harold Lawson and Carl Johnson for Y-12. Carl "Bubba" Scarbrough, ATLC president, worked with the health and safety representatives to plan and set up the sessions. He also welcomed each group and provided a brief overview of how ATLC was able to get the program initiated.

The session was taped with a tape recorder supplied by DOE. The tapes and the demographic data sheets were submitted to the DOE security office for clearance prior to release. Once cleared, a professional transcribed the tapes; this report is based on that transcription and reports from the health and safety representatives and Tom Moser. Due to a technical problem involving the tape, some of the comments from the participants were inaudible.

The Moderator Guide used for the sessions was modeled on the one originally used at the K-25 focus groups, which was modified by the X-10 and Y-12 health and safety representatives after group discussions on May 20, 2003 (See Appendix __). At that time, Sylvia Kieding gave an instructional presentation on focus groups and made recommendations to Tom Moser on how the X-10 and Y-12 sessions should be conducted.

The presence of knowledgeable and trusted health and safety representatives from X-10 and Y-12, as well as the experience of the moderator, Tom Moser, provided an indispensable contribution to the discussions.

Focus Group Format

All participants were assured that their names would remain confidential and were asked permission to audiotape the session. As decided previously by the ATLC health and safety representatives, the agreement had to be unanimous. The participants were asked to fill out demographic information sheets, which are summarized in the tables preceding each set of focus groups.

The participants consisted of former and current workers, both salaried and hourly. The ATLC health and safety representatives attempted to make the groups representative of the sites, selecting participants on the basis of their experience and job category at the plant.

Table 1. Demographic Characteristics of X-10 Focus Group Participants, by Date of Focus Group

	July 8	August 5	Total
Gender			
Male	7	5	12
Female	0	3	3
Average age, years	60.7	65.6	63.15
Duration of employment at X-10, years	27.7	32.9	30.3
Employee type			
Hourly	4	2	6
Salaried	3	6	9
Reason for leaving X-10			
Retirement	1	4	5
Early retirement	4	3	7
Voluntary separation package	0	0	0
Other (i.e., off-the-job injury/illness)	2	1	3
Race			
White	6	6	12
Black	1	2	3
Marital status			
Married	6	8	14
Single	1	0	1
Education			
Some high school or less	1	0	2
High school graduate	1	4	5
Some college or advanced vocational training	3	2	5
College degree	0	1	1
Some post-college	1	0	0
Graduate degree	1	1	1
Income			
$10,001-20,000	0	0	0
$20,001-30,000	1	1	2
$30,001-40,000	1	2	3
$40,001-50,000	0	3	3
$50,001-70,000	1	2	3
$70,000+	3	1	4
No answer	0	0	0
Religion			
Protestant	7	8	15
Other	0	0	0
No answer	0	0	0

Report of X-10 Focus Group Findings, by Topic

The following is a breakdown of responses to the questions posed by the Moderator following the Moderator's Guide for the X-10 sessions the mornings of July 8 and August 5. The results from the two X-10 focus groups have been condensed into the most salient findings from both sessions.

Topic I: Health Concerns – Perception of Occupational Health Risks

Questions:

Participants were asked if they think that they or their co-workers are at risk from occupationally related health problems and, if so, what they are.

Summary of responses:

- The primary hazards named by the participants included radiation, mercury, asbestos, beryllium and chemical exposures in general.
- The workers said that management told them that radiation didn't bother you. Workers were sent into radiation areas repeatedly regardless of whether or not they were hot.
- Participants said that they would go on a job and not know what they were working with and that their exposures dated back to a time when monitoring was inadequate or non-existent. There was really no program to address the various hazards.
- Most of them stated that cancer and lung disease are their major concerns from job exposures. A few mentioned heart disease. The cancers of concern were prostrate and leukemia and one area, reproduction, was cited as an area where "everyone got cancer."
- The workers felt that the cancer rate was higher at X-10 than in the general population. Because of lack of ventilation, they felt that secretaries could have high or higher exposures than other workers to such substances as mercury. Every day they walked past a building with a mercury pit without any protection.

Sample responses:

"In a steam pit below a particular building, there was a mercury pit. They literally shoveled the mercury out of the pit."

"We worked at a time when asbestos was not viewed as a problem, you'd have to shower in the afternoon to get the asbestos out of your hair."

"I was a laborer finally assigned to the burial ground collecting and transporting and disposing of radioactive waste."

"In a 1995 regular (every two year) screening, I had a PSA reading of 51.85 but was not told about it until June of 1999. I had prostrate surgery eventually followed up by 35 radiation treatments. Hand I been told in 1995 that I had the 51.85 reading, in all probability the cancer would not have spread outside the prostrate."

"I have had vein problems, heart problems and I got lung problems. I was never informed by the company but I have had asbestosis."
"My mother worked in reproduction for years and she died with leukemia. Everybody in the reproduction area had some form of cancer."

Topic II: Health Care/Delivery Utilization Issues

Questions:

1. Participants were asked about their current medical needs and current medical programs.
2. Participants were also asked if they would be interested in and participate in a medical and health information program for their occupational health concerns.
3. The workers were asked what they would like in an occupational health program and where/how they would like the program administered.
4. Are there any roadblocks or impediments to participation, and how can they be resolved?

Summary of responses:

- Participants generally had periodic physicals from their primary care physicians but admitted that the primary care physician never discussed their work, nor was he/she qualified to look at occupational disease.

- The workers were unanimously in favor of an occupational medical screening program, under certain conditions. They were emphatic that none of the testing take place at clinics in Oak Ridge because they felt there were no physicians that could be trusted in Oak Ridge.

- They would like a complete physical with special attention paid to the exposures at the site. They felt that plant medical records should be incorporated into the testing program. Two of the most important components of the program should be trust and credibility, which should be reflected in the clinics chosen. Clinics should be within driving distance and the program should be continuous as opposed to consisting of a single exam. It should also include current workers. They are hoping to get the CT scan unit because of their exposures to beryllium, asbestos and possible other lung carcinogens. They feel that the CT scan unit can save lives, as it has done at K-25.

- The three biggest impediments to a successful program would be lack of trust, inconvenience, and the absence of physicians independent of the DOE. Also cited was the difficulty of getting plant medical records for use in the program.

Sample responses:

"I would like to see a program that would just monitor our health, just a good overall physical looking for things that might be particular to exposures that we might have had in the workplace, either chemicals, radiation paints, or whatever."

"I think the perception is that Oak Ridge physicians may be biased...they're not going to step on anybody's toes."

Topic III: Outreach/Access and Health Education/Information Resources

Questions:

1. Participants were asked the best ways to notify people of a medical testing program and to invite them to participate.
2. What are their current sources of health information?
3. How do participants like to get health information?

Summary of responses:

- There was general agreement among the workers that direct mailings to their houses are the best form of notification and invitation. Other methods included the TV news, retiree newsletters, and a notice in the checks paid out to retirees. Participants also cited word-of-mouth.

- Current sources of health information include the AARP magazine, a retirement paper, brochures in doctor's offices and the Internet. They like to get health information through direct mailings.

Sample responses:

"You get a retirement newsletter, they've got addresses."

"Most everyone watches the news. If you had it on, like channel 10."

"We're retirees, benefit plans will have, will know where we're at because they mail our checks out."

"I'm involved in the sale of health insurance and life insurance and those kinds of thins and I'm bombarded with all that information. I tend to try to read it as much as I can and I am one that, if I see a brochure laying around somewhere, I tend to pick it up."

Observations, X-10 Focus Groups

The use of focus groups in this needs assessment has yielded information that will be invaluable in structuring a medical testing program and providing health hazard education at X-10.

The impressions captured here are based on a review of the transcript of the sessions as well as demographic sheets, both of which were reviewed by DOE for clearance. The focus group moderator, Tom Moser, and the X-10 health and safety representatives were, of course, responsible for the quality of the data gathered and for keeping the discussions focused.

There was a lack of trust in DOE and local clinics, which they believed were too closely tied to DOE. The lack of past exposure data prompted the recommendation that any medical testing program consist of a comprehensive physical supplemented by testing targeted to the specific exposures at X-10.

There was repeated insistence that medical data from the plant medical clinics be included and reviewed as part of the medical testing program.

All of the participants felt that the program should be ongoing rather than consist of a one-time exam. They felt that the latency period for many diseases demanded periodic monitoring.

Recommendations, X-10

- **The need exists for an occupational medical surveillance program.**
  Focus group participants felt that an occupational medical program was necessary because of the lack of knowledge of their primary care physicians of the impact of occupational exposures.

- **Independent physicians without any ties should administer the medical testing program to DOE or the contractors and in cooperation with ATLC.**
  Participants cited trust and credibility as the most important components of any medical testing program or there would be lack of interest and participation. They ruled out Oak Ridge as a testing site because of its close ties with DOE and the contractors, for instance. Local clinics should be used but they should be within driving distance.

- **The testing program should incorporate plant medical records.**
  Participants stressed their desire to include plant medical records if this were at all feasible.

- **Participants favored direct mailings to inform workers of the program and invite them to participate.**
  The workers felt that the best way to reach X-10 workers is through direct mail, perhaps through a notice included in pension and pay checks.

- **The testing program should be on going rather than a one-time occurrence.**
  Participants repeatedly stressed the need for periodic testing because of the long latency periods common to many of the diseases of concern.

- **Current as well as former workers should participate in the testing program.**
  The focus group members felt that the program should begin with the retirees but should go on to include current workers because of the mistrust of the site clinic.

Table 1. Demographic Characteristics of Y-12 Focus Group Participants, by Date of Focus Group

	July 8	August 5	Total
Gender			
Male	11	7	18
Female	0	0	0
Average age, years	59.8	67.2	63.5
Duration of employment at X-10, years	31.0	31.5	31.2
Employee type			
Hourly	10	7	17
Salaried	1	0	1
Reason for leaving X-10			
Retirement	1	3	4
Early retirement	3	0	3
Voluntary separation package	0	0	0
Other (i.e., off-the-job injury/illness)	0	2	2
Race			
White	10	7	17
Black	1	0	1
Marital status			
Married	9	7	16
Single	1	0	1
Divorced	1	0	1
Education			
Some high school or less	0	0	2
High school graduate	8	4	5
Some college or advanced vocational training	3	2	5
College degree	0	1	1
Some post-college	0	0	0
Graduate degree	0	0	0
No answer	0	1	1
Income			
$10,001-20,000	1	0	1
$20,001-30,000	1	3	4
$30,001-40,000	1	0	1
$40,001-50,000	2	1	3
$50,001-70,000	5	2	7
$70,000+	1	1	2
No answer	0	0	0
Religion			
Protestant	11	6	17
Other	0	1	1
No answer	0	0	0

Report of Y-12 Focus Group Findings, By Topic

The following is a breakdown of responses posed by the Moderator using the Moderator's Guide for the Y-12 sessions that took place on July 8 and August 5. Questions 3-5 of Topic I are included in Topic II for continuity. The findings from the two groups are combined here to give an overall picture.

Topic I: Health Concerns – Perception of Occupational Health Risks

Questions:

Participants were asked if they think that they or their co-workers are at risk from occupationally related health problems and, if so, what they are.

Summary of responses:

- Workers cited concerns about exposures to uranium smoke (from uranium fires), asbestos, mercury, solvents, acids, and beryllium, as well as heavy metals.
- Health concerns included mesothelioma and cancers of the lung, prostrate, stomach, and brain as well as hearing loss, chronic beryllium disease, heart problems and neurological problems from mercury exposure.
- The participants attributed many of the health problems today to unsafe work practices in the past as well as threats of job loss if workers complained about working conditions. For instance, in the past, workers would eat, drink and smoke around the equipment; painters would work in an area with no ventilation; and personal protective equipment such as respirators were not available. The contractor failed to warn workers of the job hazards, telling them that "they could eat all of it [they] want, not worry about it."

Sample responses:

"I had a brother-in-law work out there and he had cancer of the brain and passed away and it was related back to the plant."

"I left Y-12 when I was 59, I had heart problems, I had hearing problems, where we went through so many noisy compressors, areas that we had to go in."

"Some of my fellow workers got beryliosis. We lost one last year, he had lung cancer and we've lost a lot of our group, the painters."

"Well, I've got one out there (machinist) that's got cancer of the bladder. I know another one who's got cancer of the bladder."

Topic II: Health Care/Delivery Utilization Issues

Questions:

1. Participants were asked about their current medical needs and current medical programs.

2. Are the workers interested in a program for their occupational health concerns? How would it be structured? Would you and your fellow workers participate and do you receive yearly (or periodic) physicals?
3. Where do the workers go for current medical services? Are there specific clinics or hospitals that people feel most comfortable with?
4. Are there any impediments to participation in an occupational medical program and how can these be resolved?

Summary of responses:

- The current workers now get a physical from the site clinic every five years instead of every two years, as in the past.
- The retired workers generally get physicals every year from their primary care physician. One current worker expressed a concern about taking the BeLPT because if sensitivity is confirmed, it could have job repercussions.
- Workers are skeptical of local primary care physicians' ability to be attentive to their needs.
- Those with health problems not only have a primary care physician but a specialist as well.
- In general, the workers want a well-structured physical examination by physicians independent of the DOE and its contractors. They want to be screened for hearing loss, cancers and stomach problems.
- They want the CT scan like the one the K-25 screening program has. They also want to include neurological testing for mercury.
- They would like for plant medical records to be included in the program and expressed concern about the difficulty of getting and using those records.
- They want physicians and a program outside of the Oak Ridge area because of its ties with DOE and its contractors.
- They are concerned with cost and credibility because of their past experience with any program funded by DOE. They cited transportation as another impediment to participation.

Sample responses:

"A big problem right now is…some doctor's offices just herd you in and herd you out. They work for these big outfits and they just have to see so many patients in a day. It makes you feel like you ain't getting taken care

"This is a company town where (sic) they won't admit it or not. When it comes to push and shove, I'd rather have an independent somebody that's not tied to this area. "

"A lot of people who are weekly and monthly who did not take the BeLPT are afraid if they get confirmed that they're sensitive to it, it could affect their job.

"I think one of the roadblocks if they do this is getting this screening out to the entire workers, I think it's hard to find them. That would be a real roadblock."

Topic III: Outreach/Access and Health Education/Information Resources

Questions:

1. Participants were asked the best way to notify people of an occupational medical testing program and to invite them to participate.
2. What are their current sources of health information?
3. How do participants like to get health information?

Summary of responses:

- Some of the suggestions for contacting people for participation included getting addresses and telephone numbers from the union, word-of-mouth, brochures mailed to their house advertising a "Y-12 health screening or ATLC health screening," the retirement newsletter, posters at local retail stores like Wal-Mart, telephone and rallies for sick workers.

- Their principal (and preferred) sources of medical information are television, the doctors' office, or publications – such as the AARP's – sent to their homes.

Sample responses:

"Workers, if they make a list of people they work with ...especially if you know them or know their address, phone number, just write it down and when this comes about, we'll be calling them."

"What you were talking about like telling a buddy when we start it, ask about other people. Do you know anybody else that would be interested"

"Anything that's got Y-12, even the paper, I check it."

<u>*Observations, Y-12 Focus Groups*</u>

The two focus group sessions with current and former Y-12 workers on July 8 and August 5, 2003, were yielded valuable information that will assist in structuring the medical testing program. Of particular value was the information gathered regarding the workers' health concerns and current medical care, types of tests desired, the preferred clinics for testing, and suggestions for outreach.

Participants in the two sessions included both current and former Y-12 workers (both hourly and salaried), all of whom were male, with an average age of 63.5 and an average of 31.2 years working the plant.

Because of the classified nature of much of the work at Y-12, the focus group was held in a secure room in the security building at the site. Because the author of this report had no clearance, the final report is based on the reports of the moderator and health and safety representatives, and the transcripts created from the tape recordings of the two sessions.

The participants expressed a distrust of both DOE and the contractors, emphasizing that they did not want to use clinics in Oak Ridge because of its "company town" nature.

They stated a desire for an independent occupational medical testing program that would not only provide a thorough physical examination, but one tailored to the various exposures incurred at the facility (i.e., radiation, asbestos, beryllium, mercury, solvents, acids and noise).

Both groups of participants wanted plant medical records to be incorporated into the program if at all possible. They also felt strongly that, because of their exposures, they would benefit from having the CT scan unit that the K-25 screening program has.

Recommendations, Y-12

- **There is a need for an occupational medical testing program**
  Participants clearly felt that their personal physicians did not address their occupational health concerns, nor were they qualified to do so.

- **The participants prefer local clinics in a convenient, easily accessible location with oversight from occupational medical physician. They do not want the clinics in Oak Ridge.**
  Access, cost, and transportation are some of the concerns expressed by the participants. They did not want to use Oak Ridge clinics because of their proximity to and influence by DOE and the contractors.

- **Participants want to include current as well as former workers.**
  While they feel the first priority should be the former workers, they also want to include the current workers in the program.

- **Word of mouth and direct mailings are the preferred methods for communication.**
  Participants recommended, as a means of outreach, that workers write down the names and addresses of other potential participants. They suggested that mailings marked "Y-12" would attract the attention of recipients.

- **All of the participants expressed a desire that the CT scan unit used at K-25 be part of their program.**

Section VII. Epidemiologic and Health Studies Review

Epidemiologic Studies of Y-12 and ORNL Workers

Workers at Y-12 and ORNL have been the subject of numerous epidemiologic studies. With a few exceptions, these studies have examined the mortality experience of these workers. While they suffer some important limitations, these studies provide data useful in understanding the effects of exposure to radiation and a small number of chemical hazards at these facilities.

As a rule, however, mortality studies done on DOE cohorts have certain important limitations:

- Most mortality studies involve comparing the mortality experience of employed workers (in this case employed at Y-12 and ORNL) with that of the general population. This comparison population includes many individuals to sick or disabled to work, individuals also more likely to die prematurely than people in the workforce. This bias, known as the "healthy worker effect," results in the underestimation of the effects of toxic exposure in the population under study. A strong "healthy worker effect exists in studies of Oak Ridge workers.

- Most studies at Oak Ridge were undertaken long after the exposures of interest occurred. While there are limited exposure data available (either through actual records or retrospective dose reconstruction) for radiation exposure, there are few records available to quantify exposure to any of the toxic chemicals to which Y-12 and ORNL workers were exposed.

- The potential for confounding and selection bias is significant in these studies. The oldest facilities began employing workers in the early 1940s; these workers have been followed the longest and constitute a sizable proportion of all workers studied. The exposures that occurred during World War II were likely somewhat different than subsequent exposures, since production processes changed significantly after the war in many facilities. At the same time, employment selection factors are likely to be of some importance. Workers who were first employed during World War II (and who were not in the armed services during the war) are likely to be different than those who came to work in later years in many respects, beyond the obvious difference in birth cohort, exposure history and years of follow-up. As a result, for example, examination of the effect of radiation exposure on the mortality experience of workers first employed after age 45 may actually be detecting a birth cohort effect, or the effect of some type of selection bias in employment, rather or in addition to a radiation effect.

These limitations must be considered in reviewing the findings discussed in this needs assessment.

In the section below, we attempt to review what can be learned from the epidemiologic studies on Oak Ridge workers. Since different versions of most of these studies have been published several times, we attempt to cite the most recent report, except in those cases where earlier versions provide additional useful data. Negative results are not summarized, except where they are necessary to explain a choice made in the design of the screening program.

1. Overall and Radiation-Related Mortality

The largest study of the mortality experience of Oak Ridge workers involved 28,00 deaths among 106,000 persons employed at one Y-12, ORNL or K-25 between 1943 and 1985 (Frome et al 1997), expanding upon an earlier study that included only white males who worked before 1947 (Frome, Cragle, McLain 1990). The objective of the study was to examine the effects of radiation exposure on mortality; since the type of radiation exposure was different at each facility, the facility was the primary surrogate measure employed for radiation exposure. However, many of these workers worked at more than one of the Oak Ridge facilities, posing a methodologic challenge to the authors. Rather than exclude workers who had worked at more than one facility, as had been done in some previous studies, the investigators employed a Poisson regression analysis to control facility as well as for age, birth cohort, length of employment, socio-economic status and a rough surrogate for internal radiation exposure.

Overall, the all cause (SMR=1.00, based on 27,982 deaths) and all cancer (SMR=0.98, 6,114 deaths) mortality of the cohort were not different than those expected based on national comparison rates. There were substantial differences in the mortality patterns associated with each facility. Workers at K-25 had higher risk of mortality from non-malignant causes than workers at Y-12 or ORNL. Lung cancer was the only specific cancer associated with external radiation (SMR=1.18, based on 1,849 lung cancer deaths, no 95% CI provided; among white males employed at Y-12 or ORNL, there was a dose effect relationship between external radiation exposure and risk of death for all causes and for cancer. External radiation dose with a ten-year lag was found to increase overall risk of death by 0.31 per Sv (95% CI = 0.16, 1.01) and cancer mortality by 1.45 per Sv (95% CI = 0.15, 3.48). Interestingly, no relationship between external radiation exposure and leukemia was seen, perhaps suggesting that some or all of the radiation effect seen for lung cancer may the result of an unidentified bias or the incomplete control of confounders.

Wilkinson (2000) conducted a mortality study among female workers throughout the DOE complex; reported that the relative risk for all cause mortality was increased among women not monitored for radiation, in comparison to those who were monitored, at both Y-12 (RR = 1.20, 95% CI=1.03, 1.39) and ORNL (RR = 1.30, 95% CI = 1.07, 1.57). This was also true for cancer mortality at ORNL (RR = 1.4, 95% CI=1.0, 2.0). This is likely an artifact of the health worker effect, with women in more stable, higher paying jobs more likely to be monitored. For all DOE sites combined, Wilkinson reported that leukemia risk increased with cumulative exposure (RR/rem = 1.13, 95% CI = 1.02, 1.25), as well as associations on the edge of statistical significance between cumulative external radiation exposure and all cancers (RR/rem = 1.03, 95% CI = .99, 1.16), breast cancer (RR/rem = 1.05, 95% CI = .99, 1.12) and hematologic (RR/rem = 1.08, 95% CI = .99, 1.17). However, no excess breast cancer risk was seen among women employed at either Y-12 (SMR=73 , 354 observed deaths, no 95% CI provided) or X-10 (SMR= 82, 48 observed deaths, no 95% CI provided). A non-significantly elevated SMR for mouth and buccal cancer was seen among women at X-10, although based on small number (SMR=148, based on 5 observed deaths), no 95% CI provided.) Increased SMRs were also seen among X-10 workers for cancer of the esophagus (SMR=207, 95% CI=67-484), cancer of the kidney (SMR=151, 95% CI=55-328), and mental disorders (SMR=161, 95% CI=59-350).

Among Y-12 female workers, elevated mortality risk was seen for chronic and unspecified bronchitis (SMR=149, 95% CI=94-226) and diseases of the genitourinary system other than nephritis, kidney infections, female genital organs (SMR=156, 95% CI=120-199).

a. Y-12

Workers employed at the Y-12 plant manufacture nuclear weapons components; historically, the primary route of exposure to radiation at the facility was inhalation of uranium compounds. Although no film badges were worn in the early years, it was assumed that external (gamma) exposure was low, and that most exposure was though inhaled uranium alpha particles and, to a lesser extent, dermal exposure to beta-emitting uranium daughters. Airborne uranium dust levels were thought to be highest through September 1945.

Mortality among almost 19,000 workers employed at Y-12 during 1943-1947 (followed through 1977) was examined by Polednak and Frome (1981). This represents about half of the workers employed during those years; women, who made up 47% of the workforce, were not included in this study. Replicating the findings in the overall Oak Ridge cohort study (see above), Polednak and Frome found an SMR of 1.22 for lung cancer (95% = CI 1.10, 1.36). The population was divided into four subgroups, Alpha and Beta Chemistry, all Alpha and Beta Departments, electrical workers and all other. Among these subgroups examined, the highest lung cancer SMR (1.42, 26 deaths observed) was seen among electrical workers who did maintenance work. No excess lung cancer was seen among the chemical workers "in Alpha and Beta Chemistry" who had higher uranium dust exposures, or those who worked in all Alpha and Beta Departments. The fourth group examined "all others" had a small excess risk (SMR=1.13, based on 182 lung cancer deaths.

White male workers employed at Y-12 between 1947 and 1974 (followed through 1979) are the subject of another series of mortality analyses. Checkoway et al (1988) reported that among these workers, there were elevated risks of mortality from cancers of the lung (SMR=1.36, 95% CI 1.09, 1.67, 89 observed deaths) and central nervous system (SMR=1.80, 95% CI 0.96,3.02, 14 observed deaths) . In contrast with earlier studies, individual radiation monitoring data were available for slightly more than half of the workers in the cohort, and the investigators constructed models to examine the relationship of dose (alpha or gamma, and cumulative level), latency and risk. Depending upon the model used, the risk of lung cancer among those whose cumulative dose was 5 or more rem, was more than 4 times higher that of those receiving less than 1 rem. No comparable dose-effect trend was seen for cancers of the brain and central nervous system. Of the 6,781 white male workers who were employed at least 30 days at Y-12, 2,222 (33%) has external radiation (gamma) exposure >0-.49 rem, 1,264 (19%) had between .5 and .99 rem, 1504 (22%) had between 1 and 4.99 rem, and 132 (2%) had 5 or more rem. No analyses by job tityle or department were reported.

Although the Checkoway study was relatively large (6,781 cohort members, of whom 862 were known to have died), the increases in lung cancer risks associated with the highest radiation exposure were based on a small number of lung cancer deaths. In spite off this, the authors on the study concluded "the observed dose-response trends indicate potential carcinogenic effects to the lung of relatively low-dose radiation."

Loomis and Wolf (1994) extended the follow-up period of this study through 1990. Mortality from lung and brain cancer remained elevated, and the authors report increased risk of some lymphatic cancers, as well as cancer of the pancreas, prostate and kidney. An excess in lung cancer mortality was seen (SMR=1.17, 95% CI 1.01-1.34, 202 deaths observed) Further analysis of the lung cancer mortality patterns found that much of the lung cancer excess appeared to be limited to workers who were first employed at Y-12 between 1947 and 1954 (SMR=1.27, 161 deaths observed, no 95% CI provided). The excess lung cancer mortality first manifested in the 1955-1964 time period, and decreased after 1979. The SMR for lung cancer among female workers was 0.78, based on 5 deaths.

Loomis and Wolf conclude: "*Lung cancer mortality among these workers warrants continued surveillance because of the link between internal alpha radiation exposure and this disease, but other agents, notably beryllium, also merit consideration as potential causes of lung cancer.*" (p. 131, Loomis and Wolf, 1996)

Lung cancer risk at Y-12 has also been examined using a nested case control method, with many of the cases coming from the studies discussed above. Dupree et al (1993; 1995) identified 787 lung cancer cases among workers at Y-12 or two other uranium processing facilities (Mallinckrodt Chemical Works and Fernald Feed Materials Production Center) for at least 183 days. Controls were matched to cases on race, gender, date of birth and date of hire (± 3 years), and facility. It was not an uncommon practice for workers to move from one AEC facility to another. Of the 787 cases, 180, or 23% worked at more than one facility. 567 (72%) were first employed at Y-12 during the 1943-1947 period and 142 (18%) after 1947; in total, 7609 (9077%) cases were first employed at Y-12. This is of interest, because work at Y-12 contributed the largest amount of exposure, and the longest periods of follow-up after exposure began, in the study.

The Dupree study (1995) detected a non-statistically significant two-fold excess risk of lung cancer (OR = 2.05, 95% CI = 0.20, 20.70) among workers exposed to 25 centigrays or higher. Although there were no indications of a dose-response relationship between lung cancer and internal exposure to uranium dust, the data suggested an effect from internal dose and external radiation among workers hired after age 45; as a result, the authors felt there findings were not inconsistent with those reported by Checkoway et al (1988). Using the same exposure data, this study had many of the same limitations as the other Y-12 studies discussed above. In particular, the authors acknowledged the potential for exposure misclassification, especially among workers from the earlier Y-12 employment cohort. If this misclassification was random, the effect would likely be to reduce the measured effect of radiation exposure, resulting in an underestimate of the radiation effect.

b. ORNL

The mortality experience of ORNL workers has been examined in several studies. The first published study limited to ORNL employees was by Checkoway et al (1985), updated by Wing et al (1991). The later analysis included 8381 men employed between 1943 and 1972 followed through 1984. The only significant excess seen overall was leukemia (SMR = 1.63; 95% CI = 1.08, 2.35; there were 28 observed deaths). Non-significant excesses were seen for cancers of the pancreas (SMR = 1.09; 95% CI = 0.71, 1.61; 25 observed deaths), prostate (SMR = 1.05; 95% CI = 0.68, 1.53; 26 observed deaths) and brain/CNS (SMR = 1.04; 95% CI = 0.58, 1.72; 15 observed deaths), along with lymphosacrcoma/reticulosarcoma (SMR = 1.05; 95% CI = 0.48, 1.99; 9 observed deaths). Using internal comparisons, the investigators found that all cause mortality appeared to be related to radiation dose, a finding that was not seen in the earlier study of the same cohort by Checkoway et al, perhaps because of the shorter follow-up time of the earlier studies.

This radiation effect was primarily associated with cancer mortality; taking SES into account and with a 20 year time lag, the authors found an approximately 5% excess risk of cancer mortality for every 10mSv (1 rem) of dose (p=.001). This estimate is substantially higher than the radiation effect estimated from data gathered from survivors of the Hiroshima and Nagasaki nuclear blasts. Among specific cancers, the authors a 5% excess lung cancer mortality risk for each 10 mSv (p=.06), and a 9% excess for leukemia (p=.44).

The differences between these results and those from the Japanese survivor cohorts underscore the limitations and uncertainties of dose-effect estimates. While there are few if any environmental dose-effect relationships about which we have more and better data than we do for radiation, dose-effect models drawn from different populations have provided discordant models. Differences between estimates and models are probably attributable to incomplete or inaccurate exposure measurement, or uncontrolled confounding. It is unlikely, however, that studies in the United States will provide significant clarification of the questions raised by these differences, because the mortality experience of most of the major US radiation-exposed populations have already been examined and analyzed.

A subsequent analysis (Wing et al 1993) of the ORNL cohort replicated these same results after adjustment for the potential effects of exposure to beryllium, lead and mercury, as well as for selection biases associated with war-related employment patterns.

Richardson and Wing (1999) followed this cohort through 1990, and reported that, lagging the data, radiation doses received after age 45 appear (7% per 10 mSv, SE=2.2) to have a greater impact on cancer mortality risk than exposures that occur at younger ages (5% per 10 mSv, SE=1.5). Further, they reported a positive association between radiation dose after age 45 and risk of non-malignant respiratory disease (5% per 10 mSv, SE=2.9).

This age effect has been suggested in other studies as well. Wing et al (2000) conducted a case control study of workers who dies of multiple myeloma at four facilities, including ORNL. While lifetime cumulative radiation dose was not associated with increased risk of multiple myeloma mortality, exposures at older ages appear to increase risk.

Wilkinson (2000) examined mortality among female workers employed at ORNL, and found that excesses of hematologic cancer (SMR = 1.25, 95% CI = 1.07, 1.47), and within that, for leukemia (SMR = 1.32, 95% CI = 1.12, 1.55). Non-significant excesses were seen for cancers of the esophagus (SMR = 2.07, 95% CI = 0.67, 4.84), kidney (SMR = 1.51, 95% CI = 0.55, 3.28, and mental disorders (SMR = 1.61, 95% CI = 0.59, 3.50).

In addition, investigators examined the mortality experience in a combined cohort from ORNL, Hanford and Rocky Flats, publishing several articles on the study. In a 1993 publication, for example, Gilbert, Cragle and Wiggs found that cancers of the esophagus and larynx and Hodgkin's Disease was significantly correlated with radiation exposure, with the esophagus and larynx cancer excesses seen primarily among the ORNL workers. Radiation exposure at ORNL also appeared to be associated with an increased risk of cancer mortality overall (RR=1.2 per Sv, 90% CI <0, 3.7), with greater effects being seen among those developing cancer at older ages.

1. Beryllium

Exposure to beryllium was extensive at the Y-12 facility. By July, 2003, more than 4,000 current and former Y-12 workers were tested as part of DOE's Chronic Beryllium Disease (CBD) Surveillance Program. Of these 133 (3.3%) were found to have beryllium sensitization. Ninety of the 133 completed follow-up clinical evaluations, with 46 cases of CBD diagnosed in this group.

Beryllium exposure appears to have been less common at ORNL. The surveillance program has tested 438 current and former ORNL workers, and have found 8 (1.8%) sensitized. No cases of CBD have been diagnosed at ORNL.

DOE reports have documented relatively recent exposure to beryllium. The 1996 DOE Beryllium Information Survey Report noted that Y-12 reported 158 exposed workers, and ORNL 51. Y-12 reported that maximum exposure beryllium levels that year exceeded the DOE standard in effect at that time, 2.0 ug/m^3.

2. Mercury

The mortality experience of workers exposed to mercury at Y-12 was examined in a study published in 1984 (Cragle et al). Using data from mercury urinalysis testing, the cohort was divided into exposed and non-exposed subcohorts, and the exposed group further divided into high exposure and low exposure groups. No significant mercury-related differences in mortality patterns were detected. As with other Y-12 studies, the investigators found a (non-significant) excess of lung cancer in these workers, (SMR=134, 42 deaths observed, $p>.05$, no CI provided) but also found a similar excess in non-mercury exposed Y-12 workers (SMR=1.34, 71 observed deaths, $p<.05$), suggesting that mercury exposure was not associated with detectable mortality excesses in this population. The authors note in the paper, however, that mortality is not the preferred endpoint to use in studies of the effects of mercury exposure.

In the middle 1980s, long after the period of high-level exposure to mercury at Y-12 had occurred (1953-1965), a study of neurological effects was undertaken by scientists associated with the University of Michigan (Albers et al 1988). Clinical examinations were given to 502 workers, of whom 247 had been exposed 20 to 35 years previously. Urine mercury levels were available for exposed workers

Both peak and cumulative mercury exposure were found to be correlated with each other and with the presence of selected neurological abnormalities. Workers whose peak exposure exceeded 0/6mg/L were found to have decreased strength, coordination and sensation, as well as increased tremor and prevalence of Babinski and snout reflexes. Workers with clinical neuropathy had significantly higher peak exposure levels (0.85mg/L vs. 0.61 mg/L) than normal workers. Mercury exposure duration was not correlated with these conditions.

Ten years later, a follow-up study was conducted involving 104 mercury-exposed workers and 101 non-exposed workers drawn from the same population (Letz et al 2000). For the most part, mercury exposure had ended 30 years before the clinical examinations were performed and the mean age of the study subjects was, at the time of examination, 71 years. A range of peripheral nerve function outcomes, principally defined electrophysiologically, were found to be statistically significantly associated with cumulative mercury exposure, as were the results of the hand-eye coordination test and postural tremor. Importantly, they found no relationship between mercury exposure and dementia or any measure of cognitive function. The authors note that these associations were observed despite greater mortality in the exposed (compared with the unexposed) group, and sizable loss to follow-up.

3. Asbestos

While the occurrence of asbestos-related disease has not been studies in production workers at ORNL or Y-12, data from the medical surveillance program of Oak Ridge construction workers strongly suggests that asbestos-related disease will be detected in production workers in these facilities. According to Dement et al (2003), 19% of construction workers employed at one or more of DOE Oak Ridge sites had radiographic abnormalities associated with asbestos exposure.

4. Welding

Mortality among white, male welders employed at Y-12 and ORNL 1943 through 1985 was examined in a series of studies (Polednak 1981; Wells, Cragle and Tankersly, 1998). The authors of the 1998 study assert that stainless steel welding was common at Y-12, and that the major contaminants were iron and chromium. Welders at both facilities also worked with aluminum. The subpopulation employed at Y-12 or ORNL had elevated risk of cancer of the prostate (SMR = 2.33, 95% CI = 1.00,4.60) and lung (SMR = 1.34, 95% CI = 0.87, 1.98).

5. Phosgene

Significant phosgene exposure occurred in the early years at Y-12. Polednak (1980), then Polednak and Hollis (1985) examined the mortality experience of Y-12 chemical workers who worked in departments where daily exposures to phosgene occurred. A slightly elevated increase (SMR=1.21, 95% CI = 0.86, 1.65) in all-cause mortality was seen among male workers who were acutely exposed to high levels of phosgene, with an SMR of 2.66 (95% CI = 0.86, 6.22) for non-malignant respiratory disease. Included in this is at least one death that appears to be directly attributable to acute phosgene exposure.

6. Central Nervous System (CNS) Cancers

A study examining the relationship of CNS cancer with radiation and chemical exposure was conducted using the case-control method. The investigators selected study subjects from Y-12 and ORNL. There was no clear association with either radiation or any of 26 chemical exposures, although an increased risk of CNS cancer (OR = 7.0, 95% CI = 1.2, 41) was observed among those employed for more than 20 years (Carpenter et al, 1987; Carpenter et al, 1988).

References

Albers JW, Kallenbach LR, Fine LJ, Langolf GD, Wolfe RA, Donofrio PD, Alessi AG, Stolp-Smith KA, Bromberg MB. Neurological abnormalities associated with remote occupational elemental mercury exposure. Annals of Neurology 1988; 24:651-659.

Carpenter AV, Flanders WD, Frome EL, Crawford-Brown DJ, Fry SA. CNS cancers and radiation exposure: a case-control study among workers at two nuclear facilities. Journal of Occupational Medicine 1987;29:601-604.

Carpenter AV, Flanders WD, Frome EL, Tankersley WG, Fry SA. Chemical exposures and central nervous system cancers: a case-control study among workers at two nuclear facilities. American Journal of Industrial Medicine 1988; 13:351-362.

Checkoway H, Mathew RM, Shy CM, Watson JE Jr, Tankersley WG, Wolf SH, Smith C, Fry SA. Radiation, work experience, and cause specific mortality among workers at an energy research laboratory. British Journal of Industrial Medicine 1985;42(8):525-33.

Checkoway H, Pearce N, Crawford-Brown DJ, Cragle DL. Radiation doses and cause: specific mortality among workers at a nuclear materials fabrication plant. American Journal of Epidemiology 1988; 127:255-366. Comment in: American Journal of Epidemiology 1989; 129:639-640.

Cragle DL, Hollis DR, Qualters JR, Tankersley WG, Fry SA. A mortality study of men exposed to elemental mercury. Journal of Occupational Medicine 1984; 26:817-821.

Cragle D, Letz R. Undated. A study of the health effects of exposure to elemental mercury: A follow-up of mercury exposed workers at the Y-12 Plant in Oak Ridge, Tennessee. Final Report: NIOSH Contract No. 200-93-2629, 1997. Oak Ridge Associated Universities and Emory University.

Dement JM, Welch L, Bingham E, Cameron B, Rice C, Quinn P, Ringen 2003. Surveillance of respiratory diseases among construction and trade workers at Department of Energy nuclear sites. Am J Ind Med. Jun;43(6):559-73.

Dupree E, Watkins J, Ingle J, Wallace P, West C, Tankersley W. Risk of lung cancer among uranium processing workers. Am J Epidmiol 138:640, 1993.

Dupree EA, Watkins JP, Ingle JN, Wallace PW, West CM, Tankersley WG. Uranium dust exposure and lung cancer risk in four uranium processing operations. Epidemiology 1995; 6:370-375.

Frome EL, Cragle DL, McLain RW. Poisson regression analysis of the mortality among a cohort of WWII nuclear Industry Workers. Radiation Research 1990; 123:138-152.

Frome EL, Cragle DL, Watkins JP, Wing S, Shy CM, Tankersley WG, West CM. A mortality study of employees of the nuclear industry in Oak Ridge, Tennessee. Radiation Research 1997; 148:64-80. [Published erratum appears in Radiat Res 1997; 148:297-298.]

Gilbert ES, Cragle DL, Wiggs LD. Updated analyses of combined mortality data for workers at the Hanford Site, Oak Ridge National Laboratory, and Rocky Flats Weapons Plant. Radiation Research 1993; 136:408-421.

Letz R, Gerr F, Cragle D, Green RC, Watkins J, Fidler AT. Residual neurologic deficits 30 years after occupational exposure to elemental mercury. NeuroToxicology 2000; 21:459-474.

Loomis DP, Wolf SH. Mortality of workers at a nuclear materials production plant at Oak Ridge, Tennessee, 1947-1990. American Journal of Industrial Medicine 1996; 29:131-141. Comment in: American Journal of Industrial Medicine 1997; 31:121.

Polednak AP. Mortality among men occupationally exposed to phosgene in 1943-1945. Environmental Research 1980; 22:357-367.

Polednak AP. Mortality among welders, including a group exposed to nickel oxides. Archives of Environmental Health 1981; 36:235-241.

Polednak AP, Frome EL. Mortality among men employed between 1943 and 1947 at a uranium-processing plant. Journal of Occupational Medicine 1981; 23:169-178.

Polednak AP, Hollis DR. Mortality and causes of death among workers exposed to phosgene in 1943-45. Toxicology and Industrial Health 1985; 1:137-151

Richardson DB, Wing S. Radiation and mortality of workers at Oak Ridge National Laboratory: Positive associations for doses received at older ages. Environmental Health Perspectives 1999; 107:649-656.

Wilkinson GS, Trieff, N, Graham, R. 2000. Study of mortality among female nuclear weapons workers. Buffalo, NY: Department of Social and Preventative Medicine, School of Medicine and Biomedical Sciences, University of Buffalo, State University of New York; (DHHS Grant Numbers: 1R01 OHO3274, R01/CCR214546, R01/CCR61 2934-01, Final Report.)

Wing S, Richardson D, Wolf S, Mihlan G, Crawford-Brown D, Wood J. 2000. A case control study of multiple myeloma at four nuclear facilities. Annals of Epidemiology 10:144-153.

Wing S, Shy CM, Wood JL, Wolf S, Cragle DL, Frome EL. Mortality among workers at Oak Ridge National Laboratory. Evidence of radiation effects in follow-up through 1984. Journal of the American Medical Association 1991; 265:1397-1402. [Published errata appear in JAMA 1991; 266:657.]

Wing S, Shy CM, Wood JL, Wolf S, Cragle DL, Tankersley W, Frome EL. Job factors, radiation and cancer mortality at Oak Ridge National Laboratory: follow-up through 1984. American Journal of Industrial Medicine 1993; 23:265-279. Published errata appear in American Journal of Industrial Medicine 1993; 23:673.

Attachments and Appendices: Exposure Assessment

Attachment 1

Job Exposure Information Sheet

Process Area and Description ____

____

Process Number ________
(Assigned number)

Building Name / # ____________ Map ID Number ____________

Chemicals or Agents
(Assign a number to chemicals added to list and use number in lower table as needed)

Job Title or Group	Chemical(s) (# from list)	Level of Exposure (High, Med, Low)	Frequency of Exposure (Sometimes, Always)	Comments

Attachment 2

Descriptive Building Report

Date Conducted: ____________________ Number of Participants _______

Investigators Names: ________________

____

____

1. Site Name: ____________

2. Building Name: ____________________________________

3. Building Number: ________________

4. Years of Operation ________________

5. Summary of Participants Work Histories

(Describe the participants job titles, nature of their work, and years of experience – Do not identify participants)

6. Description and History of Major Processes or Operations

7. Describe the major exposures that took place within the building over time

8. Describe the Workforce within the Building over time

9. Other Information of Interest

(This section may include accidents, incidents, information regarding the changes that took place over time within the building, etc.)

10. Industrial Hygiene / Health Physics

a. Summary of External Dose measurements
(type of dosimetry, primary radiation, frequency)

b. Summary of Internal Dose monitoring
(type, radionuclide tested for, frequency, specials)

c. Contamination Control and Monitoring Practices

d. Was any IH monitoring performed? If so, for what substances? Frequency?

e. Summary of PPE requirements and practices over time?

f. Summary of Work Practices over time?

OTHER COMMENTS:

Appendix A

A-1

X-10 Risk Mapping Results

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
Fission Products	High Rad. Level Analytical Lab.	2026	Hot Cells and glove boxes	
Tritium	High Rad. Level Analytical Lab.	2026	storage	
I-131	Graphite Reactor	3001		
Plutonium	Graphite Reactor	3001		
External radiation	Bulk Shield Reactor	3010		HPs
neutron	Bulk Shield Reactor	3010		HPs
External radiation	Bulk Shield Reactor	3010		Research Scientists
neutron	Bulk Shield Reactor	3010		Research Scientists
External radiation	Bulk Shield Reactor	3010		Reactor Operators
neutron	Bulk Shield Reactor	3010		Reactor Operators
Hydorlic Fluids	Seperations Bldg	3019	Pipe Tunnel	Maintenance
Internal radiation	Seperations Bldg	3019	Pipe Tunnel	Maintenance
External radiation	Seperations Bldg	3019	Pipe Tunnel	Maintenance
Hydorlic Fluids	Seperations Bldg	3019	Pipe Tunnel	Chemical Operators
Internal radiation	Seperations Bldg	3019	Pipe Tunnel	Chemical Operators
External radiation	Seperations Bldg	3019	Pipe Tunnel	Chemical Operators
Internal radiation	Seperations Bldg	3019	Basement	Chemical Operators
External radiation	Seperations Bldg	3019	Basement	Chemical Operators
Internal radiation	Seperations Bldg	3019	Basement	Maintenance
External radiation	Seperations Bldg	3019	Basement	Maintenance
Fluoride	Seperations Bldg	3019	Fluoride Volatility Process	Chemical Operators
UF6	Seperations Bldg	3019	Fluoride Volatility Process	Chemical Operators
HF	Seperations Bldg	3019	Fluoride Volatility Process	Chemical Operators
External radiation	Seperations Bldg	3019	Fluoride Volatility Process	Chemical Operators
Internal radiation	Seperations Bldg	3019	Fluoride Volatility Process	Chemical Operators
Beryllium	Seperations Bldg	3019	Fluoride Volatility Process	Chemical Operators
Heat	Seperations Bldg	3019	Fluoride Volatility Process	Chemical Operators
Fluoride	Seperations Bldg	3019	Fluoride Volatility Process	Maintenance
UF6	Seperations Bldg	3019	Fluoride Volatility Process	Maintenance
HF	Seperations Bldg	3019	Fluoride Volatility Process	Maintenance
External radiation	Seperations Bldg	3019	Fluoride Volatility Process	Maintenance
Internal radiation	Seperations Bldg	3019	Fluoride Volatility Process	Maintenance
Beryllium	Seperations Bldg	3019	Fluoride Volatility Process	Maintenance
Heat	Seperations Bldg	3019	Fluoride Volatility Process	Maintenance

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
External radiation	Seperations Bldg	3019	Analytical Lab - A Lab	chemists
Internal radiation	Seperations Bldg	3019	Analytical Lab - A Lab	chemists
Heat	Seperations Bldg	3019	penthouse	Chemical Operators
Internal radiation	Seperations Bldg	3019	penthouse	Chemical Operators
External radiation	Seperations Bldg	3019	penthouse	Chemical Operators
Asbestos	Seperations Bldg	3019	penthouse	Chemical Operators
PCBs	Seperations Bldg	3019	penthouse	Chemical Operators
Heat	Seperations Bldg	3019	penthouse	Maintenance
Internal radiation	Seperations Bldg	3019	penthouse	Maintenance
External radiation	Seperations Bldg	3019	penthouse	Maintenance
Asbestos	Seperations Bldg	3019	penthouse	Maintenance
PCBs	Seperations Bldg	3019	penthouse	Maintenance
Heat	Seperations Bldg	3019	Purex	Chemical Operators
Internal radiation	Seperations Bldg	3019	Purex	Chemical Operators
External radiation	Seperations Bldg	3019	Purex	Chemical Operators
Nitric Acid	Seperations Bldg	3019	Purex	Chemical Operators
Aluminum Nitrate	Seperations Bldg	3019	Purex	Chemical Operators
Heat	Seperations Bldg	3019	Purex	Maintenance
Internal radiation	Seperations Bldg	3019	Purex	Maintenance
External radiation	Seperations Bldg	3019	Purex	Maintenance
Nitric Acid	Seperations Bldg	3019	Purex	Maintenance
Aluminum Nitrate	Seperations Bldg	3019	Purex	Maintenance
Internal radiation	Seperations Bldg	3019	Purex Pulse Columns	Chemical Operators
External radiation	Seperations Bldg	3019	Purex Pulse Columns	Chemical Operators
Tributylphosphate (TBP)	Seperations Bldg	3019	Purex Pulse Columns	Chemical Operators
Amsco (Kerosene)	Seperations Bldg	3019	Purex Pulse Columns	Chemical Operators
Nitric Acid	Seperations Bldg	3019	Purex Pulse Columns	Chemical Operators
Internal radiation	Seperations Bldg	3019	Purex Pulse Columns	Maintenance
External radiation	Seperations Bldg	3019	Purex Pulse Columns	Maintenance
Tributylphosphate (TBP)	Seperations Bldg	3019	Purex Pulse Columns	Maintenance
Amsco (Kerosene)	Seperations Bldg	3019	Purex Pulse Columns	Maintenance
Nitric Acid	Seperations Bldg	3019	Purex Pulse Columns	Maintenance
Fluoride	Seperations Bldg	3019	Fluoride Volatility Process	Foreman
UF6	Seperations Bldg	3019	Fluoride Volatility Process	Foreman

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
HF	Seperations Bldg	3019	Fluoride Volatility Process	Foreman
External radiation	Seperations Bldg	3019	Fluoride Volatility Process	Foreman
Internal radiation	Seperations Bldg	3019	Fluoride Volatility Process	Foreman
Beryllium	Seperations Bldg	3019	Fluoride Volatility Process	Foreman
Heat	Seperations Bldg	3019	Fluoride Volatility Process	Foreman
Fluoride	Seperations Bldg	3019	Fluoride Volatility Process	Pipefitters
UF6	Seperations Bldg	3019	Fluoride Volatility Process	Pipefitters
HF	Seperations Bldg	3019	Fluoride Volatility Process	Pipefitters
External radiation	Seperations Bldg	3019	Fluoride Volatility Process	Pipefitters
Internal radiation	Seperations Bldg	3019	Fluoride Volatility Process	Pipefitters
Beryllium	Seperations Bldg	3019	Fluoride Volatility Process	Pipefitters
Heat	Seperations Bldg	3019	Fluoride Volatility Process	Pipefitters
Fluoride	Seperations Bldg	3019	Fluoride Volatility Process	Millwrights
UF6	Seperations Bldg	3019	Fluoride Volatility Process	Millwrights
HF	Seperations Bldg	3019	Fluoride Volatility Process	Millwrights
External radiation	Seperations Bldg	3019	Fluoride Volatility Process	Millwrights
Internal radiation	Seperations Bldg	3019	Fluoride Volatility Process	Millwrights
Beryllium	Seperations Bldg	3019	Fluoride Volatility Process	Millwrights
Heat	Seperations Bldg	3019	Fluoride Volatility Process	Millwrights
Fluoride	Seperations Bldg	3019	Fluoride Volatility Process	Electrician
UF6	Seperations Bldg	3019	Fluoride Volatility Process	Electrician
HF	Seperations Bldg	3019	Fluoride Volatility Process	Electrician
External radiation	Seperations Bldg	3019	Fluoride Volatility Process	Electrician
Internal radiation	Seperations Bldg	3019	Fluoride Volatility Process	Electrician
Beryllium	Seperations Bldg	3019	Fluoride Volatility Process	Electrician
Heat	Seperations Bldg	3019	Fluoride Volatility Process	Electrician
Fluoride	Seperations Bldg	3019	Fluoride Volatility Process	Instrument Mechanic
UF6	Seperations Bldg	3019	Fluoride Volatility Process	Instrument Mechanic
HF	Seperations Bldg	3019	Fluoride Volatility Process	Instrument Mechanic
External radiation	Seperations Bldg	3019	Fluoride Volatility Process	Instrument Mechanic
Internal radiation	Seperations Bldg	3019	Fluoride Volatility Process	Instrument Mechanic
Beryllium	Seperations Bldg	3019	Fluoride Volatility Process	Instrument Mechanic
Heat	Seperations Bldg	3019	Fluoride Volatility Process	Instrument Mechanic
Fluoride	Seperations Bldg	3019	Fluoride Volatility Process	Welder

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
UF6	Seperations Bldg	3019	Fluoride Volatility Process	Welder
HF	Seperations Bldg	3019	Fluoride Volatility Process	Welder
External radiation	Seperations Bldg	3019	Fluoride Volatility Process	Welder
Internal radiation	Seperations Bldg	3019	Fluoride Volatility Process	Welder
Beryllium	Seperations Bldg	3019	Fluoride Volatility Process	Welder
Heat	Seperations Bldg	3019	Fluoride Volatility Process	Welder
Hydorlic Fluids	Seperations Bldg	3019	Pipe Tunnel	Maintenance
Internal radiation	Seperations Bldg	3019	Pipe Tunnel	Maintenance
External radiation	Seperations Bldg	3019	Pipe Tunnel	Maintenance
Hydorlic Fluids	Seperations Bldg	3019	Pipe Tunnel	Foreman
Internal radiation	Seperations Bldg	3019	Pipe Tunnel	Foreman
External radiation	Seperations Bldg	3019	Pipe Tunnel	Foreman
Hydorlic Fluids	Seperations Bldg	3019	Pipe Tunnel	Pipefitters
Internal radiation	Seperations Bldg	3019	Pipe Tunnel	Pipefitters
External radiation	Seperations Bldg	3019	Pipe Tunnel	Pipefitters
Hydorlic Fluids	Seperations Bldg	3019	Pipe Tunnel	Millwrights
Internal radiation	Seperations Bldg	3019	Pipe Tunnel	Millwrights
External radiation	Seperations Bldg	3019	Pipe Tunnel	Millwrights
Hydorlic Fluids	Seperations Bldg	3019	Pipe Tunnel	Electrician
Internal radiation	Seperations Bldg	3019	Pipe Tunnel	Electrician
External radiation	Seperations Bldg	3019	Pipe Tunnel	Electrician
Hydorlic Fluids	Seperations Bldg	3019	Pipe Tunnel	Instrument Mechanic
Internal radiation	Seperations Bldg	3019	Pipe Tunnel	Instrument Mechanic
External radiation	Seperations Bldg	3019	Pipe Tunnel	Instrument Mechanic
Hydorlic Fluids	Seperations Bldg	3019	Pipe Tunnel	Welder
Internal radiation	Seperations Bldg	3019	Pipe Tunnel	Welder
External radiation	Seperations Bldg	3019	Pipe Tunnel	Welder
Heat	Seperations Bldg	3019	penthouse	Foreman
Internal radiation	Seperations Bldg	3019	penthouse	Foreman
External radiation	Seperations Bldg	3019	penthouse	Foreman
Asbestos	Seperations Bldg	3019	penthouse	Foreman
PCBs	Seperations Bldg	3019	penthouse	Foreman
Heat	Seperations Bldg	3019	penthouse	Millwrights
Internal radiation	Seperations Bldg	3019	penthouse	Millwrights

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
External radiation	Seperations Bldg	3019	penthouse	Millwrights
Asbestos	Seperations Bldg	3019	penthouse	Millwrights
PCBs	Seperations Bldg	3019	penthouse	Millwrights
Heat	Seperations Bldg	3019	penthouse	Pipefitters
Internal radiation	Seperations Bldg	3019	penthouse	Pipefitters
External radiation	Seperations Bldg	3019	penthouse	Pipefitters
Asbestos	Seperations Bldg	3019	penthouse	Pipefitters
PCBs	Seperations Bldg	3019	penthouse	Pipefitters
Heat	Seperations Bldg	3019	penthouse	Electrician
Internal radiation	Seperations Bldg	3019	penthouse	Electrician
External radiation	Seperations Bldg	3019	penthouse	Electrician
Asbestos	Seperations Bldg	3019	penthouse	Electrician
PCBs	Seperations Bldg	3019	penthouse	Electrician
Heat	Seperations Bldg	3019	penthouse	Instrument Mechanic
Internal radiation	Seperations Bldg	3019	penthouse	Instrument Mechanic
External radiation	Seperations Bldg	3019	penthouse	Instrument Mechanic
Asbestos	Seperations Bldg	3019	penthouse	Instrument Mechanic
PCBs	Seperations Bldg	3019	penthouse	Instrument Mechanic
Heat	Seperations Bldg	3019	penthouse	Welder
Internal radiation	Seperations Bldg	3019	penthouse	Welder
External radiation	Seperations Bldg	3019	penthouse	Welder
Asbestos	Seperations Bldg	3019	penthouse	Welder
PCBs	Seperations Bldg	3019	penthouse	Welder
Heat	Seperations Bldg	3019	Purex	Foreman
Internal radiation	Seperations Bldg	3019	Purex	Foreman
External radiation	Seperations Bldg	3019	Purex	Foreman
Nitric Acid	Seperations Bldg	3019	Purex	Foreman
Aluminum Nitrate	Seperations Bldg	3019	Purex	Foreman
Internal radiation	Seperations Bldg	3019	Purex Pulse Columns	Foreman
External radiation	Seperations Bldg	3019	Purex Pulse Columns	Foreman
Tributylphosphate (TBP)	Seperations Bldg	3019	Purex Pulse Columns	Foreman
Amsco (Kerosene)	Seperations Bldg	3019	Purex Pulse Columns	Foreman
Nitric Acid	Seperations Bldg	3019	Purex Pulse Columns	Foreman
Heat	Seperations Bldg	3019	Purex	Pipefitters

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
Internal radiation	Seperations Bldg	3019	Purex	Pipefitters
External radiation	Seperations Bldg	3019	Purex	Pipefitters
Nitric Acid	Seperations Bldg	3019	Purex	Pipefitters
Aluminum Nitrate	Seperations Bldg	3019	Purex	Pipefitters
Internal radiation	Seperations Bldg	3019	Purex Pulse Columns	Pipefitters
External radiation	Seperations Bldg	3019	Purex Pulse Columns	Pipefitters
Tributylphosphate (TBP)	Seperations Bldg	3019	Purex Pulse Columns	Pipefitters
Amsco (Kerosene)	Seperations Bldg	3019	Purex Pulse Columns	Pipefitters
Nitric Acid	Seperations Bldg	3019	Purex Pulse Columns	Pipefitters
Heat	Seperations Bldg	3019	Purex	Electrician
Internal radiation	Seperations Bldg	3019	Purex	Electrician
External radiation	Seperations Bldg	3019	Purex	Electrician
Nitric Acid	Seperations Bldg	3019	Purex	Electrician
Aluminum Nitrate	Seperations Bldg	3019	Purex	Electrician
Internal radiation	Seperations Bldg	3019	Purex Pulse Columns	Electrician
External radiation	Seperations Bldg	3019	Purex Pulse Columns	Electrician
Tributylphosphate (TBP)	Seperations Bldg	3019	Purex Pulse Columns	Electrician
Amsco (Kerosene)	Seperations Bldg	3019	Purex Pulse Columns	Electrician
Nitric Acid	Seperations Bldg	3019	Purex Pulse Columns	Electrician
Heat	Seperations Bldg	3019	Purex	Millwrights
Internal radiation	Seperations Bldg	3019	Purex	Millwrights
External radiation	Seperations Bldg	3019	Purex	Millwrights
Nitric Acid	Seperations Bldg	3019	Purex	Millwrights
Aluminum Nitrate	Seperations Bldg	3019	Purex	Millwrights
Internal radiation	Seperations Bldg	3019	Purex Pulse Columns	Millwrights
External radiation	Seperations Bldg	3019	Purex Pulse Columns	Millwrights
Tributylphosphate (TBP)	Seperations Bldg	3019	Purex Pulse Columns	Millwrights
Amsco (Kerosene)	Seperations Bldg	3019	Purex Pulse Columns	Millwrights
Nitric Acid	Seperations Bldg	3019	Purex Pulse Columns	Millwrights
Heat	Seperations Bldg	3019	Purex	Instrument Mechanic
Internal radiation	Seperations Bldg	3019	Purex	Instrument Mechanic
External radiation	Seperations Bldg	3019	Purex	Instrument Mechanic
Nitric Acid	Seperations Bldg	3019	Purex	Instrument Mechanic
Aluminum Nitrate	Seperations Bldg	3019	Purex	Instrument Mechanic

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
Internal radiation	Seperations Bldg	3019	Purex Pulse Columns	Instrument Mechanic
External radiation	Seperations Bldg	3019	Purex Pulse Columns	Instrument Mechanic
Tributylphosphate (TBP)	Seperations Bldg	3019	Purex Pulse Columns	Instrument Mechanic
Amsco (Kerosene)	Seperations Bldg	3019	Purex Pulse Columns	Instrument Mechanic
Nitric Acid	Seperations Bldg	3019	Purex Pulse Columns	Instrument Mechanic
Heat	Seperations Bldg	3019	Purex	Welder
Internal radiation	Seperations Bldg	3019	Purex	Welder
External radiation	Seperations Bldg	3019	Purex	Welder
Nitric Acid	Seperations Bldg	3019	Purex	Welder
Aluminum Nitrate	Seperations Bldg	3019	Purex	Welder
Internal radiation	Seperations Bldg	3019	Purex Pulse Columns	Welder
External radiation	Seperations Bldg	3019	Purex Pulse Columns	Welder
Tributylphosphate (TBP)	Seperations Bldg	3019	Purex Pulse Columns	Welder
Amsco (Kerosene)	Seperations Bldg	3019	Purex Pulse Columns	Welder
Nitric Acid	Seperations Bldg	3019	Purex Pulse Columns	Welder
External radiation	Seperations Bldg	3019	Sampling Column	Chemical Operators
Internal radiation	Seperations Bldg	3019	Sampling Column	Chemical Operators
External radiation	Seperations Bldg	3019	Sampling Column	Group Leader
Internal radiation	Seperations Bldg	3019	Sampling Column	Group Leader
External radiation	Seperations Bldg	3019	Sampling Column	Sampling
Internal radiation	Seperations Bldg	3019	Sampling Column	Sampling
External radiation	Seperations Bldg	3019	Sampling Column	Shift Supervisor
Internal radiation	Seperations Bldg	3019	Sampling Column	Shift Supervisor
External radiation	Seperations Bldg	3019	Sampling Column	Foreman
Internal radiation	Seperations Bldg	3019	Sampling Column	Foreman
External radiation	Seperations Bldg	3019	Sampling Column	Pipefitters
Internal radiation	Seperations Bldg	3019	Sampling Column	Pipefitters
External radiation	Seperations Bldg	3019	Sampling Column	Millwrights
Internal radiation	Seperations Bldg	3019	Sampling Column	Millwrights
External radiation	Seperations Bldg	3019	Sampling Column	Electrician
Internal radiation	Seperations Bldg	3019	Sampling Column	Electrician
External radiation	Seperations Bldg	3019	Sampling Column	Instrument Mechanic
Internal radiation	Seperations Bldg	3019	Sampling Column	Instrument Mechanic
External radiation	Seperations Bldg	3019	Sampling Column	Welder

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
Internal radiation	Seperations Bldg	3019	Sampling Column	Welder
Acids	Seperations Bldg	3019	Cell Ventillation	Maintenance
Internal radiation	Seperations Bldg	3019	Cell Ventillation	Maintenance
External radiation	Seperations Bldg	3019	Cell Ventillation	Maintenance
Pu-239	Seperations Bldg	3019	Purex	
Curium	Radioisotope Processing Bldg F	3028	Hot cells	
Cobalt	Radioisotope Processing Bldg F	3028	Hot cells	
Curium	Radioisotope Processing Bldg E	3029	Hot cells	
Cobalt	Radioisotope Processing Bldg E	3029	Hot cells	
Alpha	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	HPs
Iodine-131	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	HPs
Technecium-99m	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	HPs
Strontium-90	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	HPs
Cesium-137	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	HPs
Molybdenum	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	HPs
Tritium	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	HPs
Alpha	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Chemical Operators
Iodine-131	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Chemical Operators
Technecium-99m	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Chemical Operators
Strontium-90	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Chemical Operators
Cesium-137	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Chemical Operators
Molybdenum	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Chemical Operators
Tritium	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Chemical Operators
Alpha	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Maintenance
Iodine-131	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Maintenance
Technecium-99m	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Maintenance
Strontium-90	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Maintenance
Cesium-137	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Maintenance
Molybdenum	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Maintenance
Tritium	adioisotope Analytical & Packing Bld	3038	Hot Cells and glove boxes	Maintenance
External radiation	ORR	3042		HPs
neutron	ORR	3042		HPs
External radiation	ORR	3042		Research Scientists
neutron	ORR	3042		Research Scientists

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
External radiation	ORR	3042		Reactor Operators
neutron	ORR	3042		Reactor Operators
Irridium-192	Radioisotope Development Lab.	3047		
Tritium	Radioisotope Development Lab.	3047	Hot Cells and glove boxes	
Curium	Radioisotope Development Lab.	3047	Hot Cells and glove boxes	
External radiation	Interim Manipulator Repair Facility	3074	Manipulator Shop	Millwrights
Internal radiation	Interim Manipulator Repair Facility	3074	Manipulator Shop	Millwrights
External radiation	Interim Manipulator Repair Facility	3074	Manipulator Shop	Electrician
Internal radiation	Interim Manipulator Repair Facility	3074	Manipulator Shop	Electrician
neutron	LITR	3085	Training Reactor	HPs
External radiation	LITR	3085	Training Reactor	HPs
neutron	LITR	3085	Training Reactor	Research Scientists
External radiation	LITR	3085	Training Reactor	Research Scientists
neutron	LITR	3085	Training Reactor	Reactor Operators
External radiation	LITR	3085	Training Reactor	Reactor Operators
Heat	Metal Recovery Bldg.	3505	Purex Production	Chemical Operators
Internal radiation	Metal Recovery Bldg.	3505	Purex Production	Chemical Operators
External radiation	Metal Recovery Bldg.	3505	Purex Production	Chemical Operators
Nitric Acid	Metal Recovery Bldg.	3505	Purex Production	Chemical Operators
Aluminum Nitrate	Metal Recovery Bldg.	3505	Purex Production	Chemical Operators
Tributylphosphate (TBP)	Metal Recovery Bldg.	3505	Purex Production	Chemical Operators.
Amsco (Kerosene)	Metal Recovery Bldg.	3505	Purex Production	Chemical Operators
Heat	Metal Recovery Bldg.	3505	Purex Production	Technicians
Internal radiation	Metal Recovery Bldg.	3505	Purex Production	Technicians
External radiation	Metal Recovery Bldg.	3505	Purex Production	Technicians
Nitric Acid	Metal Recovery Bldg.	3505	Purex Production	Technicians
Aluminum Nitrate	Metal Recovery Bldg.	3505	Purex Production	Technicians
Tributylphosphate (TBP)	Metal Recovery Bldg.	3505	Purex Production	Technicians
Amsco (Kerosene)	Metal Recovery Bldg.	3505	Purex Production	Technicians
Heat	Metal Recovery Bldg.	3505	Purex Production	Group Leader
Internal radiation	Metal Recovery Bldg.	3505	Purex Production	Group Leader
External radiation	Metal Recovery Bldg.	3505	Purex Production	Group Leader
Nitric Acid	Metal Recovery Bldg.	3505	Purex Production	Group Leader
Aluminum Nitrate	Metal Recovery Bldg.	3505	Purex Production	Group Leader

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
Tributylphosphate (TBP)	Metal Recovery Bldg.	3505	Purex Production	Group Leader
Amsco (Kerosene)	Metal Recovery Bldg.	3505	Purex Production	Group Leader
Heat	Metal Recovery Bldg.	3505	Purex Production	Foreman
Internal radiation	Metal Recovery Bldg.	3505	Purex Production	Foreman
External radiation	Metal Recovery Bldg.	3505	Purex Production	Foreman
Nitric Acid	Metal Recovery Bldg.	3505	Purex Production	Foreman
Aluminum Nitrate	Metal Recovery Bldg.	3505	Purex Production	Foreman
Tributylphosphate (TBP)	Metal Recovery Bldg.	3505	Purex Production	Foreman
Amsco (Kerosene)	Metal Recovery Bldg.	3505	Purex Production	Foreman
Heat	Metal Recovery Bldg.	3505	Purex Production	Maintenance
Internal radiation	Metal Recovery Bldg.	3505	Purex Production	Maintenance
External radiation	Metal Recovery Bldg.	3505	Purex Production	Maintenance
Nitric Acid	Metal Recovery Bldg.	3505	Purex Production	Maintenance
Aluminum Nitrate	Metal Recovery Bldg.	3505	Purex Production	Maintenance
Tributylphosphate (TBP)	Metal Recovery Bldg.	3505	Purex Production	Maintenance
Amsco (Kerosene)	Metal Recovery Bldg.	3505	Purex Production	Maintenance
Transuranics	Fission Product Development Lab	3517	Hot Cells	
Cesium-137	Fission Product Development Lab	3517	Hot cells	Chemical Operators
Cerium-144	Fission Product Development Lab	3517	Hot cells	Chemical Operators
Strontium-90	Fission Product Development Lab	3517	Hot cells	Chemical Operators
Cesium-137	Fission Product Development Lab	3517	Hot cells	Pipefitters
Cerium-144	Fission Product Development Lab	3517	Hot cells	Pipefitters
Strontium-90	Fission Product Development Lab	3517	Hot cells	Pipefitters
Cesium-137	Fission Product Development Lab	3517	Hot cells	Millwrights
Cerium-144	Fission Product Development Lab	3517	Hot cells	Millwrights
Strontium-90	Fission Product Development Lab	3517	Hot cells	Millwrights
Cesium-137	Fission Product Development Lab	3517	Hot cells	Sheet Metal Workers
Cerium-144	Fission Product Development Lab	3517	Hot cells	Sheet Metal Workers
Strontium-90	Fission Product Development Lab	3517	Hot cells	Sheet Metal Workers
Cesium-137	Fission Product Development Lab	3517	Hot cells	Welders
Cerium-144	Fission Product Development Lab	3517	Hot cells	Welders
Strontium-90	Fission Product Development Lab	3517	Hot cells	Welders
Cesium-137	Fission Product Development Lab	3517	Hot cells	Instrument Mechanic
Cerium-144	Fission Product Development Lab	3517	Hot cells	Instrument Mechanic

X-10 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job
Strontium-90	Fission Product Development Lab	3517	Hot cells	Instrument Mechanic
Cesium-137	Fission Product Development Lab	3517	Hot cells	Chemical Technician
Cerium-144	Fission Product Development Lab	3517	Hot cells	Chemical Technician
Strontium-90	Fission Product Development Lab	3517	Hot cells	Chemical Technician
Cesium-137	Fission Product Development Lab	3517	Hot cells	Maintenance
Cerium-144	Fission Product Development Lab	3517	Hot cells	Maintenance
Strontium-90	Fission Product Development Lab	3517	Hot cells	Maintenance
Strontium-90	Fission Product Development Lab	3517	Cell 10	Maintenance
Strontium-90	Fission Product Development Lab	3517	Cell 10	Chemical Operators
Internal radiation	High Rad. Level Examination Lab.	3525	Cells and Glove Boxes	
Plutonium	High Rad. Level Examination Lab.	3525	Cells and Glove Boxes	
Curium	High Rad. Level Examination Lab.	3525	Cells and Glove Boxes	
Plutonium	igh Rad. Level Chem. Develop. La	4507	Hot Cells	
Americium	igh Rad. Level Chem. Develop. La	4507	Hot Cells	
Curium	igh Rad. Level Chem. Develop. La	4507	Hot Cells	
Tramex	igh Rad. Level Chem. Develop. La	4507	Hot Cells	
neutron	DSAR	7710	low power reactor	HPs
External radiation	DSAR	7710	low power reactor	HPs
neutron	HFIR	7900		
External radiation	HFIR	7900		

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Y-12 Risk Mapping Results

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Radiation	velopment Lab and Offi	9202	Development	R & D Mechanics	
Welding Fumes	velopment Lab and Offi	9202	Development	R & D Mechanics	
Radiation	velopment Lab and Offi	9203	Development	R & D Mechanics	
Welding Fumes	velopment Lab and Offi	9203	Development	R & D Mechanics	
Uranium	velopment Lab and Offi	9203	Development	R & D Mechanics	
Radiation	Chemical Building	9206			
Radiation	Chemical Building	9206			
Radiation	Chemical Building	9206			
Enriched Uranium	Chemical Building	9206			
Uranium w/ metal alloys	Chemical Building	9206			
Radiation	Biology Bldgs	9207			
Lead	Biology Lab	9207		Scientists	
PCBs	Biology Lab	9207		Scientists	
Asbestos	Biology Lab	9207		Scientists	
Radiation	Biology Lab	9207		Scientists	
Red Dye	Biology Lab	9207		Scientists	
Radiation	Biology Bldgs	9208			
Lead	Biology Maintenance	9208		Scientists	
PCBs	Biology Maintenance	9208		Scientists	
Asbestos	Biology Maintenance	9208		Scientists	
Radiation	Biology Maintenance	9208		Scientists	
Red Dye	Biology Maintenance	9208		Scientists	
Radiation	Biology Bldgs	9210			
Lead	Rat Building'	9210		Scientists	
PCBs	Rat Building'	9210		Scientists	
Asbestos	Rat Building'	9210		Scientists	
Radiation	Rat Building'	9210		Scientists	
Red Dye	Rat Building'	9210		Scientists	
Radiation	Biology Bldgs	9211			
Lead	Biology Lab	9211		Scientists	
PCBs	Biology Lab	9211		Scientists	
Asbestos	Biology Lab	9211		Scientists	
Radiation	Biology Lab	9211		Scientists	
Red Dye	Biology Lab	9211		Scientists	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Uranium	Chemical and Metallur	9212	Foundry		
U-238	Chemical and Metallur	9212	Foundry		
Percolene	Chemical and Metallur	9212	M-Wing Rolling Mills		
Enriched Uranium	Chemical and Metallur	9212	M-Wing Rolling Mills		
UF4	Chemical and Metallur	9212	UF4 production		
UF4	Chemical and Metallur	9212	m Recovery and Processing		
Radiation	Chemical and Metallur	9212	X-ray Vaults		
HF	Chemical and Metallur	9212	UF4 production		
HF	Chemical and Metallur	9212	m Recovery and Processing		
Radiation	Chemical and Metallur	9212	X-ray Vaults		
Graphite	Chemical and Metallur	9212	Carbon Shop		
Cadmium	Chemical and Metallur	9212	Cadium plating		
Internal Radiation	Chemical and Metallur	9212	Floor Decontamination	Chemical Operators	
Uranium	Chemical and Metallur	9212	Floor Decontamination	Chemical Operators	
U-238	Chemical and Metallur	9212	machining	Machinists	
Tungsten	Chemical and Metallur	9212	machining	Machinists	
Magnesium	Chemical and Metallur	9212	machining	Machinists	
methanol	Chemical and Metallur	9212	machining	Machinists	
trimsol	Chemical and Metallur	9212	machining	Machinists	
U-238	Chemical and Metallur	9212	machining	Machine Cleaners	
Tungsten	Chemical and Metallur	9212	machining	Machine Cleaners	
Magnesium	Chemical and Metallur	9212	machining	Machine Cleaners	
methanol	Chemical and Metallur	9212	machining	Machine Cleaners	
trimsol	Chemical and Metallur	9212	machining	Machine Cleaners	
U-238	Chemical and Metallur	9212	machining	Oilers	
Tungsten	Chemical and Metallur	9212	machining	Oilers	
Magnesium	Chemical and Metallur	9212	machining	Oilers	
methanol	Chemical and Metallur	9212	machining	Oilers	
trimsol	Chemical and Metallur	9212	machining	Oilers	
U-238	Chemical and Metallur	9212	machining	Maintenance	
Tungsten	Chemical and Metallur	9212	machining	Maintenance	
Magnesium	Chemical and Metallur	9212	machining	Maintenance	
methanol	Chemical and Metallur	9212	machining	Maintenance	
trimsol	Chemical and Metallur	9212	machining	Maintenance	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Noise	Chemical and Metallur	9212	B and C wings	Chemical Operators	
HF	Chemical and Metallur	9212	B and C wings	Chemical Operators	
UF4	Chemical and Metallur	9212	B and C wings	Chemical Operators	
Fuming Nitric Acid	Chemical and Metallur	9212	B and C wings	Chemical Operators	
Sodium Hydroxide	Chemical and Metallur	9212	B and C wings	Chemical Operators	
Lithium	Chemical and Metallur	9212	B and C wings	Chemical Operators	
Noise	Chemical and Metallur	9212	B and C wings	Electricians	
HF	Chemical and Metallur	9212	B and C wings	Electricians	
UF4	Chemical and Metallur	9212	B and C wings	Electricians	
Fuming Nitric Acid	Chemical and Metallur	9212	B and C wings	Electricians	
Sodium Hydroxide	Chemical and Metallur	9212	B and C wings	Electricians	
Lithium	Chemical and Metallur	9212	B and C wings	Electricians	
Noise	Chemical and Metallur	9212	B and C wings	Pipefitters	
HF	Chemical and Metallur	9212	B and C wings	Pipefitters	
UF4	Chemical and Metallur	9212	B and C wings	Pipefitters	
Fuming Nitric Acid	Chemical and Metallur	9212	B and C wings	Pipefitters	
Sodium Hydroxide	Chemical and Metallur	9212	B and C wings	Pipefitters	
Lithium	Chemical and Metallur	9212	B and C wings	Pipefitters	
Noise	Chemical and Metallur	9212	B and C wings	Millwright	
HF	Chemical and Metallur	9212	B and C wings	Millwright	
UF4	Chemical and Metallur	9212	B and C wings	Millwright	
Fuming Nitric Acid	Chemical and Metallur	9212	B and C wings	Millwright	
Sodium Hydroxide	Chemical and Metallur	9212	B and C wings	Millwright	
Lithium	Chemical and Metallur	9212	B and C wings	Millwright	
nitrogen Tetroxide	Chemical and Metallur	9212	B and C wings	Chemical Operators	
UF4	Chemical and Metallur	9212	Room 1010	Chemical Operators	
Lithium	Chemical and Metallur	9212	Room 1010	Chemical Operators	
Nitric Acid	Chemical and Metallur	9212	Foundry, Casting	Chemical Operators	
Uranium Metal	Chemical and Metallur	9212	Foundry, Casting	Chemical Operators	
Argon	Chemical and Metallur	9212	Foundry, Casting	Chemical Operators	
Neutron Sources	Chemical and Metallur	9212	Foundry, Casting	Chemical Operators	
freon	Chemical and Metallur	9212	Foundry, Casting	Chemical Operators	
DAG	Chemical and Metallur	9212	Foundry, Casting	Chemical Operators	
Nitric Acid	Chemical and Metallur	9212	Foundry, Casting	Machinists	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Uranium Metal	Chemical and Metallur	9212	Foundry, Casting	Machinists	
Argon	Chemical and Metallur	9212	Foundry, Casting	Machinists	
Neutron Sources	Chemical and Metallur	9212	Foundry, Casting	Machinists	
freon	Chemical and Metallur	9212	Foundry, Casting	Machinists	
DAG	Chemical and Metallur	9212	Foundry, Casting	Machinists	
Nitric Acid	Chemical and Metallur	9212	Foundry, Casting	Security Guard	
Uranium Metal	Chemical and Metallur	9212	Foundry, Casting	Security Guard	
Argon	Chemical and Metallur	9212	Foundry, Casting	Security Guard	
Neutron Sources	Chemical and Metallur	9212	Foundry, Casting	Security Guard	
freon	Chemical and Metallur	9212	Foundry, Casting	Security Guard	
DAG	Chemical and Metallur	9212	Foundry, Casting	Security Guard	
Nitric Acid	Chemical and Metallur	9212	Foundry, Casting	Office Workers	
Uranium Metal	Chemical and Metallur	9212	Foundry, Casting	Office Workers	
Argon	Chemical and Metallur	9212	Foundry, Casting	Office Workers	
Neutron Sources	Chemical and Metallur	9212	Foundry, Casting	Office Workers	
freon	Chemical and Metallur	9212	Foundry, Casting	Office Workers	
DAG	Chemical and Metallur	9212	Foundry, Casting	Office Workers	
Radiation	Experimental Building	9213			
Radiation	Katies Kitchen	9213		Radiation Techs	
Radiation	Katies Kitchen	9213		Health Physicists	
Percolene	"Third Mill"	9215	M-Wing Rolling Mills		
Enriched Uranium	"Third Mill"	9215	M-Wing Rolling Mills		
Asbestos	"Third Mill"	9215	Rolling Mills		
Depleted U	"Third Mill"	9215	Rolling Mills		
Enriched Uranium	"Third Mill"	9215	M-Wing Machining	Machinists	
Perchloroethylene	"Third Mill"	9215	M-Wing Machining	Machinists	
ethylene glycol w/ borax	"Third Mill"	9215	M-Wing Machining	Machinists	
Stainless Steel	"Third Mill"	9215	M-Wing Machining	Machinists	
Aluminum	"Third Mill"	9215	M-Wing Machining	Machinists	
Titanium	"Third Mill"	9215	M-Wing Machining	Machinists	
Beryllium	"Third Mill"	9215	M-Wing Machining	Machinists	
Enriched Uranium	"Third Mill"	9215	M-Wing Machining	Material handlers	
Perchloroethylene	"Third Mill"	9215	M-Wing Machining	Material handlers	
ethylene glycol w/ borax	"Third Mill"	9215	M-Wing Machining	Material handlers	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Stainless Steel	"Third Mill"	9215	M-Wing Machining	Material handlers	
Aluminum	"Third Mill"	9215	M-Wing Machining	Material handlers	
Titanium	"Third Mill"	9215	M-Wing Machining	Material handlers	
Beryllium	"Third Mill"	9215	M-Wing Machining	Material handlers	
Enriched Uranium	"Third Mill"	9215	M-Wing Machining	Maintenance	
Perchloroethylene	"Third Mill"	9215	M-Wing Machining	Maintenance	
ethylene glycol w/ borax	"Third Mill"	9215	M-Wing Machining	Maintenance	
Stainless Steel	"Third Mill"	9215	M-Wing Machining	Maintenance	
Aluminum	"Third Mill"	9215	M-Wing Machining	Maintenance	
Titanium	"Third Mill"	9215	M-Wing Machining	Maintenance	
Beryllium	"Third Mill"	9215	M-Wing Machining	Maintenance	
Enriched Uranium	"Third Mill"	9215	M-Wing Machining	Office	
Perchloroethylene	"Third Mill"	9215	M-Wing Machining	Office	
ethylene glycol w/ borax	"Third Mill"	9215	M-Wing Machining	Office	
Stainless Steel	"Third Mill"	9215	M-Wing Machining	Office	
Aluminum	"Third Mill"	9215	M-Wing Machining	Office	
Titanium	"Third Mill"	9215	M-Wing Machining	Office	
Beryllium	"Third Mill"	9215	M-Wing Machining	Office	
Enriched Uranium	"Third Mill"	9215	M-Wing Inspection	Machinists	
Beryllium	"Third Mill"	9215	M-Wing Inspection	Machinists	
TCE	"Third Mill"	9215	M-Wing Inspection	Machinists	
Enriched Uranium	"Third Mill"	9215	M-Wing Inspection	Material Clerks	
Beryllium	"Third Mill"	9215	M-Wing Inspection	Materials Clerks	
TCE	"Third Mill"	9215	M-Wing Inspection	Materials Clerks	
Enriched Uranium	"Third Mill"	9215	M-Wing Inspection	Janitors	
Beryllium	"Third Mill"	9215	M-Wing Inspection	Janitors	
TCE	"Third Mill"	9215	M-Wing Inspection	Janitors	
Uranium	"Third Mill"	9215	M-Wing Inspection	Machinists	
Uranium	"Third Mill"	9215	M-Wing Inspection	Material Clerks	
Uranium	"Third Mill"	9215	M-Wing Inspection	Janitors	
Heat	"Third Mill"	9215	O-Wing Rolling Mill	Machinists	
Enriched Uranium	"Third Mill"	9215	O-Wing Rolling Mill	Machinists	
Internal Radiation	"Third Mill"	9215	O-Wing Rolling Mill	Machinists	
lead	"Third Mill"	9215	O-Wing Rolling Mill	Machinists	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Asbestos	"Third Mill"	9215	O-Wing Rolling Mill	Machinists	
Heat	"Third Mill"	9215	O-Wing Rolling Mill	Cleaners	
Enriched Uranium	"Third Mill"	9215	O-Wing Rolling Mill	Cleaners	
Internal Radiation	"Third Mill"	9215	O-Wing Rolling Mill	Cleaners	
lead	"Third Mill"	9215	O-Wing Rolling Mill	Cleaners	
Asbestos	"Third Mill"	9215	O-Wing Rolling Mill	Cleaners	
Heat	"Third Mill"	9215	O-Wing Rolling Mill	Supervisor	
Enriched Uranium	"Third Mill"	9215	O-Wing Rolling Mill	Supervisor	
Internal Radiation	"Third Mill"	9215	O-Wing Rolling Mill	Supervisor	
lead	"Third Mill"	9215	O-Wing Rolling Mill	Supervisor	
Asbestos	"Third Mill"	9215	O-Wing Rolling Mill	Supervisor	
U-238	"Third Mill"	9215	ing Heat Treat Hydrof	Machinists	
Thorium	"Third Mill"	9215	ing Heat Treat Hydrof	Machinists	
Perchloroethylene	"Third Mill"	9215	ing Heat Treat Hydrof	Machinists	
TCE	"Third Mill"	9215	ing Heat Treat Hydrof	Machinists	
Stainless Steel	"Third Mill"	9215	ing Heat Treat Hydrof	Machinists	
Asbestos	"Third Mill"	9215	ing Heat Treat Hydrof	Machinists	
PCBs	"Third Mill"	9215	ing Heat Treat Hydrof	Machinists	
U-238	"Third Mill"	9215	ing Heat Treat Hydrof	Cleaners	
Thorium	"Third Mill"	9215	ing Heat Treat Hydrof	Cleaners	
Perchloroethylene	"Third Mill"	9215	ing Heat Treat Hydrof	Cleaners	
TCE	"Third Mill"	9215	ing Heat Treat Hydrof	Cleaners	
Stainless Steel	"Third Mill"	9215	ing Heat Treat Hydrof	Cleaners	
Asbestos	"Third Mill"	9215	ing Heat Treat Hydrof	Cleaners	
PCBs	"Third Mill"	9215	ing Heat Treat Hydrof	Cleaners	
Asbestos	"Third Mill"	9215	Maintenance Area	Electrician	
Internal Radiation	"Third Mill"	9215	Maintenance Area	Electrician	
Beryllium	"Third Mill"	9215	Maintenance Area	Electrician	
Uranium	"Third Mill"	9215	Maintenance Area	Electrician	
Asbestos	"Third Mill"	9215	Maintenance Area	Pipefitters	
Internal Radiation	"Third Mill"	9215	Maintenance Area	Pipefitters	
Beryllium	"Third Mill"	9215	Maintenance Area	Pipefitters	
Uranium	"Third Mill"	9215	Maintenance Area	Pipefitters	
Asbestos	"Third Mill"	9215	Maintenance Area	Machinists	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Internal Radiation	"Third Mill"	9215	Maintenance Area	Machinists	
Beryllium	"Third Mill"	9215	Maintenance Area	Machinists	
Uranium	"Third Mill"	9215	Maintenance Area	Machinists	
Asbestos	"Third Mill"	9215	Maintenance Area	OM	
Internal Radiation	"Third Mill"	9215	Maintenance Area	OM	
Beryllium	"Third Mill"	9215	Maintenance Area	OM	
Uranium	"Third Mill"	9215	Maintenance Area	OM	
Asbestos	"Third Mill"	9215	Maintenance Area	Welder	
Internal Radiation	"Third Mill"	9215	Maintenance Area	Welder	
Beryllium	"Third Mill"	9215	Maintenance Area	Welder	
Uranium	"Third Mill"	9215	Maintenance Area	Welder	
U-238	"Third Mill"	9215	3rd Mill	Machinists	
Uranium w/ metal alloys	"Third Mill"	9215	3rd Mill	Machinists	
Noise	"Third Mill"	9215	3rd Mill	Machinists	
Enriched Uranium	"Third Mill"	9215	M-Wing Blister Packing	Material Clerks	
Freon	"Third Mill"	9215	M-Wing Blister Packing	Material Clerks	
Etchant	"Third Mill"	9215	M-Wing Blister Packing	Material Clerks	
Potassium Carbonate	"Third Mill"	9215	O-Wing Salt Baths	Machinists	
Sodium Hydroxide	"Third Mill"	9215	O-Wing Salt Baths	Machinists	
Lithium	"Third Mill"	9215	O-Wing Salt Baths	Machinists	
Heat	"Third Mill"	9215	O-Wing Salt Baths	Machinists	
Potassium Carbonate	"Third Mill"	9215	O-Wing Salt Baths	Cleaners	
Sodium Hydroxide	"Third Mill"	9215	O-Wing Salt Baths	Cleaners	
Lithium	"Third Mill"	9215	O-Wing Salt Baths	Cleaners	
Heat	"Third Mill"	9215	O-Wing Salt Baths	Cleaners	
Potassium Carbonate	"Third Mill"	9215	O-Wing Salt Baths	Supervisor	
Sodium Hydroxide	"Third Mill"	9215	O-Wing Salt Baths	Supervisor	
Lithium	"Third Mill"	9215	O-Wing Salt Baths	Supervisor	
Heat	"Third Mill"	9215	O-Wing Salt Baths	Supervisor	
DAG	"Third Mill"	9215	O-Wing Oil Baths	Machinists	
Perchloroethylene	"Third Mill"	9215	O-Wing Oil Baths	Machinists	
Freon	"Third Mill"	9215	O-Wing Oil Baths	Machinists	
DAG	"Third Mill"	9215	O-Wing Oil Baths	Cleaners	
Perchloroethylene	"Third Mill"	9215	O-Wing Oil Baths	Cleaners	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Freon	"Third Mill"	9215	O-Wing Oil Baths	Cleaners	
DAG	"Third Mill"	9215	O-Wing Oil Baths	Supervisor	
Perchloroethylene	"Third Mill"	9215	O-Wing Oil Baths	Supervisor	
Freon	"Third Mill"	9215	O-Wing Oil Baths	Supervisor	
lead	"Third Mill"	9215	O-Wing Lead Baths	Machinists	
Bismuth	"Third Mill"	9215	O-Wing Lead Baths	Machinists	
lead	"Third Mill"	9215	O-Wing Lead Baths	Cleaners	
Bismuth	"Third Mill"	9215	O-Wing Lead Baths	Cleaners	
lead	"Third Mill"	9215	O-Wing Lead Baths	Supervisor	
Bismuth	"Third Mill"	9215	O-Wing Lead Baths	Supervisor	
Black Oxide	"Third Mill"	9215	O-Wing Rolling Mill	Machinists	
Black Oxide	"Third Mill"	9215	O-Wing Rolling Mill	Cleaners	
Black Oxide	"Third Mill"	9215	O-Wing Rolling Mill	Supervisor	
Plutonium	"Third Mill"	9215	O-Wing Rolling Mill	Machinists	
Plutonium	"Third Mill"	9215	O-Wing Rolling Mill	Cleaners	
Plutonium	"Third Mill"	9215	O-Wing Rolling Mill	Supervisor	
Beryllium	"Third Mill"	9215	M-Wing Inspection		
U-238	"Third Mill"	9215	M-Wing		
Perchloroethylene	"Third Mill"	9215	M-Wing		
TCE	"Third Mill"	9215	M-Wing		
U-235	"Third Mill"	9215	W-Wing		
Thorium	"Third Mill"	9215			
Tungsten	"Third Mill"	9215			
fiberglass	"Third Mill"	9215			
Titanium	"Third Mill"	9215			
Graphite	"Third Mill"	9215			
Irridium	"Third Mill"	9215			
TCE	"Third Mill"	9215			
Perchloroethylene	"Third Mill"	9215			
Freon	"Third Mill"	9215			
Dykam	"Third Mill"	9215			
Dykam Remover	"Third Mill"	9215			
Acetone	"Third Mill"	9215			
Alcohol	"Third Mill"	9215			

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Carbon Tetrachloride	"Third Mill"	9215			
Lead	Biology Lab	9220		Scientists	
PCBs	Biology Lab	9220		Scientists	
Asbestos	Biology Lab	9220		Scientists	
Radiation	Biology Lab	9220		Scientists	
Red Dye	Biology Lab	9220		Scientists	
Lead	Biology Lab	9224		Scientists	
PCBs	Biology Lab	9224		Scientists	
Asbestos	Biology Lab	9224		Scientists	
Radiation	Biology Lab	9224		Scientists	
Red Dye	Biology Lab	9224		Scientists	
Beryllium	Office	9766	West End		
Thorium	Office	9766	West End		
Lead	Old Steam Plant	9769		Scientists	
PCBs	Old Steam Plant	9769		Scientists	
Asbestos	Old Steam Plant	9769		Scientists	
Radiation	Old Steam Plant	9769		Scientists	
Red Dye	Old Steam Plant	9769		Scientists	
mercury	Old Pump Shop	9808	Mercury Pumps	OM	
Uranium	Manufacturing/Industria	9996	crucible machining	Machinists	
U-238	Manufacturing/Industria	9996	crucible machining	Machinists	
Black Oxide	Foundry	9998	Foundry		
Depleted U	Foundry	9998	H2 Machine Shop	Machinists	
Stainless Steel	Foundry	9998	H2 Machine Shop	Machinists	
Uranium w/ metal alloys	Foundry	9998	H2 Machine Shop	Machinists	
Depleted U	Foundry	9998	H2 Machine Shop	Supervisor	
Stainless Steel	Foundry	9998	H2 Machine Shop	Supervisor	
Uranium w/ metal alloys	Foundry	9998	H2 Machine Shop	Supervisor	
Depleted U	Foundry	9998	H2 Machine Shop	Cleaners	
Stainless Steel	Foundry	9998	H2 Machine Shop	Cleaners	
Uranium w/ metal alloys	Foundry	9998	H2 Machine Shop	Cleaners	
Depleted U	Foundry	9998	H2 Machine Shop	Material handlers	
Stainless Steel	Foundry	9998	H2 Machine Shop	Material handlers	
Uranium w/ metal alloys	Foundry	9998	H2 Machine Shop	Material handlers	

Y-12 Risk Mapping Results
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Chemical	Building Name	Building Number	Process Area	Job	
Enriched Uranium	Alpha -1	9201-1	Calutron	Chemical Operators	
Magnetic Fields	Alpha -1	9201-1	Calutron	Chemical Operators	
Graphite	Alpha -1	9201-1	Carbon Shop		
Enriched Uranium	Alpha -1	9201-2	Calutron	Chemical Operators	
Magnetic Fields	Alpha -1	9201-2	Calutron	Chemical Operators	
Radiation	Alpha-2	9201-2	Cyclotron		
mercury	Alpha-2	9201-2	COLEX		
HF	alpha-2	9201-2	COLEX		
mercury	Alpha 2	9201-2	Colex	Chemical Operators	
alcohol	Alpha 2	9201-2	Colex	Chemical Operators	
mercury	Alpha 2	9201-2	Elex	Chemical Operators	
alcohol	Alpha 2	9201-2	Elex	Chemical Operators	
mercury	Alpha 2	9201-2	Colex	Electrician	
alcohol	Alpha 2	9201-2	Colex	Electrician	
mercury	Alpha 2	9201-2	Elex	Electrician	
alcohol	Alpha 2	9201-2	Elex	Electrician	
mercury	Alpha 2	9201-2	Colex	pipefitter	
alcohol	Alpha 2	9201-2	Colex	pipefitter	
mercury	Alpha 2	9201-2	Elex	pipefitter	
alcohol	Alpha 2	9201-2	Elex	pipefitter	
mercury	Alpha 2	9201-2	Colex	OM	
alcohol	Alpha 2	9201-2	Colex	OM	
mercury	Alpha 2	9201-2	Elex	OM	
alcohol	Alpha 2	9201-2	Elex	OM	
mercury	Alpha 2	9201-2	Colex	Welder	
alcohol	Alpha 2	9201-2	Colex	Welder	
mercury	Alpha 2	9201-2	Elex	Welder	
alcohol	Alpha 2	9201-2	Elex	Welder	
Enriched Uranium	Alpha -3	9201-3	Calutron	Chemical Operators	
Magnetic Fields	Alpha -3	9201-3	Calutron	Chemical Operators	
Enriched Uranium	Alpha-4	9201-4	Calutron	Chemical Operators	
Magnetic Fields	Alpha-4	9201-4	Calutron	Chemical Operators	
mercury	Alpha-4	9201-4	Colex	Chemical Operators	
alcohol	Alpha-4	9201-4	Colex	Chemical Operators	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
mercury	Alpha-4	9201-4	Elex	Chemical Operators	
alcohol	Alpha-4	9201-4	Elex	Chemical Operators	
mercury	Alpha-4	9201-4	Colex	Electrician	
alcohol	Alpha-4	9201-4	Colex	Electrician	
mercury	Alpha-4	9201-4	Elex	Electrician	
alcohol	Alpha-4	9201-4	Elex	Electrician	
mercury	Alpha-4	9201-4	Colex	pipefitter	
alcohol	Alpha-4	9201-4	Colex	pipefitter	
mercury	Alpha-4	9201-4	Elex	pipefitter	
alcohol	Alpha-4	9201-4	Elex	pipefitter	
mercury	Alpha-4	9201-4	Colex	OM	
alcohol	Alpha-4	9201-4	Colex	OM	
mercury	Alpha-4	9201-4	Elex	OM	
alcohol	Alpha-4	9201-4	Elex	OM	
mercury	Alpha-4	9201-4	Colex	Welder	
alcohol	Alpha-4	9201-4	Colex	Welder	
mercury	Alpha-4	9201-4	Elex	Welder	
alcohol	Alpha-4	9201-4	Elex	Welder	
mercury	Alpha-4	9201-4		Chemical Operators	
Beryllium Oxide	Alpha-5	9201-5	Bulter Bldg	Machinists	
Thorium	Alpha-5	9201-5	Bulter Bldg	Machinists	
Beryllium Oxide	Alpha-5	9201-5	Bulter Bldg	Machinists	
Thorium	Alpha-5	9201-5	Bulter Bldg	Machinists	
mercury	Alpha-5	9201-5	Seperation Bldg		
Lithium	Alpha-5	9201-5	Seperation Bldg		
mercury	Alpha-5	9201-5	Seperation Bldg		
Lithium	Alpha-5	9201-5	Seperation Bldg		
Enriched Uranium	Alpha-5	9201-5	Calutron	Chemical Operators	
Magnetic Fields	Alpha-5	9201-5	Calutron	Chemical Operators	
Cyanide	Alpha-5	9201-5	Electroplating		
NaK	Alpha-5	9201-5	2nd floor press		
mercury	Alpha-5	9201-5	Colex	Chemical Operators	
alcohol	Alpha-5	9201-5	Colex	Chemical Operators	
mercury	Alpha-5	9201-5	Elex	Chemical Operators	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
alcohol	Alpha-5	9201-5	Elex	Chemical Operators	
mercury	Alpha-5	9201-5	Colex	Electrician	
alcohol	Alpha-5	9201-5	Colex	Electrician	
mercury	Alpha-5	9201-5	Elex	Electrician	
alcohol	Alpha-5	9201-5	Elex	Electrician	
mercury	Alpha-5	9201-5	Colex	pipefitter	
alcohol	Alpha-5	9201-5	Colex	pipefitter	
mercury	Alpha-5	9201-5	Elex	pipefitter	
alcohol	Alpha-5	9201-5	Elex	pipefitter	
mercury	Alpha-5	9201-5	Colex	OM	
alcohol	Alpha-5	9201-5	Colex	OM	
mercury	Alpha-5	9201-5	Elex	OM	
alcohol	Alpha-5	9201-5	Elex	OM	
mercury	Alpha-5	9201-5	Colex	Welder	
alcohol	Alpha-5	9201-5	Colex	Welder	
mercury	Alpha-5	9201-5	Elex	Welder	
alcohol	Alpha-5	9201-5	Elex	Welder	
mercury	Alpha-5	9201-5		Chemical Operators	
Mineral Oil	Alpha-5	9201-5		Chemical Operators	
Heat	Alpha-5	9201-5		Chemical Operators	
Uranium	Alpha-5	9201-5		Chemical Operators	
Thorium	Alpha-5	9201-5		Chemical Operators	
NaK	Alpha-5	9201-5		Chemical Operators	
Beryllium	Alpha-5	9201-5	Butler Building	Inspector	
Freon	Alpha-5	9201-5	Butler Building	Inspector	
Perchloroethylene	Alpha-5	9201-5	Butler Building	Inspector	
TCE	Alpha-5	9201-5	Butler Building	Inspector	
Beryllium	Alpha-5	9201-5	Butler Building	Machinists	
Mineral Oil	Alpha-5	9201-5	Butler Building	Machinists	
Beryllium	Alpha-5	9201-5	Butler Building	Maintenance	
Mineral Oil	Alpha-5	9201-5	Butler Building	Maintenance	
Beryllium	Alpha-5	9201-5	Butler Building	Electricians	
Mineral Oil	Alpha-5	9201-5	Butler Building	Electricians	
Beryllium	Alpha-5	9201-5	Butler Building	Pipefitters	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Mineral Oil	Alpha-5	9201-5	Butler Building	Pipefitters	
Beryllium	Alpha-5	9201-5	Butler Building	Machine Cleaners	
Mineral Oil	Alpha-5	9201-5	Butler Building	Machine Cleaners	
Beryllium	Alpha-5	9201-5	Butler Building	Engineers	
Mineral Oil	Alpha-5	9201-5	Butler Building	Engineers	
Carbon Foam	Alpha-5	9201-5	Foam Shop	Machinists	
Noise	Alpha-5	9201-5	Utility Area	Maintenance	
Noise	Alpha-5	9201-5	Utility Area	Electricians	
Noise	Alpha-5	9201-5	Utility Area	Pipefitters	
Noise	Alpha-5	9201-5	Hydraulics	Maintenance	
Noise	Alpha-5	9201-5	Hydraulics	Electricians	
Noise	Alpha-5	9201-5	Hydraulics	Pipefitters	
uranium	Alpha-5	9201-5	2nd floor	Machinists	
Beryllium	Alpha-5	9201-5	2nd floor	Machinists	
asbestos	Alpha-5	9201-5	2nd floor	Machinists	
Beryllium	Alpha-5	9201-5	2nd floor	Machinists	
Beryllium	Alpha-5	9201-5	2nd floor	Inspector	
Beryllium	Alpha-5	9201-5	2nd floor	Chemical Operators	
Beryllium	Alpha-5	9201-5	2nd floor		
Uranium	Alpha-5	9201-5	3rd floor	Machinists	
Beryllium	Alpha-5	9201-5	3rd floor	Machinists	
silver solder	Alpha-5	9201-5	3rd floor	Machinists	
Beryllium	Alpha-5	9201-5	3rd floor	Maintenance	
uranium	Alpha-5	9201-5	3rd floor	Maintenance	
Beryllium	Alpha-5	9201-5	Beryllium Spray Area	Electroplaters	
U-238	Alpha-5	9201-5E		Machinists	
gold	Alpha-5	9201-5E		Machinists	
Platinum	Alpha-5	9201-5E		Machinists	
Lead	Alpha-5	9201-5E		Machinists	
Thorium	Alpha-5	9201-5E		Machinists	
Plutonium	Alpha-5	9201-5E		Machinists	
U-238	Alpha-5	9201-5E		Foreman	
gold	Alpha-5	9201-5E		Foreman	
Platinum	Alpha-5	9201-5E		Foreman	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Lead	Alpha-5	9201-5E		Foreman	
Thorium	Alpha-5	9201-5E		Foreman	
Plutonium	Alpha-5	9201-5E		Foreman	
Beryllium	Alpha-5	9201-5E	Inspection	Inspector	
U-238	Alpha-5	9201-5E	Uranium Inspection	Inspector	
cyanide	Plate Shop	9201-5N		Electroplaters	
Beryllium	Plate Shop	9201-5N		Electroplaters	
HEU	Plate Shop	9201-5N		Electroplaters	
HEU	Plate Shop	9201-5N		Security Guard	
U-238	Plate Shop	9201-5N	machining	Machinists	
Binary	Plate Shop	9201-5N	machining	Machinists	
Aluminum	Plate Shop	9201-5N	machining	Machinists	
Steel	Plate Shop	9201-5N	machining	Machinists	
Perchloroethylene	Plate Shop	9201-5N	machining	Machinists	
freon	Plate Shop	9201-5N	machining	Machinists	
cyanide	Plate Shop	9201-5N	Plate Shop	Electroplaters	
caustics	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Copper	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Nickel	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Chrome	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Chromium Oxide	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Gold	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Silver	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Cadmium	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Aqua Regia	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Potassium Cyanide	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Perchloroethylene	Plate Shop	9201-5N	Plate Shop	Electroplaters	
Uranium w/ metal alloys	Manufacturing/Industria	9201-5W		Machinists	
Aluminum	Manufacturing/Industria	9201-5W		Machinists	
Internal Radiation	Manufacturing/Industria	9201-5W		Machinists	
Uranium w/ metal alloys	Manufacturing/Industria	9201-5W		Maintenance	
Aluminum	Manufacturing/Industria	9201-5W		Maintenance	
Internal Radiation	Manufacturing/Industria	9201-5W		Maintenance	
Uranium w/ metal alloys	Manufacturing/Industria	9201-5W		Electricians	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Aluminum	Manufacturing/Industria	9201-5W		Electricians	
Internal Radiation	Manufacturing/Industria	9201-5W		Electricians	
alcohol	Manufacturing/Industria	9201-5W	Machine Cleaning	Machine Cleaners	
acetone	Manufacturing/Industria	9201-5W	Machine Cleaning	Machine Cleaners	
freon	Manufacturing/Industria	9201-5W	Machine Cleaning	Machine Cleaners	
Perchloroethylene	Manufacturing/Industria	9201-5W	Machine Cleaning	Machine Cleaners	
trimsol	Manufacturing/Industria	9201-5W	Machine Cleaning	Machine Cleaners	
kerosene	Manufacturing/Industria	9201-5W	Machine Cleaning	Machine Cleaners	
Nitric Acid	Beta-2	9204-2	Salt bath area	Chemical Operators	
Lithium Deutiride	Beta-2	9204-2	Salt bath area	Chemical Operators	
Lithium Salt	Beta-2	9204-2	Salt bath area	Chemical Operators	
mercury	Beta 2	9204-2	Colex	Chemical Operators	
alcohol	Beta 2	9204-2	Colex	Chemical Operators	
mercury	Beta 2	9204-2	Elex	Chemical Operators	
alcohol	Beta 2	9204-2	Elex	Chemical Operators	
mercury	Beta 2	9204-2	Colex	Electrician	
alcohol	Beta 2	9204-2	Colex	Electrician	
mercury	Beta 2	9204-2	Elex	Electrician	
alcohol	Beta 2	9204-2	Elex	Electrician	
mercury	Beta 2	9204-2	Colex	pipefitter	
alcohol	Beta 2	9204-2	Colex	pipefitter	
mercury	Beta 2	9204-2	Elex	pipefitter	
alcohol	Beta 2	9204-2	Elex	pipefitter	
mercury	Beta 2	9204-2	Colex	OM	
alcohol	Beta 2	9204-2	Colex	OM	
mercury	Beta 2	9204-2	Elex	OM	
alcohol	Beta 2	9204-2	Elex	OM	
mercury	Beta 2	9204-2	Colex	Welder	
alcohol	Beta 2	9204-2	Colex	Welder	
mercury	Beta 2	9204-2	Elex	Welder	
alcohol	Beta 2	9204-2	Elex	Welder	
Lithium Hydride	Beta 2	9204-2	Machine Shop	Machinist	
Lithium Deutiride	Beta 2	9204-2	Machine Shop	Machinist	
Arsenic	Beta 2	9204-2	Machine Shop	Machinist	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
PCBs	Beta 2	9204-2		Chemical Operators	
Lithium	Beta 2	9204-2			
Fissile Material	Beta 2	9204-2E	Assembly		
Enriched Uranium	Beta-3	9204-3	Calutron	Chemical Operators	
Radiation	Beta-3	9204-3	Cyclotron		
Plutonium	Beta-3	9204-3	Calutron		
U-238	Beta-4	9204-4	Press Area		
U-238	Beta-4	9204-4	Machining		
Acid	Beta-4	9204-4	Acid Vats		
Lead	Beta-4	9204-4			
Silver	Beta-4	9204-4			
Beryllium	Beta-4	9204-4			
Uranium	Beta-4	9204-4			
Stainless Steel	Beta-4	9204-4			
Boric acid	Beta-4	9204-4			
Fissile Material	Beta-4	9204-4	Disassembly		
Nitric Acid	Beta-4 Plate Shop	9204-4		Electroplaters	
Sulfuric Acid	Beta-4 Plate Shop	9204-4		Electroplaters	
Sodium Hydroxide	Beta-4 Plate Shop	9204-4		Electroplaters	
Nickel Sulfamate	Beta-4 Plate Shop	9204-4		Electroplaters	
Cadmium	Beta-4 Plate Shop	9204-4		Electroplaters	
Copper	Beta-4 Plate Shop	9204-4		Electroplaters	
Natural U	P-wing	9212 Complex	Rolling Mills		
Enriched Uranium	O-wing	9212 Complex	Rolling Mills		
Cyanide	Plate Shop	9401-2	Plating shop		
Nickel	Plate Shop	9401-2	Plating shop		
Copper	Plate Shop	9401-2	Plating shop		
Gold	Plate Shop	9401-2	Plating shop		
Chromium	Plate Shop	9401-2	Plating shop		
Coal Dust	Steam Plant	9401-2		Steam Plant Operators	
Fly Ash	Steam Plant	9401-2		Steam Plant Operators	
Sulfuric Acid	Steam Plant	9401-2		Steam Plant Operators	
Phosphates	Steam Plant	9401-2		Steam Plant Operators	
Coal Dust	Steam Plant	9401-2		Foreman	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Fly Ash	Steam Plant	9401-2		Foreman	
Sulfuric Acid	Steam Plant	9401-2		Foreman	
Phosphates	Steam Plant	9401-2		Foreman	
Coal Dust	Steam Plant	9401-2		Maintenance	
Fly Ash	Steam Plant	9401-2		Maintenance	
Sulfuric Acid	Steam Plant	9401-2		Maintenance	
Phosphates	Steam Plant	9401-2		Maintenance	
Coal Dust	Steam Plant	9401-2		Janitor	
Fly Ash	Steam Plant	9401-2		Janitor	
Sulfuric Acid	Steam Plant	9401-2		Janitor	
Phosphates	Steam Plant	9401-2		Janitor	
Acids	Steam Plant	9401-2		Electroplaters	
Heat	Steam Plant	9401-2		Electroplaters	
Chromium	Steam Plant	9401-2		Electroplaters	
Dyes	Steam Plant	9401-2		Electroplaters	
Acids	Steam Plant	9401-2		Supervisor	
Heat	Steam Plant	9401-2		Supervisor	
Chromium	Steam Plant	9401-2		Supervisor	
Dyes	Steam Plant	9401-2		Supervisor	
Acids	Steam Plant	9401-2		Electricians	
Heat	Steam Plant	9401-2		Electricians	
Chromium	Steam Plant	9401-2		Electricians	
Dyes	Steam Plant	9401-2		Electricians	
Acids	Steam Plant	9401-2		Pipefitters	
Heat	Steam Plant	9401-2		Pipefitters	
Chromium	Steam Plant	9401-2		Pipefitters	
Dyes	Steam Plant	9401-2		Pipefitters	
Acids	Steam Plant	9401-2		OM	
Heat	Steam Plant	9401-2		OM	
Chromium	Steam Plant	9401-2		OM	
Dyes	Steam Plant	9401-2		OM	
Acids	Steam Plant	9401-2		Crane and Hoist	
Heat	Steam Plant	9401-2		Crane and Hoist	
Chromium	Steam Plant	9401-2		Crane and Hoist	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Dyes	Steam Plant	9401-2		Crane and Hoist	
HF	Steam Plant	9401-2		Electroplaters	
Nitric Acid	Steam Plant	9401-2		Electroplaters	
Hydrochloric Acid	Steam Plant	9401-2		Electroplaters	
HF	Steam Plant	9401-2		Supervisor	
Nitric Acid	Steam Plant	9401-2		Supervisor	
Hydrochloric Acid	Steam Plant	9401-2		Supervisor	
HF	Steam Plant	9401-2		Electricians	
Nitric Acid	Steam Plant	9401-2		Electricians	
Hydrochloric Acid	Steam Plant	9401-2		Electricians	
HF	Steam Plant	9401-2		Pipefitters	
Nitric Acid	Steam Plant	9401-2		Pipefitters	
Hydrochloric Acid	Steam Plant	9401-2		Pipefitters	
HF	Steam Plant	9401-2		OM	
Nitric Acid	Steam Plant	9401-2		OM	
Hydrochloric Acid	Steam Plant	9401-2		OM	
HF	Steam Plant	9401-2		Crane and Hoist	
Nitric Acid	Steam Plant	9401-2		Crane and Hoist	
Hydrochloric Acid	Steam Plant	9401-2		Crane and Hoist	
cyanide	Steam Plant	9401-2		Electroplaters	
cyanide	Steam Plant	9401-2		Supervisor	
cyanide	Steam Plant	9401-2		Electricians	
cyanide	Steam Plant	9401-2		Pipefitters	
cyanide	Steam Plant	9401-2		OM	
cyanide	Steam Plant	9401-2		Crane and Hoist	
allodine	Steam Plant	9401-2		Electroplaters	
allodine	Steam Plant	9401-2		Supervisor	
allodine	Steam Plant	9401-2		Electricians	
allodine	Steam Plant	9401-2		Pipefitters	
allodine	Steam Plant	9401-2		OM	
allodine	Steam Plant	9401-2		Crane and Hoist	
Lead	Chicken House	9743-2		Scientists	
PCBs	Chicken House	9743-2		Scientists	
Asbestos	Chicken House	9743-2		Scientists	

Y-12 Risk Mapping Results
Summary Report

Chemical	Building Name	Building Number	Process Area	Job	
Radiation	Chicken House	9743-2		Scientists	
Red Dye	Chicken House	9743-2		Scientists	
Lead	Chiller Building	9767		Scientists	
PCBs	Chiller Building	9767		Scientists	
Asbestos	Chiller Building	9767		Scientists	
Radiation	Chiller Building	9767		Scientists	
Red Dye	Chiller Building	9767		Scientists	
Lead	Green House			Scientists	
PCBs	Green House			Scientists	
Asbestos	Green House			Scientists	
Radiation	Green House			Scientists	
Red Dye	Green House			Scientists	

Appendix B

B-1

Y-12 External Dose

Y-12 Penetrating Dose (1950-1988) >500 mrem by Department

Dept	Number >500 mrem		Dept	Number >500 mrem
2000	18		*Grand Total*	*695*
2001	5		2702	100
2003	2		2617	90
2014	13		2619	81
2015	6		2018	67
2018	67		2044	24
2035	2		2703	24
2038	3		2701	21
2044	24		2000	18
2055	4		2638	18
2057	1		2640	14
2066	1		2014	13
2070	2		2601	9
2077	6		2637	9
2091	4		2644	9
2093	2		2618	8
2098	1		2231	7
2106	1		2722	7
2107	2		2015	6
2108	5		2077	6
2133	1		2233	6
2157	2		2375	6
2158	4		2624	6
2162	1		2705	6
2164	1		2001	5
2186	1		2108	5
2188	1		2259	5
2200	3		2635	5
2231	7		2720	5
2233	6		2736	5
2239	1		2791	5
2259	5		2055	4
2301	4		2091	4
2315	2		2158	4
2345	2		2301	4
2360	1		2387	4
2365	1		2726	4
2371	1		7410	4
2373	2		2038	3
2375	6		2200	3
2376	1		2388	3
2377	1		2654	3
2382	1		2664	3
2387	4		2793	3
2388	3		2003	2
2465	1		2035	2
2601	9		2070	2
2604	1		2093	2
2610	2		2107	2
2616	2		2157	2
2617	90		2315	2

Y-12 Penetrating Dose (1950-1988) >500 mrem by Department

Dept	Number >500 mrem		Dept	Number >500 mrem
2618	8		2345	2
2619	81		2373	2
2624	6		2610	2
2625	1		2616	2
2628	2		2628	2
2629	1		2636	2
2635	5		2695	2
2636	2		2718	2
2637	9		2742	2
2638	18		2057	1
2640	14		2066	1
2644	9		2098	1
2650	1		2106	1
2654	3		2133	1
2664	3		2162	1
2691	1		2164	1
2695	2		2186	1
2699	1		2188	1
2700	1		2239	1
2701	21		2360	1
2702	100		2365	1
2703	24		2371	1
2705	6		2376	1
2718	2		2377	1
2720	5		2382	1
2722	7		2465	1
2726	4		2604	1
2736	5		2625	1
2742	2		2629	1
2774	1		2650	1
2776	1		2691	1
2791	5		2699	1
2793	3		2700	1
7169	1		2774	1
7410	4		2776	1
(blank)			7169	1
Grand Tota	695		(blank)	

Y-12 Skin Dose (1950-1988) >500mrem by Department

Dept	Number >500 mrem		Dept	Number >500 mrem
2000	187		*Grand Total*	*22601*
2001	61		2703	3448
2002	24	✓	2618	2106
2003	79	✓	2702	2012
2009	1		2792	1308
2014	71	✓	2638	1069
2015	138		2701	1062
2018	292		2619	1060
2035	2		2640	1025
2037	3		2720	813
2038	9		2375	566
2041	1		2793	544
2043	1		2617	525
2044	132		2637	470
2046	1		2233	461
2055	229		2722	417
2057	2		2387	368
2060	16		2736	340
2063	1		2018	292
2064	15		2093	278
2065	2		2665	257
2066	2		2624	245
2068	3		2644	238
2069	4		2055	229
2070	24		2616	202
2071	4		2000	187
2077	111		2231	171
2085	1		2791	151
2089	1		2259	150
2090	15		2015	138
2091	19		2044	132
2093	278		2705	122
2094	1		2108	115
2098	1		2077	111
2106	1		2200	111
2107	4		2726	106
2108	115		2625	96
2128	35		2776	92
2133	1		2301	83
2136	1		2601	83
2137	1		2003	79
2141	4		2365	78
2142	8		2695	75
2143	1		2014	71
2145	1		2773	71
2151	1		2001	61
2157	2		2158	60
2158	60		2162	40
2159	13		2664	37
2160	6		2128	35
2162	40		2774	34

Y-12 Skin Dose (1950-1988) >500mrem by Department

Dept	Number >500 mrem		Dept	Number >500 mrem
2164	4		2388	31
2165	1		2654	30
2183	1		2713	30
2186	1		2252	27
2188	2		2002	24
2200	111		2070	24
2204	3		2376	24
2231	171		2389	24
2233	461		2742	22
2235	3		2707	21
2239	6		2600	20
2252	27		2628	20
2257	13		2689	20
2259	150		2091	19
2260	2		2344	18
2282	5		2060	16
2300	1		2064	15
2301	83		2090	15
2302	2		2345	14
2303	6		2159	13
2304	1		2257	13
2315	6		2636	13
2320	7		2799	13
2342	3		2687	11
2343	3		2694	10
2344	18		2038	9
2345	14		2790	9
2346	1		2142	8
2347	1		2320	7
2351	3		2377	7
2356	3		2602	7
2360	2		2635	7
2365	78		2700	7
2366	2		2723	7
2371	6		7410	7
2373	4		2160	6
2375	566		2239	6
2376	24		2303	6
2377	7		2315	6
2378	4		2371	6
2380	1		2282	5
2382	1		2410	5
2386	1		2738	5
2387	368		2069	4
2388	31		2071	4
2389	24		2107	4
2390	1		2141	4
2410	5		2164	4
2439	1		2373	4
2465	1		2378	4
2600	20		2605	4

Y-12 Skin Dose (1950-1988) >500mrem by Department

Dept	Number >500 mrem		Dept	Number >500 mrem
2601	83		2629	4
2602	7		2685	4
2603	1		2691	4
2604	1		2037	3
2605	4		2068	3
2606	1		2204	3
2610	3		2235	3
2616	202		2342	3
2617	525		2343	3
2618	2106		2351	3
2619	1060		2356	3
2624	245		2610	3
2625	96		2633	3
2628	20		2704	3
2629	4		2712	3
2630	1		2714	3
2633	3		2739	3
2635	7		2035	2
2636	13		2057	2
2637	470		2065	2
2638	1069		2066	2
2640	1025		2157	2
2643	2		2188	2
2644	238		2260	2
2646	2		2302	2
2648	2		2360	2
2649	1		2366	2
2650	2		2643	2
2652	2		2646	2
2654	30		2648	2
2664	37		2650	2
2665	257		2652	2
2668	2		2668	2
2682	2		2682	2
2685	4		2690	2
2687	11		2718	2
2689	20		7161	2
2690	2		7169	2
2691	4		2009	1
2692	1		2041	1
2694	10		2043	1
2695	75		2046	1
2697	1		2063	1
2699	1		2085	1
2700	7		2089	1
2701	1062		2094	1
2702	2012		2098	1
2703	3448		2106	1
2704	3		2133	1
2705	122		2136	1
2707	21		2137	1

Y-12 Skin Dose (1950-1988) >500mrem by Department

Dept	Number >500 mrem		Dept	Number >500 mrem
2711	1		2143	1
2712	3		2145	1
2713	30		2151	1
2714	3		2165	1
2718	2		2183	1
2720	813		2186	1
2722	417		2300	1
2723	7		2304	1
2724	1		2346	1
2726	106		2347	1
2732	1		2380	1
2736	340		2382	1
2738	5		2386	1
2739	3		2390	1
2742	22		2439	1
2760	1		2465	1
2773	71		2603	1
2774	34		2604	1
2776	92		2606	1
2790	9		2630	1
2791	151		2649	1
2792	1308		2692	1
2793	544		2697	1
2799	13		2699	1
7161	2		2711	1
7169	2		2724	1
7410	7		2732	1
	1		2760	1
(blank)				1
Grand Tota	22601		(blank)	

Y12 Neutron Dose (1950-1980) (Rounded dose in mrem) vs. Dept.

Count of neutron_round	neutron_round																			
dept	<10	10	20	30	40	50	60	70	80	90	100	200	300	400	500	600	700	900	(	Grand Total
2000	1	1				4						1								7
2001			1		1															2
2003											1			1						2
2018	3	2	1	1	1	1														9
2044			2										1							3
2070						1				2										3
2077	4	5	3	2		1		1	1	1		1		1						20
2091						1														1
2108		7	6	4	5	2	2	3	1		4	2	2	1						39
2158		4	1	1		1	3	1	1											12
2159	1	3	5	8	2	5	3	1	2	1	5	2	8		2	1		1		50
2160	2	5		2							2	3	3				1			18
2231	2	2	8	5		4														21
2260						1														1
2301	3	21	20	12	18	14	8	7	6	4	6	1	2							122
2303										1		1		2						4
2345									1		1									2
2616			1			1						4	4			1				11
2617						6					11	7	6		2					32
2618				1		1		1		1			2							6
2685						1														1
2687	1	2	2																	5
2701											1									1
2703			1																	1
2791				3																3
(blank)																				
Grand Total	17	52	51	39	27	44	16	14	12	10	31	22	28	5	4	2	1	1		376

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Y-12 Urinalysis Data

Y-12 Urinalysis Results vs. Department (based on greatest 5% of sample results)

Dept	Number of Samples		Dept	Number of Samples
0	1		*Grand Total*	*15508*
2001	83		2617	5967
2003	20		2619	1441
2006	1		2618	1271
2014	244		2158	897
2015	216			543
2018	77		2776	535
2037	5		5001	522
2038	13		2638	509
2044	7		2687	468
2055	20		2793	348
2065	3		2230	280
2077	137		2791	276
2108	21		2014	244
2128	19		2015	216
2158	897		2301	158
2161	2		2077	137
2162	1		2702	122
2204	5		2703	113
2230	280		2792	97
2231	72		2616	94
2233	70		2260	89
2257	78		2001	83
2259	25		2257	78
2260	89		2018	77
2262	1		2718	76
2301	158		2231	72
2342	15		2233	70
2343	31		2701	57
2344	42		2720	53
2345	6		2665	47
2346	16		2692	43
2347	2		2344	42
2371	2		2640	33
2373	1		2343	31
2375	5		2628	31
2377	5		2774	30
2378	4		2648	29
2379	12		2259	25
2382	1		2108	21
2600	4		2003	20
2616	94		2055	20
2617	5967		2128	19
2618	1271		2346	16
2619	1441		2342	15
2625	2		2038	13
2628	31		2379	12
2633	6		2646	12
2638	509		2647	12
2640	33		2736	12
2644	6		2695	9

Y-12 Urinalysis Results vs. Department (based on greatest 5% of sample results)

Dept	Number of Samples		Dept	Number of Samples
2646	12		4300	8
2647	12		2044	7
2648	29		2742	7
2654	4		2799	7
2664	1		2345	6
2665	47		2633	6
2668	2		2644	6
2687	468		2689	6
2689	6		2037	5
2690	1		2204	5
2692	43		2375	5
2694	2		2377	5
2695	9		2705	5
2701	57		2378	4
2702	122		2600	4
2703	113		2654	4
2705	5		2065	3
2713	3		2713	3
2718	76		2722	3
2720	53		2794	3
2722	3		2161	2
2736	12		2347	2
2742	7		2371	2
2774	30		2625	2
2776	535		2668	2
2791	276		2694	2
2792	97		0	1
2793	348		2006	1
2794	3		2162	1
2799	7		2262	1
4300	8		2373	1
5001	522		2382	1
9990	1		2664	1
	543		2690	1
(blank)			9990	1
Grand Tota	15508		(blank)	

B-3

X-10 External Dose

X-10 Penetrating Dose >500 mrem by Department Number

Dept	Number > 500 mrem		Dept	Number > 500 mrem
.	9		*Grand Total*	*9247*
3 A	20		3 X	6577
3 C	581		3 C	581
3 D	3		3650H	389
3 X	6577		3363W	156
3001	1		3370W	142
3001H	2		3078H	129
3003M	1		3650W	95
3003W	2		3370M	85
3016H	38		3674H	63
3016W	3		3360W	57
3060M	1		3193M	56
3062H	3		3390W	46
3062M	1		3193W	41
3063	2		3079H	39
3063H	15		3369W	39
3063M	5		3016H	38
3075H	3		4650	35
3077	1		3650M	33
3077H	30		4460	31
3078	2		3077H	30
3078H	129		3080H	28
3078M	13		4362	26
3079H	39		3470W	23
3079M	4		3490M	23
3079W	2		3632M	23
3080	2		3320M	21
3080H	28		3410M	21
3080M	6		3 A	20
3081H	2		3390M	19
3089M	1		3632H	18
3193	2		3639H	16
3193M	56		3063H	15
3193W	41		3410W	15
3194W	3		3363M	14
3234M	2		3078M	13
3234W	11		3650	12
3320M	21		3674W	12
3320W	3		3234W	11
3325	4		4360	11
3325H	2		3360H	10
3325M	3		3490W	10
3341	1		3639M	10
3341M	8		.	9
3345	1		3341M	8
3360H	10		3369M	8
3360W	57		3602	8
3361M	1		3614M	8
3361W	2		3080M	6
3363M	14		3369H	6
3363W	156		3405M	6

X-10 Penetrating Dose >500 mrem by Department Number

Dept	Number > 500 mrem		Dept	Number > 500 mrem
3369H	6		3420M	6
3369M	8		3675W	6
3369W	39		3063M	5
3370	5		3370	5
3370M	85		3675	5
3370W	142		3079M	4
3380M	1		3325	4
3390	3		3435W	4
3390M	19		3608	4
3390W	46		3674M	4
3405	1		3 D	3
3405M	6		3016W	3
3410M	21		3062H	3
3410W	15		3075H	3
3420M	6		3194W	3
3420W	1		3320W	3
3430M	1		3325M	3
3430W	1		3390	3
3435	2		3490	3
3435W	4		3604	3
3470W	23		3606M	3
3490	3		3614W	3
3490M	23		3674	3
3490W	10		4193	3
3602	8		4435	3
3602H	2		3001H	2
3602M	1		3003W	2
3602W	2		3063	2
3604	3		3078	2
3606	2		3079W	2
3606M	3		3080	2
3608	4		3081H	2
3608M	1		3193	2
3614M	8		3234M	2
3614W	3		3325H	2
3632	2		3361W	2
3632H	18		3435	2
3632M	23		3602H	2
3639H	16		3602W	2
3639M	10		3606	2
3642H	2		3632	2
3642M	2		3642H	2
3650	12		3642M	2
3650H	389		4435M	2
3650M	33		4435W	2
3650W	95		4455	2
3674	3		3001	1
3674H	63		3003M	1
3674M	4		3060M	1
3674W	12		3062M	1
3675	5		3077	1

X-10 Penetrating Dose >500 mrem by Department Number

Dept	Number > 500 mrem		Dept	Number > 500 mrem
3675M	1		3089M	1
3675W	6		3341	1
3743H	1		3345	1
4193	3		3361M	1
4360	11		3380M	1
4362	26		3405	1
4390W	1		3420W	1
4435	3		3430M	1
4435M	2		3430W	1
4435W	2		3602M	1
4455	2		3608M	1
4460	31		3675M	1
4650	35		3743H	1
4650M	1		4390W	1
8410	1		4650M	1
(blank)			8410	1
Grand Tota	9247		(blank)	

X-10 Skin Dose > 500 mrem by Department Number

Dept	Number >500 mrem		Dept	Number >500 mrem
3001	23		*Grand Total*	*18400*
3003	2		3 X	11994
3016	40		3650H	1188
3061	17		3 C	621
3063	23		3078H	372
3073	1		3370W	260
3075	1		3363W	214
3077	1		3390W	209
3078	30		3193M	205
3079	25		3602	170
3080	3		3079H	157
3081	4		3370M	155
3091	4		3650W	140
3193	37		3390M	130
3194	1		3016H	129
3234	1		3650M	124
3236	1		3360W	110
3325	42		3632H	109
3341	1		3193W	108
3345	1		3674H	106
3370	16		3077H	98
3390	32		4650	71
3405	1		3063H	70
3410	2		3369W	61
3420	1		3639H	60
3435	3		3080H	55
3470	4		3470W	55
3475	2		4362	52
3490	7		4460	46
3602	170		3632M	43
3604	18		3325	42
3606	22		3410M	41
3608	7		3016	40
3632	2		3320M	40
3639	1		3490M	38
3650	15		3193	37
3674	9		3390	32
3675	6		3078	30
4193	5		3420M	30
4360	27		3363M	28
4362	52		4360	27
4390	2		3410W	27
4430	1		3079	25
4435	17		3062H	24
4455	11		3001	23
4460	46		3063	23
4650	71		3614M	23
8410	1		3606	22
30168	2		3078M	22
.	14		3639M	21
3 C	621		3:00:00 AM	21

X-10 Skin Dose > 500 mrem by Department Number

Dept	Number >500 mrem		Dept	Number >500 mrem
3 D	4		3430M	20
3 N	1		3490W	20
3 X	11994		3674W	20
3001H	2		3604	18
3003M	3		3061	17
3003W	5		4435	17
3016H	129		3081H	17
3016M	1		3234W	17
3016W	8		3369M	17
3032H	7		3602H	17
3060M	2		3370	16
3060W	1		3075H	16
3062H	24		3650	15
3062M	1			14
3063H	70		3079W	14
3063M	9		3360H	14
3075H	16		3325H	13
3075M	3		3341M	13
3075W	1		3369H	13
3077H	98		3642H	12
3078H	372		3675W	12
3078M	22		4650M	12
3079H	157		4455	11
3079M	7		3435W	11
3079W	14		3470M	11
3080H	55		3606M	11
3080M	8		4455M	11
3081H	17		3360M	10
3089M	1		3475M	10
3091H	3		3614W	10
3091M	1		3674	9
3093H	1		3063M	9
3137M	1		3325M	9
3148W	1		3405M	9
3191M	1		3016W	8
3193M	205		3080M	8
3193W	108		3320W	8
3194W	4		3361W	8
3200M	1		3674M	8
3202W	1		3490	7
3234M	3		3608	7
3234W	17		3032H	7
3320M	40		3079M	7
3320W	8		3675	6
3325H	13		4193	5
3325M	9		3003W	5
3340M	1		3370H	5
3341M	13		4435W	5
3360H	14		3081	4
3360M	10		3091	4
3360W	110		3470	4

X-10 Skin Dose > 500 mrem by Department Number

Dept	Number >500 mrem		Dept	Number >500 mrem
3361M	2		3 D	4
3361W	8		3194W	4
3363M	28		3743H	4
3363W	214		4390W	4
3369H	13		3080	3
3369M	17		3435	3
3369W	61		3003M	3
3370H	5		3075M	3
3370M	155		3091H	3
3370W	260		3234M	3
3380M	1		3602W	3
3390M	130		4435M	3
3390W	209		3003	2
3405M	9		3410	2
3405W	1		3475	2
3410M	41		3632	2
3410W	27		4390	2
3420M	30		30168	2
3420W	2		3001H	2
3430M	20		3060M	2
3430W	2		3361M	2
3435W	11		3420W	2
3470M	11		3430W	2
3470W	55		3612H	2
3475M	10		3642M	2
3490M	38		3675M	2
3490W	20		4390M	2
3602H	17		3073	1
3602M	1		3075	1
3602W	3		3077	1
3606M	11		3194	1
3608M	1		3234	1
3612H	2		3236	1
3614M	23		3341	1
3614W	10		3345	1
3632H	109		3405	1
3632M	43		3420	1
3639H	60		3639	1
3639M	21		4430	1
3642H	12		8410	1
3642M	2		3 N	1
3650H	1188		3016M	1
3650M	124		3060W	1
3650W	140		3062M	1
3674H	106		3075W	1
3674M	8		3089M	1
3674W	20		3091M	1
3675M	2		3093H	1
3675W	12		3137M	1
3743H	4		3148W	1
4390M	2		3191M	1

X-10 Skin Dose > 500 mrem by Department Number

Dept	Number >500 mrem		Dept	Number >500 mrem
4390W	4		3200M	1
4435M	3		3202W	1
4435W	5		3340M	1
4455M	11		3380M	1
4650M	12		3405W	1
########	21		3602M	1
(blank)			3608M	1
Grand Tota	18400		(blank)	

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X-10 Urinalysis Data

X-10 Division Codes

EDP code	Division Name
AC	Analytical Chemistry
AH	Industrial Safety and Applied Health Physixs
BI	Biology
CH	Chemistry
CM	Central Management(formely DI-Directors
CS	Computer Sciences (formely MA-Mathematics)
CT	Chemical Technology
DI	Directors now Central Management
EL	
EN	Energy
ER	Employee Relations(formely PR-personnel)
ES	Environmental Safety
FM	Finance Materials
FR	Fuel Recycle
GE	(General) Engineering
HE	Health
HP	Health Physics
IC	Instrumentation & Controls
IE	Inspection Engineering
IN	Information
IS	Isotopes Division
LP	Laboratory Protection
MA	Mathematics now Computer Sciences (CS)
MC	Metals & Ceramics
MT	MIT Engineering Practice
NP	Neutron Physics
OP	Operations
PE	plant & Equipment
PH	Physics
PI	
PR	Personnel now Employee Relations (ER)
QA	QA Inspection Engineering
RE	Reactor
SS	Solid State
TH	Thermonuclear
TI	
UR	Universal Relations
XX	
YY	

X-10 Urinalysis Codes

Urinalysis code	Radionuclide	comment
CO0	Cobalt-60	
CS0	Cesium-137	
CO7	Cesium-137	no results
FP0	Fission Products	
FU0	neodymiun-144	rare earths
GA0	Uranium-234	
GB0	Strontium-90	
GF0	grossed fecal	
GG0	Gross Gamma	
GU0	Gross Alpha	
HY3	Tritum	
NP0	Neptunium-237	
OF0	other, fecal	
PA0	protactinium-231	
PA3	protactinium-233	
PF0	Plutonium-239, fecal	
PF3	protactinium-233, fecal	
PH2	phosphorus-32	
PO0	poloium-210	
PU0	plutonium-239	
PU1	Plutonium-241	
PU9	Plutonium-239	
RA0	radium-226	
RF0	sodium-144, fecal	not possible
RU6	ruthenium-106	
SF0	Strontium-90, fecal	
SF9	strontium-89, fecal	
SR0	Strontium-90, fecal	
SR5	strontium-85	
SR9	strontium-89, fecal	
TF0	curium-244, fecal	
TP0	curium-244	
UF0	uranium-234, fecal	
UR0	uranium-234	
OO0	unknown isotope	
OO1	sulfur-35	
OO2	cobalt-60	
OO3	Lead-210	
OO4	Sodium-24	
OO5	zinc-65	
OO6	technetium-99	
OO7	arsenic-74	
OO8	bromine-82	
OO9	iron-59	
O10	manganese-54	
O11	iodine-131	
O12	cesium-134	
O13	Strontium-90, fecal	
O14	barium-140	
O15	tin-125	

X-10 Urinalysis Codes

Urinalysis code	Radionuclide	comment
O16	thallium-204	
O17	neptunium-237	
O18	silver-110	

Plutonium-239 (pu9)						
Count of isotope	isotope					
dept	PU9	Grand Total			Dept	Count
0	3	3			Grand Tota	747
3001	14	14			3370	182
3003	3	3			3390	82
3016	22	22			4650	44
3017	1	1			4455	39
3041	1	1			4435	37
3046	2	2			3078	25
3047	4	4			4362	25
3050	3	3			3016	22
3060	11	11			3193	20
3062	6	6			3360	19
3063	1	1			3001	14
3072	2	2			3077	14
3075	12	12			3075	12
3077	14	14			3490	12
3078	25	25			3650	12
3089	3	3			3060	11
3090	1	1			3674	10
3091	2	2			3430	9
3093	1	1			3234	8
3096	4	4			4460	8
3098	1	1			3475	7
3107	1	1			3062	6
3109	1	1			3142	6
3112	1	1			3117	5
3115	1	1			3405	5
3117	5	5			3657	5
3137	4	4			3047	4
3139	1	1			3096	4
3140	1	1			3137	4
3141	1	1			3166	4
3142	6	6			3320	4
3143	2	2			3410	4
3144	1	1			3470	4
3151	2	2			3615	4
3165	1	1			3640	4
3166	4	4			0	3
3167	1	1			3003	3
3171	1	1			3050	3
3191	3	3			3089	3
3193	20	20			3191	3
3195	2	2			3200	3
3200	3	3			3632	3
3202	2	2			3046	2
3234	8	8			3072	2
3320	4	4			3091	2
3341	1	1			3143	2
3360	19	19			3151	2

Plutonium-239 (pu9)						
Count of isotope	isotope					
dept	PU9	Grand Total			Dept	Count
3361	2	2			3195	2
3369	2	2			3202	2
3370	182	182			3361	2
3390	82	82			3369	2
3405	5	5			3420	2
3410	4	4			3435	2
3420	2	2			3482	2
3430	9	9			3634	2
3435	2	2			4390	2
3470	4	4			3017	1
3475	7	7			3041	1
3482	2	2			3063	1
3483	1	1			3090	1
3490	12	12			3093	1
3615	4	4			3098	1
3632	3	3			3107	1
3634	2	2			3109	1
3640	4	4			3112	1
3650	12	12			3115	1
3657	5	5			3139	1
3674	10	10			3140	1
3743	1	1			3141	1
4163	1	1			3144	1
4360	1	1			3165	1
4362	25	25			3167	1
4390	2	2			3171	1
4430	1	1			3341	1
4435	37	37			3483	1
4455	39	39			3743	1
4460	8	8			4163	1
4650	44	44			4360	1
Grand Total	747	747			4430	1

Plutonium-239 (Pu0)					
Count of isotope	isotope				
dept	PU0	Grand Total		Dept	Count
0	37	37		Grand Tota	2019
3	23	23		3370	597
2601	2	2		3602	200
3003	8	8		3390	177
3015	2	2		3079	127
3016	6	6		3193	97
3061	4	4		3078	86
3062	8	8		3325	83
3063	15	15		3234	61
3068	3	3		4370	56
3071	16	16		3420	54
3073	5	5		3604	49
3075	5	5		3080	48
3077	1	1		3675	44
3078	86	86		0	37
3079	127	127		3470	37
3080	48	48		4390	26
3081	3	3		3	23
3191	1	1		3475	22
3193	97	97		3071	16
3194	1	1		3490	16
3195	1	1		3063	15
3198	1	1		3632	14
3200	1	1		4603	12
3234	61	61		3608	11
3290	2	2		3650	10
3325	83	83		3674	10
3360	3	3		3003	8
3369	1	1		3062	8
3370	597	597		3380	8
3380	8	8		3614	7
3390	177	177		3016	6
3410	3	3		3073	5
3420	54	54		3075	5
3430	1	1		3061	4
3470	37	37		8410	4
3475	22	22		3068	3
3490	16	16		3081	3
3602	200	200		3360	3
3603	2	2		3410	3
3604	49	49		4193	3
3608	11	11		2601	2
3612	1	1		3015	2
3614	7	7		3290	2
3632	14	14		3603	2
3634	1	1		4650	2
3650	10	10		3077	1
3674	10	10		3191	1

Plutonium-239 (Pu0)					
Count of isotope	isotope				
dept	PU0	Grand Total		Dept	Count
3675	44	44		3194	1
4193	3	3		3195	1
4370	56	56		3198	1
4390	26	26		3200	1
4435	1	1		3369	1
4603	12	12		3430	1
4650	2	2		3612	1
8410	4	4		3634	1
Grand Total	2019	2019		4435	1

Gross Alpha					
Count of isotope	isotope				
dept	GU0	Grand Total		Dept	Count
0	39	39		Grand Tota	7293
3001	36	36		3370	2483
3003	324	324		3290	736
3004	72	72		3078	567
3006	15	15		3470	328
3008	5	5		3003	324
3009	1	1		3193	264
3011	12	12		4362	174
3016	93	93		3475	167
3017	1	1		3490	121
3019	1	1		3420	119
3032	28	28		4435	119
3046	2	2		3650	114
3060	12	12		3075	110
3062	65	65		3390	107
3063	58	58		3016	93
3072	1	1		3641	93
3075	110	110		4650	90
3077	71	71		4320	85
3078	567	567		3004	72
3089	2	2		3077	71
3090	5	5		3630	70
3091	21	21		3062	65
3093	10	10		3063	58
3095	1	1		3410	50
3096	16	16		3639	49
3112	1	1		3194	47
3117	8	8		4455	40
3136	1	1		0	39
3139	2	2		3001	36
3141	2	2		3405	35
3151	1	1		3191	29
3152	1	1		3430	29
3166	1	1		3032	28
3167	2	2		3632	28
3173	2	2		3435	25
3191	29	29		4193	25
3192	5	5		4430	23
3193	264	264		3638	22
3194	47	47		3091	21
3195	14	14		3642	20
3200	7	7		3096	16
3234	5	5		3006	15
3290	736	736		3360	15
3320	6	6		3195	14
3340	1	1		3640	14
3341	4	4		4460	14
3350	1	1		3634	13

Gross Alpha					
Count of isotope	isotope				
dept	GU0	Grand Total		Dept	Count
3360	15	15		3011	12
3370	2483	2483		3060	12
3380	1	1		3643	12
3390	107	107		3093	10
3405	35	35		4380	10
3410	50	50		3615	9
3420	119	119		4360	9
3430	29	29		4420	9
3435	25	25			9
3470	328	328		3117	8
3475	167	167		4270	8
3480	2	2		3200	7
3482	1	1		3674	7
3483	2	2		3320	6
3490	121	121		4370	6
3612	2	2		3008	5
3615	9	9		3090	5
3630	70	70		3192	5
3632	28	28		3234	5
3634	13	13		3341	4
3638	22	22		3649	4
3639	49	49		3743	4
3640	14	14		3725	3
3641	93	93		4112	3
3642	20	20		4390	3
3643	12	12		3046	2
3649	4	4		3089	2
3650	114	114		3139	2
3657	2	2		3141	2
3671	2	2		3167	2
3674	7	7		3173	2
3725	3	3		3480	2
3743	4	4		3483	2
4112	3	3		3612	2
4163	1	1		3657	2
4193	25	25		3671	2
4270	8	8		4490	2
4300	1	1		3009	1
4320	85	85		3017	1
4360	9	9		3019	1
4362	174	174		3072	1
4364	1	1		3095	1
4370	6	6		3112	1
4380	10	10		3136	1
4390	3	3		3151	1
4420	9	9		3152	1
4430	23	23		3166	1
4435	119	119		3340	1

Gross Alpha					
Count of isotope	isotope				
dept	GU0	Grand Total		Dept	Count
4455	40	40		3350	1
4460	14	14		3380	1
4490	2	2		3482	1
4650	90	90		4163	1
	9	9		4300	1
Grand Total	7293	7293		4364	1

Uranium-234						
Count of isotope	isotope					
dept	U-234	Grand Total			Dept	Count
0	85	85			3370	2093
3	21	21			3470	1037
4	1	1			3290	789
2601	2	2			3003	421
3001	47	47			3078	324
3003	421	421			3193	300
3004	29	29			3390	271
3006	11	11			4362	267
3008	3	3			3475	257
3009	1	1			3016	230
3011	1	1			3410	188
3015	5	5			4435	184
3016	230	230			4650	179
3019	1	1			3075	177
3021	1	1			3420	174
3032	10	10			3079	153
3047	1	1			3490	139
3060	18	18			3602	138
3061	4	4			3641	121
3062	29	29			3234	91
3063	13	13			3630	86
3066	1	1			0	85
3068	2	2			3639	80
3070	1	1			3435	76
3071	20	20			4370	73
3072	1	1			3675	71
3073	10	10			3604	63
3075	177	177			3638	63
3077	61	61			3077	61
3078	324	324			4320	57
3079	153	153			3194	49
3080	6	6			3001	47
3081	3	3			3650	40
3091	18	18			3430	38
3093	12	12			3405	37
3094	1	1			3380	33
3096	11	11			4193	32
3112	2	2			3191	31
3137	1	1			3640	30
3142	3	3			3004	29
3144	2	2			3062	29
3148	1	1			4390	29
3151	3	3			3	21
3152	1	1			3071	20
3173	1	1			4490	20
3191	31	31			3325	19
3192	4	4			3060	18
3193	300	300			3091	18

Uranium-234						
Count of isotope	isotope					
dept	U-234	Grand Total			Dept	Count
3194	49	49			3195	15
3195	15	15			3642	15
3196	1	1			4603	15
3200	9	9			3063	13
3201	1	1			3608	13
3234	91	91			3632	13
3290	789	789			3093	12
3325	19	19			3375	12
3340	3	3			3006	11
3341	11	11			3096	11
3360	7	7			3341	11
3365	1	1			4360	11
3370	2093	2093			3032	10
3375	12	12			3073	10
3380	33	33			3615	10
3390	271	271			3200	9
3405	37	37			4420	9
3410	188	188			3643	8
3420	174	174			3674	8
3430	38	38			3360	7
3435	76	76			4380	7
3470	1037	1037			3080	6
3475	257	257			4300	6
3480	3	3			4430	6
3482	1	1			4455	6
3483	3	3			3015	5
3490	139	139			4460	5
3602	138	138			3061	4
3604	63	63			3192	4
3608	13	13			3649	4
3615	10	10			3671	4
3630	86	86			4112	4
3632	13	13			3008	3
3634	2	2			3081	3
3638	63	63			3142	3
3639	80	80			3151	3
3640	30	30			3340	3
3641	121	121			3480	3
3642	15	15			3483	3
3643	8	8			8410	3
3649	4	4			2601	2
3650	40	40			3068	2
3671	4	4			3112	2
3674	8	8			3144	2
3675	71	71			3634	2
4112	4	4			4270	2
4163	1	1			4	1
4193	32	32			3009	1

Uranium-234						
Count of isotope	isotope					
dept	U-234	Grand Total			Dept	Count
4270	2	2			3011	1
4290	1	1			3019	1
4300	6	6			3021	1
4320	57	57			3047	1
4360	11	11			3066	1
4362	267	267			3070	1
4370	73	73			3072	1
4380	7	7			3094	1
4390	29	29			3137	1
4420	9	9			3148	1
4430	6	6			3152	1
4435	184	184			3173	1
4455	6	6			3196	1
4460	5	5			3201	1
4490	20	20			3365	1
4603	15	15			3482	1
4650	179	179			4163	1
8410	3	3			4290	1
(blank)	18	18			(blank)	18
Grand Total	9146	9146			Grand Tota	9146

Curium-244						
Count of isotope	isotope					
dept	TP0	Grand Total			Dept	Count
0	72	72			Grand Tota	2909
3	34	34			3370	650
1025	1	1			3602	296
3001	1	1			3325	217
3003	14	14			3390	208
3015	3	3			3078	191
3016	16	16			3193	150
3045	1	1			3675	137
3061	9	9			3234	121
3062	17	17			3080	115
3063	37	37			3079	100
3068	2	2			3420	82
3070	1	1			3604	78
3071	9	9			0	72
3073	5	5			3632	40
3074	1	1			3063	37
3075	19	19			3470	35
3077	2	2			3	34
3078	191	191			3674	33
3079	100	100			3650	31
3080	115	115			3475	23
3081	7	7			4390	20
3088	1	1			3075	19
3191	3	3			3380	19
3193	150	150			3062	17
3194	1	1			3614	17
3195	5	5			3016	16
3198	1	1			3490	16
3200	2	2			3608	16
3202	1	1			4370	16
3234	121	121			3003	14
3290	2	2			3061	9
3325	217	217			3071	9
3360	1	1			3081	7
3369	4	4			3073	5
3370	650	650			3195	5
3380	19	19			8410	5
3390	208	208			3369	4
3405	1	1			3410	4
3410	4	4			4650	4
3420	82	82			3015	3
3470	35	35			3191	3
3475	23	23			3634	3
3490	16	16			3068	2
3602	296	296			3077	2
3603	2	2			3200	2
3604	78	78			3290	2
3608	16	16			3603	2

Curium-244

Count of isotope	isotope	
dept	TP0	Grand Total
3612	1	1
3613	1	1
3614	17	17
3632	40	40
3634	3	3
3639	1	1
3650	31	31
3674	33	33
3675	137	137
4112	1	1
4193	2	2
4370	16	16
4390	20	20
4435	1	1
4650	4	4
8410	5	5
Grand Total	2909	2909

Dept	Count
4193	2
1025	1
3001	1
3045	1
3070	1
3074	1
3088	1
3194	1
3198	1
3202	1
3360	1
3405	1
3612	1
3613	1
3639	1
4112	1
4435	1

Strontium-90						
Count of isotope	isotope					
dept	SR0	Grand Total			Dept	Count
0	122	122			Grand Tota	14238
3	19	19			3370	2192
13	1	1			3078	1107
1025	1	1			3390	1008
2601	1	1			3470	874
3001	126	126			3290	735
3003	295	295			3650	683
3004	141	141			3193	547
3006	23	23			3490	415
3008	16	16			3475	404
3009	2	2			3016	388
3011	3	3			3075	359
3015	6	6			4435	350
3016	388	388			4455	312
3017	1	1			3003	295
3019	2	2			3602	237
3032	85	85			3410	228
3041	3	3			3435	210
3046	11	11			3420	204
3047	16	16			3639	188
3050	9	9			3234	174
3060	88	88			3674	158
3061	5	5			3638	150
3062	114	114			3360	143
3063	76	76			3004	141
3068	1	1			3077	134
3070	1	1			3001	126
3071	12	12			3430	126
3072	11	11			3325	125
3073	12	12			3632	125
3074	1	1			0	122
3075	359	359			3062	114
3077	134	134			3630	99
3078	1107	1107			3060	88
3079	54	54			3641	86
3080	1	1			3032	85
3081	9	9			3405	79
3085	4	4			3063	76
3086	5	5			3380	63
3088	1	1			3194	56
3089	10	10			3079	54
3090	14	14			4460	54
3091	39	39			3640	47
3093	18	18			4390	45
3094	4	4			3191	43
3095	3	3			3091	39
3096	28	28			4650	39
3097	1	1			3320	38

Strontium-90						
Count of isotope	isotope					
dept	SR0	Grand Total			Dept	Count
3098	1	1			4430	37
3100	1	1			3117	35
3107	14	14			3615	31
3109	2	2			3634	30
3112	1	1			3341	29
3115	1	1			3096	28
3117	35	35			3195	25
3133	2	2			3643	25
3136	2	2			3006	23
3137	4	4			3657	23
3139	6	6			3642	22
3140	5	5			4490	20
3141	18	18			3	19
3142	14	14			3152	19
3143	4	4			3093	18
3144	6	6			3141	18
3148	3	3			3483	18
3151	7	7			4193	17
3152	19	19			3008	16
3160	1	1			3047	16
3165	6	6			3090	14
3166	8	8			3107	14
3167	13	13			3142	14
3171	1	1			3167	13
3173	5	5			3200	13
3191	43	43			3071	12
3192	5	5			3073	12
3193	547	547			4362	12
3194	56	56			3046	11
3195	25	25			3072	11
3196	5	5			3743	11
3198	1	1			3089	10
3200	13	13			3050	9
3201	2	2			3081	9
3202	4	4			3482	9
3234	174	174			3166	8
3290	735	735			3151	7
3320	38	38			3671	7
3325	125	125			4364	7
3340	3	3			4370	7
3341	29	29			3015	6
3350	5	5			3139	6
3360	143	143			3144	6
3361	6	6			3165	6
3365	1	1			3361	6
3369	6	6			3369	6
3370	2192	2192			3649	6
3380	63	63			4112	6

Strontium-90						
Count of isotope	isotope					
dept	SR0	Grand Total			Dept	Count
3390	1008	1008			4360	6
3405	79	79			4380	6
3410	228	228			(blank)	6
3420	204	204			3061	5
3430	126	126			3086	5
3435	210	210			3140	5
3470	874	874			3173	5
3475	404	404			3192	5
3480	3	3			3196	5
3481	1	1			3350	5
3482	9	9			4270	5
3483	18	18			3085	4
3490	415	415			3094	4
3602	237	237			3137	4
3608	1	1			3143	4
3612	2	2			3202	4
3613	2	2			4163	4
3615	31	31			4320	4
3630	99	99			3011	3
3632	125	125			3041	3
3634	30	30			3095	3
3638	150	150			3148	3
3639	188	188			3340	3
3640	47	47			3480	3
3641	86	86			8410	3
3642	22	22			3009	2
3643	25	25			3019	2
3648	2	2			3109	2
3649	6	6			3133	2
3650	683	683			3136	2
3657	23	23			3201	2
3671	7	7			3612	2
3674	158	158			3613	2
3743	11	11			3648	2
4112	6	6			13	1
4163	4	4			1025	1
4193	17	17			2601	1
4270	5	5			3017	1
4290	1	1			3068	1
4320	4	4			3070	1
4360	6	6			3074	1
4362	12	12			3080	1
4364	7	7			3088	1
4370	7	7			3097	1
4380	6	6			3098	1
4390	45	45			3100	1
4430	37	37			3112	1
4435	350	350			3115	1

Strontium-90						
Count of isotope	isotope					
dept	SR0	Grand Total			Dept	Count
4455	312	312			3160	1
4460	54	54			3171	1
4490	20	20			3198	1
4650	39	39			3365	1
8410	3	3			3481	1
(blank)	6	6			3608	1
Grand Total	14238	14238			4290	1

Tritium						
Count of isotope	isotope					
dept	HY3	Grand Total			Dept	Count
0	44	44			Grand Tota	4355
3	34	34			3602	1047
3001	4	4			3369	434
3003	21	21			3675	326
3009	1	1			3325	270
3011	1	1			3405	238
3015	2	2			3193	234
3016	49	49			3079	206
3060	1	1			3604	189
3062	67	67			3075	125
3063	4	4			3080	106
3068	2	2			4455	103
3071	3	3			3390	73
3073	4	4			3490	71
3075	125	125			3062	67
3077	2	2			3370	67
3078	51	51			3650	65
3079	206	206			3363	61
3080	106	106			3430	57
3081	9	9			3380	55
3193	234	234			3078	51
3195	12	12			3016	49
3203	2	2			0	44
3234	2	2			3420	40
3320	2	2			3470	37
3325	270	270			3410	35
3341	3	3			3	34
3360	32	32			3360	32
3361	31	31			3475	32
3363	61	61			3361	31
3369	434	434			4603	27
3370	67	67			3003	21
3380	55	55			3195	12
3390	73	73			4193	11
3405	238	238			3638	10
3410	35	35			3081	9
3420	40	40			3435	9
3430	57	57			3608	7
3435	9	9			3636	6
3470	37	37			3657	5
3475	32	32			4435	5
3483	2	2			3001	4
3490	71	71			3063	4
3602	1047	1047			3073	4
3604	189	189			3639	4
3608	7	7			3071	3
3614	3	3			3341	3
3636	6	6			3614	3

Tritium						
Count of isotope	isotope					
dept	HY3	Grand Total			Dept	Count
3638	10	10			3015	2
3639	4	4			3068	2
3643	2	2			3077	2
3650	65	65			3203	2
3657	5	5			3234	2
3675	326	326			3320	2
4193	11	11			3483	2
4390	1	1			3643	2
4405	2	2			4405	2
4430	2	2			4430	2
4435	5	5			4650	2
4455	103	103			8410	2
4603	27	27			3009	1
4650	2	2			3011	1
8410	2	2			3060	1
	1	1			4390	1
Grand Total	4355	4355				1

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X-10 In-Vivo Data

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
		1												1
Total		1												1
.	0		7											7
. Total			7											7
AC	0							8						8
	1			7	2	1		29	4	7				50
	907							1						1
	2011							1						1
	2016							3	1					4
	2026							64	1					65
	2525							1						1
	2626							1						1
	3001							4	3		2			9
	3017							2						2
	3019				39		2	224	246		147			658
	3037							1						1
	3038				3			50	3	1				57
	3042							2						2
	3047							1						1
	3508				2			23						25
	3550				2		1	42	8				1	54
	4500				3			156	7		5			171
	4501							9						9
	4505							1						1
	5500				2			117	19					138
	5505							1	1		5			7
	7900				7			47	48		9			111
	7920				1			25	13		17			56
	9241							4						4
	9734							7						7
	9735							21						21
	9771						2	35	10		3		2	52
AC Total				7	61	1	5	880	364	8	188		3	1517
AH	2008								2		6			8
	2012								3					3
	2016						5		16					21
	3001								7		4			11
	3019								24		32			56
	3038								22		14			36
	3517								5		4			9
	3550								7		9			16
	4500								15		44			59
	4508								1		2			3
	5500						3		28		11			42
	5505								3		2			5
	7500										1			1
	7900				1				3		2			6
	7920										2			2

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
AH	9771								2		1			3
AH Total					1		8		138		134			281
BI	1						1							1
	7900				1									1
	9207							4						4
	9211										9			9
	9771						1	14	18		21			54
BI Total					1		2	18	18		30			69
CH	1							78						78
	3019							1	1					2
	3550							1	5					6
	4500				7			29	20		9			65
	5500				1			10	37					48
	5505				1			2	13		61	1		78
	7920								1					1
CH Total					9			121	77		70	1		278
CM	3500								1					1
	4500										1			1
	5500										1			1
CM Total									1		2			3
CS	2008										1			1
	4500										2			2
CS Total											3			3
CT	1				24	3		205	21					253
	1000							1						1
	2026										1			1
	3019				31		2	107	270	1	221			632
	3038								1		1			2
	3503							5						5
	3505							1						1
	3508							18						18
	3550				3			18	14		8			43
	3591							1						1
	3592							1						1
	4500				28			242	166	2	24			462
	4501				1			1						2
	4505				2			38						40
	4507				3			16	3					22
	4508							1						1
	5500				5		7	31	28	8	3			82
	5505										1			1
	7509							1						1
	7720							1						1
	7800								1					1
	7900				7		2	64	100		17		2	192
	7920							38	48		41			127
	9201							1						1
	9771				1			8	44		3			56
CT Total					105	3	11	799	696	11	320		2	1947
DI	1					1		1						2

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
DI	2001							1						1
	3019							2						2
	3550							1						1
	4500				1			5						6
	5000							5						5
	9204							2						2
DI Total					1	1		17						19
EL	1							3						3
	5500							15	8					23
	6000				2			36						38
EL Total					2			54	8					64
EN	3001										2			2
	4500										1			1
EN Total											3			3
EO	2008										3			3
	3001										2			2
	3019										17			17
	3038										3			3
	3517										4			4
	3550										4			4
	4508										1			1
	5500										14			14
	5505										7			7
	7900										2			2
EO Total											57			57
EP	6000										6			6
	6010										5			5
EP Total											11			11
ER	2016								3					3
ER Total									3					3
ES	2008										3			3
	3019				25			40	110		47			222
	3500								1					1
	3550								10		19			29
ES Total					25			40	121		69			255
ET	3001								1		3			4
	3550										1			1
	9771										3			3
ET Total									1		7			8
FM	3001										1			1
	3517										1			1
	4500				1						2			3
FM Total					1						4			5
FR	2008										10			10
	7600										1			1
FR Total											11			11
GE	1					1		7						8
	2008										1			1
	2016								79					79
	3001								1					1

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
GE	3019										14			14
	3038							1						1
	7900								2		1			3
GE Total						1		8	82		16			107
HE	2008										1			1
	3550							5			5			10
	4500							3						3
HE Total								8			6			14
HP	1			15	1	18		102						136
	2001							56						56
	2007							3						3
	2008							11						11
	2016			4	75		1	77	6	1				164
	2026							2						2
	2523							3						3
	2620							1						1
	3001				2			23	6					31
	3017							20						20
	3019				8			87	36					131
	3026							2						2
	3037							6						6
	3038				2			21	8	2				33
	3042							2						2
	3047							6						6
	3504							29						29
	3508							2						2
	3517							11	6					17
	3525							2						2
	3550							17	7					24
	4500				1			118	17					136
	4501							1						1
	4507							2						2
	4508							1	1					2
	5000							4						4
	5500				3			50	7					60
	5505							3	1					4
	6000							3						3
	7000				1									1
	7017							1						1
	7500							1	1					2
	7503							2						2
	7710							19	5					24
	7900				1		1	23	21					46
	7920							3						3
	9201							1						1
	9204							3						3
	9207							1						1
	9213							1						1
	9771							13	5					18
HP Total				19	94	18	2	733	127	3				996

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
HS	2016								1					1
	3038								36		43			79
	4500										1			1
	5505										1			1
	7500				1						9			10
	7900				10				6		1			17
HS Total					11				43		55			109
IC	1					3		20						23
	200							1						1
	2007							2						2
	2008										1			1
	2012								1					1
	2013							1						1
	2016							3						3
	2026							1						1
	2506							4						4
	3001							20	8		11			39
	3005							1						1
	3010							4						4
	3019				3			6	12		22			43
	3025							1						1
	3038							2	2		1			5
	3042							27						27
	3500							197	4					201
	3517							2						2
	3550				1		1	30	10		44			86
	4500							18	1					19
	4508							4						4
	5500				1		1	41	8		4			55
	6000							12			6			18
	6025							4						4
	7500							4						4
	7503							11						11
	7509							2						2
	7702							7						7
	7710							2						2
	7900							28	3		2			33
	7920							3	3		2			8
	9201							17						17
	9204							14						14
	9771							2						2
IC Total					5	3	2	491	52		93			646
IE	2000							48		1				49
	2013							1						1
	2016							1						1
	2518							2						2
	3012							1						1
	3019				25			60	68	3				156
	4500							19						19
	5500							1						1

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
IE	7930							1						1
	9201							3						3
	9771							1						1
IE Total					25			138	68	4				235
IN	2008										7			7
	4500										6			6
	9771						1							1
IN Total							1				13			14
IS	1				10	20		100	1					131
	3001							1						1
	3019								1					1
	3026							4						4
	3027							2						2
	3028				1			18	1					20
	3029							17						17
	3030							1						1
	3031							2						2
	3033							1						1
	3037							20						20
	3038				44		2	140	98	7				291
	3047				1			30						31
	3092							1						1
	3517				15			79	29					123
	3550				25			65	81					171
	9201				4			7						11
	9771							24	38					62
IS Total					100	20	2	512	249	7				890
LP	1							1						1
	2008										1			1
LP Total								1			1			2
MA	4500							4						4
	5500							1						1
	9771							1						1
MA Total								6						6
MC	1				4			18						22
	2506							2						2
	2528							2						2
	3001							4			2			6
	3012							3						3
	3019				1		1	6	6					14
	3025							1						1
	3525							28						28
	3550				1			16	12					29
	4500				1			218	2		1			222
	4501							1						1
	4508				1			133	19		12			165
	5500				6			104	89					199
	5505								1					1
	6000							2						2
	7900				2		1	13	9					25

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
MC	7920							4	2					6
	9201							7						7
	9771								1					1
MC Total					16		2	562	141		15			736
MO	2016							4						4
MO Total								4						4
NP	1					3		11						14
	3001							4						4
	3010				2			19						21
	3115							6						6
	4500				1			31						32
	5500							42	5		1			48
	6025							10						10
	7000							1						1
	7202							1						1
	7700							7						7
	7702				2			24						26
	7710				1			2	1					4
	7900							13	2					15
	9213				9			23						32
	9241				1									1
	9771				1			9						10
NP Total					17	3		203	8		1			232
OP	1				3			163						166
	2008										19			19
	2016				5			30	13					48
	2026							1						1
	2325							1						1
	2523							4						4
	3001				2			62	55		78			197
	3005							1						1
	3010							3						3
	3019							2	4		11			17
	3025				1			6						7
	3026				2			69						71
	3028								1					1
	3038				2		1	31	170	1	257			462
	3042							53			1			54
	3517								30		52			82
	3525							23						23
	3550				1			39	37		60			137
	4500							1						1
	6000							1						1
	7002				4			1						5
	7500							1						1
	7804				2									2
	7819							1						1
	7900				1			59	139		97			296
	7910							17	1		2			20
	9213							1						1

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
OP	9771							1	6		6			13
OP Total					23		1	571	456	1	583			1635
PE	0							1						1
	1				2	5		83						90
	1000							69						69
	2000							1						1
	2001							1						1
	2008										103			103
	2010							1						1
	2012							1	6					7
	2013							50						50
	2016				30			94	81					205
	2018							6						6
	2026							3						3
	2506							16						16
	2516							16						16
	2518							5						5
	2525							72						72
	2526							1						1
	2567							38						38
	2612				7			5						12
	2804				1									1
	3001				2		1	25	36		61			125
	3010							2						2
	3014							1						1
	3019				25			72	159		180		4	440
	3024							31						31
	3025							12						12
	3026							2						2
	3031							1						1
	3034							8	1					9
	3035							1						1
	3038				1			6	52		43			102
	3042							33						33
	3044							15						15
	3047				3			4	5					12
	3074				1			33						34
	3087							1						1
	3104							84						84
	3115							1						1
	3500							3						3
	3502							67						67
	3505							3						3
	3517							19	2		60			81
	3525							22						22
	3547							1						1
	3550				4			8	22		32			66
	3570							1						1
	3578							1						1
	3587							89						89

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea			AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
PE	3592							1						1
	4500				2			84	22		10			118
	4501							3						3
	4505							1						1
	4507							7						7
	4508							12	6		9			27
	5500						1	7	18		16			42
	5505										6			6
	6000							11	5		43			59
	6010										2			2
	7000							3						3
	7001							1						1
	7002				8			96						104
	7003							9						9
	7004				1									1
	7005							8						8
	7007							17						17
	7008							1						1
	7009							12						12
	7012							114						114
	7015							6						6
	7500							4	2					6
	7503							42						42
	7506							1						1
	7520							1						1
	7700							3						3
	7702							1						1
	7710							1	1					2
	7804				9			7						16
	7852							1						1
	7900				2			10	79		39		1	131
	7910							6			2			8
	7920								10		12			22
PE Total					98	5	2	1479	507		618		5	2714
PH	1							1						1
	3000										1			1
	4500							52	1					53
	5500							31			8			39
	6000							2	8		20			30
	6010										2			2
PH Total								86	9		31			126
PI	4500							5						5
	5500							1						1
PI Total								6						6
PR	1							2						2
	2016							1	1					2
	4500										1			1
PR Total								3	1		1			5
QA	3001										1			1
	3019								49		95			144

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
QA	3047										9			9
	7900								1		1			2
QA Total									50		106			156
RC	1							8						8
	2024							3						3
	3001							2						2
	3019							5						5
	3025							1						1
	3026							2						2
	3038							1						1
	3042							4						4
	3550							1						1
	4500				10			69	14	1				94
	4501							28						28
	5500							20	4					24
	7900							2						2
	9102							1						1
	9201							11						11
	9204							4						4
	9241							2						2
	9771							5						5
RC Total					10			169	18	1				198
RE	1				2	5		18						25
	2024							1						1
	3001							3						3
	4500							1						1
	5500								3					3
	7500				10			27		12				49
	7503							19						19
	7509							4						4
	7900							28	10					38
	9201							4						4
	9204							2						2
	9241							1						1
	9243							1						1
	9771							17	5					22
RE Total					12	5		126	18	12				173
SS	1							20						20
	3001							7						7
	3019							3	2		6			11
	3025							1						1
	3038								104		24		2	130
	3550								1				1	2
	5500								1					1
	7900										1			1
SS Total								31	108		31		3	173
TH	9201							1						1
TH Total								1						1
TI	1							1						1
	4500							6						6

X10 In-Vivo testing (19xx - 19xx) (all data) vs. HP Area and Division

Count of type_		type_												
division	hparea		.	AR	CH	CR	OT	SC	TC	TH	WB	WN	WO	Grand Total
TI	5500							1						1
	9771							3						3
TI Total								11						11
UR	1							1						1
	5500							1						1
UR Total								2						2
XX	1				2	4		80	2				1	89
	3001								1					1
	3033										35			35
	3047										4			4
	4508								1					1
	7920								1					1
	9771								48		1			49
XX Total					2	4		80	53		40		1	180
YY	9771								1					1
YY Total									1					1
(blank)	(blank)													
(blank) Total														
Grand Total		1	7	26	619	64	38	7160	3418	47	2519	1	14	13914

Appendix C

C-1

Y-12 Job Titles

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

jobtitle	Count
.	732
ACCOUNTANT	15
ACCOUNTANT I	13
ACCOUNTANT II	28
ACCOUNTING ANA	39
ACCOUNTING ASS	31
ACCOUNTING CLE	94
ACCOUNTING SUP	17
ADMINISTRATIVE	153
AIDE COMPUTER	11
AIDE ENGINEER	72
AIDE INSPECTOR	16
AIDELABORATORY	34
AIR COND & REF	31
ANAL	29
ANALYST ASSAY	96
ANALYST LAB	417
ANALYSTANALLAB	48
ANALYTICAL CHE	16
APPLIED HEALTH	84
ASSEMBLY ENGIN	21
ASSEMBLY FOREM	13
ASSEMBLY PERSO	21
ASSEMBLYMAN	127
ASSEMBLYMAN A	69
ASSEMBLYMAN B	128
ASSEMBLYMAN C	16
ASSEMBLYPERSON	245
ASSIGNMENT SPE	44
ASSISTANT CHEM	11
ASSISTANT ENGR	101
ASSISTANT OPER	34
ASSISTANT PROD	39
ASSISTANT TECH	113
ASSOCIATE ASSE	11
ASSOCIATE CHEM	24
ASSOCIATE DESI	28
ASSOCIATE DEVE	13
ASSOCIATE ENGR	26
ASSOCIATE PHYS	13
ASST CHEMISTRY	47
ASST ENGINEER	42
ASST OPERATOR	20
ASST SERV OPER	74
ASST SKIL TRA	12
ASST SKILL TRA	38
ASST STATISTIC	13
ASST TECHNICAL	13
ASST. GEN. SUP	133
ASST. GENERAL	28
ASSTSKILLTRADE	65

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

ATTENDANT TOOL	22
ATTENDANTCOUNT	28
ATTENDFIRSTAID	16
BENEFIT PLANS	14
BOILERMAKER	23
BUDGETING AND	37
BUILDING SERVI	1255
CAPTAIN FIRE	18
CARPENTER	237
CARPENTER APPR	14
CASHIER AND GR	73
CHAUFFEUR	24
CHECKERPROPERT	13
CHEM	14
CHEMICAL OPER	70
CHEMICAL OPERA	627
CHEMIST	331
CHEMIST ANAL	14
CHEMIST ASSOC	115
CHEMIST DEV	18
CHEMIST I	39
CHEMIST II	42
CHEMIST III	44
CHEMIST IV	21
CHEMISTASSOCIA	21
CHIEF FILES &	13
CHIEF FILES AN	19
CLEANER	1008
CLEANRLABEQUIP	17
CLERICAL ASSIS	100
CLERICAL TRAIN	55
CLERK	1478
CLERK CONTROL	17
CLERK EDPM	28
CLERK FILE	40
CLERK FOREMANS	21
CLERK KEYPUNCH	49
CLERK MAIL	18
CLERK MAT CONT	47
CLERK MATERIAL	13
CLERK PROPERTY	13
CLERK RECORD	348
CLERK REPROD	14
CLERK STORES	15
CLERK TRAFFIC	11
CLERK TYPIST	41
CLERKACCOUNTIN	60
CLERKACCOUNTNG	13
CLERKRECEIVING	71
CLERKTABULATIN	46
COAL HANDLING	15
COMMUNICATIONS	17

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

COMPUTER APPLI	13
COMPUTING ANAL	249
COMPUTING APPL	15
COMPUTING CONS	20
COMPUTING SPEC	166
COMPUTING TECH	52
CONSULTANT DEV	17
CONSULTANTENGR	14
CONTROL CENTER	34
CONTROL OPER	12
COOK	20
CO-OP STUDENT	389
COORD PRODUCTN	18
COORDFABRICATN	13
COORDINATOR -	15
COST ESTIMATOR	11
CRANE AND HEAV	29
CUSTODIAL FORE	17
DATA ENTRY CLE	35
DEPT. HD. - EN	144
DEPT. HD. - LA	25
DEPT. HD. - MA	34
DEPT. HD. - PR	15
DEPT. HD. - SH	28
DEPT. HD. - TE	15
DEPT. SUPT. -	156
DESIGN ENGINEE	103
DESIGN SUPERVI	19
DESIGN TECHNOL	39
DESIGNER	84
DETLR ESTMTR	17
DETLRANDESTMTR	13
DEVELOPMENT AS	280
DEVELOPMENT CH	24
DEVELOPMENT EN	74
DEVELOPMENT GR	68
DEVELOPMENT SP	36
DEVELOPMENT ST	252
DISPATCHER MAT	116
DISPATCHERBATC	14
DRAFTING TECHN	66
DRAFTSMAN	289
DRAFTSMAN ENGR	165
DRAFTSMAN TRAI	40
DRIVER TRUCK	154
EDP AIDE	92
EDP ASSISTANT	39
EDP JOB CONTRO	79
EDP LEADER	11
EDP SPECIALIST	20
EDP SUPPORT SP	12
EDP TECHNICIAN	62

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

ELECTRCN MAINT	39
ELECTRICAL APP	76
ELECTRICIAN	1714
ELECTROPLATER	115
EMPLOYEE RELAT	87
EMPMSTRCOMPARE	29
ENG	199
ENGINEER	585
ENGINEER - EST	11
ENGINEER - FIR	14
ENGINEER - INS	36
ENGINEER - NUC	19
ENGINEER - PRO	13
ENGINEER ASSO	12
ENGINEER ASSOC	318
ENGINEER ASST	31
ENGINEER CONST	12
ENGINEER DEV	95
ENGINEER I	337
ENGINEER II	457
ENGINEER III	700
ENGINEER IV	440
ENGINEER MAINT	31
ENGINEER OPERA	14
ENGINEER PROD	48
ENGINEER SUPER	33
ENGINEERDESIGN	87
ENGINEERINDUST	17
ENGINEERING AI	32
ENGINEERING AS	231
ENGINEERING DE	23
ENGINEERING DR	127
ENGINEERING PR	28
ENGINEERING SP	171
ENGINEERING TE	201
ENGINEERINSPEC	17
ENGINEERMATERI	21
ENGINEERPROCES	17
ENGINEERPROJEC	18
ENGINEERSAFETY	14
ENGR ASSOC DES	15
ENGR ASSOC DEV	47
ENGR ASSOCPROD	16
ENGR DEVELASSO	11
ENGR SPEC PROJ	12
ENGRASSOCMAINT	15
ENVIRONMENTAL	35
EXECUTIVE SECR	26
FABRICATION CO	17
FABRICATOR	59
FILE CLERK	27

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

FILTER SERVICE	45
FIRE & GUARD L	21
FIRE AND GUARD	146
FIRE PROTECTIO	46
FIRE SERVICEMA	26
FIRE TRUCK OPE	101
FIREMAN	36
FOOD SERVICES	16
FORE	172
FORE ASST PROC	148
FORE ASSTCRAFT	237
FOREASSTINSPEC	15
FOREASSTPROCES	29
FOREMAN CRAFT	471
FOREMAN INSPEC	40
FOREMAN LABOR	39
FOREMAN MAINT	143
FOREMAN RSWP	11
FOREMAN STORES	16
FOREMANASSEMBL	19
FOREMANFOUNDRY	14
FOREMANGROUNDS	13
FOREMANJANITOR	13
FOREMANMACHINE	64
FOREMANMACHINI	77
FOREMANMATERIA	28
FOREMANPROCESS	246
FOREMANSALVAGE	17
FOREMANUTILITI	12
FOREMANUTILITY	13
FOUNDRYMAN	14
GARAGE MECHANI	45
GEN. SUPV. - I	23
GEN. SUPV. - M	98
GEN. SUPV. - P	24
GEN. SUPV. - U	16
GENERAL HELPER	141
GROUNDS EQUIPM	12
GUARD	886
H. P. TECHNICI	24
HAND MACHINE	68
HANDLER	17
HANDLER MAT	24
HANDLERMATERIA	312
HANDLERSALVAGE	171
HEAD DEV DEPT	12
HEAD MAINTDEPT	17
HEAD PROC DEPT	13
HEALTH PHYSICS	186
HELPER	325
HELPR SKIL TRA	26
HUMAN RESOURCE	53

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

H-V-E INSPECTO	35
ILLUSTRATOR	27
ILLUSTRATOR II	17
INDUSTRIAL HYG	89
INFORMATION AS	20
INFORMATION PR	44
INFORMATION RE	13
INSPEC PRODFAB	69
INSPECHLTHPHYS	42
INSPECTION ENG	11
INSPECTION FOR	22
INSPECTION TEC	17
INSPECTOR	200
INSPECTOR AIDE	43
INSPECTOR MATR	11
INSPECTOR SHOP	91
INSPECTOR-WELD	72
INSTRUMENT MEC	65
INSULATOR	88
INTERVIEWER	21
INTVR	12
IRON WORKER AN	65
JANITOR	393
JANITRESS	19
JUNIOR STUDENT	30
KEEPER SALV YD	25
KEY PUNCH I	25
KEY PUNCH II	17
KEY PUNCH TRAI	26
LAB ANALYST	12
LABORATORY AID	35
LABORATORY ANA	158
LABORATORY SUP	21
LABORATORY TEC	96
LABORER	1108
LIEUTENANT - P	64
LINEMAN	14
M.S. PROGRAMME	50
MACH	21
MACH PROD FAB	333
MACHINE OPER	17
MACHINE SPECIA	677
MACHINE SPECIAL	11
MACHINE TOOL S	77
MACHINING FORE	62
MACHINING GENE	14
MACHINIST	3697
MACHINIST - EX	54
MACHINIST %PRO	392
MACHINIST (PRO	904
MACHINIST PF	21
MACHINIST PROD	756

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

MACHINISTMAINT	50
MACHINISTSETUP	31
MAINT. FOREMAN	58
MAINTENANCE EN	30
MAINTENANCE GE	21
MAINTENANCE PL	38
MAN MATERIALS	13
MAN PARTS	35
MAN SHOP MAINT	30
MATERIAL EXPED	122
MATERIAL HANDL	603
MATERIALS AND	51
MATERIALS CLER	179
MATERIALS DISP	222
MATERIALS INSP	32
MATERIALS SPEC	12
MATERIEL ASSIS	18
MATHEMATICIAN	14
MATL. ORDER CL	21
MATL. PLANNER	55
MATL. REC. AND	17
MECH DEV EQUIP	15
MECHANIC	19
MECHANIC DEV	105
MECHANIC ELECT	19
MECHANIC EQUIP	49
MECHANIC INST	46
MECHANIC INSTR	149
MECHANIC MAINT	24
MECHANICGARAGE	13
MECHELECTMAINT	16
MEDICAL TECHNI	18
METAL FABRICAT	14
METALLURGIST	39
MICROGRAPHICS	18
MILLWRIGHT	127
MOBILE CRANE O	29
MOBILE EQUIPME	24
NURSE	64
OFFICE ASSISTA	54
OPER	16
OPER ASST	21
OPER ASST PROD	28
OPER ASST SERV	26
OPER CHEM PROC	22
OPER FIRETRUCK	24
OPER MACHINE	16
OPER PROC SERV	114
OPER STEAM PLT	18
OPERATOR	132
OPERATOR ASST	14
OPERATOR ASSIS	555

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

OPERATOR ASST	833
OPERATOR AT	12
OPERATOR CHEM	39
OPERATOR CHEMI	12
OPERATOR CRANE	21
OPERATOR EQUIP	19
OPERATOR MACH	66
OPERATOR PC	82
OPERATOR PP	26
OPERATOR PROD	167
OPERATOR RSWP	58
OPERATOR TRACK	18
OPERATORBOILER	14
OPERATORCHEMIC	949
OPERATORCONTRO	30
OPERATORMACHIN	1020
OPERATORPROCES	376
OPERATORPROCESS	24
OPERATORSALVAG	19
OPEREXTRACTION	14
OPERSTEAMPLANT	13
OUTSIDE MACH	13
OUTSIDE MACHIN	338
OUTSIDEMACHINST	44
PAINTER	139
PAINTER APPREN	16
PARK LIFEGUARD	13
PARTS PROGRAMM	38
PAYROLL ASSIST	11
PAYROLL SERVIC	12
PHY	13
PHYSASSOCHEALT	13
PHYSICIAN	28
PHYSICIST	125
PHYSICIST III	20
PHYSICISTASSOC	44
PHYSICISTHEALT	18
PIPEFITTER	778
PIPEFITTER APP	36
PLANNER AND ES	463
PLANNERMATERIA	47
PLANR ESTMTR	121
PLANRANDESTMTR	15
PLANT PROTECTI	54
PRINTING AND D	11
PRINTING DESIG	12
PROCEDURES SPE	24
PROCESS FOREMA	46
PROCESS FOREMAN	18
PROCESS OPER	66

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

PROCESS OPERAT	692
PRODMACHINIST	13
PRODUCTION BOI	91
PRODUCTION COO	11
PRODUCTION DIS	27
PRODUCTION ENG	61
PRODUCTION OPE	44
PRODUCTION SCH	127
PROGRAMMERPART	24
PROJECT ENGINE	14
PUBLIC INFORMA	21
Q. A. SPECIALI	47
QUALITY CONTRO	77
R & D GROUP LE	11
R. E. DEVELOPM	118
RADIOGRAPHER	144
RADIOGRAPHER A	40
RECEIVING AND	198
RECORD CLERK	531
REPAIRMANELECT	12
REPORTS AND DA	174
REPRODUCTION A	17
REPRODUCTION C	40
REQUISITRSTORE	12
RESEARCH ASSOC	12
RIGGER	75
RIGGER&IRONWKR	28
SAFETY SPECIAL	37
SALVAGE YARD K	36
SCHEDULER PROD	26
SCIENCE TECHNO	57
SECRETARY	617
SECRETARY I	153
SECRETARY II	149
SECTION HD. -	60
SECTION SUPV.	14
SECURITY ANALY	23
SECURITY INSPE	997
SECURITY OFFIC	20
SENIOR ENGINEE	14
SENIOR TECHNOL	19
SERVICES COORD	18
SHEET METAL WO	91
SHEETMETAL WOR	57
SHIFT CAPTAIN	12
SHIFT SUPERINT	40
SHIFT SUPERVIS	34
SHOP MAINTENAN	70
SPEC	52
SPEC ENGINEER	14
SPEC MACH TOOL	11
SPEC MACHINE	1004

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

SPECIAL PROJEC	17
SPECIALIST DEV	35
SPECIALISTENGR	19
SPECIALISTMACH	25
SR. ACCOUNTING	61
SR. CLERICAL A	127
SR. COMPUTING	17
SR. CONTROL CE	14
SR. DEVELOPMEN	17
SR. DRAFTING T	85
SR. EDP ASSIST	40
SR. ENGINEERIN	479
SR. FABRICATIO	19
SR. H. P. INSP	35
SR. H. P. TECH	11
SR. HEALTH PHY	11
SR. ILLUSTRATO	20
SR. INFORMATIO	15
SR. INSPECTOR	139
SR. LABORATORY	293
SR. MANAGERS	14
SR. MATERIALS	74
SR. OFFICE ASS	62
SR. PARTS PROG	44
SR. PAYROLL AS	15
SR. PRODUCTION	45
SR. QUALITY CO	13
SR. RADIOGRAPH	106
SR. REPORTS AN	66
SR. REPRODUCTI	27
SR. SCHEDULER	17
SR. SECRETARY	240
SR. STAFF CONS	11
SR. STAFF ENGI	19
SR. STENOGRAPH	70
SR. WEAPON MAT	42
STAFF ENGINEER	202
STATIONARY ENG	310
STATIST ASSOC	15
STATISTICAL AI	15
STATISTICAL AS	15
STATISTICIAN	40
STATISTICIAN I	63
STEAM PLANT OP	77
STENOGRAPHER	423
STOCKKEEPER	568
STUDENT	134
STUDENT COOP	246
STUDENT INTERN	52
STUDENT TRAINE	23
SUPER ASST LAB	15
SUPER DESIGN	15

Y-12 Job Titles
(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

SUPERVISOR DEV	13
SUPERVISOR LAB	38
SUPERVISORDESI	16
SUPERVISORY TR	38
SUPT DEV DEPT	13
SUPT ENGR DEPT	14
SUPT PROC DEPT	12
SUPT SHIFT	11
SUPV	51
SUPV. - ACCOUN	20
SUPV. - ASSEMB	63
SUPV. - BUILDI	43
SUPV. - DISPAT	101
SUPV. - EDP	16
SUPV. - ENGINE	84
SUPV. - EQUIPM	16
SUPV. - FABRIC	26
SUPV. - H. P.	12
SUPV. - INSPEC	106
SUPV. - LABORA	67
SUPV. - MACHIN	320
SUPV. - MAINTE	333
SUPV. - MATERI	47
SUPV. - PROCES	328
SUPV. - PRODUC	19
SUPV. - TECHNI	14
SUPV. - UTILIT	85
SUPV. - WEAPON	34
TECH HLTH PHYS	21
TECH. ASSISTAN	37
TECHNICAL ASSO	114
TECHNICAL DIVI	11
TECHNICAL INFO	17
TECHNICAL LIBR	18
TECHNICAL PUBL	34
TECHNICIAN DEV	20
TECHNICIAN MED	13
TECHNICIANENGR	14
TIMEKEEPER	64
TIMEKEEPER TRA	11
TRAINEE	14
TRAINEE LAB	121
TRAINEE STUDEN	18
TRAINING ANALY	14
TRAVEL ASSISTA	20
TRUCK DRIVER	77
TRUCK DRIVER -	154
TYPIST	279
UTILITIES FORE	23
UTILITIES OPER	21
WASHER WINDOW	77
WEAPON MATLS.	24

Y-12 Job Titles

(abbreviated listing -- job titles that appeared more than 10 times in CEDR database)

WELDER	475
WELDING TECHNO	12
WORKER LAUNDRY	48
WORKER METAL	84

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X-10 Job Titles

X-10 Job Titles
(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

jobtitle	Count
.	347
ACCOUNTANT I	31
ACCOUNTANT II	30
ACCOUNTING ANA	56
ACCOUNTING ASS	60
ACCOUNTING CLE	60
ACCOUNTING SPE	10
ACCOUNTING SUP	24
ADJUNCT R & D	12
ADJUNCT R AND	68
ADMINISTRATIVE	210
AIDE ENGINEER	45
AIDELABORATORY	80
AIR COND & REF	53
ANAL	31
ANALYST ACCT	11
ANALYST BUDGET	19
ANALYST LAB	236
ANALYSTTECHRPT	28
ANALYTICAL CHE	29
ANIMAL FAC. WK	97
APP	79
APPLIED HEALTH	158
ASSIGNMENT SPE	70
ASSISTANT BIO	13
ASSISTANT DEV	20
ASSISTANT ENGR	45
ASSISTANT LAB	46
ASSISTANT MATH	19
ASSISTANT TECH	442
ASSISTANTADMIN	11
ASSISTANTBIOLO	77
ASSO	128
ASSOC RESEARCH	730
ASSOC. LAB. DI	10
ASSOC. TECH. D	23
ASSOCIATE DESI	21
ASSOCIATE DEVE	66
ASST	23
ASST ADMINISTR	14
ASST ANIMALFAC	43
ASST BIOLOGY	33
ASST CHEMISTRY	16
ASST DIV ADMIN	26
ASST ENGINEER	24
ASST EXECUTIVE	12
ASST LIBRARY	16
ASST PUBLICATN	11
ASST RESEARCH	253
ASST TECHNICAL	57
ASST. GEN. SUP	36

X-10 Job Titles
(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

ASST. LIBRARIA	36
ASST. TO DIVIS	20
ASSTANIMAL FAC	11
ASSTBIOLOGICAL	21
ATTENDANT CAFE	45
ATTENDANT LAB	146
ATTENDANT TOOL	32
ATTENDANTCOUNT	49
ATTENDANTSTORE	101
ATTENDT STORES	10
AUTOMOTIVE MEC	29
BAKER	10
BIOCHEMIST	54
BIOCHEMISTASSO	25
BIOLOGICAL ASS	36
BIOLOGICAL LAB	338
BIOLOGIST	236
BIOLOGIST ASSO	12
BIOLOGISTASSOC	183
BOILERMAKER	69
BOILERMAKER AP	10
BOILERMAKER/BL	11
BUDGETING AND	62
BUS AND TRUCK	46
BUYER	14
CAFETERIA HELP	71
CAPTAIN FIRE	10
CARPENTER	234
CARPENTER APPR	17
CHAUFFEUR	161
CHECKER INST	17
CHECKER INSTR	144
CHECKERLAUNDRY	19
CHEM	18
CHEM OPER	10
CHEMICAL OPERA	194
CHEMIST	1009
CHEMIST ANAL	34
CHEMIST ASSO	11
CHEMIST ASSOC	322
CHEMIST II	16
CHEMIST III	10
CHEMISTASSOCIA	79
CHIEF STORES A	24
CLERICAL ASSIS	41
CLERICAL STUDE	158
CLERICAL TRAIN	124
CLERICAL TRAINE	13
CLERK	1685
CLERK BADGE	10
CLERK FILE	48
CLERK FOREMANS	13

X-10 Job Titles
(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

CLERK KEYPUNCH	31
CLERK MAIL	134
CLERK MATORDER	16
CLERK PROPERTY	19
CLERK RECORD	135
CLERK REPRO	13
CLERK REPROD	10
CLERK STORES	28
CLERK STUDENT	15
CLERK TRAFFIC	24
CLERK TRAVEL	10
CLERK TYPIST	80
CLERKACCOUNTIN	50
CLERKWORKORDER	13
CO OP STUDENT	10
COMPUTER	19
COMPUTER APPLI	38
COMPUTER MATH	42
COMPUTER SYSTE	10
COMPUTING ANAL	309
COMPUTING APPL	98
COMPUTING CONS	82
COMPUTING SPEC	299
COMPUTING SYST	13
COMPUTING TECH	73
COOK	16
COOP STUDENT	25
CO-OP STUDENT	709
CORPORATE FELL	21
COUNTER ATTEND	41
DARK ROOM TECH	28
DATA ENTRY CLE	38
DEPT. HD. - AC	14
DEPT. HD. - EN	62
DEPT. HD. - LA	14
DEPT. HD. - MA	29
DEPT. HD. - RE	14
DEPT. HD. - SA	11
DEPT. HD. - TE	12
DEPT. SUPT. -	91
DESIGN ENGINEE	72
DESIGN SPECIAL	42
DESIGN TECHNOL	31
DESIGNER	82
DESK LT.	22
DEVELOPMENT AS	786
DEVELOPMENT EN	141
DEVELOPMENT GR	22
DEVELOPMENT SP	79
DEVELOPMENT ST	1062
DIR. - R & D P	87
DIRECTOR - TEC	10

X-10 Job Titles

(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

DIRECTORDIVISI	30
DIRECTORPROGRM	19
DIRECTRASSTDIV	20
DISPATCHER	14
DISTINGUISHED	25
DRAFTING TECHN	76
DRAFTSMAN	246
DRAFTSMAN ENGR	183
DRAFTSMAN TRAI	74
DRAFTSMANDESIG	34
DRIVER FIRE	19
DRIVER TRUCK	67
DRIVRFIRETRUCK	12
EDP AIDE	56
EDP ASSISTANT	13
EDP JOB CONTRO	64
EDP SPECIALIST	41
EDP TECHNICIAN	113
ELECTRICIAN	466
ELECTRICIAN AP	31
ELECTRICIAN HE	13
EMPLOYEE RELAT	77
EMPMSTRCOMPARE	12
ENG	70
ENGINEER	425
ENGINEER - INS	11
ENGINEER AREA	11
ENGINEER ASSOC	268
ENGINEER ASST	29
ENGINEER CHEM	12
ENGINEER DEV	767
ENGINEER DEVEL	41
ENGINEER ELECT	19
ENGINEER FIELD	19
ENGINEER I	186
ENGINEER II	314
ENGINEER III	385
ENGINEER INSTR	47
ENGINEER IV	317
ENGINEER MECH	47
ENGINEER STAFF	22
ENGINEER SUPER	44
ENGINEERCHEMIC	116
ENGINEERDESIGN	254
ENGINEERINDUST	11
ENGINEERING AI	23
ENGINEERING AS	226
ENGINEERING DE	14
ENGINEERING DR	67
ENGINEERING PR	17
ENGINEERING SP	117
ENGINEERING TE	480

X-10 Job Titles
(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

ENGINEERPROGRA	34
ENGINEERPROJEC	24
ENGINEERRESEAR	47
ENGR ASSOC DES	65
ENGR ASSOC DEV	346
ENGR ASSOCCHEM	50
ENGR ASST AREA	14
ENGR ASST PROJ	42
ENGR ASSTINSTR	12
ENGR CHEMICAL	15
ENGR HEAD DEV	14
ENGR RESEARCH	104
ENGRASSOCDESIG	12
ENGRASSOCINSTR	14
ENVIRONMENTAL	17
ESCORT PATROL	19
EXECUTIVE SECR	17
FIGHTER FIRE	31
FILE CLERK	34
FIRE & GUARD L	11
FIRE AND GUARD	42
FIRE EQUIPMENT	10
FIRE PROTECTIO	25
FIRE TRUCK DRI	34
FIREFIGHTER	21
FIREMAN	104
FOOD SERVICES	15
FORE	51
FORE ASST PROC	15
FORE ASSTCRAFT	39
FOREELECTMAINT	14
FOREINSTRMAINT	16
FOREMAN CRAFT	113
FOREMAN LABOR	24
FOREMAN MAINT	39
FOREMAN SHIFT	22
FOREMANJANITOR	16
FOREMANMACHINI	12
FOREMANPROCESS	28
GEN. SUPV. - M	31
GEN. SUPV. - S	11
GLASSBLOWER	25
GRILL MAN	14
GRILLMAN	35
GROUP LEADER	19
GROUP LEADER -	10
GUARD	532
H. P. TECHNICI	72
H. P. TECHNOLO	19
HANDLERMATERIA	40
HEAD DESIGN	15
HEALTH PHYSICS	119

X-10 Job Titles

(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

HELPER	290
HELPER CAFE	21
HELPER STORES	19
HELPER TRANS	28
HELPERCAFETERI	52
HUMAN RESOURCE	19
ILLUSTRATOR	107
ILLUSTRATOR II	23
ILLUSTRATOR TR	22
INDUSTRIAL HYG	82
INDUSTRIAL REL	15
INFORMATION AS	70
INFORMATION CE	162
INFORMATION PR	84
INFORMATION RE	46
INSPECHLTHPHYS	31
INSPECTION TEC	12
INSPECTOR	52
INSPECTOR FIRE	26
INSPECTORFIELD	31
INSPECTR EQUIP	11
INSTRUMENT TEC	393
INSULATOR	27
INTERVIEWER	18
ISOTOPE DATA C	13
JANITOR	741
JANITOR AND JA	81
JANITRESS	36
JUNIOR STUDENT	54
KEY PUNCH I	29
KEY PUNCH II	40
KEY PUNCH TRAI	12
LAB TECH	13
LABORATORIAN	120
LABORATORY AID	92
LABORATORY ANA	35
LABORATORY SUP	12
LABORATORY TEC	475
LABORATORY WOR	23
LABORER	1600
LAUNDRY CHECKE	31
LAUNDRY WASHER	16
LEAD PROGRAM E	10
LEADBURNER	27
LEADER GROUP	56
LEADERENGINEER	12
LIBRARIAN	40
LIBRARIAN ASST	34
LIBRARY ASSIST	64
LIBRARY SPECIA	13
LIEUTENANT - P	18
LINEMAN	22

X-10 Job Titles
(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

MACHINING FORE	11
MACHINIST	636
MACHINIST APPR	28
MAIL ASSISTANT	19
MAIL CLERK	36
MAINT. FOREMAN	43
MAINTENANCE PL	12
MAKER TOOL	18
MAKERMECHINSTR	30
MATERIAL HANDL	45
MATERIALS CLER	37
MATERIALS PREP	23
MATH ASSOCIATE	32
MATH. ASSISTAN	37
MATHEMATICIAN	93
MATL. ORDER CL	37
MATL. REQUISIT	12
MECHANIC	341
MECHANIC AUTO	39
MECHANIC ELECT	10
MECHANIC INST	33
MECHANIC INSTR	175
MECHANIC REFRI	37
MECHANICAL INS	34
MECHANICUTILIT	33
MEDICAL TECHNI	19
MEM	15
MESSENGER	80
METALL ASSOC	90
METALLURGIST	192
MILLWRIGHT	368
MILLWRIGHT APP	30
MONITRHLTHPHYS	26
NUCLEAR REACTO	126
NURSE	75
OFFICE ASSISTA	288
OPER OFF MACH	20
OPER PWR EQUIP	19
OPER RESEARCH	41
OPERATOR	97
OPERATOR PILE	85
OPERATOR POWER	53
OPERATOR REPRO	10
OPERATOR STEAM	13
OPERATOR TRUCK	21
OPERATORCHEMIC	148
OPERATORLAUNDR	13
OPERATORREPROD	11
OPERATORRESEAR	73
OPERSTEAMPOWER	17
OPERSUBSTATION	12
PAINTER	109

X-10 Job Titles

(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

PATROLMAN	110
PHOTOGRAPHER	47
PHOTOGRAPHER A	22
PHY	11
PHYS ASSOCHLTH	25
PHYSASSOCHEALT	62
PHYSICIAN	40
PHYSICIST	773
PHYSICIST ASSO	17
PHYSICIST HLTH	10
PHYSICISTASSOC	248
PHYSICISTHEALT	146
PIPEFITTER	573
PIPEFITTER APP	44
PIPEFITTER HEL	21
PLANNER AND ES	77
PLANR ESTMTR	19
PLANT PROTECTI	10
POWER EQUIPMEN	35
PRAC SCH PART	33
PRAC SCHOOL PAR	24
PRACTICE SCHOO	133
PRINCIPAL TECH	51
PRINTING AND D	14
PRINTING DESIG	91
PROCESS FOREMA	15
PROGRAM ASSOC	17
PROGRAM ENGINE	12
PROGRAMMER	31
PROJECT ENGINE	12
PROJECT MANAGE	23
PUBLICATION AS	49
Q. A. SPECIALI	48
R & D GROUP LE	329
R&D PROGRAM MA	14
RADIATION BADG	13
REACTOR SHIFT	15
RECORD CLERK	199
REPORTS AND DA	54
REPRODUCTION A	34
REPRODUCTION C	36
REPRODUCTION S	13
RES ASSOC	16
RES ASSOC III	16
RES ASSOCIATE	26
RES ST MBR	47
RES STAFF II	11
RES STAFF MBR	74
RES STAFF MBR I	14
RES STAFF MEM	25
RES STAFF MEM I	10
RESEARCH ASSO	14

X-10 Job Titles
(abbreviated l'sting -- job titles that appered more than 10 times in CEDR database)

RESEARCH ASSOC	1810
RESEARCH ENGIN	64
RESEARCH STAFF	1933
RIGGER	32
RIGGER AND IRO	42
RIGGER&IRONWKR	13
SAFETY SPECIAL	41
SALAD MAKER	19
SCIENCE TECHNO	217
SCIENTRESEARCH	23
SECRETARY	1363
SECRETARY I	445
SECRETARY II	263
SECTION HD. -	240
SECTION SUPV.	11
SECURITY INSPE	105
SENIOR COMPUTI	18
SENIOR DEVELOP	66
SENIOR ENGINEE	15
SENIOR RESEARC	55
SENIOR TECHNOL	79
SERVICES COORD	22
SHEET METAL AP	20
SHEET METAL WO	52
SHIFT SUPERINT.	16
SHIFT SUPERTEN	10
SKILLED LABORE	19
SPEC	11
SPEC BTO LAB	49
SPEC DESIGN	11
SPECIALIST - A	30
SPECIALIST DEV	199
SPECIALISTDESI	35
SR LAB TECH	11
SR. ACCOUNTING	64
SR. CLERICAL A	44
SR. COMPUTING	27
SR. DEVELOPMEN	263
SR. DRAFTING T	55
SR. EDP JOB CO	11
SR. ENGINEERIN	477
SR. FABRICATIO	10
SR. GLASSBLOWE	13
SR. H. P. INSP	10
SR. H. P. TECH	70
SR. HEALTH PHY	41
SR. ILLUSTRATO	69
SR. INFORMATIO	28
SR. INSPECTOR	45
SR. LABORATORY	670
SR. OFFICE ASS	190
SR. PHOTO LAB.	13

X-10 Job Titles
(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

SR. PHOTOGRAPH	14
SR. PRINTING D	26
SR. R&D PROGRA	18
SR. REPORTS AN	27
SR. REPRODUCTI	27
SR. RESEARCH S	462
SR. SECRETARY	367
SR. STAFF ENGI	15
SR. TECHNICAL	32
SR. TRAVEL ASS	14
SS MATERIALS R	13
STAFF ENGINEER	81
STAFF RESEARCH	1058
STATISTICIAN	12
STEAM POWER OP	96
STENOGRAPHER	1183
STORES ATTENDA	51
STUDENT	556
STUDENT CLERK	28
STUDENT CO OP	11
STUDENT COOP	272
STUDENT INTERN	142
STUDENT TRAINE	115
STUDENT TRAINEE	11
STUDENTREACTOR	146
SUBSTATION OPE	27
SUMMER CLERICA	292
SUPER ASST LAB	22
SUPER CALUTRON	53
SUPER HLTHPHYS	18
SUPER LAB DEPT	12
SUPER SHIFT	28
SUPER TRAINING	14
SUPERINTENDENT	22
SUPERVISOR	65
SUPERVISOR LAB	42
SUPERVISORSHIF	22
SUPERVISORY TR	27
SUPV	40
SUPV. - ACCOUN	27
SUPV. - ADMINI	11
SUPV. - ANIMAL	15
SUPV. - APPLIE	15
SUPV. - BUILDI	36
SUPV. - CALUTR	19
SUPV. - EDP	11
SUPV. - ENGINE	30
SUPV. - HEALTH	26
SUPV. - INFORM	29
SUPV. - INSPEC	12
SUPV. - LABORA	19
SUPV. - MAINTE	209

X-10 Job Titles
(abbreviated listing -- job titles that appered more than 10 times in CEDR database)

SUPV. - MATERI	12
SUPV. - PHOTOG	10
SUPV. - PROCES	98
SUPV. - REACTO	48
SUPV. - SHOPS	73
SUPV. - TECH.	10
SUPV. - TECHNI	64
SUPV. - UTILIT	35
TECH ASST	22
TECH HLTH PHYS	75
TECH RESEARCH	119
TECH SCIENCE	39
TECH WELDING	18
TECH. ASSISTAN	172
TECH. ILLUSTRA	15
TECH. REPORTS	66
TECHINSTRUMENT	112
TECHNICAL ASSO	255
TECHNICAL ASST	20
TECHNICAL DIVI	64
TECHNICAL INFO	204
TECHNICAL LIBR	67
TECHNICAL PROG	35
TECHNICAL PUBL	115
TECHNICAL REPO	84
TECHNICIAN	30
TECHNICIAN LAB	1210
TECHNICIAN MED	36
TECHNICIANENGR	30
TECHNICIANINST	38
TIMEKEEPER	33
TOOLROOM ATTEN	15
TRAINEE	156
TRAINEE LAB	184
TRAINING COORD	12
TRAVEL ASSISTA	25
TRUCK DRIVER	37
TRUCK DRIVER -	74
TYPIST	1678
UTILITY MECHAN	14
WASHER LAUNDRY	13
WASHER WINDOW	27
WELDER	197
WELDER APPRENT	11
WELDING TECHNO	56
WINDOW WASHER	14
WORKER METAL	64
YOUTH OPPORTUN	70

C-3

Y-12 and X-10 Department Names and Numbers

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
A12A	A12A	JANITOR DEPT
A12AH	A12A	JANITOR DEPT
A12AH3	A12A	JANITOR DEPT
A12D	A12D	DISPENSARY
A12G	A12G	GUARD DEPT
A12J	A12J	EMPLOYEES RELATIONS DEPARTMENT (SERVICE DEPT.)
A12L	A12L	EMPLOYMENT
A12LW	A12L	EMPLOYMENT
A12M	A12M	MANUFACTURING OFFICE (GENERAL OFFICE)
A12N	A12N	GENERAL MAINT OFFICE/PLANNING & ESTIMATING
A12P	A12P	CENTRAL REPORTS AND INFORMATION OFFICE
A12R	A12R	CAFETERIA AND CANTEENS
A12S	A12S	RECEIVING/STORES AND SHIPPING
A12T	A12T	AUTOMOTIVE REPAIR SHOPS
A12W	A12W	ENGINEERING DEPT
A12WM4	A12W	ENGINEERING DEPT
A13D	A13D	HEALTH PHYSICS
A13J	A13J	SAFETY
A13N	A13N	GENERAL UTILITIES AND STANDBY
A13S	A13S	TOOL AND CLOTHING DEPT
A13T	A13T	TRANSPORTATION
A13W	A13W	DEVELOPMENT ENGINEERING DEPT
A14J	A14J	FIRE DEPARTMENT
A14N	A14N	ELECTRICAL EQUIPMENT REPAIR AND MAINT DEPT
A15J	A15J	RECREATION & ATHLETICS(INCLUDING BULLETIN OFFICE)
A15N	A15N	EXPERIMENTAL PROCESS EQUIPMENT MAINT DEPT
A16J	A16J	WAGE STANDARDS
A16N	A16N	MAINT SHOPS
A17N	A17N	BUILDING AND GROUNDS MAINT
A17NH	A17N	BUILDING AND GROUNDS MAINT
A18N	A18N	MAINTENANCE SALVAGE
A19N	A19N	LAUNDRY
A20N	A20N	FIELD MAINT DEPT
A21N	A21N	MAINT SERVICES
A22J	A22J	TRAINING DEPARTMENT
A23J	A23J	SECURITY DEPARTMENT
A24J	A24J	FIRE PREVENTION AND INSPECTION
A50W	A50W	PLANT DESIGN DEPARTMENT
B12A	B12A	PLANT SUPERINTENDENT AND DIRECTORS
B12AM	B12A	PLANT SUPERINTENDENT AND DIRECTORS
B12AM3	B12A	PLANT SUPERINTENDENT AND DIRECTORS
B12C	B12C	CHEMICAL DEPT (BUSINESS)
BI2H	B12H	REFINING DEPT
B12H	B12H	REFINING DEPT
B12HM1	B12H	REFINING DEPT
B12L	B12L	ANALYTICAL LABORATORY
B12LH	B12L	ANALYTICAL LABORATORY
B13L	B13L	ASSAY LABORATORY
B13W	B13W	SALES AND USE TAX
H12D	H12D	CHEMICAL DEVELOPMENT
H12E	H12E	PROCESS DEVELOPMENT DEPT

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
H12EM4	H12E	PROCESS DEVELOPMENT DEPT
H12L	H12L	ISOTOPE DEVELOPMENT DEPT
H12L43	H12L	ISOTOPE DEVELOPMENT DEPT
M12B	M12B	REFINING DIVISION GENERAL
M12C	M12C	CHEMICAL DIVISION GENERAL
M12M	M12M	MATERIAL CONTROL-PRODUCT
M12P	M12P	PRODUCT CHEMICAL DEPARTMENT
M12PH	M12P	PRODUCT CHEMICAL DEPARTMENT
M12S	M12S	BOILER ROOM
M12W	M12W	WATER DISTRIBUTION SYSTEM
M13B	M13B	REFINING DEPT
M13BM1	M13B	REFINING DEPT
M13C	M13C	CHEMICAL RECYCLE/BUILDING 9206
M13P	M13P	PRODUCT PROCESSING DEPARTMENT
M14C	M14C	CHEMICAL RECYCLE/BUILDINGS 9211/9928
M15C	M15C	CHEMICAL RECYCLE/BUILDING 9204-3
M15CH	M15C	CHEMICAL RECYCLE/BUILDING 9204-3
M15P	M15P	CHEMICAL DEPARTMENT
M15PH	M15P	CHEMICAL DEPARTMENT
2001	2001	BUILDING SERVICES
2001H	2001	BUILDING SERVICES
200101	2001	BUILDING SERVICES
2002	2002	MAINT PROCESS
2003	2003	MAINT SHOPS
2005	2005	MAINT UTILITIES
2006	2006	MAINT SALVAGE
2008	2008	TRANSPORTATION
2009	2009	MAINT AUTOMOTIVE EQUIPMENT(NORMAL)
2011	2011	HEAVY EQUIPMENT MAINTENANCE
2014	2014	BLDG.,GRDS.,& MAINT.SHOPS DEPT.
2014N	2014	BLDG.,GRDS.,& MAINT.SHOPS DEPT.
2015	2015	FIELD MAINT
2017	2017	MAINT & UTIL ADMIN
2018	2018	RESEARCH SERVICES DEPT
2026	2026	ADP MAINT (ALLOY DEVELOPMENT P_____ MAINT)
2033	2033	UNKNOWN
2036	2036	PRODUCTION CONTROL
2037	2037	N.M. SFG. SHIP. & STORAGE
2040	2040	UNKNOWN
2041	2041	INDUSTRIAL SAFETY
2043	2043	FIRE PREVENTION AND PROTECTION
2044	2044	MECHANICAL INSPECTION DEPT
2045	2045	UNKNOWN
2046	2046	PLANT RECORDS
2048	2048	PUBLIC & TECHNICAL INFORMATION
2049	2049	GRAPHIC ARTS
2050	2050	SAFETY ANALYSIS
2051	2051	ENGINEERING RECORDS
2055	2055	SPECIAL MECHANICAL PRODUCTION DEPT
2056	2056	LIGHTING MAINTENANCE
2057	2057	FACILITIES ENGINEERING

DEPT NO	DEPT NO	DEPARTMENT NAME
2058	2058	MAINTENANCE SERVICES
2059	2059	PROCESS ANALYSIS DEPT
2060	2060	PLANT ENGINEERING
2063	2063	MAINT BUILDINGS
2064	2064	ENGINEERING DEVELOPMENT
2065	2065	ENGINEERING MECHANICS DEPT
2066	2066	ENVIRONMENTAL CONTROL ENGINEERING
2067	2067	CIVIL & ARCHITECTURAL ENGINEERING DEPT
2068	2068	ELECTRICAL ENGINEERING DEPT
2069	2069	INSTRUMENT ENGINEERING DEPT
2070	2070	MECHANICAL ENGINEERING DEPT
2071	2071	REVISED TO 2704 ACCOUNT-SAME DESCRIPTION
2073	2073	ENGINEERING ANALYSIS
2077	2077	ELECTRICAL & ELECTRONICS DEPT
2083	2083	FIXED FIRE PROTECTION SYSTEMS
2085	2085	EMPLOYEE RELATIONS DEPT
2087	2087	PUBLICATIONS
2089	2089	INDUSTRIAL HYGIENE
2090	2090	HEALTH CENTER
2091	2091	GUARD DEPT.
2093	2093	FIRE
2094	2094	SECURITY
2095	2095	HUMAN RESOURCES DEVELOPMENT
2096	2096	LAUNDRY
2097	2097	RECREATION AND ATHLETICS
2098	2098	LABOR RELATIONS
2099	2099	PUBLICATIONS
2100	2100	CLERICAL POOL
2101	2101	INSURANCE DEPT
2102	2102	EMPLOYMENT
2103	2103	INBOUND MOVING EXPENSES
2106	2106	BENEFIT PLANS
2107	2107	CAFETERIA AND CANTEENS
210700	2107	CAFETERIA AND CANTEENS
2108	2108	CLERICAL POOL
2109	2109	EMPLOYEES RELATIONS DEPT(SERVICE DEPT)
2110	2110	PERSONNEL DIVISION ADMIN
2115	2115	SALARY ADMINISTRATION
2116	2116	UNKNOWN
2125	2125	MEAL ALLOWANCE
2128	2128	NON-OCCUPATIONAL DISABILITY
2130	2130	NATIONAL GUARD-RESERVE TRAINING
2132	2132	FM&S DIVISION ADMIN
2133	2133	MANUFACTURING OFFICE(GENERAL OFFICE)
2134	2134	OFFICE SERVICES DEPARTMENT
2135	2135	CASHIER AND TRAVEL OFFICE
2136	2136	TRAFFIC
2137	2137	ADMINISTRATIVE SERVICES
2139	2139	TIMEKEEPING
2140	2140	PROPERTY DEPT
2141	2141	MAIL

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
2142	2142	STORES
2143	2143	RECEIVING
2144	2144	TOOL
2145	2145	MATERIALS DELIVERY SERVICE
2146	2146	PLANT RECORDS
2147	2147	DATA SYSTEMS DEVELOPMENT
2148	2148	REPRODUCTION
2149	2149	ENGINEERING SERVICES
2150	2150	UNKNOWN
2151	2151	MATERIAL CONTROL
2157	2157	ACCOUNTING AND BUDGET
2158	2158	AREA 5 MAINTENANCE DEPT
2159	2159	Y-12 PROPERTY SALES
2160	2160	MATERIAL ENGINEERING DEPT
2161	2161	PRODUCTION SERVICES
2162	2162	CRITICAL PATH & REGULAR PRODUCTION SCHEDULING
2163	2163	QUALITY CONTROL
2164	2164	PLANT TOOLING COORDINATION
2165	2165	PRODUCTION COORDINATION
2171	2171	DATA SERVICES ADMINISTRATION
2177	2177	CIM PROGRAM MANAGEMENT
2178	2178	CAD/CAM SYSTEMS
2182	2182	GENERAL WELD SHOP
2183	2183	GENERAL CAN FABRICATION SHOP
2184	2184	GENERAL SHOP INSPECTION
2185	2185	GENERAL FIELD SHOP
2186	2186	GENERAL METAL FABRICATION SHOP
2187	2187	GENERAL FOUNDRY
2188	2188	GENERAL EXPEDITING & AUXILIARY SERVICES
2189	2189	GENERAL ESTIMATING & PLANNING
2190	2190	RAILROAD FACILITY
2200	2200	PLANT MANAGERS DEPARTMENT
2201	2201	CAPITAL ASSETS MANAGEMENT
2204	2204	PLANT PROTECTION DEPARTMENT
2205	2205	SAFEGUARDS ENGINEERING
2206	2206	PROTECTION FORCES TRAINING
2210	2210	SAFEGUARDS & SECURITY ADMIN
2213	2213	PROD ENG CONFIG CNTRL & STAFF
2214	2214	MATERIAL PLANNING AND PROCUREMENT
2216	2216	SS CONTROL
2230	2230	PRODUCT ANALYSIS
2231	2231	SPECIAL TESTING
2233	2233	ALPHA-5 PRODUCTION & INSPECTION
2252	2252	ANALYTICAL LABORATORY DEPT
2257	2257	PRODUCTION ASSAY
2259	2259	ALLOY ASSAY LAB
2260	2260	LABORATORY OPERATIONS
2262	2262	METHODS EVALUATION GROUP
2270	2270	TECHNICAL SERVICE LABORATORY
2282	2282	ANALYTICAL LABORATORY
2283	2283	ASSAY LABORATORY

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
2300	2300	CHEMICAL RESEARCH
2301	2301	CHEMICAL ENGINEERING
2302	2302	COLEX & PRODUCT FINISHING DEVELOPMENT
2303	2303	ANALYTICAL DEVELOPMENT DEPT
2304	2304	ATOMIC LASER ISOTOPE SEPARATION
2320	2320	PROCESS RESEARCH
2320M	2320	PROCESS RESEARCH
2342	2342	CERAMICS & PLASTICS DEVELOPMENT
2343	2343	MATERIALS ENGINEERING DEVELOPMENT
2344	2344	METALLURGICAL DEVELOPMENT
2345	2345	LABORATORY DEVELOPMENT
2346	2346	CHEMISTRY DEVELOPMENT
2347	2347	FABRICATION SYSTEMS DEVELOPMENT
2350	2350	TECHNICAL ADMINISTRATION
2351	2351	CRITICALITY STUDIES
2352	2352	COMPUTER SYSTEMS DEPARTMENT
2353	2353	OPERATIONS ANALYSIS AND LONG RANGE PLANNING
2354	2354	HSEA ADMINISTRATION
2355	2355	CERTIFICATION SYSTEM
2356	2356	DATA PROCESSING
2357	2357	DATA SYSTEMS DEVELOPMENT
2358	2358	STATISTICAL SERVICES & SS CONTROL
2359	2359	NM ACCOUNTABILITY
2360	2360	ISOTOPE RESEARCH AND DEVELOPMENT
2360M	2360	ISOTOPE RESEARCH AND DEVELOPMENT
2361	2361	ENVIRONMENTAL AFFAIRS
2363	2363	GENERAL SHOP INSPECTION
2366	2366	HEALTH PHYSICS
2367	2367	TECHNICAL INFORMATION SERVICES DEPARTMENT
2371	2371	PT - WELD INSPECTION
2373	2373	CRITICALITY SAFETY
2374	2374	QUALITY ASSURANCE INSPECTION
2375	2375	DI - DIRECT OPERATIONS
2376	2376	PHYSICAL TESTING
2377	2377	LABORATORY OPERATIONS
2378	2378	PRODUCTION ASSAY
2379	2379	PRODUCTION ANALYSIS
2380	2380	DIMENSIONAL STANDARDS LAB
2381	2381	STANDARDS & CALIBRATION
2382	2382	QIS/SAMPLING PLOAN ADMIN
2383	2383	QUALITY ASSURANCE
2384	2384	QUALITY ENGINEERING
2385	2385	PRIDE IN EXCELLENCE PROGRAM
2386	2386	PHYSICAL TESTING OPERATION
2387	2387	PRODUCTION RADIATION TESTING
2388	2388	MATERIALS TESTING SUPPORT
2389	2389	NON DESTRUCTIVE TESTING
2390	2390	ENGINEERING TEST SYSTEM
2399	2399	UNKNOWN
2410	2410	Y-12 PLANT ENGINEERING DIVISION
2450	2450	LONG RANGE PLANNING

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
2457	2457	FACILITIES ENGINEERING
2459	2459	PLANNING & ANALYSIS
2460	2460	ENGINEERING DIVISION
2463	2463	MECHANICAL DESIGN ENGINEERING
2465	2465	ENGINEERING MECHANICS
2466	2466	ENVIRONMENTAL CONTROL ENGINEERING
2467	2467	CIVIL AND ARCHITECTURAL ENGINEERING
2468	2468	ELECTRICAL ENGINEERING
2469	2469	INSTRUMENT ENGINEERING
2470	2470	TOOL DESIGN
2471	2471	NUMERICAL CONTROL ENGINEERING
2472	2472	MECHANICAL MANUFACTURING DESIGN
2473	2473	ELECTRONIC SYSTEMS DESIGN
2600	2600	EQUIPMENT SERVICES
2601	2601	GENERAL EXPEDITING
2602	2602	NUCLEAR DIVISION MICROGRAPHICS
2603	2603	GENERAL SHOP INSPECTION
2604	2604	UNKNOWN
2605	2605	GENERAL METAL FABRICATION SHOP
2606	2606	GENERAL FOUNDRY
2607	2607	GENERAL EXPEDITING & AUXILIARY SERVICES
2608	2608	EURI & EUCFM ADMINISTRATION
2610	2610	CAP EQUIP & DIV STAFF ENGR
2611	2611	STANDBY PLANT MAINT
2616	2616	BUILDING UTILITIES OPERATIONS
2617	2617	CHEMICAL SERVICES
2618	2618	URANIUM CHIP RECOVERY
2618M	2618	URANIUM CHIP RECOVERY
2619	2619	ALPHA-5 PROCESSING
2619H	2619	ALPHA-5 PROCESSING
2624	2624	FABRICATION DIV ADMIN
2625	2625	SPECIAL SERVICES
2628	2628	CASTING
2629	2629	9766 MACHINE SHOP-EDP 060
2633	2633	MECHANICAL INSPECTION
2635	2635	RADIATION SAFETY
2636	2636	ORNL CHEMICAL SERVICE DEPT.
2637	2637	ALPHA-5 EAST SHOP
2638	2638	ALPHA-5 WEST SHOP
2640	2640	ALPHA-5 NORTH SHOP
2643	2643	METHODS EVALUATION GROUP
2644	2644	PHYSICAL TESTING
2645	2645	FABRICATION DIV ENGINEERING
2646	2646	LABORATORY OPERATIONS-REVISED 7/68 TO 2377 ACCOUNT
2647	2647	PRODUCTION ASSAY
2648	2648	WATER DISTRIBUTION SYSTEM
2650	2650	PLANT UTILITIES OPER - STAFF
2651	2651	PLANT UTILITIES OPERATIONS
2652	2652	FILTER SERVICE
2654	2654	UTILITIES ADMINISTRATION
2662	2662	SAFEGUARDS STAFF

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
2663	2663	CENTRAL TRAINING FACILITY
2664	2664	MATERIAL SPECIMEN SHOP
2665	2665	UNKNOWN
2668	2668	(2668-100) CHEMICAL PORODUCTION PROCESSING
2681	2681	ALLOY LABORATORY
2682	2682	ALPHA-4 CASCADE
2683	2683	ALPHA-5 CASCADE
2683H	2683	ALPHA-5 CASCADE
2685	2685	ALPHA-5 CASCADE OPERATION
2686	2686	BIO FACILITIES ENGINEERING
2687	2687	BETA-2 DEPT
2689	2689	BETA-2 CHEMISTRY
2690	2690	ALLOY DIVISION (2681/2682/2683/2686)
2691	2691	KAPPA FACILITY
2692	2692	POTASSIUM SEPARATION
2694	2694	MATERIALS FORMING
2695	2695	MATERIALS SHOP
2697	2697	ALPHA-4 STRIPPING
2699	2699	GENERAL ESTIMATING & PLANNING DEPT
2700	2700	GRAPHITE SHOP
2701	2701	ASSEMBLY
2702	2702	H-1 FOUNDRY
2703	2703	A WING
2704	2704	B83/W84 PROGRAMS
2705	2705	ADMINISTRATION
2707	2707	ASSY DIVISION ADMIN
2708	2708	W88 PROGRAM
2710	2710	PROG SCHED AND WEAP MATL MGMT
2711	2711	ASSEMBLY ENGINEERING
2712	2712	ALPHA-5 ASSEMBLY AREA
2713	2713	EQUALITY EVALUATION
2714	2714	BETA-4 ASSEMBLY
2716	2716	W89 PROGRAM
2718	2718	MACHINING
2720	2720	BETA-4 FORMING
2722	2722	BETA-4 ASSEMBLY
2723	2723	BETA-2 ASSEMBLY
2724	2724	COMP. OPERATIONS
2726	2726	BETA-2 EXPANSION ASSEMBLY
2732	2732	GENERAL CAN FABRICATION SHOP
2736	2736	SPECIAL PRODUCTION MACHINING
2737	2737	ARGON GAS-CYLINDERS
2739	2739	URANIUM CONTROL DEPT
2742	2742	TOOL GRINDING
2743	2743	STEAM PLANT
2760	2760	GAGE CERTIFICATION LABORATORY-EDP 060
2762	2762	QUALITY LIAISON
2763	2763	REVISED TO 2383 ACCOUNT
2770	2770	TOOLING-PROCURED NO DATE GIVEN
2772	2772	TOOLING-FABRICATED NO DATE GIVEN
2773	2773	G3 PROCESSING (NOT VALID FOR PERIOD OF LAB OPERATIONS)

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
2776	2776	E/M/C - WING & 9206 SHOPS
2790	2790	UNKNOWN
2791	2791	MECHANICAL OPERATIONS DEPT
2792	2792	EXCESS ACCOUNTS
2793	2793	9215 ROLLING
2794	2794	DOE-ORO
2795	2795	SCRAP
2799	2799	SAMPLES
2800	2800	CONTAINERS RETURNABLE
2900	2900	PROPERTY ACCOUNT - GENERAL
4320	4320	ELECTRONUCLEAR RESEARCH
4370	4370	CHEMICAL TECHNOLOGY
4435	4435	ENGINEERING TECHNOLOGY - DIV. GEN.
4455	4455	BIOLOGY
4460	4460	FUSION ENERGY DIVISION - GEN.
6130	6130	GENEARL ACCOUNTING DIV. ADM.
6140	6140	CENTRAL ACCOUNTING SERVICES DEPARTMENT
6142	6142	CENTRAL COMMUNICATIONS DEPARTMENT
6160	6160	CENTRAL DATA PROCESSING-ADMINISTRATION
6161	6161	COMPUTER SERVICES DEPARTMENT
6167	6167	MATHEMATICAL PROGRAMMING DEPARTMENT
6169	6169	COMMERCIAL PROGRAMMING DEPARTMENT
6190	6190	PURCHASING DIVISION
6385	6385	OPERATING CONTRACTORS PROJECT OFFICE
6410	6410	ENGINEERING - ORGDP
7110	7110	EXECUTIVE OFFICES
7111	7111	PUBLIC RELATIONS
7112	7112	INDUSTRIAL COOPERATION OFFICE
7113	7113	UNKNOWN
7120	7120	GENERAL INDUSTRIAL RELATIONS DIVISION ADMINISTRATION
7124	7124	CENTRAL EMPLOYMENT DEPT
7125	7125	HEALTH, SAFETY AND ENVIRONMENTAL AFFAIRS
7130	7130	UNKNOWN
7139	7139	UNKNOWN
7140	7140	EXECUTIVE OFFICES WORD PROCESSING CENTER
7142	7142	UNKNOWN
7146	7146	UNKNOWN
7150	7150	LAW DEPARTMENT
7155	7155	N D SAFEGUARDS ADM.
7160	7160	UNKNOWN
7161	7161	OPERATIONS - Y-12
7162	7162	DATA ENTRY - Y-12 SITE
7164	7164	PROGRAM CONTROL - Y-12 SITE
7165	7165	JOB CONTROL - Y-12 SITE
7167	7167	UNKNOWN
7168	7168	COMPUTER SYSTEMS SUPPORT - Y-12
7169	7169	INFORMATION SYSTEMS - Y-12
7170	7170	TECHNICAL APPLICATIONS - Y-12 SITE
7191	7191	UNKNOWN
7193	7193	UNKNOWN
7301	7301	UNKNOWN

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
7360	7360	UNKNOWN
7385	7385	OPERATING CONTRACTORS PROJECT OFFICE
7390	7390	OFFICE OF QUALITY ASSURANCE
7410	7410	ENGINEERING - Y-12
7601	7601	OFFICE OF WASTE ISOLATION
7603	7603	UNKNOWN
7701	7701	UNKNOWN
7702	7702	UNKNOWN
7703	7703	UNKNOWN
8169	8169	INFORMATION SYSTEMS - X-10
8170	8170	TECHNICAL APPLICATIONS - X-10
8410	8410	ENGINEERING - ORNL
A50D	A50D	MEDICAL
A50E	A50E	INSTRUMENT DEPARTMENT
A50G	A50G	GUARDS
A50H	A50H	HEALTH PHYSICS DEPARTMENT
A50K	A50K	SEWAGE DISPOSAL
A50L	A50L	EMPLOYMENT
A50M	A50M	GENERAL OFFICES
A50MW	A50M	GENERAL OFFICES
A50N	A50N	EXCLUSIVE OF A50E, A50T, A51T
50N	A50N	MECHANICAL MAINTENANCE (EXCLUSIVE OF
A50E,A50T,A51T)		
A50NH	A50N	EXCLUSIVE OF A50E, A50T, A51T
A50R	A50R	CAFETERIA
A50S	A50S	STORES
A50T	A50T	TRANSPORTATION
A50W	A50W	PLANT DESIGN DEPARTMENT
A51G	A51G	GUARD DEPARTMENT
51G	A51G	GUARD DEPARTMENT
A51H	A51H	HEALTH PHYSICS DEPARTMENT - INSTRUMENT SERVICES
A51J	A51J	RECREATION AND ATHLETICS
A51L	A51L	INBOUND MOVING EXPENSES
A51S	A51S	RECEIVING AND SHIPPING
A51T	A51T	MAINTENANCE AUTOMOTIVE EQUIPMENT (NORMAL)
A51W	A51W	NEW FACILITIES DESIGN
051W	A51W	RESEARCH ENGINEERING - SHOPS
A52G	A52G	FIRE DEPARTMENT
A52H	A52H	HEALTH PHYSICS DEPARTMENT - PERSONNEL MONITORING
A52J	A52J	LAUNDRY
A52L	A52L	INBOUND PER DIEM
A52S	A52S	TOOL DEPARTMENT
A52W	A52W	RESEARCH ENGINEERING - DESIGN
A53G	A53G	SAFETY
A53H	A53H	HEALTH PHYSICS DEPARTMENT - SURVEY GROUP
A53J	A53J	TRAINING AND SPECIALIZED SERVICES
A56J	A56J	OCCUPATIONAL DISABILITY
A60H	A60H	UNKNOWN - PROBABLY HEALTH PHYSICS DEPT.
A60J	A60J	OUTBOUND MOVING EXPENSE
A60L	A60L	UNKNOWN

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
A60N	A60N	RESEARCH SHOPS
A63J	A63J	LABOR RELATIONS
A64J	A64J	PHOTOGRAPHY
A65J	A65J	TRAINING DEPARTMENT
A66J	A66J	INSURANCE DEPARTMENT
B50A	B50A	DIRECTOR'S DEPARTMENT
B50L	B50L	CHEMICAL ANALYSIS
B52A	B52A	WAGE STANDARDS
D	D	UNKNOWN
G	G	UNKNOWN
HH	HH	UNKNOWN
H100	H100L	LIBRARIES
H100L	H100L	LIBRARIES
H200	H200L	RESEARCH AND DEVELOPMENT - PHYSICS
H200L	H200L	RESEARCH AND DEVELOPMENT - PHYSICS
H300	H300L	RESEARCH & DEVELOPMENT-CHEM DIV
H300L	H300L	RESEARCH & DEVELOPMENT-CHEM DIV
H300LM	H300L	RESEARCH & DEVELOPMENT-CHEM DIV
400L	H400L	RESEARCH AND DEVELOPMENT - TECHNICAL
H400L	H400L	RESEARCH & DEVELOPMENT-TECHNICAL
400	H400L	RESEARCH AND DEVELOPMENT - TECHNICAL
H400	H400L	RESEARCH & DEVELOPMENT-TECHNICAL
50L	H50L	RESEARCH AND DEVELOPMENT OVERHEAD
H500L	H500L	RESEARCH & DEVELOPMENT - POWER PILE
H500	H500L	RESEARCH & DEVELOPMENT - POWER PILE
500L	H500L	RESEARCH AND DEVELOPMENT - POWER
H600	H600L	RESEARCH & DEVELOPMENT - BIOLOGY
H700	H700L	RESEARCH & DEVELOPMENT - METALLURGY
H700L	H700L	RESEARCH & DEVELOPMENT - METALLURGY
H800	H800L	RESEARCH & DEVELOPMENT - TRAINING
H900	H900L	TECHNICAL HEALTH PHYSICS DIVISION
M50C	M50C	CHEMICAL OPERATION - 706-D AREA
M50D	M50D	ISOTOPE DEVELOPMENT
M50E	M50E	ISOTOPE CONTROL DEPARTMENT
M50K	M50K	ELECTRICAL DISTRIBUTION SYSTEM
M50P	M50P	PILE OPERATIONS - 100 AREA
M50S	M50S	BOILER ROOM
50S	M50S	STEAM PLANT
M50T	M50T	WATER DISTRIBUTION SYSTEM
M56P	M56P	MISC. IRRADIATION UNITS (REQUIRIING CHEM. PROC.)
1	1	PILE OPERATIONS - 100 AREA
10	10	RECEIVING AND SHIPPING
11	11	GENERAL OFFICES
11	11	GENERAL OFFICES
12	12	EMPLOYEES SERVICES
12	12	EMPLOYEES SERVICES
13	13	GUARD DEPARTMENT
14	14	FIRE PROTECTION
14	14	FIRE PROTECTION
15	15	CAFETERIA
15	15	CAFETERIA

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
16	16	LAUNDRY
17	17	JANITOR DEPARTMENT
17	17	JANITOR DEPARTMENT
18	18	POWER DEPT(EXCLUSIVE OF M50T,M50S)
18	18	POWER DEPT(EXCLUSIVE OF M50T,M50S)
19	19	PLANT DESIGN DEPARTMENT
19	19	PLANT DESIGN DEPARTMENT
2	2	CHEMICAL OPERATIONS 706D AREA
2	2	CHEMICAL OPERATIONS 706D AREA
20	20	MECHANICAL MAINTENANCE (EXCLUSIVE OF
A50E,A50T,A51T)		
20W	20	MECHANICAL MAINTENANCE (EXCLUSIVE OF
A50E,A50T,A51T)		
20	20	MECHANICAL MAINTENANCE (EXCLUSIVE OF
A50E,A50T,A51T)		
21	21	MAINTENANCE - AUTOMOTIVE EQUIPMENT
21W	21	MAINTENANCE - AUTOMOTIVE EQUIPMENT
21	21	MAINTENANCE - AUTOMOTIVE EQUIPMENT
22	22	MECHANICAL DEPARTMENT - INSTRUMENT
22M	22	MECHANICAL DEPARTMENT - INSTRUMENT
22	22	MECHANICAL DEPARTMENT - INSTRUMENT
23	23	MEDICAL DEPARTMENT
23	23	MEDICAL DEPARTMENT
023M	23	MEDICAL DEPARTMENT
23W	23	MEDICAL DEPARTMENT
25	25	HEALTH PHYSICS DEPARTMENT
26	26	HEALTH PHYSICS DEPARTMENT - INSTRUMENT SERVICES
27	27	HEALTH PHYSICS DEPARTMENT - PERSONNEL MONITORING
28	28	HEALTH PHYSICS DEPARTMENT - SURVEY GROUP
29	29	MAINTENENCE - BUILDINGS
3M	3	RESEARCH AND DEVELOPMENT - CHEMISTRY
3W	3	RESEARCH AND DEVELOPMENT - CHEMISTRY
3	3	RESEARCH AND DEVELOPMENT - CHEMISTRY
3	3	RESEARCH AND DEVELOPMENT - CHEMISTRY
3001	3001	JANITOR
3003	3003	FIELD ENGINEERING
3004	3004	MECH SHOPS GROUP
3006	3006	SALVAGE & RECLAMATION
3008	3008	TRANSPORTATION
3008H	3008	TRANSPORTATION
3009	3009	MAINT AUTO EQUIP
3011	3011	MAINT HEAVY EQUIP
3015	3015	CENTRAL MECHANICAL SHOPS
3016	3016	CENTRAL MACHINE SHOP
3017	3017	F & M DIVISION ADMN
3019	3019	MAINTENANCE PLANNING
3020	3020	MAINT PLANNING
3021	3021	GE & C DIV ADMN
3032	3032	BURIAL GROUND
3040	3040	LAB PROTECTION ADM
3041	3041	SAFETY

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
3043	3043	FIRE PROTECT EQUIP INSPECT & CONTROL
3045	3045	SS MATERIAL MANAGEMENT
3046	3046	LABORATORY RECORDS
3047	3047	LIBRARIES
3048	3048	TECHNICAL UTILIZATION/COMMERCIALIZATION
3049	3049	SPECIAL PUBLICATIONS
3050	3050	TECHNICAL PUBLICATIONS
3051	3051	LABORATORY RECORDS
3052	3052	PERSONNEL SAFETY
3057	3057	UNKNOWN
3058	3058	UNKNOWN
3059	3059	I AND C CONTROLS ADMIN
3060	3060	DESIGN ENGINEERING
3061	3061	APPRENTICE PROGRAM
3062	3062	MAINT GROUNDS
3062H	3062	MAINT GROUNDS
3063	3063	MAINTENANCE BUILDINGS
3065	3065	NEW FAC DESIGN
3066	3066	I AND C ENGINEERING CONTROLS
3067	3067	I AND C ENGINEERING SECTION B
3068	3068	I AND C ENGINEERING SECTION A
3070	3070	I & C MAINTENANCE - ADMINISTRATION
3071	3071	I AND C MAINTENANCE SECTION B
3072	3072	GRAPHIC ARTS
3073	3073	I AND C MAINTENANCE SECTION A
3074	3074	UNKNOWN
3075	3075	CONTROLS
3077	3077	ELECTRICAL SERVICES
3078	3078	FIELD SERVICES
3079	3079	RESEARCH SERVICES DEPARTMENT WEST
3080	3080	RESEARCH SERVICES DEPARTMENT SOUTH
3081	3081	FIELD SERVICES DEPARTMENT
3081H	3081	FIELD SERVICES DEPARTMENT
3082	3082	EXCEPTIONAL SUMMER STUDENTS
3085	3085	INDUSTRIAL RELATIONS
3086	3086	PLANNING & STANDARDS
3087	3087	MIT PRACTICE SCHOOL PARTICIPANT
3088	3088	INDUSTRIAL HYGIENE
3089	3089	CONSTRUCTION ENGINEERING
3090	3090	HEALTH
3091	3091	GRARD
3091H	3091	GRARD
3092	3092	OPERATIONS ANALYSIS
3093	3093	FIRE
3094	3094	SECURITY
3095	3095	APPRENTICESHIP TRAINING
3096	3096	DECONTAMINATION LAUNDRY
3097	3097	HOUSING
3098	3098	EMPLOYEE RELATIONS
3099	3099	LAB NEWS
3100	3100	EMPLOYEE RECORDS

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
3101	3101	INSURANCE
3102	3102	EMPLOYMENT
3107	3107	CAFETERIA
3109	3109	EMPLOYEE RELATIONS
3112	3112	ORNL PHOTOGRAPHY
3113	3113	PATROL
3113H	3113	PATROL
3115	3115	COMPENSATION
3116	3116	HOUSING
3117	3117	ASSIGNMENT GROUP
3118	3118	SEMINARS AND CONFERENCES
3133	3133	F & M ADMINISTRATION
3135	3135	SPECIAL TRAVEL AND PERSONNEL SERVICES
3136	3136	TRAFFIC
3137	3137	CASHIER & TRAVEL
3139	3139	TIMEKEEPING
3140	3140	PROPERTY
3140W	3140	PROPERTY
3141	3141	MAIL
3142	3142	STORES
3143	3143	RECEIVING
3144	3144	TOOL DEPARTMENT
3148	3148	ORNL REPRODUCTION
3151	3151	MATERIAL CONTROL
3151W	3151	MATERIAL CONTROL
3152	3152	ORACLE DATA PROC & PROGR
3153	3153	EQUIPMENT POOL
3160	3160	ACCOUNTING
3162	3162	BUDGET & PROGRAM PLANNING
3165	3165	BUDGET
3166	3166	COMPUTER SERVICES
3167	3167	NUMERICAL ANALYSIS PORGRAMMING
3169	3169	UNKNOWN
3171	3171	TECH INFO GEN ADMN
3172	3172	NUCLEAR DATA
3173	3173	PUBLIC INFORMATION
3173M	3173	PUBLIC INFORMATION
3180	3180	SEWAGE DISPOSAL
3181	3181	UNKNOWN
3191	3191	APPL HEALTH PHYSICS
3192	3192	PERSONNEL METERS
3193	3193	RADIATION SURVEY
3194	3194	DOSIMETRY RECORDS & PROCEDURES
3195	3195	AREA MONITORING
3196	3196	HEALTH PHYSICS INSTRUMENTS
3197	3197	LABORATORY ASSAYS GROUP
3198	3198	FOREST MGMT OF O R RESERVATION PROPERTIES
3200	3200	DIRECTOR'S
3200M	3200	DIRECTOR'S
3201	3201	RADIATION SAFETY & CONTROL
3202	3202	SHIFT SUPERINTENDENT

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
3203	3203	CENTRAL MANAGEMENT - SPECIAL PROJECTS
3234	3234	INSPECTION ENGINEERING
3236	3236	QUALITY ASSURANCE
3290	3290	ANALYTICAL CHEMISTRY
3295	3295	WAGE STANDARDS
33	33	LIBRARIES
33	33	LIBRARIES
3315	3315	CIVIL DEFENSE
3320	3320	ELECTRONUCLEAR
3325	3325	HFIR PREOPERATIONS
3340	3340	ASSOCIATE DIRECTORS DEPARTMENT
3341	3341	INSTR & CONTROLS
3342	3342	UNKNOWN
3344	3344	UNKNOWN
3345	3345	ENERGY DIVISION
3350	3350	MATHEMATICS
3355	3355	INFORMATION DIVISION - RESEARCH AND DEVELOPMENT
3360	3360	ISOTOPE RESEARCH AND DEVELOPMENT
3361	3361	ISOTOPES ENGINEERING
3363	3363	RADIOISOTOPE TECHNOLOGY
3365	3365	ISOTOPE TRNG & INFORMATION
3369	3369	ISOTOPES TARGET PREPARATION R & D
3370	3370	CHEMICAL TECHNOLOGY
3375	3375	FUEL RECYCLE
3380	3380	AIRCRAFT REACTOR EXPER
3390	3390	ANALYTICAL CHEMISTRY
3405	3405	PHYSICS
3410	3410	NEUTRON PHYSICS
3420	3420	CHEMISTRY
3420M	3420	CHEMISTRY
3430	3430	REACTOR CHEMISTRY
3435	3435	HOMOGENEOUS REACTOR EXP
3450	3450	UNKNOWN
3455	3455	BIOLOGY
3460	3460	UNKNOWN
3470	3470	METALLURGY
3475	3475	SOLID STATE
3477	3477	MOLECULAR ANATOMY PROGRAM
3480	3480	EDUCATION
3481	3481	SCHOOL OF REACTOR TECH
3482	3482	RES PART PROG HP & BIOL
3483	3483	RES PART PROG SC & ENGR
3490	3490	ASS'T TO DIVISION DIRECTOR
35	35	MAINTENANCE - GROUNDS
3530	3530	BILLED EXPENSE TO OTHER THAN AEC AGENCIES
36	36	RESEARCH AND DEVELOPMENT - POWER PILE
36	36	RESEARCH AND DEVELOPMENT - POWER PILE
3601	3601	ISOTOPES ADMINISTRATION
3602	3602	RADIOISOTOPES
3603	3603	UNKNOWN
3604	3604	ISOTOPE RESEARCH MATERIALS LAB

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
3605	3605	ISOTOPES SALES DEPARTMENT
3607	3607	UNKNOWN
3612H	3612	ELEC DISTR SYSTEM
3612	3612	ELEC DISTR SYSTEM
3613	3613	UNKNOWN
3614	3614	ISOTOPES DIVISION ADM
3615	3615	SF MATERIAL CONTROL
3630	3630	CHEMICAL OPERATION - 706-D AREA
3632	3632	LIQUID & GASEOUS WASTE DISPOSAL
3634	3634	EQUIPMENT DECONTAMINATION
3636	3636	BULK SHIELDING REACTOR OPRS
3638	3638	ISOTOPE DEVELOPMENT
3639	3639	OAK RIDGE RESEARCH REACTOR
3640	3640	ISOTOPE CONTROL
3641	3641	PILE OPERATIONS
3642	3642	LOW INTENSITY TEST REACTOR
3643	3643	IODINE ISOTOPES
3648	3648	TREATED WATER DISTR SYSTEM
3649	3649	DEMINERALIZED WATER PLANT
3650	3650	RADIOISOTOPE PROCESSING
3657	3657	UNKNOWN
3671	3671	LABORATORY FACILITIES
3674	3674	HOT CELL OPERATIONS
3675	3675	SOLID STATE DIVISION - TARGET PREPARATION
3725	3725	AIR COMPRESSOR
3743	3743	BOILER ROOM
39	39	RESEARCH AND DEVELOPMENT - TRAINING
39	39	RESEARCH AND DEVELOPMENT - TRAINING
3900	3900	PROPERTY ACCOUNT - GENERAL
4	4	RESEARCH AND DEVELOPMENT - PHYSICS
004M	4	RESEARCH AND DEVELOPMENT - PHYSICS
40	40	(COST ACCT. FOR ENGINEERING & MECHANICAL)
40	40	(COST ACCT. FOR ENGINEERING & MECHANICAL)
4021	4021	BUILDING MAINT ORNL AT Y12
4047	4047	LIBRARIES
4099	4099	DIVISION PUBLICATIONS OFFICE
41	41	RESEARCH AND DEVELOPMENT - METALLURGY
41	41	RESEARCH AND DEVELOPMENT - METALLURGY
4112	4112	ORNL Y12 PHOTOGRAPHY
4163	4163	STATISTICAL SERVICES
4192	4192	Y12 PERS MONTR
4193	4193	ORNL Y12 HP RAD SURVEY
42	42	RESEARCH ENGINEERING - SHOPS
42	42	RESEARCH ENGINEERING - SHOPS
42W	42W	RESEARCH ENGINEERING - SHOPS
4270	4270	ANALYTICAL CHEMISTRY
4290	4290	ANALYTICAL CHEMISTRY
43	43	RESEARCH AND DEVELOPMENT OVERHEAD
43	43	RESEARCH AND DEVELOPMENT OVERHEAD
4300	4300	MATERIALS CHEMISTRY
4320	4320	ELECTRONUCLEAR RESEARCH

Y-12 and X-10 Dept. Numbers and Dept. Names

DEPT NO	DEPT NO	DEPARTMENT NAME
4325	4325	SEPARATIONS TECHNOLOGY
4341	4341	UNKNOWN
4342	4342	UNKNOWN
4345	4345	ENERGY DIVISION AT Y-12
4355	4355	INFORMATION DIVISION - RESEARCH AND DEVELOPMENT
4360	4360	STABLE ISOTOPE RES & PROD
4360M	4360	STABLE ISOTOPE RES & PROD
4362	4362	SPECIAL SEPARATIONS
4364	4364	THERMAL DIFFUSION R & D
4370	4370	CHEMICAL TECHNOLOGY
4380	4380	AIRCRAFT REACTOR ENGR
4390	4390	ANALYTICAL CHEMISTRY
44	44	RESEARCH ENGINEERING - DESIGN
44	44	RESEARCH ENGINEERING - DESIGN
4405	4405	PHYSICS
4420	4420	CHEMISTRY
4430	4430	REACTOR CHEMISTRY
4435	4435	ENGINEERING TECHNOLOGY - DIV. GEN.
4455	4455	BIOLOGY
4456	4456	UNKNOWN
4460	4460	FUSION ENERGY DIVISION - GEN.
4490	4490	Y12 H P RESEARCH
45	45	TOOL DEPARTMENT
4602	4602	86-INCH CYCLOTRON OPERATIONS
4603	4603	EM STABLE ISOTOPES
4647	4647	STABLE ISOTOPES
4650	4650	ELECTROMAGNETIC SEP
5	5	RESEARCH AND DEVELOPMENT - TECHNICAL
5	5	RESEARCH AND DEVELOPMENT - TECHNICAL
5W	5	RESEARCH AND DEVELOPMENT - TECHNICAL
6	6	RESEARCH AND DEVELOPMENT - BIOLOGY
6W	6	RESEARCH AND DEVELOPMENT - BIOLOGY
6	6	RESEARCH AND DEVELOPMENT - BIOLOGY
7	7	DIRECTOR'S DEPARTMENT
8	8	GENERAL OFFICES
8	8	GENERAL OFFICES
008W	8	GENERAL OFFICES
8160	8160	COMPUTER SCIENCES DIVISION - ADM
8161	8161	OPERATIONS - ORNL
8162	8162	DATA ENTRY - X-10 SITE
8163	8163	MATH AND STATICS RESEARCH
8165	8165	JOB CONTROL - X-10 SITE
8168	8168	COMPUTER SYSTEMS SUPPORT - X-10
8169	8169	INFORMATION SYSTEMS - X-10
8170	8170	TECHNICAL APPLICATIONS - X-10
8410	8410	ENGINEERING - ORNL
9	9	PURCHASING DEPARTMENT

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X-10 Department Names, Department Numbers, and Division Names

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
105	10/24/1947	1	Pile Operations		
	1/27/1948	1	Pile Operations - 100 Area		
	1/27/1948	2	Chemical Operations, 706D Area		
706-D	10/24/1947	2	Production Special		
706-A	10/24/1947	3	Chemistry		
	1/27/1948	3	Research & Development - Chemistry Div		
735-B	10/24/1947	4	Physics		
	1/27/1948	4	Research & Development - Physics Div.		
	1/27/1948	5	Research & Development - Technical Div		
703-A	10/24/1947	5	Technical		
719-A	10/24/1947	6	Biology		
	1/27/1948	6	Research & Development - Biology Div		
735-B	10/24/1947	7	Administrative		
	1/27/1948	7	Superintendents Department		
703-C	10/24/1947	8	Accounting		
	1/27/1948	8	General Offices		
703-C	10/24/1947	9	Purchasing & Traffic		
	1/27/1948	9	Purchasing Department		
	1/27/1948	10	Receiving and Shipping Department		
713-A	10/24/1947	10	Storehouse		
	1/27/1948	10	Stores Department		
	1/27/1948	11	General Offices		
	1/27/1948	12	Employee Services		
	1/27/1948	12	Employment & Personnel		
703-C	10/24/1947	12	Personnel		
	1/27/1948	13	Guard Department		
703-C	10/24/1947	13	Security & Protection		
	1/27/1948	14	Fire Protection		
720	10/24/1947	14	Safety & Fire Protection		
735-A	10/24/1947	14	Safety & Fire Protection		
	1/27/1948	14	Safety Department		
	1/27/1948	15	Cafeteria		
708	10/24/1947	15	Cafeteria		
	1/27/1948	16	Laundry		
723	10/24/1947	16	Laundry		
703-C	10/24/1947	17	General Services		
	1/27/1948	17	Janitors Department		
	1/27/1948	18	Power Department (Exclusive of M50S,M50T		
	1/27/1948	18	Steam Plant		

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
801	10/24/1947	18	Steam Power & Water Treatment		
	1/27/1948	18	Water Treating		
	1/27/1948	19	Plant Design Department		
703-B	10/24/1947	19	Plant Engr. & Design		
717-J	10/24/1947	20	Mechanical		
	1/27/1948	20	Mechanical Maintenance (ExA50E,A50T,A51T		
	1/27/1948	21	Maintenance - Automotive Equipment		
717-F	10/24/1947	21	Transportation		
	1/27/1948	21	Transportation (Exclusive of A51T)		
717-B	10/24/1947	22	Instruments		
	1/27/1948	22	Mechanical Department - Instruments		
719	10/24/1947	23	General Medical		
	1/27/1948	23	Medical Department		
	1/27/1948	24	HealthPhysicsDept.Urinalysis (CostCenter		
719-A	10/24/1947	25	Health Physics		
	1/27/1948	25	Health Physics Department		
	1/27/1948	26	Health Physics Department-Instrument Ser		
	1/27/1948	27	Health Physics Department-Personnel Moni		
	1/27/1948	28	Health Physics Department-Survey Group		
	1/27/1948	29	Maintenance - Buildings		
	1/27/1948	30	General Plant (CostCenter)		
	1/27/1948	31	Tank Farm Area (CostCenter)		
	1/27/1948	32	Radium and Beryllium (CostCenter)		
	1/27/1948	33	Libraries		
735-B	10/24/1947	33	Library		
	1/27/1948	34	Charges to AEC (CostCenter)		
	1/27/1948	35	Maintenance-Grounds		
703-A	10/24/1947	36	Power Pile		
	1/27/1948	36	Research & Development - Power Pile Div		
	1/27/1948	37	Isotope Separation (CostCenter)		
	1/27/1948	38	Pile Operations - Isotopes (CostCenter)		
	1/27/1948	39	Research & Development-Training Div.		
735-B	10/24/1947	39	Training School		
	1/27/1948	39	Training-Industrial Relations		
	1/27/1948	40	Construction and Design (CostCenter)		
703-A	10/24/1947	41	Metallurgy		
	1/27/1948	41	Research & Development-Metallurgy		
	1/27/1948	42	Research Engineering - Shops		
717-BB	10/24/1947	42	Research Shop		

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
	1/27/1948	43	Research & Development-Overhead		
703-A	10/24/1947	43	Research Administration		
	1/27/1948	44	Research Engineering-Design		
703-B	10/24/1947	44	Research Engr. & Design		
	1/27/1948	45	Tool Department		
	1/27/1948	46	Chemical Analysis (CostCenter)		
	1/27/1948	47	Isotope Development		
	1/27/1948	48	Hot Pilot Plant (CostCenter)		
	1/27/1948	53	Compens.,Pub.Liabil.,Soc.Sec.Tax(CostCtr		
	1/27/1948	62	Freight, Express and Cartage (CostCenter		
	1/27/1948	63	Compens.,Pub.Liabil.,Soc.Sec.Tax(CostCtr		
	1/27/1948	64	Non-occupational Disability (CostCenter)		
	1/27/1948	64	Occupational Disability Payments(CostCtr		
	1/27/1948	70	Employee Plans (CostCenter)		
	1/27/1948	71	Inventory Adjustment (CostCenter)		
	1/27/1948	76	Tennessee Sales & Use Tax (CostCenter)		
	7/14/1949	3001	Janitors Department		
1000	5/1/1953	3001	Janitors	Industrial Relations	
3026	4/30/1964	3001	Janitors	Operations	
3026	8/31/1970	3001	Janitors	Operations	
3048	4/30/1960	3001	Janitors	Operations	
2518	1/1/1993	3001		Plant & Equipment	21
3047	12/31/1981	3001		Operations (Services)	28
	7/14/1949	3003	Mechanical Department-Maintenance &Shops		
2610	5/1/1953	3003	Mechanical	Engineering & Maintenance	
3022	4/30/1960	3003	Program Engineering	Engineering & Mechanical	
1000	4/30/1964	3003	Field Engineering	Plant & Equipment	
2518	8/31/1970	3003	Field Engineering	Plant & Equipment	
2518	12/31/1981	3003		Plant & Equipment	21
2518	1/1/1993	3003		Plant & Equipment	21
3022	4/30/1960	3004	Mech.Shops Group	Engineering & Mechanical	
2610	5/1/1953	3006	Salvage & Reclamation	Engineering & Maintenance	
3022	4/30/1960	3006	Salvage & Reclamation	Engineering & Mechanical	
	7/14/1949	3008	Transportation		
2610	5/1/1953	3008	Transportation	Engineering & Maintenance	
3022	4/30/1960	3008	Transportation	Engineering & Mechanical	
	7/14/1949	3009	Maintenance-Automotive Equipment(Normal)		
2610	5/1/1953	3009	Maint. Auto. Equip.	Engineering & Maintenance	
3022	4/30/1960	3009	Maint. Auto. Equip.	Engineering & Mechanical	

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
1000	4/30/1964	3009	Maint. Auto. Equip.	Plant & Equipment	
7002	8/31/1970	3009	Maint. Auto. Equip.	Plant & Equipment	
2518	12/31/1981	3009		Plant & Equipment	21
2518	1/1/1993	3009		Plant & Equipment	21
2610	5/1/1953	3011	Maint. Heavy Equipment	Engineering & Maintenance	
3022	4/30/1960	3011	Maint. Heavy Equip.	Engineering & Mechanical	
1000	4/30/1964	3011	Maint. Heavy Equip.	Plant & Equipment	
7002	8/31/1970	3011	Maint. Heavy Equip.	Plant & Equipment	
2518	12/31/1981	3011		Plant & Equipment	21
2518	1/1/1993	3011		Plant & Equipment	21
2518	1/1/1993	3014		Plant & Equipment	21
3026	4/30/1964	3015	Field Maintenance	Operations	
3026	8/31/1970	3015	Field Maintenance	Operations	
3048	4/30/1960	3015	Field Maintenance	Operations	
2518	12/31/1981	3015		Plant & Equipment	21
2518	1/1/1993	3015		Plant & Equipment	21
	7/14/1949	3016	Research Shops Department		
3024	5/1/1953	3016	Research Shops	Engineering & Maintenance	
3022	4/30/1960	3016	Fabrication	Engineering & Mechanical	
1000	4/30/1964	3016	Fabrication	Plant & Equipment	
2518	8/31/1970	3016	Fabrication	Plant & Equipment	
2518	12/31/1981	3016		Plant & Equipment	21
2518	1/1/1993	3016		Plant & Equipment	21
3022	4/30/1960	3017	E&M Division Admn.	Engineering & Mechanical	
1000	4/30/1964	3017	P & E Division Admn.	Plant & Equipment	
2518	8/31/1970	3017	P & E Division Admn.	Plant & Equipment	
2518	12/31/1981	3017		Plant & Equipment	21
2518	1/1/1993	3017		Plant & Equipment	21
1000	4/30/1964	3019	Programmed Maint.	Plant & Equipment	
2518	8/31/1970	3019	Programmed Maint.	Plant & Equipment	
2518	12/31/1981	3019		Plant & Equipment	21
2518	1/1/1993	3019		Plant & Equipment	21
1000	4/30/1964	3020	Maint. Planning	Plant & Equipment	
1000	8/31/1970	3021	G. E. Admn.	Gen. Eng.	
1000	4/30/1964	3021	G. E. & C. Div. Admn.	Gen. Engr. & Constr.	
2518	1/1/1993	3024		Plant & Equipment	21
3022	4/30/1960	3032	Burial Ground	Engineering & Mechanical	
1000	4/30/1964	3032	Burial Ground	Plant & Equipment	
7002	8/31/1970	3032	Solid Waste Storage	Plant & Equipment	

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
5000	4/30/1960	3040	Lab. Protection - Admn	Laboratory Protection	
5000	4/30/1964	3040	Lab. Protection - Admn	Laboratory Protection	
5000	8/31/1970	3040	Lab. Protection - Admn.	Laboratory Protection	
5000	12/31/1981	3040		Laboratory Protection	26
5000	1/1/1993	3040		Laboratory Protection	26
	7/14/1949	3041	Safety Department		
4500S	8/31/1970	3041	Safety	Appl. Health Physics & Safety	
2517	5/1/1953	3041	Safety	Laboratory Protection	
2517	4/30/1960	3041	Safety	Laboratory Protection	
2517	4/30/1964	3041	Safety	Laboratory Protection	
4500S	12/31/1981	3041		Industrial Safety & Appl. Health Physics	36
5000	8/31/1970	3043	Fire Prot. Equip. Insp. & Control	Laboratory Protection	
5000	1/1/1993	3043		Laboratory Protection	26
5000	12/31/1981	3045		Laboratory Protection	26
5000	1/1/1993	3045		Laboratory Protection	26
4500	4/30/1960	3046	Laboratory Records	Technical Information	
4500N	4/30/1964	3046	Laboratory Records	Technical Information	
4500N	8/31/1970	3046	Laboratory Records	Technical Information	
4500N	12/31/1981	3046		Information	31
	7/14/1949	3047	Libraries		
4500	5/1/1953	3047	Libraries	Research Director	
4500	4/30/1960	3047	Libraries	Technical Information	
4500N	4/30/1964	3047	Libraries	Technical Information	
4500N	8/31/1970	3047	Libraries	Technical Information	
4500N	12/31/1981	3047		Information	31
4500N	12/31/1981	3048		Information	31
4500N	12/31/1981	3049		Information	31
2068	5/1/1953	3050	Technical Publications	Information & Reports	
2068	4/30/1960	3050	Technical Publications	Technical Information	
4500N	4/30/1964	3050	Technical Publications	Technical Information	
4500S	8/31/1970	3050	Technical Publications	Technical Information	
4500N	12/31/1981	3050		Information	31
4500	5/1/1953	3051	Central Files	Information & Reports	
3500	12/31/1981	3059		Instr. & Controls (Services)	34
3500	1/1/1993	3059		Instr. & Controls (Services)	34
	7/14/1949	3060	Engineering Department		
1000	5/1/1953	3060	Engineering	Engineering & Maintenance	
3022	4/30/1960	3060	Planning & Design	Engineering & Mechanical	
1000	8/31/1970	3060	Design Engineering	Gen. Eng.	

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
1000	4/30/1964	3060	Design Engineering	Gen. Engr. & Constr.	
2518	12/31/1981	3061		Plant & Equipment	21
2610	5/1/1953	3062	Maint. Roads & Grounds	Engineering & Maintenance	
3022	4/30/1960	3062	Maintenance Grounds	Engineering & Mechanical	
7002	8/31/1970	3062	Maintenance - Grounds	Plant & Equipment	
1000	4/30/1964	3062	Maintenance Grounds	Plant & Equipment	
2518	12/31/1981	3062		Plant & Equipment	21
2610	5/1/1953	3063	Maintenance-Buildings	Engineering & Maintenance	
3022	4/30/1960	3063	Maintenance Buildings	Engineering & Mechanical	
2518	8/31/1970	3063	Maintenance - Buildings	Plant & Equipment	
2518	12/31/1981	3063		Plant & Equipment	21
2518	1/1/1993	3063		Plant & Equipment	21
	7/14/1949	3065	New Facilities Design		
3500	12/31/1981	3066		Instr. & Controls (Services)	34
3500	12/31/1981	3067		Instr. & Controls (Services)	34
3500	12/31/1981	3068		Instr. & Controls (Services)	34
3500	12/31/1981	3070		Instr. & Controls (Services)	34
3500	1/1/1993	3070		Instr. & Controls (Services)	34
3500	12/31/1981	3071		Instr. & Controls (Services)	34
2068	4/30/1960	3072	Graphic Arts	Technical Information	
4500N	4/30/1964	3072	Graphic Arts	Technical Information	
4500S	8/31/1970	3072	Graphic Arts	Technical Information	
4500N	12/31/1981	3072		Information	31
3500	12/31/1981	3073		Instr. & Controls (Services)	34
	7/14/1949	3075	Instrument Department		
3500	5/1/1953	3075	Instrumentation & Controls	Instr. & Contr.	
4500	5/1/1953	3075	Instrumentation & Controls	Instr. & Contr.	
3500	4/30/1960	3075	Controls	Instr. & Controls	
3500	4/30/1964	3075	Controls	Instr. & Controls	
3500	8/31/1970	3075	Controls	Instr. & Controls	
3500	4/30/1960	3075	Instrument	Instr. & Controls	
3500	4/30/1964	3075	Instrument	Instr. & Controls	
3500	8/31/1970	3075	Instrument	Instr. & Controls	
3022	4/30/1960	3077	Electrical Services	Engineering & Mechanical	
1000	4/30/1964	3077	Plant Services	Plant & Equipment	
2518	8/31/1970	3077	Plant Services	Plant & Equipment	
2518	12/31/1981	3077		Plant & Equipment	21
2518	1/1/1993	3077		Plant & Equipment	21
3022	4/30/1960	3078	Field Services	Engineering & Mechanical	

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
1000	4/30/1964	3078	Research Services	Plant & Equipment	
3502	8/31/1970	3078	Research Services - East	Plant & Equipment	
2518	12/31/1981	3078		Plant & Equipment	21
2518	1/1/1993	3078		Plant & Equipment	21
3104	8/31/1970	3079	Research Services - West	Plant & Equipment	
2518	12/31/1981	3079		Plant & Equipment	21
2518	1/1/1993	3079		Plant & Equipment	21
7910	8/31/1970	3080	Research Services - South	Plant & Equipment	
2518	12/31/1981	3080		Plant & Equipment	21
2518	1/1/1993	3080		Plant & Equipment	21
7002	8/31/1970	3081	Field Services	Plant & Equipment	
2518	12/31/1981	3081		Plant & Equipment	21
2518	1/1/1993	3081		Plant & Equipment	21
2518	1/1/1993	3082		Plant & Equipment	21
4500	4/30/1964	3085	Personnel Administration	Personnel	
4500N	8/31/1970	3085	Personnel Administration	Personnel	
1000	4/30/1960	3085	Personnel Admn.	Personnel	
4500N	12/31/1981	3085		Employee Relations	29
4500N	1/1/1993	3085		Human Resources	29
3022	4/30/1960	3086	Planning & Standards	Engineering & Mechanical	
3550	8/31/1970	3088	Industrial Hygiene	Health	
4500	4/30/1964	3088	Industrial Hygiene	Health	
3550	12/31/1981	3088		Health	23
3022	4/30/1960	3089	Controls	Engineering & Mechanical	
1000	8/31/1970	3089	Construction Engineering	Gen. Eng.	
1000	4/30/1964	3089	Construction Engineering	Gen. Engr. & Constr.	
	7/14/1949	3090	Health Division		
2013	5/1/1953	3090	Health	Health	
2013	4/30/1960	3090	Health	Health	
4500	4/30/1964	3090	Health	Health	
4500N	8/31/1970	3090	Health	Health	
4500N	12/31/1981	3090		Health	23
4500N	1/1/1993	3090		Health	23
	7/14/1949	3091	Laboratory Protection		
2500	5/1/1953	3091	Guard	Laboratory Protection	
2500	4/30/1960	3091	Guard	Laboratory Protection	
2500	4/30/1964	3091	Guard	Laboratory Protection	
2500	8/31/1970	3091	Guard	Laboratory Protection	
5000	12/31/1981	3091		Laboratory Protection	26

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
5000	1/1/1993	3091		Laboratory Protection	26
1000	4/30/1964	3092	Industrial Engineering	Plant & Equipment	
2518	8/31/1970	3092	Operations Analysis	Plant & Equipment	
2518	12/31/1981	3092		Plant & Equipment	21
	7/14/1949	3093	Fire Department		
2500	5/1/1953	3093	Fire	Laboratory Protection	
2500	4/30/1960	3093	Fire	Laboratory Protection	
2500	4/30/1964	3093	Fire	Laboratory Protection	
2500	8/31/1970	3093	Fire	Laboratory Protection	
5000	12/31/1981	3093		Laboratory Protection	26
5000	1/1/1993	3093		Laboratory Protection	26
5000	5/1/1953	3094	Security	Laboratory Protection	
5000	4/30/1960	3094	Security	Laboratory Protection	
5000	4/30/1964	3094	Security	Laboratory Protection	
5000	8/31/1970	3094	Security	Laboratory Protection	
5000	12/31/1981	3094		Laboratory Protection	26
5000	1/1/1993	3094		Laboratory Protection	26
	7/14/1949	3095	Employee Training Department		
1000	5/1/1953	3095	Employee Training	Industrial Relations	
2517	8/31/1970	3095	Apprenticeship Training	Personnel	
4500	4/30/1964	3095	Apprenticeship Training	Personnel	
2517	8/31/1970	3095	Educational Assistance	Personnel	
4500	4/30/1964	3095	Educational Assistance	Personnel	
2517	8/31/1970	3095	Method Studies	Personnel	
4500	4/30/1964	3095	Method Studies	Personnel	
4500	4/30/1964	3095	Personnel Development	Personnel	
2517	8/31/1970	3095	Personnel Development & Systems	Personnel	
2517	8/31/1970	3095	Staff Conf. Orientation	Personnel	
4500	4/30/1964	3095	Staff Conf., Orientation	Personnel	
2517	8/31/1970	3095	Standard Practice Proc.	Personnel	
4500	4/30/1964	3095	Standard Practice Proc.	Personnel	
1000	4/30/1960	3095	Training & Methods	Personnel	
	7/14/1949	3096	Laundry		
1000	5/1/1953	3096	Laundry	Industrial Relations	
3026	4/30/1964	3096	Decontamination Laundry	Operations	
3026	8/31/1970	3096	Decontamination Laundry	Operations	
3048	4/30/1960	3096	Decontamination Laundry	Operations	
2518	1/1/1993	3096		Plant & Equipment	21
3047	12/31/1981	3096		Operations (Services)	28

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
	7/14/1949	3097	Recreation & Athletics		
1000	5/1/1953	3097	Recreat. & Athletics	Industrial Relations	
1000	4/30/1960	3097	Housing	Personnel	
4500	4/30/1964	3097	Housing	Personnel	
1000	4/30/1960	3097	Recreation	Personnel	
4500	4/30/1964	3097	Recreation	Personnel	
4500N	8/31/1970	3097	Recreation	Personnel	
	7/14/1949	3098	Labor Relations Department		
1000	5/1/1953	3098	Employee Relations	Industrial Relations	
1000	4/30/1960	3098	Employee Relations	Personnel	
4500	4/30/1964	3098	Labor Relations	Personnel	
4500N	8/31/1970	3098	Labor Relations	Personnel	
2068	4/30/1960	3099	LAB. News	Public Information	
4500N	4/30/1964	3099	Laboratory News	Public Information	
4500N	8/31/1970	3099	Laboratory News	Public Information	
2518	1/1/1993	3099		Plant & Equipment	21
4500N	12/31/1981	3099		Information	31
1000	5/1/1953	3100	Personnel Services	Industrial Relations	
1000	4/30/1960	3100	Personnel Records	Personnel	
4500	4/30/1964	3100	Personnel Records	Personnel	
4500N	8/31/1970	3100	Personnel Records	Personnel	
	7/14/1949	3101	Insurance Section		
1000	5/1/1953	3101	Insurance	Industrial Relations	
1000	4/30/1960	3101	Insurance	Personnel	
4500	4/30/1964	3101	Insurance	Personnel	
4500N	8/31/1970	3101	Insurance	Personnel	
	7/14/1949	3102	Personnel & Employment Department		
1000	5/1/1953	3102	Employment	Industrial Relations	
1000	4/30/1960	3102	Employment	Personnel	
4500	4/30/1964	3102	Employment	Personnel	
4500N	8/31/1970	3102	Employment	Personnel	
	7/14/1949	3107	Cafeteria & Canteens		
1000	5/1/1953	3107	Cafeteria & Canteens	Industrial Relations	
2010	4/30/1960	3107	Cafeteria	Personnel	
2010	4/30/1964	3107	Cafeteria & Canteen	Personnel	
2010	8/31/1970	3107	Cafeteria & Canteens	Personnel	
4500N	12/31/1981	3107		Employee Relations	29
4500N	1/1/1993	3107		Human Resources	29
	7/14/1949	3109	Service Department		

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
4500	4/30/1964	3109	Employee Relations	Personnel	
4500N	8/31/1970	3109	Employee Relations	Personnel	
	7/14/1949	3112	Photography		
2068	4/30/1960	3112	Photography	Technical Information	
4500N	4/30/1964	3112	Photography	Technical Information	
4500NA	8/31/1970	3112	Photography	Technical Information	
4500N	12/31/1981	3112		Information	31
	7/14/1949	3113	Patrol Department		
1000	5/1/1953	3115	Wage & Salary	Industrial Relations	
4500N	8/31/1970	3115	Compensation	Personnel	
1000	4/30/1960	3115	Wage Standards	Personnel	
4500	4/30/1964	3115	Wage Standards	Personnel	
1000	5/1/1953	3116	Housing	Industrial Relations	
1000	5/1/1953	3117	Stenographic Pool	Industrial Relations	
1000	4/30/1960	3117	Assignment Group	Personnel	
4500	4/30/1964	3117	Assignment Group	Personnel	
4500N	8/31/1970	3117	Assignment Group	Personnel	
4500N	8/31/1970	3117	Housing	Personnel	
4500N	8/31/1970	3118	Conferences	Personnel	
4500N	12/31/1981	3118		Finanace & Materials	37
4500N	1/1/1993	3118		Finance & Business Management	37
	7/14/1949	3133	General Office		
1000	4/30/1960	3133	F & M Administration	Finance & Materials	
4500	4/30/1964	3133	F & M Administration	Finance & Materials	
1000	5/1/1953	3133	General Office	General Office	
4500N	12/31/1981	3133		Finanace & Materials	37
4500N	8/31/1970	3135	Special Travel	Personnel	
1000	4/30/1960	3136	Traffic	Finance & Materials	
4500N	4/30/1964	3136	Traffic	Finance & Materials	
4500N	8/31/1970	3136	Traffic	Personnel	
4500N	12/31/1981	3136		Finanace & Materials	37
4500N	1/1/1993	3136		Finance & Business Management	37
1000	4/30/1960	3137	Cashier & Travel	Finance & Materials	
4500N	4/30/1964	3137	Cashier & Travel	Finance & Materials	
4500N	8/31/1970	3137	Cashier & Travel	Personnel	
4500N	8/31/1970	3137	Teletype	Personnel	
4500N	12/31/1981	3137		Finanace & Materials	37
4500N	1/1/1993	3137		Finance & Business Management	37
1000	4/30/1960	3139	Timekeeping & Paymaster	Finance & Materials	

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
4500N	4/30/1964	3139	Timekeeping & Paymaster	Finance & Materials	
2506	8/31/1970	3139	Timekeeping & Paymaster	Personnel	
4500N	12/31/1981	3139		Finanace & Materials	37
4500N	4/30/1964	3140	Property Accounting	Budget & Prog. Office	
4500N	8/31/1970	3140	Property Accounting	Budget & Prog. Planning Office	
1000	4/30/1960	3140	Property	Finance & Materials	
1000	5/1/1953	3140	Property	General Office	
1000	4/30/1960	3141	Mail	Finance & Materials	
4500N	4/30/1964	3141	Mail	Finance & Materials	
4500S	8/31/1970	3141	Mail	Personnel	
4500N	12/31/1981	3141		Finanace & Materials	37
4500N	1/1/1993	3141		Finance & Business Management	37
	7/14/1949	3142	Stores Section		
1000	4/30/1960	3142	Stores	Finance & Materials	
4500	4/30/1964	3142	Stores	Finance & Materials	
1000	5/1/1953	3142	Stores	General Office	
4500N	8/31/1970	3142	Stores	Plant & Equipment	
4500N	12/31/1981	3142		Finanace & Materials	37
4500N	1/1/1993	3142		Finance & Business Management	37
	7/14/1949	3143	Receiving and Shipping Section		
1000	4/30/1960	3143	Receiving	Finance & Materials	
4500	4/30/1964	3143	Receiving & Shipping	Finance & Materials	
1000	5/1/1953	3143	Receiving & Shipping	General Office	
4500N	8/31/1970	3143	Receiving & Shipping	Plant & Equipment	
4500N	12/31/1981	3143		Finanace & Materials	37
4500N	1/1/1993	3143		Finance & Business Management	37
	7/14/1949	3144	Tool Section		
1000	4/30/1960	3144	Tools	Finance & Materials	
4500	4/30/1964	3144	Tools	Finance & Materials	
1000	5/1/1953	3144	Tool Section	General Office	
4500N	8/31/1970	3144	Tools	Plant & Equipment	
4500N	12/31/1981	3144		Finanace & Materials	37
1000	5/1/1953	3148	Reproduction	Information & Reports	
1000	4/30/1960	3148	Reproduction	Technical Information	
4500	4/30/1964	3148	Reproduction	Technical Information	
4500S	8/31/1970	3148	Reproduction	Technical Information	
4500N	12/31/1981	3148		Information	31
1000	4/30/1960	3151	Material Control	Finance & Materials	
4500	4/30/1964	3151	Material Services	Finance & Materials	

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
1000	5/1/1953	3151	Material Control	General Office-	
4500N	8/31/1970	3151	Material Services	Plant & Equipment	
4500N	12/31/1981	3151		Finanace & Materials	37
4500N	1/1/1993	3151		Finance & Business Management	37
4500	4/30/1960	3152	Oracle Data Proc. & Progr.	Math. Panel	
1000	4/30/1960	3153	Equipment Pool	Finance & Materials	
4500	4/30/1964	3153	Equipment Pool	Finance & Materials	
4500N	8/31/1970	3153	Equipment Pool	Plant & Equipment	
4500N	4/30/1964	3160	Accounting	Budget & Prog. Office	
4500N	8/31/1970	3160	Accounting	Budget & Prog. Planning Office	
4500N	1/1/1993	3161		Finance & Business Management	37
4500N	4/30/1964	3162	Budget & Program Planning	Budget & Prog. Office	
4500N	8/31/1970	3162	Budget & Program Planning	Budget & Prog. Planning Office	
4500N	12/31/1981	3162		Finanace & Materials	37
4500N	1/1/1993	3162		Finance & Business Management	37
4500N	4/30/1964	3165	Budget	Budget & Prog. Office	
4500N	8/31/1970	3165	Budget	Budget & Prog. Planning Office	
1000	4/30/1960	3165	Budget	Finance & Materials	
4500N	12/31/1981	3165		Finanace & Materials	37
4500N	1/1/1993	3165		Finance & Business Management	37
4500N	4/30/1964	3166	Computer Services	Mathematics	
4500N	8/31/1970	3166	Computer Services	Mathematics	
4500N	8/31/1970	3167	Numerical Analysis Program	Mathematics	
4500N	4/30/1964	3167	Numerical Analysis Programming	Mathematics	
4500	4/30/1960	3171	Tech. Info. Gen. Admn	Technical Information	
4500N	4/30/1964	3171	Tech. Infor. Gen. Admn.	Technical Information	
4500N	8/31/1970	3171	Tech. Infor. Gen. Admn.	Technical Information	
4500N	12/31/1981	3171		Information	31
4500	4/30/1960	3172	Nuclear Data	Technical Information	
4500	4/30/1960	3173	Public Information	Public Information	
4500N	4/30/1964	3173	Public Information	Public Information	
4500N	8/31/1970	3173	Public Information	Public Information	
4500S	1/1/1993	3175		Office of Radiation Protection	38
3048	4/30/1960	3180	Sewage Disposal System	Operations	
4500N	1/1/1993	3185		Off. of Env. Compl. & Documentation	35
	7/14/1949	3191	Radiation Survey-Monitoring (General)		
4500S	8/31/1970	3191	Appl. Health Physics	Appl. Health Physics & Safety	
2001	4/30/1960	3191	Appl. Health Physics	Health Physics	
4500S	4/30/1964	3191	Appl. Health Physics	Health Physics	

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
2001	5/1/1953	3191	Radiation Survey - Montr.	Health Physics	
4500S	12/31/1981	3191		Industrial Safety & Appl. Health Physics	36
4500S	1/1/1993	3191		Off. of Safety & Health Protection	36
	7/14/1949	3192	Personnel Monitoring		
4500S	8/31/1970	3192	Personnel Meters Group	Appl. Health Physics & Safety	
4500S	4/30/1964	3192	Personnel Meters Group	Health Physics	
2001	5/1/1953	3192	Personnel Monitoring	Health Physics	
2001	4/30/1960	3192	Personnel Monitoring	Health Physics	
4500S	12/31/1981	3192		Industrial Safety & Appl. Health Physics	36
	7/14/1949	3193	Radiation Survey		
4500S	8/31/1970	3193	Radiation Survey	Appl. Health Physics & Safety	
2001	5/1/1953	3193	Radiation Survey	Health Physics	
2001	4/30/1960	3193	Radiation Survey	Health Physics	
4500S	4/30/1964	3193	Radiation Survey	Health Physics	
4500S	12/31/1981	3193		Industrial Safety & Appl. Health Physics	36
	7/14/1949	3194	Instrument & Assay Group		
4500S	8/31/1970	3194	Dosimetry Records & Proced.	Appl. Health Physics & Safety	
4500S	4/30/1964	3194	Dosimetry, Records & Procedures	Health Physics	
2001	5/1/1953	3194	Instr. & Assay Group	Health Physics	
2001	4/30/1960	3194	Instr. & Assay Group	Health Physics	
4500S	12/31/1981	3194		Industrial Safety & Appl. Health Physics	36
4500S	8/31/1970	3195	Environmental Monitoring	Appl. Health Physics & Safety	
2001	5/1/1953	3195	Area Monitoring	Health Physics	
2001	4/30/1960	3195	Area Monitoring	Health Physics	
4500S	4/30/1964	3195	Environmental Monitoring	Health Physics	
4500S	12/31/1981	3195		Industrial Safety & Appl. Health Physics	36
4500S	4/30/1964	3196	Health Physics Technology	Health Physics	
4500S	8/31/1970	3196	Health Physics Technology	Health Physics	
4500S	12/31/1981	3196		Industrial Safety & Appl. Health Physics	36
4500S	8/31/1970	3197	Laboratory Assays Group	Appl. Health Physics & Safety	
4500S	4/30/1964	3197	Laboratory Assays Group	Health Physics	
4500S	8/31/1970	3198	Forest Mgmt. of O. R. Reservation Proper	Health Physics	
4500S	12/31/1981	3198		Industrial Safety & Appl. Health Physics	36
	7/14/1949	3200	Director's Department		
4500N	4/30/1964	3200	Director's	Director	
4500N	8/31/1970	3200	Director's	Director	
3001	5/1/1953	3200	Laboratory Shift Supervisor	Director	
4500	5/1/1953	3200	Staff	Director	
9204-1	4/30/1964	3200	Y-12 Coordinator	Director	

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
4500	4/30/1960	3200	Constr. Prog. Coord.	Lab. Serv. Supt.	
9204-1	4/30/1960	3200	Director's Dept. - Admn.	Lab. Serv. Supt.	
3550	4/30/1960	3200	Shift Superintendent	Lab. Serv. Supt.	
4500N	12/31/1981	3200		Central Management	20
4500N	1/1/1993	3200		Central Mgmt. Offices	20
4500N	4/30/1964	3201	Radiation Safety & Control	Asst. Deputy Director	
4500N	1/1/1993	3201		Office of Oper. Readiness & Fac. Safety	22
4500S	12/31/1981	3201		Industrial Safety & Appl. Health Physics	36
5000	8/31/1970	3202	Shift Supt.	Assistant Director Services	
5000	4/30/1964	3202	Shift Superintendent	Lab. Services Supt.	
4500N	4/30/1964	3202	Special Services	Lab. Services Supt.	
4500N	12/31/1981	3202		Central Management	20
5000	1/1/1993	3202		Laboratory Protection	26
4500N	12/31/1981	3203		Central Management	20
5000	1/1/1993	3205		Laboratory Protection	26
2024	1/1/1993	3229		Off. of Quality Progs. & Inspection	24
9204-1	4/30/1960	3234	Inspection Engineering	Insp. Engr.	
4500S	4/30/1964	3234	Inspection Engineering	Inspection Engr.	
4500S	8/31/1970	3234	Inspection Engineering	Inspection Engr.	
2024	1/1/1993	3234		Off. of Quality Progs. & Inspection	24
2024	12/31/1981	3234		Quality Assur. & Inspection	24
2024	1/1/1993	3235		Off. of Quality Progs. & Inspection	24
2024	1/1/1993	3236		Off. of Quality Progs. & Inspection	24
2024	12/31/1981	3236		Quality Assur. & Inspection	24
	1/1/1993	3271		Executive Offices	90
4500	5/1/1953	3290	Analytical Chemistry	Anal. Chem.	
4500	4/30/1960	3290	Analytical Chemistry	Anal. Chem.	
	7/14/1949	3295	Wage Standards		
4500N	8/31/1970	3315	Civil Defense	Civil Def. Res. Proj.	
4500S	4/30/1964	3320	Electronuclear	Electronuclear	
6000	8/31/1970	3320	Electronuclear	Electronuclear	
3042	8/31/1970	3325	HFIR Operations	Operations	
3042	4/30/1964	3325	HFIR Preoperations	Operations	
3047	12/31/1981	3325		Operations R&D	27
3047	1/1/1993	3325		Waste Mgmt. & Remedial Action	27
7917	1/1/1993	3330		Research Reactors	6
4500N	1/1/1993	3336		Central Mgmt. Offices	20
4500N	1/1/1993	3337		Central Mgmt. Offices	20
	7/14/1949	3340	Associate Director's Department		

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
9204-1	5/1/1953	3340	Research & Development	Asst. Res. Director	
9204-1	5/1/1953	3340	Homogeneous Reactor Project	Deputy Res. Director	
4500	4/30/1960	3340	Director's Department - Research	Director	
4500	4/30/1960	3340	Radiation Safety & Control	Director	
4500	4/30/1960	3340	Reactor Evaluation	Director	
9204-1	4/30/1960	3340	Thermal Breeder Program	Director	
4500	5/1/1953	3340	Research Director	Research Director	
3500	8/31/1970	3341	Instr. & Contr.	Instr. & Controls	
3500	4/30/1960	3341	Instr. & Controls	Instr. & Controls	
3500	4/30/1964	3341	Instr. & Controls	Instr. & Controls	
4500S	1/1/1993	3341		Instr. & Contls (R&D)	9
3500	12/31/1981	3341		Instr. & Controls R&D	9
4500N	12/31/1981	3345		Energy	15
4500N	1/1/1993	3345		Energy	15
	7/14/1949	3350	Mathematics Panel		
4500	4/30/1960	3350	Mathematics Panel	Math. Panel	
4500N	4/30/1964	3350	Mathematics	Mathematics	
4500N	8/31/1970	3350	Mathematics	Mathematics	
4500	5/1/1953	3350	Mathematics Panel	Mathematics Panel	
4500N	1/1/1993	3350		Computing Applications	10
4500N	12/31/1981	3355		Information R&D	7
3026-C	4/30/1964	3360	Engineering	Isotopes	
3047	4/30/1964	3360	Isotope Infor. & Publications	Isotopes	
3047	4/30/1964	3360	Radioisotope R & D	Isotopes	
3047	8/31/1970	3360	Radioisotope R & D	Isotopes	
3037	4/30/1960	3360	Radioisotope Res. & Dev.	Isotopes	
3047	4/30/1964	3360	Target Devel. & Production	Isotopes	
3047	8/31/1970	3361	Isotopes Engineering	Isotopes	
3037	8/31/1970	3363	Radioisotope Technology	Isotopes	
3047	8/31/1970	3365	Isotope Trng. & Information	Isotopes	
3037	8/31/1970	3369	Isotopes Target Preparation R & D	Isotopes	
4500	5/1/1953	3370	Chemical Technology	Chem. Tech.	
4500	4/30/1960	3370	Chemical Technology	Chemical Technology	
4500	4/30/1964	3370	Chemical Technology	Chemical Technology	
4500N	8/31/1970	3370	Chemical Technology	Chemical Technology	
4500N	12/31/1981	3370		Chemical Technology	3
4500N	1/1/1993	3370		Chemical Technology	3
7601	12/31/1981	3375		Fuel Recycle	14
7601	1/1/1993	3375		Robotics & Process Systems	14

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
2001	8/31/1970	3380	Ecological Sciences	Ecological Sciences	
1505	1/1/1993	3380		Environ. Sciences	42
1505	12/31/1981	3380		Environmental Sciences	42
4500	4/30/1960	3390	Analytical Chemistry	Anal. Chem.	
4500S	8/31/1970	3390	Anal. Chem.	Anal. Chemistry	
4500S	4/30/1964	3390	Analytical Chemistry	Analytical Chemistry	
4500S	12/31/1981	3390		Analytical Chem.	1
4500S	1/1/1993	3390		Analytical Chemistry	1
	7/14/1949	3405	Physics Division		
4500	5/1/1953	3405	Physics	Physics	
4500	4/30/1960	3405	Physics	Physics	
4500N	4/30/1964	3405	Physics	Physics	
4500N	8/31/1970	3405	Physics	Physics	
6000	12/31/1981	3405		Physics	13
6000	1/1/1993	3405		Physics	13
4500	4/30/1960	3410	Neutron Physics	Neutron Physics	
4500N	4/30/1964	3410	Neutron Physics	Neutron Physics	
6025	8/31/1970	3410	Neutron Physics	Neutron Physics	
6025	12/31/1981	3410		Engineering Physics	12
6025	1/1/1993	3410		Engr. Physics & Math	12
K-1225	1/1/1993	3415		Engineering Technology	7
	7/14/1949	3420	Chemistry Division		
4500	5/1/1953	3420	Chemistry	Chemistry	
4500	4/30/1960	3420	Chemistry	Chemistry	
4500N	4/30/1964	3420	Chemistry	Chemistry	
4500N	8/31/1970	3420	Chemistry	Chemistry	
4500N	12/31/1981	3420		Chemistry	4
4500N	1/1/1993	3420		Chemistry	4
4500S	8/31/1970	3430	React. Chem.	React. Chem.	
4500S	4/30/1964	3430	Reactor Chemistry	Reactor Chem.	
9733-1	4/30/1960	3430	Reactor Chemistry	Reactor Chemistry	
	7/14/1949	3435	Technical Division		
9204-1	4/30/1960	3435	Reactor Exp. Engr.	REE	
9201-3	4/30/1964	3435	Reactor	Reactor	
9201-3	8/31/1970	3435	Reactor	Reactor	
4500N	1/1/1993	3450		Cemter for Computational Sciences	55
	7/14/1949	3455	Biology Division		
	7/14/1949	3470	Metallurgy Division		
4500S	8/31/1970	3470	Met. & Cer.	Met. & Ceramics	

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
2000	5/1/1953	3470	Metallurgy	Metallurgy	
2000	4/30/1960	3470	Metallurgy	Metallurgy	
4500S	4/30/1964	3470	Metals & Ceramics	Metals & Ceramics	
4500S	12/31/1981	3470		Metals & Ceramics	11
4500S	1/1/1993	3470		Metals & Ceramics	11
3025	5/1/1953	3475	Solid State	Solid State	
3025	4/30/1960	3475	Solid State	Solid State	
3025	4/30/1964	3475	Solid State	Solid State	
3025	8/31/1970	3475	Solid State	Solid State	
3025	12/31/1981	3475		Solid State	18
3025	1/1/1993	3475		Solid State	18
K-703	8/31/1970	3477	Molecular Anatomy Program	Molecular Anatomy Program	
	7/14/1949	3480	Technical Training		
2068	5/1/1953	3480	Educ. Rel. & Trng.	Educ. Rel. & Training	
2068	4/30/1960	3480	Education	Education	
2068	4/30/1964	3480	Education	Education	
2068	5/1/1953	3481	School of Reactor Technology	Educ. Rel. & Training	
1000	4/30/1960	3482	Research Participation	Asst. Dir for Prof. Personnel	
4500	4/30/1964	3482	Research Participation & Travel Lecture	Asst. Dir. for Prof. Personnel & Univ. R	
2068	5/1/1953	3482	Res Part. Prog., H. P. & Biology	Educ. Rel. & Training	
4500N	8/31/1970	3482	Research Participation & Travel Lecture	Education & Univ. Relations	
1000	4/30/1960	3483	Travel Lecture Program	Asst. Dir for Prof. Personnel	
4500	4/30/1964	3483	Research Participation & Travel Lecture	Asst. Dir. for Prof. Personnel & Univ. R	
2068	5/1/1953	3483	Res Part. Prog., Science & Engr.	Educ. Rel. & Training	
4500N	8/31/1970	3483	Research Participation & Travel Lecture	Education & Univ. Relations	
	7/14/1949	3490	Health Physics Division		
2001	5/1/1953	3490	Health Physics	Health Physics	
2001	4/30/1960	3490	Health Physics	Health Physics	
4500S	4/30/1964	3490	Health Physics	Health Physics	
4500S	8/31/1970	3490	Health Physics	Health Physics	
4500S	12/31/1981	3490		Health & Safety Res.	8
4500S	1/1/1993	3490		Health & Safety Res.	8
3047	12/31/1981	3601		Operations - Radioisotope Prod.	32
3047	12/31/1981	3602		Operations - Radioisotope Prod.	32
3047	12/31/1981	3604		Operations - Radioisotope Prod.	32
	7/14/1949	3612	Electrical Distribution System		
2610	5/1/1953	3612	Elect. Distr. Syst	Engineering & Maintenance	
3022	4/30/1960	3612	Elec. Distr. System	Engineering & Mechanical	
1000	4/30/1964	3612	Elec. Distr. System	Plant & Equipment	

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
2518	8/31/1970	3612	Elec. Distr. System	Plant & Equipment	
2518	12/31/1981	3612		Plant & Equipment	21
2518	1/1/1993	3612		Plant & Equipment	21
3047	8/31/1970	3614	Isotopes Division Adm.	Isotopes	
	7/14/1949	3615	S. F. Material Control	-	
3037	4/30/1964	3615	SS Accountability	Isotopes	
3037	8/31/1970	3615	SS Accountability	Isotopes	
3001	4/30/1960	3615	SSN & Isotope Accountability	Isotopes	
	7/14/1949	3630	Chemical Operations 706-D		
3037	5/1/1953	3630	Chemical Operations	Operations	
3026	4/30/1964	3632	Liquid & Gaseous Waste Disposal	Operations	
3026	8/31/1970	3632	Liquid & Gaseous Waste Disposal	Operations	
3048	4/30/1960	3632	Liquid & Gaseous Waste Disposal	Operations	
3026	4/30/1964	3634	Equipment Decontamination	Operations	
3026	8/31/1970	3634	Equipment Decontamination	Operations	
3048	4/30/1960	3634	Equipment Decontamination	Operations	
3042	8/31/1970	3636	Bulk Shielding Reactor Oprs.	Operations	
	7/14/1949	3638	Isotope Development-Radium & Beryllium		
3037	5/1/1953	3638	Radioisotope Development	Operations	
3042	4/30/1960	3639	Research Reactor	Operations	
3042	4/30/1964	3639	Research Reactor	Operations	
3042	8/31/1970	3639	Research Reactor	Operations	
3047	12/31/1981	3639		Operations (Services)	28
	7/14/1949	3640	Isotope Control Department		
3037	4/30/1960	3640	Isotope Sales	Isotopes	
3037	4/30/1964	3640	Isotope Sales	Isotopes	
3037	8/31/1970	3640	Isotope Sales	Isotopes	
3037	5/1/1953	3640	Radioisotope Sales	Operations	
	7/14/1949	3641	Pile Operations - 100 Area		
3001	5/1/1953	3641	Reactor Operations	Operations	
3042	4/30/1960	3641	Reactor Operations	Operations	
3042	4/30/1960	3642	Low Intensity Test Reactor	Operations	
3042	4/30/1964	3642	Low Intensity Test Reactor	Operations	
3001	4/30/1960	3643	Reactor Operations Tech.	Operations	
3001	4/30/1964	3643	Reactor Operations Tech.	Operations	
3001	8/31/1970	3643	Reactor Operations Tech.	Operations	
	7/14/1949	3648	Water Distribution System		
3026	4/30/1964	3648	Treated Water Distr. System	Operations	
3026	8/31/1970	3648	Treated Water Distr. System	Operations	

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X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
3048	4/30/1960	3648	Treated Water Distr. System	Operations	
3042	4/30/1960	3649	Demineralized Water Plant	Operations	
3042	4/30/1964	3649	Demineralized Water Plant	Operations	
3042	8/31/1970	3649	Demineralized Water Plant	Operations	
3037	4/30/1964	3650	Radioisotope Processing	Isotopes	
3037	8/31/1970	3650	Radioisotope Processing	Isotopes	
3037	4/30/1960	3650	Radioisotope Prod.	Isotopes	
3037	4/30/1964	3657	Radioisotope Tech. Services	Isotopes	
3048	4/30/1960	3671	Laboratory Facilities	Operations	
3525	4/30/1964	3674	Hot Cell Operations	Operations	
3525	8/31/1970	3674	Hot Cell Operations	Operations	
3047	12/31/1981	3674		Operations (Services)	28
3026	4/30/1964	3725	Air Compressor	Operations	
3026	8/31/1970	3725	Air Compressor	Operations	
3048	4/30/1960	3725	Air Compressor	Operations	
	7/14/1949	3743	Steam Plant		
2610	5/1/1953	3743	Steam Plant	Engineering & Maintenance	
3026	4/30/1964	3743	Steam Plant	Operations	
3026	8/31/1970	3743	Steam Plant	Operations	
3048	4/30/1960	3743	Steam Plant	Operations	
2518	1/1/1993	3743		Plant & Equipment	21
3047	12/31/1981	3743		Operations (Services)	28
2518	1/1/1993	4021	Bldg. Maint. ORNL @ Y-12	Plant & Equipment	21
2518	12/31/1981	4021	Bldg. Maint. ORNL at Y-12	Plant & Equipment	21
4500N	8/31/1970	4047	Libraries	Technical Information	
4500N	12/31/1981	4047		Information	31
4500N	12/31/1981	4099		Information	31
4500NA	8/31/1970	4112	ORNL Y-12 Photography	Technical Information	
2068	4/30/1960	4112	Photography	Technical Information	
4500N	4/30/1964	4112	Photography	Technical Information	
4500N	12/31/1981	4112		Information	31
4500N	4/30/1964	4163	Statistical Services	Mathematics	
4500N	8/31/1970	4163	Statistical Services	Mathematics	
4500S	1/1/1993	4175		Office of Radiation Protection	38
2001	4/30/1960	4192	Y-12 Pers. Montr.	Health Physics	
4500S	8/31/1970	4193	ORNL - Y-12 Rad. Survey	Appl. Health Physics & Safety	
4500S	4/30/1964	4193	ORNL - Y-12 Rad. Survey	Health Physics	
2001	4/30/1960	4193	Y-12 Rad. Survey	Health Physics	
4500S	12/31/1981	4193		Industrial Safety & Appl. Health Physics	36

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
4500	4/30/1960	4270	Analytical Chemistry	Anal. Chem.	
9733-2	5/1/1953	4270	Chemical Analysis	Anal. Chem.	
4500	4/30/1960	4290	Analytical Chemistry	Anal. Chem.	
9733-1	5/1/1953	4300	Materials Chemistry	Mat. Chem.	
9204-3	5/1/1953	4320	Electromagnetic Research	Elect. Res.	
9204-3	4/30/1960	4320	Electronuclear Research	Electro. Research	
3047	12/31/1981	4325		Operations R&D	27
9204-1	5/1/1953	4342	Long Range Reactor Planning	Long Range Reactor Planning	
4500N	12/31/1981	4355		Information R&D	7
9731	5/1/1953	4360	Isotope Research & Prod.	Iso. Res. & Prod.	
9731	4/30/1964	4360	Stable Isotopes R & D	Isotopes	
9731	8/31/1970	4360	Stable Isotopes R & D	Isotopes	
9731	4/30/1960	4360	Stable Isotopes Res. & Dev.	Isotopes	
9731	4/30/1960	4362	Special Separations	Isotopes	
9731	4/30/1964	4362	Special Separations	Isotopes	
9731	8/31/1970	4362	Special Separations	Isotopes	
3047	4/30/1964	4364	Thermal Diffusion R & D	Isotopes	
4500	4/30/1960	4370	Chemical Technology	Chemical Technology	
4500N	1/1/1993	4370		Chemical Technology	3
9704-1	5/1/1953	4380	Aircraft Nuclear Propulsion	ANP	
9201-3	4/30/1960	4380	Reactor Projects	Asst. Director	
4500	4/30/1960	4390	Analytical Chemistry	Anal. Chem.	
4500S	8/31/1970	4390	Anal. Chem.	Anal. Chemistry	
4500S	4/30/1964	4390	Analytical Chemistry	Analytical Chemistry	
4500S	1/1/1993	4390		Analytical Chemistry	1
4500	4/30/1960	4405	Physics	Physics	
4500	4/30/1960	4420	Chemistry	Chemistry	
4500S	8/31/1970	4430	React. Chem.	React. Chem.	
4500S	4/30/1964	4430	Reactor Chemistry	Reactor Chemistry	
9733-1	4/30/1960	4430	Reactor Chemistry	Reactor Chemistry	
9204-1	5/1/1953	4435	Reactor Exper. Engr.	R.E.E.	
9204-1	4/30/1960	4435	Reactor Exp. Engr.	REE	
9201-3	4/30/1964	4435	Reactor	Reactor	
9201-3	8/31/1970	4435	Reactor	Reactor	
9201-3	12/31/1981	4435		Eng. Technology	16
9201-3	1/1/1993	4435		Engineering Technology	16
9207	5/1/1953	4455	Biology	Biology	
9207	4/30/1960	4455	Biology	Biology	
9207	4/30/1964	4455	Biology	Biology	

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
9207	8/31/1970	4455	Biology	Biology	
9207	12/31/1981	4455		Biology	2
9207	1/1/1993	4455		Biology	2
9201-2	4/30/1964	4460	Thermonuclear	Asst. Director	
9201-2	8/31/1970	4460	Thermonuclear	Thermonuclear	
9201-2	4/30/1960	4460	Thermonuclear Exp.	Thermonuclear Exp.	
9201-2	12/31/1981	4460		Fusion Energy	19
9201-2	1/1/1993	4460		Fusion Energy	19
2001	4/30/1960	4490	Y-12 H. P. Research	Health Physics	
3047	12/31/1981	4602		Operations - Radioisotope Prod.	32
3047	12/31/1981	4603		Operations - Radioisotope Prod.	32
9731	4/30/1960	4647	Stable Isotopes	Isotopes	
9731	4/30/1964	4650	Electromagnetic Sep.	Isotopes	
9731	8/31/1970	4650	Electromagnetic Sep.	Isotopes	
9731	4/30/1960	4650	Stable Isotopes Prod.	Isotopes	
JacksonPlz	1/1/1993	8137		Business Systems	95
K-1007	1/1/1993	8139		Off. of the Controller	62
1580/K-25	1/1/1993	8142		Computing & Telecommunications	63
Com.Pk.	1/1/1993	8146		Off. of the Treasurer	60
4500N	12/31/1981	8161		Computer Sciences	63
1580/K-25	1/1/1993	8161		Computing & Telecommunications	63
4500N	12/31/1981	8162		Computer Sciences	63
4500N	12/31/1981	8163		Computer Sciences	63
1580/K-25	1/1/1993	8164		Computing & Telecommunications	63
4500N	12/31/1981	8165		Computer Sciences	63
1580/K-25	1/1/1993	8165		Computing & Telecommunications	63
1580/K-25	1/1/1993	8166		Computing & Telecommunications	63
1580/K-25	1/1/1993	8167		Computing & Telecommunications	63
4500N	12/31/1981	8169		Computer Sciences	63
1580/K-25	1/1/1993	8169		Computing & Telecommunications	63
4500N	12/31/1981	8170		Computer Sciences	63
Townsite	1/1/1993	8191		Procurement	64
K-1200	1/1/1993	8360		Environ. Restor. Off.	87
1000	12/31/1981	8410		Engineering	69
1000	1/1/1993	8410		Engineering	69
9704-2	1/1/1993	8700		Info. Res. & Admin.	70
9739	1/1/1993	8701		Graphics	71
Com.Pk.	1/1/1993	8702		Information Services	72
Com.Pk.	1/1/1993	8703		Publications	73

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
	1/27/1948	A50A	Janitors Department		
	7/14/1949	A50A	Janitors Department		
703-C	8/11/1948	A50A	Janitor	Personnel & Services	
	7/14/1949	A50D	Health Division		
	1/27/1948	A50D	Medical Department		
719	8/11/1948	A50D	Medical	Health	
	7/14/1949	A50E	Instrument Department		
	1/27/1948	A50E	Mechanical Department - Instruments		
717-B	8/11/1948	A50E	Inst.	Engineering, Maintenance & Construction	
	7/14/1949	A50G	Laboratory Protection		
	1/27/1948	A50G	Plant Protection		
703-C	8/11/1948	A50G	Plant Prot.	Security	
	1/27/1948	A50H	Health Physics Department		
104-B	8/11/1948	A50H	Health Physics	Health Physics	
	1/27/1948	A50J	Employee Services		
	7/14/1949	A50J	Service Department		
703-C	8/11/1948	A50J	Services	Personnel & Services	
	1/27/1948	A50L	Employment & Personnel		
	7/14/1949	A50L	Personnel & Employment Department		
703-C	8/11/1948	A50L	Personnel	Personnel & Services	
	7/14/1949	A50M	General Office		
	1/27/1948	A50M	General Offices		
703-C	8/11/1948	A50M	Gen. Offices	General Offices	
	7/14/1949	A50N	Mechanical Department-Maintenance &Shops		
	1/27/1948	A50N	Mechanical Maintenance (ExA50E,A50T,A51T		
717-B	8/11/1948	A50N	Mech. Maint.	Engineering, Maintenance & Construction	
	1/27/1948	A50R	Cafeteria		
	7/14/1949	A50R	Cafeteria & Canteens		
703-C	8/11/1948	A50R	Cafeteria	Personnel & Services	
	1/27/1948	A50S	Stores Department		
	7/14/1949	A50S	Stores Section		
703-C	8/11/1948	A50S	Stores	General Offices	
	7/14/1949	A50T	Transportation		
	1/27/1948	A50T	Transportation (Exclusive of A51T)		
703-B	8/11/1948	A50T	Trans.	Engineering, Maintenance & Construction	
	1/27/1948	A50U	Power Department (Exclusive of M50S,M50T		
703-B	8/11/1948	A50U	Power	Engineering, Maintenance & Construction	
	7/14/1949	A50W	Engineering Department		
	1/27/1948	A50W	Plant Design Department		

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
703-C	8/11/1948	A50W	Engineering	Engineering, Maintenance & Construction	
	1/27/1948	A50X	Maintenance-Grounds		
	1/27/1948	A50Z	Maintenance - Buildings		
	1/27/1948	A51G	Guard Department		
	7/14/1949	A51G	Patrol Department		
720	8/11/1948	A51G	Guard	Security	
	1/27/1948	A51H	Health Physics Department-Instrument Ser		
	7/14/1949	A51H	Radiation Survey-Monitoring (General)		
104-B	8/11/1948	A51H	Rad. Sur. Mon.	Health Physics	
	1/27/1948	A51J	Recreation & Athletics		
	7/14/1949	A51J	Recreation & Athletics		
703-C	8/11/1948	A51J	Recreation	Personnel & Services	
	1/27/1948	A51S	Receiving and Shipping Department		
	7/14/1949	A51S	Receiving and Shipping Section		
703-C	8/11/1948	A51S	Recv. & Shipping	General Offices	
	1/27/1948	A51T	Maintenance - Automotive Equipment		
	7/14/1949	A51T	Maintenance-Automotive Equipment(Normal)		
703-B	8/11/1948	A51T	Maint. Auto.	Engineering, Maintenance & Construction	
	7/14/1949	A51W	New Facilities Design		
	1/27/1948	A51W	Research Engineering - Shops		
	7/14/1949	A52G	Fire Department		
	1/27/1948	A52G	Fire Protection		
735-A	8/11/1948	A52G	Fire Prot.	Personnel & Services	
	1/27/1948	A52H	Health Physics Department-Personnel Moni		
	1/27/1948	A52J	Laundry		
	7/14/1949	A52J	Laundry		
703-C	8/11/1948	A52J	Laundry	Personnel & Services	
	1/27/1948	A52S	Tool Department		
	7/14/1949	A52S	Tool Section		
703-C	8/11/1948	A52S	Tools	General Offices	
	1/27/1948	A52W	Research Engineering-Design		
	1/27/1948	A53G	Safety Department		
	7/14/1949	A53G	Safety Department		
735-A	8/11/1948	A53G	Safety	Personnel & Services	
	1/27/1948	A53H	Health Physics Department-Survey Group		
	1/27/1948	A53J	Training-Industrial Relations		
	1/27/1948	A54H	HealthPhysicsDept.Urinalysis (CostCenter		
	1/27/1948	A54J	Jury Duty (Cost Center)		
	7/14/1949	A55H	Personnel Monitoring		

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Building	Date	Dept #	Department Description	Division Information	Division #
	1/27/1948	A55J	Termination Allowance (Cost Center)		
	1/27/1948	A56J	Occupational Disability Payments(CostCtr		
	1/27/1948	A57J	Non-occupational Disability (CostCenter)		
703-C	8/11/1948	A57L	Labor Rel.	Personnel & Services	
	1/27/1948	A58J	Meal Allowance (Cost Center)		
	7/14/1949	A60H	Radiation Survey		
703-C	8/11/1948	A60L	Emp. Training	Personnel & Services	
	7/14/1949	A60N	Research Shops Department		
717-BB	8/11/1948	A60N	Research Shops Dept.	Engineering, Maintenance & Construction	
	7/14/1949	A63J	Labor Relations Department		
	7/14/1949	A64J	Photography		
	7/14/1949	A65H	Instrument & Assay Group		
	7/14/1949	A65J	Employee Training Department		
	7/14/1949	A66J	Insurance Section		
	7/14/1949	B50A	Director's Department		
	1/27/1948	B50A	Superintendents Department		
703-A	8/11/1948	B50A	Supt.	Director	
	1/27/1948	B50B	Purchasing Department		
	1/27/1948	B50F	Freight, Express and Cartage (CostCenter		
	1/27/1948	B50K	Inventory Adjustment (CostCenter)		
	1/27/1948	B50P	Employee Plans (CostCenter)		
	1/27/1948	B50S	Scrap Material (Cost Center)		
	1/27/1948	B50T	Telephone, Telegraph & Postage (CostCtr)		
	1/27/1948	B50W	Compens.,Pub.Liabil.,Soc.Sec.Tax(CostCtr		
	1/27/1948	B51A	Convention Attendances		
	1/27/1948	B51W	Tennessee Sales & Use Tax (CostCenter)		
	7/14/1949	B52A	Wage Standards		
703-A	8/11/1948	B52A	Wage Stds.	Wage Stds.	
	12/31/1963	CHEM		Chemistry Division	CHEM
	12/31/1963	FUS		Fusion Research	FUS
	1/27/1948	H100L	Libraries		
	7/14/1949	H100L	Libraries		
703-A	8/11/1948	H100L	Library	Director	
	7/14/1949	H200L	Physics Division		
	1/27/1948	H200L	Research & Development - Physics Div.		
706-B	8/11/1948	H200L	Physics	Physics	
	7/14/1949	H300L	Chemistry Division		
	1/27/1948	H300L	Research & Development - Chemistry Div-		
706-A	8/11/1948	H300L	Chemistry	Chemistry	

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Building	Date	Dept #	Department Description	Division Information	Division #
	1/27/1948	H301L	Chemical Analysis (CostCenter)		
	1/27/1948	H400L	Research & Development - Technical Div		
	7/14/1949	H400L	Technical Division		
703-A	8/11/1948	H400L	Technical	Technical	
	1/27/1948	H401L	Hot Pilot Plant (CostCenter)		
	1/27/1948	H500L	Research & Development - Power Pile Div		
703-A	8/11/1948	H500L	Power Pile	Power Pile	
	1/27/1948	H50F	Deferred Charge Orders (Cost Center)		
	7/14/1949	H50L	Associate Director's Department		
	1/27/1948	H50L	Research & Development-Overhead		
703-A	8/11/1948	H50L	Res. Dev. Ov'H.	Director	
	1/27/1948	H50T	Manufacture Small Tools&Supplies(CostCtr		
	1/27/1948	H50W	Charges to AEC (CostCenter)		
	1/27/1948	H50W	Work for Outside Parties (Cost Center)		
	7/14/1949	H51L	Mathematics Panel		
	7/14/1949	H600L	Biology Division		
	1/27/1948	H600L	Research & Development - Biology Div		
9207	8/11/1948	H600L	Biology	Biology	
	7/14/1949	H700L	Metallurgy Division		
	1/27/1948	H700L	Research & Development-Metallurgy		
703-A	8/11/1948	H700L	Metallurgy	Metallurgy	
	1/27/1948	H800L	Research & Development-Training Div.		
	7/14/1949	H800L	Technical Training		
	7/14/1949	H900L	Health Physics Division		
104-B	8/11/1948	H900L	H. P. Res.	Health Physics	
	7/14/1949	M50C	Chemical Operations 706-D		
	1/27/1948	M50C	Chemical Operations, 706D Area		
706-D	8/11/1948	M50C	Chem. Oper.	Operations	
	1/27/1948	M50D	Isotope Development		
	7/14/1949	M50D	Isotope Development-Radium & Beryllium		
735-B	8/11/1948	M50D	Isotope Dev.	Operations	
	7/14/1949	M50E	Isotope Control Department		
	1/27/1948	M50E	Operations Service Department		
735-B	8/11/1948	M50E	Oper. Service	Operations	
	7/14/1949	M50K	Electrical Distribution System		
	1/27/1948	M50P	Pile Operations - 100 Area		
	7/14/1949	M50P	Pile Operations - 100 Area		
105	8/11/1948	M50P	Pile Operations	Operations	
	1/27/1948	M50S	Steam Plant		

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Building	Date	Dept #	Department Description	Division Information	Division #
	7/14/1949	M50S	Steam Plant		
703-B	8/11/1948	M50S	Steam Plant	Engineering, Maintenance & Construction	
	7/14/1949	M50T	Water Distribution System		
	1/27/1948	M50T	Water Treating		
703-B	8/11/1948	M50T	Water Treating	Engineering, Maintenance & Construction	
	1/27/1948	M51C	Isotope Separation (CostCenter)		
	1/27/1948	M51D	Radium and Beryllium (CostCenter)		
	1/27/1948	M51P	Pile Operations - Isotopes (CostCenter)		
	1/27/1948	M52C	Tank Farm Area (CostCenter)		
	12/31/1963	MED		Medical Division	MED
	12/31/1963	METAL		Metallurgy	METAL
	12/31/1963	PHYS		Physics Research and Development	PHYS
	12/31/1963	RADISO		Radioisotope Division	RADISO
	12/31/1963	SEP		Separations Development Division	SEP
	12/31/1963	SSTATE		Solid State Physics	SSTATE
	7/1/1975			Analytical Chemistry	1
	12/31/1994			Analytical Chemistry	1
	7/1/1975			Biology	2
	12/31/1994			Biology	2
	3/8/1995			Biology	2
	7/1/1975			Chemical Technology	3
	12/31/1994			Chemical Technology	3
	3/8/1995			Chemical Technology	3
	3/8/1995			ASO Analytical Support	4
	12/31/1994			Chemical & Anal. Sciences	4
	7/1/1975			Chemistry	4
	7/1/1975			Research Directors	5
	6/29/1975			Molecular Anatomy Program	6
	12/31/1994			Research Reactors	6
	3/8/1995			Research Reactors	6
	7/1/1975			Information-Research & Development	7
	7/1/1975			Health Physics	8
	12/31/1994			Health Sciences Research	8
	3/8/1995			Health Sciences Research	8
	12/31/1994			Instr. & Controls (R&D)	9
	3/8/1995			Instrumentation & Controls (R&D)	9
	7/1/1975			Instrumentation & Controls R&D	9
	3/8/1995			Computational Physics & Engineering	10
	7/1/1975			Computer Sciences - Research	10

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Building	Date	Dept #	Department Description	Division Information	Division #
	12/31/1994			Computing Applications	10
	7/1/1975			Metals & Ceramics	11
	12/31/1994			Metals & Ceramics	11
	3/8/1995			Metals & Ceramics	11
	3/8/1995			Computer Science & Mathematics	12
	12/31/1994			Engr. Physics & Math	12
	7/1/1975			Neutron Physics	12
	7/1/1975			Physics	13
	12/31/1994			Physics	13
	3/8/1995			Physics	13
	12/31/1994			Robotics & Process Systems	14
	3/8/1995			Robotics & Process Systems	14
	7/1/1975			Energy	15
	12/31/1994			Energy	15
	3/8/1995			Energy	15
	12/31/1994			Engineering Technology	16
	3/8/1995			Engineering Technology	16
	7/1/1975			Reactor	16
	7/1/1975			Solid State	18
	12/31/1994			Solid State	18
	3/8/1995			Solid State	18
	12/31/1994			Fusion Energy	19
	3/8/1995			Fusion Energy	19
	7/1/1975			Thermonuclear	19
	3/8/1995			Central Management Offices	20
	12/31/1994			Central Mgmt. Offices	20
	7/1/1975			Directors Administration	20
	7/1/1975			Plant & Equipment	21
	12/31/1994			Plant & Equipment	21
	3/8/1995			Plant & Equipment	21
	12/31/1994			Office of Oper. Readiness & Facility Saf	22
	3/8/1995			Office of Oper. Readiness & Facility Saf	22
	7/1/1975			Health	23
	12/31/1994			Health	23
	3/8/1995			Health	23
	7/1/1975			Inspection Engineering	24
	12/31/1994			Office of Quality Programs & Inspection	24
	3/8/1995			Office of Quality Programs & Inspection	24
	6/29/1975			Isotopes Research & Development	25

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
	7/1/1975			Laboratory Protection	26
	12/31/1994			Office of Lab. Protection	26
	3/8/1995			Office of Lab. Protection	26
	7/1/1975			Operations Research & Development	27
	12/31/1994			Waste Mgmt. & Remedial Action	27
	3/8/1995			Waste Mgmt. & Remedial Action	27
	7/1/1975			Operations - Services	28
	7/1/1975			Employee Relations	29
	12/31/1994			Human Resources	29
	7/1/1975			Information - Services	31
	3/8/1995			Office of Science & Technology Partnersh	31
	7/1/1975			Operations - Radioisotopes Production	32
	7/1/1975			Chemical Technology-Stable Isotopes Prod	33
	12/31/1994			Instr. & Controls (Services)	34
	3/8/1995			Instrumentation & Controls (Services)	34
	7/1/1975			Instrumentation & Controls - Services	34
	7/1/1975			Computer Sciences - Services	35
	12/31/1994			Off. of Env. Compliance & Doc.	35
	3/8/1995			Off. of Env. Compliance & Doc.	35
	7/1/1975			Applied Health Physics	36
	12/31/1994			Off. of Saf. & Health Prot.	36
	3/8/1995			Office of Safety & Health Prot.	36
	12/31/1994			Fin. & Business Mgmt.	37
	3/8/1995			Finance & Business Mgmt.	37
	7/1/1975			Finance & Materials	37
	7/1/1975			General Engineering	38
	12/31/1994			Off. of Rad. Protection	38
	3/8/1995			Office of Radiation Protection	38
	7/1/1975			Solid State-Target Preparation (New)	39
	7/1/1975			General Engineering - R&D	40
	12/31/1994			Environ. Sciences	42
	7/1/1975			Environmental Sciences	42
	3/8/1995			Environmental Sciences	42
	3/8/1995			Property and Materials Management	52
	12/31/1994			Center for Computational Sci.	55
	3/8/1995			Center for Computational Sci.	55
	3/8/1995			Chemical & Analytical Sciences	60
	12/31/1994			MMES Business Services	60
	3/8/1995			MMES Business Services	60

X-10 Department, Building, Division Listing

Building	Date	Dept #	Department Description	Division Information	Division #
	3/8/1995			Office of Quality Assurance	61
	12/31/1994			Off. of the Controller	62
	3/8/1995			Office of the Controller	62
	12/31/1994			Computing & Tele. Services	63
	3/8/1995			Computing & Tele. Services	63
	12/31/1994			Procurement	64
	3/8/1995			Procurement	64
	3/8/1995			ASO Analytical Laboratories	65
	3/8/1995			ASO Compliance and Quality	67
	12/31/1994			Analytical Services Org.	67
	3/8/1995			Central Engineering Services	69
	12/31/1994			Engineering	69
	12/31/1994			Info. Mgmt. Services Org.	70
	3/8/1995			Info. Mgmt. Services Org.	70
	12/31/1994			Graphics	71
	12/31/1994			Information Services	72
	12/31/1994			Publication	73
	12/31/1994			Environ. Restor. Programs	87
	3/8/1995			Environ. Restor. Programs	87
	12/31/1994			Executive Offices	90
	3/8/1995			Executive Offices	90
	3/8/1995			Energy Systems Human Resources	91

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X-10 Building Names and Building Numbers

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
1/1/1951	1/1/1951	ORNL0900	Pistol Range
1/1/1951	1/1/1951	ORNL0901	154 kV Substation
1/1/1951	1/1/1951	ORNL0902	Reservoir
1/1/1948	8/23/1963	ORNL0902	Reservoir
1/1/1951	1/1/1951	ORNL0903	Stationary Storage (Bethel Church)
1/1/1951	1/1/1951	ORNL0904	Oil Storage Tank
1/1/1948	8/23/1963	ORNL0907	Interim Low Level Facility
1/1/1951	1/1/1951	ORNL1000	Administration and Engineering Bldg
1/1/1946	8/23/1963	ORNL1000	Administration Building (P&E Div. Offices@1963)
	12/1/1978	ORNL1000	Engineering
	1/1/1951	ORNL101	AreaFldOff,ResShopsSpecialMaterialLab
	1/1/1951	ORNL101-B	Rolling Mill (Metallurgy Division)
	1/1/1951	ORNL101-C	Decontamination Hut (Tools&MachineShop)
	1/1/1951	ORNL101-D	Metallurgy Laboratory
	1/1/1951	ORNL102	Research Offices
	1/1/1951	ORNL103	Vault (Storage of Precious Metals)
	1/1/1951	ORNL104-A	Test Building (Health Physics)
	1/1/1951	ORNL104-B	Health-Physics Building
	1/1/1951	ORNL105	Pile Building (Graphite Pile)
	1/1/1951	ORNL105-E	Storage (Chemical and Instrument)
1/1/1951	1/1/1951	ORNL1050	Sentry Post #2
1/1/1951	1/1/1951	ORNL1051	Storage
1/1/1951	1/1/1951	ORNL1052	Sentry Post #2B
	12/1/1978	ORNL1053-A	Construction Engineering Office
	12/1/1978	ORNL1053-B	Construction Engineering Office
	12/1/1978	ORNL1054	Engineering Office Annex
	1/1/1951	ORNL106	Low Intensity Reactor
	1/1/1951	ORNL107	Physics of Solid States Cell Building
	1/1/1951	ORNL114	Graphite Pile Air Filter Building
	1/1/1951	ORNL115	Graphite Pile Fan House
	1/1/1951	ORNL115-A	Laboratory
	1/1/1951	ORNL115-B	Laboratory
1/1/1951	1/1/1951	ORNL1500	Lumber & Spare Parts, Cylinder Storage
1/1/1951	1/1/1951	ORNL1501	U.S. Weather Bureau
1/1/1951	1/1/1951	ORNL1502	Solvent Storage
	12/1/1978	ORNL1503	Greenhouse Complex
	12/1/1978	ORNL1504	Aquatic Ecology Laboratory
	12/1/1978	ORNL1505	Environmental Sciences Laboratory
	12/1/1978	ORNL1506	Controlled Environment & Animal Bldg
1/1/1951	1/1/1951	ORNL1550	Septic Tank
1/1/1951	1/1/1951	ORNL1551	Acid Storage
		ORNL1555	Mobile Office Unit
1/1/1951	1/1/1951	ORNL2000	Metallurgy Laboratory
1/1/1948	8/23/1963	ORNL2000	Metallurgy Laboratories
	12/1/1978	ORNL2000	InspectionEngineeringLabSolidStateAnnex
1/1/1951	1/1/1951	ORNL20000	Plant Wide Electrical Distribution
1/1/1951	1/1/1951	ORNL20001	Gamewall Fire Alarm System
1/1/1951	1/1/1951	ORNL20002	Auto-call System
1/1/1951	1/1/1951	ORNL20003	Roads and Walkways - Topography
1/1/1951	1/1/1951	ORNL20004	Fences
1/1/1951	1/1/1951	ORNL20005	Burial Ground #1

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
1/1/1951	1/1/1951	ORNL20006	Burial Ground #2
1/1/1951	1/1/1951	ORNL20007	Burial Ground #3
1/1/1951	1/1/1951	ORNL2001	Health-Physics Building
1/1/1948	8/23/1963	ORNL2001	Health Physics Laboratories
	12/1/1978	ORNL2001	Environmental Sciences Division
1/1/1951	1/1/1951	ORNL2002	Water Tank
1/1/1951	1/1/1951	ORNL2003	Pump House
	12/1/1978	ORNL2003	Process Water Control Station
1/1/1951	1/1/1951	ORNL2005	Physics Laboratory
1/1/1944	8/23/1963	ORNL2005	Physics Laboratory (demolished by 1963)
1/1/1951	1/1/1951	ORNL2006	Storage (Chemical and Instrument)
1/1/1951	1/1/1951	ORNL2007	Calibration Building (Health Physics)
1/1/1951	8/23/1963	ORNL2007	Health Physics Test Building
	12/1/1978	ORNL2007	Health Physics Calibration Station
1/1/1951	1/1/1951	ORNL2008	Urine Analysis Laboratory
1/1/1946	8/23/1963	ORNL2008	Health Physics Low Level Analysis Lab
	12/1/1978	ORNL2008	HealthPhysicsTechnologyInternalDosimLab
1/1/1951	1/1/1951	ORNL2009	Reservoir
	12/1/1978	ORNL2009	Cafeteria Storage Building
1/1/1951	1/1/1951	ORNL2010	Cafeteria
1/1/1951	8/23/1963	ORNL2010	New Cafeteria
	12/1/1978	ORNL2010	Cafeteria
1/1/1951	1/1/1951	ORNL2011	Accelerator Building
1/1/1943	8/23/1963	ORNL2011	Original Steam Plant
	12/1/1978	ORNL2011	Mechanical Properties Lab. No. 2
1/1/1951	1/1/1951	ORNL2012	Health Physics
1/1/1951	1/1/1951	ORNL2013	Health Division
1/1/1943	8/23/1963	ORNL2013	Medical and Biological Building (now sto
	12/1/1978	ORNL2013	West Maintenance Service Center
1/1/1951	1/1/1951	ORNL2014	Emergency Generator
1/1/1951	1/1/1951	ORNL2015	Telephone Vault
1/1/1951	1/1/1951	ORNL2016	Portal Building (Proposed)
	12/1/1978	ORNL2016	West Portal
1/1/1951	1/1/1951	ORNL2017	Generator House
1/1/1951	1/1/1951	ORNL2018	Carpenter Shop
	12/1/1978	ORNL2018	Electrical and Air Condit. Service Ctr.
	12/1/1978	ORNL2019	Vertebrate Colony House
1/1/1956	8/23/1963	ORNL2024	Metallurgy Lab Annex
	12/1/1978	ORNL2024	Inspection Eng.Environ.Sci.Div. Annex A
	12/1/1978	ORNL2026	High Radiation Level Analytical Lab
	12/1/1978	ORNL2028	Environ. Sci. Office Annex No. 1
	12/1/1978	ORNL2029	Information Center Complex
	12/1/1978	ORNL2030	Mobile Office unit
	12/1/1978	ORNL2031	Mobile Office Unit
	1/1/1951	ORNL204	Isolation Building
	1/1/1951	ORNL205	Pilot Plant
	1/1/1951	ORNL205-A	Emergency Generator
1/1/1951	1/1/1951	ORNL2051	Sentry Post #12
1/1/1951	1/1/1951	ORNL2052	Test Building (Health Physics)
1/1/1951	1/1/1951	ORNL2053	Emergency Generator
1/1/1951	1/1/1951	ORNL2054	Storage (Chemicals & Chemical Equipment)

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
1/1/1951	1/1/1951	ORNL2055	Storage (Chemicals & Chemical Equipment)
1/1/1951	1/1/1951	ORNL2056	Storage (Chemicals & Chemical Equipment)
1/1/1951	1/1/1951	ORNL2058	Sentry Post #11C
1/1/1951	1/1/1951	ORNL2059	Storage (Chemicals & Chemical Equipment)
	1/1/1951	ORNL206	SEE 3023,3507,3510,3511,3512,3513
	1/1/1951	ORNL206-A	Storage (T.V.A.)
	1/1/1951	ORNL206-B	Chemical Evaporator Building
1/1/1951	1/1/1951	ORNL2061	Smoke Stack
1/1/1951	1/1/1951	ORNL2067	Administration Building
1/1/1951	1/1/1951	ORNL2068	Administration Building
1/1/1943	8/23/1963	ORNL2068	Administration Building (ORSORT @1963)
1/1/1951	1/1/1951	ORNL2069	Reactor School
1/1/1943	8/23/1963	ORNL2069	Cafeteria (ORSORT @1963)
	12/1/1978	ORNL2069	Change House
1/1/1951	1/1/1951	ORNL2073	Paint Storage
1/1/1951	1/1/1951	ORNL2074	Paint Shop
1/1/1951	1/1/1951	ORNL2075	Pump House
1/1/1951	1/1/1951	ORNL2077	Pickling and Ladder Dipping Vats
1/1/1951	1/1/1951	ORNL2078	Clock Alley (Sentry Post #4)
1/1/1951	1/1/1951	ORNL2079	Flag Pole
1/1/1951	1/1/1951	ORNL2080	Accelerator Building Annex
1/1/1951	1/1/1951	ORNL2085	Paint Shop
	12/1/1978	ORNL2093	Environmental Storage (N. of Bldg. 2001)
	12/1/1978	ORNL2095	Environ.Sciences Insectary Bldg.
1/1/1951	1/1/1951	ORNL2500	Guard Headquarters and Fire Headquarters
1/1/1943	8/23/1963	ORNL2500	Patrol and Fire Headquarters
	12/1/1978	ORNL2500	Guard and Fire Headquarters
1/1/1951	1/1/1951	ORNL2501	Change House (Colored Men)
1/1/1951	1/1/1951	ORNL2502	Change House (Colored Women)
1/1/1951	1/1/1951	ORNL2504	Truck Scales
1/1/1951	1/1/1951	ORNL2505	Central Shops
1/1/1951	1/1/1951	ORNL2506	Tool and Pipe Stores, Timekeepers
1/1/1943	8/23/1963	ORNL2506	Instrument Shops
	12/1/1978	ORNL2506	Fabrication Shop and Timekeeping
1/1/1951	1/1/1951	ORNL2507	Sentry Post #11
	12/1/1978	ORNL2510	Air Compressor Building
1/1/1951	1/1/1951	ORNL2512	Pipe Cutting Shop
1/1/1951	1/1/1951	ORNL2513	Sewing Room (for Bldg. 2515)
1/1/1951	1/1/1951	ORNL2514	Checking Room (for Bldg. 2515)
1/1/1951	1/1/1951	ORNL2515	Laundry
1/1/1951	1/1/1951	ORNL2516	General Stores
1/1/1943	8/23/1963	ORNL2516	Central Stores
1/1/1951	1/1/1951	ORNL2517	Safety Department
1/1/1943	8/23/1963	ORNL2517	Safety Department Offices
	12/1/1978	ORNL2517	Personnel Development and Systems Dept.
1/1/1951	1/1/1951	ORNL2518	Change House (White Men)
1/1/1951	8/23/1963	ORNL2518	Change House
	12/1/1978	ORNL2518	Plant & Equipment Division Offices
1/1/1951	1/1/1951	ORNL2519	Steam Plant
1/1/1948	8/23/1963	ORNL2519	New Steam Plant
	12/1/1978	ORNL2519	Steam Plant

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
1/1/1951	1/1/1951	ORNL2520	Garage
1/1/1951	1/1/1951	ORNL2521	Sewage Treatment Plant (Under Construct)
1/1/1951	8/23/1963	ORNL2521	Sewage Treatment Plant
1/1/1951	1/1/1951	ORNL2522	Fuel Oil Tank
	12/1/1978	ORNL2522	Fuel Oil Tank
1/1/1955	8/23/1963	ORNL2523	Decontamination Laundry
	12/1/1978	ORNL2523	Decontamination Laundry
1/1/1957	8/23/1963	ORNL2525	Research Shops
	12/1/1978	ORNL2525	Fabrication Department Shops
1/1/1959	8/23/1963	ORNL2528	Low Level Waste Pilot Plant
	12/1/1978	ORNL2528	Coal Research Laboratory
	12/1/1978	ORNL2531	Radioactive Waste Evaporator Building
	12/1/1978	ORNL2536	Sewage Research Building
1/1/1951	1/1/1951	ORNL2550	Paymaster's Booth
1/1/1951	1/1/1951	ORNL2551	Millwright Shop
1/1/1951	1/1/1951	ORNL2552	Sheetmetal Storage
1/1/1951	1/1/1951	ORNL2553	Storage
1/1/1951	1/1/1951	ORNL2554	Emergency Generator
1/1/1951	1/1/1951	ORNL2555	Lead Shop
1/1/1951	1/1/1951	ORNL2556	Warehouse
1/1/1951	1/1/1951	ORNL2557	Instrument Department Maintenance Shops
1/1/1951	1/1/1951	ORNL2558	Fire Equipment Storage
1/1/1951	1/1/1951	ORNL2559	Change House (White Men)
1/1/1951	1/1/1951	ORNL2560	Aluminum Storage
1/1/1951	1/1/1951	ORNL2561	Clock Alley
1/1/1951	1/1/1951	ORNL2563	Storage (Janitors Equipment)
1/1/1951	1/1/1951	ORNL2564	Health Physics Storage
1/1/1951	1/1/1951	ORNL2565	Receiving and Shipping Warehouse
1/1/1951	1/1/1951	ORNL2566	Sterilization House(PotableWaterBottles)
1/1/1951	1/1/1951	ORNL2567	Electric Shop
	12/1/1978	ORNL2567	Craft Support Group Offices
1/1/1951	1/1/1951	ORNL2568	Automotive Storage
1/1/1951	1/1/1951	ORNL2569	Spare Parts Storage
1/1/1951	1/1/1951	ORNL2570	Automotive Stores
1/1/1951	1/1/1951	ORNL2572	Emergency Generator
1/1/1951	1/1/1951	ORNL2573	Septic Tank
1/1/1951	1/1/1951	ORNL2574	Warehouse
1/1/1951	1/1/1951	ORNL2575	Pipe Stores
1/1/1951	1/1/1951	ORNL2576	Receiving and Shipping Office
1/1/1951	1/1/1951	ORNL2577	Not in Use
1/1/1951	1/1/1951	ORNL2578	Tool Storage
1/1/1951	1/1/1951	ORNL2579	Tool Stores
1/1/1951	1/1/1951	ORNL2580	Rigger's Loft
1/1/1951	1/1/1951	ORNL2581	Tool Storage
1/1/1951	1/1/1951	ORNL2582	Tool Storage
1/1/1951	1/1/1951	ORNL2583	Tool Storage
1/1/1951	1/1/1951	ORNL2584	Equipment Storage
1/1/1951	1/1/1951	ORNL2585	Storage
1/1/1951	1/1/1951	ORNL2586	Salvage Yard Office
1/1/1951	1/1/1951	ORNL2587	Storage
1/1/1951	1/1/1951	ORNL2588	Storage

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
1/1/1951	1/1/1951	ORNL2590	Storage
1/1/1951	1/1/1951	ORNL2591	Storage
1/1/1951	1/1/1951	ORNL2592	Storage
1/1/1951	1/1/1951	ORNL2593	Storage
1/1/1951	1/1/1951	ORNL2594	Storage
1/1/1951	1/1/1951	ORNL2595	Storage
1/1/1951	1/1/1951	ORNL2596	Storage
1/1/1951	1/1/1951	ORNL2597	Storage (Automotive Parts)
1/1/1951	1/1/1951	ORNL2598	Storage (Automotive Parts)
1/1/1951	1/1/1951	ORNL2599	Auto Parts Storage
1/1/1951	1/1/1951	ORNL2600	Oil Storage
1/1/1951	1/1/1951	ORNL2601	Storage (Automotive Parts)
1/1/1951	1/1/1951	ORNL2602	Septic Tank
1/1/1951	1/1/1951	ORNL2603	Gasoline Station
1/1/1951	1/1/1951	ORNL2604	Outside Oil Storage
1/1/1951	1/1/1951	ORNL2605	Transportation Office
1/1/1951	1/1/1951	ORNL2606	Grease Rack
1/1/1951	1/1/1951	ORNL2607	Sentry Post #7
1/1/1951	1/1/1951	ORNL2608	Storage
1/1/1951	1/1/1951	ORNL2609	Sentry Post #3
1/1/1951	1/1/1951	ORNL2610	Mechanical Department Offices
1/1/1951	1/1/1951	ORNL2611	Shops
1/1/1951	1/1/1951	ORNL2612	Office (Salvage Yard & Burial Ground)
1/1/1951	1/1/1951	ORNL2613	Sentry Post #6
1/1/1951	1/1/1951	ORNL2614	Storage
1/1/1961	8/23/1963	ORNL2621	Tool Stores
	12/1/1978	ORNL2621	Tool Stores
	12/1/1978	ORNL2628	Fire Protection Maintenance&StorageShop
	12/1/1978	ORNL2631	Maintenance Equipment Shelter
	12/1/1978	ORNL2633	Electrical Material Storage
	12/1/1978	ORNL2634	Maintenance Material Storage
1/1/1951	1/1/1951	ORNL3000	13.8 kV Substation
	12/1/1978	ORNL3000	13.8 kV Substation
1/1/1951	1/1/1951	ORNL3001	Pile Building (Graphite Pile)
1/1/1943	8/23/1963	ORNL3001	Pile Building (including Graphite Reactor)
	12/1/1978	ORNL3001	Graphite Reactor
1/1/1951	1/1/1951	ORNL3002	Graphite Pile Air Filter Building
	12/1/1978	ORNL3002	Filter House
1/1/1951	1/1/1951	ORNL3003	Graphite Pile Fan House
	12/1/1978	ORNL3003	Solid State Accelerator Facility
1/1/1951	1/1/1951	ORNL3004	Water Demineralization Building
	12/1/1978	ORNL3004	Water Demineralizer
1/1/1951	1/1/1951	ORNL3005	Low Intensity Reactor
1/1/1952	8/23/1963	ORNL3005	LITR (including Reactor)
	12/1/1978	ORNL3005	Low-Intensity Testing Reactor
1/1/1951	1/1/1951	ORNL3006	AreaFldOff,ResShopsSpecialMaterialLab
1/1/1951	1/1/1951	ORNL3007	Research Offices
1/1/1951	1/1/1951	ORNL3008	Vault (Storage of Precious Metals)
1/1/1951	1/1/1951	ORNL3009	Pump House (for Bldg. 3010)
1/1/1951	1/1/1951	ORNL3010	Shielding Facilities Building
1/1/1960	8/23/1963	ORNL3010	BSF II (reactor)

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
1/1/1951	8/23/1963	ORNL3010	Bulk Shielding Building
	12/1/1978	ORNL3010	Bulk Shielding Reactor Facility
1/1/1951	1/1/1951	ORNL3011	Septic Tank (for Bldg. 3010)
1/1/1951	1/1/1951	ORNL3012	Rolling Mill (Metallurgy Division)
1/1/1947	8/23/1963	ORNL3012	Rolling Mill
	12/1/1978	ORNL3012	Rolling Mill
1/1/1951	1/1/1951	ORNL3013	Source Building
	12/1/1978	ORNL3013	Environmental Processing Laboratory
1/1/1951	1/1/1951	ORNL3014	Isolation Building
1/1/1951	1/1/1951	ORNL3015	Radio Transmitter Building
1/1/1951	1/1/1951	ORNL3016	Emergency Generator
1/1/1952	8/23/1963	ORNL3017	Reactor School Laboratory
	12/1/1978	ORNL3017	Environmental Sciences Laboratory
1/1/1951	1/1/1951	ORNL3018	Exhaust Stack (for Bldg. 3003)
1/1/1951	1/1/1951	ORNL3019	Pilot Plant
1/1/1951	8/23/1963	ORNL3019	Addition to Separations Building
1/1/1956	8/23/1963	ORNL3019	High Radiation Level Analytical Facility
1/1/1943	8/23/1963	ORNL3019	Separations Building
	12/1/1978	ORNL3019-A	Radiochemical Processing Pilot Plant
	12/1/1978	ORNL3019-B	High Level Radiation Analytical Lab. (A)
1/1/1951	1/1/1951	ORNL3020	Exhaust Stack (for Bldg. 3019)
1/1/1951	1/1/1951	ORNL3021	Fan House (N.E. Bldg. 3020)
1/1/1951	1/1/1951	ORNL3022	Training Building (TrainingSchoolOffices
1/1/1943	8/23/1963	ORNL3022	Training School (demolished by 1963)
1/1/1951	1/1/1951	ORNL3023	North Tank Farm
1/1/1951	1/1/1951	ORNL3024	Research Shop
1/1/1947	8/23/1963	ORNL3024	Research Shop
	12/1/1978	ORNL3024	Fabrication Dept. -Shop B
1/1/1951	1/1/1951	ORNL3025	Physics of Solid States Cell Building
1/1/1956	8/23/1963	ORNL3025	Addition to Solid States Lab
1/1/1951	8/23/1963	ORNL3025	Solid States Lab
	12/1/1978	ORNL3025-E	Physical Examination Hot Cells-A
	12/1/1978	ORNL3025-M	Solid State Division Laboratories
1/1/1951	1/1/1951	ORNL3026	ByProductProcessingChemicalSeparationLab
1/1/1943	8/23/1963	ORNL3026-C	By-ProductProcessBuilding&ChemistrySeparationsLab
	12/1/1978	ORNL3026-C	Radioisotope Development Laboratory-B
1/1/1945	8/23/1963	ORNL3026-D	DismantlingCellforPowerReactorDevelopmentExperimen
	12/1/1978	ORNL3026-D	Dismantling & Examination Hot Cells
1/1/1955	8/23/1963	ORNL3027	Source and Special Materials Vault
1/1/1951	1/1/1951	ORNL3028	Radioisotope Processing Building F
	12/1/1978	ORNL3028	Radioisotope Production Laboratory-A
1/1/1951	1/1/1951	ORNL3029	Radioisotope Processing Building E
1/1/1951	8/23/1963	ORNL3029	Radioisotope Area
	12/1/1978	ORNL3029	Radioisotope Production Laboratory-B
1/1/1951	1/1/1951	ORNL3030	Radioisotope Processing Building D
1/1/1951	8/23/1963	ORNL3030	Radioisotope Area
	12/1/1978	ORNL3030	Radioisotope Production Laboratory-C
1/1/1951	1/1/1951	ORNL3031	Radioisotope Processing Building C
1/1/1951	8/23/1963	ORNL3031	Radioisotope Area
	12/1/1978	ORNL3031	Radioisotope Production Laboratory-D
1/1/1951	1/1/1951	ORNL3032	Radioisotope Processing Building B

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
1/1/1951	8/23/1963	ORNL3032	Radioisotope Area
	12/1/1978	ORNL3032	Radioisotope Production Laboratory-E
1/1/1951	1/1/1951	ORNL3033	Radioisotope Processing Building A
1/1/1951	8/23/1963	ORNL3033	Radioisotope Area
	12/1/1978	ORNL3033	Radioisotope Production Laboratory-F
1/1/1951	1/1/1951	ORNL3034	Radioisotope Service Building
1/1/1951	8/23/1963	ORNL3034	Radioisotope Area
	12/1/1978	ORNL3034	Radioisotope Area Services
1/1/1951	8/23/1963	ORNL3035	Radioisotope Area
1/1/1951	1/1/1951	ORNL3036	Decontamination Building
1/1/1951	8/23/1963	ORNL3036	Radioisotope Area
	12/1/1978	ORNL3036	Isotope Area Storage&Service Bldg(Temp)
1/1/1951	1/1/1951	ORNL3037	Radioisotope Area Office Building
1/1/1951	8/23/1963	ORNL3037	Radioisotope Area
	12/1/1978	ORNL3037	Operations Division Offices
1/1/1951	1/1/1951	ORNL3038	Radioisotope Analytical & Packing Bldg.
1/1/1951	8/23/1963	ORNL3038	Radioisotope Area
	12/1/1978	ORNL3038	Radioisotope Laboratory
1/1/1951	1/1/1951	ORNL3039	Exhaust Stack (Radioisotope Area)
1/1/1951	1/1/1951	ORNL3040	Housing for Hot Waste Containers
1/1/1958	8/23/1963	ORNL3042	ORR (including Reactor)
	12/1/1978	ORNL3042	Oak Ridge Research Reactor
1/1/1955	8/23/1963	ORNL3044	Special Materials Machine Shop
	12/1/1978	ORNL3044	Special Material Machine Shop
1/1/1963	8/23/1963	ORNL3047	Radioisotope Development Lab
	12/1/1978	ORNL3047	Isotope Technology Building
1/1/1951	1/1/1951	ORNL3050	Laboratory Supplies Storage
1/1/1951	1/1/1951	ORNL3051	Emergency Generator
1/1/1951	1/1/1951	ORNL3052	Not In Use
1/1/1951	1/1/1951	ORNL3054	Sentry Post #16B
1/1/1951	1/1/1951	ORNL3058	Decontamination Hut (Tools&MachineShop)
1/1/1951	1/1/1951	ORNL3059	Storage (for Bldg. 3012)
1/1/1951	1/1/1951	ORNL3060	Sentry Post #16
1/1/1951	1/1/1951	ORNL3061	Sentry Post #13B
1/1/1951	1/1/1951	ORNL3063	Laboratory
1/1/1951	1/1/1951	ORNL3064	Laboratory
1/1/1951	1/1/1951	ORNL3065	Library Storage
1/1/1951	1/1/1951	ORNL3066	Emergency Generator
1/1/1951	1/1/1951	ORNL3067	Emergency Generator
1/1/1951	1/1/1951	ORNL3070	Chemical Separations Storage Gardens
1/1/1951	1/1/1951	ORNL3071	Machine Shop
1/1/1951	8/23/1963	ORNL3074	North Field Service Shop
	12/1/1978	ORNL3074	Interim Manipulator Repair Facility
	12/1/1978	ORNL3085	Pumphouse-ORR
	12/1/1978	ORNL3087	Heat Exchanger-ORR
	12/1/1978	ORNL3092	Off-Gas Facility-4000CFM
	12/1/1978	ORNL3095	Reactor Area Equipment Building
	12/1/1978	ORNL3102	Heat Exchanger No.2-ORR
1/1/1960	8/23/1963	ORNL3103	Cooling Tower (increase ORR power to 30MW)
	12/1/1978	ORNL3103	Cooling Tower No. 3-ORR
1/1/1961	8/23/1963	ORNL3104	Reactor Services Field Shop

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Begin Date	Ref Date	Building #	Building Name
	12/1/1978	ORNL3104	West Research Service Center
	12/1/1978	ORNL3106	Cell Ventilation Filters-4501,4505,4507
	12/1/1978	ORNL3110	Cell Ventilation Filters-Radioisotope Ar
	12/1/1978	ORNL3114	Shock Tube Laboratory
	12/1/1978	ORNL3115	Solid State Offices
1/1/1951	1/1/1951	ORNL3500	Instrument Laboratory
1/1/1960	8/23/1963	ORNL3500	Addition to Instrument Lab
1/1/1951	8/23/1963	ORNL3500	Instrument Lab
	12/1/1978	ORNL3500	Instrumentation and Controls
1/1/1951	1/1/1951	ORNL3501	Sewage Pumping Station
1/1/1951	1/1/1951	ORNL3502	Solvent Operations Office
	12/1/1978	ORNL3502	East Research Service Center
1/1/1951	1/1/1951	ORNL3503	Solvent Operations
1/1/1948	8/23/1963	ORNL3503	High Radiation Level Chemistry Lab
	12/1/1978	ORNL3503	High Rad. Level Chem. Eng. Lab.
1/1/1951	1/1/1951	ORNL3504	Waste Research Building (Proposed)
1/1/1951	8/23/1963	ORNL3504	Health Physics Waste Research Laboratory
	12/1/1978	ORNL3504	Environmental Sciences Div. Annex-B
1/1/1951	1/1/1951	ORNL3505	Metal Recovery Building
1/1/1951	8/23/1963	ORNL3505	Reactor Fuels Processing Plant
	12/1/1978	ORNL3505	Fission Product Development Lab. Annex
1/1/1951	1/1/1951	ORNL3506	Chemical Evaporator Building
	12/1/1978	ORNL3506	Radioisotope Production Laboratory-G
1/1/1951	1/1/1951	ORNL3507	South Tank Farm
1/1/1951	8/23/1963	ORNL3508	Chemical Technology Alpha Laboratory
	12/1/1978	ORNL3508	Chemical Technology Alpha Lab.
1/1/1951	1/1/1951	ORNL3509	Solvent Operations Waste Transfer
1/1/1951	1/1/1951	ORNL3510	East Pond
1/1/1951	1/1/1951	ORNL3511	West Pond
1/1/1951	1/1/1951	ORNL3512	Retention Pond
1/1/1951	1/1/1951	ORNL3513	Settling Basin
1/1/1951	1/1/1951	ORNL3514	Incinerator
1/1/1951	1/1/1951	ORNL3515	Waste Radioisotope Processing
	12/1/1978	ORNL3515	Fission Product Pilot Plant
1/1/1958	8/23/1963	ORNL3517	Fission Product Development Lab
	12/1/1978	ORNL3517	Fission Product Development Lab.
1/1/1957	8/23/1963	ORNL3518	Process Waste Treatment Plant
	12/1/1978	ORNL3518	Process Waste Water Treatment Plant
	12/1/1978	ORNL3523	Controls Research
1/1/1963	8/23/1963	ORNL3525	HighRadiationLevelExaminationLab
	12/1/1978	ORNL3525	High Rad. Level Examination Lab.
	12/1/1978	ORNL3534	Liquid Metal Cleaning Facility
	12/1/1978	ORNL3537	Hydrogen and Oxygen Distribution Station
	12/1/1978	ORNL3544	Process Waste Treatment Plant
	12/1/1978	ORNL3546	Modular Office Building for I&C
1/1/1951	1/1/1951	ORNL3550	Chemistry Laboratory
1/1/1943	8/23/1963	ORNL3550	Chemistry Laboratory
	12/1/1978	ORNL3550	Research Laboratory Annex
1/1/1951	1/1/1951	ORNL3551	Chemistry Division Machine Shop
1/1/1951	1/1/1951	ORNL3552	Emergency Generator
1/1/1951	1/1/1951	ORNL3553	Office

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Begin Date	Ref Date	Building #	Building Name
1/1/1951	1/1/1951	ORNL3554	Office
1/1/1951	1/1/1951	ORNL3555	Office
1/1/1951	1/1/1951	ORNL3556	OFFICE
1/1/1951	1/1/1951	ORNL3557	Equipment Storage
1/1/1951	1/1/1951	ORNL3558	Equipment Storage
1/1/1951	1/1/1951	ORNL3559	Chemistry Library Storage
1/1/1951	1/1/1951	ORNL3560	Equipment Storage
1/1/1951	1/1/1951	ORNL3561	Equipment Storage
1/1/1951	1/1/1951	ORNL3562	Equipment Storage
1/1/1951	1/1/1951	ORNL3563	Chemistry Library Storage
1/1/1951	1/1/1951	ORNL3564	Storage Garden
1/1/1951	1/1/1951	ORNL3567	Solvent Operations Spare Parts
1/1/1951	1/1/1951	ORNL3568	Analytical Laboratory Storage
1/1/1951	1/1/1951	ORNL3569	Chemicals Storage
1/1/1951	1/1/1951	ORNL3570	Sentry Post #13F
1/1/1951	1/1/1951	ORNL3571	Change House (Colored Men)
1/1/1951	1/1/1951	ORNL3572	Solvent Storage
1/1/1951	1/1/1951	ORNL3573	Maintenance Shop
1/1/1951	1/1/1951	ORNL3574	Maintenance Shop
1/1/1951	1/1/1951	ORNL3575	Oxygen and Acetylene Storage
1/1/1951	1/1/1951	ORNL3577	Storage (T.V.A.)
1/1/1951	1/1/1951	ORNL3578	Shelter for Incinerator Attendants
1/1/1951	1/1/1951	ORNL3579	Emergency Generator
1/1/1951	1/1/1951	ORNL3580	Septic Tank
1/1/1951	1/1/1951	ORNL3581	Solvent Operations Solvent Storage
	12/1/1978	ORNL3581	Solvent Storage
1/1/1951	1/1/1951	ORNL3582	Labor Department Office
1/1/1951	1/1/1951	ORNL3583	Temporary Office (for Bldg. 3505)
1/1/1951	1/1/1951	ORNL3584	Solvent Operations Contaminated Storage
	12/1/1978	ORNL3584	Contaminated Materials Storage
1/1/1951	1/1/1951	ORNL3585	Sentry Post #13
	12/1/1978	ORNL3587	Instrument Laboratory Annex
1/1/1952	8/23/1963	ORNL3592	Unit Operations Volatility Lab
	12/1/1978	ORNL3592	Unit Operations Volatility Laboratory
	12/1/1978	ORNL3603	Environmental Study Center
1/1/1951	1/1/1951	ORNL4000	13.8 kV Substation (Proposed)
	12/1/1978	ORNL4000	13.8 kV Substation
1/1/1951	1/1/1951	ORNL4050	Field Office
1/1/1951	1/1/1951	ORNL4500	Research Laboratory (Under Construction)
1/1/1960	8/23/1963	ORNL4500N	4500N-Wing 5 - Administration
1/1/1951	8/23/1963	ORNL4500N	Central Research Building
	12/1/1978	ORNL4500N	Central Research and Administration
1/1/1962	8/23/1963	ORNL4500S	CentralResBldgAddition(w/comp.house & cooling twr
	12/1/1978	ORNL4500S	Central Research and Administration
1/1/1951	1/1/1951	ORNL4501	IsotopeDevelopment&UnitOperations(UnderC
1/1/1951	8/23/1963	ORNL4501	High Level Radiochemical Lab
	12/1/1978	ORNL4501	High-Level Radiochemical Lab.
1/1/1951	1/1/1951	ORNL4502	Portal Building (Proposed)
1/1/1951	1/1/1951	ORNL4503	Van de Graaff Building (Proposed)
1/1/1951	1/1/1951	ORNL4504	Cooling Towers (Under Contract)
	12/1/1978	ORNL4505	Experimental Engineering

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Begin Date	Ref Date	Building #	Building Name
1/1/1958	8/23/1963	ORNL4507	HighRadiationLevelChemicalDevelopmentLab
	12/1/1978	ORNL4507	High-Radiation-Level Chem. Develop. Lab.
1/1/1962	8/23/1963	ORNL4508	Metals and Ceramics Building
	12/1/1978	ORNL4508	Metals and Ceramics Lab.
	12/1/1978	ORNL4509	Compressor House for 4500
	12/1/1978	ORNL4510	Cooling Tower for 4500
	12/1/1978	ORNL4511	Cooling Tower for 4508
	1/1/1951	ORNL500	Plant Wide Electrical Distribution
	12/1/1978	ORNL5000	Main Portal
	1/1/1951	ORNL501-H	154 kV Substation
	1/1/1951	ORNL502 #1	Emergency Generator
	1/1/1951	ORNL502 #2	Emergency Generator
	1/1/1951	ORNL502 #3	Emergency Generator
	1/1/1951	ORNL502 #3A	Emergency Generator
	1/1/1951	ORNL502 #4	Emergency Generator
	1/1/1951	ORNL502 #5	Emergency Generator
	1/1/1951	ORNL502 #6	Emergency Generator
	1/1/1951	ORNL502 #7	Emergency Generator
	1/1/1951	ORNL502 #8	Emergency Generator
	1/1/1951	ORNL502 #9	Emergency Generator
	1/1/1951	ORNL503	Gamewall Fire Alarm System
	1/1/1951	ORNL504	Auto-call System
1/1/1963	8/23/1963	ORNL5500	Addition(10MevTandemVandeGraaffAccelerator)
1/1/1952	8/23/1963	ORNL5500	High Voltage Lab
	12/1/1978	ORNL5500	High-Voltage Accelerator Laboratory
	12/1/1978	ORNL5505	Transuranium Research Laboratory
	12/1/1978	ORNL5507	Electron Spectrometer Facility
	12/1/1978	ORNL5554	Electrical Substation for Bldg 5505
1/1/1963	8/23/1963	ORNL6000	OakRidgeRelativisticIsochronousCyclotron
	12/1/1978	ORNL6000	OakRidgeIsochronousCyclotron(ORIC)&Holif
	12/1/1978	ORNL6001	Cooling Tower for Bldg. 6000
	12/1/1978	ORNL6002A	Oak Ridge Linear Accelerator OfficeAnnex
	12/1/1978	ORNL6002B	Oak Ridge Linear Accelerator OfficeAnnex
	12/1/1978	ORNL6003	Modular Building for Offices
	12/1/1978	ORNL6005	Gas Compressor House for Bldg 6000
	12/1/1978	ORNL6010	OakRidgeElectronLinearAccelerator(ORELA)
	12/1/1978	ORNL6025	Neutron Physics Office-Lab. Building
	1/1/1951	ORNL603	Roads and Walkways - Topography
	1/1/1951	ORNL604	Truck Scales
	1/1/1951	ORNL605	Fences
	1/1/1951	ORNL606-A	Burial Ground #1
	1/1/1951	ORNL606-B	Burial Ground #2
	1/1/1951	ORNL606-C	Burial Ground #3
	1/1/1951	ORNL614-6	Portal Building (Proposed)
	1/1/1951	ORNL614-7	Portal Building (Proposed)
	1/1/1951	ORNL625-C	Septic Tank
	1/1/1951	ORNL625-D	Septic Tank
	1/1/1951	ORNL625-E	Septic Tank
	1/1/1951	ORNL625-F	Septic Tank
	1/1/1951	ORNL626-B	Incinerator
	1/1/1951	ORNL634	U.S. Weather Bureau

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Begin Date	Ref Date	Building #	Building Name
	12/1/1978	ORNL7000	Septic Tank
1/1/1951	8/23/1963	ORNL7001	General Stores (former construction headquarters)
	12/1/1978	ORNL7001	General Stores
1/1/1951	8/23/1963	ORNL7002	Garage & Utility Shop (former construction facilit
	12/1/1978	ORNL7002	Garage and Utility Shop
	12/1/1978	ORNL7003	Welding and Brazing Shop
	12/1/1978	ORNL7005	Lead Shop
	12/1/1978	ORNL7006	Paint Stores
	12/1/1978	ORNL7007	Paint Shop
	12/1/1978	ORNL7009	Carpenter Shop
	1/1/1951	ORNL701-A	Clock Alley (Sentry Post #4)
	1/1/1951	ORNL701-B	Sentry Post #11
	1/1/1951	ORNL701-C	Clock Alley
	1/1/1951	ORNL701-D	Sentry Post #16B
	1/1/1951	ORNL701-E	Sentry Post #2
	1/1/1951	ORNL701-F	Sentry Post #12
	1/1/1951	ORNL701-G	Sentry Post #6
	1/1/1951	ORNL701-H	Sentry Post #2B
	1/1/1951	ORNL701-K	Sentry Post #16
	1/1/1951	ORNL701-L	Sentry Post #11C
	1/1/1951	ORNL701-M	Not in Use
	1/1/1951	ORNL701-P	Sentry Post #13F
	1/1/1951	ORNL701-Q	Sentry Post #13B
	12/1/1978	ORNL7010	Dry Lumber Storage
1/1/1953	8/23/1963	ORNL7012	Central Machine Shop
	12/1/1978	ORNL7012	Central Mechanical Shops
	12/1/1978	ORNL7013	Acid, Chemical, Flammable Liquid Storage
1/1/1959	8/23/1963	ORNL7018	Salvage Yard Facility
	12/1/1978	ORNL7018	Annex
	1/1/1951	ORNL703-A	Administration Building
	1/1/1951	ORNL703-A ANNE	Administration Building
	1/1/1951	ORNL703-B	SEE 2557, 2610, 2611
	1/1/1951	ORNL703-C	Administration and Engineering Bldg
	1/1/1951	ORNL704-A	Temporary Office (for Bldg. 3505)
	1/1/1951	ORNL705	Accelerator Building
	1/1/1951	ORNL706-A	Chemistry Laboratory
	1/1/1951	ORNL706-A1	Office
	1/1/1951	ORNL706-A2	Office
	1/1/1951	ORNL706-A3	Office
	1/1/1951	ORNL706-A4	OFFICE
	1/1/1951	ORNL706-AB	Oxygen and Acetylene Storage
	1/1/1951	ORNL706-AC1	Equipment Storage
	1/1/1951	ORNL706-AC2	Equipment Storage
	1/1/1951	ORNL706-AC3	Chemistry Library Storage
	1/1/1951	ORNL706-AC4	Equipment Storage
	1/1/1951	ORNL706-AC5	Equipment Storage
	1/1/1951	ORNL706-AC6	Equipment Storage
	1/1/1951	ORNL706-AD	Storage Garden
	1/1/1951	ORNL706-AE	Solvent Operations Spare Parts
	1/1/1951	ORNL706-AF	Chemistry Library Storage
	1/1/1951	ORNL706-B	Physics Laboratory

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Begin Date	Ref Date	Building #	Building Name
	1/1/1951	ORNL706-B4	Storage (Chemicals & Chemical Equipment)
	1/1/1951	ORNL706-BB	Storage (Chemicals & Chemical Equipment)
	1/1/1951	ORNL706-BC	Storage (Chemicals & Chemical Equipment)
	1/1/1951	ORNL706-C	ByProductProcessingChem.Sep.Lab
	1/1/1951	ORNL706-CA	Chemical Separations Storage Gardens
	1/1/1951	ORNL706-D	ByProductProcessingChem.Sep.Lab
	1/1/1951	ORNL706-F	Analytical Laboratory Storage
	1/1/1951	ORNL706-G	Source Building
	1/1/1951	ORNL706-HB	Solvent Operations
	1/1/1951	ORNL706-HC	Solvent Operations Waste Transfer
	1/1/1951	ORNL706-HD	Solvent Operations Office
	1/1/1951	ORNL706-J	Library Storage
	1/1/1951	ORNL707-A	Change House (Colored Men)
	1/1/1951	ORNL707-B	Change House (Colored Women)
	1/1/1951	ORNL707-D	Change House (White Men)
	1/1/1951	ORNL707-E	Change House (Colored Men)
	1/1/1951	ORNL707-F	Storage (Janitors Equipment)
	12/1/1978	ORNL7070	Storage Shed
	1/1/1951	ORNL708	Reactor School
	1/1/1951	ORNL708-D	Office (Salvage Yard & Burial Ground)
	1/1/1951	ORNL710-A	Shelter for Incinerator Attendants
	1/1/1951	ORNL710-B	Paymaster's Booth
	1/1/1951	ORNL713-A	General Stores
	1/1/1951	ORNL713-AE	Storage (Chemicals & Chemical Equipment)
	1/1/1951	ORNL713-AF	Pickling and Ladder Dipping Vats
	1/1/1951	ORNL713-AG	Pipe Cutting Shop
	1/1/1951	ORNL713-B	Warehouse
	1/1/1951	ORNL713-C	Electric Shop
	1/1/1951	ORNL713-DD	Lumber & Spare Parts, Cylinder Storage
	1/1/1951	ORNL713-E	Receiving and Shipping Warehouse
	1/1/1951	ORNL713-EE	Acid Storage
	1/1/1951	ORNL713-F	Pipe Stores
	1/1/1951	ORNL713-G	Automotive Storage
	1/1/1951	ORNL713-GA	Automotive Stores
	1/1/1951	ORNL713-H	Storage
	1/1/1951	ORNL713-J	Storage
	1/1/1951	ORNL713-L	Stationary Storage (Bethel Church)
	1/1/1951	ORNL713-M	Chemicals Storage
	1/1/1951	ORNL713-O	Aluminum Storage
	1/1/1951	ORNL713-P	Warehouse
	1/1/1951	ORNL713-Q	Solvent Storage
	1/1/1951	ORNL713-R	Spare Parts Storage
	1/1/1951	ORNL713-S	Oil Storage
	1/1/1951	ORNL713-T	Solvent Storage
	1/1/1951	ORNL713-UA	SEE 3581, 3584
	1/1/1951	ORNL713-V	Outside Oil Storage
	1/1/1951	ORNL713-W	Not In Use
	1/1/1951	ORNL713-X	Health Physics Storage
	1/1/1951	ORNL713-Y	Storage (for Bldg. 3012)
	1/1/1951	ORNL715	Flag Pole
	1/1/1951	ORNL717-A	Central Shops

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Begin Date	Ref Date	Building #	Building Name
	1/1/1951	ORNL717-B	Tool and Pipe Stores, Timekeepers
	1/1/1951	ORNL717-BA	Storage
	1/1/1951	ORNL717-BB	Research Shop
	1/1/1951	ORNL717-C	Carpenter Shop
	1/1/1951	ORNL717-D	Paint Shop
	1/1/1951	ORNL717-E	Tool Stores
	1/1/1951	ORNL717-EA	Storage
	1/1/1951	ORNL717-EB	Storage
	1/1/1951	ORNL717-EC	Tool Storage
	1/1/1951	ORNL717-ED	Storage
	1/1/1951	ORNL717-EE	Storage
	1/1/1951	ORNL717-EF	Paint Storage
	1/1/1951	ORNL717-EG	Storage
	1/1/1951	ORNL717-EH	Storage
	1/1/1951	ORNL717-EI	Storage
	1/1/1951	ORNL717-EJ	Storage
	1/1/1951	ORNL717-F	Receiving and Shipping Office
	1/1/1951	ORNL717-G	Transportation Office
	1/1/1951	ORNL717-H	Tool Storage
	1/1/1951	ORNL717-HA	Tool Storage
	1/1/1951	ORNL717-HB	Tool Storage
	1/1/1951	ORNL717-I	Lead Shop
	1/1/1951	ORNL717-J	Millwright Shop
	1/1/1951	ORNL717-K	Sheetmetal Storage
	1/1/1951	ORNL717-L	Rigger's Loft
	1/1/1951	ORNL717-N	Salvage Yard Office
	1/1/1951	ORNL717-P	Chemistry Division Machine Shop
	1/1/1951	ORNL717-Q	Maintenance Shop
	1/1/1951	ORNL717-QA	Maintenance Shop
	1/1/1951	ORNL717-R	Equipment Storage
	1/1/1951	ORNL717-T	Storage
	1/1/1951	ORNL717-U	Sterilization House(PotableWaterBottles)
	1/1/1951	ORNL719-A	SEE 2012, 2013
	1/1/1951	ORNL719-B	Urine Analysis Laboratory
	1/1/1951	ORNL720	Guard Headquarters and Fire Headquarters
	1/1/1951	ORNL720-A	Fire Equipment Storage
	1/1/1951	ORNL721	Radio Transmitter Building
	1/1/1951	ORNL723	Laundry
	1/1/1951	ORNL723-A	Checking Room (for Bldg. 2515)
	1/1/1951	ORNL723-B	Sewing Room (for Bldg. 2515)
	1/1/1951	ORNL724-B	Gasoline Station
	1/1/1951	ORNL725	Garage
	1/1/1951	ORNL725-A	Grease Rack
	1/1/1951	ORNL725-B	Storage (Automotive Parts)
	1/1/1951	ORNL725-C	Storage (Automotive Parts)
	1/1/1951	ORNL725-D	Storage (Automotive Parts)
	1/1/1951	ORNL725-E	Auto Parts Storage
	1/1/1951	ORNL735-A	Safety Department
	1/1/1951	ORNL735-B	Training Building (TrainingSchoolOffices
	1/1/1951	ORNL745-A	Pistol Range
	1/1/1951	ORNL745-B	Pistol Range

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
1/1/1951	1/1/1951	ORNL7500	Experimental Building (Under Constructio
1/1/1951	8/23/1963	ORNL7500	Homogeneous Reactor Experiment Building
	12/1/1978	ORNL7500	Nuclear Safety Pilot Plant
1/1/1951	1/1/1951	ORNL7501	Septic Tank
1/1/1951	1/1/1951	ORNL7502	Evaporator
1/1/1952	8/23/1963	ORNL7503	Reactor Experiments Building (ARE)
	12/1/1978	ORNL7503	Molten Salt Reactor Experiment Bldg
	12/1/1978	ORNL7505	NSPP Storage Facility (Temporary)
	12/1/1978	ORNL7506	CPFF Contractor Headquarters
	12/1/1978	ORNL7507	Sub Stores
	12/1/1978	ORNL7509	Molten Salt Reactor Office Bldg.
	12/1/1978	ORNL7516	Field Service Shop 7500 Area
	12/1/1978	ORNL7555	Diesel Generator House (for Bldg 7503)
	12/1/1978	ORNL7561	Valve Pit (for Bldg 7500)
	12/1/1978	ORNL7600	Consolidated Fuel Reprocessing Facility
	12/1/1978	ORNL7601	Office Building (for Bldg 7600)
	12/1/1978	ORNL7602	Reactor Service Building (for Bldg 7600)
	12/1/1978	ORNL7603	Turbine Building (for Bldg. 7600)
	12/1/1978	ORNL7605	Stores Building (for Bldg 7600)
	12/1/1978	ORNL7606	Maintenance Building (for Bldg 7600)
	12/1/1978	ORNL7607	River Pump Station (for Bldg 7600)
	12/1/1978	ORNL7608	Chlorination Building (for Bldg 7600)
	12/1/1978	ORNL7700	Tower Shielding Facility
1/1/1960	8/23/1963	ORNL7702	TSR II (reactor)
1/1/1954	8/23/1963	ORNL7702	Tower Shielding Facility (including TSR-1)
1/1/1963	8/23/1963	ORNL7709	Health Physics Research Reactor
	12/1/1978	ORNL7709	Health Physics Research Reactor
1/1/1963	8/23/1963	ORNL7710	Health Physics Research Reactor
	12/1/1978	ORNL7710	Dosar Facility-HPRR
	12/1/1978	ORNL7712	Dosar Low Energy Accelerator
	12/1/1978	ORNL7900	High Flux Isotope Reactor
	12/1/1978	ORNL7902	Cooling Tower (for Bldg 7900)
	12/1/1978	ORNL7910	Office Building (for Bldg 7900)
	12/1/1978	ORNL7914	Equipment and Parts Storage Building
	12/1/1978	ORNL7915	Operations Storage Building
	12/1/1978	ORNL7920	Transuranium Processing Plant
	12/1/1978	ORNL7930	Thorium-Uranium Recycle Facility
	1/1/1951	ORNL801-D	Steam Plant
	1/1/1951	ORNL802	Reservoir
	1/1/1951	ORNL803	Reservoir
	1/1/1951	ORNL807	Water Demineralization Building
	1/1/1951	ORNL811	Field Office
1/1/1951	1/1/1951	ORNL8111	Warehouse
	1/1/1951	ORNL812	Pump House
	1/1/1951	ORNL813	Accelerator Building Annex
1/1/1951	1/1/1951	ORNL8140	Warehouse
	1/1/1951	ORNL815	Water Tank
	1/1/1951	ORNL901	Radioisotope Area Office Building
	1/1/1951	ORNL902	Radioisotope Analytical & Packing Bldg.
	1/1/1951	ORNL903	Decontamination Building
	1/1/1951	ORNL904	Radioisotope Service Building

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
	1/1/1951	ORNL905	Radioisotope Processing Building A
	1/1/1951	ORNL906	Radioisotope Processing Building B
	1/1/1951	ORNL907	Radioisotope Processing Building C
	1/1/1951	ORNL908	Radioisotope Processing Building D
	1/1/1951	ORNL909	Radioisotope Processing Building E
	1/1/1951	ORNL910	Radioisotope Processing Building F
	12/1/1978	ORNL9102-1	Eng. Tech. Reports Office (at Y-12)
	12/1/1978	ORNL9102-2	Eng. Tech. Offices (at Y-12)
	12/1/1978	ORNL9104-1	Eng. Tech. Offices (at Y-12)
	12/1/1978	ORNL9104-2	ComputerSciences for FusionEnergy (Y-12)
	12/1/1978	ORNL9104-3	FusionEnergyCommunicationsCtr./Eng.(Y-12
	12/1/1978	ORNL9105	Engineering Offices (at Y-12)
	1/1/1951	ORNL911	Exhaust Stack (Radioisotope Area)
	1/1/1951	ORNL912	Housing for Hot Waste Containers
1/1/1962	8/23/1963	ORNL9201-2	Project Sherwood Relocation
1/1/1951	8/23/1963	ORNL9201-2	Thermonuclear (Y-12 transfer)
	12/1/1978	ORNL9201-2	FusionEnergyAdmin.&ResearchBldg. (Y-12)
1/1/1950	8/23/1963	ORNL9201-3	ReactorDesign&EngineerDevelopment (Y-12 transfer)
	12/1/1978	ORNL9201-3	Eng.Tech.Admin.&ResearchBldg. (at Y-12)
1/1/1950	8/23/1963	ORNL9204-1	Reactor Experimental Engineering (Y-12 transfer)
	12/1/1978	ORNL9204-1	Eng.Tech./FusionEnergyOffice&Lab. (Y-12)
1/1/1951	8/23/1963	ORNL9204-3	Electronuclear (Y-12 transfer)
1/1/1961	8/23/1963	ORNL9204-3	Expansion of Stable Isotope Production Facilities
	12/1/1978	ORNL9204-3	Isotope Separations (at Y-12)
1/1/1951	1/1/1951	ORNL9207	Biology Laboratory
1/1/1962	8/23/1963	ORNL9207	BiologyAdditions-Biochemistry Lab
1/1/1963	8/23/1963	ORNL9207	BiologyAdditions-Cell Physiology Lab
1/1/1961	8/23/1963	ORNL9207	BiologyAdditions-ChemicalProtection&Immunogenetic
1/1/1962	8/23/1963	ORNL9207	BiologyAdditions-LowLevelRadiationExperimental Fac
1/1/1960	8/23/1963	ORNL9207	BiologyAdditions-MammalianRadiationInjury&Protecti
1/1/1962	8/23/1963	ORNL9207	BiologyAdditions-Pathology&PhysiolgyLab
1/1/1947	8/23/1963	ORNL9207	BiologyResearchFacilities (taken from Y-12)
	12/1/1978	ORNL9207	Biology Admin. and Research Bldg.(Y-12)
1/1/1951	1/1/1951	ORNL9208	Shops (Not in Use)
	12/1/1978	ORNL9208	Biology Research Lab. (at Y-12)
1/1/1951	1/1/1951	ORNL9210	Animal Farm
1/1/1947	8/23/1963	ORNL9210	BiologyResearchFacilities (taken from Y-12)
1/1/1963	8/23/1963	ORNL9210	Mammalian Genetics Lab
	12/1/1978	ORNL9210	Biology Research Lab. (at Y-12)
	12/1/1978	ORNL9211	Biology Research Lab. (at Y-12)
1/1/1950	8/23/1963	ORNL9213	Criticality Lab (Y-12 transfer)
	12/1/1978	ORNL9220	Virus Control Lab. (at Y-12)
	12/1/1978	ORNL9224	Biology Research Lab. (at Y-12)
1/1/1951	1/1/1951	ORNL9409-19	Cooling Towers
1/1/1951	1/1/1951	ORNL9621	Acid Reclaiming
1/1/1950	8/23/1963	ORNL9704-1	Reactor Division Offices (Y-12 transfer)
	12/1/1978	ORNL9704-1	Computer Sciences for Biology (at Y-12)
	12/1/1978	ORNL9711-1	Y-12 Tech.LibraryNucl.SafetyInfo.Office
1/1/1951	8/23/1963	ORNL9711-4	Technical Library - Ecology Lab (Y-12 transfer)
1/1/1951	1/1/1951	ORNL9723-22	Biology Laboratory
1/1/1951	1/1/1951	ORNL9723-23	Present Shop

X-10 Building Number and Building Name Listing

Begin Date	Ref Date	Building #	Building Name
1/1/1951	8/23/1963	ORNL9731	Stable Isotope Separations (Y-12 transfer)
1/1/1951	8/23/1963	ORNL9734	Spectroscopy Research Lab (Y-12 transfer)
1/1/1951	8/23/1963	ORNL9735	Mass Spectrometer Lab (Y-12 transfer)
	12/1/1978	ORNL9735	Mass Spectrometry Lab. (at Y-12)
1/1/1951	1/1/1951	ORNL9743-2	Patrol Headquarters
	12/1/1978	ORNL9743-2	Animal Facility (at Y-12)
	12/1/1978	ORNL9764	Nuclear Safety Information Center (Y-12)
1/1/1951	8/23/1963	ORNL9766	Ceramic Lab - Photographic Lab (Y-12 transfer)
1/1/1951	1/1/1951	ORNL9768	Stack for Bldg. 9769
1/1/1951	1/1/1951	ORNL9769	Old Incinerator
	12/1/1978	ORNL9769	Biology Research Lab. (at Y-12)
1/1/1951	1/1/1951	ORNL9770-1	Pump House
1/1/1951	1/1/1951	ORNL9770-2	Pump House
1/1/1951	1/1/1951	ORNL9770-3	Pump House
1/1/1951	1/1/1951	ORNL9770-4	Pump House
1/1/1951	1/1/1951	ORNL9929-1	Warehouse
1/1/1951	1/1/1951	ORNL9929-2	Warehouse
1/1/1951	1/1/1951	ORNL9929-3	Warehouse
1/1/1951	1/1/1951	ORNL9966	Warehouse
1/1/1951	1/1/1951	ORNL9982	Head House (Includes Greenhouses)
	12/1/1978	ORNL9982	Greenhouse (at Y-12)
1/1/1951	1/1/1951	ORNL9986	Rabbit Hutch
	8/23/1963	ORNLCHEM	Chemistry Division
	8/23/1963	ORNLFUS	Fusion Research
	8/23/1963	ORNLMED	Medical Division
	8/23/1963	ORNLMETAL	Metallurgy
	8/23/1963	ORNLPHYS	Physics Research and Development
	8/23/1963	ORNLRADISO	Radioisotope Division
	8/23/1963	ORNLSEP	Separations Development Division
	8/23/1963	ORNLSSTATE	Solid State Physics
	1/1/1951	ORNLY-12	SEE8111,3140,9207,9208,9210,9621,9723-22

Appendix D

D-1

Y-12 H&S Report Air Sampling Summary

Y-12 IH/HP Report Summary Results
Trichloroethylene, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1954	1	200ppm	Operational	9212	3	33	
1954	2	200ppm	Operational	9212	2	50	
1954	2	200ppm	Operational	9204-4	4	0	
1954	4	200ppm	Operational	9212	20	0	
1955	1	200ppm	Operational	9212	75	0	
1955	1	200ppm	Operational	9204-4	24	0	
1955	2	200ppm	Operational	9204-4	0	0	
1956	1	200ppm			22	0	
1956	2	200ppm			194	40	
1956	3	200ppm			14	0	
1956	4	200ppm			52	17	
1957	1	200ppm			41	17	
1957	2	200ppm			343	18.4	
1957	3	200ppm			0	0	
1957	4	200ppm			0	0	
1959	3	200ppm			0	0	
1959	4	200ppm			10	0	
1960	1	200ppm			32	9.4	
1960	2	200ppm			11	0	
1960	3	200ppm			0	0	

Y-12 IH/HP Report Summary Results
Perchloroethylene, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1956	1	200ppm			31	0	
1956	2	200ppm			37	4	
1956	3	200ppm			28	3	
1956	4	200ppm			19	16	
1957	1	200ppm			27	26	
1957	2	200ppm			235	6.4	
1957	3	200ppm			422	19.9	
1957	4	200ppm			232	2.5	
1958	1	200ppm			189	14.8	
1958	2	200ppm			118	29.6	
1958	3	200ppm			73	8.2	
1958	4	200ppm			89	9	
1959	1	200ppm			47	14.9	
1959	2	200ppm			44	20.5	
1959	3	200ppm			18	22.2	
1959	4	200ppm			57	31.6	
1960	1	200ppm			85	16.5	
1960	2	200ppm			52	21.15	
1960	3	200ppm			167	14.37	
1960	4	200ppm			49	14.29	
1961	1	200ppm			41	7.3	
1961	2	200ppm			17	17.6	
1961	3	200ppm			82	5	no. above MAC
1961	4	100ppm			293	4	no. above MAC
1962	1	100ppm			233	25	no. above MAC
1962	2	100ppm			10	5	no. above MAC
1962	3	100ppm			42	3	no. above MAC
1962	4	100ppm			113	12	no. above MAC
1963	1	100ppm			261	53	no. above MAC

Y-12 IH/HP Report Summary Results

Lead, Air

Year	Quarter	Max Allowable Concentrations	Number of Samples	% > MPL	Comment
1956	3	.15mg/M3	6	0	
1956	4	.15mg/M3	0		
1957	1	.15mg/M3	8	0	
1957	2	.15mg/M3	20	0	
1957	3	.20mg/M3	33	24.2	
1957	4	.20mg/M3	86	2.3	
1958	1	200ug/M3	11	0	
1958	2	200ug/M3	100	12	
1958	3	200ug/M3	5	0	
1958	4	200ug/M3	12	41.7	
1959	1	200ug/M3	0	0	
1959	2	200ug/M3	32	0	
1959	3	200ug/M3	13	0	
1959	4	200ug/M3	0	0	

Y-12 IH/HP Report Summary Results
Cyanide, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1953	1	5.0mg/M3	Operational	Y-12	4	0	
1955	1	5.0mg/M3	Operational	9212	0		
1955	2	5.0mg/M3	Operational	9212	0	0	
1955	3	5.0mg/M3	Operational	9212	20	0	
1955	4	5.0mg/M3	General Air	9212	15	0	
1955	4	5.0mg/M3	Breathing Zone	9212	15	0	
1956	1	10 ppm			41	0	Hydrogen Cyanide
1956	2	10 ppm			51	0	Hydrogen Cyanide
1956	3	10 ppm			34	0	Hydrogen Cyanide
1956	4	10 ppm			61	0	Hydrogen Cyanide
1957	1	10 ppm			23	0	Hydrogen Cyanide
1957	2	10 ppm			13	0	Hydrogen Cyanide
1957	3	10 ppm			0	0	Hydrogen Cyanide
1957	4	10 ppm			36	0	Hydrogen Cyanide
1958	1	10 ppm			30	0	Hydrogen Cyanide
1958	2	10 ppm			32	0	Hydrogen Cyanide
1958	3	10 ppm			22	0	Hydrogen Cyanide
1958	4	10 ppm			29	0	Hydrogen Cyanide
1959	1	10 ppm			22	0	Hydrogen Cyanide
1959	2	10 ppm			12	0	Hydrogen Cyanide
1959	3	10 ppm			30	0	Hydrogen Cyanide
1959	4	10 ppm			56	0	Hydrogen Cyanide
1960	1	10 ppm			42	0	Hydrogen Cyanide
1960	2	10 ppm			48	0	Hydrogen Cyanide
1960	3	10 ppm			14	0	Hydrogen Cyanide
1960	4	10 ppm			0	0	Hydrogen Cyanide
1961	1	10 ppm			16	0	Hydrogen Cyanide
1961	2	10 ppm			16	0	Hydrogen Cyanide
1961	3	10 ppm			16	0	Hydrogen Cyanide
1961	4	10 ppm			93	0	Hydrogen Cyanide
1962	1	10 ppm			49	1	obtained during controlled exp.
1962	2	10 ppm			0	0	Hydrogen Cyanide
1962	3	10 ppm			11	0	Hydrogen Cyanide

Y-12 IH/HP Report Summary Results
Cyanide, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1962	4	10 ppm			43	0	Hydrogen Cyanide
1963	1	10 ppm			80	0	Hydrogen Cyanide

Y-12 IH/HP Report Summary Results
Fluoride, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1953	2	2.5mg/M3	Operational	Y-12	8	0	
1954	1	2.5mg/M3	Operational	9201-3	12	59	
1954	2	2.5mg/M3	Operational	9201-3			
1954	4	2.5mg/M3	Operational	9766	4	0	
1955	1		Operational	Stack	0		
1955	1	2.5mg/M3	Operational	Outside	11	0	
1955	2		Operational	Stack	0	0	
1955	2	2.5mg/M3	Operational	Outside	0	0	
1955	3	2.5mg/M3	Breathing Zone	9211	0		
1956	1	2.5mg/M3			9	0	dust
1956	2	2.5mg/M3			0		dust
1956	3	2.5mg/M3			0	0	dust
1956	4	2.5mg/M3			6	0	dust

Y-12 IH/HP Report Summary Results
Cadmium, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1954	4	.1mg/M3	Operational	9212	12	0	
1955	1	.1mg/M3	Operational	9212	12	0	
1955	2	.1mg/M3	Operational	9212	0	0	
1955	4	.1mg/M3	Breathing Zone	9212	15	4	
1956	1	100ug/M3			14	28	
1956	2	100ug/M3			0		
1956	3	100ug/M3			20	10	
1956	4	100ug/M3			26	0	
1957	1	100ug/M3			21	24	
1957	2	100ug/M3			6	0	
1957	3	100ug/M3			28	28.6	
1957	4	100ug/M3			0	0	

Y-12 IH/HP Report Summary Results
Silica, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1953	2	5mppci	Operational	Y-12	10	100	

Y-12 IH/HP Report Summary Results
Plutonium, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1954	4	9d/m/M3	General Air	9205	150	1	
1955	1	9d/m/M3	General Air	9205	165	0	
1955	2	9d/m/M3	General Air	9205	60	<1	
1955	3	9d/m/M3	Operational	9205	0		
1955	3	9d/m/M3	General Air	9995	100	1	
1955	3	9d/m/M3	Operational	9995	25	8	
1955	4	6.3x10-5ug/M3	General Air	9995	130	0	
1955	4	6.3x10-5ug/M3	Operational	9995	0		

Y-12 IH/HP Report Summary Results

Lithium, Air

Year	Quarter	Max Allowable Concentrations	Type of Sampl	Location	Number of Samples	% > MPL	Comment
1953	4		General Air	9204-4	10		
1954	1	35ug/M3	General Air	9204-4	7	14	MPL Based on Irritation Level
1954	2	35ug/M3	General Air	9704-4	101	70	MPL Based on Irritation Level
1954	4	35ug/M3	General Air	Y-12	5	0	MPL Based on Irritation Level
1955	1	35ug/M3	Operational	9204-2	5	0	MPL Based on Irritation Level
1955	2	35ug/M3	Operational	9204-2	135	29	MPL Based on Irritation Level
1955	3	35ug/M3	Operational	ADP Areas	50	0	MPL Based on Irritation Level
1955	4	35ug/M3	Stack	Alloy Areas	50	0	MPL Based on Irritation Level
1955	4	35ug/M3	Outdoors	Y-12	3	0	MPL Based on Irritation Level
1956	1	35ug/M3			7	28	MPL Based on Irritation Level
1956	2	35ug/M3			0		MPL Based on Irritation Level

Y-12 IH/HP Report Summary Results
Beryllium, Air

Year	Quarter	Max Allowable Concentrations	Type of Sampl	Location	Number of Samples	% > MPL	Comment
1952		2.0ug/M3			80	6	
1952		2.0ug/M3			87	1	
1952		2.0ug/M3			64	0	
1952		2.0ug/M3			71	4	
1953	1	2.0ug/M3	Operational	Y-12	27	7	
1953	1	2.0ug/M3	General Air	Y-12	458	0	
1953	2	2.0ug/M3	Operational	Y-12	16	0	
1953	3	2.0ug/M3	Operational	Y-12	35	<1	
1953	3	2.0ug/M3	General Air	Y-12	88	0	
1953	4	2.0ug/M3	General Air	9766	141	0	
1953	4	2.0ug/M3	Operational	9766	30	0	
1954	1	2.0ug/M3	General Air	9766	61	0	
1954	1	2.0ug/M3	Operational	9766	5	0	
1954	2	2.0ug/M3	General Air	9766	52	0	
1954	2	2.0ug/M3	Operational	9766	1	0	
1954	4	2.0ug/M3	General Air	9766	150	0	
1955	1	2.0ug/M3	General Air	9766	120	0	
1955	1	2.0ug/M3	Operational	9766	3	0	
1955	2	2.0ug/M3	General Air	9766	189	0	
1955	3	2.0ug/M3	General Air	9766	156	0	
1955	3	2.0ug/M3	Breathing Zone	9766	4	0	Operational BZ
1955	3	2.0ug/M3	Operational	9734-2	3	0	
1955	4	2.0ug/M3	General Air	9766	125	0	
1955	4	2.0ug/M3	Breathing Zone	9766	10	0	
1955	4	2.0ug/M3	Operational	9212	0		
1956	1	2.0ug/M3			423	0	
1956	2	2.0ug/M3			233	0	
1956	3	2.0ug/M3			182	2	
1956	4	2.0ug/M3			329	0	
1957	1	2.0ug/M3			423	0	
1957	2	2.0ug/M3			562	1.6	
1957	3	2.0ug/M3			543	0	
1957	4	2.0ug/M3			706	0	

Y-12 IH/HP Report Summary Results
Beryllium, Air

Year	Quarter	Max Allowable Concentrations	Type of Sampl	Location	Number of Samples	% > MPL	Comment
1958	1	2.0ug/M3			998	0	
1958	2	2.0ug/M3			1849	0	
1958	3	2.0ug/M3			3195	0	
1958	4	2.0ug/M3			3248	0.3	
1959	1	2.0ug/M3			4156	0.05	
1959	2	2.0ug/M3			8806	0.2	
1959	3	2.0ug/M3			9462	0.08	
1959	4	2.0ug/M3			8787	0.02	
1960	1	2.0ug/M3			8952	0.06	
1960	2	2.0ug/M3			9116	0.06	
1960	3	2.0ug/M3			9203	0.57	
1960	4	2.0ug/M3			8911	0.91	
1961	1	2.0ug/M3			8398	0.9	
1961	2	2.0ug/M3			12026	3.38	
1961	3	2.0ug/M3			14344	1476	No. above MAC
1961	4	2.0ug/M3			15609	1323	No. above MAC
1962	1	2.0ug/M3			12630	913	No. above MAC
1962	2	2.0ug/M3			9495	288	No. above MAC
1962	3	2.0ug/M3			9923	81	No. above MAC
1962	4	2.0ug/M3			9654	225	No. above MAC
1963	1	2.0ug/M3			6380	46	No. above MAC

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Y-12 IH/HP reports Summary Reports
Mercury, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1952		0.1mg/M3				19	
1952		0.1mg/M3				7	
1952		0.1mg/M3				14	
1952		0.1mg/M3				34	
1952		0.1mg/M3				48	
1953	1	0.1mg/M3	Operational	Y-12	79	15	
1953	1	0.1mg/M3	General Air	Y-12	3248	20	
1953	2	0.1mg/M3	Operational	Y-12	57	16	
1953	2	0.1mg/M3	General Air	Y-12	3266	31	
1953	3	0.1mg/M3	Spot General Air	9202	797	71	
1953	3	0.1mg/M3	Spot General Air	9201-2	1752	33	
1953	3	0.1mg/M3	Spot General Air	9204-4	1518	19	
1953	3	0.1mg/M3	ous Reading Gen	9204-4	100	0	
1953	4	0.1mg/M3	Spot General Air	9204-4	2832	11	
1953	4	0.1mg/M3	ous Reading Gen	9204-4	915	22	
1953	4	0.1mg/M3	Spot General Air	9201-2	1797	48	
1953	4	0.1mg/M3	ous Reading Gen	9201-2	9	30	
1953	4	0.1mg/M3	Spot General Air	9202	1216	87	
1953	4		Duct	9204-4	10		
1954	1	0.1mg/M3	Spot General Air	9204-4	648	4	
1954	1	0.1mg/M3	ous Reading Gen	9204-4	1044	12	
1954	1	0.1mg/M3	Spot General Air	9201-2	1196	57	
1954	1	0.1mg/M3	ous Reading Gen	9201-2			
1954	1	0.1mg/M3	Spot General Air	9202	1502	66	
1954	1		Duct	9204-4			
1954	2	0.1mg/M3	Spot General Air	9204-4	1851	30	
1954	2	0.1mg/M3	ous Reading Gen	9204-4	1136	21	
1954	2	0.1mg/M3	Spot General Air	9201-2	1750	18	
1954	2	0.1mg/M3	ous Reading Gen	9201-2			
1954	2	0.1mg/M3	Spot General Air	9202	227	24	
1954	2	0.1mg/M3	Spot General Air	Y-12	60	2	
1954	4	0.1mg/M3	Spot General Air	9204-4	2890	6	
1954	4	0.1mg/M3	ous Reading Gen	9204-4	1307	17	

Y-12 IH/HP reports Summary Reports
Mercury, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1954	4	0.1mg/M3	Spot General Air	9201-2	2149	52	
1954	4	0.1mg/M3	ous Reading Gen	9201-2	22	73	
1954	4	0.1mg/M3	Spot General Air	Y-12	25	10	
1954	4	0.1mg/M3	Duct	9204-4	16		
1955	1	0.1mg/M3	Spot General Air	9204-4	2680	6	
1955	1	0.1mg/M3	ous Reading Gen	9204-4	1204	18	
1955	1	0.1mg/M3	Spot General Air	9201-2	2028	54	
1955	1	0.1mg/M3	ous Reading Gen	9201-2	9	78	
1955	1	0.1mg/M3	Spot General Air	9202	0		
1955	1	0.1mg/M3	Spot General Air	9201-5	0		
1955	1	0.1mg/M3	ous Reading Gen	9201-5	0		
1955	1	0.1mg/M3	Spot General Air	-12,Other Area	0		
1955	1	0.1mg/M3	Operational Duct	9204-4	16	0	
1955	2	0.1mg/M3	Spot General Air	9201-2	2775	40	
1955	2	0.1mg/M3	ous Reading Gen	9201-2	0	0	
1955	2	0.1mg/M3	Spot General Air	9201-5	14985	45	
1955	2	0.1mg/M3	ous Reading Gen	9201-5	785	50	
1955	2	0.1mg/M3	Spot General Air	9202	0	0	
1955	2	0.1mg/M3	Spot General Air	9204-4	2200	8	
1955	2	0.1mg/M3	ous Reading Gen	9204-4	700	37	
1955	2	0.1mg/M3	Spot General Air	-12, Other Area	0	0	
1955	3	0.1mg/M3	Spot General Air	9201-2	2225	19	
1955	3	0.1mg/M3	Spot General Air	9201-4	12250	83	
1955	3	0.1mg/M3	Spot General Air	9201-5	1170	84	
1955	3	0.1mg/M3	ous Reading Gen	9201-5	575	68	
1955	3	0.1mg/M3	Spot General Air	9204-4	4600	13	
1955	3	0.1mg/M3	ous Reading Gen	9204-4	825	33	
1955	3	0.1mg/M3	Spot General Air	-12, Other Area	3100	25	
1955	4	0.1mg/M3	Spot General Air	9201-2	2930	44	
1955	4	0.1mg/M3	Spot General Air	9201-4	17950	74	
1955	4	0.1mg/M3	Spot General Air	9201-5	25900	74	
1955	4	0.1mg/M3	ous Reading Gen	9201-5	175	48	
1955	4	0.1mg/M3	Spot General Air	9204-4	3200	11	

Y-12 IH/HP reports Summary Reports
Mercury, Air

Year	Quarter	Max Allowable Concentrations	Type of Sample	Location	Number of Samples	% > MPL	Comment
1955	4	0.1mg/M3	ous Reading Gen	9204-4	735	18	
1955	4	0.1mg/M3	Spot General Air	-12, Other Area	1000	26	
1956	1	0.1mg/M3			73488	38	
1956	2	0.1mg/M3			87942	19	
1956	3	0.1mg/M3			86126	18	
1956	4	0.1mg/M3			73185	9	
1957	1	0.1mg/M3			77078	4.1	
1957	2	0.1mg/M3			73856	2.1	
1957	3	0.1mg/M3			58483	1.9	
1957	4	0.1mg/M3			40507	2.2	
1958	1	100ug/M3			42742	2.05	
1958	2	100ug/M3			26468	3.25	
1958	3	100ug/M3			25557	6.6	
1958	4	100ug/M3			24064	3.8	
1959	1	100ug/M3			22289	7.6	
1959	2	100ug/M3			17750	10.5	
1959	3	100ug/M3			12878	6.6	
1959	4	100ug/M3			11444	4.8	
1960	1	100ug/M3			12345	3.5	
1960	2	100ug/M3			11746	6.01	
1960	3	100ug/M3			11334	6.1	
1960	4	100ug/M3			11529	3.45	
1961	1	100ug/M3			11217	3.08	
1961	2	100ug/M3			9813	0.94	
1961	3	100ug/M3			5029	42	No. above MAC
1961	3	100ug/M3			4591	80	No. above MAC
1962	1	100ug/M3			5342	87	No. above MAC
1962	2	.10mg/M3			4261	94	No. above MAC
1962	3	.10mg/M3			4120	125	No. above MAC
1962	4	.10mg/M3			3616	176	No. above MAC
1963	1	.10mg/M3			4962	223	No. above MAC

Y-12 Report Summary Results
Mercury Monthly, Air

Year	Month	Location	Number of Samples	% > MPL	Air Concentration mg/M3	Comments	
1955	7	9201-4	2791	93	0.32		
1955	7	9201-5	3233	88	0.33	Hand Written # Taken	
1955	8	9201-4	4156	85	0.22	Hand Written # Taken	
1955	8	9201-5	4098	87	0.33	Hand Written # Taken	
1955	9	9201-4	7534	88	0.24	Hand Written # Taken	
1955	9	9201-5	6064	87	0.2	Hand Written # Taken	
1955	10	9201-4	5686	83	0.24	Hand Written # Taken	
1955	10	9201-5	9052	85	0.23	Hand Written # Taken	
1955	11	9201-4	5734	77	0.21	Hand Written # Taken	
1955	11	9201-5	7429	77	0.21	Hand Written # Taken	
1955	12	9201-4	7073	81	0.28	Hand Written # Taken	
1955	12	9201-5	8379	77	0.2	Hand Written # Taken	
1956	1	9201-4	7224	72.5	0.2	Hand Written # Taken	
1956	1	9201-5	9556	69	0.15		
1956	2	9201-4	8492	41	0.11	Hand Written # Taken	
1956	2	9201-5	13605	49.7	0.11	Hand Written # Taken	
1956	3	9201-4	10373	9.7	0.06		
1956	3	9201-5	15026	22.5	0.09	Hand Written # Taken	
1956	4	9201-4	10116	4	0.05	Hand Written # Taken	
1956	4	9201-5	17027	28	0.1	Hand Written # Taken	
1956	5	9201-5	11199	5	0.05	Hand Written # Taken	
1956	5	9201-5	15219	26	0.1	Hand Written # Taken	
1956	6	9201-4	10943	4.6	0.05	Hand Written # Taken	
1956	6	9201-5	14182	27	0.1	Hand Written # Taken	
1956	7	9201-4	10676	6	0.06	Hand Written # Taken	
1956	7	9201-5	10838	30	0.1	Hand Written # Taken	
1956	8	9201-4	11416	3	0.05	Hand Written # Taken	
1956	8	9201-5	12843	30	0.1	Hand Written # Taken	
1956	9	9201-4	7417	1.6	0.04	Hand Written # Taken	
1956	9	9201-5	15299	21	0.07	Hand Written # Taken	
1956	10	9201-4	7569	5.2	0.04		
1956	10	9201-5	15868	16.7	0.07		
1956	11	9201-4	8962	3.2	0.04		
1956	11	9201-5	15017	10.2	0.05		

Y-12 Report Summary Results
Mercury Monthly, Air

Year	Month	Location	Number of Samples	% > MPL	Air Concentration mg/M3	Comments	
1956	12	9201-4	8132	3.8	0.04		
1956	12	9201-5	13131	8.3	0.05		
1957	1	9201-4	11104	7.9	0.04		
1957	1	9201-5	15726	3.7	0.04		
1957	2	9201-4	9450	4.6	0.04		
1957	2	9201-5	13601	3.4	0.04		
1957	3	9201-4	9619	2	0.03		
1957	3	9201-5	14103	2.8	0.04		
1957	4	9201-4	9690	2.1	0.03		
1957	4	9201-5	13973	1.3	0.04		
1957	5	9201-4	10132	0.9	0.03		
1957	5	9201-5	14237	1.6	0.04		
1957	6	9201-4	9278	2.7	0.04		
1957	6	9201-5	12582	1.1	0.03		
1957	7	9201-4	9457	1.31	0.03		
1957	7	9201-5	13277	0.2	0.04		
1957	7	8110	515	23.1			
1957	8	9201-4	7470	1.05	0.02		
1957	8	9201-5	11017	0.31	0.03		
1957	8	8110	801	23.6			
1957	9	9201-4	5509	2.08	0.03		
1957	9	9201-5	7938	0.53	0.03		
1957	9	8110	610	31.2			
1957	10	9201-4	5782	1.17	0.02		
1957	10	9201-5	8616	0.56	0.02		
1957	10	8110	524	16.6			
1957	11	9201-4	4679	2.33	0.02		
1957	11	9201-5	7331	1.47	0.03		
1957	11	8110	680	9.4			
1957	12	9201-4	4416	0.88	0.02		
1957	12	9201-5	6430	1.56	0.02		
1957	12	8110	610	9.83			
1958	1	9201-4	5544	2.13	0.02		
1958	1	9201-5	7899	1.88	0.02		

Y-12 Report Summary Results
Mercury Monthly, Air

Year	Month	Location	Number of Samples	% > MPL	Air Concentration mg/M3	Comments	
1958	1	8110	634	8.05			
1958	1	9808	264	2.65	0.02		
1958	2	9201-4	5416	1.03	0.02		
1958	2	9201-5	7271	1.18	0.02		
1958	2	8110	584	7.29			
1958	2	9808	240	3.75	0.03		
1958	3	9201-4	5581	1.22	0.02		
1958	3	9201-5	7823	0.97	0.02		
1958	3	8110	551	19.2			
1958	3	9808	252	7.1	0.04		
1958	4	9201-4	3877	0.95	0.02		
1958	4	9201-5	5371	0.95	0.03		
1958	4	8110	619	11.47			
1958	4	9808	216	6.48	0.04		
1958	5	9201-4	2828	3.5	0.03		
1958	5	9201-5	3861	0.6	0.02		
1958	5	8110	589	28.52			
1958	5	9808	252	9.13	0.05		
1958	6	9201-4	2893	4.77	0.04		
1958	6	9201-5	3872	1.4	0.02		
1958	6	8110	589	28.52			
1958	6	9808	259	10.81	0.04		
1958	7	9201-4	4135	11.78	0.05		
1958	7	9201-5	4008	1.17	0.02		
1958	7	8110	785	50.45			
1958	7	9808	164	3.66	0.03		
1958	8	9201-4	2916	0.99	0.03		
1958	8	9201-5	4002	1.2	0.02		
1958	8	8110	681	45.38			
1958	8	9808	161	0	0.02		
1958	9	9201-4	3028	1.02	0.03		
1958	9	9201-5	3842	1.07	0.02		
1958	9	8110	651	23.81			
1958	9	9808	204	0.98	0.04		

Y-12 Report Summary Results
Mercury Monthly, Air

Year	Month	Location	Number of Samples	% > MPL	Air Concentration mg/M3	Comments	
1958	10	9201-4	3189	0.17	0.02		
1958	10	9201-5	4236	1.77	0.02		
1958	10	8110	713	20.61			
1958	10	9808	253	4.35	0.04		
1958	11	9201-4	2659	1.2	0.03		
1958	11	9201-5	3473	2.33	0.03		
1958	11	8110	572	34.44			
1958	11	9808	228	3.95	0.04		
1958	12	9201-4	3012	0.76	0.02		
1958	12	9201-5	4014	4.16	0.03		
1958	12	8110	681	12.63			
1958	12	9808	263	7.74	0.04		
1959	1	9201-4	2989	2.37	0.03		
1959	1	9201-5	3853	11.14	0.04		
1959	1	8110	341	4.69			
1959	1	9808	252	8.73	0.04		
1959	2	9201-4	2717	2.76	0.03		
1959	2	9201.5	3490	7.13	0.03		
1959	2	8110				no samples	
1959	2	9808	228	6.58	0.03		
1959	3	9201-4	2730	3.44	0.02		
1959	3	9201-5	3827	16.54	0.04	ading involing shut down 3/13/59	
1959	3	8110	310	12.26			
1959	3	9808	252	1.98	0.03		
1959	4	9201-4	2958	3.45	0.03		
1959	4	9201-5	2208	24.28	0.05		
1959	4	8110	682	20.97			
1959	4	9808	204	2.94	0.03		
1959	5	9201-4	2539	5.04	0.03		
1959	5	9201-5	1653	20.2	0.07		
1959	5	8110	620	25.97			
1959	5	9808	240	5.42	0.03		
1959	6	9201-4	2512	3.58	0.03		
1959	6	9201-5	745	14.02	0.04		

Y-12 Report Summary Results
Mercury Monthly, Air

Year	Month	Location	Number of Samples	% > MPL	Air Concentration mg/M3	Comments	
1959	6	8110	669	22.42			
1959	6	9808	120	0.83	0.03		
1959	7	9201-4	2504	3.72	0.03		
1959	7	9201-5	695	3.47	0.04		
1959	7	8110	682	19.35			
1959	7	9808	108	1.84	0.02		
1959	8	9201-4	2320	5.43	0.04		
1959	8	9201-5	691	7.67	0.05		
1959	8	8110	651	21.65			
1959	8	9808	108	11.11	0.04		
1959	9	9201-4	2278	2.72	0.03		
1959	9	9201-5	770	4.16	0.04		
1959	9	8110	641	19.82			
1959	9	9808	120	0.83	0.02		
1959	10	9201-4	2258	1.33	0.02		
1959	10	9201-5	639	3.81	0.03		
1959	10	8110	609	16.42			
1959	10	9808	180	3.91	0.03		
1959	11	9201-4	2173	2.35	0.02		
1959	11	9201-5	644	4.19	0.04		
1959	11	8110	551	9.08			
1959	11	9808	180	1.11	0.03		
1959	12	9201-4	2537	3.78	0.02		
1959	12	9201-5	693	23.09	0.03		
1959	12	8110	578	9.34			
1959	12	9808	180	1.11	0.03		
1960	1	9201-4	1955	1.69	0.02		
1960	1	9201-5	797	7.4	0.04		
1960	1	8110	580	7.76			
1960	1	9808	192	0.52	0.02		
1960	2	9201-4	2122	2.88	0.02		
1960	2	9201-5	681	0.29	0.02		
1960	2	8110	585	6.33			
1960	2	9808	207	1.93	0.02		

Y-12 Report Summary Results
Mercury Monthly, Air

Year	Month	Location	Number of Samples	% > MPL	Air Concentration mg/M3	Comments	
1960	3	9201-4	2695	2.67	0.02		
1960	3	9201-5	748	0	0.02		
1960	3	8110	638	15.36			
1960	3	9808	273	1.83	0.02		
1960	4	9201-4	2305	3.9	0.02		
1960	4	9201-5	620	3.22	0.04		
1960	4	8110	568	14.79			
1960	4	9808	247	0.81	0.03		
1960	5	9201-4	2434	4.27	0.03		
1960	5	9201-5	748	3.07	0.03		
1960	5	8110	357	13.72			
1960	5	9808	278	0.72	0.03		
1960	6	9201-4	2604	6.45	0.03		
1960	6	9201-5	683	11.42	0.05		
1960	6	8110	418	18.66			
1960	6	9808	308	2.6	0.03		
1960	7	9201-4	2126	6.96	0.04		
1960	7	9201-5	641	11.54	0.05		
1960	7	8110	322	9.01			
1960	7	9808	252	5.16	0.04		
1960	8	9201-4	2766	4.27	0.03		
1960	8	9201-5	741	13.22	0.05		
1960	8	8110	390	12.56			
1960	8	9808	289	2.08	0.03		
1960	9	9201-4	2279	2.98	0.03		
1960	9	9201-5	729	7.96	0.04		
1960	9	8110	354	6.78			
1960	9	9808	294	1.7	0.03		
1960	10	9201-4	2432	2.59	0.02		
1960	10	9201-5	782	4.73	0.03		
1960	10	8110	339	6.19			
1960	10	9808	266	3.38	0.03		
1960	11	9201-4	2455	2.73	0.02		
1960	11	9201-5	830	5.78	0.03		

Y-12 Report Summary Results
Mercury Monthly, Air

Year	Month	Location	Number of Samples	% > MPL	Air Concentration mg/M3	Comments
1960	11	8110	357	6.16		
1960	11	9808	266	2.26	0.03	
1960	12	9201-4	2379	3.95	0.03	
1960	12	9201-5	733	3.41	0.03	
1960	12	8110	346	1.16		
1960	12	9808	182	1.1	0.02	
1961	1	9201-4	2415	3.77	0.03	
1961	1	8110	349	0.86		
1961	1	9808	238	1.68	0.02	
1961	2	9201-4	1880	2.02	0.02	
1961	2	8110	249	5.22		
1961	2	9808	205	0.9	0.02	
1961	3	9201-4	2557	0.86	0.02	
1961	3	8110	334	9.58		
1961	3	9808	315	1.27	0.02	
1961	4	9201-4	2286	0.33	0.02	
1961	4	8110	340	8.24		
1961	4	9808	300	0.67	0.01	
1961	5	9201-4	2453	0.08	0.01	
1961	5	8110	85	3.53		
1961	5	9808	180	0	0.01	
1961	6	9201-4	2321	0.99	0.02	
1961	6	8110	68	0		
1961	6	9808	120	0	0.01	
1961	7	9201-4	955	4	0.02	
1961	7	8110	17	0		
1961	7	9808	15	0	0.01	
1961	8	9201-4	1910	20	0.02	
1961	8	8110	34	1		
1961	8	9808	45	0	0.01	
1961	9	9201-4	1554	16	0.02	
1961	9	8110	17	0		
1961	9	9808	30	0	0.01	
1961	10	9201-4				

Y-12 Report Summary Results
Mercury Monthly, Air

Year	Month	Location	Number of Samples	% > MPL	Air Concentration mg/M3	Comments	
1961	10	8110					
1961	10	9808					
1961	11	9201-4					
1961	11	8110					
1961	11	9808					
1961	12	9201-4					
1961	12	8110					
1961	12	9808					

Y-12 IH/HP Report Summary Results

All Alpha, Air

Year	Quarter	Max Allowable Concentrations	Type of Sampl	Location	Number of Samples	% > MPL	Comment
1953	3	7d/m/M3	Outdoor	Y-12	171	0	
1953	4	7d/m/M3	Outdoor	Y-12	171	0	
1954	1		Outdoor	Y-12	129	0	
1954	2	7d/m/M3	Outdoor	Y-12	270	0	
1954	4	7d/m/M3	Outdoor	Y-12	84	0	
1955	1	7d/m/M3	Outdoor	Y-12	80	0	
1955	2	7d/m/M3	Outdoor	Y-12	80	0	
1955	3	7d/m/M3	Outdoor	Y-12	65	0	
1955	4	7d/m/M3	Outdoor	Y-12	215	11	

Y-12IH/HP Report Summary Results
Enriched Uranium, Air

Year	Quarter	Max Allowable Concentrations	Type of Sampl	Location	Number of Samples	% > MPL	Comment
1952	1					60	
1952	2					42	
1952	3						
1952	4						
1953	1	70d/m/M3	Operational	9212	253	55	
1953	1	70d/m/M3	General Air	9212	1800	3	
1953	2	70d/m/M3	Operational	9212	377	40	
1953	2	70d/m/M3	General Air	9999212	3476	2	
1953	3	70d/m/M3	General Air	9212	3520	30	
1953	3	70d/m/M3	Operational	9212	264	37	
1953	4	70d/m/M3	General Air	9212	4117	13	
1953	4	70d/m/M3	Operational	9212	223	52	
1954	1		General Air	9212	2250	12	
1954	1		Operational	9212	276	35	
1954	2	.5ug/M3	General Air	9212	2652	20	
1954	2	.5ug/M3	Operational	9212	245	38	
1954	4	.5ug/M3	General Air	9212	3270	5	
1954	4	.5ug/M3	Operational	9212	302	34	
1954	4	.5ug/M3	Operational	9206	69	50	
1954	4	.5ug/M3	General Air	9206	348	34	
1955	1	.5ug/M3	General Air	9212	3572	5	
1955	1	.5ug/M3	Operational	9212	266	291	
1955	1	.5ug/M3	General Air	9206	388	26	
1955	1	.5ug/M3	Operational	9206	58	43	
1955	1	.5ug/M3	General Air	995	151	0	
1955	2	.5ug/M3	General Air	9212	3300	2	
1955	2	.5ug/M3	Operational	9212	285	35	
1955	2	.5ug/M3	General Air	9206	1675	18	
1955	2	.5ug/M3	Operational	9206	75	30	
1955	2	.5ug/M3	General Air	9995	0	0	
1955	3	.5ug/M3	General Air	9212	7300	5	
1955	3	.5ug/M3	Operational	9212	75	60	
1955	3	.5ug/M3	General Air	9206	2800	4	

Y-12IH/HP Report Summary Results
Enriched Uranium, Air

Year	Quarter	Max Allowable Concentrations	Type of Sampl	Location	Number of Samples	% > MPL	Comment
1955	3	.5ug/M3	Operational	9206	150	30	
1955	3	.5ug/M3	General Air	9995	75	0	
1955	4	.5ug/M3	General Air	9212	4300	6	
1955	4	.5ug/M3	Operational	9212	255	47	
1955	4	.5ug/M3	General Air	9206	1450	7	
1955	4	.5ug/M3	Operational	9206	220	34	
1955	4	.5ug/M3	General Air	9995	130	0	
1955	4	.5ug/M3	Operational	9995	15	0	

Y-12 IH/HP Report Summary Results
Uranium, Air

Year	Quarter	Max Allowable Concentrations	Type of Sampl	Location	Number of Samples	% > MPL	Comment
1952	1		Operational			46	
1952	2		Operational			30	
1952	3		Operational			31	
1952	4		Operational			41	
1953	1	50ug/M3	Operational	9206	136	21	
1953	1	50ug/M3	Operational	9212	251	19	
1953	1	50ug/M3	General Air	9212	1956	2	
1953	2	50ug/M3	Operational	9212	164	33	
1953	2	50ug/M3	General Air	9212	2438	1	
1953	2	50ug/M3	Operational	9206	100	38	
1953	2	50ug/M3	Operational	Rest of Y-12	52	23	
1953	3	50ug/M3	General Air	9212	2470	1	
1953	3	50ug/M3	Operational	9212	89	37	
1953	3	50ug/M3	Operational	9206	5	33	
1953	4	50ug/M3	General Air	9212	2916	3	
1953	4	50ug/M3	Operational	9212	85	56	
1953	4	50ug/M3	Operational	9206	18	33	
1953	4		Duct	9211	10	0	
1954	1	50ug/M3	General Air	9212	2238	7	
1954	1	50ug/M3	Operational	9212	204	15	
1954	1	50ug/M3	General Air	9206	75	7	
1954	1	50ug/M3	Operational	9206	40	50	
1954	1		Duct	9211			
1954	2	50ug/M3	General Air	9212	1398	3	
1954	2	50ug/M3	Operational	9212	75	25	
1954	2	50ug/M3	General Air	9206	366	0	
1954	2	50ug/M3	Operational	9206	134	11	
1954	2		Duct	9212	50		
1954	3						No Data
1954	4	50ug/M3	General Air	9212	1930	10	
1954	4	50ug/M3	Operational	9212	139	50	
1954	4	50ug/M3	General Air	9206	6	10	
1954	4	50ug/M3	Operational	9206	69	50	

Y-12 IH/HP Report Summary Results
Uranium, Air

Year	Quarter	Max Allowable Concentrations	Type of Sampl	Location	Number of Samples	% > MPL	Comment
1954	4		Duct	9212	3		
1954	4	50ug/M3	General Air	9995	176	0	
1954	4	50ug/M3	Operational	9201-2	15	75	
1955	1	50ug/M3	General Air	9212	1808	16	
1955	1	50ug/M3	Operational	9212	159	20	
1955	1	50ug/M3	Operational	9206	127	48	
1955	1		Duct	9206	0		
1955	1		Duct	9212	2		
1955	2	50ug/M3	General Air	9212	2160	7	
1955	2	50ug/M3	Operational	9212	370	90	
1955	2	50ug/M3	Operational	9206	40	40	
1955	3	50ug/M3	General Air	9212	1900	17	
1955	3	50ug/M3	Operational	9212	160	86	
1955	3	50ug/M3	Operational	9206	0		
1955	3	50ug/M3	Operational	9211	30	90	
1955	4	50ug/M3	General Air	9212	1940	5	
1955	4	50ug/M3	Operational	9212	175	82	
1955	4	50ug/M3	Operational	9206	55	35	
1955	4	50ug/M3	Operational	9211	30	80	
1956	1	.15mg/M3			3	0	Based on Chemical Toxicity (dust)
1956	2	.15mg/M3			0		
1957	1	.15mg/M3			3	0	Fume
1957	2	.15mg/M3			26	19.2	Fume
1957	3	.15mg/M3			2	0	Based on Chemical Toxicity
1957	4	.15mg/M3			0	0	Based on Chemical Toxicity

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Y-12 H&S Report Urine Data Summary

Y-12 IH/HP Report Summary Results
Cadmium, Urine

Year	Quarter	Total Number of Analyses	% > MPL	MAC
1958	4	54	0	.15ug/ml
1960	4	0	0	.10mg/L
1962	1	0	0	.10mg/L
1962	2	2	0	.10mg/L
1962	3	0	0	.10mg/L

Y-12 IH/HP Report Summary Results
Fluorides, Urine

Year	Quarter	Total Number of Analyses	% > MPL	Max. Allowable Concentrations
1958	2	17	5.9	4 ppm
1958	3	33	0	.15mg/L
1958	4	46	0	4 ppm
1959	1	80	0	4 ppm
1959	2	97	0	4 ppm
1959	2	97	8.6	2 ppm
1959	3	84	8.3	4 ppm
1959	3	84	36.9	2 ppm
1959	4	81	4.9	4 ppm
1959	4	81	39.5	2 ppm
1960	1	81	2.5	4 ppm
1960	1	81	56.8	2 ppm
1960	2	43	0	4 ppm
1960	2	43	53.5	2 ppm
1960	3	0	0	4 ppm
1960	3	0	0	2 ppm
1960	4	66	1.5	4 ppm
1960	4	66	12.1	2 ppm
1961	1	55	0	4 ppm
1961	1	55	10	2 ppm
1961	2	0	0	4 ppm
1961	3	0	0	4 ppm
1961	4	0	0	4 ppm

Y-12 IH/HP Report Summary Results
Lead, Urine

Year	Quarter	Total Number of Analyses	% > MPL	MAC	Comments
1958	2	210	0	.15mg/L	
1958	3	7	0	.15mg/L	
1958	4	76	0.13	.15mg/L	This includes 39 samples from O R Processing Personnel
1959	1	23	8.7	.15mg/L	
1959	2	30	0	.15mg/L	34 from OR Processing Co:
1959	3	20	0	.15mg/L	37 from ORPC, 36 Samples from Lab Backlog
1959	4	102	0	.15mg/L	37 ORPC
1960	1	64	0	.15mg/L	45 ORPC
1960	2	112	0	.15mg/L	37 ORPC
1960	3	17	0	.15mg/L	
1960	4	27	0	.15mg/L	
1961	1	15	0	.15mg/L	
1961	2	12	0	.15mg/L	
1961	3	14	1	.15mg/L	
1961	4	10	2	.15mg/L	
1962	1	15	0	.15mg/L	
1962	2	15	0	.15mg/L	
1962	3	7	0	.15mg/L	
1962	4	45	0	.15mg/L	TLV
1963	1	41	0	.15mg/L	TLV

Y-12 IH/HP Report Summary Results
Mercury, Urine

Year	Quarter	Total Number of Analyses(People)	% > MPL	Total Number of Analyses(Samples)	% > MPL	MAC	Comments
1952	4		5.3			.3mg/L	
1953	1		6			.3mg/L	
1953	2		0			.3mg/L	
1953	3		0			.3mg/L	
1953	4		9.4			.3mg/L	
1955	2	776	21.6	988	24	.3mg/L	
1955	3	756	32	868	34	.3mg/L	
1955	4	793	28	921	26	.3mg/L	
1956	1	931	27.5	1875	29.5	.3mg/L	
1956	2	1090	29	1948	26.5	.3mg/L	
1956	3	888	18.2	1301	15	.3mg/L	
1956	4	889	12	1213	9.6	.3mg/L	
1957	1	905	6.6	1104	6.1	.3mg/L	
1957	2	748	6.4	936	5.4	.3mg/L	
1957	3	730	5.8	1017	7.6	.3mg/L	
1957	4	730	3.2	880	4.2	.3mg/L	
1958	1	689	3.9	799	3.9	.3mg/L	
1958	2	658	6.8	928	8.8	.3mg/L	
1958	3	593	8.4	953	11.1	.3mg/L	
1958	4	588	5.8	888	5.9	.3mg/L	
1959	1	565	5.7	793	5.2	.3mg/L	
1959	2	454	7.5	677	7.1	.3mg/L	38 from Ferguson Const. Co.
1959	3	345	5.8	481	5	.3mg/L	
1959	4	324	3.1	450	4.9	.3mg/L	
1960	1	289	2.8	426	2.1	.3mg/L	9 Ferguson Const. Co.
1960	2	262	2.3	398	2	.3mg/L	
1960	3	277	2.2	408	1.7	.3mg/L	
1960	4	225	0.9	228	0.9	.3mg/L	
1961	1	181	4	194	7	.3mg/L	
1961	2	207	3	257	3	.3mg/L	
1961	3	200	1	212	1	.3mg/L	
1961	4	186	2	191	2	.3mg/L	
1962	1	179	0	180	0	.3mg/L	

Y-12 IH/HP Report Summary Results
Mercury, Urine

1962	2	146	1	147	1	.3mg/L	
1962	3	141	2	143	2	.3mg/L	
1962	4	146	2	148	2	.3mg/L	Resamples taken were within
1963	1	101	3	107	9	.3mg/L	TLV

Y-12 IH/HP Report Summary Results
Uranium, Urine

Year	Quarter	Total Number of Analyses	% > MPL	Positive Fi VMR (special)	Max. Allowable Concentrations
1952	4		2.7		50 Micrograms/24 hours
1953	1		0.55		50 Micrograms/24 hours
1953	2		2		50 Micrograms/24 hours
1953	3		3.5		50 Micrograms/24 hours
1953	4		8.8		50 Micrograms/24 hours

Y-12 IH/HP report Summary Results
Enriched Uranium, Urine

Year	Quarter	Total Number of Analyses	% > MPL	No. of Positive Findings VMR (special)	Max. Allowable Concentrations
1953			4.9		70 disintegrations/min/24 hour
1953			6.3		70 disintegrations/min/24 hour
1953			6.1		70 disintegrations/min/24 hour
1954			6.1		70 disintegrations/min/24 hour
1954			32.5		70 disintegrations/min/24 hour

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X-10 Health Physics Report Urine Data Summary

X-10 H S Reports Summary Results
Plutonium-241, Urine

Year	Total Number of Analyses
1978	26
1979	241

X-10 H S Reports Summary Results
Gross Beta, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec
1958	134	2.6	80,000
1968	3		

X-10 H S Reports Summary Results
PLutonium-239, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec	Comments
1961	35		1.3	
1962	14			
1963	21			
1964	2011			
1965	146			
1966	1429.			
1967	1468			
1968	1373			
1969	1629			
1970	979			Pu Alpha
1971	955			Pu Alpha
1972	764			Pu Alpha
1973	800			Pu Alpha
1974	589			Pu Alpha
1975	502			Pu Alpha
1976	580			Pu Alpha
1977	423			Pu Alpha
1978	449			Pu Alpha
1979	390			Pu Alpha
1980	330			Pu Alpha
1982	440			Pu Alpha

X-10 H S Reports Summary Results
Polonium, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec	Comments
1958	21		41	
1960	2		1.1	Po-210
1961	11		3.4	

X-10 H S Reports Summary Results
Gross Alpha, Feces

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec
1958	890	17.1	990
1959	361	6.94	1.2×10^3
1960	74		None
1961	378		None
1962	68		
1963	91		
1964	100		
1965	73		
1966	3		
1967	3		
1968	2		

X-10 H S Reports Summary Results
Lead, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed mg/liter of urine	
1958	150	2.9	0.29	

X-10 H S Reports Summary Results
Radium, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec	
1958	189	3.6	11	
1959	140	2.69	0.83	
1960	7		6.2x10 3	
1961	4		0.4	

X-10 H S Report Summary Results
Phosphorus-32, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec
1959	12	0.23	6.5x10 5
1960	20		1.5x10 3
1961	10		5.8x10 3
1962	4		
1963	4		
1964	15		
1965	None		
1966	None		
1967	None		
1969	40		

X-10 H S Reports Summary Results
Cesium, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec	Comments
1959	57	1.1	4.4x10 3	
1960	9		4.9x10 3	Cs-137
1961	39		790	Cs-137
1962	43			
1963	42			
1964	98			
1965	146			Cs-137
1966	182			Cs-137
1967	175			Cs-137
1968	198			Cs-137
1969	301			Cs-137
1970	198			
1971	150			
1972	25			
1973	102			
1974	55			
1975	16			
1976	34			
1977	3			

X-10 H S Report Summary Results
Protactinium-233, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec	Comments
1960	2		2	
1961	14		12	

X-10 H S Reports Summary Results
Gross Alpha, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec	
1958	966	18.2	3.6	
1959	821	15.79	2.48	
1960	1926		2	
1961	1687		13	
1962	3059			
1963	3483			
1964	697			
1968	22			

X-10 H S Reports Summary Results
Gross Alpha, Urine

X-10 H S Report Summary Results
Tritum, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed uc/liter of urine		
1958	21	0.4	4		
1959	34	0.65	150		
1960	8		5.0x10 7		
1962	62				
1963	121				
1964	187				
1965	104				
1966	524				
1967	318				
1968	134				
1969	163				
1970	258				
1971	130				
1972	58				
1973	78				
1974	136				
1975	93				
1976	160				
1977	184				
1978	229				
1979	401				
1980	169				
1982	132				

X-10 H S Report Summary Results
Tritum, Urine

X-10 H S report Summary Results
Strontium, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24Hr. Spec	comments
1958	1452	27.9	165,000 d/m/24Hr. Spec	
1959	1056	20.31	3.2x10 4	
1960	3		21	Sr-85
1960	357		3.3x10 5	Sr-89
1960	625		6.2x10 3	Sr-90
1961	4		120	Sr-89
1961	1318		1.4x10 4	Sr-90
1962	2800			Sr-90
1962	4			Sr-89
1963	3007			
1964	2659			
1965	2628			
1966	1871			
1967	1948			
1968	1262			
1969	1569			
1970	806			
1971	725			
1972	389			
1973	496			
1974	308			
1975	315			
1976	218			
1977	175			
1978	163			
1979	224			
1980	245			
1982	145			

X-10 H S report Summary Results
Strontium, Urine

X-10 H S Report Summary Results
Uranium, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24hr. Spec
1958	1203	23.1	1400
1959	789	15.17	93
1960	501		13
1961	612		160
1962	509		
1963	932		
1964	1095		
1965	1929		
1966	998		
1967	826		
1968	594		
1969	609		
1970	338		
1971	337		
1972	306		
1973	330		
1974	214		
1975	236		
1976	257		
1977	194		
1978	249		
1979	322		
1980	269		
1982	141		

X-10 H S Report Summary Results
Curium-244, Urine

Year	Total Number of Analyses
1965	502
1966	467
1967	427
1968	469
1969	606
1970	587
1971	501
1972	556
1973	680
1974	466
1975	397
1976	541
1977	364
1978	433
1979	302
1980	295
1982	357

X-10 H S Report Summary Results
Neptunium, Urine

Year	Total Number of Analyses
1968	20
1969	7

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X-10 H S Report Summary Results
Cobalt-60, Urine

Year	otal Number of Analyses
1969	52

D3-20

X-10 H S Report Summary Results
Ruthenium-106, Urine

Year	Total Number of Analyses	Weekly Average	Highest Specimen Analyzed d/m/24 Hrs Spec.
1960	3		23
1962	5		
1963	8		
1964	4		
1965	1628		
1966	15		
1967	44		
1969	26		

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X-10 Health Physics Report Occurrence Data Summary

X-10 Site Frequency of Occurences by Division

Division	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Total by Division
Analytical Chemistry	3	5	9	3	6	1	3	4	1		1	1				**37**
Biology	1	1	2		1			1						1	1	8
Chemical Technology	19	13	11	3	8	3	4	5	4	2	1	1	4	3	3	**84**
Chemistry	2										1	1		1	1	6
Plant & Equipment	4	3	1	2	2	2		1								15
Inspection Engineering		1		1						1				1		4
Electronuclear Research	7				1	1										9
Environmental Sciences													1			1
HP			1*	1	2								1			4
Instrumentation & Controls				1												1
Isotopes	9	18	5	12	10	8	4	6	2	3	4	5		2		**88**
Metals & Ceramics	5	2	1				1	1	1	1	1				1	14
Neutron Physics	3	3	2					2							1	11
Operations	12	6	9*	3	8	4			2	2	2	2	3	1	3	**48**
Physics	1	2	3	3	2	1	1					1				14
Reactor	7					2	3		1							13
Reactor Chemistry	1				1								1			3
Solid State		1							1					1	1	4
Thermonuclear	1															1
Totals:	75	55	34	29	41	22	16	20	12	9	10	11	10	10	11	

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X-10 Frequency of Occurences by Building

Bldg	1960	1961	1962	1963	1964
2000	2	1	1		
3001	3	2	2		
3005	4	1		2	1
3010			1	1	
3019	11	16	9	17	5
3025	3	2	2	2	1
3026-C	2	1			
3026-D		2			
3028	2	2	2		1
3029	2	1	1		
3031		1			1
3032			2		
3033	1		2		
3038			3	1	2
3042	3	5	3	3	
3508	2	1	1		1
3517	6	3	8	3	5
3550	1		2	2	
4500N	2	2	1	1	
4501	3	5			
4507		2	3	1	
5500			2	1	3
7500	5	7			
7700			2	1	
9201-2	4	8			1
9204-1	6	1			1
9204-3	4		1		2
9207	2	1	1	2	
9213	2	2	1		
Misc.	10	6	4		
Burial Gn. #5				1	1

Appendix E

E-1

X-10 Questionnaire Results Summary

X-10 Risk Mapping
Questionaire Results

Chemical	No. of Respondents Reporting Exposure	%
Radiation	25	86.2
Lead	24	82.8
Acetone	23	79.3
Nickel	21	72.4
Asbestos	20	69.0
Degreasing Solvents	20	69.0
Noise	20	69.0
Mercury	18	62.1
Nitric Acid	17	58.6
Aluminum	16	55.2
Beryllium	16	55.2
Cadmium	16	55.2
Copper	16	55.2
Cutting Oils	16	55.2
Epoxy Resins / Hardeners	16	55.2
Benzene	15	51.7
Fission Products	15	51.7
Uranium metal	15	51.7
Plutonium (Transuranics)	14	48.3
Tritium	14	48.3
Carbon Tetrachloride	13	44.8
Thorium-232	13	44.8
Fluorine or Hydrofluoric Acid **(HF)**	12	41.4
PCBs	12	41.4
Resins	12	41.4
Welding Fumes	12	41.4
Metals (other metals)	11	37.9
Dusts (wood,coal,fibers,etc)	10	34.5
Freon	10	34.5
Trichloroethylene (TCE), "Trico"	10	34.5
Uranium-233	10	34.5
Chromates	9	31.0
Chlorinated Solvents	8	27.6
Chromic Acid	8	27.6
Neptunium	8	27.6
UF_4 ("Green salt")	8	27.6
MEK	7	24.1
Methylene Chloride	7	24.1
Trichloroethane	7	24.1
Chlorine	6	20.7
Chloroform	6	20.7
Phosphates	6	20.7
Phosgene	5	17.2

X-10 Risk Mapping
Questionaire Results

Chemical	No. of Respondents Reporting Exposure	%
Repetitive Movement/ vibrations	5	17.2
Technicium (Tc-99)	5	17.2
UO_3 (orange cake material)	5	17.2
Acrylonitrile	4	13.8
Arsenic	4	13.8
Chlorine Trifluoride (ClF_3 – Treatment Gas)	4	13.8
Uranium (235,238)	4	13.8
Plutonium (239,241)	4	13.8
Bromine Trifluoride	3	10.3
Vinyl Chloride	2	6.9
Strontium-90	2	6.9
Cesium-137	2	6.9
Stoddard Solvent	1	3.4
Curium-244	1	3.4
Tritum	1	3.4
Iodine-131	1	3.4

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Y-12 Questionnaire Results Summary

Y-12 Risk Mapping
Questionaire Results

Chemical	No. of Respondents Reporting Exposure	%
Beryllium	36	81.8
Asbestos	33	75.0
Noise	33	75.0
Radiation	33	75.0
Uranium metal	33	75.0
Degreasing Solvents	32	72.7
Freon	31	70.5
Cutting Oils	30	68.2
Mercury	30	68.2
Lead	29	65.9
Acetone	28	63.6
Dusts (wood,coal,fibers,etc)	28	63.6
Epoxy Resins / Hardeners	25	56.8
Aluminum	24	54.5
PCBs	24	54.5
Welding Fumes	21	47.7
Copper	20	45.5
Fluorine or Hydrofluoric Acid **(HF)**	20	45.5
Trichloroethane	19	43.2
Metals (other metals)	17	38.6
Nickel	17	38.6
Nitric Acid	17	38.6
Carbon Tetrachloride	16	36.4
Chlorine	14	31.8
Fission Products	14	31.8
Thorium-232	14	31.8
Chlorinated Solvents	13	29.5
Trichloroethylene (TCE), "Trico"	13	29.5
Cadmium	12	27.3
Repetitive Movement/ vibrations	12	27.3
Resins	12	27.3
Benzene	11	25.0
Chromates	11	25.0
Methylene Chloride	11	25.0
UF_4 ("Green salt")	9	20.5
Chromic Acid	8	18.2
MEK	8	18.2
Phosphates	8	18.2
Plutonium (Transuranics)	8	18.2

Y-12 Risk Mapping
Questionaire Results

Chemical	No. of Respondents Reporting Exposure	%
Uranium-233	7	15.9
Perchloroethylene	7	15.9
Lithium	6	13.6
Arsenic	5	11.4
Cyanide	5	11.4
Chloroform	4	9.1
Phosgene	4	9.1
Tritium	4	9.1
Black Oxide	4	9.1
Acrylonitrile	3	6.8
UO_3 (orange cake material)	3	6.8
Bromine Trifluoride	2	4.5
Chlorine Trifluoride (ClF_3 – Treatment Gas)	2	4.5
Stoddard Solvent	2	4.5
Technicium (Tc-99)	2	4.5
Vinyl Chloride	2	4.5
Neptunium	0	0.0

Appendix F

External Dose Summary Results

X-10 CEDR
External Dose Summary Results

YEAR	0-1 REM	1-2 REM	2-3 REM	3-4 REM	4-5 REM	5-6 REM	6-UP REM	Max WB	Total Monitored
1943	445	8						1.43	1526
1944	1051	392	95	21				3.875	4587
1945	946	34	13	6	2	1			3331
1946	812	46	11	1	1	1		5.315	3118
1947	672	29	10	9	2	1		5.5	3654
1948	1221	34	14	8				3.845	4278
1949	674	42	31	18	5	3		5.22	2842
1950	995	71	27	5	2	1	3	6.485	3922
1951	874	87	45	15	17	3		5.74	4800
1952	1332	110	49	25	28	22	21	11.875	4985
1953	1617	131	48	27	26	13	6	9	4487
1954	1699	91	31	30	15	18	13	11.82	5029
1955	1881	149	85	40	23	6	9	9.43	
1956	2320	161	79	33	19	8	10	8.355	5577
1957	3331	2115	81	38	29	14	26	66.635	5472
1958	3893	267	78	24	13	6	5	8.23	5755
1959	3931	246	100	37	26	4	6	9.03	5968
1960	3116	210	35	16	10	5		5.87	5892
1961	8773	58	1					2.63	18145
1962	13767	36						388.608*	23346
1963	12207	32						1.91	18794
1964	11287	15							18165
1965	5357	9	1					2.3	17672
1966									26375
1967	6418	11						1.57	27368
1968	5871	10	1					2.9	26173
1969	4402	5						2	26067
1970	3879	3						1.88	24330
1971	3879	4						1.21	23124
1972	3520	5						1.15	23672
1973	3756	2						1.84	22110
1974	3965	1						1.25	23529
1975	3045	1						1	25192
1976	3148	1						1	26647
1977	2669	1						1.74	28322
1978	2544	1						1.03	29698
1979	2547	0						0.62	25811
1980	1696	0						0.88	26226
1981	1738	1	1					2.09	26363
1982	1472							0.82	24226
1983	1665							0.72	22633
1984	1700							0.8	22884
1985	1553							0.76	22421

* Data point could not be confirmed on other sources.

X-10 CDER EPI
External Dose Summary Results

YEAR	0-1 REM	1-2 REM	2-3 REM	3-4 REM	4-5 REM	5-6 REM	6-UP REM	Max WB
1943	718	4						1.43
1944	1248	284	62	17				3.88
1945	1280	72	14	4	2	7		5.705
1946	1037	44	13	1	1			4.705
1947	679	23	7	9	1			5.105
1948	1103	27	11	9				3.845
1949	670	32	23	16	5	3		5.22
1950	919	59	23	4	2	1	3	6.485
1951	822	72	42	15	15	3		5.74
1952	1245	95	40	22	24	18	17	11.875
1953	1512	107	44	25	22	13	3	8.535
1954	1540	79	28	25	10	15	13	10.635
1955	1692	133	77	36	21	5	8	9.43
1956	2032	143	73	28	15	7	9	8.355
1957	2806	190	66	36	26	12	23	66.635
1958	3237	228	66	20	14	5	5	8.23
1959	3259	224	81	27	21	3	3	9.03
1960	2628	176	28	15	6	4		5.87
1961	3074	112	12	8	1	2		6.28
1962	3667	136	24	12				3.765
1963	3374	135	15	5	5			4.89
1964	3838	112	20	6	1			4.17
1965	2243	84	30	5	1			4.41
1966	2087	97	22	5	3			4.85
1967	1965	108	34	9	3			5.1
1968	1816	73	21	7	3			4.46
1969	1486	61	10	2				3.79
1970	1415	46	4	2				3.5
1971	1315	40	9	5	1			4.95
1972	1111	50	8	2	5			4.88
1973	1187	50	8	3	1			4.63
1974	1347	21	5	1				3.58
1975	976	34	5					2.67
1976	863	37	5	1				3.42
1977	680	19	10	2				3.62
1978	759	17	6					2.99
1979	520	23	2					2.11
1980	374	16	4	1				3.14
1981	285	17	1	1				3.83
1982	225	14	1					2.11
1983	223	16	1					2.44
1984	237	8						1.89
1985	190	6						1.4

X-10 H and S Reports
External Dose Summary Reports

YEAR	0-1 REM	1-2 REM	2-3 REM	3-4 REM	4-5 REM	5-6 REM	6-UP REM	Max WB	SKIN (REM)	HAND (REM)	COMMENTS	
1959		260	95	40	25		10					
1960		204	35	15	9		5		5500			
1961		141	17	8	2	2	2			Fingers&Thumb 1200 REM, 300 REM		
1962		158	44	10	7				no data			
1963		178	22	9	5	1		5.1	9 rem	18.2 rem		
1964		148	35	9	1				20.7	14.4		
1964									10.2			
1965		124	38	9				4.4	8.1	51		
1966		129	34	19	3			4.9	16	25		
1967		140	54	17	3			5.1	11	25		
1968		103	39	9	5			4.71	13	12		
1969		90	25	2				3.79	8.8	33		
1970		65	8	2	1			4.04	10	56		
1971		61	13	5	2			4.95	8	31		
1972		78	13	2	7			4.88	10	52		
1973		66	17	3	1			4.63	8.4	19		
1974		33	7	1				3.58	12.6	22		
1975		58	13					2.71	11.3	22		
1976		61	9	3	0	0	0	3.49	16	15		
1977		34	14	3	0	0	0	3.62	5	14		
1978		39	6	1	0	0		3.34	4.3	26		
1979		46	9	0	0	0		2.8	3.6	12		
1980		35	10	1	0	0		31.4	9.3	11		
1981								38.3				
1982		28	1	0	0	0		2.11	6.5	6.5		

Y-12 CEDR
External Doses Summary Results

YEAR	.1-.5 REM	.5-1 REM	1-2 REM	>2 REM	Total Monitored
1952	4	3	0	0	17
1953	18	2	1	0	27
1954	4	0	0	0	22
1955	77	1	1	0	85
1956	569	36	6	0	1214
1957	633	29	1	0	1710
1958	1118	54	5	0	2324
1959	1340	37	2	1	2838
1960	1459	19	2	0	3740
1961	1606	10	12	1	17,640
1962	1893	40	7	0	21,622
1963	884	23	7		7713
1964	1040	16	4		7909
1965	754	14	0		14,531
1966	1057	34	1		11,434
1967	665	21	2	2	10,465
1968	554	5	1	4	14,376
1969	899	29	0	1	20,886
1970	1012	12	2	1	22,883
1971	750	2	0	1	24,206
1972	450	5	0	0	7,704
1973	369	6	0	0	7,323
1974	853	13	0	0	14,438
1975	206	8	4	0	5,547
1976	254	0	0	0	6,049
1977	165	7	0	0	5,928
1978	355	0	0	0	10,431
1979	177	0	0	0	3,495
1980	591	27	12	10	
1981	426	24	1	0	1,388
1982	709	20	0	0	1,875
1983	770	16	0	1	1,963
1984	529	8	1	0	
1985					