Denison Mines Corp.
Wheeler River Operation

Radiation Protection Program

Document # 11

Version 1

September 2023

Approval for Use

Version	Date	Description of Activities	Author	Reviewer	Approver
Version 1	15-Sept-2023	Draft for CNSC Review			

Revision History

Version	Date	Description of Revision
Version 1	15-Sept-2023	Draft for CNSC Review

Table of Contents

Figures

1 Introduction

The *Radiation Protection Program* (the Program) is one of twelve Program documents that comprise the Management System for the Wheeler River Operation (the Operation). The *Radiation Protection Program* is preceded by the *Management System Program* within the document framework for the operation as shown in Figure 1. Consistent with all other Program documents, the *Radiation Protection Program* is organized according to the 'Plan-Do-Check-Act' iterative process to incorporate continual improvement in all stages of the Program.

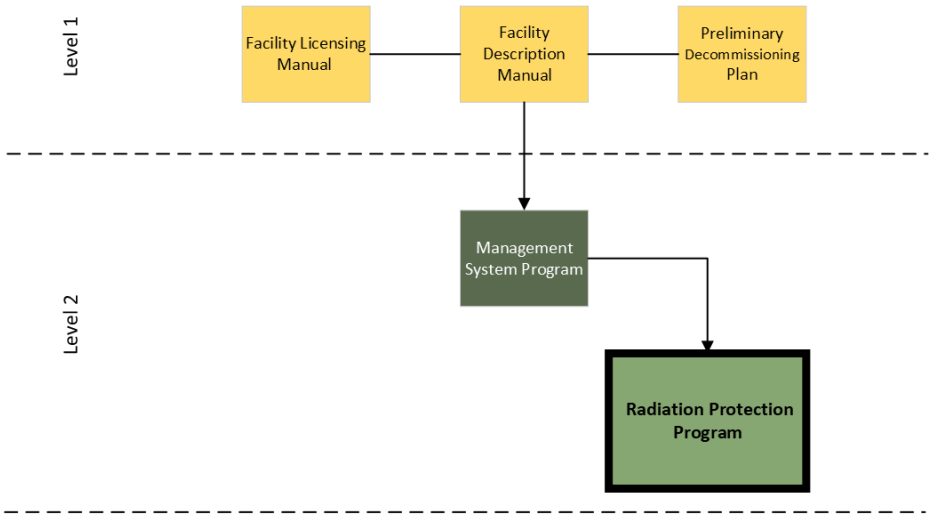

Figure 1: Program shown within Document Framework for the Wheeler River Operation

The *Radiation Protection Program* uses a risk-based approach to identify radiation protection measures, which are informed by and commensurate with the risk arising from potential radiation exposures related to the Operation, both in the workplace and in the environment.

1.1 Purpose

This Program defines the requirements, principles, and framework to promote radiation safety and effectively manage radiation risks of workers, the public, and the environment.

The Program is used to integrate Denison's radiation protection measures into a documented, managed, and auditable process. Key approaches include:

- Identifying, mitigating, and managing radiation risks;
- Identifying, implementing, and maintaining controls on radiation exposure;
- Keeping exposures in the workplace and the environment as low as reasonably achievable (ALARA) considering social and economic factors;
- Ensuring that workers have the necessary tools, qualifications and training to perform their work safely in a manner that protects the environment; and
- Maintaining a safety culture focused on continual improvement .

1.2 Scope

The *Radiation Protection Program* outlines approaches to protecting workers and members of the public from radiation effects, through managing radiation exposure and dose in the workplace, controlling radioactive contamination in the workplace, and controlling releases of radioactivity to the environment.

Environmental aspects of radiation protection, including monitoring and control of radioactive releases to the environment, monitoring of radioactivity in the environment, and assessment of public dose, are managed under the *Environmental Management Program*. Emergency preparedness and response aspects of radiation protection are managed under the *Emergency Management Program* and *Fire Protection Program*. Training aspects of radiation protection are managed under the *Training Management Program*.

1.3 Program Principles and Denison's Environment, Health, Safety & Sustainability Policy

Denison's commitment to radiation protection is communicated in its corporate Environment, Health, Safety & Sustainability Policy, applicable to all its facilities. The *Radiation Protection Program* is based on the principles outlined in that policy, and can be found in the *Management System Program* as well as at the following website:

https://denisonmines.com/about-us/corporate-governance/corporate-policies/

The Radiation Protection Program defines the requirements, principles, and framework to promote radiation safety and effectively manage radiation risks of workers, the public, and the environment.

Key principles of the Program include:

- A risk-based approach, which involves understanding the radiation risks related to Operation activities, and directing risk management effort where it is most needed to protect workers, the public and the environment; and
- The principle of keeping radiation exposures both within regulatory limits, and as low as reasonably achievable (ALARA), considering social and economic factors.

1.4 Compliance with Regulatory Requirements

This Program is compliant with the *Nuclear Safety and Control Act* and associated regulations, including the *General Nuclear Safety and Control Regulation),* the *Uranium Mines and Mills Regulations*, and the *Radiation Protection Regulations.* The Program also follows guidance and requirements in the Canadian Nuclear Safety Commission (CNSC) REGDOC 2.7.1, *Radiation Protection.*

Additionally, the Program meets provincial requirements including the *Occupational Health and Safety Regulations.*

1.5 Terminology

A list of common terms applicable to this Program and the *Management System Program* is available in the *Wheeler River Project Glossary*.

1.5.1 Definitions

Term	Definition
As low as reasonably achievable (ALARA)	A principle of radiation protection that holds that exposures to radiation are kept as low as reasonably achievable, social and economic factors taken into account. Section 4 of the *Radiation Protection Regulations* stipulates licensee requirements with respect to ALARA.
Dose limit	A maximum allowable radiation dose (effective dose or equivalent dose), as specified in the Radiation Protection Regulations, which are in place to minimize the risk of adverse health effects due to radiation exposure.
Dosimetry service	A prescribed facility for the measurement and monitoring of doses of radiation.
Effective dose	The sum of the products, in sievert, obtained by multiplying the equivalent dose of radiation received by and committed to each organ or tissue by the weighting factor of that item.
Equivalent dose	The product, in sievert, obtained by multiplying the absorbed dose of radiation of a given type by the weighting factor for that radiation type.
Nuclear energy worker	A person who is required, in the course of the person's business or occupation in connection with a nuclear substance or nuclear facility, to perform duties in such circumstances that there is a reasonable probability that the person may receive a dose of radiation that is greater than the prescribed limit for the general public.

1.5.2 Acronyms and Abbreviations

Acronym or Abbreviation	Term
ALARA	As low as reasonably achievable
EIS	Environmental Impact Statement
LLRD	Long lived radioactive dust
LRWS	Saskatchewan Ministry of Labour Relations and Workplace Safety
NEW	Nuclear Energy Worker
PPE	Personal protective equipment
RSO	Radiation safety officer

2 Plan

2.1 Risk Management

Under the *Radiation Protection Program*, a risk management process is applied to protect workers, the public and the environment. The risk management process includes identification of potential radiological hazards, risk assessment of those hazards, and implementation of relevant radiation control measures to reduce the risks, where necessary.

2.1.1 Hazard Identification

This section outlines the types of radiation hazards associated with the Operation, including the radiation sources and the key exposure pathways. Hazard identification is the first step in risk assessment for a particular work activity or exposure situation.

The radiation hazards associated with the Operation include:

- External gamma radiation, received while in proximity to radioactive sources;
- Long-lived radioactive dust (LLRD) (ore dust or uranium concentrates dust); and
- Radon (Rn-222) and short-lived progeny (Po-218, Pb-214, Bi-214, Po-214).

Hazards anticipated relevant work areas are discussed further in the *Radiation Protection Plan*.

2.1.2 Risk Assessment

Risk assessment provides a basis for development of appropriate controls on radiation exposure of workers. The risk assessment process includes consideration of the anticipated hazards and exposure situations, estimating the magnitude, frequency, and duration of radiation exposures, and evaluating the need for exposure controls, as appropriate to the situation.

Estimation of radiation exposures involves prediction of radiation dose rates from identified sources, and of airborne concentrations of LLRD and radon and progeny, as appropriate to the situation, and calculation of resulting worker doses. Calculated doses are compared to action levels and administrative levels.

2.1.3 Managing to Control Risk

Radiation exposure controls are selected, as appropriate, based on results of risk assessment. Monitoring is used to confirm the actual levels of exposure and dose when the work is performed. If exposures are higher than anticipated, plans for additional controls may be implemented to ensure that radiation safety is not compromised.

This planning to assess and control risk applies to both routine and non-routine (unusual) exposure situations. For routine situations, the resulting monitoring and controls are built into standard operating procedures. For unusual exposure situations, the assessment and control will occur through a radiation work permit. This work permit process is detailed in the *ALARA Plan*.

Approaches to monitoring and exposure control are described in Sections 3.1 and 3.2.

2.1.4 Risk Register

Denison uses a risk register to proactively identify and address significant radiation protection risk aspects, prioritize resources, and continuously improve its radiation management practices. The risk register is a central repository for recording and tracking information related to the significant training aspects.

Anticipated radiation hazards, worker doses and controls as described by work area in the Environmental Impact Statement (EIS) will be documented in the risk register, and information will be updated on an ongoing basis as the Operation advances. For unusual exposure situations, the same information, developed through the work permit process, will be added to the risk register.

Further details on the risk register are provided in the *Management System Program*.

2.1.5 Worker Classification

Workers are classified as Nuclear Energy Workers (NEWS) or non-NEWs, based on risk assessment of their job category. Workers who have a reasonable likelihood of exceeding an effective dose of 1 mSv/y are classified as NEWs, and are subject to personal dose monitoring, reporting and information requirements under the *Radiation Protection Regulations.* Workers who do not work in radiation areas, or whose activities in these areas are controlled such that they are highly unlikely to exceed 1 mSv/y, are classified as non-NEWs, and while they are still monitored, they are not subject to the same requirements.

The dose monitoring, reporting and information requirements pertaining to NEWs include:

- Dose monitoring by a licensed dosimetry service, if they have a reasonable probability of receiving an effective dose above 5 mSv/y, or an equivalent dose to the skin above 50 mSv/y;
- Licensee reporting of NEW dose and personal information to the National Dose Registry; and
- information about radiation risks, dose limits, and rights of pregnant or breastfeeding workers, as per the *Regulations,* provided in writing to NEWs, and acknowledged in writing by NEWs.

Dose limits for NEWs under the *Radiation Protection Regulations* are:

- Effective dose: 50 mSv/y and 100 mSv/5y; 4 mSv for balance of pregnancy for NEWs who are pregnant or breastfeeding, after they have informed the licensee in writing (y=dosimetry year);
- Equivalent dose: 500 mSv/y to skin or to hands and feet, 50 mSv/y to eye lens (y=dosimetry year); and
- Dose limits for specific emergency control actions as per the *Regulations*.

Dose limits for non-NEWs under the *Radiation Protection Regulations* are:

- Effective dose: 1 mSv/y (y=calendar year); and
- Equivalent dose: 50 mSv/y to skin or to hands and feet, 15 mSv/y to eye lens (y=calendar year).

2.2 Objectives and Targets

Objectives and targets of this Program will be measurable, documented, and tracked. Performance against the objectives and targets will be communicated at regular intervals (i.e., during Management Review), and opportunities for continual improvement will be identified.

The objectives of the Radiation Protection Program are to:

- Protect people and the environment from harm due to radiation exposure; and
- Keep radiation exposures to workers and members of the public as low as reasonably achievable (ALARA), considering social and economic factors.

The targets of the Radiation Protection Program are to:

- Keep radiation doses in the workplace below regulatory limits and action levels;
- Keep releases of radioactivity to the environment below action levels (see *Environmental Management Program*);
- Keep radiation and radioactivity exposures in the workplace generally below administrative levels, and decreasing or not increasing over the long term;
- Keep releases of radioactivity to the environment generally below administrative levels, and decreasing or not increasing over the long term (see *Environmental Management Program*); and
- Keep the frequency of nonconformity with radiation protection processes and standards at a low level, and decreasing or not increasing over the long term.

The process for setting overall objectives and targets is outlined in the *Management System Program* and supporting procedure.

2.3 Supporting Plans

There are a number of supporting Plans under the Radiation Protection Program, including the *Radiation Protection Plan*, the *ALARA Plan*, and the *Radiation Protection Code of Practice*. Their scope is outlined below.

2.3.1 Radiation Protection Plan

The *Radiation Protection Plan* presents details on implementation of the Radiation Protection Program, with specific reference to Operation work areas and their hazards, area and worker monitoring requirements, equipment used, and processes followed.

2.3.2 ALARA Plan

The *ALARA Plan* describes the process for ensuring that radiation exposures in the workplace are as low as reasonably achievable, considering social and economic factors. The process involves an optimized selection of controls on exposure, which may in turn affect administrative and action levels.

2.3.3 Radiation Code of Practice

The *Radiation Code of Practice* describes the administrative and action levels that will be in place, and actions that will be undertaken when these levels are exceeded, in order to control workplace exposures.

2.4 Resources

Denison is committed to providing the necessary resources to support effective development, implementation, maintenance, and continual improvement of the Program, including achievement of its objectives and targets.

2.4.1 Roles and Responsibilities

This subsection outlines the specific roles and responsibilities within the Program, including Radiation Safety Officer (RSO), Radiation Protection Technicians, and other workers at various levels of responsibility.

For effective implementation of this Program, workers are informed of their roles and responsibilities and are accountable for comprehending and performing them. Executive and Leadership level roles and responsibilities are included in the *Management System Program*.

Radiation Safety Officer (RSO)

- Managing and monitoring effectiveness of the Radiation Protection Program;
- Ensuring compliance with radiation protection regulations and licence conditions;
- Identifying radiation protection problems and recommending corrective actions;
- Ensuring adequate training for radiation protection technicians and all workers;
- Ensuring that action levels and administrative levels are appropriate;
- Maintaining radiation protection documents and records;
- Ensuring radiation protection equipment is maintained;
- Tracking worker exposures and doses to ensure that they are ALARA;
- Reporting worker exposures and doses as required by regulation;
- Identifying radiation incidents and deviations, and recommending corrective actions;
- Reviewing and approving radiation work permits;
- Participating in the management review process; and
- Identifying and recommending opportunities for improvement.

Radiation Protection Technicians

- Performing radiation protection monitoring activities as directed by the RSO;
- Performing inspections and internal audits as directed by the RSO;
- Maintaining radiation protection equipment as directed by the RSO;
- Reporting any radiation protection incidents, deviations or near misses;

Other Workers (NEWs and non-NEWs)

- Performing duties safely with attention to approved radiation protection procedures;
- Reporting any radiation protection incidents, deviations or near misses.

2.4.2 Facilities and Equipment

Facilities and equipment to support the effective implementation of the Program and its related practices are provided to Program staff and applicable workers.

Facility design has incorporated features intended to reduce radiation exposure, including separate work areas with their own ventilation, negative pressure enclosure of dust-generating equipment, and shielding materials in tanks and piping.

Equipment for measuring radiation exposure, and procedures for use and maintenance of such equipment, are important in control of exposure. In addition, personal protective equipment, such as respirators, will be available for unusual situations that may require additional exposure control.

Monitoring and control of radiation exposure are described in Section 3.1 and 3.2.

2.4.3 Legal and Other

Denison is committed to complying with all applicable legal and other requirements related to radiation protection. Examples of types of legal requirements applicable to the Operation include:

- Federal and provincial acts and regulations;
- Environmental Assessment commitments and follow-up monitoring; and
- Licensing obligations and commitments.

The process for managing legal and other requirements is outlined in the *Management System Program*. Denison has established procedures to ensure compliance with these requirements and that compliance obligations are regularly reviewed. Any changes relevant to radiation protection compliance obligations are monitored and evaluated to determine if updates to the *Radiation Protection Program* and its supporting Plans, Procedures, and Work Instructions are required.

2.5 Training and Competence

A systematic approach to training (SAT) is used to educate, train, and qualify workers and contractors to perform assigned work. Training requirements are monitored to verify workers have necessary training when needed to maintain competency and work safely.

Records of training activities and competencies will be maintained as outlined in the *Training Management Program*.

2.5.1 Program-specific Qualifications

This section describes the required qualifications for specific roles within the Radiation Protection Program, as defined in section 2.4.1. Required qualifications for the Radiation Safety Officer and Radiation Protection Technicians are as follows:

<u>Radiation Safety Officer</u>

- Minimum 2 years of related experience working in a uranium mine and mill or Class I nuclear facility or determined equivalent experience.

<u>Radiation Protection Technicians</u>

- Technical certification in radiation protection, or related field; or

- Successful completion of in-house training, and certification by an RSO.

2.5.2 Program-specific Training

Using the systematic approach to training, as outlined in the *Training Management Program,* Denison will ensure competency of radiation safety workers with respect to radiation protection, and ensure that all workers subject to occupational exposure have sufficient knowledge of radiation safety to perform their duties safely. The RSO will develop in-house training programs and materials for radiation protection staff, will present training courses, and will certify competence of staff, to ensure that all are competent to perform their duties related to radiation protection.

2.6 Documentation and Records Management

Denison will establish and maintain documented Plans, Procedures and Work Instructions to ensure effective implementation of the Program. Documentation will be controlled, reviewed, and updated as necessary in accordance with the requirements in the *Management System Program*.

Documents and records will be generated as a result of implementation of the Program and completion of licensed activities. Examples of some records generated specific to the Program may include:

- Radiation protection procedures and work instructions;
- Area monitoring results for specific work areas, as appropriate to identified hazards;
- Dosimetry records for individual workers (NEWs and non-NEWs);
- Documented hazard analyses and risk assessments;
- Radiation work permits;
- Completed inspection forms;
- Equipment inventories; and
- Equipment maintenance and calibration records.

Documents and records are readily accessible to those who require them. Dosimetry records are considered personal health information and managed in accordance with privacy legislation. Doses to NEWs will be reported to Health Canada's National Dose Registry.

Further information on documentation and records management is provided in the *Management System Program.*

2.7 Communication

Communication both with internal and external stakeholders is a critical element of the Program to promote a safe work culture that fosters radiation protection. Relevant information to inform workers of radiation protection duties, and any changes to personnel, processes, facilities, or equipment will be shared. Workers can also communicate radiation safety concerns to the RSO.

Communication principles and processes are further outlined in the *Management System Program,* and communication with indigenous communities, local communities, and the public is managed as outlined in the *Public and Indigenous Information Program.*

2.8 Change Management

Change is managed at the Operation to protect workers, the environment, and property, and to ensure that regulatory requirements are met. The Operation's change management process is outlined in the *Management System Program.*

Examples of changes captured by the process could include, but is not limited to changes to the:

- Radiation Protection Program and supporting plans, procedures, and work instructions;
- Structures, systems, and components;
- Regulatory requirements related to radiation protection;
- Emerging risks to workers; and
- Organizational changes.

2.9 Radioactive Releases

Emissions of uranium dust from the ISR Plant will be controlled by use of Venturi scrubbers in the stacks. Radon and short-lived progeny will be largely removed from uranium bearing solution at the wellfield and will be discharged through a stack on the recovered solution tank. The effectiveness of control on emissions will be verified by particulate monitoring around the ISR Plant, and monitoring of radon and progeny around the recovered solution tank. Details are described in the *Environmental Management Program* and supporting plans.

An industrial wastewater treatment plant will control discharge of radionuclides to receiving water. The effectiveness of control will be verified by monitoring of treated effluent as well as receiving water. Details are described in the *Environmental Management Program* and supporting plans.

Any potentially contaminated materials leaving the site will be checked and cleared for off-site release. The clearance process is described further in Section 3.2.7.

2.10 Emergency Preparedness and Response

Denison is committed to establishing, implementing, and maintaining a process to prepare for and respond to potential emergency situations.

The Wheeler River Operation prepares for potential emergency situations by anticipating radiological hazards, planning to monitor radiological impacts while restoring control, and planning to manage doses to emergency responders within emergency dose limits.

Denison's overall process for emergency management is outlined in the *Emergency Management Program* and *Fire Protection Program*.

3 Do

3.1 Monitoring of Worker Exposure

The monitoring of worker exposure under the *Radiation Protection Program*, includes monitoring of radiation exposure, worker dose, surface contamination, and bioassay monitoring (uranium in urine).

3.1.1 Radiation Exposure Monitoring

The type of exposure monitoring to be performed will be defined for each job category as appropriate to their identified hazards and risk assessments (exposure estimates). Exposure monitoring may include measurement of radon gas and radon progeny, LLRD, and gamma radiation in the work area. Results are compared to administrative levels. Monitoring equipment may include real-time warning systems, such as continuous air monitors and direct-reading dosimeters, enabling workers to respond to changing conditions to minimize exposure.

Types of monitoring by work area are discussed further in the *Radiation Protection Plan*. Work instructions on the type of monitoring to be conducted in each work area, and the methods, locations, and frequencies for that monitoring, are described in the *Radiation Exposure Monitoring Procedure*.

3.1.2 Worker Dose Monitoring

The type of dose monitoring to be performed will be defined for each job category as appropriate to their identified hazards and risk assessments. A licensed dosimetry service will be used to measure and monitor doses for all NEWs who have a reasonable probability of receiving an effective dose above 5 mSv/year, or an equivalent dose to skin, or to hands and feet, above 50 mSv/year. Doses for all workers will be recorded. Doses for all NEWs requiring licensed dosimetry will be reported to the National Dose Registry. Doses for individual workers will be compared to administrative levels and action levels, outlined in the *Radiation Code of Practice*.

Work instructions on the process for calculation and recording of individual worker doses over time, based on the relevant exposure measurements, are described in the *Worker Dose Calculation and Reporting Procedure*.

3.1.3 Contamination Monitoring

Surface contamination monitoring will be performed as appropriate for each contamination zone, including swipe tests for removable contamination, monitoring with a meter and pancake detector for total surface contamination, and calculation of fixed surface contamination. Results will be compared with administrative levels designed to keep clean areas from being impacted by contamination transport from other areas.

Contamination zones are described further in the *Radiation Protection Plan*. Work instructions on the contamination zones, and the methods, locations, and frequencies of surface contamination monitoring in each zone, are described in the *Contamination Monitoring and Control Procedure*.

3.1.4 Bioassay Monitoring

NEWs at the Operation will participate in a routine urine bioassay program. NEWs in work areas where there is risk of exposure to uranium ore concentrate participate in a targeted urine bioassay program.

Results will be compared to administrative levels indicative of abnormal intake. Doses are not ascertained from bioassay results except in the rare situation of an abnormal intake.

Work instructions on the methods and frequencies of urine collection and testing for the routine and targeted urine bioassay program are described in the *Urine Bioassay Monitoring Procedure*.

3.2 Radiation Exposure Controls

This section describes how controls are selected and applied in order to reduce radiation risks that have been identified through risk assessment as needing better control. Controls are selected in consideration of the following order of preference:

- Eliminate hazard or substitute with a lesser hazard;
- Engineer systems that reduce exposure;
- Define administrative (safe work) procedures and/or improve training; and
- Require personal protective equipment (PPE).

Controls may be used in combination to prevent or reduce radiation risk to workers, the public or the environment. For example, appropriate training is often critical to the effectiveness of other controls.

3.2.1 Elimination and Substitution

Neither elimination nor substitution of the hazard are feasible controls for the Operation, given its purpose to produce uranium concentrate, and given the radioactive nature of uranium. Elimination of an exposure pathway would typically involve engineering controls.

3.2.2 Engineering Controls

Engineering controls involve facility design features or equipment that serve to reduce or eliminate a pathway of exposure to the hazard. For example, ventilation is an important engineering control to reduce worker exposure to uranium dust or radon, negative pressure enclosure of dust generating equipment is a further control on dust exposure and shielding around source materials (e. g. in tanks and piping) reduces external radiation exposure. Details are discussed by work area in the *Radiation Protection Plan.*

3.2.3 Administrative Controls

Administrative controls include work practices and procedures, effective training to ensure they are understood, and effective supervision to ensure they are followed. Examples of administrative controls include procedures and work instructions, radiation work permits, signage and warning systems, and incident and deviation reporting. Work practices are developed with attention to managing time at distance from radiation sources. Further details are provided in the *Radiation Protection Plan.*

3.2.4 Personal Protective Equipment

PPE includes protective clothing, safety glasses, gloves, and respiratory protection devices designed to protect workers from radiation exposure. PPE is considered the last line of defense and is typically used in combination with other types of controls. Situations requiring PPE will be defined, and PPE will be provided for those situations. PPE is periodically inspected to verify it has not passed its date of expiry and is in good working condition. Further details are provided in the *Radiation Protection Plan.*

3.2.5 Contamination Control

Contamination is the introduction of radiological particulates into an area where they are not permitted. All areas of the Operation site, indoor and outdoor, are divided into contamination zones based on thresholds for allowable removable and fixed surface contamination within each zone. The contamination control process, via routine monitoring, verifies that particulate radiation from more contaminated zones is not routinely being tracked into areas with lower thresholds. PPE (protective clothing) and personal hygiene restrictions apply to workers moving between and within zones. Eating and drinking restrictions are applicable within designated areas. Contamination zones and control processes are detailed in the *Radiation Protection Plan a*nd the *Contamination Monitoring and Control Procedure.*

3.2.6 Managing Nuclear Substances and Radiation Devices

Nuclear substances such as uranium will be present and devices such as nuclear density gauges may be used during the Operation. These are radiation sources and must be controlled. All nuclear substances and radiation devices will be licensed and managed in accordance with the *Nuclear Substances and Radiation Devices Regulations*. A listing of nuclear substances and radiation devices licensed at the Operation site will be maintained. All licensed nuclear substances and radiation devices will be labelled as set out in the *Radiation Protection Regulations*. Only certified radiation devices are used at the Operation site.

Work instructions on the management and control of nuclear substances and radiation devices are described in the *Nuclear Substance and Radiation Devices Management Procedure*.

3.2.7 Clearance of Objects for Offsite Release

All objects from potentially contaminated work areas that need to be transported off-site as non-radioactive materials must be thoroughly cleaned and checked for contamination prior to release. Surface contamination criteria are contained in the *Packaging and Transport of Nuclear Substance Regulations*.

Work instructions on the clearance of objects for off-site release are described in the *Clearance for Off-site Release* P*rocedure*. Objects will not be released if surface contamination exceeds the clearance limits defined in this procedure.

3.2.8 Packaging and Transport of Radioactive Materials

All materials leaving the site and classified as Class 7 Radioactive Materials under the *Packaging and Transport of Nuclear Substance Regulations*, will be further classified, packaged, labelled, and transported in compliance with the Regulations. Class 7 materials will not be transported off the Operation site unless they are in transit to a person or location licensed to receive them.

3.3 Contractor Management

Contractors performing work at the Operation site are subject to the requirements of this Program. The process for ensuring contractors adhere to requirements is outlined in the *Contractor Management Procedure* as part of the *Facility and Equipment Management Program*.

3.4 Equipment Procurement and Maintenance

All equipment to be used in the implementation of the *Radiation Protection Program* will be procured and maintained in accordance with defined procedures. All equipment used to monitor radiation is required to be calibrated before first use, then at regular intervals (at least once per year) and after any repair. Calibration and maintenance records are kept and made available to anyone who may request them. Nuclear density gauges or other sealed sources are leak tested regularly in accordance with the *Nuclear Substances and Radiation Devices Regulations*. All radiation measuring equipment is quality checked prior to use to verify proper equipment function.

Work instructions on checks, equipment calibration, and proper use are available for each piece of radiation measuring equipment, are described in the *Radiation Measurement Equipment Management Procedure*.

3.5 Incident and Deviation Reporting

Incidents include identified non-conformances, non-compliances, near misses, and opportunities for improvement. Workers and visitors are required to report information regarding health, safety, incidents (including near misses), and deviations. Radiation incidents and deviations include, but are not limited to:

- Radiation incidents (doses above action levels or regulatory limits);
- Unexpected dosimetry or monitoring results (above administrative levels);
- Contamination events (contamination above administrative levels for a zone); and
- Radiation near-misses (situations where a radiation incident could have occurred but was avoided).

Incidents or deviations that result in exceedances of federally or provincially legislated radiation reporting thresholds will be reported to the relevant regulatory agencies within legislated reporting timelines. Reporting requirements for exceedances of radiation action and administrative levels will follow requirements outlined in the *Radiation Code of Practice*.

Additional details on incident and deviation reporting can be found in the *Management System Program.*

4 Check

4.1 Monitoring and Measurement

Radiation protection performance is monitored and measured against established objectives and targets (identified in Section 2.2). Monitoring results (identified in Section 3.1) will be routinely evaluated against administrative and action levels (as per the *Radiation Code of Practice*) and evaluated over time by calculating indicators of performance for the *Radiation Protection Program*. Indicators for the Program will include, but is not limited to:

- Frequency of exceeding administrative and action levels; and
- Trend over time in exposure concentrations and worker doses.

All monitoring and measurement activities must also meet defined quality assurance and quality control requirements outlined within relevant Plans as part of this Program.

The results of monitoring and measurement activities are communicated internally and externally (see Section **Error! Reference source not found.**) and documented as part of the *Records Management* process outlined in the *Management System Program.*

4.2 Inspections and Audits

Denison will conduct internal audits of the *Radiation Protection Program* to assure compliance with the requirements set out in the Program and to determine if the Program is effectively implemented and maintained.

Workplace inspections will be performed as outlined in the *Health and Safety Management Program.* Effective use of radiation exposure controls will be monitored (e.g., to verify that radiation signage is effective and meets regulatory requirements).

Deviations, instances of regulatory noncompliance, and opportunities for improvement identified through inspections or audits are managed as outlined in the *Management System Program*.

4.3 Management Review

The *Radiation Protection Program* will be reviewed by Denison management in accordance with the defined frequency to assure the Program is meeting its objectives or needs adjustment. Examples of the types of items related to radiation protection that Denison management will review may include, but is not limited to:

- Suitability, adequacy, and performance of radiation protection objectives and targets;
- Upcoming or new legislation related to radiation protection;
- Recent or planned changes in facility operations;
- Results of monitoring in relation to meeting performance objectives and targets;
- Results of audits and inspections in relation meeting performance objectives and targets;
- Identified opportunities for improvement based on incident reports and other sources;
- Communications from interested parties;

- Adequacy of resources; and
- Any needs for program adjustment.

Denison management will identify opportunities for improvement and establish action plans to implement change in accordance with the process outlined in the *Management System Program*.

4.4 Reporting

Denison will routinely report both internally and externally on the performance of the *Radiation Protection Program*. External reporting can include reporting to regulators, the public, and Indigenous and local communities.

External reports to regulators will be produced in accordance with regulatory requirements.

External reports to the public or Indigenous communities on the performance of the Program will be tailored to the interests of these groups as identified through community engagement activities. Reporting, disclosure, and communication to the public and Indigenous and local communities is discussed in more detail in the *Public and Indigenous Information Program.*

5 Act

5.1 Corrective Action

Non-conformities or areas for improvement are identified following the process outlined in the *Management System Program* and the supporting procedures. These non-conformities can include exposure related incidents, near-misses, and deviations from the *Radiation Protection Program.* Non-conformities can also be identified during inspections and audits.

Responses to identification of non-conformities include investigation of cause, and corrective action if appropriate. Corrective actions are planned, implemented, verified, and reviewed for effectiveness based on the process identified in the *Management System Program*.

5.2 Continual Improvement

Opportunities for improvement of this Program will be identified and addressed to enhance radiation protection performance. The continual improvement process for this Program follows the overall continual improvement process outlined in the *Management System* and the supporting procedures. Continual improvement may also include updating Program objectives and targets based on changing circumstances or new information. Improvement may involve benchmarking performance against other similar projects and facilities. Any changes identified through the continual improvement process will be implemented in a systematic and controlled manner.

With respect to radiation protection, opportunities for continual improvement may be identified through review by the RSO of techniques, processes, and procedures for ensuring effective protection.

6 References

6.1 Internal

Document Name
Management System Program
Facility and Equipment Management Program
Training Management Program
Environmental Management Program
Health and Safety Management Program
Emergency Management Program
Fire Protection Program
Radiation Protection Plan
ALARA Plan
Radiation Code of Practice

6.2 External

Canadian Nuclear Safety Commission (CNSC). 2021a. Radiation Protection. REGDOC 2.7.1. Canadian Nuclear Safety Commission.

Canadian Nuclear Safety Commission (CNSC). 2021b. Radiation Protection Regulations. SOR/2000-203. Minister of Justice. Government of Canada.

Canadian Nuclear Safety Commission (CNSC). 2015a. Nuclear Substances and Radiation Devices Regulations SOR/2000-207. Minister of Justice. Government of Canada.

Canadian Nuclear Safety Commission (CNSC). 2015b. Transport of Nuclear Substance Regulations. SOR/2015-145. Minister of Justice. Government of Canada.