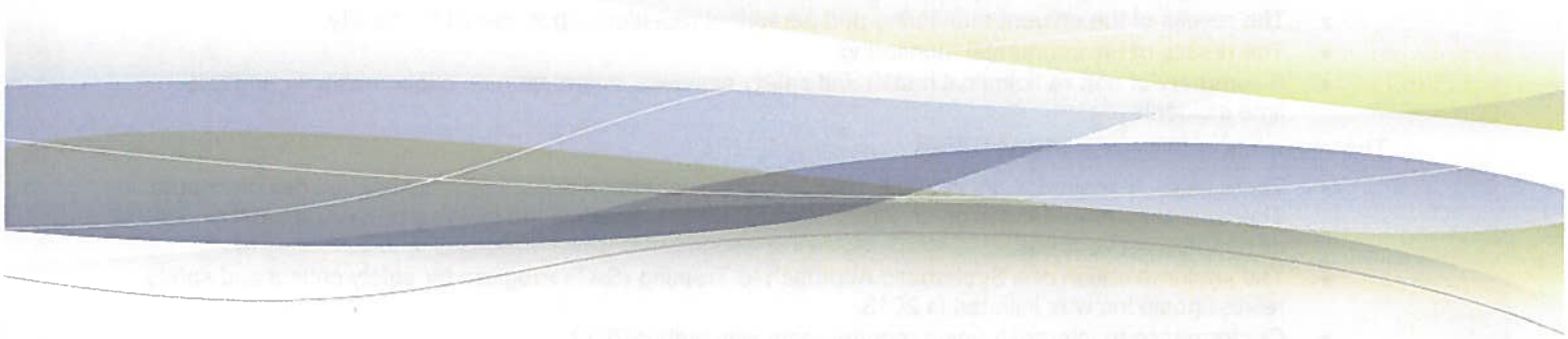

Annual Compliance and Operational Performance Report to the Canadian Nuclear Safety Commission for the period JANUARY 2013 to DECEMBER 2013

Submitted: March 31st, 2014

To: Ms. Ann Erdman

Signatures

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Approved by: [redacted] Date: _____ yy/mm/dd

ABSTRACT

This Annual Compliance and Operational Performance Report (ACOPR) provides performance and operational information for Nordion's Class 1B Facility. It reports annual performance against the Nuclear Safety and Control (NSC) Act, applicable regulations, relevant safety and operational programs and the license conditions of the Nuclear Processing Facility Operating License issued by the Canadian Nuclear Safety Commission (CNSC) (License NSFPOL-11A.04/2015). It demonstrates that Nordion is operating in a safe manner.

As per Nordion's license condition on annual reporting, this report contains the following information:

- The operation and maintenance of the facility, a summary of facility and equipment performance and changes, changes to operating policies, organization, occurrences, personnel radiation exposures and releases of nuclear substances and releases of hazardous substances from the facility.
- Changes to the emergency procedures, changes that affect or may affect the facility's emergency response arrangements, training activities, drill and exercise activities and unplanned events in which the facility's emergency response organization was tested.
- The results of the effluent monitoring and personnel radiation exposures of the facility.
- The results of environmental monitoring.
- A summary of non-radiological health and safety activities, information on minor incidents and lost-time incidents.

The key points of this report are as follows:

- There were no major issues in 2013. The facility has operated according to its original design criteria. There were no physical design changes to any structural areas of the building or changes to the designated active areas.
- The implementation of a Systematic Approach to Training (SAT) Program for safety critical and safety related positions was initiated in 2013.
- Conformance to internal training requirements was high in 2013.
- Testing of the radiation devices and instrument maintenance was performed at the required frequency and results were satisfactory. There were two pieces of equipment with recurring failures in 2013, an overhead door used for the loading dock in the shipping area of the KOB and a steam boiler for heating and processing in the KRMF building.
- The Environment, Health and Safety Committee met on a regular basis to review the environmental and safety aspects of the operations and to review and approve Final Safety Analysis Reports (FSARs).
- All measurable radiation dose received by personnel and the public were within the regulatory limit of 50 mSv/yr. and no internal dose levels or limits were exceeded.
- There were a total of 32 contamination incidents in 2013. All elevated levels of contamination were monitored and contained within the Active Area.
- There were no instances in which there was potential to exceed a regulatory limit or to reach or exceed an action level in 2013.
- Various improvements were made to the Radiation Protection Program, Conventional Health and Safety Program, Environmental Protection Program and Fire Protection Program. These programs fall within the scope of the Quality Assurance (QA) Management Program.
- There was one disabling injury in 2013 which resulted in 18 days of lost time.
- There were no instances of exceeding environmental regulatory limits or action levels in 2013. The maximum annual release of airborne from any one radionuclide was Xe-135m at 1.44% of the DRL.
- In 2013, Nordion received one EHS related external communication.
- In 2013, Nordion complied with each site-specific reporting requirement with the exception of four instances regarding sealed source reporting. These exceptions involved sealed source reporting. The instances were reportable under Section 6.1 (g) of the site license (NSPFOL-11.A.04/2015).

In 2013, Nordion's Class 1B Facility operated within the requirements of the Nuclear Safety and Control Act, the applicable regulations and the conditions of the operating license issued by the CNSC.

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GLOSSARY

ACOPR	Annual Compliance and Operational Performance Report
[redacted]	
ALARA	As Low As Reasonably Achievable
AMMS	Advanced Maintenance Monitoring System
AMP	Administrative Monetary Penalty
BH	Borehole
CAD	Charcoal Adsorber
CAM	Continuous Air Monitor
CAPA	Corrective Action Preventative Action
CNSC	Canadian Nuclear Safety Commission
COF	Cobalt Operations Facility
[redacted]	
CSA	Canadian Standards Association
DRD	Direct Reading Dosimeter
DRL	Derived Release Limit
EC	Environment Canada
EHS	Environment, Health and Safety
EMS	Environmental Management System
EMU	Emergency Measures Unit
EOC	Emergency On Call
EQMS	Electronic Quality Management System
ER	Emergency Response
FAQ	Frequently Asked Questions
FSAR	Final Safety Analysis Reports
HEPA	High Efficiency Particulate Air
HEPCO	Hospital Emergency Planning Committee of Ottawa
HRSDC	Human Resource Skills Development Centre
HVAC	Heating, Ventilation and Air Conditioning
IMS	Incident Management System
KRMF	Kanata Radiopharmaceutical Manufacturing Facility
KOB	Kanata Operations Building
LLLW	Low Level Liquid Waste
MDA	Minimum Detectable Activity
NCSP	Nuclear Critical Safety Program
NEW	Nuclear Energy Worker
NFPA	National Fire Protection Association
NMPF	Nuclear Medicine Production Facility
NPRMI	Non-production Radioactive Material Inventory
NSC	Nuclear Safety and Control
NVS	Nuclear Ventilation System
OMIS	Obligated Material Inventory Summary
[redacted]	
OSL	Optically Stimulated Luminescent
PIP	Public Information Program
PIT	Physical Inventory Taking
PIT-E	Physical Inventory Taking – Evaluation
PPE	Personal Protective Equipment
PTNSR	Packaging and Transport of Nuclear Substances Regulations
QA	Quality Assurance
RE	Roy Errington
RP	Radiation Protection
SAT	Systematic Approach to Training
SCBA	Self Contained Breathing Apparatus

SOP	Standard Operating Procedures
SSTS	Sealed Source Tracking System
TDG	Transportation of Dangerous Goods
TLD	Thermo-luminescent Dosimeter
UPS	Uninterruptible Power Supply
WSIB	Workplace Safety Insurance Board

1. INTRODUCTION

1.1 General Introduction

Nordion is a major global supplier of radioisotopes used in nuclear medicine for diagnostic and therapeutic purposes, industrial applications, and research and development activities. The Class 1B Facility is comprised of two major production operations, one involving the processing of radioisotopes used in nuclear medicine and the other involving sealed sources used in cancer therapy and irradiation technologies.

1.1.1 Summary of Production and Operational Limits

Nordion's license NSPFOL-11A.04/2015 does not include any production and operational limits.

1.1.2 Summary of Performance

Nordion operated in compliance with the Nuclear Safety and Control (NSC) Act in 2013 with the exception of 24 non-compliances with the Act or with Nordion's site license NSPFOL-11A.04/2015 (refer to Appendix A). Each of the Environment, Health and Safety (EHS) objectives and targets were met in 2013. The objectives are reviewed yearly at the Annual Joint Environmental Management System (EMS) and Quality Assurance (QA) Program for Safety Review. Refer to Section 2.3.1 for a summary of the EHS Objectives and Targets for 2013.

1.1.3 Summary of Activities

The facility modifications that took place in 2013 were the replacement of emergency power transfer switches in the Heating Plant and Cobalt buildings and the replacement of batteries in the main Uninterruptible Power Supplies (UPSs).

There were no major structural changes or changes to the licensed facility boundary.

In 2013, Nordion expanded on the Electronic Quality Management System (EQMS) procedures for training management, and began work on the next module – issues management.

In January, Nordion posted on the Nordion website the CNSC's results on the company's 2012 compliance performance. In May, Nordion posted its Annual Compliance and Operational Performance Report to the CNSC for the period of January 2012 to December 2012. In October, Nordion launched its public disclosure protocol consultation program.

Nordion's implementation of a Systematic Approach to Training (SAT) program was initiated in 2013.

In July, Nordion divested the Targeted Therapies business unit. Nordion now contract manufactures TheraSphere® for the new owners. The Specialty Isotopes business unit remains and continues to consist of two segments: Sterilization Technologies and Medical Isotopes, supported by centralized corporate functions.

In October, Nordion received Canada's Safest Employer Gold Level Award, being recognized as the safest employer in the manufacturing division for 2013.

For conventional health and safety, a number of programs were created including a Job Hazard Analysis Program and a Manual Material Handling Program. Also, a company-wide safety culture survey was conducted with positive results.

For radiation protection, a whole body contamination monitor was installed in the Cobalt Operations facility.

A review of the emergency preparedness and response program was completed and a number of continuous improvements were identified. In the area of fire protection, approval of Nordion's Fire Safety Plans was obtained from the City of Ottawa Fire Prevention Division.

1.1.4 Issues and Corrective Actions

There were no major issues in 2013. Refer to Appendix A for a summary of events.

1.1.5 Reportable Incidents

A list of reportable incidents, their causes and corrective actions are provided in Appendix A.

1.1.6 Compliance with Other Regulatory Agencies

Nordion applied to Environment Canada for Precautionary Permits to Charge a Fire Extinguishing System for in-cell fire suppression systems containing halon. These permits were approved and received in April 2013 and permit Nordion to refill halon fire extinguishing systems until April 2014.

Nordion submitted an application for amendment to Nordion's Environmental Compliance Approval from the Ontario Ministry of Environment in January 2013 as required by the Certificate of Approval 6063-8HSRMC.

Nordion reports to the Workplace Safety Insurance Board (WSIB) whenever a reportable occupational injury or illness occurs. In 2013, there were three medical treatments and one lost-time incident reported to the WSIB. WSIB may inspect Nordion's Occupational Health and Safety programs at any time; however, no inspections were held in 2013.

In compliance with Part II of the Canadian Labour Code, the one lost-time incident mentioned above was reported to the Human Resource Skills Development Centre (HRSDC).

1.2 Facility Operation

1.2.1 Facility Operation

The facility has operated according to its original design criteria in 2013. There were no investigations in 2013 related to facility design.

1.2.2 Personnel Performance

The number and significance of corrective actions related to training would be an indication of how effectively personnel performed compared to their duties and how well personnel followed procedures. During 2013, none of the 38 EHS corrective actions (arising from internal audits and investigations or external regulatory compliance inspections) initiated were related to training. This information supports the conclusion that personnel effectively performed their duties and followed procedures.

In addition, comments from the Manager Self-assessment checklists have not indicated there are any issues with personnel performance.

1.2.3 Summary of Modifications and Repairs

Modifications and repairs that were carried out in 2013 included:

- Replacement of emergency power transfer switches in the Heating Plant and Cobalt buildings.
- Replacement of batteries in the main Uninterruptible Power Supplies (UPSs).

1.2.4 Internal and External Audits

As part of the QA Program for Safety and the Environmental Management System, Nordion annually conducts internal audits to identify and correct potential environmental, health and safety related issues. In 2013, Nordion conducted a total of nine internal EHS audits. These audits included process audits as well as policy and program audits. In addition, Nordion conducted a total of eight safety inspections.

In 2013, there were a total of five external audits of Nordion and one external audit conducted by Nordion. Out of a total of 38 EHS related corrective actions initiated in 2013, 19 corrective actions were a result of internal audits and 15 were a result of external audits.

1.2.4.1 Internal Audits

The following internal audits were conducted in 2013:

1. Audit of the QC Process. Numerous Environmental Management System (EMS) and QA safety elements were audited.
2. One EMS program audit. The audit was concerned with the EHS policy, communications, documentation, monitoring and measurement, evaluation of compliance, management review, environmental aspects, objectives, targets and programs, legal requirements, and emergency preparedness and response.
3. One QA Safety program audit. The following Quality Assurance Program for Safety elements were reviewed: organization and responsibilities, manager self-assessment, use of experience, and program definition.
4. Physical Inventory Taking (PIT) of safeguarded material.
5. Non-production Radioactive Material Inventory (NPRMI) Audit.
6. Internal EHS Audit Program.
7. Process Safety Audit of the Xe-133 process.
8. Process Safety Audit of the I-125 process.
9. Fire Safety Program Audit.

In 2013, Nordion engaged a third party to conduct an internal environmental, health and safety regulatory compliance audit. There were two medium risk findings and two low risk findings identified during this audit.

1.2.4.2 External Audits of Nordion

The following external audits of Nordion were conducted in 2013:

1. On March 19-20, 2013 the CNSC conducted an Annual Compliance Inspection. There were two directives, two action notices and two recommendations identified during this inspection.
2. On March 26, 2013 the CNSC conducted a Security Inspection. There were three recommendations for improvement identified during this inspection.
3. On April 15, 16 and 25 2013 the CNSC conducted a Regulatory Compliance Inspection of Category 1 and 2 Radioactive Source Export Records. There were two action items and one recommendation identified during this inspection.
4. On June 3-5, 2013 BSI conducted an annual audit against the ISO 14001:2004 standard. There were four opportunities for improvement identified during this audit.

5. On December 5-6, 2013 the CNSC conducted a Compliance Inspection of Packaging and Transport. There were five recommendations identified during this inspection.

1.2.4.3 External Audits Conducted by Nordion

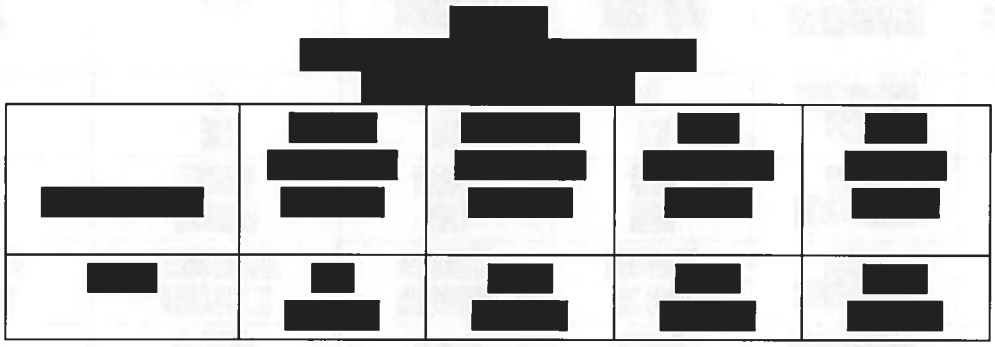
Nordion conducted one EHS Audit of a supplier in 2013. There was one corrective action identified during this audit.

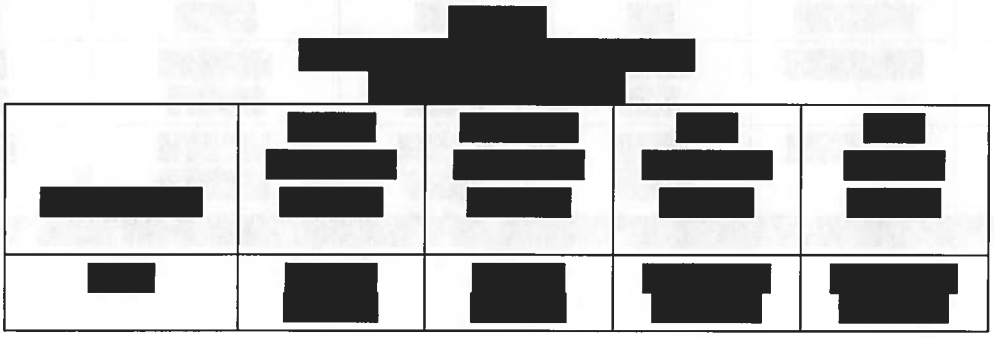
1.3 Production or Utilization

Activities conducted in the Kanata Operations Building (KOB) relating to the procurement, possession, processing and shipping of radioactive materials are conducted under Nuclear Substance Processing Facility Operating Licence, NSPFOL-11A.04/2015. The facility is comprised of the KOB, which houses the Nuclear Medicine Production Facility (NMPF) and Cobalt Operations Facility (COF), and the Kanata Radiopharmaceutical Manufacturing Facility (KRMF).

1.3.1 Sealed Source Manufacturing/Radioisotope Processing

[redacted]





1.3.2 Processing > 1 Petabecquerel (PBq)

[redacted]

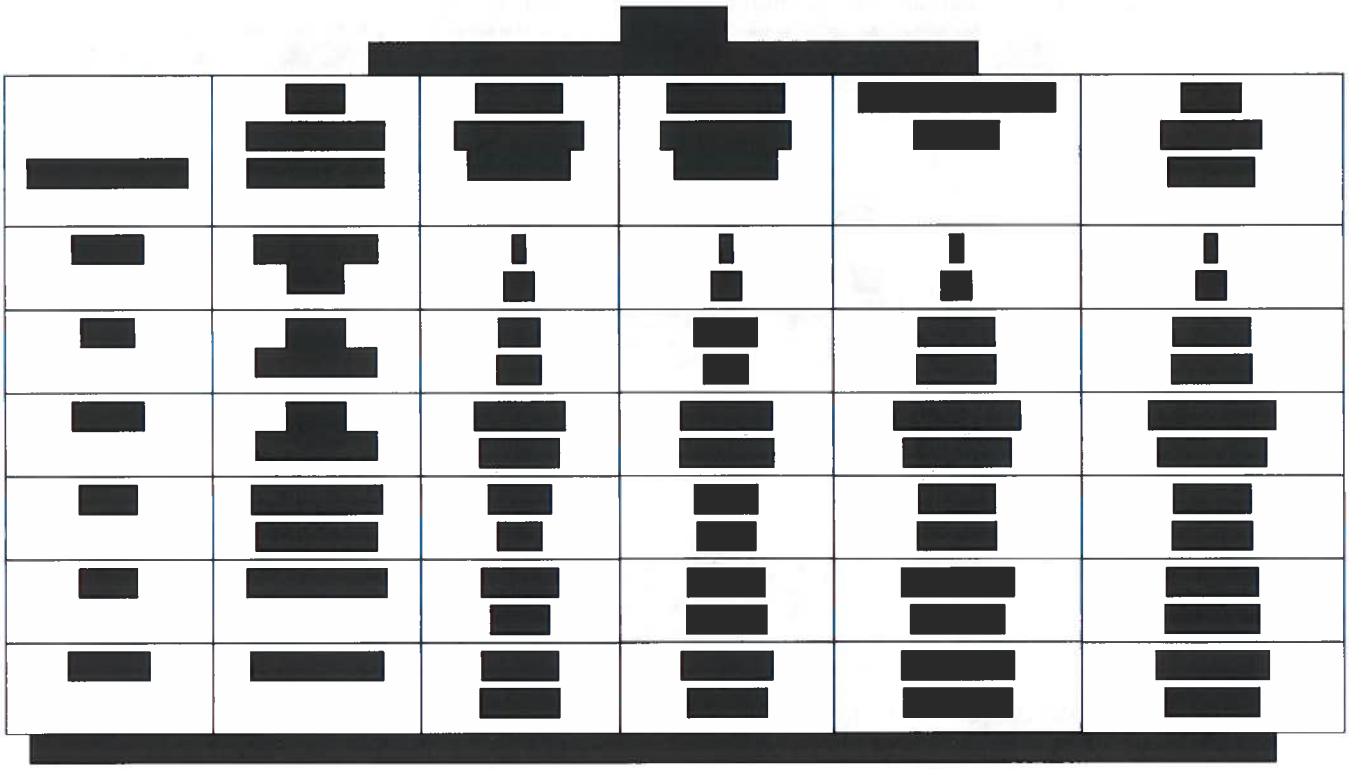
1.3.3 Acquisitions of Finished Sealed Radioactive Sources

[redacted]

[redacted]

1.3.4 Sealed Sources/Devices > 50 Megabecquerels (MBq)

[redacted]



1.4 Facility Modifications

1.4.1 Changes to the Facility Buildings, Processes and Equipment

1.4.1.1 Changes to Designated Active Area

In 2013, Nordion upgraded the high radiation level alarm panel in the Kanata Operations Building (KOB).

1.4.1.2 Structural/Functional Changes Affecting Emissions

In 2013, Nordion made no structural/functional changes that affected the emissions of the facility.

1.4.1.3 Structural/Functional Changes Affecting Active Area Ventilation

In 2013, Nordion made no structural/functional changes that affected the active area ventilation.

1.4.1.4 Structural/Functional Changes Affecting the Active Liquid Waste System

During2013, Nordion upgraded and modified the Low Level Liquid Waste (LLLW) system.

1.4.2 Changes to Procedures Related to Operations Safety and Control

Refer to Section 2.7.7 and Section 2.8.3 for changes to procedures related to operations safety and control.

1.4.3 Changes to the Training Programs

There were no changes to Nordion's existing EHS training courses in 2013. Nordion initiated implementation of a Systematic Approach to Training (SAT) Program for safety critical and safety related positions in 2013. In addition, Nordion released seven new EHS training courses, as detailed below.

Course	Type	Audience
Export/Import Controls General Awareness	Classroom	Pre-determined target audience
Worker Obligations	Self-directed	All employees
Administrative Monetary Penalties (AMPs) Awareness	Classroom	All Nuclear Energy Workers
Review of the AMP Regulations	Self-directed	Active Area Managers and select EHS Compliance Staff
Fall Protection	Self-directed	Pre-determined target audience
Lock Out/Tag Out	Self-directed	Pre-determined target audience
Arc Flash in the Electrical Workplace	Self-directed	Pre-determined target audience

1.4.4 Changes to the Organizational Structure and Key Personnel

In July 2013, Nordion divested the Targeted Therapies business unit. Nordion continues to manufacture TheraSphere® for the new owner. The Specialty Isotopes business unit remains and continues to consist of two segments: Sterilization Technologies and Medical Isotopes, supported by centralized corporate functions.

EHS personnel are organized into a Sterilization Technologies – Compliance Group and a Medical Isotopes – Compliance Group. The personnel of these two groups are outlined below. All of the positions for Sterilization - Compliance are corporate wide functions supporting both segments, with the exception of the Administrative Assistant and the Senior Radiation Training & Safety Specialist.

Sterilization – Compliance

- Director, QA EHS Compliance
- Administrative Assistant (1)
- Security & Emergency Response Plan Manager
- Information Security & Network Lead
- Contract Security Supervisor
- Security Officers (12)
- Senior Manager, Compliance, Facility & Transportation Licensing
- EHS Assistant
- Nuclear Transportation Specialist
- Senior EHS Compliance Specialist
- Senior Licensing Coordinator
- EHS Compliance Specialist
- Training Specialist
- Safety Manager
- Environmental Specialist
- Occupational Health & Safety Specialist
- EHS Safety Specialist
- Senior Radiation Training & Safety Specialist, Sterilization
- Company Physician
- Fitness Coordinator

Medical Isotopes – Compliance

- Vice-President, QA Regulatory & EHS Compliance
- Administrative Assistant (1)
- Senior Manager, Radiation Safety & Compliance
- Senior Radiation Surveyor (2)
- Radiation Surveyor (4)
- Senior Radiation & Contamination Monitor (3)
- Radiation and Contamination Monitor (6) - Includes one vacant position

2. SAFETY AND CONTROL AREA

2.1 Management System

2.1.1 Review of Quality Assurance/Management Program Activities

In 2013, Nordion conducted a total of nine internal EHS audits. These audits are described in Section 1.2.4.1.

2.1.2 Review of Quality Assurance/Management Program Effectiveness

The annual management review of the Environmental Management System and the QA Program for Safety was conducted June 11, 2013.

The management review involves the evaluation of actions from the previous meeting, the Environment Health & Safety Policy (CPM-6-06), adequacy of resources, environmental health and safety objectives and targets, changing circumstances and recommendations for improvement.

Results of the 2013 annual review concluded that:

1. A majority of the outstanding actions from the previous meetings had been completed and closed (there was one action outstanding at the time of the meeting).
2. The Environment, Health and Safety Policy (CPM-6-06) was reviewed and it was determined that the policy did not require further review and update.
3. Resource requirements for the Environmental Management System and QA Program for Safety were discussed. The Committee agreed that the most critical issues are resourced adequately. A new resource was added to the Facility and Transportation Licensing team and a further was planned for the Safety team which has since been filled.
4. There is one outstanding 2009 environmental objective and target related to the replacement of the halon fire suppression systems with a non-ozone depleting alternative. This objective is behind schedule due to the complexity of this project. These systems are unique and off-the-shelf solutions were not available. This is due to the fact that continuous ventilation must be maintained during a fire event. Due to the complex nature of these systems, finding a vendor to design such a system has been a challenge. In the interim, Nordion is using halon systems for cell fire suppression and annually receive precautionary permits to charge these systems.
5. The 2011/2012 environmental objectives and targets were completed with the exception of the objectives regarding the reduction of hazardous and other environmentally harmful materials, and the reduction of non-hazardous and hazardous waste as they have a target date of 2015. It was noted, however, that the targets had been met to date.
6. The 2013 environmental objectives and targets were reviewed and it was determined that they were on target at the time of the meeting.
7. The 2014 EHS objectives were discussed.

There were fifteen new actions identified during the meeting. The EHS Committee had no further recommendations for improvement. As such, the Committee concluded that the EHS management system (the Environmental Management System and the QA Program for Safety) is effective.

2.1.3 Summary of Quality Assurance/Management Program Improvements

In 2013, changes or revisions were made to the Radiation Protection Program, Conventional Health and Safety Program, and the Environmental Protection Program as discussed in Sections 2.7.7, 2.7.9, 2.8.3 and 2.9.6, respectively.

2.2 Human Performance Management

2.2.1 Training Program Effectiveness

The number of scheduled participants for internal safety training was 572. By the end of 2013, 567 scheduled participants completed the training, including refresher training. Therefore, the attendance completion rate in 2013 was 99%. The details of the training are documented in Table 4, below. There were no incidents in 2013 that demonstrated a lack of effectiveness in these training programs.

Nordion has designed and maintains a variety of radiation safety training courses. New employees who are not classified as Nuclear Energy Workers (NEWs) receive a basic course on Health, Safety and Environment, Level I, which provides information on the facilities, emergency response procedures/alarms, and basic procedures to follow for safety in the workplace. Nuclear Energy Workers receive a NEW Indoctrination Course. To be authorized to enter the Active Area unescorted, the employee must complete and pass a written test, as evidence of understanding the principles of radiation protection and Nordion safe work practices. NEW retraining and retesting are conducted on a three year frequency. In addition, NEWs are provided with a half day Radiation Instrumentation Workshop, dealing specifically with the selection and use of radiation survey and contamination meters for the Active Area.

Supplementary training programs are provided to all personnel working on behalf of Nordion depending on the nature of the job and the requirements specified by their Manager. These programs include such topics as "Working with Radioiodines", emergency response awareness, care and use of respirators, material handling training, and working safely with fume-hoods. A summary of the training programs and the number of participants is provided in Table 4.

Employees who transport, handle, or offer dangerous goods for transport are trained in the Transportation of Dangerous Goods (TDG) requirements. The training program includes a one day classroom training course that is required once on employment or upon job change. Retraining is conducted on a 2-year frequency and is accomplished through self-study. The self-study program is separated into three levels. Employees are required to complete the self-study refresher training level that is appropriate for their job function. For each training course, participants must complete and pass a written test, as evidence of understanding the course contents.

Table 4
Safety Training Programs – 2013

Program	Duration	Number of Participants	Refresher Training Overdue at end of 2013
Nuclear Energy Worker Indoctrination	6 Hours	6	Not Applicable
Health, Safety and Environment Level II	Self Study	73	3
Radiation Instrumentation Workshop	3 Hours	68	0
Radiation Safety Review for Operators	Half Day	21	0
Safe Handling of Radioiodines	2 Hours	60	0
Transport of Dangerous Goods Level I	Self Study	3	0
Transport of Dangerous Goods Level II	Self Study	7	0
Transport of Dangerous Goods Level III	All Day In-Class (Once Upon Employment Self Study thereafter)	35	0
TDG for Contractors	Full Day	16	0
Transportation Regulations	2 Hours	57	0
Working with BETA	1 Hour	65	1
Crane	Half Day	44	0
Pallet	Half Day	59	1
Forklift	Half Day	34	0
Contractor Radiation Safety Training	Half Day	8	0
Contractor Radiation Safety Update Training	2 Hours	9	0
HEGS Safety Training	2 Hours	3	0
In-Depth Security Awareness	2 Hours	4	0

* Employee is on leave.

2.2.2 Verification of Minimum Number of Responsible Personnel During Operations and Similar Activities

Nordion has ensured that the minimum number of responsible personnel is available to provide safety overnight during operations and during emergency situations.

2.3 Operating Performance

2.3.1 Effectiveness of Licensed Activities

The licensed activities were carried out according to Nordion's programs and procedures. There were no significant unplanned events and no major non-conformances. Nordion's programs in place for auditing and capturing non-conformances identified issues in areas that required corrective actions. These processes functioned as expected.

Summaries of the 2013 EHS Program Objectives and Health and Safety Objectives are shown in Tables 5 and 6. Each of the EHS Objectives listed in Table 5 were met in 2013. Table 6 shows Health and Safety Objectives that EHS requires of Directors and Managers and employees of high risk areas. A system is in place to ensure that the performance reviews are completed. The completion of manager self-assessments is audited annually. EHS regularly follows-up with Managers to ensure they are reviewing health and safety issues with employees and to remind them that EHS staff are available to provide updates at team meetings. Deviations, Change Forms and complaints are reviewed yearly at the Annual Joint Environmental Management System and QA Program for Safety review.

Table 5
2013 EHS Program Objectives and Results

Applicable Nordion Job Function	Objective	Measures and Targets	Result
All Directors and Managers All Directors and Managers of Operations, Facilities, or Nuclear Energy Worker employees	Minimize the number and extent of occupational injuries, environmental and radiation incidents.	• The number of Incidents ≤ 6 • Lost Time Injuries ≤ 0.5 per 200,000 hours worked (3-yr rolling) • The severity of lost-time injuries to ≤ 4 days per 200,000 hours worked (3-yr rolling)	6 0.13 (3-yr rolling) 1.8 (3-yr rolling)
	Minimize the use and release of hazardous materials to the environment.	• Radioactive materials emissions to ≤ 5.0% of the Derived Release Limits (DRL) • No non-compliant sanitary sewer emissions of non-radioactive hazardous materials • Reduction in the use of hazardous materials (by 5%) and the generation of hazardous and non-hazardous waste (by 5%)	1.74 % DRL 0 47% reduction in use of hazardous materials since 2010 42% reduction in non-hazardous waste since 2010 46% reduction in hazardous waste since 2010
	Maintain radiation doses to employees as per ALARA principle.	• Average Active Area employee dose rate ≤ 1.5 mSv/yr • Maximum employee dose rate ≤ 7.5 mSv/yr • Radiation Incidents ≤ 5/year	0.35 mSv (Rolling 12) 6.49 mSv (Rolling 12) 0

Table 6
2013 Health and Safety Objectives

Applicable Nordion Job Function	Objective	Measures and Targets
All Directors and Managers All Directors and Managers of Operations, Facilities, or Nuclear Energy Worker employees	Ensure all managers of high risk areas conduct / document regular self-assessments of their management processes and safety performance.	• Mid-Year and Year-End performance reviews.
	Ensure all managers actively consider impacts to the environment and health and safety	• Environment, health and safety impacts are assessed as part of product realization planning and risks are mitigated through application of ALARA and pro-active planning. • Opportunities for minimizing waste (hazardous and non-hazardous) are assessed and implemented as feasible. • Ensure all near-misses are reported and appropriate corrective action(s) are taken. • Ensure timely closure of EHS CAPAs.
	Communicate monthly with teams about environment, health and safety performance and impacts. Openly evaluate employee environment, health safety concerns.	• Environment, health & safety information and concerns are discussed regularly at team meetings. • Health and safety concerns are assessed with the results of the evaluation communicated to the employee(s). • Deviations, CF's, Non-conformances and Complaints are assessed for EHS risks against targets and reported accordingly. • Routinely invite EHS Representatives to team meetings to discuss EHS topics and/or concerns.
All High Risk Employees	Work safely at all times. It is unacceptable to take risk in order to get the job done.	• Work follows applicable Nordion EHS standards and procedures, and is performed with care and attention to safety principles. • Wear all applicable personal protective equipment (PPE). • Submit all dosimeter(s) and rings for monitoring on time (i.e. no later than one month following end of monitoring period without good reason, i.e. extended illness or company travel, etc.).
	Report the occurrence of workplace injuries, unsafe conditions and near misses.	• All workplace injuries and observed unsafe conditions & near misses are reported immediately to the direct Supervisor.
	Correct co-workers who are working unsafely.	• Following Nordion values, coach co-workers who are seen working unsafely.

Applicable Nordion Job Function	Objective	Measures and Targets
	Identify opportunities to reduce environmental impacts	• Identity opportunities for reducing waste, and using less harmful materials where feasible. • Ensure EHS reviews and approves all new hazardous materials or chemicals prior to ordering.

2.3.2 Effectiveness in Implementing Operational Controls

EHS operational controls are documented in a specific series of documents (SE-OP series) and added to routine production documents for safety critical steps. These procedures are routinely updated using Nordion's change control process when safety improvements are identified.

2.3.3 Summary of Safety Inspections and Audits

Refer to Section 1.2.4 for a summary of the safety inspections and audits.

2.3.4 Radiation Devices and Instruments Maintenance

Performance of the following equipment, alarms and monitoring devices is checked at various frequencies throughout the year. Test results are indicated to be satisfactory if the tested item functioned within acceptable parameters.

2.3.4.1 Ventilation

Duplex fan tests are conducted every 6 months. This involves testing of more than 100 fans which form part of the NVS. Testing in 2013 was performed at the required frequency and results were satisfactory.

In-situ testing of High Efficiency Particulate Air (HEPA) filters and Charcoal Adsorbers (CADs) is required at a minimum once annually, but two testing campaigns were done for both in 2013.

Table 7 details the results of Nuclear Ventilation System Filter testing and replacement. The filters summarized in Table 7 are credited with mitigating releases in Nordion's Safety Analysis reports.

Table 7
NVS Filter Efficiency Testing/Replacements

	Q1/Q2 HEPA	Q1/Q2 CAD	Q3/Q4 HEPA	Q3/Q4 CAD
Filters in fleet	239	74	239	74
Number tested	237	67	237	67
Filters which met specification	235	67	237	66
Filters out of specification*	2	0	0	1
Out of specification filters replaced during test cycle	2	0	0	1
Not tested	2	7	2	7
Total replaced during this cycle	13	16	0	2
Filters (systems) removed from service	0	0	0	0
New Filters (systems) Added	0	0	0	0

* The HEPA filters that were out of specification were on Systems 42 and 19 and the CAD filters were on System 53. The failures did not result in any apparent increase to releases.

Comments Q1/Q2 HEPA: Two filters were not tested because they were not in service. Two filters did not meet the testing criteria. These HEPA's were replaced and had successful in-situ tests performed afterwards. Eleven filters were replaced due to flow issues and high radiation readings.

Comments Q1/Q2 CAD: Six trench filters were not tested, but are changed every three years as per SE-OP-021, "Charcoal Adsorber Filter Testing". One CAD filter on System 5 was not tested as it is not in use. 16 CAD filters were changed out due to their shelf life expiration (as per SE-OP-021). The in-situ/lab tests performed afterwards on the new filters were successful.

Comments Q3/Q4 HEPA: Two filters were not tested because they were not in service.

Comments Q3/Q4 CAD: Six trench filters were not tested, but are changed every three years as per sE-OP-021, "Charcoal Adsorber Filter Testing". One CAD filter on System 5 was not tested as it is not in use. One CAD filter did not meet the testing criteria. This filter was replaced and the new filter had a successful in-situ test performed afterwards. One CAD filter was changed out due to its shelf life expiration (as per SE-OP-021). The lab test performed prior to installation of the new filter was successful.

Nuclear Medicine in-cell charcoal roughing filters are on a preventative maintenance schedule and replaced by cell technicians typically every 6 months. The replacement of these filters is described in Table 8. These filters are not credited with mitigating releases in Nordion's Safety Analysis reports.

Table 8
Roughing Filter Change-outs

Filter Type	Total Number of Filters	Results
Nuclear Ventilation System Roughing Filters	145 roughing 51 charcoal/roughing/HEPA 34 in-cell roughing	94 roughing filter replacements 53 charcoal/roughing/HEPA filter replacements
Cobalt Production In-cell Filters	16 in-cell HEPA 22 in-cell roughing	0 in-cell HEPA filters replacements 24 in-cell roughing filters replacements

2.3.4.2 Back-up Power Facilities

The emergency generators which supply emergency power to the KOB, KRMF and the Heating Plant are tested monthly. Testing in 2013 was performed at the required frequency. The results were satisfactory with the exception of one incident that occurred, which was documented as Investigation 13-11 (refer to Appendix A).

2.3.4.3 Radiation Evacuation Alarms

Radiation evacuation alarms are tested weekly and quarterly by the Radiation Surveyors. They are additionally tested annually by Facilities and Site Services staff. Testing in 2013 was performed at the required frequency and results were satisfactory.

2.3.4.4 Radiation Alarms

The radiation alarms are scheduled for testing on a weekly basis and were tested every week in 2013. The tests verify that the alarms sound at the preset alarm levels and that the alarms register on the Metasys monitoring system. If the alarms do not function as required, adjustments to the alarm levels and/or the Metasys are conducted immediately by Facilities and Site Services personnel. The results were satisfactory with the exception of routine testing of the intermittent klaxons. This was documented as Investigation 13-16 (refer to Appendix A).

2.3.4.5 Sprinkler System Fire Alarms

The sprinkler system fire alarms in KOB, KRMF and the Heating Plant are tested every month. Testing in 2013 was performed at the required frequency and results were satisfactory. All dry systems were tested and verified in good operating condition in 2013 as required by the National Fire Protection Association (NFPA).

2.3.4.6 Fire Alarm Panels

The fire alarm panels for KOB, KRMF and the Heating Plant are tested and verified by the manufacturer once a year.

The fire alarm panels that monitor the KOB, KRMF and the Heating Plant are tested monthly. Testing in 2013 was performed at the required frequency and results were satisfactory.

2.3.4.7 Contamination Monitoring Equipment

Handheld contamination monitoring equipment is maintained twice a year. Area monitors are checked on a daily basis. Testing in 2013 was performed at the required frequency and results were satisfactory.

2.3.4.8 Contamination Control Equipment

The hand and foot monitors are calibrated twice a year, checked daily, tested weekly and serviced on a routine basis. They are also repaired as required; typically two to three times a year. Testing in 2013 was performed at the required frequency and the results were satisfactory.

2.3.4.9 Environmental Monitoring Equipment

Environmental monitoring equipment is tested on a weekly basis. If required, repairs to equipment are carried out immediately after the testing by Facilities and Site Services personnel.

2.3.4.10 Radiation Survey Instruments

Radiation Survey Instruments are tested on a monthly, bi-annual, or annual basis as required. There were no instruments in 2013 that tested outside of the acceptable range. Testing in 2013 was performed at the required frequency and the results were satisfactory.

2.3.4.11 Trends

There were two pieces of equipment with recurring failures in 2013; however, none of the failures created a critical situation. One was an overhead door used for the loading dock in the shipping area of the KOB and the other was a steam boiler for heating and processing in the KRMF building. The corrective action taken to address the recurring breakdown of the overhead door was to replace the door operator unit. For the steam boiler, the combustion system was rebuilt to replace parts that had failed.

2.3.5 Non-Production Sealed and Un-Sealed Source Inventory

The inventory of non-production sealed and unsealed sources is provided in Appendix B.

2.3.6 Effectiveness of the Nuclear Criticality Safety Program (NCSP)

Not applicable.

2.3.7 Emergency Drills Related to Nuclear Criticality

Not applicable.

2.4 Safety Analysis

Nordion has an established EHS Committee comprised of senior management and technical professionals and is chaired by the Director, Quality Assurance Environment Health and Safety Compliance, or designate. The EHS Committee reviews new/amended processes which might have an impact on health, safety, and environment. Activities that relate specifically to CNSC licensing and the radiation protection of workers, the public and the environment, are addressed in the EHS Committee meetings typically held on a bi-monthly basis with ad hoc meetings arranged as required. Typical agendas include Safety Analysis Reports, significant changes (repairs/modifications) to existing facilities, Radiation Incident Report reviews, safety procedures, and review of CNSC licensing requirements (radiation monitoring, ALARA program, emissions, dosimetry, project approval, etc.). In 2013, the EHS Committee met on six occasions (five regular meetings and one ad hoc meeting).

Final Safety Analysis Reports (FSARs) are prepared by project leaders to encompass risk analysis and safety and environment reviews. FSARs must be approved by the EHS Committee before a new process goes into full production. Primary focus is placed on the Nuclear Medicine Production Facility (NMPF) FSAR and the Cobalt Operations FSAR, since these are the two main documents covering the production operations. Revisions to these documents are reviewed and approved internally, and submitted to the CNSC for approval. Secondary FSARs (for each individual production process) are reviewed and approved internally as per an established review schedule.

[redacted]

Summaries of the activities and modifications and repairs are provided in Sections 1.1.3 and 1.2.3 respectively.

Nordion evaluates over time the effectiveness of the preventative measures and strategies implemented as operational experience is gained with each of the facilities.

[redacted]

2.5 Physical Design

In 2013, within the boundaries of the active area for Nordion's production facilities, there were no physical design changes to any structural areas of the building.

2.6 Fitness for Service

The management structure of Nordion's Preventative Maintenance Program was not altered in 2013. Nordion continues to use an "Advanced Maintenance Management System" (AMMS) to control Nordion's maintenance activities. Maintenance performance is reviewed monthly for outstanding activities and is acted on by team leaders. This continues to prove effective as during 2013, there were no major equipment failures.

Every year a detailed review is carried out at the senior management level to discuss aging equipment at the KOB. This review takes into account three criteria: safety of facility, regulatory requirements and site improvements. Projects are prioritized into three categories and funds are allocated as required to approved projects. During the 2013 review, it was determined that, in addition to replacing one of the 29 year old cooling towers, the second tower should be refurbished. The cooling towers are used to cool water for the chillers that supply cooling water for Heating, Ventilation and Air Conditioning (HVAC) of the building and for the Cobalt pools and for climate control within the Radiopharmaceutical Facility. This aging equipment review process, because of the link to the Senior Management team and Finance, has worked very well in keeping the Nordion facility up-to-date with current technology.

Following Nordion's Standard Operating Procedures for the verification of equipment has proved successful during 2013. There were no equipment failures.

2.7 Radiation Protection

2.7.1 Dose Control Data

2.7.1.1 Occupational External Dosimetry

Currently Nordion is using Luxel+ or Optically Stimulated Luminescent (OSL) dosimeters as Thermo-luminescent Dosimeter (TLD) technology. Nordion's Radiation Protection Manual states that the traditional term "TLD" may be used interchangeably with OSL or other CNSC approved dosimeters.

All employees who regularly work in the Active Area are classified as NEWs and are assigned monthly TLDs. NEWs are trained to work in various production processes and move from one production area to another during the year. In the Nuclear Medicine Operations, personnel may receive exposure from working with more than one radionuclide. Those working with radionuclides where there is concern for extremity exposure to radiation are assigned extremity TLDs. Other employees who normally work outside the Active Area and visit the Active Area on a regular basis are also classified as NEWs, but are assigned quarterly TLDs.

All measurable radiation dose received by personnel were within the regulatory limit of 50 mSv/yr in 2013.

Contractors who are given access to the Active Area are called "Contractor NEWs" at Nordion. They are trained as NEWs, tested and have security clearance, but are subject to the regulatory dose limit and Action Levels of non-NEWs. For accuracy of review, their doses are reported in a separate group and their results are not broken down in Tables 9 and 10. Minimum, maximum and average body and skin doses for Contractor NEWs are listed in Table 11 and Table 12.

Tables 9 and 10 provide dosimetry data with employees grouped in various ranges of exposure. Data on the minimum, maximum and average doses for all employees are shown in Tables 11, 12 and 13.

Table 9
Personnel Dosimetry

Number of Employees										
Dose Range (mSv)	Whole Body					Skin				
	2009	2010	2011	2012	2013	2009	2010	2011	2012	2013
< 0.2	201	169	192	187	197	186	152	180	186	184
0.2 - < 0.5	52	49	39	41	25	63	60	48	40	37
0.5 - < 1.0	31	39	30	28	24	31	39	30	30	25
1.0 - < 5.0	44	52	49	36	36	48	58	52	36	36
5.0 - < 20.0	0	0	1	1	2	0	0	1	1	2
20.0 - < 50.0	0	0	0	0	0	0	0	0	0	0
> 50	0	0	0	0	0	0	0	0	0	0
Number of Employees										
Dose Range (mSv)	Right Hand					Left Hand				
	2009	2010	2011	2012	2013	2009	2010	2011	2012	2013
< 0.2	110	101	111	105	103	113	104	110	106	102
0.2 - < 0.5	12	13	15	15	6	13	17	12	15	7
0.5 - < 1.0	22	14	9	5	10	20	11	15	4	7
1.0 - < 5.0	25	35	28	16	17	23	30	28	15	19
5.0 - < 20.0	9	9	8	5	4	8	8	5	4	3
20.0 - < 50.0	0	0	0	0	0	0	0	0	0	0
> 50	0	0	0	0	0	0	0	0	0	0

Table 10
Breakdown of Whole Body Radiation Doses 5.0 to < 20 mSv

Year	Dose Range			
	5<8 mSv	8<10mSv	10<15 mSv	15<20 mSv
2009	0	0	0	0
2010	0	0	0	0
2011	1	0	0	0
2012	1	0	0	0
2013	2	0	0	0

Table 11
Minimum, Maximum and Average Whole Body Doses (mSv)

		Active Area Personnel (NEWs)	Non-Active Area Personnel (NEWs)	Non-NEWs (Contractors)
Minimum	2009	0	0	0
	2010	0	0	0
	2011	0	0	0
	2012	0	0	0
	2013	0	0	0
Average	2009	0.62	0.13	0.34
	2010	0.65	0.14	0.05
	2011	0.64	0.11	0.05
	2012	0.56	0.12	0.03
	2013	0.59	0.12	0.03
Maximum	2009	4.63	2.48	0.55
	2010	4.86	3.66	0.36
	2011	5.08	1.62	0.45
	2012	5.19	1.36	0.21
	2013	6.39	1.48	0.27
CNSC Regulatory Limits		50/yr; 100/5yr	50/yr; 100/5yr	1/yr

Table 12
Minimum, Maximum and Average Skin Doses (mSv)

		Active Area Personnel (NEWs)	Non-Active Area Personnel (NEWs)	Non-NEWs (Contractors)
Minimum	2009	0	0	0
	2010	0	0	0
	2011	0	0	0
	2012	0	0	0
	2013	0	0	0
Average	2009	0.69	0.14	0.07
	2010	0.81	0.17	0.06
	2011	0.72	0.12	0.05
	2012	0.61	0.12	0.04
	2013	0.60	0.15	0.03
Maximum	2009	4.46	2.51	0.36
	2010	5.53	3.56	0.38
	2011	6.09	1.58	0.48
	2012	5.19	1.41	0.23
	2013	6.39	2.89	0.28
CNSC Regulatory Limits		50/yr; 100/5yr	50/yr; 100/5yr	1/yr

Table 13
Minimum, Maximum and Average Extremity Doses (mSv)

		Active Area Personnel (NEWs)	Non-Active Area Personnel (NEWs)	Non-NEWs (Contractors)
Minimum	2009	0	0	
	2010	0	0	
	2011	0	0	
	2012	0	0	
	2013	0	0	
Average	2009	1.38	0.04	
	2010	1.48	0.02	
	2011	1.14	0	N/A
	2012	0.54	0	
	2013	0.54	0	
Maximum	2009	19.4	0.9	
	2010	25.9	0.3	
	2011	18.3	0	
	2012	10.3	0	
	2013	7.4	0	
CNSC Regulatory Limits		500/yr	500/yr	500/yr

2.7.1.2 Internal Occupational Radiation Doses

Nordion's bioassay program includes thyroid monitoring on a scheduled routine basis and whole body counting or urine analysis if air/contamination monitoring indicates it is needed.

During 2013, there were no cases of employees exceeding Nordion's administrative investigation level of 1000 Bq I-125 or I-131.

No whole body counting or urinalysis was required in 2013.

There were no employees who recorded internal doses exceeding any of the dose limits in Sections 13 and 14 of the Radiation Protection Regulations.

2.7.2 Significance of Results for the Dose Control Data

A further breakdown of dose trends by group, for the last five years is provided in Figures 1 to 19 at the end of this report. The graphical trends show group average, individual maximum and group cumulative doses. This trend data is reviewed yearly at the Annual Joint Environmental Management System and QA Program for Safety Review. There are a few general observations in the trend data: Cobalt (Sterilization) groups have either stable or increasing doses, whereas Medical Isotope production doses are trending downward. These two observations closely follow increases in Co-60 production and shipments and decreases in Medical Isotope production and shipments. A detailed analysis, by group, is provided in Table 14.

Table 14
Analysis of Radiation Doses and Trends (if individual doses exceed 1 mSv/yr)

Figure #	Group	Analysis of Radiation Doses and Trends
1	**Cobalt Production Technicians**	There is an overall slight increase in cumulative dose for the group and individual maximum, and a slight decrease in average dose. This is consistent with increased production activities in 2013.
2	**Cobalt Monitoring, Decontam and Shipping**	Doses are very closely managed in this group. Cobalt Shippers routinely have the highest doses at Nordion. The dose trend is increasing. This is consistent with increased production activities in 2013.
3	**Cobalt Development**	Individual doses are low - less than 1 mSv/yr over 5 years.
4	**Cobalt QC**	Doses are fairly stable in this group.
5	**Radiopharm Development**	Doses are low and have remained low in 2013. Doses are trending downward, in great part due to reduced development activities.
6	**Technical Support**	Individual doses are low - less than 1 mSv/yr over 5 years.
7	**Nuclear Medicine Shippers, Waste, Containers**	Doses are relatively stable with a slight downward trend. Doses are closely managed for this group due to the nature of their work.
8	**I-131, Ir-192 & Miscellaneous Production Technicians**	Doses are relatively stable with a slight downward trend.
9	**Mo-99/I-125 Production Technicians**	Doses are trending downward.
10	**Radiopharm Production Technicians**	Doses are low, have remained low in 2013, and are trending downward, in great part due to reduced processing and staff reductions.
11	**Machinists**	Doses are generally trending downward as most Machinists support Medical Isotope production where processing has reduced. The exception is higher individual doses to Machinists supporting Cobalt Sterilization where processing has been increasing.
12	**Nuclear Medicine QC**	Doses are trending downward, in great part due to reduced processing and the introduction of the use of a new cell used for testing in late 2011. Individual doses are low in this group - less than 1 mSv/yr over 5 years.
13	**Surveyors**	Doses are trending downward, in great part due to reduced processing.
14	**Nuclear Medicine Operators, Helpers**	Doses are trending downward, in great part due to reduced processing.
15	**Nuclear Medicine Radiation and Contamination Monitors**	Doses are trending downward, in great part due to reduced processing.
16	**Maintenance & Motor Pool**	Maximum individual doses have been ~1 mSv for the last four years. Group cumulative and average doses are trending very stable year over year.
17	**Maintenance & Electronic Calibration Lab**	Individual doses are low - less than 1 mSv/yr over 5 years.
18	**Radiopharm QC**	Doses are low, have remained low in 2013, and are trending downward. In great part this is due to reduced processing and staff reductions.
19	**Facilities, Electrical**	Individual doses are low - less than 1 mSv/yr over 5 years.

Table 9, Personnel Dosimetry, shows the distribution of dosimetry results for Nordion workers. The distribution of whole body doses year over year is similar between 2012 and 2013. This demonstrates continued high performance of Nordion employees in accordance with ALARA, especially in light of increased Co-60 production in 2013. The highest effective doses received in 2013 by employees are listed below. This demonstrates that the higher dose work at Nordion mainly involves personnel dedicated to Co-60 production activities. The 20 employees with the highest effective doses account for 48.2% of the cumulative dose at Nordion in 2013.

2013 Effective Dose (mSv)	Nordion Role
6.39	Sr. Cobalt Shipper
5.20	Sr. Cobalt Monitor/Production Support
4.78	Cobalt Decontam Operator/Shipper
4.66	Sr. Cobalt Monitor
3.34	Cobalt Production Technician
3.24	Sr. Cobalt Production Technician
3.05	Cobalt Production Technician
2.56	Cobalt Production Technician
2.33	Cobalt Monitor
1.95	Cobalt Production Technician
1.82	Surveyor
1.80	Sr. Surveyor
1.79	Medical Isotope Shipper
1.78	Medical Isotope Shipper
1.62	Cobalt Production Technician
1.61	Sr. Medical Isotope Monitor
1.54	Cobalt Machinist
1.46	Cobalt Production Technician
1.43	Cobalt Monitor
1.37	Surveyor

Table 10 shows very similar trend results to previous years except that in 2013 there are two employees in the 5-8 mSv/y range vs. one or zero employees in the previous four years. However, compared over a longer timeframe (the previous five years, as shown in Table 15), it is clear that these are normal fluctuations.

Table 15
Breakdown of Whole Body Radiation Doses 5.0 to < 20 mSv
(2004 to 2008)

Year	Dose Range			
	5<8 mSv	8<10mSv	10<15 mSv	15<20 mSv
2008	1	0	0	0
2007	1	0	0	0
2006	3	0	0	0
2005	6	0	0	0
2004	6	0	0	0

Table 11 shows an increase in maximum effective dose to Active Area personnel in 2013. There was an eight percent increase in total activity shipped of Co-60 year over year. Contractor dosimeters and doses continue to be well managed and controlled. It is worthwhile noting that the top eight doses to non-Active Area personnel involve employees who travel to customer sites with their Nordion dosimeters; some to work on installing Co-60 in Industrial Irradiators. At times, these dosimeters are inadvertently x-rayed in the airport security scanning system.

Table 12 shows similar results to Table 11 with the exception of the 2.89 mSv maximum skin dose to a Non-Active area employee who inadvertently had their dosimeter x-rayed in an airport security scanning system. This recorded dose was inconsistent with Co-60 exposure and greatly in excess of the employee's recorded Direct Reading Dosimeters (DRD) readings. This, and other minor non-personal doses recorded by Nordion employees who travel with dosimeters are not the subject of requests for revision at the National Dose Registry.

Table 13 shows a decrease in maximum extremity dose year over year. The same employee received the maximum hand dose in 2012 and in 2013. This employee is a Medical Isotopes Monitor who performed the majority of the removal of Y-90 [redacted] orders and the [redacted] hot cell cleanings in both years. This decrease is observed despite increases in [redacted] production in both 2012 and 2013. The decrease is attributed to increased performance and continuous improvement in [redacted] production techniques. Improvements included additional instruction provided by the Monitors to Production Technicians on techniques to minimize contamination during waste disposals, improved efficiency by the Monitor, and improved remote cleaning methods when in-cell spills occur.

The above analysis of trends demonstrates continuously improving performance at Nordion and adherence to the ALARA principle in the execution of duties by Nordion personnel.

2.7.3 Contamination Control Data

The contamination control program for the Active Area includes routine sampling and monitoring on a daily basis of the floors, benches, fume-hoods, glove-boxes, support/service areas, and on a weekly basis, change-rooms and inactive floors. Regular sampling, by wipe testing, of the corridors and office areas is conducted several times daily to ensure areas are maintained contamination free and, should contamination be found, to decontaminate immediately to the levels specified in the decontamination procedure. In addition, equipment leaving the Active Area is monitored by wipe test and/or direct measurement to provide assurance that equipment leaving the Active Area meets administrative and regulatory requirements.

During 2013 operations, there were instances where elevated levels of contamination (above "clean on swipe") were found and subsequently contained within the Active Area. Most were due to routine operations such as the replacement of manipulators and associated boots on a cell, decontamination of materials/equipment and shielding containers, and tracking of contaminants from a cell, glove-box, or fume-hood when product or samples were being removed.

There were a total of 32 contamination incidents in 2013 (Table 16). This stable trend in contamination incidents as compared to 2012 continues to reflect the reduction in the amount of material processed into customer orders for sale as compared to historical levels. It is anticipated that should the amount of material processed for sale increase, the number of contamination incidents could rise to reflect this.

The distribution of contamination incidents in 2013 is shown in Table 16 and 17 and is illustrated in Graph 1. The distribution of contamination incidents by isotope reflects the amount of material processed for sale, with the exception of Co-60 due the fact that the activity of a given order is typically shipped in 200,000 Ci orders.

There does not appear to be a discernible trend in the contamination incidents by month.

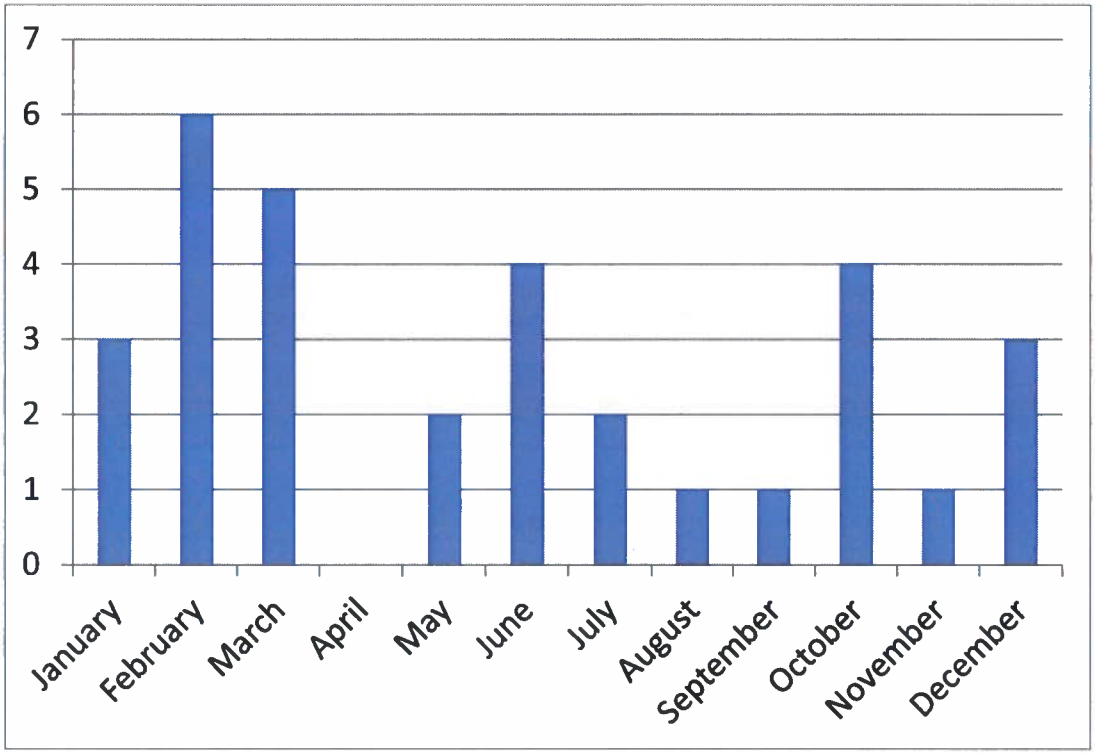
Table 16
Breakdown of Contamination Incidents by Contamination Level

Year	Not recorded	<500 cpm	>500 cpm, <2,000 cpm	>2,000 cpm, <10,000 cpm	> 10,000 cpm, < 50,000 cpm	>50,000 cpm	Annual Total
2009	4	5	35	23	7	5	79
2010	1	2	18	15	4	3	43
2011	0	11	11	9	3	3	37
2012	1	1	7	13	6	4	32
2013	0	1	12	8	6	5	32

Table 17
Breakdown of Contamination Incidents by Radionuclide

Year	Not recorded	C-14	Co-60	I-125	I-131	Mo-99	Y-90	Decayed Mo-99
2009	1	0	21	1	20	10	9	-
2010	0	0	3	1	13	3	8	5
2011	1	0	7	3	6	12	3	0
2012	1	0	5	2	7	10	5	0
2013	1	0	9	1	10	5	4	0
Year	**Ir-192**	**In-111**	**Lu-177**	**Xe-133**	**Sr-82**	**I-123**	**Eu-152**	**Annual Total**
2009	10	1	0	0	4	0	1	78
2010	2	0	0	1	7	1	0	43
2011	0	2	2	0	0	2	1	37
2012	1	0	0	0	0	1	0	32
2013	1	0	0	1	0	0	0	32

Graph 1: Contamination Incidents by Month, 2013



2.7.4 Facility Radiological Conditions

The radiation survey program involves radiation measurements within the Active Area, and on the perimeter and exterior of the KOB. Within the Active Area, radiation surveys are conducted on a daily basis, throughout all the labs/rooms. Areas where radiation fields are above 2.5 mrem/hr (0.025 mSv/hr) are posted with radiation warning signs, indicating the radiation fields. In addition, surveys are conducted at employee work areas, at cells, glove-boxes, and fume-hoods, during production and test operations, to ensure radiation fields during processing are within acceptable levels. Special surveys are conducted on new processes/equipment to provide information on the safety performance of new operations. Detailed surveys are conducted on each of the Cobalt Operations cells every three years, to check for integrity of the cells and ensure radiation levels are within acceptable levels.

On a monthly basis, radiation surveys have been conducted on the perimeter of the Active Areas, and within the Inactive Office Areas. The monthly survey also includes measurement of radiation fields outside the KOB to ensure conditions have not changed in the operations that may impact the environment/exterior exposure. All the monthly surveys were conducted in 2013.

Breathing air was monitored at 12 Continuous Air Monitor (CAM) stations and at over 50 locations with 24 hour air filters. In addition to having the capability of alarming locally, CAMs are monitored and logged at the Surveyor's control panel and on the building monitoring system. The 24 hour air filters are measured at the end of the day shift on a daily basis in accordance with SE-OP-007, "Daily Workstation Air Monitoring".

For work known to have the possibility of creating radioactive contamination of the breathing air, a zone is demarcated and signage is posted requiring respirators to be worn. Respirator requirements are removed only once air monitoring measurements are below the levels stated in SE-OP-007. In 2013, all breathing air sampling was performed in accordance with procedures and results indicated that processes were in control.

2.7.5 Exceeding Regulatory Limits or Action Levels

There were no incident investigations completed where a regulatory limit was exceeded or an action level was reached or exceeded. There was one ALARA investigation completed, documented as Investigation 13-38. Refer to Appendix A. There was no potential for exceeding a regulatory or action level as a result of this incident.

2.7.6 Radiation Protection Program Effectiveness

The Radiation Protection (RP) Program is reviewed by conducting process audits and process safety audits. Refer to Section 1.2.4.1. Data and performance of the Radiation Protection Program is reviewed regularly at EHS Committee meetings.

2.7.7 Radiation Protection Program Improvements

Improvements to the RP Program in 2013 included the following:

- Installing a whole body contamination monitor in the Cobalt Operations facility.

Efforts to monitor and track unreturned dosimeters continued in 2013, including maintaining awareness with employees and Managers.

There were no new RP program procedures created.

2.7.8 Radiation Protection Program Performance

The objectives, goals and targets of the Radiation Protection Program are shown in Table 5 of Section 2.3.1. The targets average and maximum NEW dose and environmental releases were met in 2013. These targets are tracked as key performance indicators at EHS Committee meetings and in Monthly Operational reports. The targets are reviewed yearly at the Annual Joint Environmental Management System and QA Program for Safety Review. Refer to Section 3.2 Table 24 for a summary of the initiatives and targets for the upcoming year. Despite increases in Co-60 production, the 2014 target for average employee dose was reduced from ≤ 1.5 mSv/yr to ≤ 1.3 mSv/yr to challenge and demonstrate Nordion's commitment to continuous improvement.

The return rate of unreturned dosimeters has greatly improved since 2011 (167 unreturned in 2011, 27 unreturned in 2012, and 23 unreturned in 2013). As a result, the working target for unreturned dosimeters was reduced from < 100 to < 25 returned later than one month for 2014.

2.7.9 Continuous Improvements Under ALARA Performance

ALARA objectives and performance is reviewed at EHS Committee meetings and all activities in the ALARA program are described in SE-RP-002, "Keeping Radiation Exposures and Doses "As Low as Reasonably Achievable (ALARA)". This procedure was followed in 2013, and performance against targets is demonstrated in Table 5 of Section 2.3.1.

2.7.10 Radiation Protection Training Program and Effectiveness

Refer to Section 2.2.1.

2.8 Conventional Health and Safety

2.8.1 Conventional Health and Safety Program Effectiveness

The Conventional Health & Safety Program is reviewed by conducting program audits, process audits, regular inspections by both employees and management, and a review of revised safety programs is performed by the Policy Health & Safety Committee. The Policy Health & Safety Committee is also responsible for reviewing the Hazard Prevention Program and updating the Hazard Assessment and Ranking system. In addition, the EHS Management Committee sets targets each fiscal year in the areas of Medical Treatment Incidents, Lost Time Incidents and Severity Rates. Refer to Sections 1.2.4.1 and 1.2.4.2 for a description of audits and inspections.

2.8.2 Conventional Health and Safety Committee Performance

The Kanata Operations Building (KOB) Workplace Health and Safety Committee is represented by union and management and typically meets on a monthly basis. The KOB Health & Safety Policy Committee is represented by union and management and typically meets on a quarterly basis.

The KOB Workplace Health and Safety Committee met nine times in 2013. The KOB Health & Safety Policy Committee met on five occasions in 2013. The accomplishments for 2013 were that the Policy Committee continued to review the Hazard Prevention Program and participated in the review of the Safety Objectives and Targets and the Safety Culture Survey results. In addition, the Policy Committee continued to review operational ergonomics as a standing agenda item for each meeting.

2.8.3 Conventional Health and Safety Program Improvements

Improvements to the Conventional Health and Safety Program in 2013 included the following:

- Creating a Job Hazard Analysis Program which is completed jointly between Managers of high risk operations and employees performing the work. This program will be reviewed semi-annually by Department Managers.
- Creating a Working Safely with Cryogens procedure and training program.
- Enhancing the Workplace Violence Program.
- Conducting a Safety Culture Survey among all employees with positive results.
- Improving the Bio-safety Program by documenting in more detail the procedures for handling and storage.
- Creating and implementing a Manual Material Handling Program which includes instructions and training for operations employees describing correct ergonomic practices when manually lifting or handling materials.

2.8.4 Hazardous Occurrences

During 2013, there was one disabling injury that resulted in 18 days of lost time and three minor injuries.

The disabling injury was the result of an employee bending over to pick up a portable piece of equipment and experiencing pain in their lower back when standing. One of the minor injuries was the result of an employee slipping and straining their back requiring a short course of physiotherapy. Another minor incident occurred when an employee strained their groin while guiding a container onto a stand which resulted in medication being prescribed. The third minor injury occurred when an employee lost their balance while getting off a platform and struck their finger on the wall which required a prescribed splint.

2.9 Environmental Protection

2.9.1 Air and Water Release Monitoring

The environmental monitoring program is designed to monitor and measure effluent releases to the environment and to determine radiation levels in areas exterior to the KOB. The program includes the following elements:

a) Continuous monitoring of process ventilation, exhausts ductwork, and stack emissions by use of in-situ detectors and samplers and computerized recording

b) Weekly air sampling and analyses for KOB exhaust stack emissions

c) Holding tanks for Active Area liquid effluent to allow sampling, analysis, and authorized release of liquid effluent

d) Environmental TLD program

e) Soil sampling (which is performed every two years and was performed in 2012).

f) Groundwater sampling

Ventilation and stack sampling is conducted by using particulate and/or activated charcoal filters, depending on the physical and chemical nature of the radionuclide. Radioiodine sampling involves the use of activated charcoal filter cartridges, and analyses by gamma measurement. Particulates are sampled by use of cellulose filter papers and analyzed by gamma measurement.

All production operations are contained within cells, glove-boxes and/or fume-hoods. Ventilated air from these containment systems is filtered through roughing and HEPA filters and, where appropriate, activated charcoal adsorbers. These systems are designed with redundant fan/motor and filtration units that include pre-filters, primary and secondary filtration units. The NVS has been designed and is maintained to prevent the unnecessary release of radioisotopes to the atmosphere.

2.9.1.1 Airborne Effluent

Allowable releases to the environment are limited to the values in SE-OP-029 (4), "Derived Release Limits". A revised version of SE-OP-029 (5) has been submitted to the CNSC for approval. Some radionuclides are reported using SE-OP-029 (5) as values for these radionuclides were not listed in the previous version (Version 4). A summary of airborne releases is provided in Table 18. The total percentage of the Derived Release Limit (DRL) per year is presented in Graph 2.

In 2013, the maximum annual release of airborne from any one radionuclide was Xe-135m at 1.44% of the Derived Release Limit (DRL). No Action Levels were exceeded in 2013. Since the submission of SE-OP-029 (5), the Canadian Standards Association (CSA) has published a new standard for calculating DRLs. Nordion submitted a revised draft SE-OP-029 (6) with revised calculations as per the CSA-N288.1 standard to the CNSC in 2013.

Table 18
Airborne Releases

Year	C14 (GBq/yr)	Co-60 (GBq/yr)	I-125 (GBq/yr)	I-131 (GBq/yr)	Xe-133 (GBq/yr)	Xe-135 (GBq/yr)	Xe-135m (GBq/yr)
2009	37.8	0.006	0.47	1.05	26,407	14,439	20,444
2010	43.1	0.006	0.37	0.99	9,066	6,407	9,366
2011	67.9	0.006	0.38	0.29	34,967	17,239	27,688
2012	15.7	0.006	0.46	0.40	36,153	23,943	39,498
2013	N/A*	0.005	0.23	0.39	30,735	28,193	43,383

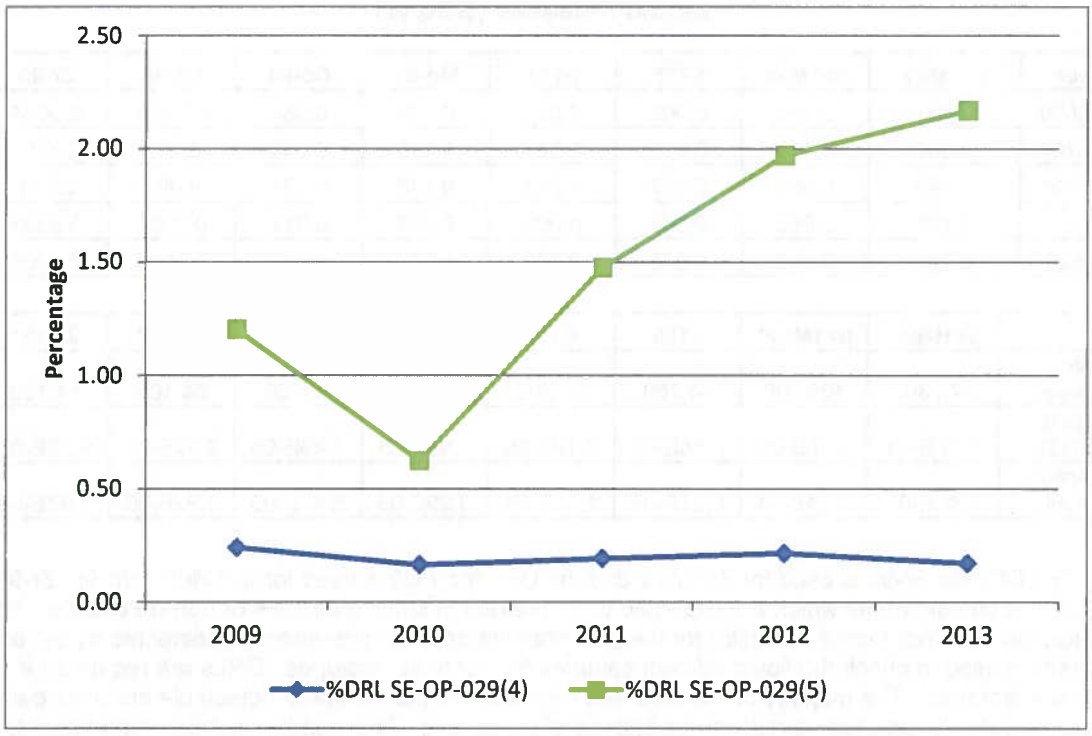
	C14	Co-60	I-125	I-131	Xe-133	Xe-135	Xe-135m
DRL (GBq/yr) Using SE-OP-029 (4)	*	78	990	1110	2.90E+07	*	*
% DRL (2013)	*	0.01%	0.02%	0.04%	0.11%	*	*
% Action Level (2013)	*	0.01%	0.05%	0.07%	0.21%	*	*

* No limit established for these isotopes in SE-OP-029 (4)

	C14	Co-60	I-125	I-131	Xe-133	Xe-135	Xe-135m
DRL (GBq/yr) Using Draft SE-OP-029 (5)	9.95E+04	1.17E+04	1.22E+03	1.13E+03	4.27E+07	5.00E+06	3.00E+06
% DRL (2013)	N/A**	0.00%	0.02%	0.04%	0.07%	0.56%	1.48%
% Action Level (2013)	N/A**	0.00%	0.04%	0.07%	0.14%	1.13%	2.96%

** C-14 production stopped toward the end of 2008, and measurement of C-14 was stopped in 2012.

Graph 2: Total %DRL per Year



2.9.1.2 Liquid Effluent

Allowable liquid effluent releases to the environment are also limited to values in SE-OP-029 (4), "Derived Release Limits". The five year variation in activities released is listed in Table 19. The volume and total percentage of the DRL per year is presented in Graph 3.

No Action Levels or Administrative Levels were exceeded in 2013. All liquid effluent releases have been below the Nordion action levels and well within CNSC licensed limits. A summary of liquid releases, expressed as a % DRL, is provided in Table 19.

The City of Ottawa is informed whenever a release to the sanitary sewer takes place. In addition, a monthly summary report of the activity levels released is provided to the City of Ottawa.

Table 19
Liquid Releases (GBq/yr)

Year	Litres	β<1MeV	β>1MeV	I-125	I-131	Mo-99	Co-60	Nb-95	Zr-95	Cs-137
2009	1130670	0.424	0.096	0.008	0.016	0.144	0.034	0.0006	0.0004	0.0007
2010	1510764	0.569	0.129	0.011	0.021	0.180	0.044	0.001	0.001	0.001
2011	1024391	0.395	0.088	0.007	0.013	0.116	0.027	0.001	0.001	0.0004
2012	720821	0.261	0.060	0.005	0.009	0.075	0.017	0.0002	0.0003	0.0004
2013	782848	0.288	0.065	0.005	0.009	0.077	0.022	0.0006	0.0006	0.0005

	β<1MeV*	β>1MeV*	I-125	I-131	Mo-99	Co-60	Nb-95*	Zr-95*	Cs-137*
DRL (GBq/yr)	7,780	105,000	14,700	10,800	467,000	64,100	64,100	64,100	64,100
% DRL (2013)	3.70E-03	6.18E-05	3.45E-05	8.19E-05	1.64E-05	3.49E-05	9.12E-07	9.36E-07	7.74E-07
% Action Level	7.40E-03	1.24E-04	6.91E-05	1.64E-04	3.29E-05	6.97E-05	1.82E-06	1.87E-06	1.55E-06

* The DRL for Sr-90 is used for β<1MeV and the DRL for Y-90 is used for β>1MeV. Nb-95, Zr-95 and Cs-137 are contaminants which are expected to be present in small quantities or non-detectable. Although Nordion does not formally monitor for these contaminants, their presence was detected by the analysis method used to check the liquid effluent samples for our major isotopes. DRLs are required for only the major isotopes. The majority of the recorded releases are the minimum detectable activities being conservatively reported as real values instead of using zero. This number is then proportional to volumes released, which explains the lower reported releases in 2012 and 2013 than in recent years.

Graph 3: Volume and Total % DRL per Year

2.9.1.3 Environmental TLDs

The locations of environmental TLDs are shown on Figures 20 and 21 (on pages 63 and 64) and listed in Table 20. The Environmental TLD results are shown in Table 20 and presented in Graph 4. These locations are detailed in procedure SE-OP-012, "Environmental and Office Monitoring Dosimeters". The environmental TLD placement corresponds roughly to the historical locations of these dosimeters. The dosimeters are deployed to generally cover the points of a compass and preferentially to the east of the facility, which is the direction of the prevailing winds. The TLDs are also placed in residences of Nordion employees.

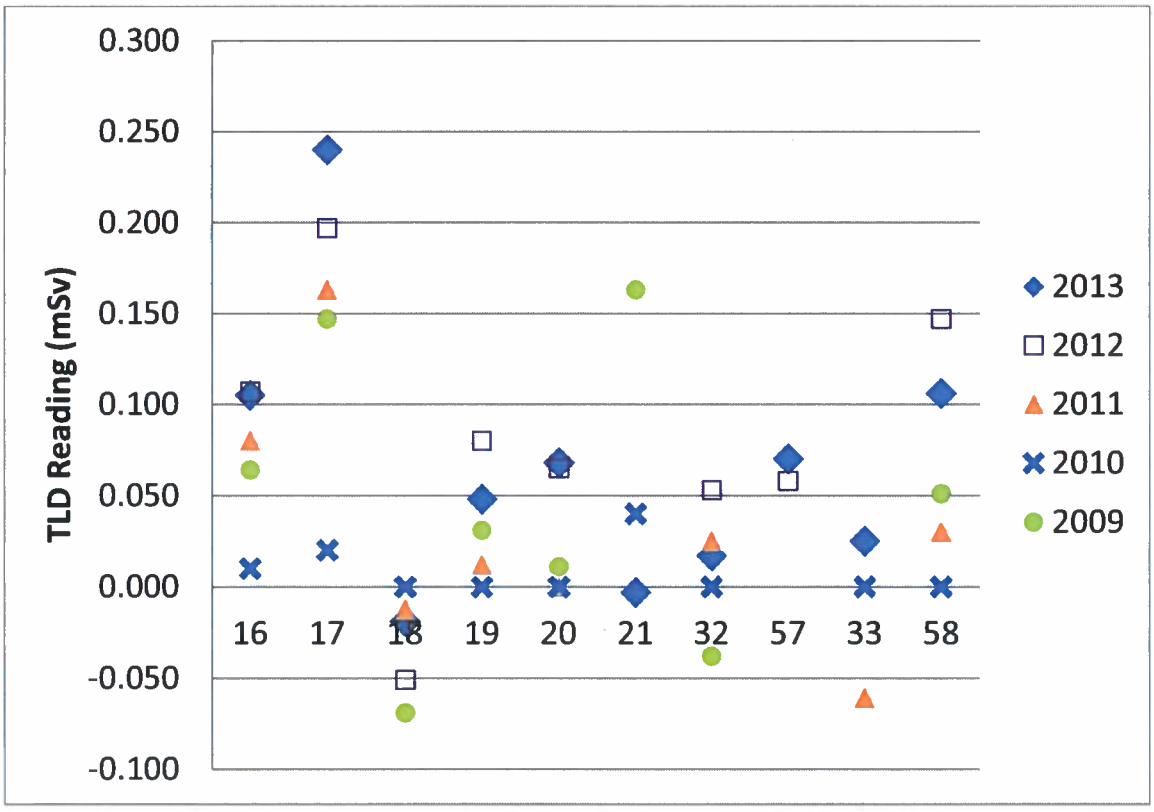
Locations 17 and 20 are locations that are representative of critical receptors for air effluent from the facility. Soil samples at these locations have not shown any radionuclides attributable to Nordion's licensed activities. The similarity in the recorded dose in these locations year over year, taken with the absence of any contamination found in soil illustrates that the variation between locations is due to variations in natural background radiation at these different times and locations.

Table 20
Environmental TLD Results

Location		Totals				
		2013 (mSv)	2012 (mSv)	2011 (mSv)	2010 (mSv)	2009 (mSv)
16	R.E. BUILDING, ROOM 5513	0.105	0.107	0.08	0.01	0.064
17	POLE, NORTH CORNER	0.240	0.197	0.163	0.02	0.147
18	HEATING PLANT, ROOF	-0.019	-0.051	-0.0124	m	-0.069
19	HYDRO POLE, SOUTH-WEST	0.048	0.08	0.012	m	0.031
20	TREE, EAST CORNER	0.068	0.065	0.0	m	0.011
21	THERAPY SYSTEMS, ROOM 209	-0.003	ND	ND	0.04	0.163
32	RESIDENCE	0.017	0.053	0.025	m	-0.038
57	RESIDENCE	0.070	0.058	ND	*	*
33	RESIDENCE	0.025	ND	-0.061	m	*
58	LOCAL BUSINESS	0.106	0.147	0.03	m	0.051

* missing TLD
m = less than 0.01 mSv
ND = not deployed

Graph 4: Environmental TLD Results (mSv)



2.9.2 Significance of Air and Water Release Monitoring Results

Unlike in 2009 and 2010, Mo-99 production was mostly uninterrupted throughout the year, then fairly stable with a slight year over year increase in 2013. Production activities processed closely follow changes in noble gas (Xe-133/-135/-135m) air releases. The year over year (2012-2013) changes in radio-xenon releases are within normal variations (of reactor processing times) taking into account slightly increased production in 2013. C-14 production stopped toward the end of 2008; and therefore, a decrease in C-14 releases for 2009 through 2012 is observed. The C-14 production cell was dedicated to another process in 2009. Nordion stopped C-14 monitoring of CO and CO_2 in 2012. Possible C-14 releases during the dismantling of the C-14 production glove-boxes and fume-hoods will be verified via particulate monitoring. Year over year releases for I-125 decreased by ~50% and production decreased by 17%. Releases of I-131 continue to be low, relative to years prior to 2011 when the use of new in-cell charcoal roughing filters began in the new I-131 processing facility. No other specific trends were noted.

Trends in changes in volumes of water released from the facility continue to be roughly proportional to activities released. Nordion employs a conservative practice of assuming the Minimum Detectable Activity (MDA) is always released. This explains why the year over year trend very closely follows the number of litres released. The next largest factor is variation in the MDA between the Cobalt Operations Facility and the Nuclear Medicine Production Facility. A small percentage of the release reported is activity detected over the MDA.

2.9.3 Exceeding Regulatory Limits or Action Levels

There were no instances of exceeding environmental regulatory limits or action levels in 2013.

2.9.4 Environmental Protection Program Effectiveness

The Environmental Protection Program is evaluated on an annual basis. In 2013, this review was held during the Annual Joint Environmental Management System and QA Program for Safety Review held June 11, 2013. The results of the review are identified in Section 2.1.2 items 3, 4, 5 and 6.

Refer to Section 1.2.4 for a summary of internal and external inspections, audits and reviews.

2.9.5 Environmental Protection Program Activities

Activities which took place in 2013 included the following:

- Conducting a total of 10 fire and environmental inspections to identify areas for improvement and/or concerns. These were completed as part of a process to conduct routine environmental inspections implemented in 2011. Significant improvements have been observed as a result of these inspections.
- Maintaining ISO 14001 certification. In 2013, Nordion was subject to an annual maintenance audit of the system. There were no non-conformances and four opportunities for improvement identified during the course of this audit.
- Conducting a supplier audit of a supplier whose goods/services could have a significant impact on the environment.

2.9.6 Environmental Protection Program Improvements

There were no improvements to the environmental protection program in 2013.

2.9.7 Environmental Protection Program Performance

A description of the Environmental Protection Program Initiatives is provided in Table 21, along with the results/outcome.

A summary of initiatives and targets for the upcoming year is provided in Table 22.

Table 21
2013 Environmental Objectives

Objective	Result / Outcome
Reduce the use of hazardous and other environmentally harmful materials*	Reduction of 5% by 2015 (refer to Table 5 for 2012 results)
Reduce Waste*	Reduction of non-hazardous waste by 5% by 2015 (refer to Table 5 for 2012 results) Reduction of hazardous waste by 5% by 2015 (refer to Table 5 for 2012 results)
Conduct an audit of a supplier whose goods and/or services could have a significant impact on the environment	Completed one supplier audit in accordance with SE-ENV-019 "External Supplier Environmental Audits

** Standardized by revenue to allow for growth. Baseline year of 2010. Hazardous material refers to hazardous chemicals and excludes radiological materials.*

Table 22
2014 Environmental Objectives and Targets

Objective	Target
Reduce the use of hazardous and other environmentally harmful materials*	Reduce use of hazardous and other environmentally harmful materials by 5% by 2015
Reduce Waste*	Reduce non-hazardous waste by 5% by 2015 Reduce hazardous waste by 5% by 2015
Conduct an audit of a supplier whose goods and/or services could have a significant impact on the environment	Complete one supplier audit in accordance with SE-ENV-019 "External Supplier Environmental Audits

** Standardized by revenue to allow for growth. Baseline year of 2010. Hazardous material refers to hazardous chemicals and excludes radiological materials.*

2.9.8 Well and Soil Sampling and Measuring/Monitoring

2.9.8.1 Soil Sampling

Soil sampling is conducted at least every two years to determine the presence/absence of radioactive materials in the soil. Soil sampling was performed in 2012. No radionuclides attributable to licensed activities were detected in the soil samples.

2.9.8.2 Groundwater Sampling

Since 2005, Nordion has been monitoring groundwater at least once a year for non-radioactive contaminants. The results are monitored to ensure there are no significant changes in results since the Limited Phase I and Phase II Environmental Site Assessment which was conducted by WESA for Nordion in August 2005.

Figure 22 on page 65 shows current groundwater well locations.

2.9.8.2.1 Non-Radiological Sampling

Non-radiological groundwater samples were taken in September 2013. Samples were taken from the following wells:

- 2005-BH1
- 2005-BH2 (background well)
- 2005-BH3

2005-BH4 results, including those from the recent analysis, from four years previous and from the original sampling in 2005 are provided in Appendix C by borehole, with borehole two (2005-BH2) representing background conditions.

Parameters for the analysis were chosen based on the Limited Phase I and Phase II Environmental Site Assessment conducted in 2005. Results are compared with previous results and compared to the results from the background well.

A second sample was taken from 2005-BH1 in November 2013 for F3 (hydrocarbon) as the first sample indicated 0.5 mg/L. Results from the second sample indicated that F3 was below detectable limits (<200 µg/L).

The results of this analysis demonstrated that there were no significant changes in the groundwater in 2013.

2.9.8.2.2 Radiological Sampling

Samples were taken in November 2013 from the following boreholes to assess potential radiological contaminants:

- 1991-BH1
- 1991-BH2
- 1991-BH3
- 1991-BH4
- 2012-BH1

It was determined that only naturally occurring radionuclides which are not processed at this site were detected.

2.10 Emergency Management and Response

2.10.1 Emergency Preparedness Program Effectiveness

Management has assessed the existing program and deemed it effective through historical success in meeting the response objectives during exercises. However, continuous improvement opportunities have been identified based on internal and external feedback to exercises and discussion with Ottawa first responders. As a result, Nordion management has chosen to re-develop the program.

In 2013, Management review of the Emergency Management Program focused on the re-development of the incident management governance model and the revision of the Site Emergency Response Plan. These changes are to align the plan with Incident Management Systems and to incorporate other continuous improvements identified. Once this action is complete, the sub-plans will be modified to align with these changes.

Objectives for 2013 included:

- Strengthening Nordion's relationship with the local hospitals to optimize rapid, safe care of casualties. This was achieved through a number of inter-agency meetings which were held throughout 2013 (refer to Section 2.10.2 for further details).
- Executing emergency response exercises and drills. In 2013, all planned emergency response drills were completed with the exception of the Emergency Response Procedure for Industrial/Irradiation Equipment and the Chemical Spill Response Plan. These two drills were postponed to 2014 as a result of the overall program review. This will enable testing of the revised plans in 2014.
- Completing a review of the Emergency Response Program and initiating an update of the program to incorporate the Incident Management System and other identified improvements. Throughout 2013, a thorough review of Nordion's Emergency Management Program was conducted. Significant improvements were made to the Site Emergency Response Plan model to incorporate Incident Management System and other continuous improvements that were identified. A draft of the revised plan was provided to the CNSC in early 2014.

Nordion met their scheduled activities for 2013.

2.10.2 Emergency Preparedness Program Activities

Nordion has an extensive emergency preparedness program to respond to various types of emergency situations, including on-site and off-site emergencies. During 2013, a number of Emergency Response (ER) exercises were conducted to test these emergency response plans and provide training to employees having responsibilities within the plans.

Activities which took place in 2013 included:

- Hosting a Hospital Emergency Planning Committee of Ottawa (HEPCO) meeting which included a Nordion awareness session and facility tour. HEPCO includes representation from all area hospitals, paramedics, Ottawa Emergency Measures Unit (EMU), paramedic physicians and Ottawa Public Health.
- Hosting representatives from The Ottawa Hospital and the Queensway Carleton Hospital for a meeting focusing on the treatment of casualties from the Nordion site. The meeting included an awareness session, facility tour and discussions on protocols for dealing with potentially contaminated casualties.
- Testing of the Fire Safety Plan in each of the three buildings (KOB, Roy Errington (RE) Building, and Heating Plant), including alarm activation and full evacuation.
- Testing of the Emergency Response Contact List to ensure accuracy of telephone numbers listed, to determine availability of personnel, and to estimate response times.
- On-going emergency response training (refer to Section 2.10.3 for additional information).

2.10.3 Emergency Preparedness Program Improvements

In 2013, Nordion completed its review of the emergency preparedness and response program and generated a number of continuous improvements as a result of this review. This includes, but is not limited to recommendations such as:

- Modifying emergency response plans to follow an Incident Management System (IMS) structure for improved capabilities and interoperability with first responders.
- Predefining more suitable incident management locations depending on the event location and phase of response.
- Developing a new format for the plans and ensuring, during all plan revisions, that the standard template is used, that relationships between the plans are defined, functional and interoperable, and that responsibilities are clear and simplified.
- Improving emergency response communication tools (e.g. purchasing additional radios, assigning additional personnel to act as "runners", purchasing or leasing satellite phones, etc.).
- Developing a quick reference guide.
- Increasing exercise frequency, including participation from external agencies.
- Potentially moving to a code-based emergency notification system.

In 2013, Nordion commissioned a third part to assist in the revision of the existing program and response structure to IMS and the creation of a new document to replace the existing Site Emergency Response Plan.

Nordion is committed to doing an effective implementation of IMS and the various other program improvements.

2.10.4 Emergency Preparedness Program Performance

In 2013, equipment checks and work conducted to ensure readiness related to the Emergency Management Program included:

Equipment	Frequency
Emergency Response Kit Inspections	Quarterly
Emergency Generators Test	Monthly
Communications Emergency On Call (EOC) Test	Quarterly
Radiation Evacuation Test	Annual
Self Contained Breathing Apparatus (SCBAs) Hydrostatic Testing	Every 5 years
SCBA Air Replacement	Once / year
Emergency Response Gear Inventory	Quarterly

Overall compliance with the Emergency Management Program was proven satisfactory. There were no events (planned or actual) demonstrating non-compliance with the existing Emergency Management Program.

There were no impairments to the Emergency Management Program systems in 2013.

2.10.5 Emergency Preparedness Training Program Effectiveness

All new employees and contractors are provided with emergency response training prior to being granted a security badge.

During 2013, the following emergency response training was provided to employees and those working on behalf of Nordion:

- Fire Warden and Marshall Training – 88 Participants
- ER Personnel – 54 Participants
- New Employee/Contractors Emergency Alarm and Response Training – 58 Participants
- Emergency Alarms & Response Training – 17 Participants

As a result of the ongoing review of Nordion's emergency response program and the implementation of SAT, training requirements for the Emergency Preparedness Program are currently under review. In the interim, existing training program requirements are being maintained.

2.10.6 Fire Protection Program Effectiveness

As a result of the full-scale emergency response drill conducted in 2011 Nordion has undertaken a thorough review of all emergency response plans, including the fire safety plans with the goal of aligning these plans with an Incident Management System model.

Fire Drills were conducted in the Heating Plant, the RE Building and the KOB in 2013. There were no significant findings or actions identified as a result of these drills.

Nordion's Inspection, Testing and Maintenance report which is conducted by a Third Party is submitted to the CNSC annually. This report was submitted to the CNSC in December 2013. There were minor observations identified during this review regarding housekeeping, fire stopping, and minor sprinkler repairs. All of the issues identified have been corrected.

In 2013, Management review of the Emergency Management Program focused on the redevelopment of the incident management governance model and revision of the Site Emergency Response Plan. These changes are to align the plan with Incident Management Systems and to incorporate other continuous improvements identified. Once this action is complete, the sub-plans, including the Fire Safety Plans will be modified to align with these changes.

The objective of the fire protection program is to promote life safety, the conservation of property and essential equipment, the protection of the environment and the continuity of operations through provisions of fire prevention and fire protection measures. Nordion met all scheduled activities related to the fire protection program in 2013.

2.10.7 Fire Protection Program Activities

Activities that took place in 2013 included:

- Testing of the fire safety plans. This test involved evacuation of the three buildings (KOB, RE Building and Heating Plant) by activation of the building fire alarm system.
- Conducting 10fire and environmental inspections.
- Continuing work on the project to replace fire suppression in hot cells with argon.

2.10.8 Fire Protection Program Improvements

Improvements to the Fire Protection Program in 2013 included:

- Obtaining approval of Nordion's Fire Safety Plans from the City of Ottawa Fire Prevention Division.
- Conducting an audit of the Fire Safety Program.
- There were no changes to training, methods instrumentation or equipment in 2013.

2.10.9 Fire Protection Program Performance

In 2013, equipment checks and work conducted to ensure readiness related to the Fire Protection Program included:

Equipment	Frequency
Fire Pump Test	Monthly
Sprinklers Inspection	Monthly
Fire Extinguishers Inspection	Monthly
Fire Protection System Verification (Third Party)	Annual

Generally, compliance with the Fire Protection Program is satisfactory. A review of Inspection, Testing and Maintenance conducted by a third party demonstrated compliance with requirements; however, there were three minor issues identified as follows:

- Housekeeping - Two minor housekeeping issues
- Fire Stopping - Two minor fire stopping issues, and
- Fire Protection Systems - Two issues where escutcheon plate were missing

All of these issues have since been corrected.

Fire suppression for Cell 7 (used for handling and storage of waste from the Mo-99 process) has been impaired as a result of a leaking cylinder. As a result, there is currently no fire suppression in this cell. Impairments are typically managed through the work permit process; however, due to the nature of this impairment, the removal of fire suppression was also assessed by a third party prior to removing it from the cell to ensure the impairment would not significantly impact life safety or the environment.

2.11 Waste Management

Nordion production facilities have been designed and operated in a manner to prevent radioactive waste being released to municipal garbage or sewer systems and to ensure that releases to the environment via air or water emissions are within limits approved by the CNSC. All radioactive waste that was generated through the production operations was collected and sent to a CNSC approved radioactive waste management [redacted]

[redacted]

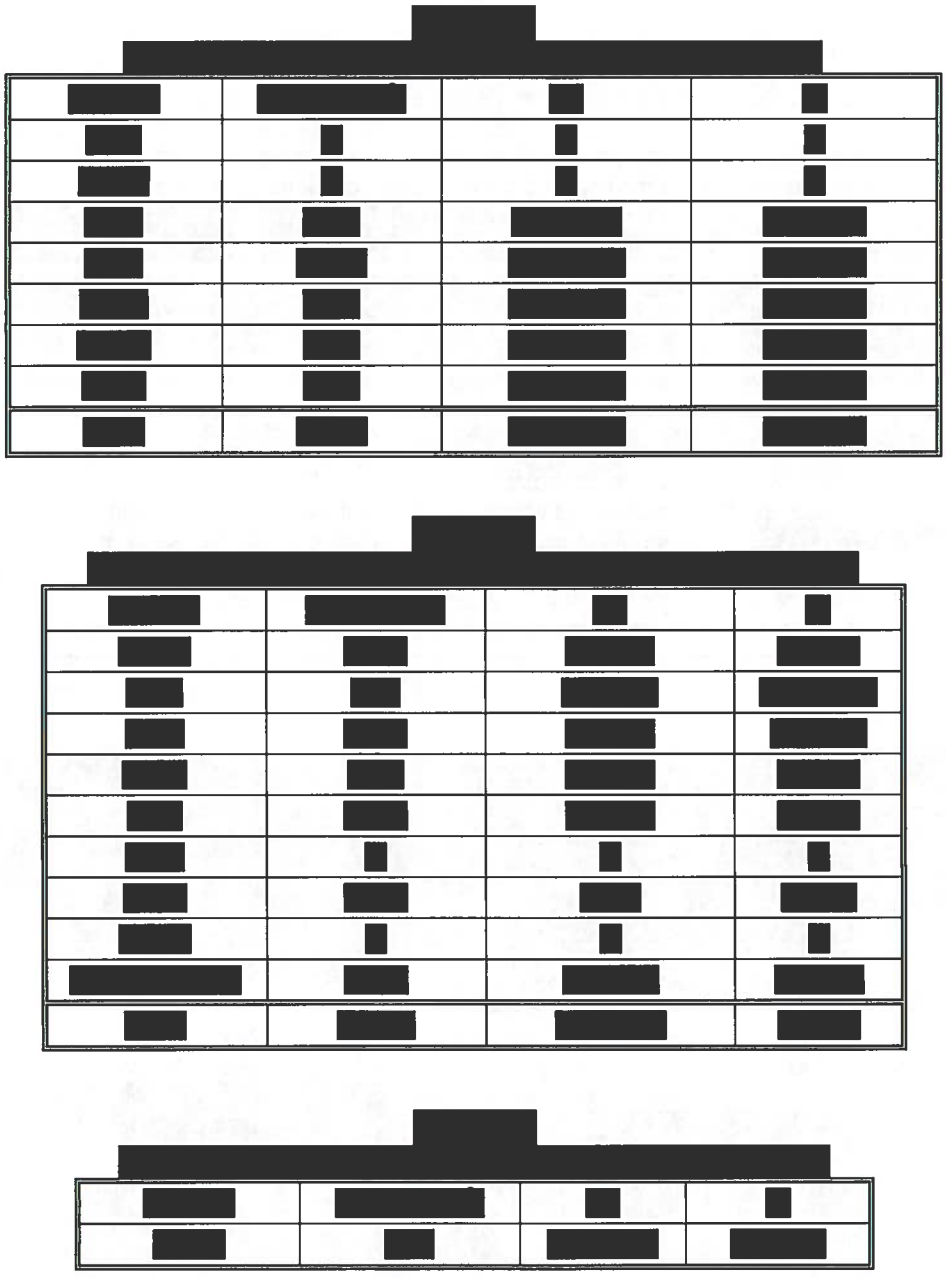
In 2013, there were two waste minimization initiatives. The first initiative involved addressing the potential build-up of low level liquid waste (LLLW) that exceeded lead (Pb) levels for disposal at [redacted]. The use of an evaporator and filtration/collection system was proposed to resolve this issue. This proposal is still under investigation at this time. A second initiative involved the reduction of a backlog of biohazard waste from the microbiology labs in radiopharmaceutical operations active area. This waste was being stored in drums in a segregated area while the autoclave previously being used to reduce the bio-burden levels was not functioning. An agreement was arranged to ship this waste to [redacted] which alleviated the backlog and build-up of this waste.

[redacted]

Waste from other radioisotope licensees is not transferred to Nordion for subsequent disposal. However, spent sealed sources may be returned to Nordion where they may be reprocessed or included with other product material for disposal. [redacted]

[redacted]

[redacted]



2.12 Nuclear Security

Details of Nordion security and all of the security improvements of 2012 were provided in the Nordion Physical Security Report for 2012, submitted in 2013. These safeguards and improvements are prescribed information and were reviewed and accepted by CNSC Security during an inspection on March 26th, 2013. Additional enhancements were made in 2013 following the inspection that will be reviewed by CNSC Security in 2014.

2.13 Safeguards and Nuclear-proliferation

Nordion has a program in place for the management of safeguarded material at the Nordion Ottawa site. The program meets the safeguards requirements of specified license conditions, CNSC Nuclear Non-Proliferation Import and Export Control Regulations, the Nuclear Safety and Control Act and General Nuclear Safety and Control Regulations and was recently revised to meet the safeguards requirements of the CNSC regulatory document RD-336, "Accounting and Reporting of Nuclear Material".

In 2013, one safeguards inspection was conducted by the CNSC. This safeguards inspection was the Physical Inventory Taking - Evaluation (PIT-E) conducted on September 3, 2013. There were no follow-up items required as a result of this inspection.

2.14 Packaging and Transport of Nuclear Substances

In 2013, Nordion reported 18 non-conformances related to packaging and transport of nuclear substances. Nine were non-conformances with the Packaging and Transportation of Nuclear Substances Regulations (Section 19 (1)). The remaining events were reported as required by the Nuclear Safety Act (other non-conformances with regulations). Seven of the reported non-conformances were external to Nordion's control (damaged packages, lost package, or improper labelling). Of the non-conformances that fell within Nordion's control, the issues were due to improper labelling/documentation (three), breach of containment (two), maintenance/testing (two), unauthorized contents (one), incorrect components (one), pressure build up (one), and transportation error (one). Three of the incidents occurred prior to 2013 (historic issues identified in 2013); however, they are included as they were reported in 2013. Refer to Appendix A for further information regarding these incidents.

2.15 Public Information Program

2.15.1 Public Information Program Activities

On January 27, 2013, Nordion posted the CNSC's results on the company's 2012 compliance performance noting that under the 14 categories in which Nordion was rated, the company met or exceeded all compliance requirements and CNSC expectations.

Nordion received one external communication in 2013. It was from a customer requesting a copy of Nordion's ISO 14001 certification and requesting facility information for a supplier questionnaire.

Nordion regularly issues news releases to inform the public of company initiatives, achievements and issues the business may be facing. On October 3, 2013, Nordion posted an ad in the *Kanata Kourier-Standard EMC*, a free weekly distribution newspaper that has a circulation of 23,400, and serves the communities surrounding Nordion's Kanata site. A copy of the ad is provided in Appendix D.

The ad underlined Nordion's ongoing commitment to protect the safety of employees, the community and the environment. It noted that Nordion is certified to ISO 14001 - an international standard for environmental management systems, directed people to the Nordion website, provided the names of key contacts within the company, and overall, encouraged the public to contact Nordion with any questions, comments, or concerns. The ad also highlighted a new feature of Nordion's Public Information Program (PIP), directing people to the feedback form on the Corporate Social Responsibility section of the company web site, which provides them with the opportunity to tell Nordion what they want to hear about and how they want the program to evolve. A copy of the feedback survey is provided in Appendix D.

Nordion continues to update and enhance the Corporate Social Responsibility section of its website to include more information on safety programs and the environmental management system, and to update the Frequently Asked Questions (FAQ) section. The Safety page outlines Nordion's commitment to radiation, employee, public and environmental safety. transportation safety and security, and outlines the regulators for the

facility with links to the regulatory body's homepages. The Environmental Management page outlines the commitments made to environmental stability, including Nordion's ISO 14001:2004 certification, which demonstrates the company's commitment to improving environmental performance. The FAQ page answers common questions posed by the general public. In 2013, the Corporate Social Responsibility site received approximately 1,500 visits.

There were no Nordion media articles relating to environment, health, and safety issues/topics during 2013.

2.15.2 Public Information Program Improvements

In October 2012, Nordion implemented its new public disclosure protocol which commits to informing the public of desired information related to the licensed facility during the course of the license period. This public disclosure protocol is an integral part of Nordion's Public Information Program.

In October 2013, Nordion launched its public disclosure protocol consultation program. As part of this program, Nordion performed the following:

1) Communications were emailed to the target audiences informing them of Nordion's Public Information Program and Public Disclosure Protocol, and reminding them that Nordion was available to present at community group meetings. The letter also invited them to participate in an online survey to provide feedback. A sample of the public disclosure consultation email is provided in Appendix D.
2) Social media was used to reach out to target audiences and the broader community and to invite them to participate in an online survey to provide feedback on Nordion's Public Disclosure Protocol. A sample of Nordion's use of social media is provided in Appendix D.

As a result of Nordion's outreach activities, Nordion received one request to speak at a community group meeting, and one response to the online survey.

In addition to ongoing updates to the Corporate Social Responsibility section on Nordion.com, on May 24, 2013, Nordion posted its Annual Compliance and Operational Performance Report to the CNSC for the period of January 2012 to December 2012. While some portions of this report were redacted on the grounds of commercial confidentiality, the posting provides the public with a detailed overview of Nordion's compliance and operational performance.

2.16 Site Specific Information

Nordion's site-specific reporting requirements are as follows:

- Nordion shall make and submit reports to the Commission regarding safeguarded material in accordance with RD-336, "Accounting and Reporting of Nuclear Material".
- Nordion shall annually update and submit the Annual Physical Security Report by March 31, of the following calendar year.
- Nordion shall report the transfer, receipt, export or import of sealed sources if the activity exceeds the threshold limits as indicated in the site license and within the specified timeframes as detailed in the site license.

In 2013, Nordion complied with each site-specific reporting requirement with the exception of a number of instances regarding sealed source reporting. These events were documented in the following investigation reports: 13-03, 12-26, 13-28, and 13-32. These instances were reportable under Section 6.1 (g) of the site license (NSPFOL-11.A.04/2015). Refer to Appendix A for further details.

The Financial Guarantee, as approved by the Commission and based on the Facility's Decommissioning Plan, is still valid.

3. FUTURE PLANS AND CONCLUDING REMARKS

3.1 Improvement Plans and Future Outlook

[redacted]

3.2 Safety Performance Objectives for Following Year

Nordion plans to replace its in-cell halon fire suppression system with a more environmentally friendly argon fire suppression system.

There are no projected changes to the organizational structure for 2014.

Nordion's 2014 EHS Program Objectives and Targets and Health and Safety Objectives are shown in Tables 26 and 27. For 2014, the target for average employee dose was reduced from ≤ 1.5 mSv/yr to ≤ 1.3 mSv/yr. The objective regarding ensuring timely closure of EHS Corrective Actions Preventive Actions (CAPAs) was expanded to include the target to meet all CAPA target dates and was extended to all employees working in high risk areas in addition to Directors and Managers. The target regarding EHS review and approval of all new hazardous materials or environmentally harmful materials prior to ordering was expanded to also include any equipment designed to contain these materials. Additional targets regarding ensuring the departmental job hazard analysis is kept up-to-date, and maintaining control of non-production radioactive material was added. The EHS Committee has been reviewing the results of the non-production radioactive material inventory audits since 2012; therefore, it was added as an official measure for 2014. The other targets remain unchanged for the 2014 fiscal year.

Table 26
2014 EHS Program Objectives and Targets

Applicable Nordion Job Function	Objective	Measures and Targets
All Directors and Managers All Directors and Managers of Operations, Facilities, or Nuclear Energy Worker employees	Minimize the number and extent of occupational injuries, environmental and radiation incidents.	• The number of Incidents ≤ 6 • Lost Time Injuries ≤ 0.5 per 200,000 hours worked (3-yr rolling) • The severity of lost-time injuries to ≤4 days per 200,000 hours worked (3-yr rolling)
	Minimize the use and release of hazardous materials to the environment.	• Radioactive materials emissions to ≤ 5.0% of the Derived Release Limits (DRL) • No non-compliant sanitary sewer emissions of non-radioactive hazardous materials • Reduction in the use of hazardous materials and the generation of hazardous and non-hazardous waste
	Maintain radiation doses to employees as per ALARA principle.	• Average Active Area employee dose rate ≤ 1.3 mSv/yr • Maximum employee dose rate ≤ 7.5 mSv/yr • Radiation Incidents ≤ 5/year
	Timely closure of EHS CAPAs	• Meet all CAPA target dates • Ensure timely closure of EHS CAPAs

Table 27
2014 Health and Safety Objectives

Applicable Nordion Job Function	Objective	Measures and Targets
All Directors and Managers	Ensure all managers of high risk areas conduct / document regular self-assessments of their management processes and safety performance.	• Mid-Year and Year-End performance reviews. • Ensure the departmental job hazard analysis is kept up-to-date.
All Directors and Managers of Operations, Facilities, or Nuclear Energy Worker employees	Ensure all managers actively consider impacts to the environment and health and safety.	• Environment, health and safety impacts are assessed as part of product realization planning and risks are mitigated through application of ALARA and pro-active planning. • Opportunities for minimizing waste (hazardous and non-hazardous) are assessed and implemented as feasible. • Ensure all near misses are reported and appropriate corrective actions(s) are taken. • Maintain control of non-production radioactive material.
	Communicate monthly with teams about environment, health and safety performance and impacts. Openly evaluate employee environment, health safety concerns and encourage reporting of near misses.	• Environment, health & safety information and concerns are discussed regularly at team meetings. • Health and safety concerns are assessed with the results of the evaluation communicated to the employee(s). • Deviations, CFs, Non-conformances and Complaints are assessed for EHS risks against targets and reported accordingly. • Routinely invite EHS Representatives to team meetings to discuss EHS topics and/or concerns.
All High Risk Employees	Work safely at all times. It is unacceptable to take risk in order to get the job done.	• Work follows Nordion applicable EHS standards and procedures, and is performed with care and attention to safety principles. • Wear all applicable personal protective equipment (PPE). • Submit all dosimeter(s) and rings for monitoring on time (i.e. no later than one month following end of monitoring period without good reason, such as extended illness or company travel, etc.).
	Report the occurrence of workplace injuries, unsafe conditions and near misses.	• All workplace injuries and observed unsafe conditions & near misses are reported immediately to the direct Supervisor.
	Correct co-workers who are working unsafely.	• Following Nordion values, coach co-workers who are seen working unsafely.
	Reduce environmental impacts.	• Identify opportunities for reducing waste, and using less harmful materials where feasible. • Ensure EHS reviews and approves all new hazardous or environmentally harmful materials prior to ordering as well as equipment designed to contain these materials.
	Timely closure of EHS CAPAs.	• Meet all CAPA target dates. • Ensure timely closure of EHS CAPAs.

3.3 Concluding Remarks

The key points of this report are as follows:

- There were no major issues in 2013. The facility has operated according to its original design criteria. There were no physical design changes to any structural areas of the building or changes to the designated active areas.
- The implementation of a Systematic Approach to Training (SAT) Program for safety critical and safety related positions was initiated in 2013.
- Conformance to internal training requirements was high in 2013.
- Testing of the radiation devices and instrument maintenance was performed at the required frequency and results were satisfactory. There were two pieces of equipment with recurring failures in 2013, an overhead door used for the loading dock in the shipping area of the KOB and a steam boiler for heating and processing in the KRMF building.
- The Environment, Health and Safety Committee met on a regular basis to review the environmental and safety aspects of the operations and to review and approve Final Safety Analysis Reports (FSARs).
- All measurable radiation dose received by personnel and the public were within the regulatory limit of 50 mSv/yr. and no internal dose levels or limits were exceeded.
- There were a total of 32 contamination incidents in 2013. All elevated levels of contamination were monitored and contained within the Active Area.
- There were no instances in which there was potential to exceed a regulatory limit or to reach or exceed an action level in 2013.
- Various improvements were made to the Radiation Protection Program, Conventional Health and Safety Program, Environmental Protection Program and Fire Protection Program. These programs fall within the scope of the Quality Assurance (QA) Management Program.
- There was one disabling injury in 2013 which resulted in 18 days of lost time.
- There were no instances of exceeding environmental regulatory limits or action levels in 2013. The maximum annual release of airborne from any one radionuclide was Xe-135m at 1.44% of the DRL.
- In 2013, Nordion received one EHS related external communication.
- In 2013, Nordion complied with each site-specific reporting requirement with the exception of four instances regarding sealed source reporting. These exceptions involved sealed source reporting. The instances were reportable under Section 6.1 (g) of the site license (NSPFOL-11.A.04/2015).

In 2013, Nordion's Class 1B Facility operated within the requirements of the Nuclear Safety and Control Act, the applicable regulations and the conditions of the operating license issued by the CNSC.

Figure 1: Cobalt Production Technicians

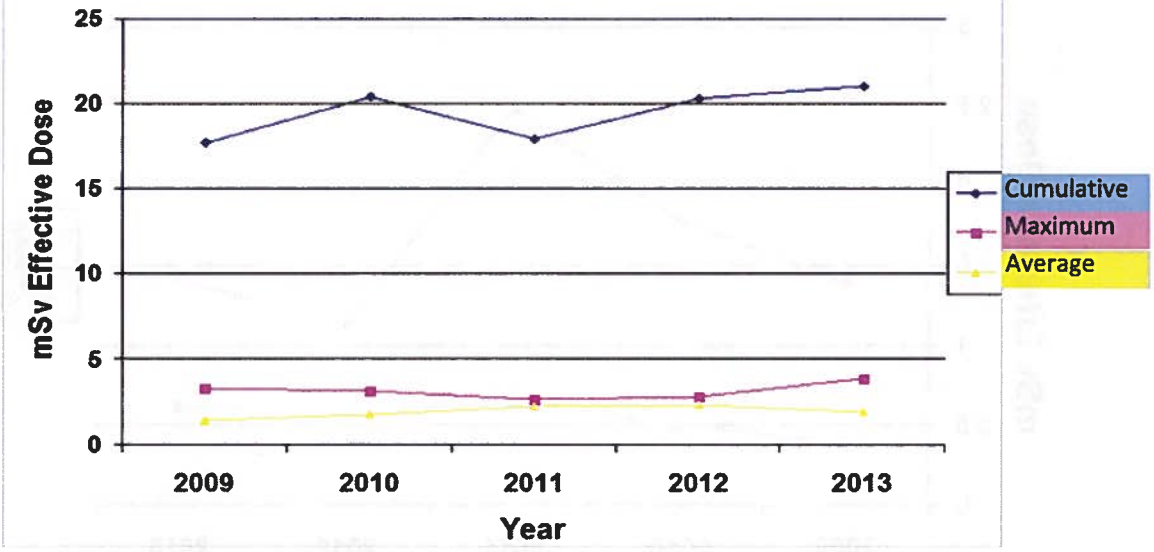


Figure 2: Cobalt Monitoring, Decontam and Shipping

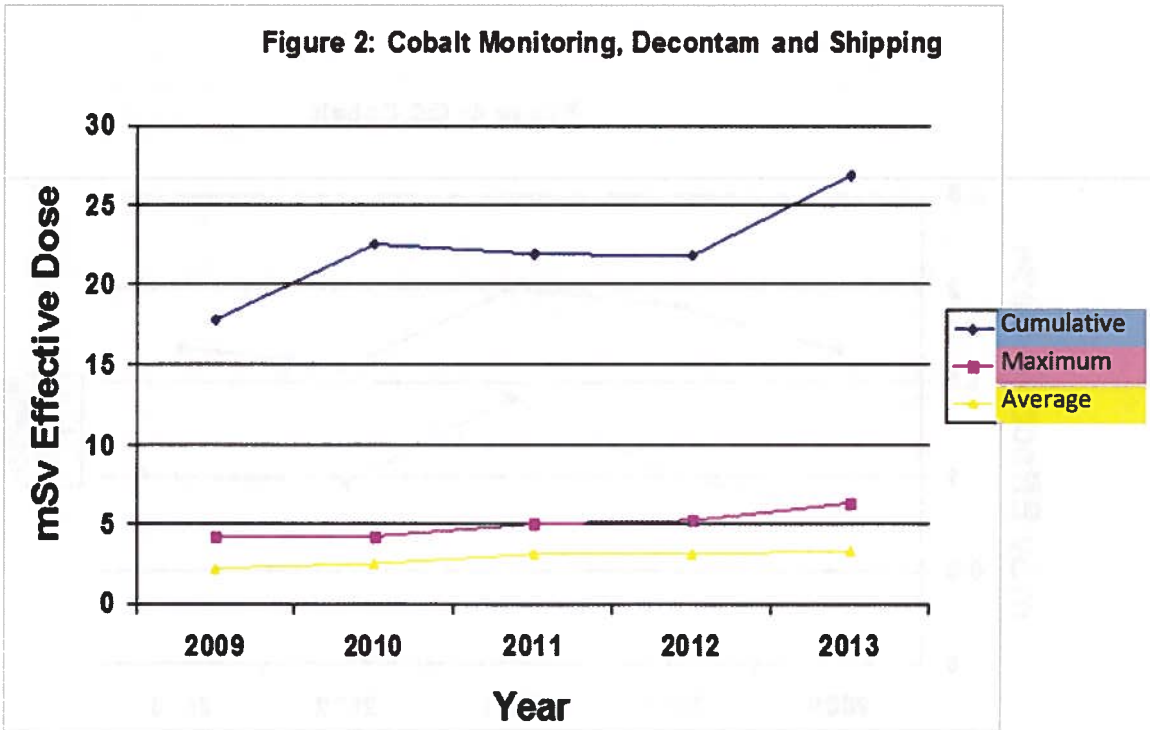


Figure 3: Cobalt Development

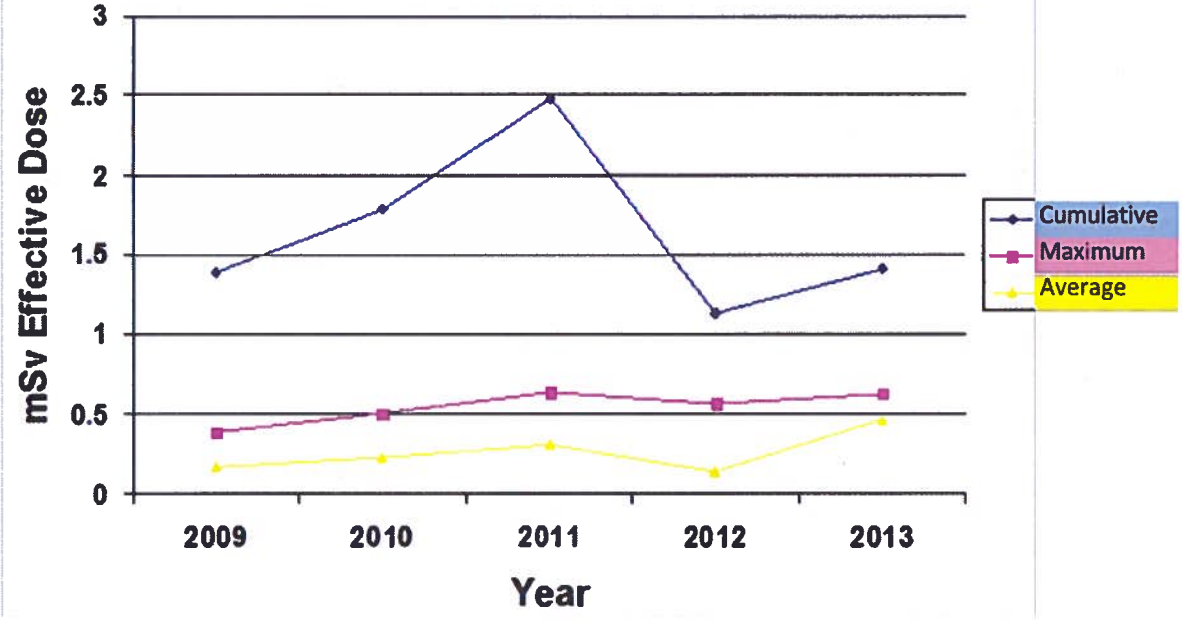


Figure 4: QC Cobalt

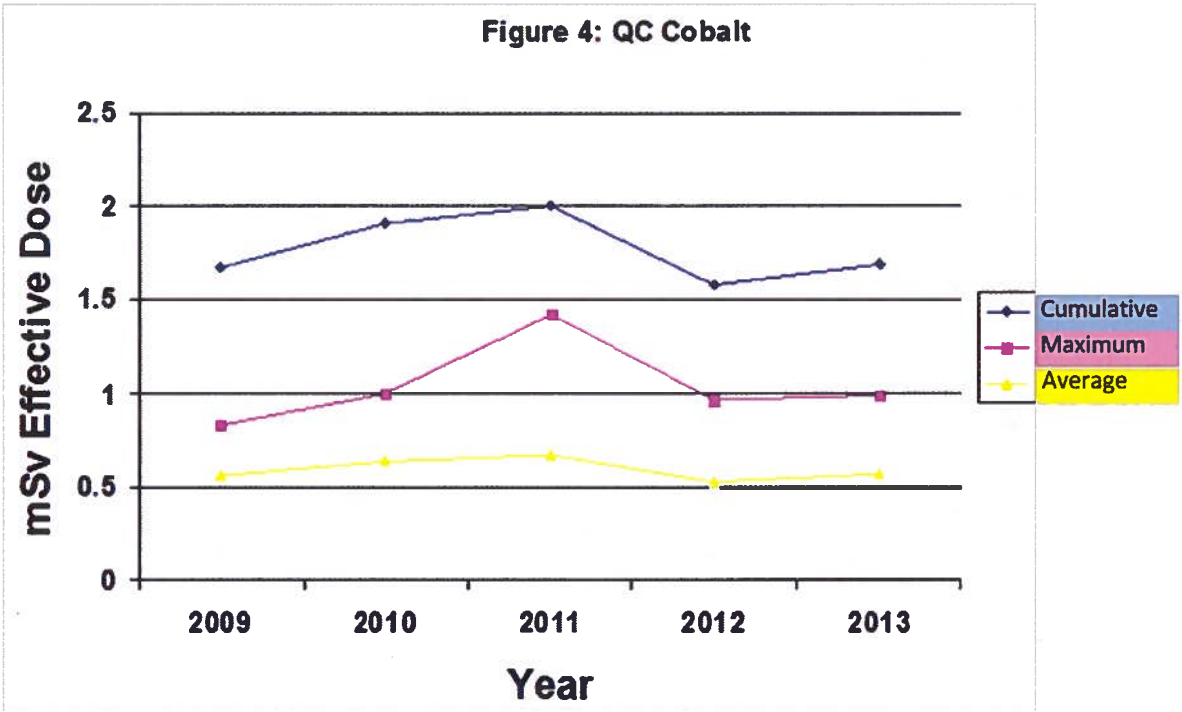


Figure 5: Radiopharm Development

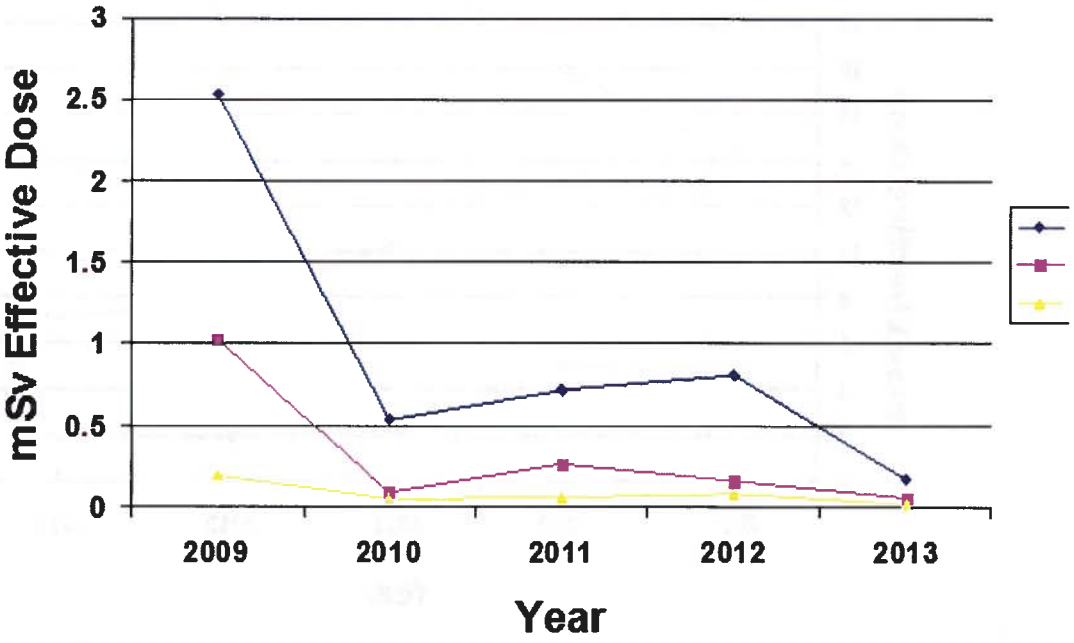


Figure 6: Technical Support

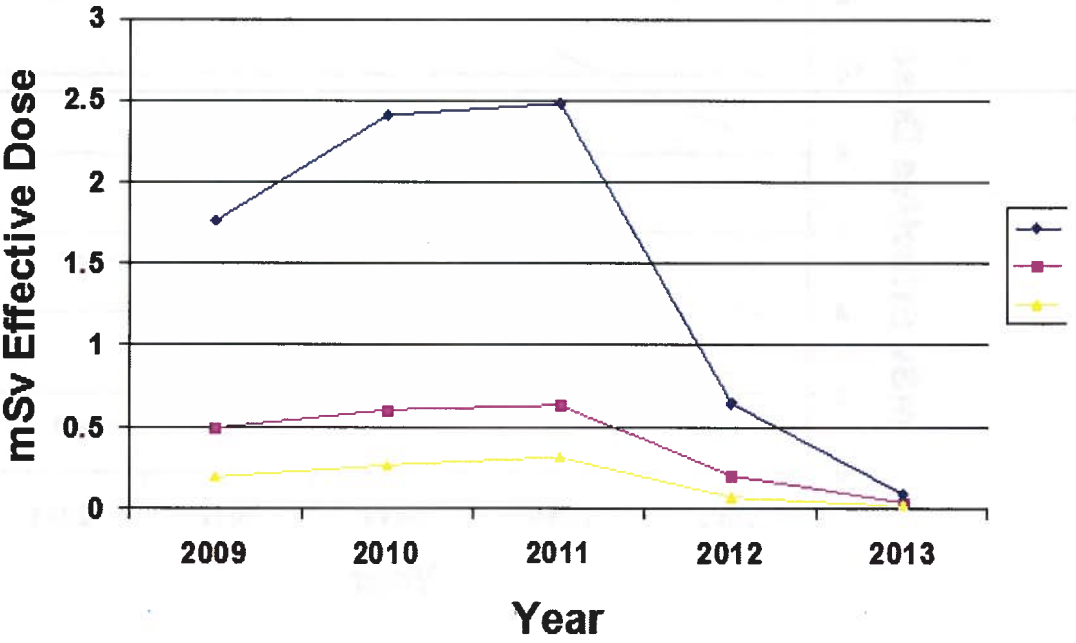


Figure 7: Nuclear Medicine Shippers, Waste, Containers

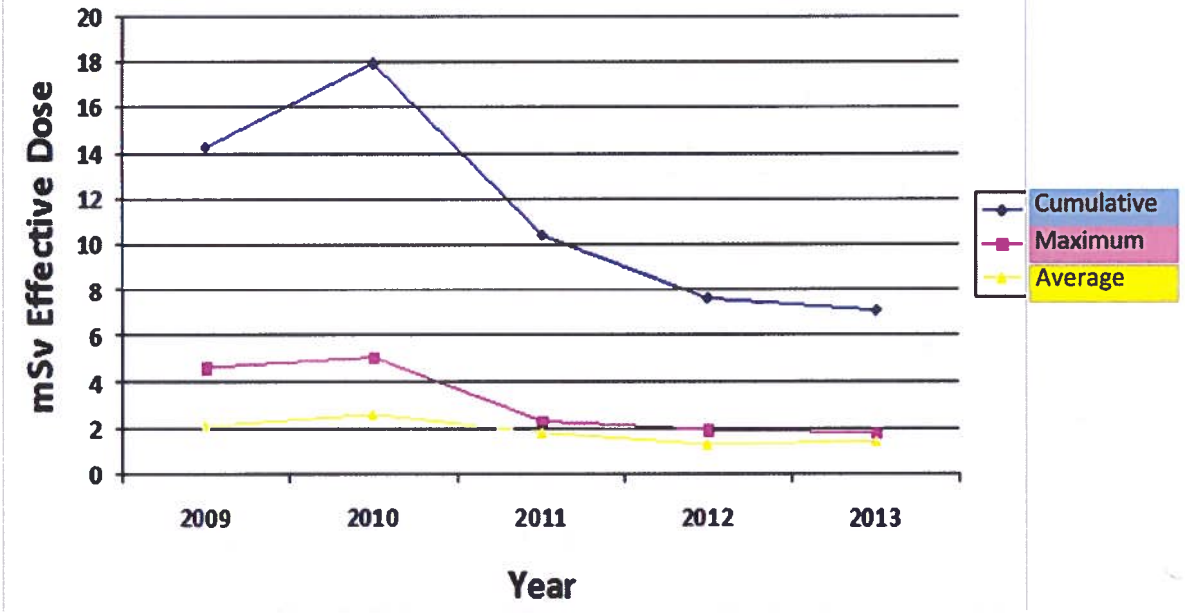


Figure 8: I-131, Ir-192 & Miscelaneous Production Technicians

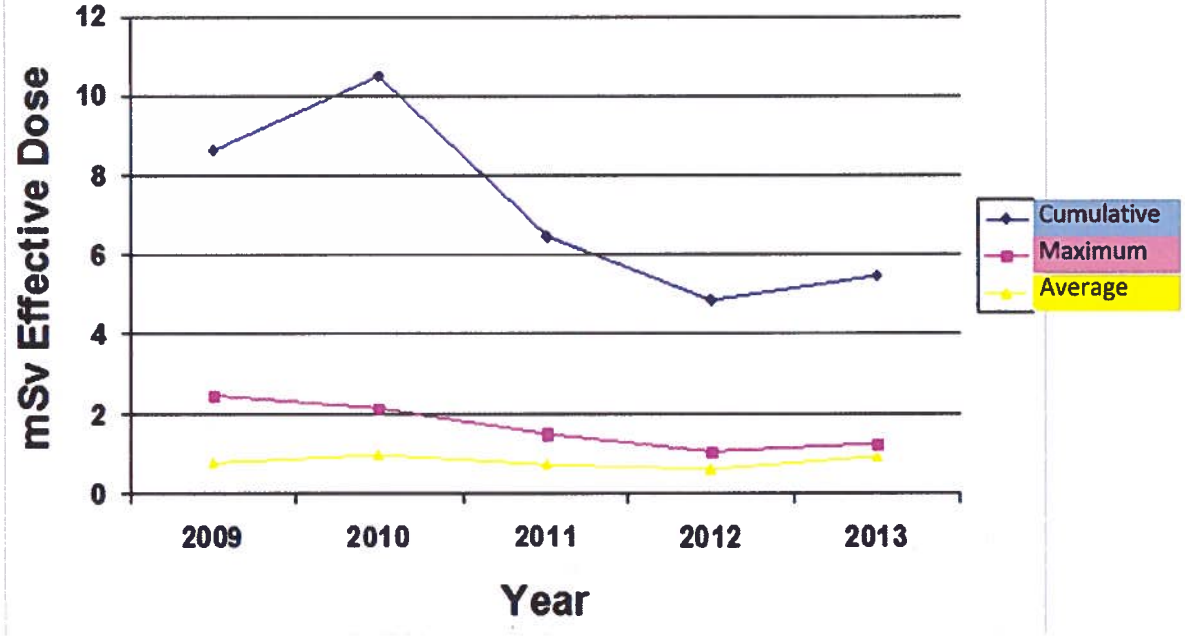


Figure 9: Mo-99/I-125 Production Technicians

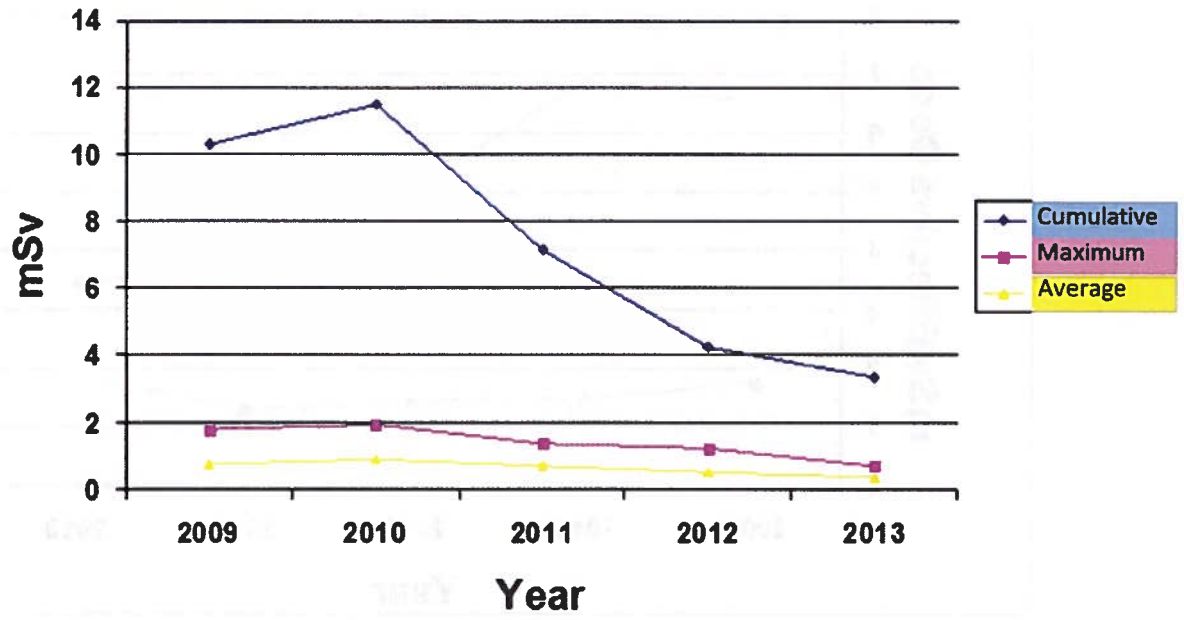


Figure 10: Radiopharm Production Technicians

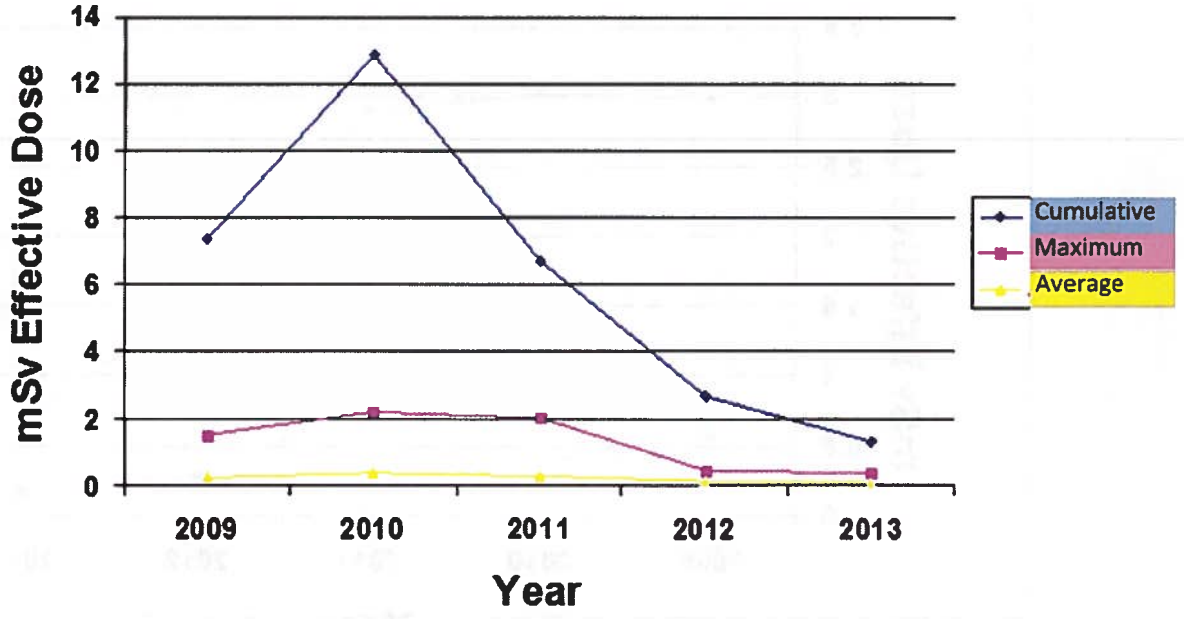


Figure 11: Machinists

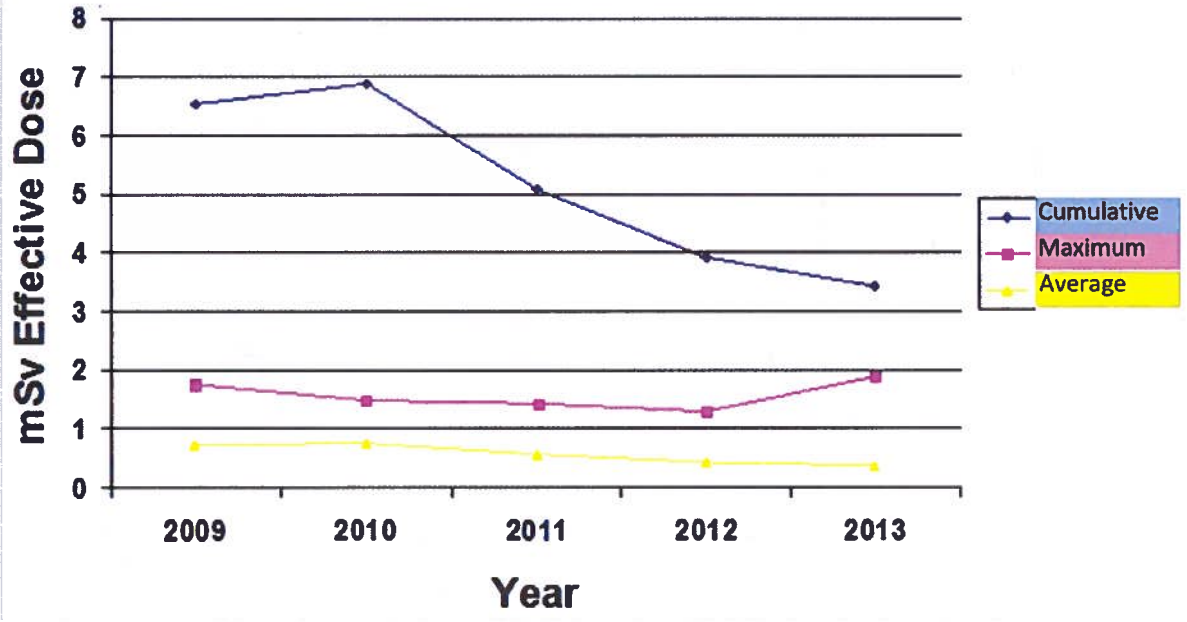


Figure 12: Nuclear Medicine QC

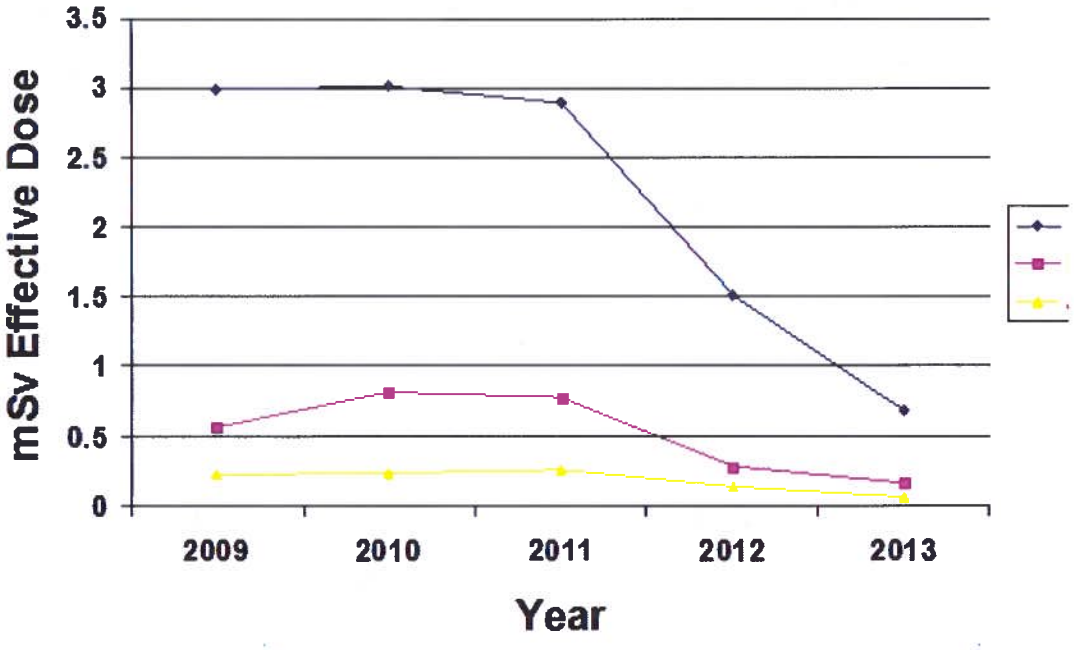


Figure 13: Surveyors

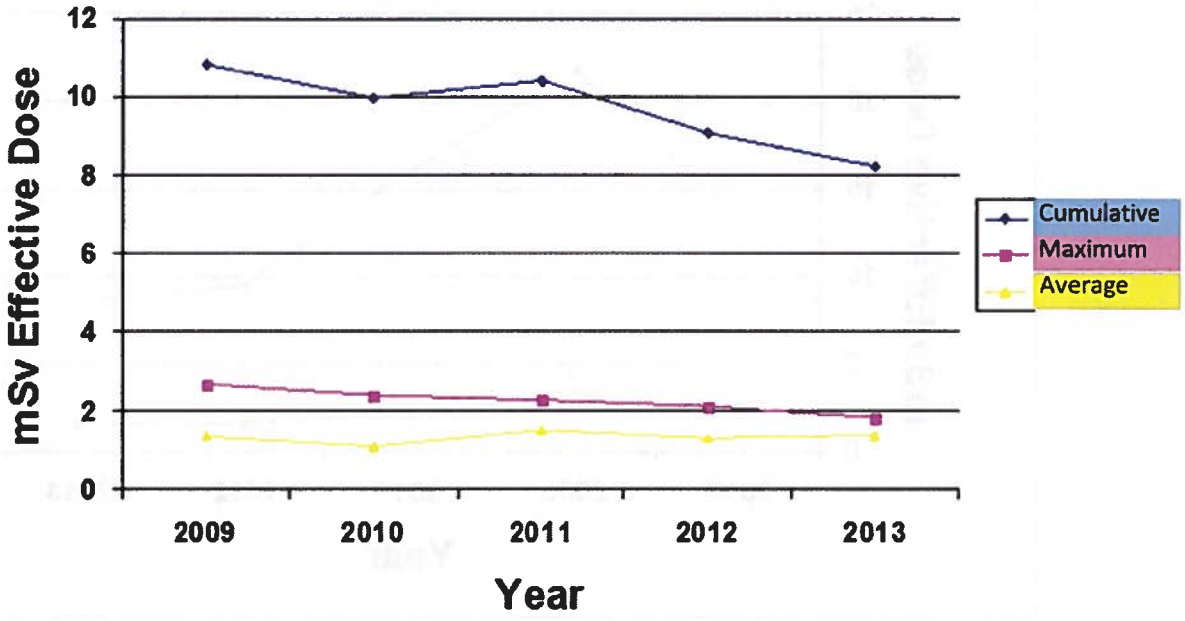


Figure 14: Nuclear Medicine Operators, Helpers

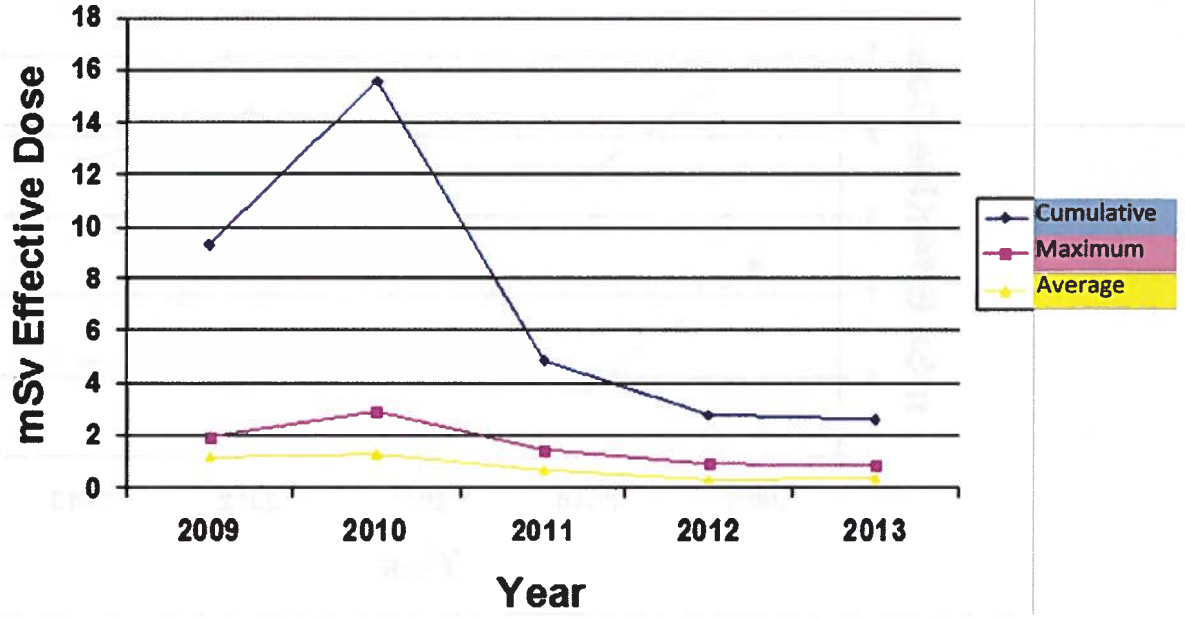


Figure 15: Nuclear Medicine Radiation and Contamination Monitors

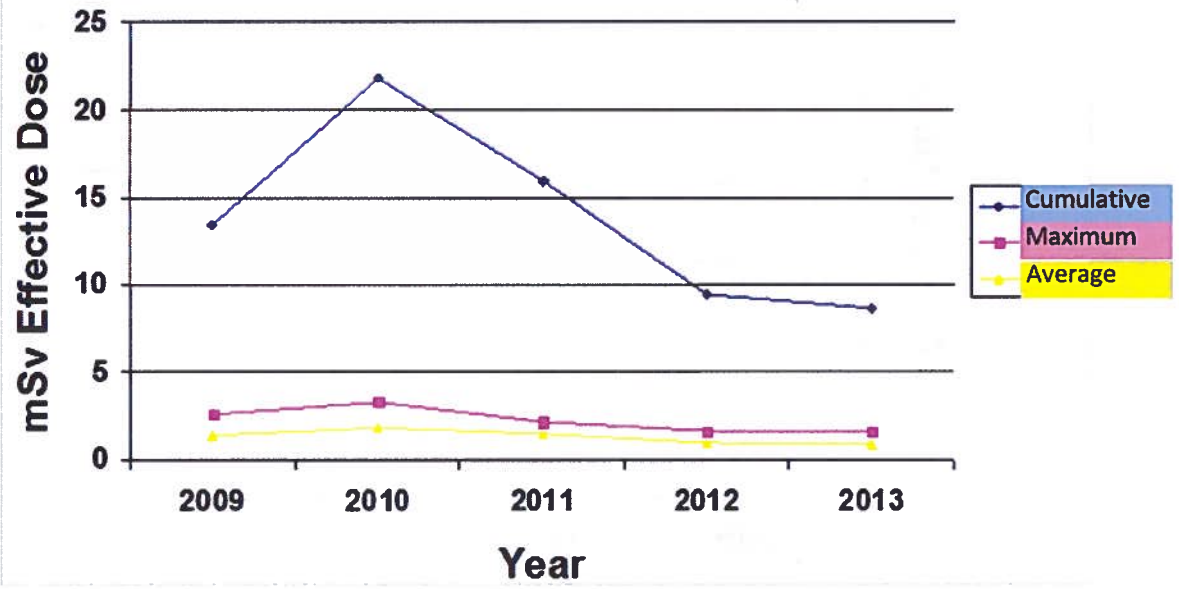


Figure 16: Maintenance & Motor Pool

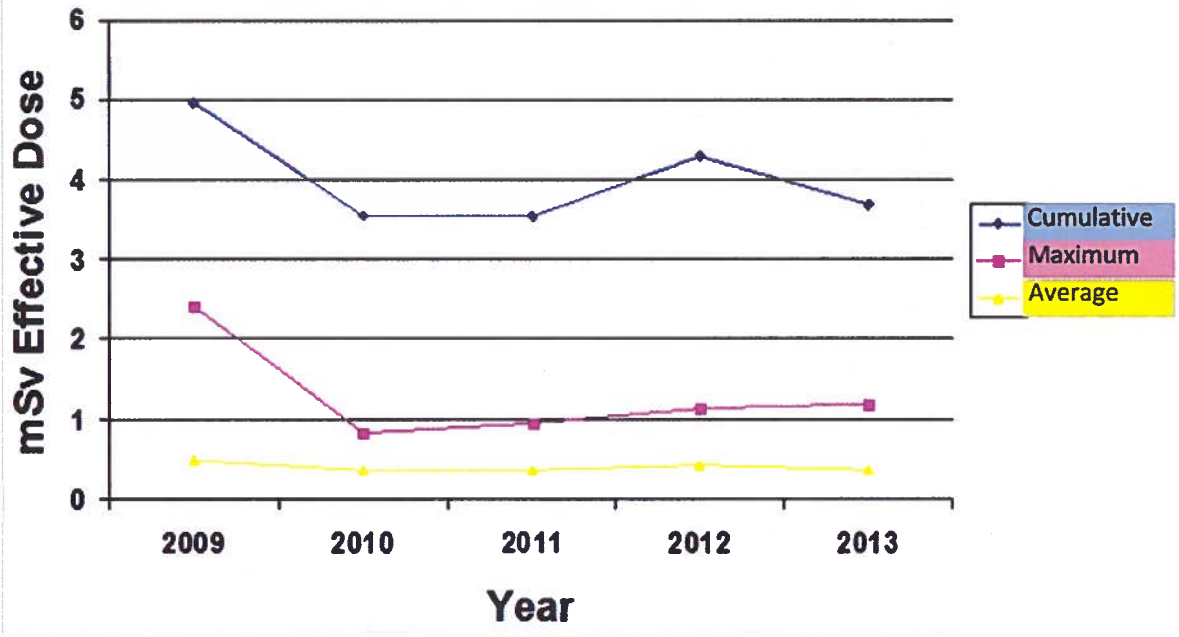


Figure 17: Maintenance & Electronic Calibration Lab

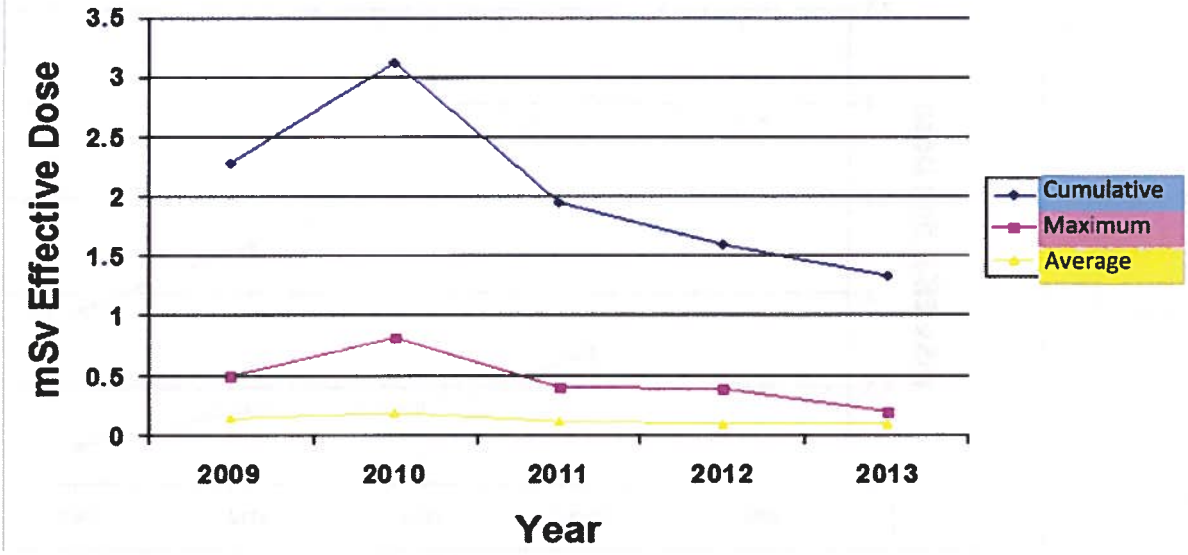


Figure 18: Radiopharm QC

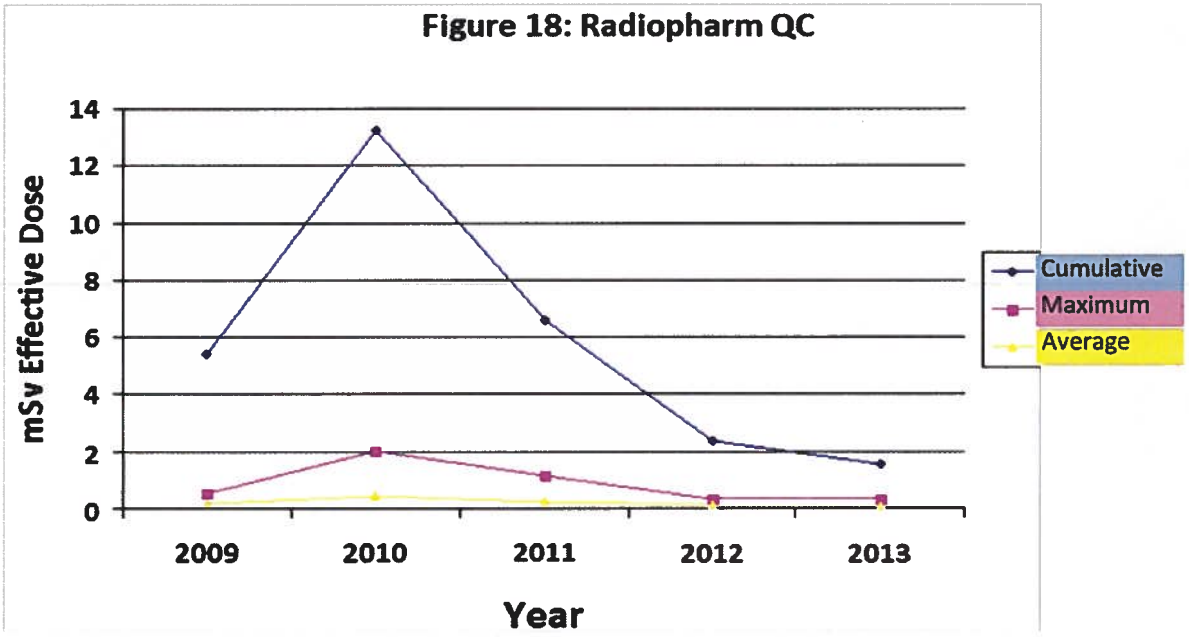
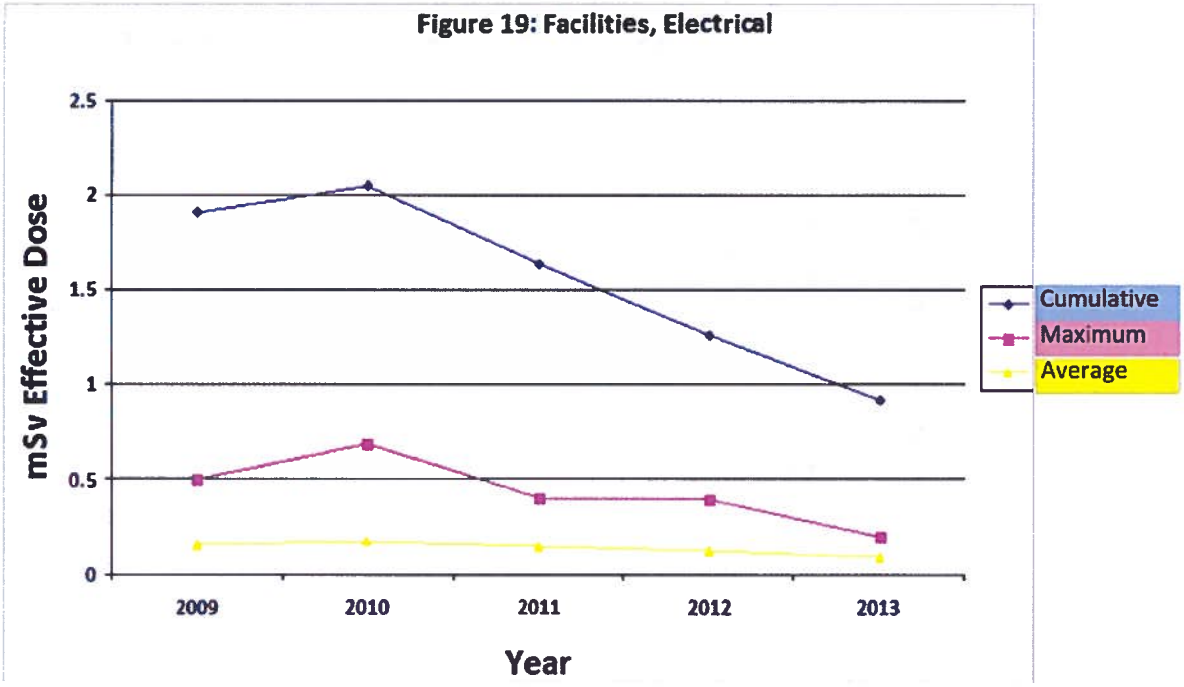


Figure 19: Facilities, Electrical



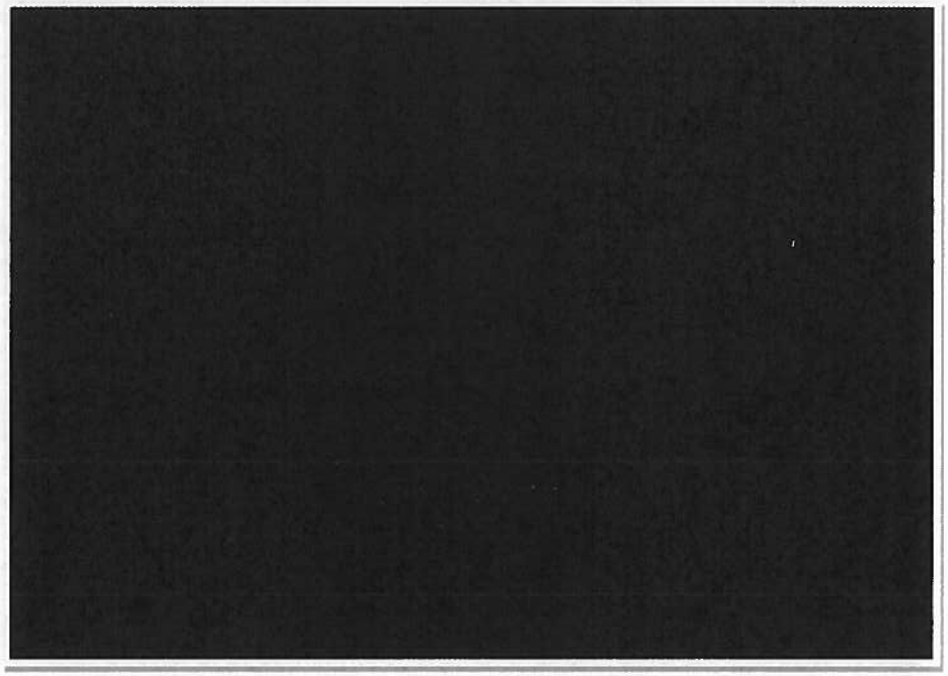


Figure 20 - Location of "Off Site" TLDs

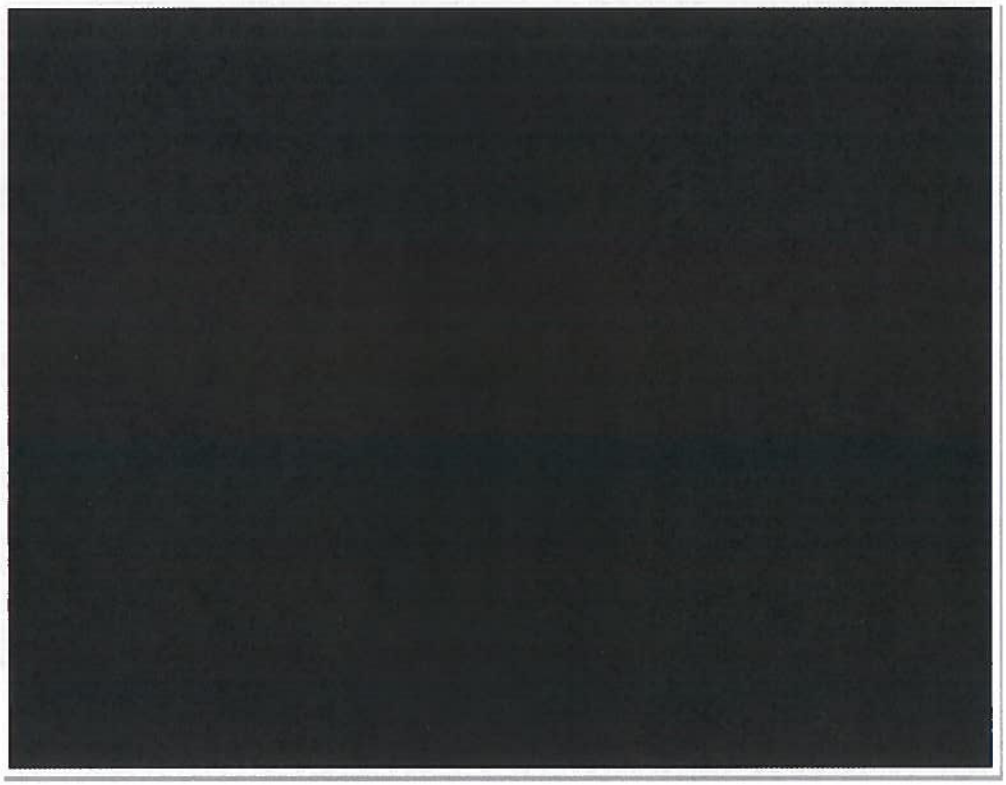


Figure 21 - Location of "On Site" TLDs

Figure 22: Groundwater Well Locations

Appendix A
Table of Incidents

Date of Occurrence	Incident Number	Description	Reportability	Causes	Corrective Actions
Aug.16, 2012	13-01	Halocarbon Release 37 kg of R-22 was released due to a crack in the evaporator temperature sensor housing.	Reportable event – as required by the Federal Halocarbon Regulations, Environment Canada (EC).	Faulty component - cracked evaporator temperature sensor housing.	The system was isolated, remaining refrigerant was recovered, and the faulty component was replaced. Follow-up leak testing confirmed no additional leaks.
Jan. 3, 2013	13-02	Pressure Build-up in Vial A customer reported hearing a noise and observing deformation of septa when piercing two separate vials.	Reportable as required by Section 19 (1)(c) of the Packaging and Transport of Nuclear Substances Regulations (PTNSR).	Hydrogen pressure build-up in vial. Activity limits were proven to be too high for this configuration.	Shipments were stopped. Activity limits were put in place for subsequent shipments to ensure no adverse pressure build-up in vials.
Jan. 4, 2013	13-03	Failure to Report the Transfer of a Co-60 Sealed Source to CNSC SSTS The transfer of one Co-60 sealed source with an activity exceeding 0.3 TBq transferred from Nordion's license to a Canadian customer's license was not reported to the CNSC Sealed Source Tracking System (SSTS) prior to transfer.	Non-compliance with Class 1B site license NSPFOL-11A.04/2015. Reportable as required by Section 6.1 (g) of Class 1B site license NSPFOL-11A.04/2015.	1) Responsibilities regarding sealed source reporting were misunderstood. 2) There was a lack of communication between EHS personnel.	1) A communication was sent to appropriate personnel to remind them of reporting requirements. 2) A meeting was held to discuss this incident and review the communication within the EHS team.
Jan. 21, 2013	13-04	Damaged F-458/F-251 Transport Container Customer reported damaged F-458 transport container upon receipt.	Reportable as required by Section 19 (1)(a) of the PTNSR.	Damage occurred in transport.	Container was repaired upon return.

Date of Occurrence	Incident Number	Description	Reportability	Causes	Corrective Actions
Jan. 11, 2013	13-05	Loss of Containment of Xe-133 Customer reported high fields when they opened the Xe-133 Type A package.	Reportable as required by Section 19 (1)(b) of the PTNSR.	Containment valve had failed during transit.	Valves are now helium leak tested prior to each use.
Dec. 14, 2012	13-06	Loss of Containment of AC150 Capsule An AC150 capsule containing irradiated [redacted] target was received at Nordion with an incomplete weld between the cap and body.	Non-compliance with a document listed on the transport certificate. Reportable as required by Section 27(b)(ii) of the NSC Act.	The cause is related to the capsule preparation and welding steps at Nordion for this particular capsule type.	Nordion is not using this particular capsule for shipment until a review of the preparation and welding processes are completed.
Jan. 31, 2013	13-07	Damaged Type A Package (F-325) A F-325 Type A package was received at customer site with the lid separated from the pail.	Reportable as required by Section 19 (1)(b) of the PTNSR.	Package was damaged during handling.	Nordion provided feedback to carrier.
Mar. 1, 2013	13-08	Loss of Containment of I-123 in a Type A Package Customer reported recovering only 6 mCi of a 9 mCi order. Contamination was found on the inside of the lead pot.	Reportable as required by Section 19 (1)(b) of the PTNSR.	The issue was attributed to a possible leaking vial.	Vial integrity testing was performed and showed that inventory on hand met specifications. There have not been any other similar incidents in the past year.

Date of Occurrence	Incident Number	Description	Reportability	Causes	Corrective Actions
Jan. 31, 2013	13-09*	Missed Null Safeguards Report Submission Nordion did not submit to the CNSC the null Obligated Material Inventory Summary (OMIS) for the 2012 calendar year by the due date in accordance with the document RD-336, "Accounting and Reporting of Nuclear Material".	CNSC concluded this event was not reportable.	Not applicable - It was concluded that the regulatory and guide document did not explicitly indicate that a null report was required to be submitted.	Nordion submitted the null Obligated Material Inventory Summary OMIS for the 2012 calendar year to the CNSC.
Historic Issue	13-10	Zircaloy 2/4 Imported and Exported Without Proper Permits and Licenses Nordion had not received the proper permits and licenses for the import and export of zircaloy tubing and caps.	Non-compliance with the Nuclear Non-proliferation Import and Export Control Regulations. Reportable as required by Section 27(b)(ii) of the NSC Act.	Nordion was unaware, and did not implement a system to obtain licenses and permits prior to export and import of zircaloy in the form of raw material (tubing), in process material (C339's, AC339s) and finished product (Type 2, Type 5 C188's).	Systems have been implemented to ensure permits and licenses are obtained prior to import/export.
Mar. 21, 2013	13-11	Back-up Generator Failure Back-up generator failed during routine testing.	Reportable event - as required by Section 6.1 (f) of Class 1B site license NSPFOL-11A.04/2015.	1) Defective oil pressure switch-gauge on the generator was defective. 2) The emergency generator test procedures failed to address the situation of an emergency generator failure.	1) The defective part was replaced and the new oil pressure switch-gauge was placed on a 5-year replacement schedule. 2) Modifications were made to allow for automatic transfer of the load back to normal power supply if there is a generator failure during testing.

* Event was posted to Nordion website; however, an investigation report was not submitted as the CNSC deemed this event not reportable.

Date of Occurrence	Incident Number	Description	Reportability	Causes	Corrective Actions
Apr. 12, 2013	13-12	Export of Ir-192 Exceeded Authorized Amount One of five sources shipped (76.15 TBq) exceeded the maximum activity per source authorized by the export license (75.0 TBq).	Non-compliance with Export License EL-SS-11166-US. Reportable as required by Section 27(b)(ii) of the NSC Act.	The capsule activity upon receipt at the customer site was incorrectly calculated.	Additional systems were implemented to ensure compliance with export license.
Apr. 17, 2013	13-13	Shipping Paperwork Error The Transport Index was not listed on the shipping documents.	Non-compliance with Section 17.1 of the PTNSR. Reportable as required by Section 27(b)(ii) of the NSC Act.	This was an error on the part of a Nordion employee.	Nordion employees were made aware of the error.
Apr. 23, 2013	13-16	Intermittent Klaxon Malfunction During routine testing of the intermittent klaxon it was noted that some klaxons were not sounding in the inactive office areas in the KOB facility.	Reportable event - as required by Section 6.1 (c) of Class 1B site license NSPFOL-11A.04/2015.	Zones 14, 15 and 16 that service the inactive KOB ground and second floors were found to be drawing current in excess of the amperage limits of the alarm panel.	Wiring was changed and booster panels were installed to ensure correct amperage requirements of the Klaxon Alarm Panel are met.
May 9, 2013	13-17	Halocarbon Release 12.25 kg of R-22 was released due to a leak in an expansion valve.	Reportable event – as required by the Federal Halocarbon Regulations, Environment Canada (EC).	Faulty component - Leak in expansion valve.	A total of four electronic expansion valves were replaced. Each has two circuits and both were replaced in this unit as well as in a similar unit.
June 21, 2013	13-18	Damaged F-458/F-251 Transport Container A F-458/F-251 transport container was received at a customer site with a dent in the over-pack.	Reportable as required by Section 19 (1)(b) of the PTNSR.	Damage occurred in transport.	Nordion provided feedback to the carrier.

Date of Occurrence	Incident Number	Description	Reportability	Causes	Corrective Actions
July 2, 2013	13-20	Additional Category Label on Type B Package A customer reported that a third category label was found on a Type B package. Only two category labels are required.	Non-compliance with Section 16.4 of the PTNSR. Reportable as required by Section 27(b)(ii) of the NSC Act.	Cause is unknown. It is not clear if the additional label was applied at Nordion or in transit.	An investigation revealed that there were no similar instances reported in the past five years. As this was an isolated incident, no further action was taken.
July 17, 2013	13-21	Deficiencies in Cobalt Operations Hazard Assessment The Final Safety Analysis Report for Cobalt Operations does not adequately describe the hazards associated with the storage of Co-60 at the current facility limits. In addition, there are inaccuracies and incompleteness associated with the sections that describe pool water cooling.	Reportable event - as required by Sections 6.1 (e) and 6.1 (f) of Class 1B site license NSPFOL-11A.04/2015.	Procedure – In the Safety Analysis Reports procedure, there is no methodology describing how to identify what constitutes a credible case.	The Safety Analysis Reports procedure is to be modified to include a section that requires an explicit review of the nature and types of credible cases between revisions of the FSAR to ensure that all hazards are identified and addressed.
July 10, 2013	13-22**	Waste Shipping Documents Incomplete Shipping paperwork did not make reference to special form capsules in waste shipments.	CNSC concluded this event was not reportable.	Communication error between departments.	Document requirements and processes were clarified with Nordion personnel.

** Event was posted to Nordion website and an investigation report was submitted; however, the CNSC deemed this event not reportable.

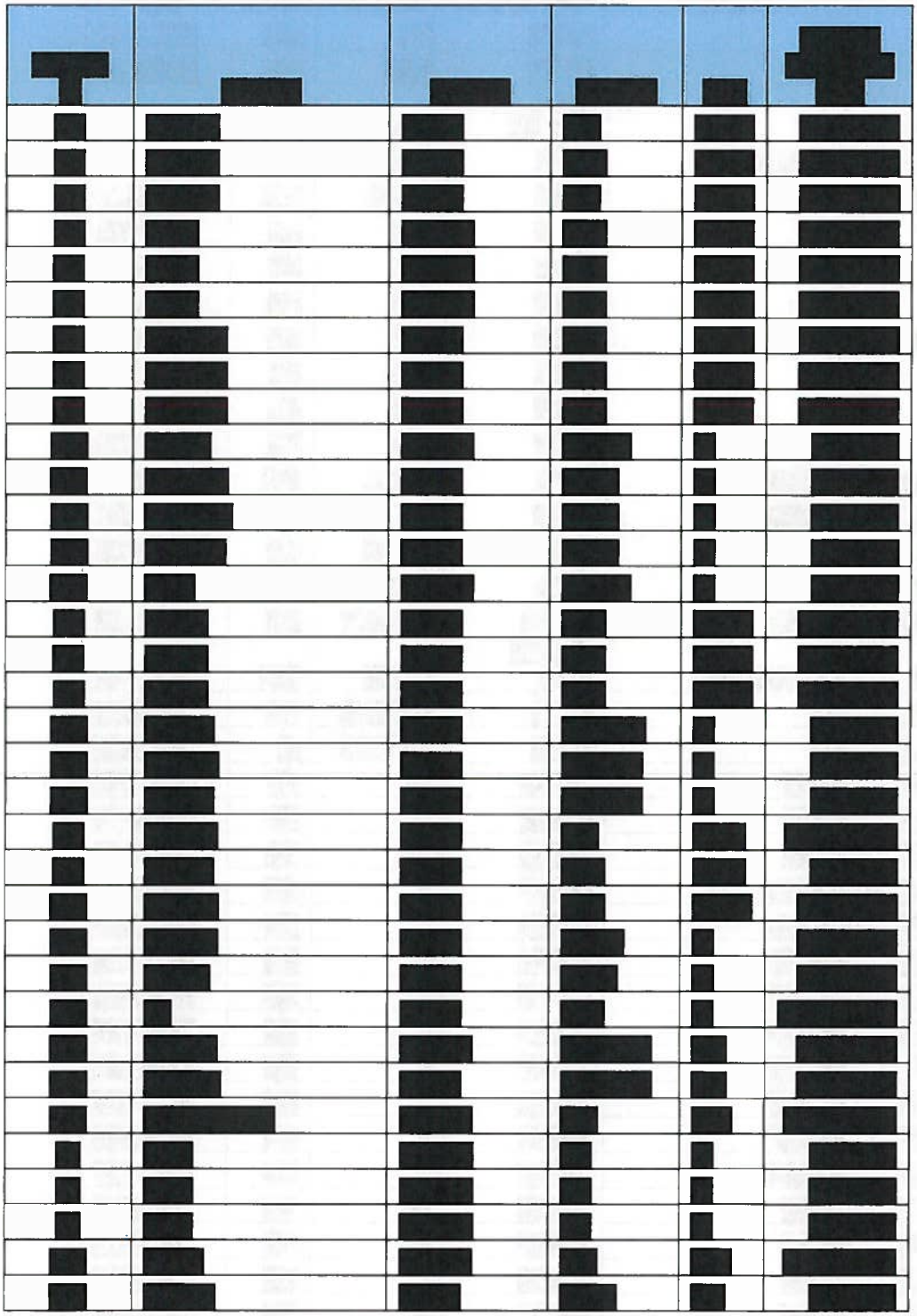
Date of Occurrence	Incident Number	Description	Reportability	Causes	Corrective Actions
July 23, 2013	13-23	Missing I-123 Package A Type A package containing I-123 was not received by Nordion's customer.	Non-compliance with Section 19 (1)(d) of the PTNSR. Reportable as required by Section 27(b)(ii) of the NSC Act.	The package was lost en-route [redacted]	Nordion made all reasonable efforts to locate the package. Investigation determined that no radiological hazard existed, as the contents had decayed. No further action was taken.
Aug. 20, 2013	13-24	Damaged Paint and Labels on Transport Container A F-168 transport container was received at customer site with visible damage to paint (rust) and category labels were almost falling off.	Non-compliance with Section 19 (1)(b) of the PTNSR. Reportable as required by Section 27(b)(ii) of the NSC Act.	Cause likely due to conditions experienced during transport.	The container was inspected and repaired upon return.
Sept. 19, 2013	13-25	Unauthorized Contents in Waste Shipment Depleted special form sources were shipped in a 1973 Regulations approved F-127 container and did not meet the authorized contents listed on the transport certificate.	Non-compliance with the transport certificate. Reportable as required by Section 27(b)(ii) of the NSC Act.	Misunderstanding of package requirements by Nordion personnel.	Requirements were clarified with Nordion personnel.
Sept. 16, 2013	13-26	Failure to Report the Export and Import of Co-60 Sealed Source to CNSC SSTS The export of 192 Co-60 sealed sources and the import of 86 Co-60 sealed sources, all with an activity exceeding 0.3 TBq were not reported to the CNSC SSTS within the required timeframes.	Non-compliance with Class 1B site license NSPFOL-11A.04/2015. Reportable as required by Section 6.1 (g) of Class 1B site license NSPFOL-11A.04/2015.	Equipment Difficulty – one bulk file for sealed source reporting was not generated by the Nordion tracking system correctly.	The process was revised to include a verification step to check that the correct number of transactions have been included in the electronically generated reporting file.

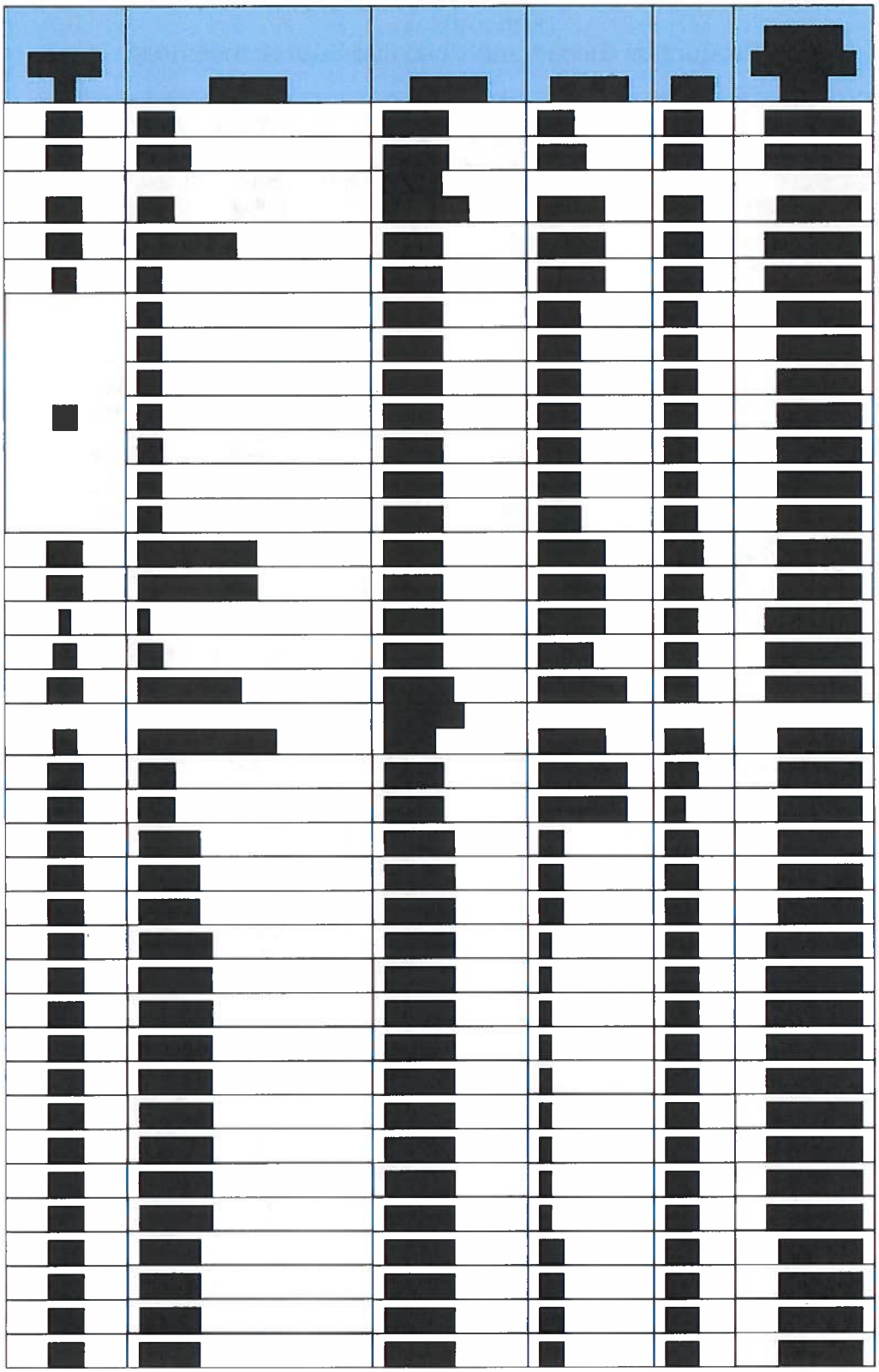
Date of Occurrence	Incident Number	Description	Reportability	Causes	Corrective Actions
Historic Issue	13-27	Failure to Perform Post Manufacture Leak Test on RAI/F-127 Transport Package The leak test was not performed on RAI/F-127 transport package as per the requirements.	Non-compliance with a document listed on the transport certificate. Reportable as required by Section 27(b)(ii) of the NSC Act.	Standard methods for leak testing do not work on this transport package due to the design. For this model, the package plug and body do not form a leak tight seal.	Containers have been removed from service until leak testing can be performed.
Oct. 16, 2013	13-28	Failure to Report the Transfer of Co-60 Sealed Sources to the CNSC SSTS The domestic transfer of 108 Co-60 sealed sources, all with an activity exceeding 0.3 TBq were not reported to the CNSC SSTS within the required timeframe.	Non-compliance with Class 1B site license NSPFOL-11A.04/2015. Reportable as required by Section 6.1 (g) of Class 1B site license NSPFOL-11A.04/2015.	1) Required steps in the tracking system(s) were not completed. 2) The applicable procedure is incomplete. 3) Inadequate turnover of information between personnel prevented the detection of the error.	The existing process for ensuring the required information is entered into the inventory tracking system(s) is to be reviewed and improved, as applicable. Documentation is to be revised as appropriate.
Oct. 10, 2013	13-29	Transport Performed Without Shipping Documentation Nordion driver knowingly transported dangerous goods (empty packages) after shipping documents were misplaced.	Non-compliance with Section 17.3 of the PTNSR. Reportable as required by Section 27(b)(ii) of the NSC Act.	The driver did not consider the TDG requirements prior to transporting without documents.	Training was provided to all Nordion drivers. There was no potential impact to health, safety and security.
Nov. 12, 2013	13-30	Damaged Type A Package (F-261) Two damaged Type A Packages were received at Nordion Vancouver site.	Reportable as required by Section 19 (1)(b) of the PTNSR.	Damage occurred in transport.	Container was repaired upon return. There was no impact to health, safety and security.

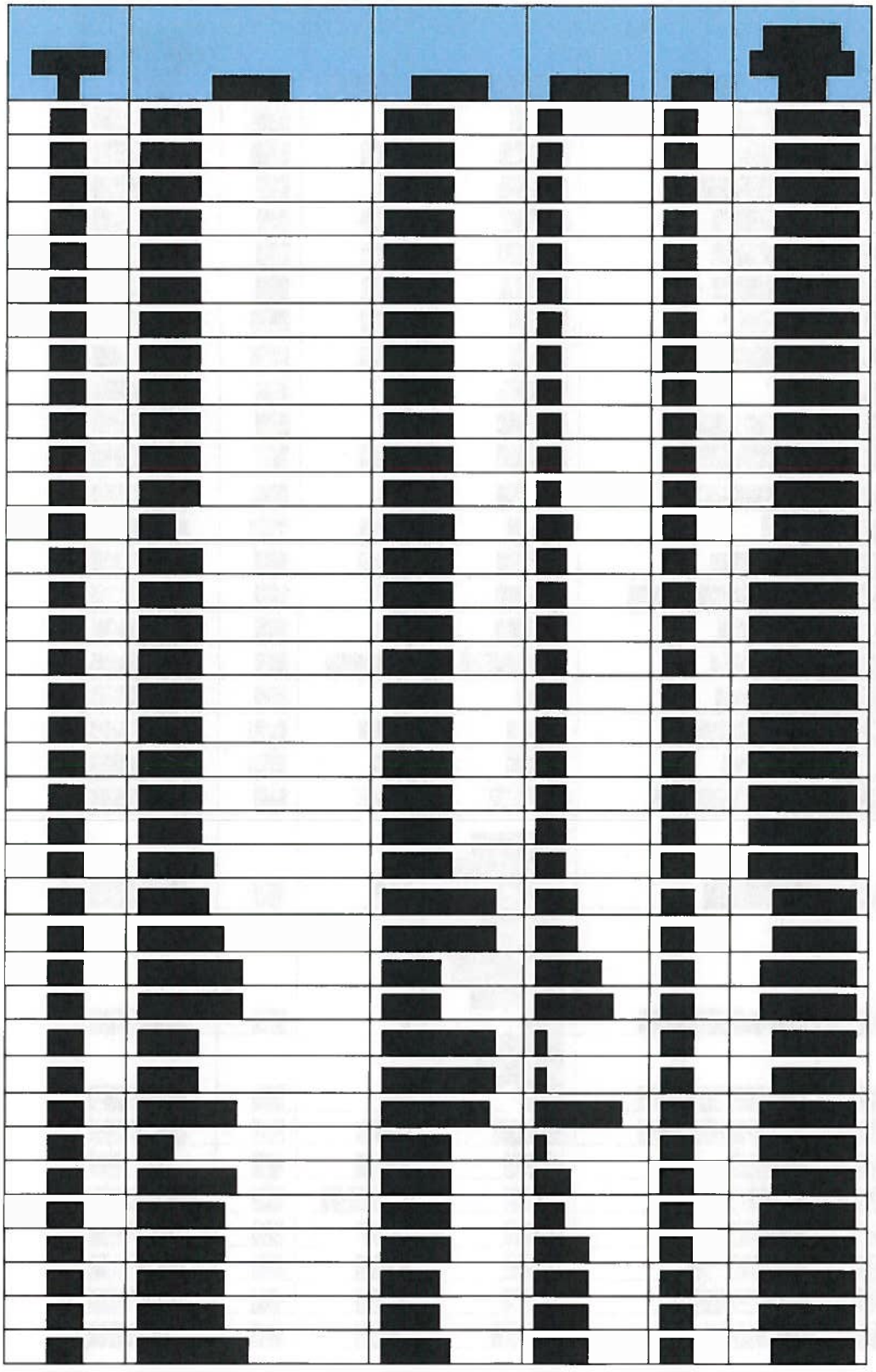
Date of Occurrence	Incident Number	Description	Reportability	Causes	Corrective Actions
Nov. 1, 2013	13-32	Failure to Report the Import of Co-60 Sealed Sources The import of 53 Co-60 sealed sources, all with an activity exceeding 0.3 TBq were not reported to the CNSC SSTS within the required timeframe.	Non-compliance with Class 1B site license NSPFOL-11A.04/2015. Reportable as required by Section 6.1 (g) of Class 1B site license NSPFOL-11A.04/2015.	The sealed source reporting policy was not followed. Work preparation was inadequate.	This event was a non-routine return of a shipment before reaching the final destination. Regulatory personnel have been added to notifications regarding non-routine events to ensure changes in inventory are reported. A communication is to be prepared and awareness session conducted regarding the sealed source reporting policy. Job aids are to be created.
Historic Issue	13-34	Failure to Perform Maintenance on F-339 Transport Container as per the Requirements. The visual check of the F-339 cavity was not being performed during routine inspection as indicated in the specification document.	Non-compliance with a document listed on the transport certificate. Reportable as required by Section 27(b)(ii) of the NSC Act.	Two documents listed the maintenance requirements. They were not in agreement regarding the frequency of the cavity inspection.	The maintenance requirements in the specification document are to be changed so that the visual check of the F-339 cavity is performed annually and not prior to each use.
Historic Issue	13-35	Incorrect Components Used on Transport Packages Some components used on approved Type B transport packages did not meet the required standards or specifications.	Non-compliance with multiple drawings referenced on the transport certificates. Reportable as required by Section 27(b)(ii) of the NSC Act.	Investigation is ongoing.	A project is underway to replace non-conforming components. There was no potential impact to health, safety and security.

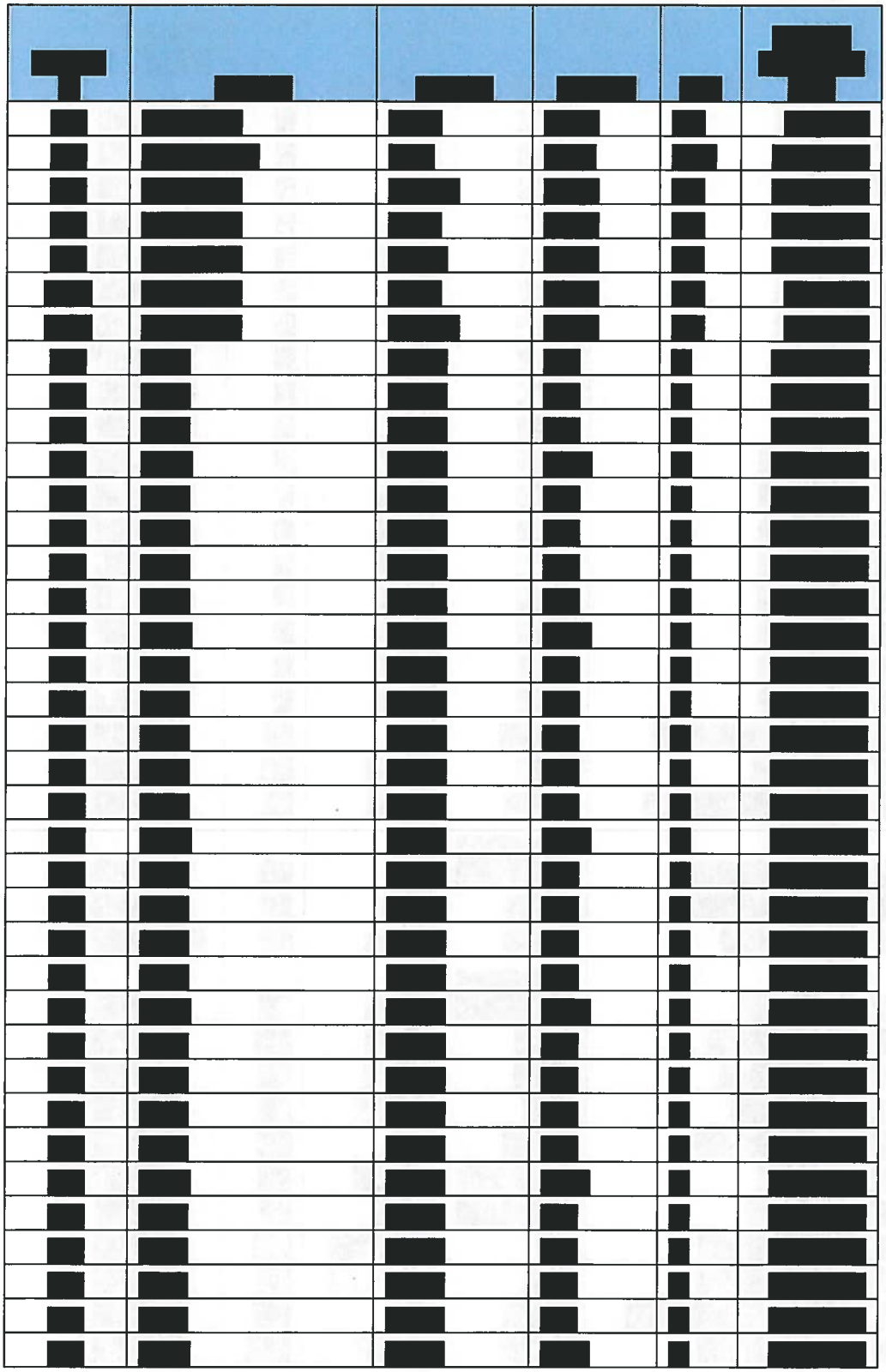
Date of Occurrence	Incident Number	Description	Reportability	Causes	Corrective Actions
Dec. 19, 2013	13-37	Shipping Paperwork Does not Match Package Labeling Information on the shipping document did not match the labeling on the transport package.	Non-compliance with Section 17.1 of the PTNSR. Reportable as required by Section 27(b)(ii) of the NSC Act.	The incorrect information was input into the computer system resulting in an incorrect category being referenced on the shipping document.	Nordion personnel involved were made aware of the error. There was no potential impact to health, safety and security.
Oct. 10, 2013	13-38	Improper Alignment of Waste Container A pail of target waste from the I-131 process was lowered into the waste container while the container was not fully in contact with the underside of the cell.	Not applicable	Operator error – the Monitor and Technician did not follow training.	The Monitors now ensure the container is in full contact with the underside of the cell before they give control of the under cell lift table over to the Technician. One inch of lead surrounds the lift table; therefore, there was no dose consequence.

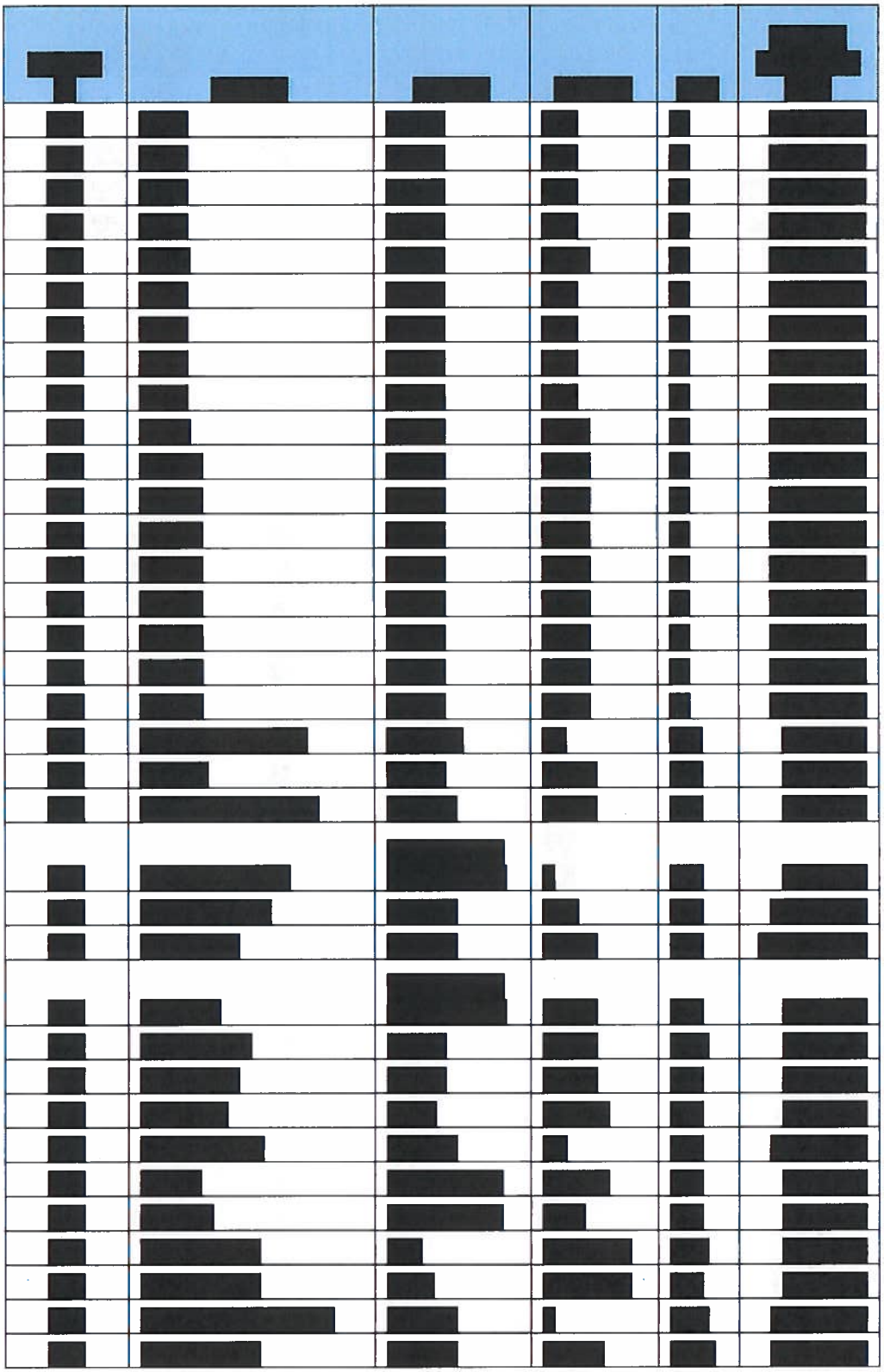
Appendix B
Non-Production Sealed and Unsealed Source Inventory

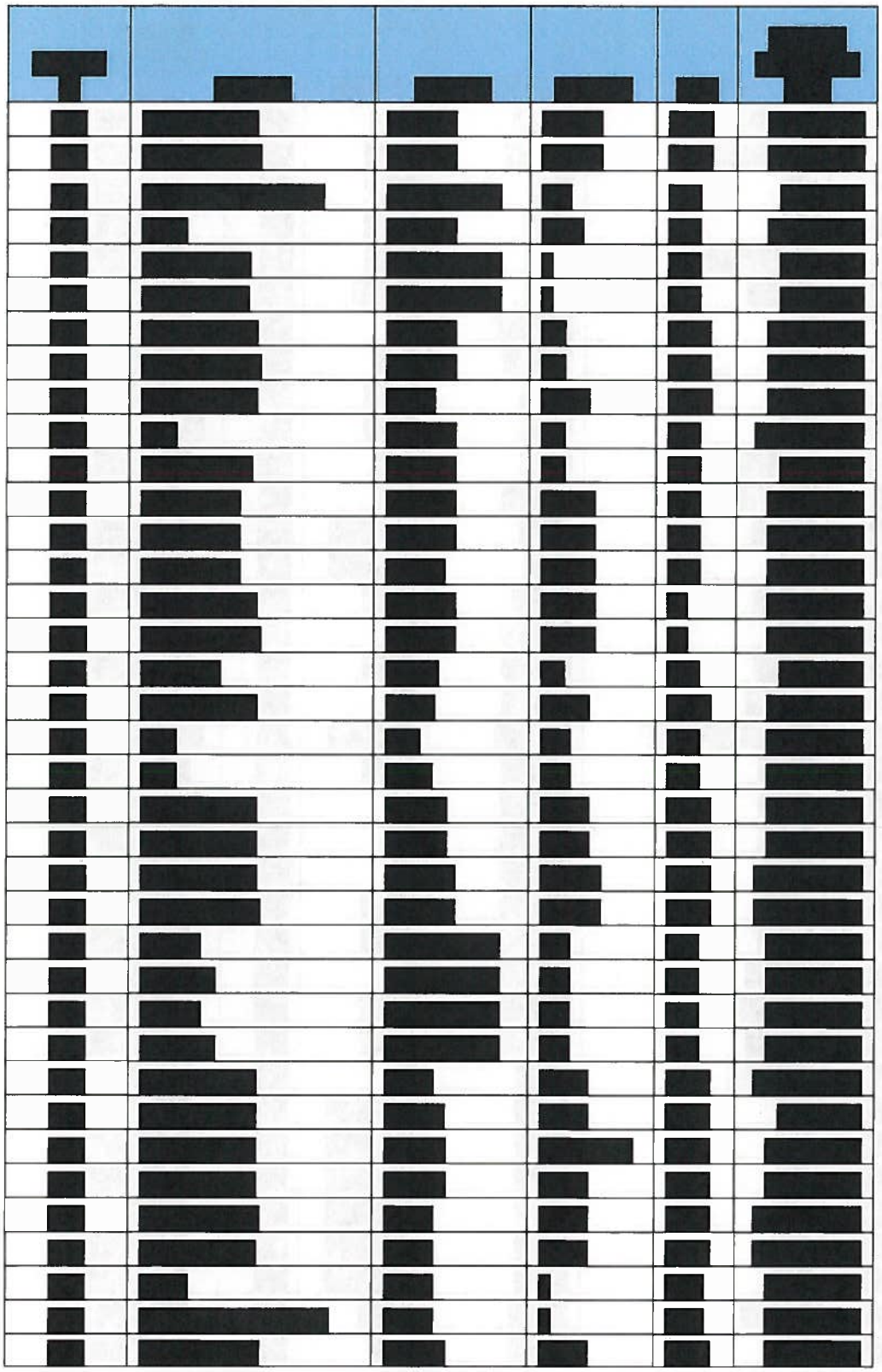


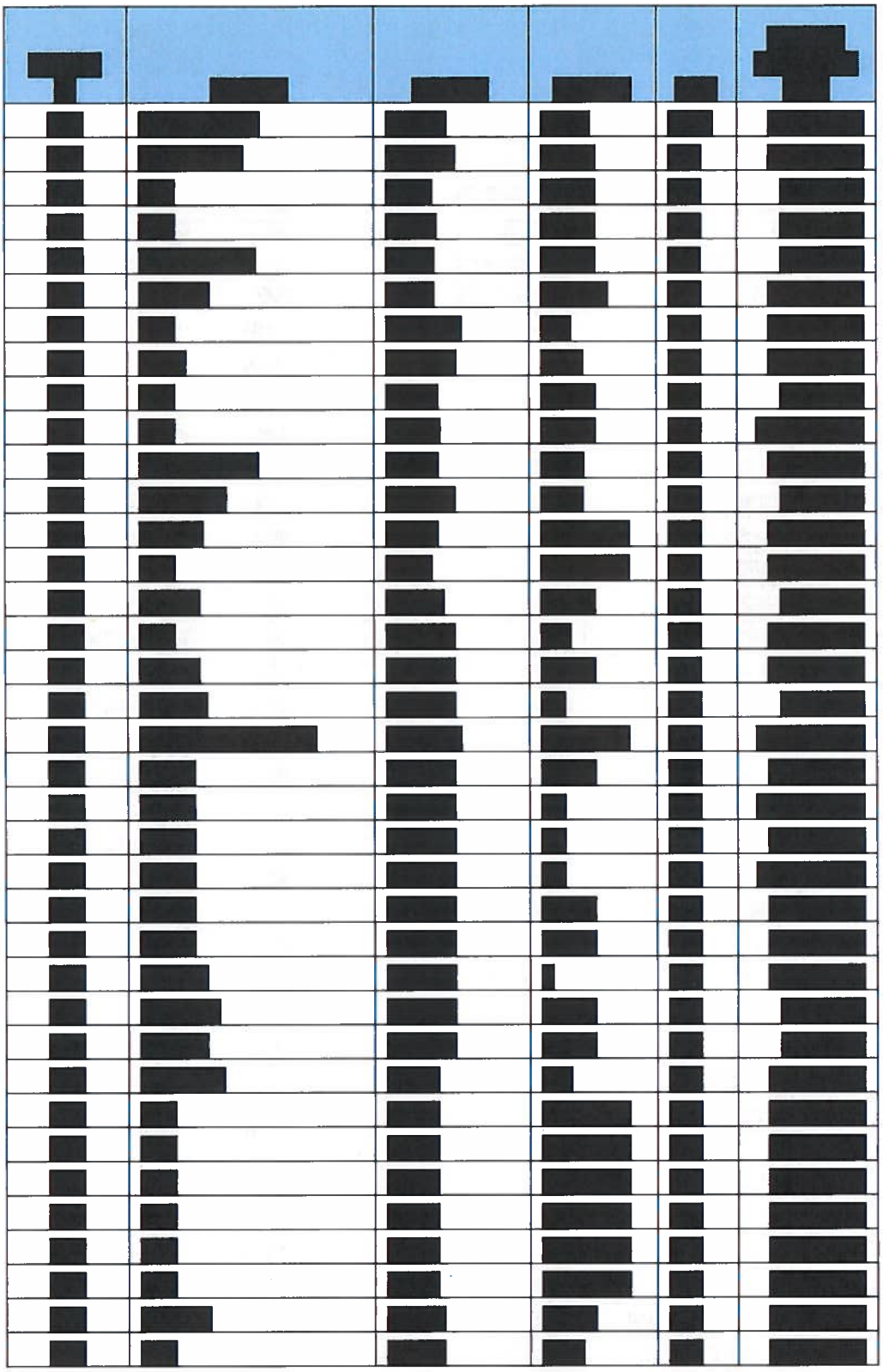


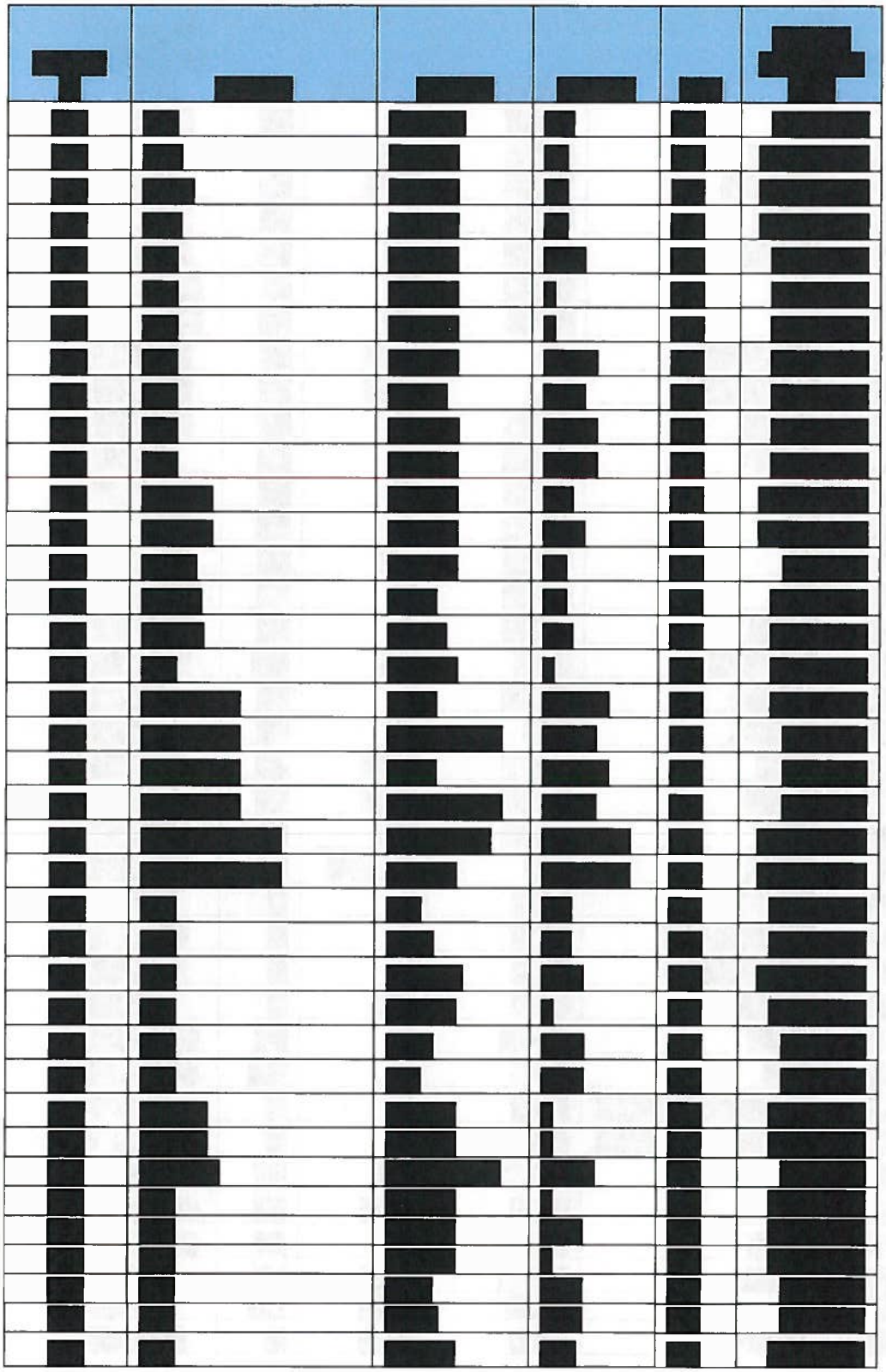


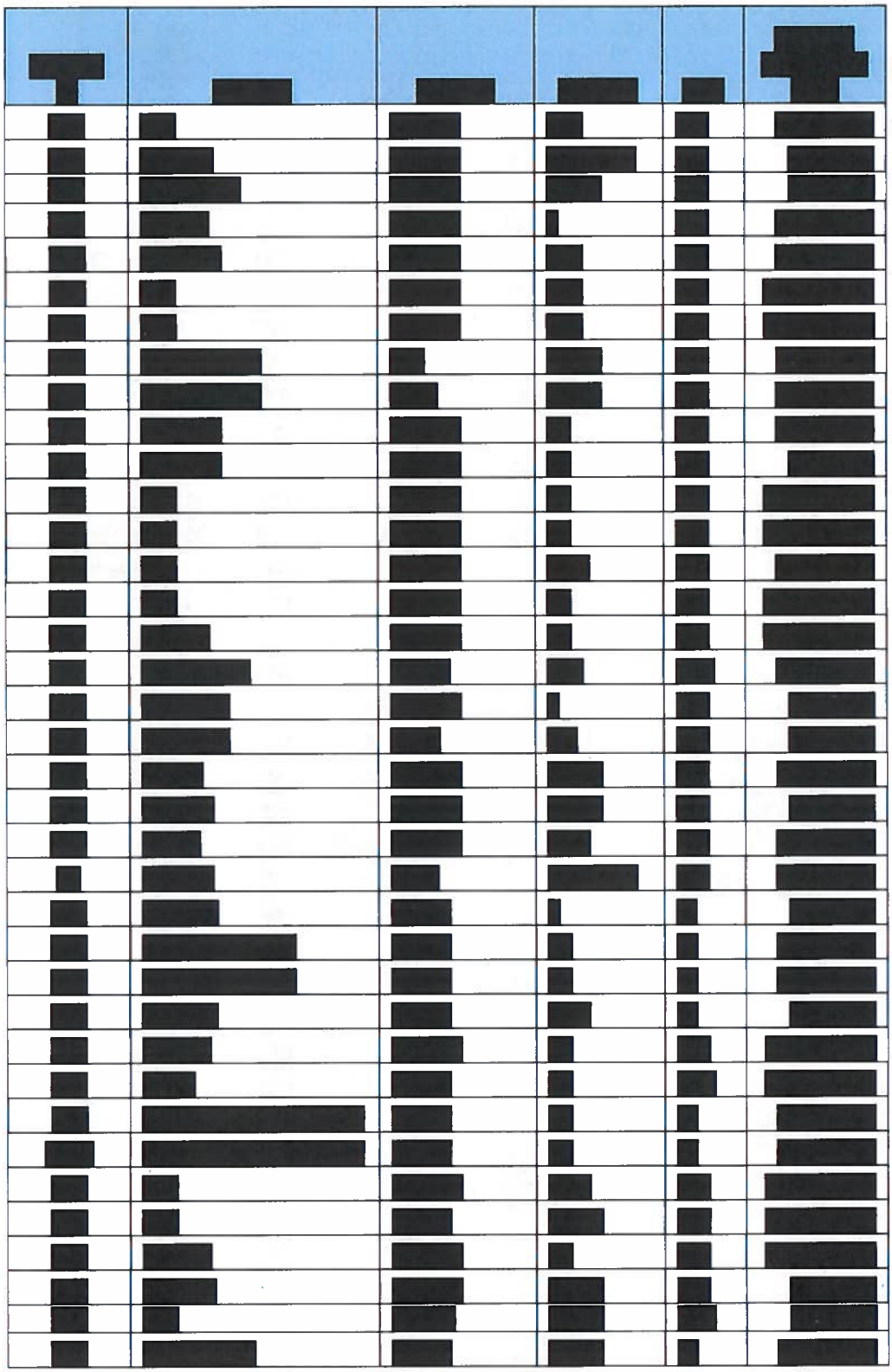


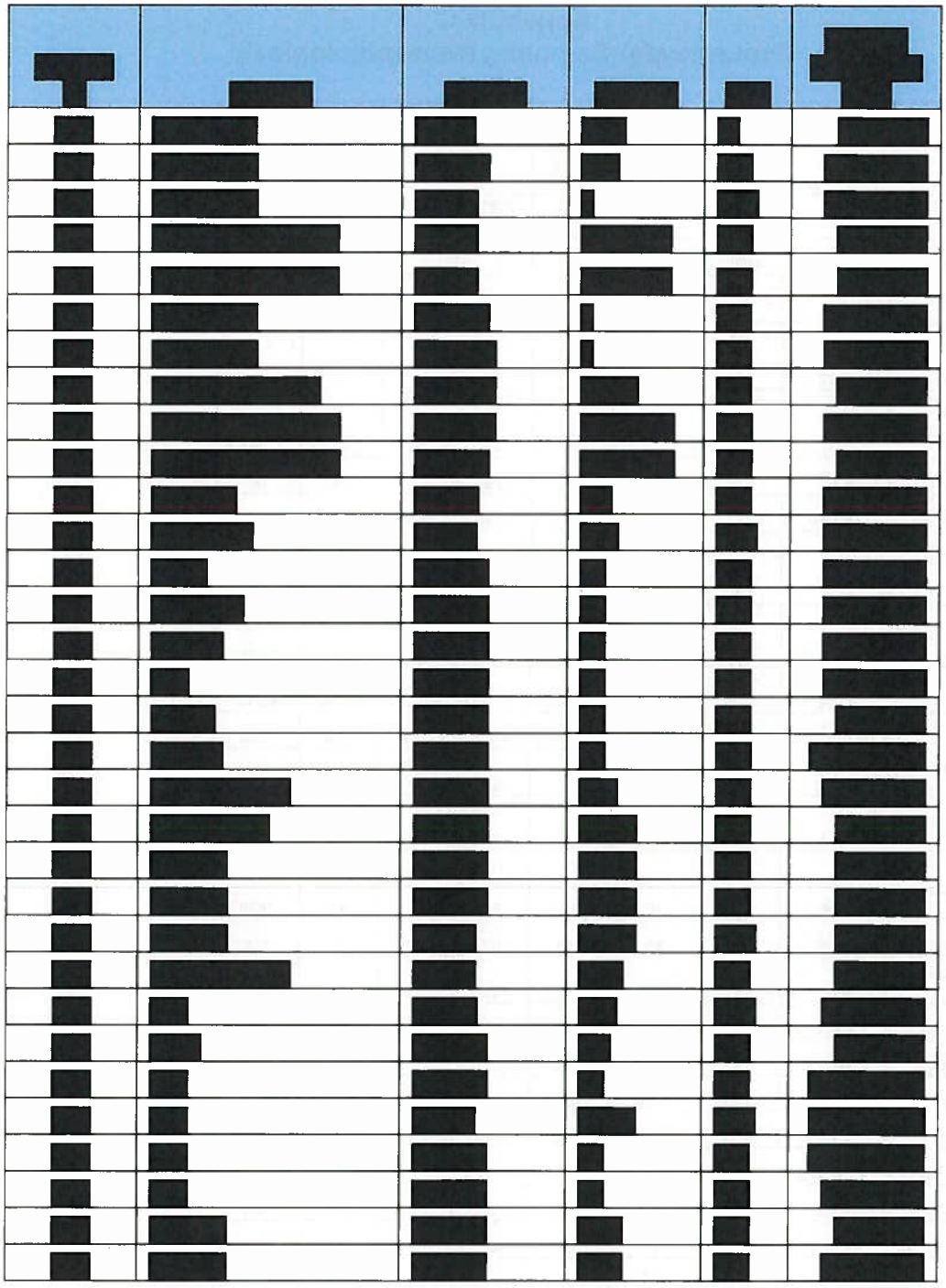












Appendix C
Groundwater Sampling (Non-radiological)

Sample Date:			2013-09-18	2012-11-16	2011-11-01	2010-10-18	2009-10-06	2005-04-07
Sample ID:			2005-BH1	2005-BH1	2005-BH1	2005-BH1	2005-BH1	2005-BH1
Parameter	**UNITS**	**MDL**						
Alkalinity as CaCO3	mg/L	5	493	536	505	496	207	409
Biochemical Oxygen Demand	mg/L	1	2	12	1	<1	3	<1
Chemical Oxygen Demand	mg/L	5	5	25	15	15	6	29
Chloride (Cl)	mg/L	1	46	97	78	53	49	76
Conductivity	µS/cm	5	1110	1320	1190	1170	1200	1130
Dissolved Organic Carbon	mg/L	0.5	3.0	6.5	3.8	3	3.5	8.8
N-NH3 (Ammonia)	mg/L	0.02	0.12	0.12	0.1	0.07	0.07	0.09
N-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
pH			7.76	7.69	7.72	7.77	7.76	7.58
Sulphate (SO4)	mg/L	1	60	59	62	77	86	92
TDS (COND - CALC)	mg/L	5	722	858	774	761	780	735
Total Suspended Solids	mg/L	2	36	51	36	52	41	1820
Calcium (Ca)	mg/L	1	90	115	108	86	87	118
Magnesium (Mg)	mg/L	1	39	61	52	38	40	60
Sodium (Na)	mg/L	2	102	68	66	101	106	33
Barium (Ba)	mg/L	0.01	0.07	0.08	0.07	<0.1	0.06	0.08
Boron (B)	mg/L	0.01	0.05	0.1	0.09	0.1	0.07	0.12
Iron (Fe)	mg/L	0.03	0.35	0.69	0.19	<0.3	0.56	<0.01
CCME Total Petroleum Hydrocarbons								
F1 (C6-C10)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
F2 (C10-C16)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
F3 (C16-C34)	mg/L	0.2	0.5 <0.2*	<0.2	<0.2	<0.2	<0.2	<0.2
F4 (C34-C50)	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4

* Note: The initial sample from 2005-BH1 taken September 18, 2013 indicated 0.5 mg/L of F3 (hydrocarbon). As a result, a second sample was taken from 2005-BH1 November 16, 2013. Results from the second sample indicated that F3 was below detectable limits (< 200 µg/L).

2005 - Borehole 2 (Background Well)								
		Sample Date:	2013-09-18	2012-11-16	2011-11-01	2010-10-18	2009-10-06	2005-04-07
		Sample ID:	2005-BH2	2005-BH2	2005-BH2	2005-BH2	2005-BH2	2005-BH2
Parameter	UNITS	MDL						
Alkalinity as CaCO3	mg/L	5	314	308	309	296	304	278
Biochemical Oxygen Demand	mg/L	1	1	8	1	<1	2	<1
Chemical Oxygen Demand	mg/L	5	<5	29	5	5	<5	7
Chloride (Cl)	mg/L	1	89	76	84	76	91	40
Conductivity	µS/cm	5	888	834	828	822	887	676
Dissolved Organic Carbon	mg/L	0.5	1.6	5.7	1.6	1.4	2.8	1.6
N-NH3 (Ammonia)	mg/L	0.02	0.08	<0.02	<0.02	<0.02	<0.02	0.02
N-NO3 (Nitrate)	mg/L	0.1	0	0	0.24	0.52	0	0.53
pH			7.82	7.80	7.65	7.80	7.85	7.71
Sulphate (SO4)	mg/L	1	23	23	21	22	22	22
TDS (COND - CALC)	mg/L	5	577	542	538	534	577	439
Total Suspended Solids	mg/L	2	24	18	56	6	43	1390
Calcium (Ca)	mg/L	1	97	92	94	97	96	80
Magnesium (Mg)	mg/L	1	37	33	32	34	32	29
Sodium (Na)	mg/L	2	30	29	25	26	22	18
Barium (Ba)	mg/L	0.01	0.02	<0.01	0.02	<0.1	0.02	0.02
Boron (B)	mg/L	0.01	0.03	0.03	0.02	<0.1	0.03	0.07
Iron (Fe)	mg/L	0.03	0.24	0.19	<0.03	<0.3	0.25	<0.01
CCME Total Petroleum Hydrocarbons								
F1 (C6-C10)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
F2 (C10-C16)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
F3 (C16-C34)	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
F4 (C34-C50)	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

2005 - Borehole 3								
	Sample Date:		2013-09-18	2012-11-16	2011-11-01	2010-10-18	2009-10-06	2005-04-07
	Sample ID:		2005-BH3	2005-BH3	2005-BH3	2005-BH3	2005-BH3	2005-BH3
Parameter	**UNITS**	**MDL**						
Alkalinity as CaCO3	mg/L	5	471	481	484	471	479	471
Biochemical Oxygen Demand	mg/L	1	2	>21	1	<1	3	<1
Chemical Oxygen Demand	mg/L	5	8	61	10	13	7	10
Chloride (Cl)	mg/L	1	59	57	56	49	43	64
Conductivity	µS/cm	5	1140	1150	1120	1110	1110	1170
Dissolved Organic Carbon	mg/L	0.5	3.0	9.5	3.0	3.0	3.8	3.3
N-NH3 (Ammonia)	mg/L	0.02	0.06	0.06	0.03	0.13	0.07	0.09
N-NO3 (Nitrate)	mg/L	0.1	<0.10	0.15	0.18	0.29	0.34	<0.10
pH			7.81	7.88	7.81	7.79	7.84	7.49
Sulphate (SO4)	mg/L	1	77	78	74	83	74	81
TDS (COND - CALC)	mg/L	5	741	748	728	722	722	761
Total Suspended Solids	mg/L	2	8	8	6	9	16	496
Calcium (Ca)	mg/L	1	97	104	96	104	95	121
Magnesium (Mg)	mg/L	1	45	46	41	45	39	51
Sodium (Na)	mg/L	2	84	87	76	84	76	63
Barium (Ba)	mg/L	0.01	0.09	0.07	0.05	<0.1	0.06	0.06
Boron (B)	mg/L	0.01	0.25	0.28	0.17	0.20	0.20	0.14
Iron (Fe)	mg/L	0.03	0.04	<0.03	<0.03	<0.3	0.03	<0.01
CCME Total Petroleum Hydrocarbons								
F1 (C6-C10)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
F2 (C10-C16)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
F3 (C16-C34)	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
F4 (C34-C50)	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

2005 - Borehole 4								
Sample Date:			2013-09-18	2012-11-16	2011-11-01	2010-10-18	2009-10-06	2005-04-07
Sample ID:			2005-BH4	2005-BH4	2005-BH4	2005-BH4	2005-BH4	2005-BH4
Parameter	UNITS	MDL						
Alkalinity as CaCO3	mg/L	5	264	245	275	278	275	279
Biochemical Oxygen Demand	mg/L	1	2	5	1	<1	5	<1
Chemical Oxygen Demand	mg/L	5	<5	18	5	13	9	6
Chloride (Cl)	mg/L	1	18	15	32	27	18	15
Conductivity	µS/cm	5	657	611	684	679	676	646
Dissolved Organic Carbon	mg/L	0.5	2.5	4.7	2.9	3.4	3.0	2.1
N-NH3 (Ammonia)	mg/L	0.02	0.29	0.12	0.14	0.19	0.21	0.17
N-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
pH			7.97	7.92	7.53	7.90	7.97	7.84
Sulphate (SO4)	mg/L	1	55	56	52	45	58	41
TDS (COND - CALC)	mg/L	5	427	397	445	441	439	420
Total Suspended Solids	mg/L	2	<2	10	4	<2	5	175
Calcium (Ca)	mg/L	1	36	36	56	41	35	39
Magnesium (Mg)	mg/L	1	16	14	21	17	16	18
Sodium (Na)	mg/L	2	81	78	47	76	81	76
Barium (Ba)	mg/L	0.01	0.07	0.05	0.08	<0.1	0.06	0.07
Boron (B)	mg/L	0.01	0.22	0.24	0.11	<0.1	0.19	0.19
Iron (Fe)	mg/L	0.03	0.29	0.71	0.23	<0.3	0.25	0.16
CCME Total Petroleum Hydrocarbons								
F1 (C6-C10)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
F2 (C10-C16)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
F3 (C16-C34)	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
F4 (C34-C50)	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Appendix D.1
Copy of Nordion Ad Posted in the *Kanata Kourier-Standard EMC*

nordion
SCIENCE ADVANCING HEALTH

COMMITTED TO HEALTH AND SAFETY AT WORK AND IN THE COMMUNITY

Our Work

Nordion is a global health science company that provides market-leading products used for the prevention, diagnosis and treatment of disease. We are a leading provider of sterilization technologies and medical isotopes that benefit the lives of millions of people in more than 40 countries around the world.

Our products are used daily by pharmaceutical and biotechnology companies, medical-device manufacturers, hospitals, clinics and research laboratories.

Our Commitment

Nordion's core company purpose is to make a distinctive contribution to the health and well-being of people. This extends to protecting the safety of our employees, our community and the environment. For over 60 years, Nordion has been committed to safe work practices and the protection of the environment. Nordion's facilities in Kanata are certified to ISO 14001, an international standard for environmental management systems.

Nordion is currently reviewing its Public Information Program (PIP), which includes a commitment to and a Protocol for ongoing, timely communication to the members of the communities in which we live and work. **We want to hear from you** to help ensure that the information we share is timely, useful and relevant.

To provide your feedback or for more information, please visit:

www.nordion.com/pip

R001235002B

Appendix D.2
Copy of Nordion's Online Survey – Public Disclosure Protocol Consultation

Thank you for your interest in Nordion's Public Information Program (PIP). Nordion is focused on protecting the health and safety of our employees, our community, and the environment. Our operations continually exceed the standards set by the Canadian Nuclear Safety Commission (CNSC).

Our Public Information Program relates to the CNSC licensed activities of our Kanata facility and is designed to ensure that information related to the health, safety and security of persons and the environment, and other issues associated with the lifecycle of the facility are effectively communicated to the public. This program includes a commitment to and a Protocol for ongoing, timely communication.

Please take a moment to read the Nordion Public Disclosure Protocol and provide us with your feedback below. Your feedback will be used to further refine our communications to help ensure that our information is timely, useful and relevant for the members of the communities in which we live and work.

Name

First Name

Last Name

Email

City

Community (i.e. Kanata North, Beaverbrook, Glen Cairn, etc.)

Are you satisfied with the scope of information covered under the Public Disclosure Protocol?

● Yes ● No

Are you satisfied with the suggested timeframes for posting different types of information?

● Yes ● No

Overall, how satisfied with are you with Nordion's efforts to communicate information about the impact of our operations?

● Very satisfied ● Somewhat satisfied ● Not at all satisfied

On what platform would you like to receive updates related to our Public Disclosure Protocol?

● Twitter ● Facebook ● Website ● Email ● Any of the above

● Other:

Please provide any additional comments you have on our Public Disclosure Protocol.

Appendix D.3
Public Disclosure Consultation Sample Email

Dear Sir/Madam,

With a focus on protecting the health and safety of our employees, our community, and the environment, Nordion is committed to transparency and relevancy in our communications with surrounding communities. As such, we are seeking feedback from residents in your community regarding our Public Information Program and corresponding Public Disclosure Protocol.

Our Public Information Program relates to the CNSC licensed activities of our Kanata facility and is designed to ensure that information related to the health, safety and security of persons and the environment, and other issues associated with the lifecycle of the facility are effectively communicated to the public. This program includes a commitment to and a Protocol for ongoing, timely communication.

Please take a moment to read the Nordion Public Disclosure Protocol and provide us with your feedback by visiting:

http://www.nordion.com/pip

We encourage you to share this information with your residents in your upcoming communications—on your website, in your newsletter and/or via social media.

Your residents' feedback will be used to further refine our communications to help ensure that our information is timely, useful and relevant for the members of the communities in which we live and work.

Lastly, further to our communication earlier this year, Nordion representatives would be happy to present at an upcoming meeting/event in your community. We could give a high-level presentation about our organization, including our commitment to environment, health and safety, and would be available to reply to any questions that community members may have about our operations.

Thank you in advance for your time and attention. Please don't hesitate to contact us should you wish to arrange for a presentation, or should you require any further information on our Public Information Program.

Best Regards,

VP Public and Government Relations
Nordion

Appendix D.4
Social Media Use in Nordion's Public Disclosure Program