ATTACHMENT 2

HDP-PO-HP-100
Radiation Protection Plan
33 Pages

Westinghouse Electric Company LLC,
Hematite Decommissioning Project

Docket No. 070-00036

Hematite Decommissioning Project

NUMBER: **HDP-PO-HP-100**

TITLE: **Radiation Protection Plan**

REVISION: **0**

EFFECTIVE DATE: **10/18/2010**

QUALITY-RELATED

REVISION LOG	
Revision No. Effect. Date	**Change(s)**
0 10/18/2010	This policy supersedes the following policies and procedures: PO-HP-001, Radiation Protection Plan, Revision 6 and HDP-PO-HP-002, ALARA Program, Revision 0. Changes from these procedures include formatting, editing, sequencing, and the technical changes noted on the following pages. In summary: - Updated to be consistent with SNM-33, 10 CFR 20 or other regulatory guidance. - Consolidated policy level material from other HP procedures into this policy. - Removed inconsistencies and redundancies to improve logical flow. - Removed guidance better suited for implementing procedures. - A Section was added to the RPP to cover the ALARA Policy - Included wording for visitor access training to make it consistent with the visitor access request form in HDP-PR-PSP-111-8. - Changed the definition for Investigation Level to a more generic definition because it was only referring to some operational air sample investigation levels and did not adequately define all types of investigation levels in the program. The specific details of the various investigation levels will be covered in implementing procedures. - Removes the reference for NRC Policy and Guidance directive FC 83-23 and when discussing release limits it now references the license. - Added monitoring requirements for Declared Pregnant Females into section 10.1 and 10.2.

Are Quality Records generated? **YES** or NO. If yes, list below and ensure that these completed records are retained in accordance with HDP-PR-QA-009 (Reference 5.7).

RSO Written Annual Report to the Project Oversight Committee
POC Annual Audit of the Radiation Protection Program
ALARA Suggestion Form

CHANGE LOG		
Section	**Change**	**Reason(s) for Change**
All	Changed discussion of regulator guidance documents to reflect they are guidance rather than requirements.	Match the external reference statements that they are guidance documents.
4.0	Added, deleted, and revised definitions	Reflect terms used in the revised policy and make definitions consistent with regulations.
5.0	Added and deleted references.	Reflect references used in the revised policy.
6.0	Updated titles and responsibilities.	Consistency with SNM-33.
Old 7.1	Removed section describing Facilities and Equipment	Reflects current state of project and information not needed in this document.
8.0	Updated ALARA section.	Incorporates intent of policy PO-HP-002.
9.0	Added Radiological Limits Section.	Incorporates requirements of superseded procedure LVI-HP-03.
9.0	Reworded NRC limits and modified administrative limits.	Reflect 10 CFR 20 requirements and clarification.
10.0	Consolidated internal and external monitoring practices into one section. Simplified and modified program description	Reflect 10 CFR 20 and SNM-33 requirements and clarification.
11.0	Added Radiological Survey Program section. Modified and simplified program description.	Compliance with SNM-33 and clarification of program limitations.
12.0	Updated Instrumentation Program section. Modified and simplified program description.	Incorporates requirements of SNM-33 and clarifies minimum instrumentation requirements.
13.0	Updated RP Work Controls section to include requirements for RWPs, respirator use, and radiological posting and labeling.	SNM-33 compliance and consolidate guidance.
14.0	Updated Contamination Control section.	SNM-33 compliance.
15.0	Updated Radioactive Materials Controls section.	SNM-33 compliance and clarification.
16.0	Added Waste Management Section.	SNM-33 compliance and clarification of requirements.
17.0	Updated Effluent and Environmental Monitoring and Control Program section.	SNM-33 compliance and clarification of requirements.
18.0	Added Decommissioning Survey Program section.	SNM-33 compliance and clarification of requirements.
19.0	Updated Audits and Inspections section.	SNM-33 compliance.

CHANGE LOG		
Section	**Change**	**Reason(s) for Change**
20.0	Added Radiological Occurrence Reporting section.	Ensure events are properly documented for trending and followup.
21.0	Updated Records Management section.	Provide an overview of record management requirements.
22.0	Added Regulatory Notifications and Reports section.	Added to discuss reporting requirements and reference Licensing procedure for implementation.
23.0	Updated Emergency Response section	Updated consistent with current Emergency Action plan

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1.0 PURPOSE

The Westinghouse Hematite Decommissioning Project (HDP) Radiation Protection Plan (RPP) provides standards and requirements to minimize the potential for risk of harm to employees, contractors, visitors, the public, or the environment from radiation and radioactive material. This RPP implements applicable U.S. Nuclear Regulatory Commission (NRC) regulations established in 10 CFR 20 (Reference 5.4), and implements License SNM-33 (Reference 5.1) requirements regarding radiation safety.

2.0 POLICY

It is the policy of HDP to exercise control over operations involving radiation and radioactive material by maintaining radiation exposure to the public, the employees and the environment as low as reasonably achievable (ALARA) by complying with applicable regulations, licenses, permits, policies, and procedures and by ensuring that personnel carry out their responsibilities in the safe and proper handling of radioactive material. (10 CFR 20.1101).

3.0 APPLICABILITY

This RPP applies to all personnel and activities at HDP that involve radiation or radioactive materials.

4.0 DEFINITIONS/ACRONYMS

4.1 Definitions

4.1.1 Airborne Radioactivity Area – A room, enclosure, or area in which airborne radioactive materials exist, or are likely to exist, in concentrations:

4.1.1.1 In excess of the derived air concentrations (DACs) specified in Appendix B to 10 CFR 20 (Reference 5.4), which was determined to be 2.0 E -11 μCi/ml gross alpha radioactivity or 6.0 E -8 μCi/ml gross beta radioactivity, or

4.1.1.2 To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours.

4.1.2 ALARA (acronym for "as low as reasonably achievable") – Making every reasonable effort to maintain exposures to radiation as far below the regulatory dose limits as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic

considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest. (10 CFR 20)

4.1.3 Annual Limit on Intake (ALI) – The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the Reference Man that would result in a Committed Effective Dose Equivalent of 5 rem (0.05 Sv) or a Committed Dose Equivalent of 50 rem (0.5 Sv) to any individual organ or tissue. ALI values for intake by ingestion and by inhalation are given in Table 1, Columns 1 and 2, of Appendix B, 10 CFR 20.

4.1.4 Audit – A planned and documented activity performed to determine by investigation, examination, or evaluation of objective evidence the compliance with regulations and license requirements, as well as the effectiveness and implementation of procedures and instructions.

4.1.5 Breathing Zone (BZ) – That region in the vicinity of a worker's mouth and nostrils from which air is drawn into the lungs while performing his/her assigned work.

4.1.6 Committed Dose Equivalent (CDE, $H_{T,50}$) – The dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50-year period following the intake. (10 CFR 20)

4.1.7 Committed Effective Dose Equivalent (CEDE, $H_{E,50}$) – The sum of the products of the tissue weighting factors (w_T) applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues. $H_{E,50} = \Sigma W_T H_{T,50}$. (10 CFR 20)

4.1.8 Contamination Area – Any area with removable contamination levels greater than 1000 dpm/100 cm^2 alpha or beta radioactivity.

4.1.9 Controlled Area – An area, outside of a Restricted Area but inside the boundary, access to which can be limited by the licensee for any reason. (10 CFR 20)

4.1.10 Deep Dose Equivalent (DDE, H_d) – As applied to external whole-body exposure, the dose equivalent at a tissue depth of one (1) cm. (10 CFR 20)

4.1.11 Derived Air Concentration (DAC) – The concentration of a given radionuclide in air which, if breathed by the Reference Man for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in an intake of one ALI. DAC values are given in Table 1, Column 3 of Appendix B to 10 CFR 20.

4.1.12 Effective Dose Equivalent (H_E) – The sum of the products of the dose equivalent to the organ or tissue (H_T) and the weighting factors (W_T) applicable to each of the body organs or tissues that are irradiated. $H_E = \Sigma W_T H_T$. (10 CFR 20)

4.1.13 Environmental Air Sampling – In the context of this plan, monitoring for airborne radioactivity at fixed locations that were selected as representative of ambient air around the HDP..

4.1.14 Extremities – The hand, elbow, arm below the elbow, foot, knee or leg below the knee. (10 CFR 20)

4.1.15 General Area Sampling (GA) – Sampling of the ambient air within or adjacent to areas where work involving radioactive materials is in progress. A GA air sample is usually collected using a sampler having a flow rate of 20 – 50 liters per minute (l/min or lpm).

4.1.16 Intake Retention Factor (IRF) – The fraction of the intake that is retained in the body at time (t) following the intake.

4.1.17 Investigation Level – Sample analysis result when, if exceeded, initiates an investigation into the cause of the elevated sample result.

4.1.18 In-vitro measurement – Measurement of the amount of radioactivity introduced or retained in the body based on the amount of radioactivity observed in samples obtained from the body.

4.1.19 In-vivo measurement – Measurement of the amount of radioactivity introduced or retained in the body based on the amount of gamma or x-ray radiation emitted from radioactive material located within the body.

4.1.20 Lens Dose Equivalent (LDE) – As applied to external exposure of the lens of the eye, taken as the dose equivalent at a tissue depth of 0.3 cm. (300 mg/cm^2). (10 CFR 20)

4.1.21 Minimum Detectable Activity (MDA) – The smallest amount of radioactivity in a sample that can be detected with a 5% probability of erroneously detecting radioactivity, when in fact none was present (Type I error) and also, a 5% probability of not detecting radioactivity, when in fact it is present (Type II error).

4.1.22 Non-Radiation Worker – HDP employee or contractor employee working at the Hematite Site that is not qualified as a Radiation Worker.

4.1.23 Quality Factor – The modifying factor (listed in tables 1004(b).1 and 1004(b).2 of 10 CFR 20.1004) that is used to absorbed dose to dose equivalent. (10 CFR 20)

4.1.24 Perimeter Air Sampling – Monitoring of airborne radioactivity with portable sampler(s) positioned downwind of decommissioning work activities.

4.1.25 Radiation Area – An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess

of 0.005 rem (5 mrem) in one hour at 30 cm from the radiation source or from any surface that the radiation penetrates. (10 CFR 20)

4.1.26 Radiation Symbol – A magenta, black, or purple 3-blade design on a yellow background.

4.1.27 Radiation Work Permit (RWP) – The Radiation Work Permit is an administrative mechanism used to establish radiological controls for intended work activities. The RWP informs workers of area radiological conditions and entry requirements, and provides a mechanism to relate worker exposure to specific work activities. Two types of RWPs are identified within this program:

- General RWP – Establishes radiological controls for routine or repetitive activities, and where relatively low radiological hazards and low occupational exposures are anticipated. General RWPs remain in effect for a period of up to one year.
- Job-Specific RWP – Establishes radiological controls for non-routine or non-repetitive operations in areas with changing radiological conditions or that are anticipated to involve greater radiological hazards and exposures. Job-Specific RWPs include a greater level of detail regarding engineering controls, specific work practices, and personal protective equipment. These RWPs are in effect for the duration of the task or until the end of the calendar year, whichever occurs first.

4.1.28 Radioactive Material Area (RMA) – Any area, room, or enclosure where radioactive material is used or stored in quantities exceeding 10 times the quantity in Appendix C of 10 CFR 20. If a combination of materials is present (e.g., a combination of uranium and technetium) the following relationship must be used to determine if the area must be posted and controlled as an RMA:

$$\frac{\mu Ci_{Tc}}{Q_{Tc}} + \frac{\mu Ci_{U}}{Q_{U}} \leq 10$$

where Q = the quantity shown in Appendix C of 10 CFR 20.

4.1.29 Reference Man – A hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base. Parameters for Reference Man are identified in ICRP 23 (Reference 5.5).

4.1.30 Restricted Area – An area, access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. (10 CFR 20)

4.1.31 Shallow Dose Equivalent (SDE, H_S) – As applied to the external exposure of the extremities or skin of the whole body, is taken as the dose

equivalent at a tissue depth of 0.007 cm (7 mg/cm^2), averaged over an area of 1 square centimeter. (10 CFR 20)

4.1.32 Total Surface Contamination – Removable plus fixed surface contamination.

4.1.33 Total Effective Dose Equivalent (TEDE) – The sum of the Effective Dose Equivalent (for external exposure) and the Committed Effective Dose Equivalent (for internal exposure). TEDE = H_E + CEDE. (10 CFR 20)

4.1.34 Visitor – Any individual who is expected to be on site for less than 30 days in a calendar year and who is not likely to receive an exposure to radioactive material which would exceed 0.1 rem for the year.

4.1.35 Whole Body – For purposes of external exposure, head, trunk (including male gonads), arms above the elbow, and legs above the knee. (10 CFR 20)

4.2 Acronyms

ALARA	As Low As Reasonably Achievable
ALI	Annual Limit on Intake
ANI	American Nuclear Insurers
BZ	Breathing Zone
CAAS	Criticality Accident Alarm System
CDE ($H_{T,50}$)	Committed Dose Equivalent
CEDE ($H_{E,50}$)	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
DAC	Derived Air Concentration
DDE (H_d)	Deep Dose Equivalent
EH&S	Environmental, Health & Safety
GA	General Area
GET	General Employee Training
HDP	Hematite Decommissioning Project
H_E	Effective Dose Equivalent
H_T	Tissue Dose Equivalent
HP	Health Physics
IRF	Intake Retention Factor
LDE	Lens Dose Equivalent
MDA	Minimum Detectable Activity
NRC	U. S. Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
POC	Project Oversight Committee
RMA	Radioactive Materials Area
RPP	Radiation Protection Plan
RSO	Radiation Safety Officer
RWP	Radiation Work Permit
RWT	Radiation Worker Training
SDE (H_S)	Shallow Dose Equivalent

SNM	Special Nuclear Material
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescent Dosimeter
W_T	Tissue Weighting Factor

5.0 REFERENCES

5.1 SNM-33, Hematite License No. SNM-33

5.2 HDP-PO-GM-007, Project Management Plan

5.3 10 CFR 19, Notices, Instructions and Reports for Workers: Inspection and Investigations

5.4 10 CFR 20, Standards for Protection against Radiation

5.5 ICRP 23, International Commission on Radiological Protection (ICRP) Publication 23, *Report of the Task Group on Reference Man*

5.6 NRC Regulatory Guide 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable, May 1977

5.7 HDP-PR-QA-009, Records Management

5.8 10 CFR 71, Packaging and Transportation of Radioactive Materials

5.9 49 CFR, Department of Transportation Regulations

5.10 HDP-PO-GM-002, *Training Plan*

5.11 HDP-PO-EHS-003, Emergency Action Plan

5.12 NRC Regulatory Guide 8.25, Air Sampling in the Workplace

5.13 HDP-PO-EM-001, Effluent and Environmental Monitoring Plan

5.14 American Nuclear Insurers (ANI) Bulletin 80-1A, *Nuclear Liability Insurance Records Retention*, Revision 6, December 2005

5.15 MO-0000761, *Missouri State Operating Permit*, February 24, 2006

5.16 MO-ARAR013, Applicable or Relevant and Appropriate Requirements, Discharges to Waters and Ground Water of the State in Section 19, R5E, Jefferson County, MO, November 7, 2003

5.17 HDP-PR-QA-020, HDP Corrective Actions Process (CAPS)

5.18 HDP-PR-LI-001, Regulatory Reporting

5.19 HDP-PR-HP-102, Health Physics Technician Training

5.20 HDP-PR-HP-201, Radiological Boundaries, Postings and Labeling

6.0 RESPONSIBILITIES

6.1 The Project Director is responsible for:

6.1.1 Maintaining corporate responsibility for overall safety, environmental protection and compliance with the RPP.

6.1.2 Ensuring that the capability of HDP radiation protection services is sufficient to meet the requirements of the RPP and Federal and State regulations, licenses, and permits.

6.1.3 Ensuring the health and safety of workers and visitors during the decontamination and decommissioning of the Hematite Facility, including the implementation of the Radiation Protection and ALARA programs.

6.2 The Project Oversight Committee (POC) is responsible for:

6.2.1 Ensuring that appropriate measures are taken to maintain radiation exposures ALARA through administrative and procedural controls in addition to the design and control of radiological facilities and equipment.

6.2.2 Performing an annual review of radiation safety trends, environmental protection trends, criticality safety practices, adequacy of emergency planning and drills, effectiveness of the ALARA program, effectiveness of the waste minimization program, and abnormal occurrences and accidents.

6.3 The Radiation Safety Officer (RSO) is responsible for:

6.3.1 Providing technical oversight, administration, and guidance on the implementation of the RPP, including direction to and oversight of the HP staff.

6.3.2 Ensuring activities involving the use of radioactive material are conducted safely and in accordance with applicable regulatory, program and procedural requirements.

6.3.3 Evaluating potential and/or acute radiation exposures and establishing appropriate control measures.

6.3.4 Directing HP Staff activities for implementing the RPP and associated procedures. The RSO may delegate specific responsibilities for implementation of the RPP to qualified personnel; however, in such cases the RSO shall maintain ultimate responsibility for proper implementation.

6.3.5 Maintaining a qualified and effective staff for implementing the Radiation Protection Program.

6.3.6 Terminating work activities that do or may violate regulatory or HDP requirements for radiological protection.

6.4 HDP Managers are responsible for:

6.4.1 Implementing applicable sections of the RPP and ensuring their project personnel conduct work in accordance with the Radiation Protection Program.

6.4.2 Initiating RWP requests for their work activities in Restricted Areas.

6.4.3 Ensuring their project personnel maintain current training and qualifications for work within the Restricted Area.

6.5 The Environmental Health and Safety (EH&S) Manager is responsible for:

Supporting the collection, analysis by offsite laboratory, tracking, and reporting of environmental monitoring data.

6.6 HP Supervision is responsible for:

6.6.1 Assisting in the management and implementation of the RPP and associated procedures under the direction of the RSO.

6.6.2 Directly supervising the Health Physics (HP) Technicians and providing contractor oversight to ensure radiation protection policies and procedures are properly implemented.

6.6.3 Interfacing with Operations and other site personnel to ensure integration of radiation protection and ALARA principles with work activities.

6.6.4 Providing input into pre-job planning for work activities inside the Restricted Area so that appropriate radiological controls are established.

6.6.5 Stopping unsafe work activities and reporting non-compliance with HP policies and procedures to the RSO.

6.7 HP Technicians are responsible for:

6.7.1 Implementing the RPP and associated procedures under the direction of the RSO and the direct supervision of HP Supervision.

6.7.2 Stopping unsafe work activities and reporting non-compliance with HP policies and procedures to HP Supervision or the RSO.

6.8 HP Staff are responsible for:

Assisting, under the direction of the RSO, in the performance of the technical aspects of this RPP including performing analyses, taking measurements, maintaining records, reporting measurements, and addressing non-conformance with HP procedures and policies. HP supervisory reviews required by any HDP document may be performed by any member of HP Staff as authorized by the RSO.

6.9 Radiation Workers are responsible for:

6.9.1 Performing HDP work activities that involve radiation or radioactive materials in accordance with this RPP and its implementing procedures.

6.9.2 Adhering to all signs, postings, and radiological requirements, and maintaining radiation exposure ALARA.

6.9.3 Reporting to the RSO and management any condition that could result in an increased radiological hazard to any individual.

6.9.4 Making suggestions for the improvement of work methods, facilities, and procedures to reduce exposure to radiation or radioactive material.

7.0 QUALIFICATIONS AND TRAINING

7.1 The requirements for Education, Experience and Specialized Knowledge for the RSO are listed in HDP-PO-GM-007, Project Management Plan (Reference 5.2), and the requirements for HP Technicians are listed in HDP-PR-HP-102, Health Physics Technician Training (Reference 5.19).

7.2 Radiation Protection Training

Radiation Protection Training shall be provided for visitors, general employees, radiation workers, and HP Technicians. The level of radiation protection training should be commensurate with the expected radiological conditions likely to be encountered. The RSO is responsible for ensuring the radiological training materials meet the requirements needed to implement an effective radiation protection program. The training program for radiation protection is approved by the RSO.

7.2.1 Visitors

Visitor Access Training is intended for individuals who will be on-site for less than 30 days and will not require unescorted access to either a restricted or controlled area. Visitor Access Training shall include general safety, emergency actions, radiological safety and security requirements. Visitor access training is required for individuals who are authorized to be on-site by project management in order to facilitate administrative or infrastructure functions.

7.2.2 General Employee

General Employee Training (GET) contains a module on radiation safety. GET is required for all non-radiation workers prior to obtaining unescorted access to the Controlled Area. GET is designed for workers who require access to the Controlled Area but will not handle radioactive material or enter a Restricted Area. GET is further described in HDP-PO-GM-002, Training Plan (Reference 5.10), and associated implementing procedures.

7.2.3 Radiation Worker Training

Radiation Worker Training (RWT) is required for all project personnel, except HP Technicians, whose job assignments routinely require work in radiological areas. RWT includes generic, project-specific and practical factor components. RWT is further described in the Training Plan and implementing procedures. Individuals who have not completed Radiation Worker Training may enter Radiological Areas only with a qualified escort.

7.2.4 HP Technician Training

HP Technician training is designed to provide suitably experienced personnel with the knowledge and skills necessary to implement an effective radiation protection program. Training consists of generic, project-specific, and practical factor components. HP Technician training is further described in the Training Plan and implementing procedures.

7.2.5 Contractor Training

A contractor's radiological training may be accepted for contractor personnel after review and acceptance of their training program. Acceptable training shall meet the requirements of SNM-33 and the Training Plan. The RSO shall be responsible for the review and acceptance of the radiological training for the contractor.

7.2.6 Examinations

Evaluations of Non-Radiation Workers, Radiation Workers, and HP Technicians shall verify their knowledge, competency, and understanding prior to unsupervised assignment. The evaluation consists of a written examination and performance of appropriate practical factors. Personnel shall receive additional instruction and be retested in any subject in which the worker's performance is deficient.

7.2.7 Refresher Training

Refresher training for GET, and RWT shall be conducted at intervals not exceeding 12 months with a 30-day grace period. Satisfactory performance on a re-qualification exam is required. Meetings, posting, memos, or other means of communication will be used, as necessary, to inform workers of important new developments in procedures, equipment, and regulations that have an immediate impact on the radiation protection aspects of their work.

8.0 ALARA POLICY

ALARA Program leadership is the responsibility of HDP Management, the RSO, and Health Physics personnel. While occupational radiation exposures incurred by employees or contractors of HDP are expected to be low relative to regulatory limits, radiation exposures shall be assumed to entail some risk to the employee. The ALARA philosophy is to reduce occupational exposures as far below the specified limits as is reasonably achievable by means of good radiation protection planning and practice, as well as by management commitment to policies that foster vigilance against departures from good practice in accordance with the guidance of Regulatory Guide 8.10 (Reference 5.6). HDP management shall adopt the following three principles to govern all work activities with the potential for exposure to radiation or radioactive materials:

- Activities and operations shall produce a positive net benefit.

- Radiation exposures for the HDP program shall be kept ALARA in light of economic and societal costs.
- Radiation exposures received by individuals shall not exceed the radiation dose limits described in this RPP and its associated implementing procedures.

The implementation and effectiveness of the ALARA Program is the responsibility of all site personnel. Employees are encouraged to submit an ALARA Suggestion Form (HDP-PO-HP-100-1) to Health Physics Supervision to recommend alternate methods of performing work or identify equipment that may allow a task to be completed in less time or for less total exposure.

8.1 ALARA Goals

HDP shall maintain ALARA goals for occupational radiation exposure, as well as airborne and liquid effluent concentrations. Each project task may have its own occupational radiation exposure goal. Occupational ALARA goals should be realistic and challenging. They should be based on many factors including past work experiences, expected conditions, and reasonable radiological controls.

ALARA goals are intended to be applied as standards for comparison during decommissioning work. These goals may be adjusted based on decommissioning experience or based on detailed information related to a specific work activity.

8.2 ALARA Evaluations

As part of the work control and RWP process, HP shall perform ALARA Pre-Job Evaluations to estimate the potential external and internal exposures, to determine the type of engineering or administrative controls that are appropriate for the work, and to define the appropriate personal protective equipment. HDP Managers and Health Physics Supervision should begin pre-job planning as far in advance of work initiation as possible to ensure adequate time to implement effective radiological controls. Controls should be instituted that maintain a reasonable balance between work activity schedules and maintaining radiological exposures ALARA.

9.0 RADIOLOGICAL LIMITS

9.1 Regulatory Occupational Exposure Limits

9.1.1 Individual doses for occupational workers shall not exceed 5,000 mrem TEDE or 50,000 mrem CDE per year, excluding medical radiation exposures, as a result of HDP activities.

9.1.2 Dose to the lens of the eye shall not exceed 15,000 mrem per year LDE as a result of HDP activities.

9.1.3 Doses to the skin and the extremities shall not exceed 50,000 mrem per year (SDE and DDE respectively) as a result of HDP activities.

9.1.4 The dose equivalent to the embryo/fetus of a declared pregnant woman shall not exceed 500 mrem during the entire pregnancy as a result of HDP activities. If the dose to the embryo/fetus exceeds 500 mrem or is

within 50 mrem of the limit at the time of declaration, then compliance with this limit will be demonstrated provided the dose to the embryo/fetus does not exceed 50 mrem for the remainder of the gestation period.

9.1.5 Individual doses for members of the general public and visitors shall not exceed 100 mrem per calendar year from HDP operations and the radiation dose in any unrestricted areas from external sources shall be less than 2 mrem in any one hour.

9.1.6 Class D uranium intake shall be limited to less than 10 mg/week per individual as a result of HDP activities. Work activity restrictions shall be imposed when an individual reaches 80 percent of the applicable annual internal limit (e.g., 0.8 ALI) for Class W and Class Y uranium and 8 mg per week for Class D uranium. A diagnostic study to evaluate intakes shall be started at these levels.

9.2 Administrative Occupational Exposure Limits

9.2.1 Annual individual occupational doses for employees should not exceed 2,000 mrem TEDE. The action level for investigation and possible work restrictions shall be 1,000 mrem for DDE.

9.2.2 Approval by the Project Director and RSO is required for an employee to exceed the administrative limits.

9.2.3 Persons under 18 years of age are not permitted access to Restricted Areas at HDP.

9.2.4 Planned Special Exposures as defined in 10 CFR 20.1206 are not authorized at HDP.

9.3 Contamination Limits

The surface contamination limits established by SNM-33 (Reference 5.1) are provided in Appendix A. For a mixture of radionuclides with differing limits, the effective contamination limit may be derived by using the most conservative radionuclide present, by weighting the radionuclides, or by an alternate means determined by the RSO. The RSO shall approve any effective contamination limit.

The following exceptions apply to the Appendix A surface contamination limits:

- The acceptable level of total surface contamination on the skin of personnel will be evaluated on a case-by-case basis by the RSO.
- The fixed contamination limit for personal protective equipment is 5000 dpm/100 cm^2 (gross alpha or gross beta-gamma radioactivity).
- The removable surface contamination limit for respiratory protection equipment is no detectable activity above the MDA (gross alpha or gross beta-gamma radioactivity).
- Step-off pad areas and non-contamination areas with removable surface contamination exceeding 200 dpm/100 cm^2 (gross alpha or gross beta-gamma

radioactivity) shall be investigated, which may include surveys and decontamination.

9.4 ALARA Goals, Investigation Levels, and Limits for Air Effluent and Environmental Air Monitoring

The following goals and limits, listed in the table below, shall apply at the site boundary and are average values for the year. The investigation levels are for individual sample results.

	Annual Average ALARA Goal		**Sample Investigation Level**		**Annual Average Limit**	
	Fractional	**(μCi/ml)**	**Fractional**	**(μCi/ml)**	**Fractional**	**(μCi/ml)**
Gross Alpha	0.2	1.0E-14	0.5	2.5E-14	1.0	5.0E-14
Gross Beta	0.2	4.0E-11	0.5	1.0E-10	1.0	2.0E-10

9.5 ALARA Goals, Investigation Levels and Limits for Liquid Effluents and Environmental Water Monitoring

The following goals and limits, listed in the table below, shall apply at site discharge locations and are average values for the year. The investigation levels are for individual sample results. If the Annual Average Limit is exceeded over a calendar quarter, then an evaluation will be conducted and corrective action, as necessary shall be taken.

	Annual Average ALARA Goal		**Sample Investigation Level**		**Annual Average Limit**	
	Fractional	**(μCi/ml)**	**Fractional**	**(μCi/ml)**	**Fractional**	**(μCi/ml)**
Gross Alpha	0.2	6.0E-8	0.5	1.5E-7	1.0	3.0E-7
Gross Beta	0.2	1.0E-6	0.5	2.5E-6	1.0	5.0E-6

10.0 OCCUPATIONAL EXPOSURE MONITORING PROGRAM

Occupational exposures shall be monitored when it is determined that a worker's dose is likely to exceed 10 percent of the annual limit. Radiological surveys, air sampling and experience with similar work activities may be used as the basis for this determination. In accordance with 10 CFR 20, TEDE for workers requiring monitoring for occupational exposures shall be calculated using a combination of external radiation exposure data, representative air sampling data, and/or bioassay measurement data. Individuals shall be provided with the results of occupational exposure monitoring upon request.

Radiation Workers who have received medical treatments with radioactive isotopes must notify the RSO. The RSO shall be provided with the specific isotope and quantity that was used for treatment or diagnosis.

10.1 External Exposure Determination

External exposure to radiation shall be monitored for declared pregnant workers likely to receive 100 mrem during the entire pregnancy and for individuals likely to receive 10 percent of the annual occupational dose limits specified in 10 CFR

20. When external exposure monitoring of individuals is required, dosimeters issued to individuals will be the primary means of determining the occupational exposure.

10.1.1 Dosimetry Devices

10.1.1.1 The type of primary dosimetry device used to measure external radiation may be a thermoluminescent dosimeter (TLD), or an optically stimulated luminescence dosimeter. Dosimeters will be processed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited dosimetry processor.

10.1.1.2 A secondary dosimetry device may also be issued to personnel if they are expected to receive more than 100 mrem of external exposure annually.

10.1.2 Extremity Dosimetry

For work situations in which extremity exposures are expected to be at least five times greater than whole body exposures or if extremity exposures are expected to exceed 1,250 mrem per calendar quarter, the RSO shall specify the type and placement of additional dosimetry devices for the extremities to measure and control extremity dose.

10.1.3 Monitoring for Skin Exposure

10.1.3.1 Dose to the skin of the whole body and the skin of the extremities shall normally be based on the SDE recorded by primary dosimetry.

10.1.3.2 When supplemental primary dosimetry is worn to determine the exposure to extremities, the dose to the skin of the extremity shall be based on supplemental dosimetry results.

10.1.3.3 A skin dose estimate may be performed if a skin contamination occurs. The RSO shall determine when a skin dose calculation is required.

10.2 Internal Exposure Determination

Internal exposure resulting from the intake of radioactive material shall be monitored for declared pregnant workers likely to receive 100 mrem during the entire pregnancy and for individuals likely to receive in excess of 10 percent of the applicable ALI. The primary method of calculating CEDE is by using breathing zone air sample results. A bioassay program shall be maintained for confirmation and evaluation of unplanned intakes.

The DAC shall be based on the values specified in 10 CFR 20, Appendix B, Table 1, Column 3. The DAC may be based on the most conservative radionuclide present or on a calculation weighting the radionuclides. In general, the DAC for alpha radioactivity is 2.0 E-11 μCi/ml based on uranium (Class Y), and 6.0 E-8 μCi/ml based on thorium-234 (Class Y) for beta radioactivity.

11.0 RADIOLOGICAL SURVEY PROGRAM

Radiation, surface contamination, and airborne radioactivity surveys are performed using instruments that have been calibrated for the radiation types and energies to be encountered. Routine surveys are performed to identify unanticipated changes in radiological conditions, and at the frequencies described in the implementing procedures for this RPP. Job-specific surveys are performed as necessary during the planning process and during the course of the work to confirm anticipated conditions and the adequacy of control measures. The frequencies for job-specific surveys are defined by the associated RWP.

11.1 Radiation Surveys

Radiation surveys are performed to determine the radiation levels within general work areas and at specific work locations to identify localized areas of elevated radiation levels, and to serve as a comparator when determining radiological posting and physical control requirements.

11.2 Contamination Surveys

Contamination surveys are performed to determine the level of total and removable radioactivity in the form of surface contamination. The level of total contamination is typically determined by direct measurement of the surface. The level of removable contamination is typically determined by wiping a defined surface area with an absorbent material and then analyzing the material to determine the amount of removed radioactivity per unit surface area. The results are used to define radiological posting requirements, establish effective radiological controls to prevent the spread of contamination, and prescribe the type of personal protective equipment required based on the type of work to be performed in the area.

11.3 Airborne Radioactivity Sampling

Air sampling will be performed during decommissioning activities likely to generate airborne radioactivity concentrations in excess of 2 percent of the occupational DAC value. Air sampling shall be performed using fixed location samplers, portable samplers, and/or personal (lapel) samplers. The type of air sample(s) collected for a specific work activity shall depend on the type, frequency, and duration of work being performed. Continuous Air Monitors with alarm capability will be used during work activities likely to generate airborne radioactivity concentrations exceeding five times the occupational DAC values as provided in 10 CFR 20, Appendix B, Table 1, Column3, and workers are likely to exceed 40 DAC-hrs in one day after credit is taken for respiratory protective devices.

Concentrations of airborne radioactive materials are measured within work areas where radioactive materials are handled and within adjacent areas to assess occupational exposure; and at locations that are representative of the concentrations released to the environment. The locations for these measurements are appropriate for the intended use of the data. The measurement results are used to define radiological posting requirements, appropriate

engineering controls and work practices, and to prescribe the requirements for respiratory protection equipment.

Personal air sampling (lapel sampler) may be performed and the data used as the basis for calculating internal exposure assigned to a group of radiation workers.

11.4 Personnel Contamination Surveys

Personnel contamination surveys are required of individuals upon exit from Contamination Areas or following work having the potential to result in the transfer of contamination to clothing or body surfaces, as directed by Health Physics. Project personnel are advised of the proper survey technique during Radiation Worker Training. Health Physics personnel shall be notified if detectable contamination is identified on clothing or skin.

12.0 INSTRUMENTATION PROGRAM

An adequate number of instruments of sufficient accuracy and sensitivity shall be available to ensure the radiation monitoring and measuring requirements of this radiation protection program are met. Instrument calibrations should be scheduled so that an adequate number of instruments are in service at any given time. The type of instrumentation needed to support decommissioning operations is provided in Table 1. Additions, deletions, or equivalent substitutions may occur at the discretion of the RSO.

Table 1. Health Physics Instrumentation

Type	Radiation Detected	Detection Method	Criteria
Criticality Accident Alarm System (CAAS) [a]	Gamma	Geiger-Mueller	In accordance with NRC Regulatory Guide 3.71
Laboratory Counter (automatic)	Alpha	Gas Flow Proportional	Nominal Eff. 25% (4π) Target MDA 10 dpm
	Beta		Nominal Eff. 30% (4π) Target MDA 200 dpm
Radiation Survey	Beta-Gamma	Ionization	Up to 5 rem/hr
	Beta-Gamma	Scintillation	Up to 5,000 μR/hr
	Neutron	BF_3	Up to 100 rem/hr
Contamination Survey	Beta-Gamma	Geiger-Mueller and Scintillation	Nominal Eff. 20% (4π) Target MDA 400 dpm (static) Min. Range- 0 – 60,000 cpm
	Alpha	Scintillation	Nominal Eff. 10% (4π), 20% (2π) Target MDA 200 dpm Min. Range- 0 – 100,000 cpm
BZ (Lapel) Air Sampler	N/A	N/A	Avg. > 2 l/min (0.1 cfm)
General Area Air Sampler	N/A	N/A	10-100 l/min (0.4-4 cfm)

Note (a) – The fixed location CAAS was removed from service in 2006 following the removal of the special nuclear material (SNM) inventory and majority of the processing equipment. Where required, a portable CAAS would be used.

12.1 Calibration of Instruments

Radiological monitoring instrumentation shall be tested, calibrated, and used in accordance with approved procedures. Calibration is typically performed by an off-site vendor. The calibration frequency shall be at least every 6 months. Calibration is also required after maintenance, repair, or adjustment likely to affect the primary calibration, or as recommended by the instrument manufacturer.

Air samplers used for quantitative measurements shall have a means to determine the volume of air sampled. Airflow meters for air samplers shall be calibrated as recommended by the manufacturer at intervals not exceeding 12 months. The calibration methods shall meet the requirements of NRC Regulatory Guide 8.25, Air Sampling in the Workplace (Reference 5.12).

12.2 Functional Tests

12.2.1 Portable instruments shall undergo a physical inspection, operational check, and source check daily or prior to use.

12.2.2 Laboratory radioactivity measuring instruments shall undergo an operational check, background count, and efficiency determination daily or prior to use and after gas change-outs.

12.2.3 Air samplers shall be flow tested with a calibrated standard before and after the sample is collected.

13.0 RADIATION PROTECTION WORK CONTROLS

13.1 Radiation Work Permits

Work activities performed inside Restricted Areas will be performed using an RWP. The purpose of an RWP is to ensure that effective radiological controls are in place for a given work activity in order to maintain occupational exposures ALARA. RWPs are prepared by HP Staff, and approved by the RSO.

RWPs describe the radiological hazard associated with work activities and include specific appropriate radiological controls such as personal protective equipment, radiological monitoring, dosimetry, respiratory, and ALARA considerations.

13.2 Respiratory Protection Program

The primary objective of the Respiratory Protection Program is to limit the inhalation of airborne radioactive material when the application of engineering or work controls are not practicable. Respiratory protection devices which have been tested and certified by the National Institute of Occupational Safety and Health shall be provided when it has been determined the use of respiratory protection devices is the best option for maintaining occupational exposures ALARA.

The use of respiratory protection equipment will be in accordance with written procedures and appropriate training as required by 10 CFR 20 Subpart H.

Pursuant to Subpart H of 10 CFR 20, credit for assigned protection factors shall be consistent with Appendix A of 10 CFR 20.

13.3 Posting and Labeling

Postings define boundaries that are based on known or anticipated radiological conditions. Each posting shall be prominently displayed and shall be recognizable from a safe distance from the hazard. Posting shall be modified to reflect changes in radiological conditions. Supplementary notices specifying additional requirements or information may be posted in conjunction with radiation warning signs and tags to provide personnel with any additional instructions or information not given by the signs and tags. Posting/Labeling will be performed in accordance with HDP-PR-HP-201 (Reference 5.20) implementing the requirements of 10 CFR 20 (Reference 5.4).

Informational notices required by 10 CFR 19 (Reference 5.3) shall be prominently displayed.

14.0 CONTAMINATION CONTROL

Radioactive contamination on surfaces (both fixed and removable) shall be controlled to prevent the inadvertent spread of contamination, to control airborne radioactivity, and to minimize external radiation exposures.

15.0 RADIOACTIVE MATERIALS CONTROL

15.1 Control of Radioactive Material

Radioactive material shall be controlled to minimize the exposure of personnel, potential impact to the public and environment, and to prevent the unauthorized use or theft of materials. Radioactive material shall be controlled by: personnel access control, material accountability, packaging, labeling and marking, receipt control, storage control, inventory, and/or proper disposal.

15.2 Non-Exempt Sealed Sources

The RSO shall have responsibility for the use of non-exempt sealed sources for training and instrument calibration. When not in use, non-exempt sealed sources shall be stored in a labeled container in a manner that prevents unauthorized removal or use. Radioactive sources shall be leak tested every six months. Leak test results shall be reported in units of microcuries (μCi). The leak test shall be capable of detecting the presence of 0.005 μCi of removable activity on the test sample. Any source with removable activity greater than the minimum detectable activity shall be immediately withdrawn from service and HP supervision notified.

15.3 Procurement of Radioactive Material

The procurement of any radioactive material, including sealed sources and instrument check sources, shall be according to program needs as determined by

the RSO. Procurement of radioactive material shall comply with regulatory requirements and site materials license limits.

15.4 Packaging and Transport of Radioactive Materials

Packaging and transport of radioactive materials shall be performed in accordance with the Waste Management and Transportation Plan and its implementing procedures.

16.0 WASTE MANAGEMENT

16.1 Radioactive waste streams generated as a result of decommissioning activities will be characterized to determine packaging and disposal requirements.

16.2 Licensed radioactive material intended for transport shall be packaged, labeled, and surveyed in accordance with 10 CFR 71 (Reference 5.8) and 49 CFR (Reference 5.9). Prior to shipment of licensed materials, the shipper shall obtain confirmation that the receiver is licensed to receive the type, quantity, and form of radioactive materials contained in the shipment.

16.3 Radioactive waste stored on site must be in compliance with controls as set forth in criticality safety analyses and evaluations.

16.4 Radioactive waste should be minimized by using methods such as:

- Preventing excess materials from entering Restricted Areas or Contamination Areas;
- Decontaminating and reusing materials when applicable;
- Segregating non-radioactive materials prior to disposal; and
- Proper planning to minimize the number of entries into contamination areas.

16.5 Surveys of Packages Prepared for Shipment

Packages shall not be released for shipment or transferred to other licensees unless the external radiation and surface contamination levels meet the limits set by the U.S. Department of Transportation in 49 CFR.

All personnel involved in handling, packaging, and shipping radioactive material shall be trained commensurate with their responsibilities in accordance with 49 CFR 172, Subpart H.

17.0 EFFLUENT AND ENVIRONMENTAL MONITORING AND CONTROL PROGRAM

In accordance with SNM-33 (Reference 5.1), every reasonable effort shall be made to ensure that the concentrations of air and liquid effluents are minimized in a manner that is consistent with ALARA and below the license limits. Environmental monitoring shall be performed for air, soil, sediment, vegetation, ground water, surface water, and direct exposure as specified in SNM-33. HDP Policy HDP-PO-EM-001, Effluent and Environmental Monitoring Plan (Reference 5.13), implements the requirements of SNM-

33, Operating Permit No. MO-0000761 (Reference 5.15), and Applicable or Relevant and Appropriate Requirements determination MO-ARAR013 (Reference 5.16). References 5.15 and 5.16 are issued by the Missouri Department of Natural Resources and contain monitoring requirements for radioactivity and other parameters in liquid effluents.

18.0 DECOMMISSIONING SURVEY PROGRAM

Surveys performed to demonstrate that the site meets the criteria for license termination and release for unrestricted use will be in accordance with the requirements of an approved Decommissioning Plan. Instrumentation use and survey techniques will be in accordance with approved training and procedures.

19.0 AUDITS AND INSPECTIONS

19.1 Audit Program

19.1.1 The Project Oversight Committee (POC) shall ensure that appropriate measures are taken to maintain radiation exposures ALARA through administrative and procedural controls in addition to the design and control of radiological facilities and equipment. An annual review of the Radiation Protection Program shall be conducted by the POC to monitor the effectiveness of the program. Areas reviewed may include the following:

- Industrial safety trends
- Radiation safety trends
- Environmental protection trends
- Criticality safety practices
- Adequacy of emergency planning and drills
- Effectiveness of ALARA Program
- Effectiveness of Waste Minimization Program
- Abnormal occurrences and accidents

19.1.2 RSO Reports

The RSO, with assistance from the EH&S Manager, shall make a written annual report to the POC and executive management having responsibility for the license. This report shall include a review of employee exposures, effluent release data, audits, inspections, and radiological measurements performed during the past calendar year with emphasis on the data collected from the following areas: bioassay results and environmental monitoring. Reportable incidents, as listed in 10 CFR 20 Subpart M, should also be identified in the report.

The RSO, with assistance from the EH&S Manager, shall issue a written report to the Project Director every six months providing occupational radiation exposure (internal and external) and effluent release data. The report shall identify trends in the reported data to reveal: (1) areas where exposures and releases can be lowered consistent with ALARA principles;

and (2) potential problems involving personnel exposure, effluent release, or equipment for measuring effluents and exposures.

The RSO may fulfill the requirement for one of the semi-annual reports to the Project Director and the POC with a single report submitted to both parties.

19.1.3 A comprehensive annual audit of the Radiation Protection Program, including ALARA and the respiratory protection program, shall be performed to meet the requirement of 10 CFR 20.1101 (c). The audit shall be by personnel other than the HP Staff. Members of the audit team should be knowledgeable in the functional areas of radiation protection and ALARA.

20.0 RADIOLOGICAL OCCURRENCE REPORTING

Radiological incidents, events or occurrences that are in violation or non-conformance with federal, state or HDP guidance and regulations governing the safe use, storage, and handling of radioactive materials, or result in a condition adverse to radiological safety shall be identified, documented, analyzed, and corrected in accordance with HDP-PR-QA-020 (Reference 5.17), HDP Corrective Actions Process (CAPS).

21.0 RECORDS MANAGEMENT

The RSO shall ensure the generation and retention of records that document the implementation of this plan. The records will demonstrate control of radiation, contamination, airborne radioactivity, and radioactive materials as well as worker dose associated with occupational exposure to these items. Records consist of surveys, sample results, vendor provided reports, technical basis documents, and other written or electronic records as determined by Quality Assurance requirements. Records shall be complete, accurate, legible, and retained in a uniform manner. HP Staff reviews required by any HDP document may be conducted by any member of HP Staff.

Records shall be maintained in accordance with 10 CFR 20 requirements and HDP-PR-QA-009, Records Management (Reference 5.7), and retained for whichever of the following periods is longer: 3 years, until the materials license is terminated, or the retention period identified in Appendix B. Appendix B was derived from the American Nuclear Insurers Information Bulleting 80-1A (Reference 5.14). These record retention requirements apply to records whether they are in electronic or paper form.

The transfer/disposal of radioactive material to another organization shall be documented via an appropriate method, such as Chain of Custody form, shipping manifest, or Certificate of Disposal.

22.0 REGULATORY NOTIFICATIONS AND REPORTS

The RSO, Licensing Manager, or Project Director shall notify the NRC of events as required by 10 CFR 20 and HDP-PR-LI-001, Regulatory Reporting (Reference 5.18).

23.0 EMERGENCY RESPONSE

For emergencies where radioactive materials may be involved, consideration shall be given to exposure to radioactive materials and ionizing radiation in addition to the other hazards present. The Project Director, RSO, and EH&S Manager shall be notified of any spills or unplanned releases. Emergency response actions shall be performed pursuant to the Emergency Action Plan (Reference 5.11).

24.0 FORMS

HDP-PO-HP-100-1 ALARA Suggestion Form

25.0 APPENDICES

Appendix A: Surface Contamination Limits

Appendix B: Records Retention Requirements

FORM HDP-PO-HP-100-1
ALARA SUGGESTION FORM

Name: _____ **Date:** _____

Suggestion: _____

_____

_____

_____

_____

_____

_____

_____

_____

Approve for Implementation ☐ **Disapprove for Implementation** ☐

RSO: _____/_____

Signature Date

Comments: _____

_____

_____

_____

_____

_____

Quality Record

APPENDIX A

SURFACE CONTAMINATION LIMITS

NUCLIDES[a]	AVERAGE[b,c,f]	MAXIMUM[b,d,f]	REMOVABLE[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000 dpm β-γ/100 cm^2	15,000 dpm β-γ/100 cm^2	1,000 dpm β-γ/100 cm^2

[a] Where surface contamination by both alpha and beta-gamma-emitting nuclides exist, the limits established for alpha and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination of objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

APPENDIX B
RECORDS RETENTION REQUIREMENTS

(Based on American Nuclear Insurers Bulletin 80-1A, "*Nuclear Liability Insurance Records Retention*," Revision 6, December 2005)

Category of Documents	Types of Records	Retention Requirement
Employment Records - For Persons Entering Radiologically Controlled Areas (e.g., Radiation Areas, Contamination Areas, Restricted Areas, but not Controlled Areas)	Employment application and resume (if available)[a]	Retain until notified that one year has passed from the termination date of the ANI Worker Certificate (NW-0519 for HDP) to the Master Work Policy.
	Pre-Employment and periodic medical examination reports[a,b]	
	Respirator use physical examination reports (if applicable)[a]	
	Internal exposure records including baseline, routine, special and termination in vivo and in vitro results, as applicable	
	NRC Form 4 or equivalent	
	NRC Form 5 or equivalent	
Training and Retraining Records	**Company Employees and Contractors**	
	Instructor manuals, topical outlines, syllabi, and lesson plans[c]	
	Video, audio, and computer based instruction materials (document dates used)	
	Handouts[c]	
	Tests, test results, answer sheets, and acknowledgement of training (including control of pre-natal radiation exposure and exam review)	
	Attendance sheets with attendees' signatures	
	Special training, including instructor manuals, tests, instructor evaluations and acknowledgement of training (e.g., mockup, doffing/donning, and frisking)	
	Visitors and Escorts	
	Special Instructions given to such persons	
	A procedure or program for presenting the instructions	
Radiological Surveys (These surveys should be recorded on standard forms that include results, location, date, time, technician signature, instrument serial number, reference to work control document if appropriate)	Radiation Surveys	
	Air Sampling Surveys	
	Contamination Surveys	
Work Control Documents (The documents should identify the specific location of the work, the names of involved personnel, radiological conditions and precautions, and effective dates)	Radiation Work Permits	
	Work Orders/Work Authorizing Documents	

APPENDIX B
RECORDS RETENTION REQUIREMENTS

(Based on American Nuclear Insurers Bulletin 80-1A, "*Nuclear Liability Insurance Records Retention*," Revision 6, December 2005)

Category of Documents	Types of Records	Retention Requirement
Instrumentation Calibration Records (These records should include the technician's name, date, source identification, and results.)	Procedures for calibration and periodic operational check for fixed, portable and laboratory radiation measuring equipment	Items 1-11: Retain until notified that one year has passed from the termination date of the ANI Worker Certificate (NW-0519 for HDP) to the Master Work Policy. Items 12-14: Retain until notified that 10 years have passed from the termination date of the ANI Facility Form Policy (NF-0052 for HDP).
	Calibration records for the following instruments and any additional checks or tests associated with a suspected or alleged overexposure or unusual occurrence. . 1) Portable survey instruments 2) Bioassay measurement, including in vivo counters and excreta analyses 3) Dosimetry equipment and associated Dosimetry Laboratory Accreditation Program certifications 4) Laboratory, count room, and fixed radiation measuring equipment 5) Radiation area monitors 6) Meteorological monitoring equipment 7) Portal monitors and other personnel contamination monitors 8) Self-reading dosimeters, including PICs and electronic dosimeters 9) Air sampling equipment 10) Air sampling equipment 11) Protective clothing scanners and monitors 12) Process and effluent monitors and/or sampling equipment 13) Environmental monitoring and/or sampling equipment, including environmental TLDs 14) Tool and waste monitoring equipment	
Policies and Procedures	Standard operating procedures, manuals, implementation procedures, and subsequent revisions	Retain until notified that one year has passed from the termination date of the ANI Worker Certificate (NW-0519 for HDP) to the Master Work Policy.
Personnel Exposure Records	**External Exposures**	
	Exposure records determined from radiation area survey, various types of dosimeters, including backup, multiple and extremity dosimetry results, and their serial numbers	
	Evaluations resulting from anomalous exposure indications	
	Evaluations of skin dose from hot particles (include nuclide identification) or radioactive contamination	
	Internal Exposures	
	Assignment of quantitative exposure as appropriate	
	Nasal blow results	
	In vitro and in vivo results	
	Air sampling results	

APPENDIX B
RECORDS RETENTION REQUIREMENTS
(Based on American Nuclear Insurers Bulletin 80-1A, "*Nuclear Liability Insurance Records Retention*," Revision 6, December 2005)

Category of Documents	Types of Records	Retention Requirement
Personnel Exposure Records (Continued)	Determination of CDE, CEDE, Total Organ Dose Equivalent, and ALI	Retain until notified that one year has passed from the termination date of the ANI Worker Certificate (NW-0519 for HDP) to the Master Work Policy.
	Documentation by employees of current use of radiopharmaceuticals	
	Waivers of requirements for whole body counting	
	TEDE	
	Determination of H_D, H_E, Skin Dose Equivalent, Lens Dose Equivalent, and TEDE	
	Evaluations of TEDE ALARA for the possible use of respirators	
	Approvals for exceeding administrative limits	
	Declarations and un-declarations of pregnancy by Radiation Workers	
	Technical Overexposures and other Significant Radiological Incidents	
	Documented overexposures including names involved and of those conducting the investigation	
	Interviews with employees involved or with other employees containing an abstract of the interview and should be signed and dated by the parties present	
	Determination of root cause and corrective action to prevent recurrence	
	All data, information and supporting documents	
	Respiratory Protection	
	Records of initial and periodic quantitative respirator fit tests	
	Respirator use information, when available, including type, identification number and wearer's name and RWP number under which the respirator is used	
	Repair and maintenance history of respirators	
	Planned Special Exposure Required Records	
	Any records associated with Planned Special Exposures	
Exposure Monitoring Policy	Records when dosimetry is issued to visitors	
	Procedures governing exceptions from dosimetry should exist and documentation recorded and retained when these exceptions are used.	
Environmental and Effluent Measurements	Pre-operational environmental monitoring sample results and reports	Retain until notified that 10 years have passed from the termination date of the ANI Facility Form Policy (NF-0052 for HDP).
	Radiological environmental monitoring sample results and reports	
	Radiological effluent release reports (NRC Regulatory Guide 1.21)	
	Liquid and gaseous effluent release sample results	
	Liquid and gaseous effluent discharge permits	

APPENDIX B
RECORDS RETENTION REQUIREMENTS
(Based on American Nuclear Insurers Bulletin 80-1A, "*Nuclear Liability Insurance Records Retention*," Revision 6, December 2005)

Category of Documents	Types of Records	Retention Requirement
Environmental and Effluent Measurements (Continued)	Inter-laboratory comparison reports	Retain until notified that 10 years have passed from the termination date of the ANI Facility Form Policy (NF-0052 for HDP).
	Meteorological joint frequency distribution data to support environmental effluent monitoring measurements	
	On-site contamination or spills (e.g., records to meet 10 CFR 50.75(g))	
	Liquid and sludge discharges from sewage treatment facilities	
	Materials released for burial at landfills	
Radioactive Material/Radioactive Waste Shipments and Disposal	Surveys of transport vehicles and their loads	
	Shipment records for radioactive material/waste transported offsite, including radionuclides, activity and classification	
	Onsite disposal of licensed material 1) Application and approval for onsite disposal 2) Description of materials including date, radionuclides and activity 3) Periodic environmental surveys if required	
Release of Potentially Contaminated Materials	Procedures and records for survey and release of potentially contaminated materials	
Miscellaneous Records	Records of radiological engineering and exposure optimization reviews	Retain until notified that one year has passed from the termination date of the ANI Worker Certificate (NW-0519 for HDP) to the Master Work Policy.
	Records of ALARA job reviews and pre-job briefings; ALARA Committee meeting minutes	
	The minutes of meetings of committees specified in the license	
	Records of radiological and environmental comparative data analysis and trend analysis	
	HP logs containing radiological survey information, contamination events, radiological incidents, release information, radiation monitor information, event descriptions, etc.	
	Quality assurance audits and/or NVLAP audits of TLD vendors	

[a]Not required for Visitors and escorted personnel
[b]Not required for Contractor Employees
[c]Treat as controlled documents