2017 Fourth Quarter Compliance Monitoring
&
Operational Performance Report

Reporting Period October 1 – December 31, 2017

Port Hope Conversion Facility
Operating Licence
FFOL-3631.00/2027

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I Executive Summary

Cameco Corporation (Cameco) is a major supplier of uranium processing services required to produce nuclear fuel for the generation of clean electricity around the world. Cameco's Fuel Services Division is comprised of the Blind River Refinery, the Port Hope Conversion Facility (PHCF), Cameco Fuel Manufacturing Inc. and a divisional head office located in Port Hope, Ontario.

Cameco operates a Class IB nuclear facility in Port Hope, Ontario and employs approximately 330 workers. In the fourth quarter of 2017, the facility operated under operating licence FFOL-3631.00/2027, which is valid until February 28, 2027.

Cameco is committed to the safe, clean and reliable operation of all of its facilities and continually strives to improve its performance and processes to ensure the safety of both its employees and local residents. PHCF maintains the required programs, plans and procedures in the areas of health and safety, radiation protection, environment, emergency response, fire protection, waste management, and training.

As a result of these programs, plans and procedures, PHCF's operations have maintained radiation exposures to workers and the public well below the regulatory dose limits. Environmental emissions are also being controlled to levels that are a fraction of the regulatory limits.

In 2016 and early 2017, as part of the relicensing process, a daily sanitary sewer discharge action level of 100 µg/L and a monthly mean release limit of 275 µg U/L were developed and accepted. On October 9, 2017, the sanitary sewer discharge action level was exceeded and attributed to groundwater infiltration associated with a significant precipitation event. An exceedance of an action level does not pose a risk to people or the environment.

II Table of Contents

1.0 INTRODUCTION

1.1 General Introduction

Cameco Corporation (Cameco) is a major supplier of uranium processing services required to produce fuel for the generation of clean electricity around the world.

Cameco's Fuel Services Division (FSD) is comprised of the Blind River Refinery (BRR), the Port Hope Conversion Facility (PHCF), Cameco Fuel Manufacturing Inc. (CFM) and a divisional head office located in Port Hope, Ontario.

Cameco operates a Class IB nuclear conversion facility in Port Hope, Ontario and employs approximately 330 workers. The facility operated under a Canadian Nuclear Safety Commission (CNSC) five-year operating licence (the Licence), FFOL-3631.00/2027, which is valid until February 28, 2027.

Cameco is committed to the safe, clean and reliable operation of all of its facilities and continually strives to improve safety performance and processes to ensure the safety of both its employees and local residents.

PHCF maintains the required programs, plans and procedures in the areas of health and safety, radiation protection, environment, emergency response, fire protection, waste management, and training.

In addition to the CNSC, the PHCF is regulated by other federal and provincial regulators, such as the Ontario Ministry of Environment and Climate Change (MOECC), Environment and Climate Change Canada (ECCC), Employment and Social Development Canada (ESDC), and Transport Canada (TC).

The acronyms in the following table may appear in this report.

Table 1

Acronyms Used Within This Report	
Acronym	**Description**
AAQC	Ambient Air Quality Criteria
AHF	Anhydrous Hydrogen Fluoride
ALARA	As Low As Reasonably Achievable
BRR	Blind River Refinery

Bq/cm^2	Becquerel per Square Centimeter
Cameco	Cameco Corporation
CaO	Calcium Oxide
CBT	Computer Based Training
CCC	Criticality Control Committee
CCM	Contaminated Combustible Material
CCME	Canadian Council of Ministers of the Environment
CFM	Cameco Fuel Manufacturing
Charter	The Safety Charter
CIRS	Cameco Incident Reporting System
CNC	Contaminated Non-Combustible Material
CNL	Canadian Nuclear Laboratories
CNSC	Canadian Nuclear Safety Commission
COC	Contaminants of Concern
CSSC	Conversion Safety Steering Committee
CUP	Clean Up Program Operations Group
DU	Depleted Uranium
EC	Environment and Climate Change Canada
ECA	Environmental Compliance Approval
EHS	Environmental Health and Safety
EMP	Environmental Monitoring Plan
ERP	Emergency Response Plan
ERT	Emergency Response Team

FHA	Fire Hazard Assessment
FBW	Filter Backwash
FFI	Facility Fire Inspections
FMEA	Failure Mode and Effects Analysis
FPP	Fire Protection Program
FSD	Fuel Services Division
gU/h	Grams of Uranium per Hour
HAZOP	Hazard and Operability Analysis
HF	Hydrogen Fluoride
HIRAC	Hazard Identification, Risk Assessment and Control
HRSDC	Human Resources and Skills Development Canada
IAEA	International Atomic Energy Agency
ICAM	Intelligent Alpha/Beta Continuous Air Monitor
IMS	Incident Management System
ISO	International Standards Organization
ITM	Inspection, Testing and Maintenance
JHA	Job Hazard Analysis
LCH	Licence Conditions Handbook
Licence	Licence FFOL-3631.00/2027
LIMS	Laboratory Information Management System
LOPC	Loss of Primary Containment
LTWMF	Long Term Waste Management Facility
MEWS	Ministry of the Environment Wastewater System

MISA	Municipal/Industrial Strategy for Abatement
MOECC	Ontario Ministry of the Environment and Climate Change
MPH	Municipality of Port Hope
mSv	Millisievert
NDR	National Dose Registry
NEW	Nuclear Energy Worker
NFPA	National Fire Protection Association
NO_x	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NO_3	Nitrate
NSCA	Nuclear Safety Control Act
NUO_2	North UO_2 Plant
OH&S	Occupational Health and Safety
ORL	Operating Release Level
OSL	Optically Stimulated Luminescence
PDP	Preliminary Decommissioning Plan
PHCF	Port Hope Conversion Facility
PHFES	Port Hope Fire and Emergency Services
PTTW	Permit to Take Water
Q1	First Quarter
Q2	Second Quarter
Q3	Third Quarter
Q4	Fourth Quarter

QA	Quality Assurance
QMI-SAI	Quality Management Institute – Standards Australia International
RE	Reliability Engineering
SAT	Systematic Approach to Training
SCBA	Self-Contained Breathing Apparatus
SCI	South Cooling Water Intake
SEU	Slightly Enriched Uranium
SHEQ	Safety Health Environment and Quality
SPOC	Single Point of Contact
SSC	Systems Structures and Components
SuperCUP	Clean Up Program to remove historic equipment and structures
SWCS	Storm Water Control Study
TC	Transport Canada
TRIR	Total Recordable Injury Rate
UF_6	Uranium Hexafluoride
µgU/L	Micrograms of Uranium per Litre
ULN	Upper Limit of Normal
UO_2	Uranium Dioxide
UO_2N	UF_6 plant/Building 2 Cooling Water Return
UO_2S	UO_2 Plant Cooling Water Return
UO_3	Uranium Trioxide
µSv/h	Microsievert per Hour

µSv	Microsievert
WSIB	Workplace Safety and Insurance Board

* Not all acronyms listed above appear in every quarterly.

1.2 Facility Operation

Cameco continues to strive for operational excellence at all of its facilities through consistent application of management systems to ensure that they operate in a safe, clean and reliable manner. Corporate policies and programs, including that for Safety, Health, Environment and Quality (SHEQ) provide guidance and direction for all site-based programs and procedures that define the PHCF Quality Management System.

In addition to Cameco requirements regarding management systems, the facility's quality program has been designed to meet section 3(d) of the *Class I Nuclear Facilities Regulations*. This program provides the controls to ensure all processes are conducted in a safe manner and that processes applying to licensed activities are conducted in accordance with applicable CNSC quality requirements and other regulatory requirements. The application of the quality requirements is scaled according to the safety significance (complexity and hazard potential) of a particular activity.

Changes to the physical design of equipment, processes and the facility with the potential to impact safety are evaluated from project planning through to the completion of the project. This review identifies impacts and potential impacts to the environment, radiation protection, health and safety and fire protection. A site design control procedure is in-place which ensures that any equipment changes or modifications will not have an adverse effect on the environment or on the health and safety of employees or members of the public.

The Emergency Response Team (ERT) was activated on October 18, 2017 to respond to a small fire and tail gas (mostly F_2 and HF fumes) release from piping around the uranium hexafluoride (UF_6) compressors in the cold trap area. There were no environmental or personnel impacts as a result of this event.

The UF_6 plant was shut down for a week in December for a scheduled holiday shutdown.

The UO_2 plant was shut down on December 22, 2017 for a scheduled holiday shutdown and restarted in January 2018.

In the fourth quarter, CQP-113 Process and Design Change Control was revised to reflect the new Management of Change SAP-based program that has been implemented at the PHCF.

1.3 Production or Utilization

The maximum daily production rate for the UF_6 plant did not exceed the licensed limit of 45 tonnes uranium as UF_6 per day during the fourth quarter.

Detailed plant production information is considered “Protected Proprietary” and is submitted to the CNSC on an annual basis under a separate cover.

1.4 Facility Modification

There were no modifications affecting the safety analysis of the licensed facility made in the quarter that required written approval of the Commission or a person authorized by the Commission.

The following PHCF documents referenced in the Licence Conditions Handbook (LCH) were updated and submitted for CNSC staff review in the fourth quarter:

- Emergency Response Plan;
- Environmental Protection Program documents;
- CQP-113 Process and Design Change Control;
- CQP-501 In Service Inspection of Safety Significant Systems/Structures/Components;
- CQP-706 Pressure and Safety Significant Piping and Vessel Control; and,
- CQP-707 Registration and Inspection Requirements of Pressure Piping and Pressure Vessels.

2.0 SAFETY AND CONTROL AREAS

2.1 Management

2.1.1 Management System

This safety and control area covers the framework which establishes the processes and programs required to ensure that the organization achieves its safety objectives and continually monitors its performance against these objectives, as well as fostering a healthy safety culture.

The PHCF's management systems program identifies the controls required to ensure all processes are conducted in a safe manner and that processes applying to licensed activities are conducted in accordance with applicable CNSC management systems requirements and other regulatory requirements. The application of the management systems requirements is scaled according to the complexity and hazard potential of a particular activity.

The 2017 internal audits were completed as scheduled.

One external customer audit was completed during the fourth quarter of 2017. The results of the audit were communicated at the closing meeting and the final report is pending.

In order to come into compliance with CSA N286-12 Management System requirements for nuclear facilities, Cameco updated its Management Systems Program Manual.

The CNSC conducted three inspections at the PHCF during the fourth quarter.

The PHCF received the following inspection report from the CNSC in the fourth quarter:

- CNSC Compliance Inspection Cameco-PHCF-2017-03 Report

Cameco strives for continual improvement and is committed to ensuring the safety of employees, the public and the environment. The corrective actions related to inspection reports are assigned as appropriate.

2.1.2 Human Performance Management

This safety and control area covers activities that enable effective human performance through the development and implementation of processes that ensure that licensee staff members are sufficient in numbers in all relevant job areas and have the necessary knowledge, skills and tools in place, in order to safely carry out their duties.

The UF_6 plant resumed activities, with training conducted for a new supervisor, new chemical operator and chemical operators training in new areas. UF_6 chemical operators also continued with their maintenance of qualification schedule. Early in December, the CNSC conducted a successful Type II training audit, with a focus on UF_6 training.

Production in the UO_2 plant went from routine to a ramped up schedule, which finished during December. Once again, the ramped up schedule was supported by several transferred UF_6 operators that were previously qualified in specific operating areas. Training also continued for the UO_2 supervisor.

During the fourth quarter, the PHCF maintained a sufficient number of production personnel and emergency response team members to ensure that operating production areas and the site were adequately staffed to run safely.

2.1.3 Operating Performance

This safety and control area includes an overall review of the conduct of the licensed activities and the activities that enable effective facility performance.

In the fourth quarter of 2017, the PHCF continued to operate in a manner that supports safe, clean and reliable production and in compliance with applicable acts and regulations.

The UF_6 plant was shut down for a week in December for a scheduled holiday shutdown.

The UO_2 plant was shut down on December 22, 2017 for a scheduled holiday shutdown and restarted in January 2018.

The PHCF operated in accordance with site programs and procedures and did not exceed any CNSC regulatory limits during the quarter.

2.2 Facility and Equipment

2.2.1 Safety Analysis

This safety and control area covers the maintenance of the safety analysis which supports the overall safety case for the facility. This safety analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards.

The PHCF has a safety report that documents the detailed safety analysis carried out for the facility. The safety report summarizes the systematic review of site operations to identify and assess hazards and potential risks to the public and environment. Cameco uses a hazards and operability (HAZOP) approach to assess new processes or equipment. This focuses on equipment, instrumentation, human actions and other factors that impact on the process. HAZOPs are conducted prior to making any plant modifications that may affect the safety case for the facility, with the site safety report updated at least every five years to include the findings from any HAZOP's completed since the last revision to the report. The safety report was most recently updated in the fourth quarter of 2015 and was accepted by CNSC staff on April 22, 2016.

There were no modifications made in the quarter that affected the safety case for the PHCF. The safety-significant systems at the facility have been identified and a preventive maintenance program is in place to ensure that the equipment associated with these systems is properly maintained.

2.2.2 Physical Design

This safety and control area relates to activities that impact on the ability of systems, structures and components (SSCs) to meet and maintain their design basis, given new information arising over time and taking into account changes in the external environment.

As part of Cameco's budgeting process for capital expenditures, plant improvements related to physical design are identified and prioritized. A Stage Gate process is used at PHCF to review capital projects at up to four points in the design process. This process includes sign-off by site management (or designate), to ensure that these requirements are addressed in every capital project.

Changes to the physical design of equipment, processes and the facility with the potential to impact safety are evaluated from initial planning through to the completion of the project. This review identifies impacts and potential impacts to the environment, radiation protection, health and safety and fire protection. A site design control procedure is in place which ensures that any equipment changes or modifications will not have an adverse effect on the environment, on the health and safety of employees or on members of the public.

In the fourth quarter, CQP-113 Process and Design Change Control was revised to reflect the new Management of Change SAP-based program that has been implemented at the PHCF.

2.2.3 Fitness for Service

This safety and control area covers activities that impact on the physical condition of SSCs, to ensure that they remain effective over time. This includes programs that ensure all equipment is available to perform its intended design function when called upon to do so.

In the fourth quarter of 2017, work was conducted in all four areas of Operational Reliability. Highlights included:

- Work Management (WM): Two three-day workshops were held with a Prometheus training consultant which will allow PHCF to improve its day-to-day use of the software and allow full transition from Primavera to Prometheus shutdown planning.
- Materials Management (MM): Reviews of inventory levels continued in the fourth quarter, beginning with high cost inventory, resulting in significant reductions.
- Reliability Engineering (RE): Sixty preventive maintenance (PM) plans were updated in 2017 based on feedback from trades' personnel.
    - Predictive Maintenance:
        - Vibration
            - Millwrights given additional hands-on training on equipment in November;
            - 67 assets covering 250 check points currently checked quarterly; and,
            - Transition to monthly PM's (best practice), first stage implementation began in December 2017.
    - Thermography
        - Reliability Engineer completed Level 1 training;
        - Approximately 200 current assets were reviewed on an annual PM frequency, the Reliability Engineer in conjunction with an electrician conducted an initial PM round and consequently will be assessing the value of moving to more frequent checks; and,
        - New report to be generated using training from Level 1 for analysis.
    - Oil analysis
        - Reliability Engineer completed Level 1 training.
- Operations Improvement (OI): Piping and instrumentation drawing verification and valve tagging is 80% complete in the UO_2 plant with the balance to be completed in 2018. Piping and instrumentation drawing verifications are virtually complete in the Powerhouse with some final verifications remaining.

The effectiveness of the program, as it pertains to reliability of equipment and systems, continues to be measured through a number of leading and lagging metrics. Program effectiveness is defined by upward trends of these indicators to reach world class standards for chemical manufacturing facilities.

Testing and verification activities are integrated into the preventive maintenance strategy for any SSCs. Compliance to the activities is measured on a weekly basis.

The asset management program accounts for aging through a number of processes designed to detect early warning signs and to prescribe rehabilitation programs or pro-active replacement strategies. The effectiveness of the program is measured by the same means as the overall maintenance program.

2.3 Core Control Processes

2.3.1 Radiation Protection

This safety and control area covers the implementation of a radiation protection program, in accordance with the *Radiation Protection Regulations*. This program must ensure that contamination and radiation doses are monitored and controlled.

PHCF has an extensive Radiation Safety Program in place to meet the requirements of the *Nuclear and Safety Control Act* and the *Radiation Protection Regulations* and ensure exposures are kept to levels as low as reasonably achievable (ALARA). The program includes the following aspects:

- External dosimetry – personal monitoring;
- Internal dosimetry – urine analysis and lung counting programs;
- Radioactive contamination control;
- Radioactive waste handling;
- Radioisotope control;
- ALARA program;
- Radiation protection training;
- Respiratory protection program; and
- Radiation exposure control and monitoring.

The CNSC regulatory limits for effective dose for nuclear energy workers (NEWs) are 50 millisievert (mSv) per year and no more than 100 mSv over a specified five year period.

For various radiological parameters, Cameco has established action levels, accepted by the CNSC, which may be indicative of a potential loss of control for that specific parameter. These action levels serve as an early warning of a condition that warrants further investigation. In addition, as a continual improvement tool, Cameco has established lower-tier internal administrative levels and ALARA targets, which are set below the action levels and provide very early warning of a potential concern. A result above an internal administrative level is also investigated and remedial actions taken, if necessary.

Audits and inspections are performed in accordance with the Management Systems Program Manual. Refer to the Management Systems section of this report for further details.

The radiation protection and ALARA programs have been demonstrated to be effective. The PHCF did not implement any significant changes in the fourth quarter.

The strategic plan for excellence in radiation protection was developed and discussed at a site leadership team meeting in 2013. The plan provides long term objectives in the areas of dosimetry and contamination control. These objectives were streamlined into more specific plans with the involvement of the Conversion Safety Steering Committee (CSSC) Radiation Protection (RP) subcommittee in 2014. To date, the RP subcommittee has largely focused on contamination control.

Cameco uses in-house licensed dosimetry services for assigning internal doses to individuals utilizing urine analysis and lung counting programs. In the fourth quarter of 2014, Cameco received the renewed dosimetry services licence (11010-16-24.0) which is due to expire on November 30, 2024.

The PHCF uses a licensed dosimetry service provider that is accredited by the CNSC for external dosimetry. The dosimetry service provides optically stimulated luminescence (OSL) dosimeters to the PHCF for use by employees, contractors, and visitors. An OSL dosimeter is used to monitor whole body and skin dose. Dosimeters are changed monthly for production, maintenance and support services and quarterly for all other employees. The provider reports the OSL dosimeters' results to the National Dose Registry (NDR) as well as provides a copy to the PHCF.

The radiation protection program at the PHCF is well established, with detailed procedures outlining the processes under each element of the program. Review of the quarterly dose data indicates that the program is effective in the prevention of unreasonable risk to the health and safety of workers. Cameco follows a "top five" approach whereby the work practices of the five employees with the highest year-to-date doses are reviewed.

The following tables and graphs summarize employee external exposure results. Note that in figures with ranges on the horizontal axis, a range of one to two, for example, means all results are greater than one and less than or equal to two.

Whole Body Dose

Table 2 shows the whole body dose summary results from the fourth quarter of 2017 for six work groups: UF_6 Plant; UO_2 Plant, Maintenance; Technical Support (including NEW contractors), Major Projects; and Administration. The highest exposures were from the UF_6 plant group.

All results were below the monthly action level of 2 mSv.

Table 2

Fourth Quarter 2017 Whole Body Dose Results				
Work Group	**Number of Individuals**	**Average Dose (mSv)**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**
UF_6 Plant	83	0.14	0.00	1.10
UO_2 Plant	23	0.18	0.00	0.38
Maintenance	66	0.07	0.00	0.33
Technical Support [1]	278	0.03	0.00	0.76
Major Projects	14	0.00	0.00	0.00
Administration	82	0.00	0.00	0.04
Total (Max)	**546**	**0.05**	**0.00**	**1.10**
[1]Includes contractors (NEWs)				

Distributions of the quarterly external whole body exposures are shown in Figure 1. 99.8% of whole body exposures were below 1 mSv.

Figure 1

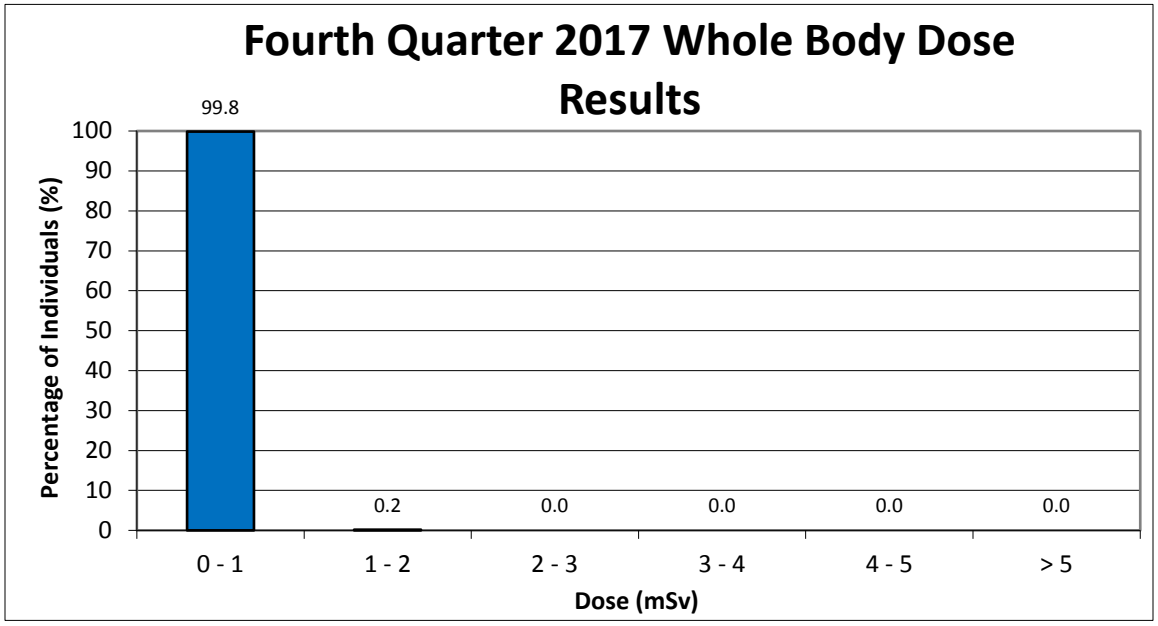
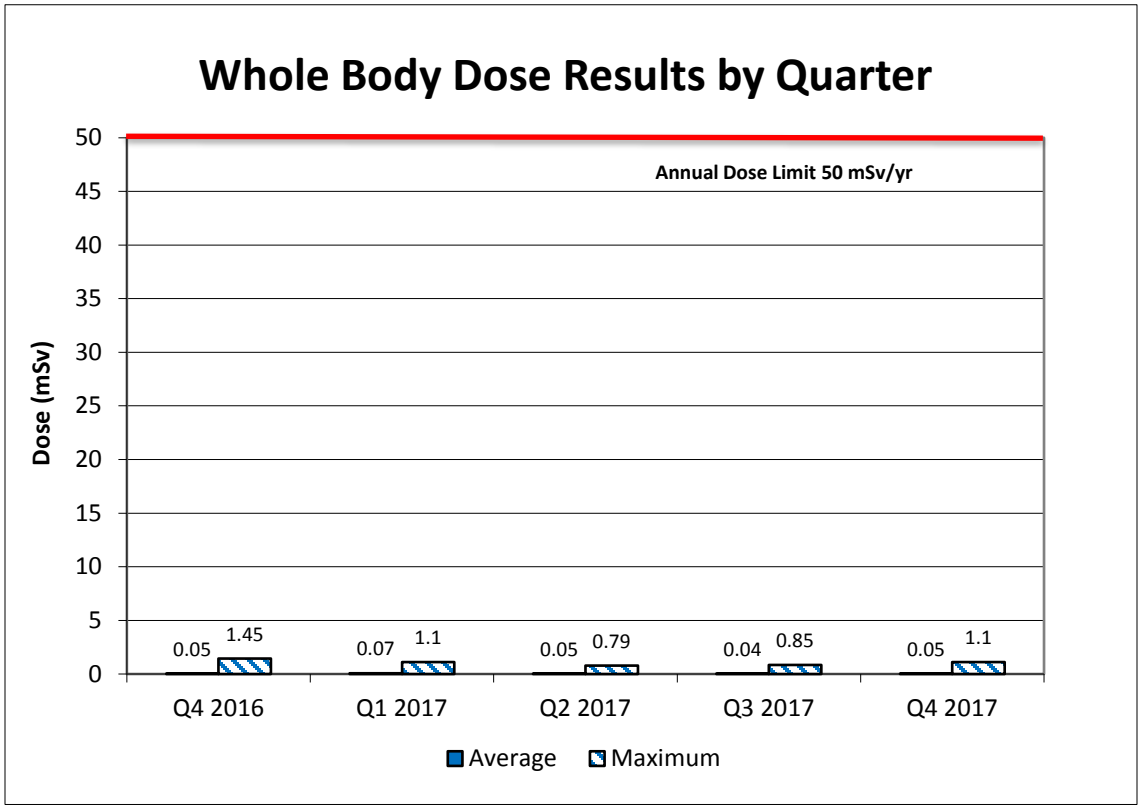


Table 3 and Figure 2 show the employee average, minimum and maximum quarterly individual external whole body exposures for the fourth quarter of 2016 through to the fourth quarter of 2017. The average whole body dose is consistent with previous quarters. The maximum whole body dose received by a UF_6 operator was related to work completed in the flame reactor area.

Table 3

Whole Body Dose Results by Quarter				
Monitoring Period	**Number of Individuals**	**Average Dose (mSv)**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**
Q4 2016	513	0.05	0.00	1.45
Q1 2017	530	0.07	0.00	1.10
Q2 2017	520	0.05	0.00	0.79
Q3 2017	574	0.04	0.00	0.85
Q4 2017	546	0.05	0.00	1.10

Figure 2



Skin Dose

Table 4 shows the quarterly skin dose summary results for six work groups: UF_6 Plant; UO_2 Plant; Maintenance; Technical Support (including NEW contractors), Major Projects; and Administration. The highest exposures are from the UF_6 group related to work in the flame reactor area.

Table 4

Fourth Quarter 2017 Skin Dose Results				
Work Group	**Number of Individuals**	**Average Dose (mSv)**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**
UF_6 Plant	83	0.81	0.00	7.04
UO_2 Plant	23	0.75	0.00	1.55
Maintenance	66	0.45	0.00	1.99
Technical[1]	278	0.06	0.00	0.93
Major Projects	14	0.00	0.00	0.00
Administration	82	0.00	0.00	0.04
Total (Max)	**546**	**0.24**	0.00	**7.04**
[1]Includes contractors (NEWs)				

Distributions of the quarterly external skin exposures are shown in Figure 3. All of the external skin exposures were below 10 mSv.

Figure 3

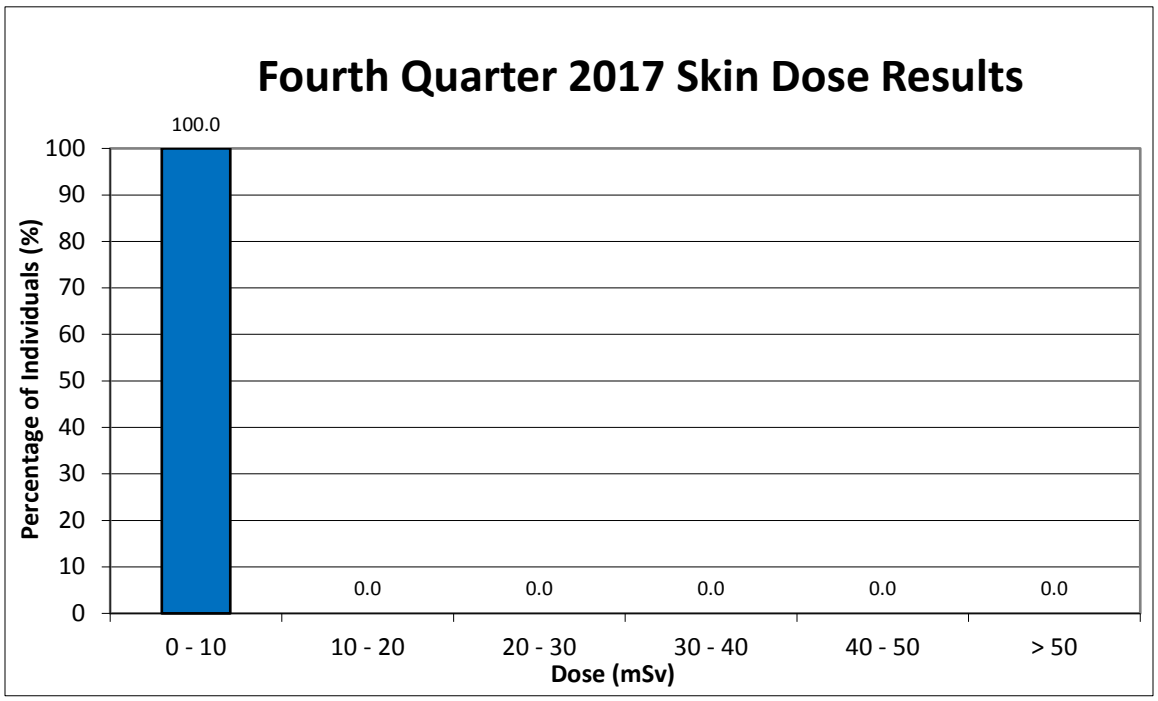
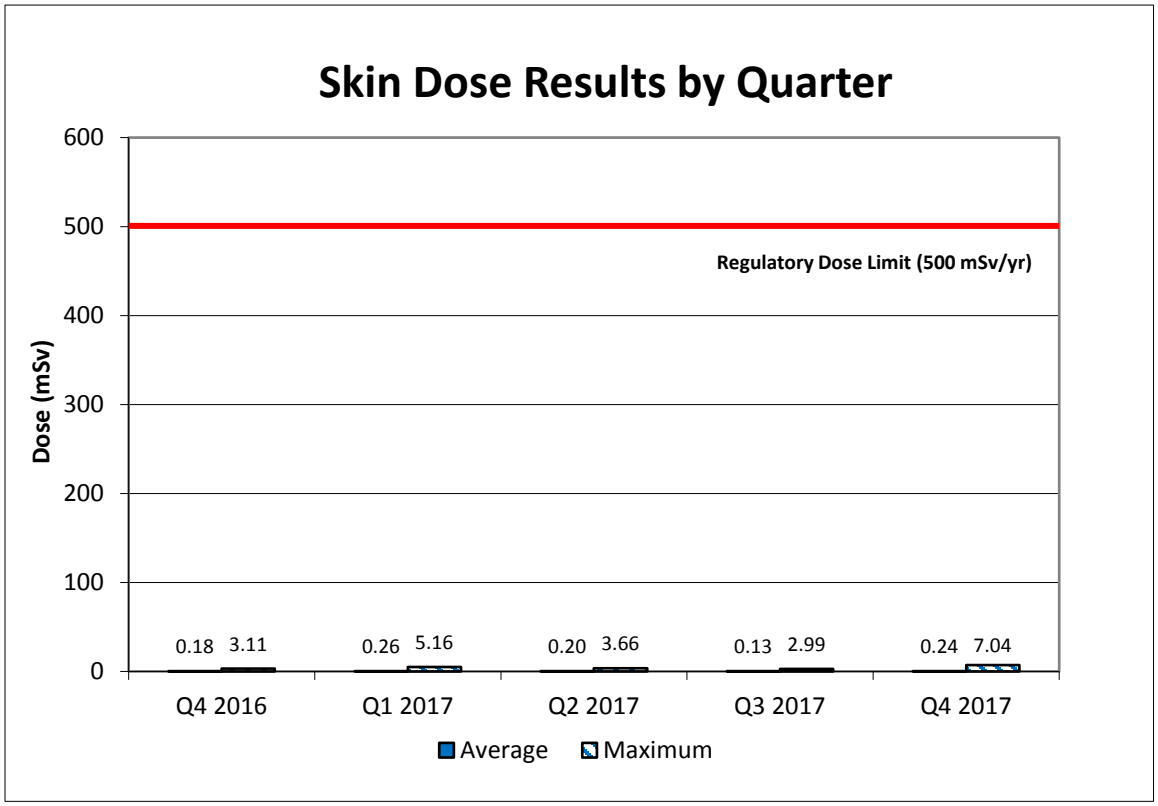


Table 5 and Figure 4 show the employee average and maximum quarterly individual skin exposure for the fourth quarter of 2016 through to the fourth quarter of 2017. The average skin dose is consistent with previous quarters in which production and maintenance activities were occurring. The maximum skin dose received by a UF_6 operator was related to flame reactor work activities.

Table 5

Skin Dose Results by Quarter				
Monitoring Period	**Number of Individuals**	**Average Dose (mSv)**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**
Q4 2016	513	0.18	0.00	3.11
Q1 2017	530	0.26	0.00	5.16
Q2 2017	520	0.20	0.00	3.66
Q3 2017	574	0.13	0.00	2.99
Q4 2017	546	0.24	0.00	7.04

Figure 4



Urine Analysis

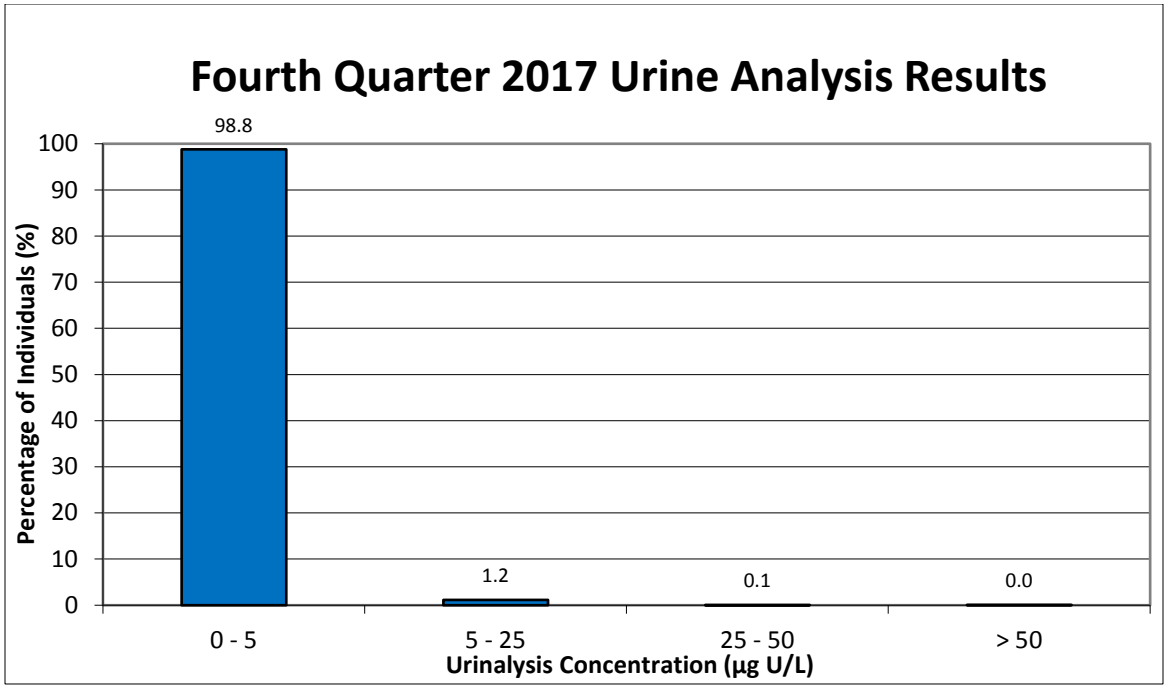
Table 6 and Figure 5 show the distribution of urine results for the fourth quarter. A total of 6,928 urine samples were collected and analyzed for uranium during the fourth quarter of 2017. The majority of routine urine analysis results (98.8%) were less than 5 µg U/L in the quarter.

All results above 13 µg U/L were screened by radiation protection staff. There were no official investigations for urine analysis during the fourth quarter of 2017.

Table 6

Fourth Quarter 2017 Routine Urine Analysis Results	
Distribution of Results	**Q4 2017**
Number of Samples < 5 µg U/L	6,842
Number of Samples > 5 to < 25 µg U/L	80
Number of Samples > 25 to < 50 µg U/L	5
Number of Samples > 50 µg U/L	1
Number of Samples Analyzed (Uranium)	6,928

Figure 5



The distribution of the quarterly internal urine dose for employees is shown in Figure 6. All individual assigned doses were below 0.2 mSv.

Figure 6

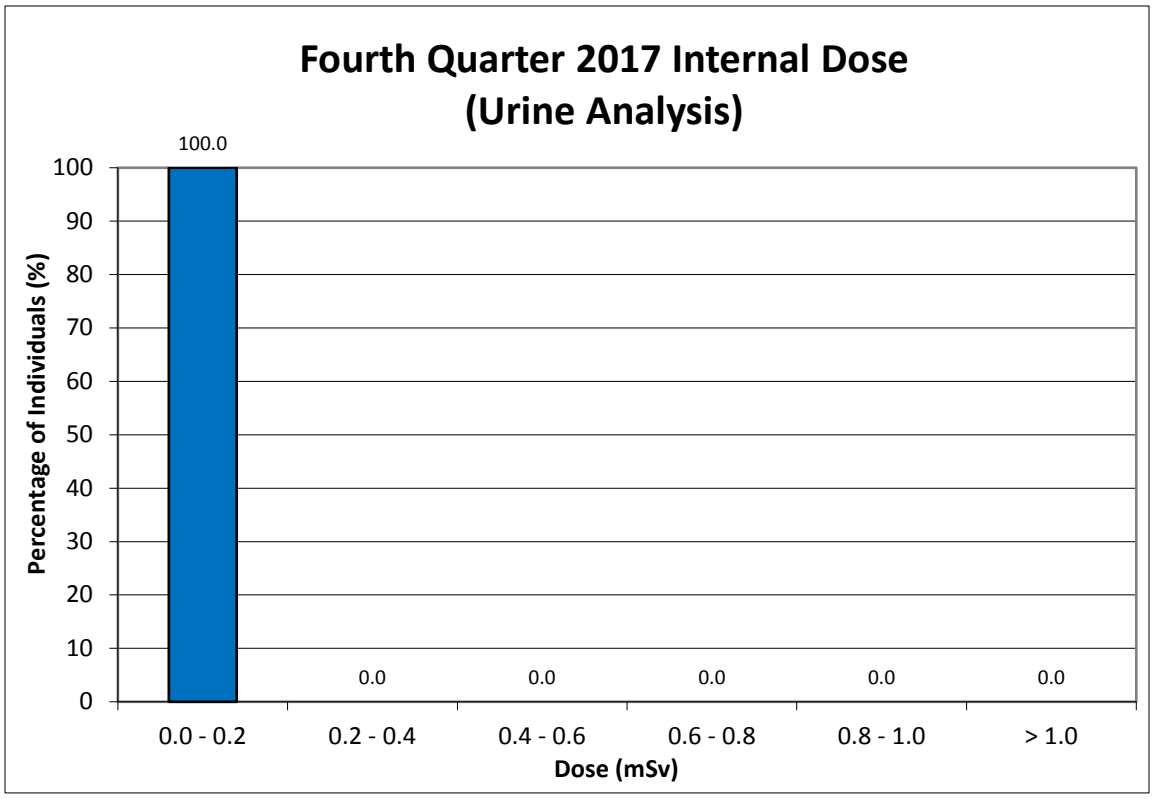
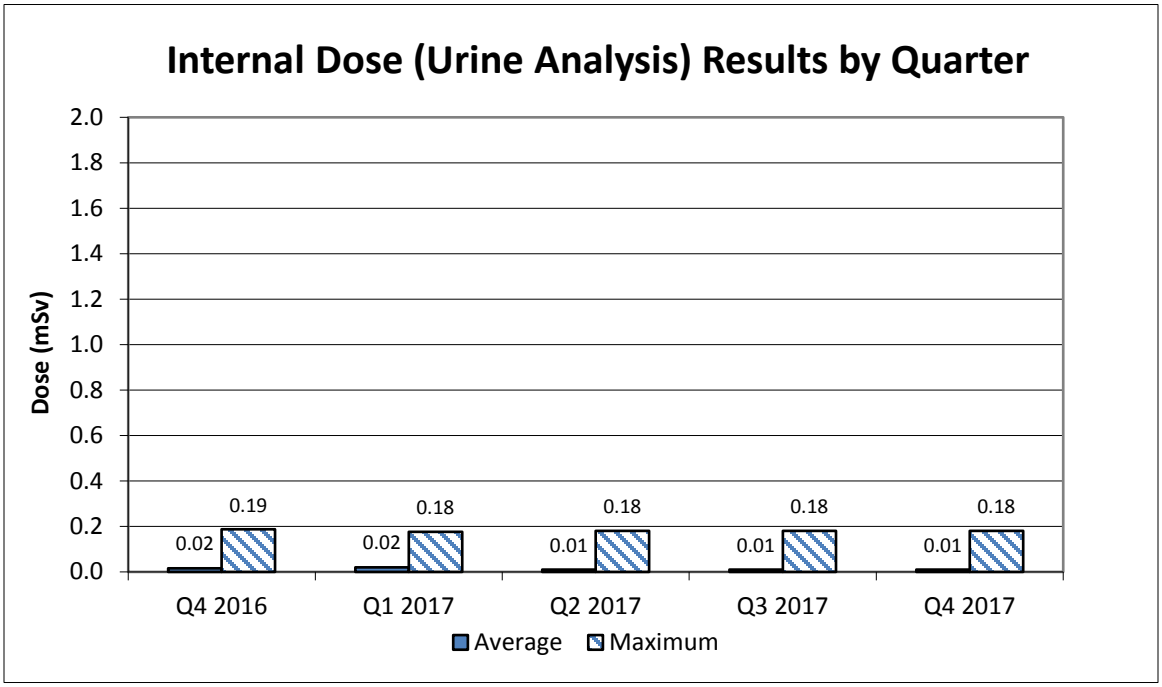


Table 7 and Figure 7 present the internal urine analysis doses for the last five quarters. A total of 476 employees and contractors (NEW) were monitored by the urine analysis program during the fourth quarter. The average and maximum internal urine analysis doses in the quarter were 0.01 mSv and 0.18 mSv, respectively, which were comparable to previous quarters.

Table 7

Internal Dose (Urine) by Quarter				
Quarter	**Number of Individuals**	**Minimum Dose (mSv)**	**Maximum Dose (mSv)**	**Average Dose (mSv)**
Q4 2016	459	0.00	0.19	0.02
Q1 2017	461	0.00	0.18	0.02
Q2 2017	456	0.00	0.18	0.01
Q3 2017	489	0.00	0.18	0.01
Q4 2017	476	0.00	0.18	0.01

Figure 7



Fluoride in Urine

A total of 2,803 urine samples were analyzed for fluoride during the fourth quarter, with summary results provided in Table 8. There were 2 samples above the internal administrative investigation level of 4 mg F/L during the fourth quarter, which were determined to be non-occupational.

Table 8

Fourth Quarter 2017 Fluoride in Urine Analysis Results			
Type of Fluoride Samples	**Number of Samples**	**Minimum Concentration (mg F/L)**	**Maximum Concentration (mg F/L)**
All fluoride samples	2,803	0.1	5.0
Routine post-shift fluoride samples >= 7 mg F/L	0	-	-
Routine pre-shift fluoride samples >= 4 mg F/L	2	-	-
Non-routine fluoride samples	269	0.1	2.9
Samples analyzed for U, insufficient volume (< 30mL) for F analysis	4	-	-

Lung Counting

As part of the licensed internal dosimetry program, Cameco employs the use of a lung counter to monitor and assess internal exposure to uranium of its employees at the PHCF. This equipment is capable of measuring low levels of exposure to the point where an employee's further exposure can be prevented well before it exceeds a regulatory action level or dose limit. The lung counting program runs in parallel with the urinalysis program.

A total of 17 PHCF lung count measurements were completed in the fourth quarter. There were no PHCF investigations triggered by the lung counting program during the quarter and no regulatory action level was exceeded for PHCF lung count measurements.

Contamination Control

The PHCF is divided into three zones for contamination control purposes. Zone 1 areas (clean areas - no radioactive sources other than monitoring equipment) are clearly delineated. Whole body monitors are located at the Zone 1 boundary in the main lobby, men's and women's change rooms and gate 12 vehicle port. In Zone 2 areas and the yard Zone 3 areas (transition areas – may contain limited amounts of uranium compounds), no visible contamination should exist and, when detected, loose contamination is promptly isolated, monitored, cleaned and monitored again to ensure the contamination has been removed. Zone 3 production areas are production areas where uranium compounds are expected. Designated Zone 1 and 2 areas are monitored on a weekly schedule (lunchrooms and change houses) and rotating monthly schedule (offices) as defined in the RPPM so that each office area is monitored at least annually. Additional monitoring is done on an as-needed basis (i.e. during an investigation, when requested or where contamination is suspected).

Table 9

Fourth Quarter 2017 Alpha Contamination Monitoring Results			
Area	**Number of Samples Taken**	**Zone Contamination Criteria (Bq/cm²)**	**Number of Samples Above Criteria**
Zone 1	880	0.4	0
Zone 2	8,817	0.4	22

The contamination in Zone 2 areas was primarily detected in the office areas and lunch rooms of production buildings. Contamination measurements are taken upon request in Zone 3 areas when contamination is suspected and only documented when above the applicable levels.

Vehicle contamination check verification forms are used to record contamination checks on vehicles leaving the site. The tires, seats, floors and pedals are checked for contamination on all vehicles. If contamination above the unrestricted release criteria is detected in these areas, vehicles are directed to the site truck wash booth to be decontaminated prior to leaving the site. In addition, Class 7 transport vehicles are monitored to comply with transport regulations.

In-Plant Air

Routine air sampling is performed by collecting airborne particulate on air sampling filters and quantifying the airborne concentration of uranium.

The site administrative level and derived air concentration (DAC), based on slow moving (low solubility) material, is 100 µg U/m^3 but protective measures, such as investigation and respiratory protection, are normally required as a precaution at lower DAC levels. Continuous air monitoring equipment (iCAMs) in the UF_6 and UO_2 plants are also used to provide early warning and to prompt response to elevated airborne uranium concentrations. Local alarms and direct communication with the control rooms provide early warning to plant personnel.

Elevated airborne uranium concentrations have occurred following process upsets or maintenance activities. The release of uranium as an aerosol during an upset condition prompts additional air sampling and non-routine personnel monitoring such as urine analysis and lung counting where applicable. There were no such incidents during the fourth quarter.

Table 10

Fourth Quarter 2017 In-Plant Air Uranium Concentration by Operations Group				
Operations Group	**Number of Samples Taken**	**Average (µg U/m^3)**	**Maximum (µg U/m^3)**	**Number of Samples Taken Above Administrative Level**
UF_6 Plant	5,052	8	560	72
UO_2 Plant	1,562	2	26	0
Waste Recovery	655	2	14	0
CUP	426	1	8	0

The maximum in-plant air sample of 560 µg U/m^3 was recorded on October 19, 2017 as a result of an upset condition. This area was posted as a respirator area.

The average in-plant air concentrations were in line with the previous quarters in which the production plants were operational.

Gamma Surveys

Plant gamma surveys using hand-held meters are conducted on a routine basis throughout the site. The frequency of the readings and the number of readings taken in each area varies based on the area and the historical results from that area.

2.3.2 Conventional Health and Safety

This safety and control area covers the implementation of a program to manage non-radiological workplace safety hazards and to protect personnel and equipment.

The health and safety management program fosters and promotes a strong sustainable safety culture. Cameco has five key principles in the area of safety that form the framework for how safety is managed. These are:

- safety is our first priority;
- we are all accountable for safety;
- safety is part of everything that we do;
- safety leadership is critical to Cameco Corporation; and,
- we are a learning organization.

The health and safety of workers at the PHCF is assured through site-specific safety and health management programs. These programs set out the requirements for management of health and safety aspects of the operation consistent with Cameco's corporate safety, health, environment and quality (SHEQ) policy, which is modeled on the OHSAS 18001 standard. Key components of the program include:

- compliance with all safety and health-related legal and regulatory requirements;
- the setting of site safety and health objectives;
- the implementation of corporate safety standards;
- the development and maintenance of a formal hazard recognition, risk assessment and change control processes; and,
- the documentation of health and safety significant incidents from the start through to the verification of completion of corrective actions via the CIRS database.

Several Occupational Health and Safety initiatives progressed in the fourth quarter including the following:

- Continue support of the subcommittee process by:
  - Continuing to meet with sub-committees to review their target status;
- The steering committee continued to work on the execution of the 2017 targets for all sub-committees and themselves. Updates are listed below:
  - To improve safety engagement and eliminate hazards/injuries for the site the committee has developed an initiative that has been formalized and involves all employees in safety initiatives. The first day for this site wide initiative took place on December 13, 2017;
  - In order to make significant improvements towards hand, eye and ergonomic injuries the ergonomic sub-committee will have 10 assessments completed before

the end of the year (11 have been completed), the PPE sub-committee will implement three new gloves by the end of the year (two new gloves have already been implemented), promote hand safety by conducting five PPE assessments by year end (four have been completed), and promote eye safety and any improvements by the end of the year (several sample safety glasses have been reviewed, a new pair of safety glasses has been approved for use and the committee set up eye glass fitting sessions with our vendor who comes on site to fit prescription safety glasses in order to promote eye safety);

- To increase site resources for carrying out the completion of hazard identification, risk assessment and control (HIRAC) analyses, the HIRAC sub-committee provided an instructional video before the end of the third quarter (the committee prepared awareness training slides by the end of the fourth quarter), as well as conducting two HIRACs with the confined space sub-committee;
- To increase efficiencies on following up on injuries and HIRAC assessments, the CSSC developed job-aids;
- The CSSC developed their three year plan, safety targets for 2018 have been proposed and the reorganization along with short term targets has been completed for all subcommittees;
- In order to increase safe accessibility to permanent fall prevention tie off points and hoisting and rigging points to improve compliance with the regulations, the sub-committees have developed long term plans for both permanent fall prevention tie off points and hoisting and rigging points; and,
- To support ALARA by decreasing the number of worker uranium uptakes, the industrial hygiene sub-committee will continue to trial full-face respirators in the UF_6 plant, and the radiation sub-committee completed a HIRAC on jobs including scaffolding erection and dismantling;

- 120 Safety Wins have been completed as of the fourth quarter;
  - Work continues on the implementation of the corporate industrial hygiene standard and electrical safety standard has been fully implemented;
- Total Recordable Injury Rate (TRIR) is 1.67 for 2017;
  - 2017 has been the second safest year in the past 5 years, as well as we have seen the lowest number of first aids for 2017 then we have had in the last 5 years. This shows a great focus towards safety and improvements as there has also been an increase focus on reporting.

Table 11

2017 Safety Statistics					
Quarter / Parameter	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**	**YTD**
First Aid Injuries	20	14	14	12	60
Medical Diagnostic Procedures	0	1	0	0	1
Medical Treatment Injuries	2	1	1	0	4
Lost Time Injuries	0	1	0	0	1
Lost Time Injury Frequency	0.00	1.09	0.00	0.00	0.28
Lost Time Injury Severity	0.00	0.00	6.88	0.00	1.67

2.3.3 Environmental Protection

This safety and control area covers the programs that monitor and control all releases of nuclear and hazardous substances into the environment, as well as their effects on the environment, as the result of licensed activities.

There are federal, provincial and municipal regulatory authorities that have legislative jurisdiction over environmental protection at the facility. PHCF's Environmental Monitoring Plan (EMP) is comprised of monitoring the following components:

- water and air emissions;
- gamma levels;
- soil and vegetation; and
- groundwater.

The key characteristics of the operation and activities that can have a significant environmental impact are monitored and measured and are described in the EMP and associated procedures. These documents identify all of the emissions to the air, water and land, the programs that are in place to monitor them, what is measured, the legal requirements and the reporting requirements.

Audits and inspections were performed in accordance with the Management Systems Program Manual.

Though the environmental program has been demonstrated to be effective, the PHCF has also implemented changes during the quarter as part of its continual improvement program, including:

Program Update:

- The PHCF has completed a review of CSA standards N288.4 Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills and N288.5 Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills and submitted revised environmental program documents to CNSC staff in the fourth quarter to come into full compliance with the CSA standards.

Procedural Update:

- There were no significant procedural updates completed in the fourth quarter.

Cameco has established action levels, which have been accepted by the CNSC, for key environmental parameters. These action levels serve as an early warning of a condition that warrants further investigation. An exceedance of an action level does not pose a risk

to people or the environment. A result above an action level is investigated and remedial actions taken, if necessary.

Public Dose

The Operating Release Level (ORL) is based on the releases of uranium and external gamma radiation to the environment that ensures the dose to the public from the PHCF is below 0.3 mSv/year with the air and water components each being less than 0.05 mSv/year and gamma component being less than 0.3 mSv/year to ensure the dose to the public remains well below the annual regulatory dose limit for a member of the public of 1.0 mSv.

An ORL equation has been developed to account for all public dose exposure pathways – gamma, air and water. In accordance with the requirements of the CNSC, the ORL for the PHCF was updated in 2016 and subsequently accepted by the CNSC. The 2016 report resulted in changes to dose calculations related to releases to water and the fenceline gamma locations used for reporting the dose to the public. These changes included calculating dose to the public from facility discharges to the sanitary sewer, as well as including a fenceline monitoring location closer to the operating facility than previously used in the dose to the public calculations and calculating two doses to a member of the public, one for a resident near Site 1 and the other for a resident near Site 2. Changes to the ORL are incorporated into PHCF reporting effective the first quarter of 2017 and represent a more conservative estimate of dose to the public that can be used throughout the Vision in Motion project.

ORL equations for Site 1 and Site 2 have been derived and are expressed in the form shown below.

$$\text{Public Dose} = \text{Dose}_{\text{Air}} + \text{Dose}_{\text{Water}} + \text{Dose}_{\text{Gamma}} < 0.3 \text{ mSv/y}$$

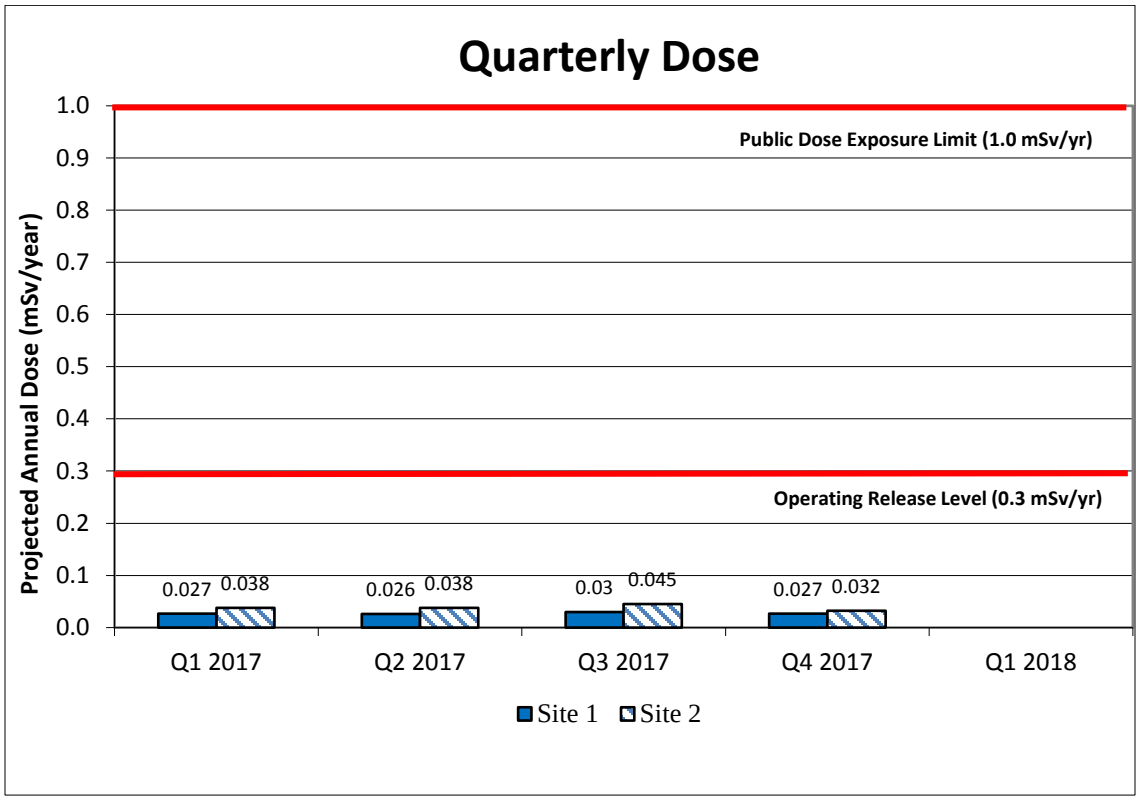
The monthly dose from Site 1 and Site 2 are based on monitoring results for each dose component as shown in Table 12. This table illustrates the individual contributions from air, water and gamma as well as the total public dose from each site.

Table 12

Quarterly Dose (mSv/quarter)					
ORL Component	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**	**YTD 2017**
Air	<0.001	0.002	<0.001	0.001	<0.001
Water	<0.001	<0.001	<0.001	<0.001	0.001
Gamma – Site 1	0.027	0.026	0.030	0.026	0.109
Gamma – Site 2	0.037	0.038	0.045	0.032	0.152
Quarterly Dose – Site 1	0.027	0.026	0.030	0.027	0.110
Quarterly Dose – Site 2	0.038	0.038	0.045	0.032	0.153

The results beginning in 2017 cannot be compared to previous years due to significant changes in the ORL as accepted by CNSC. The perceived increase in dose to the public compared to previous years is a function of including fenceline gamma monitoring at the facility fenceline (Station 2 adjacent to the warehouse vs Station 14 at the Centre Pier as per previous ORL) in the calculations – and not a realized increase in emissions/dose from the facility. The current dose calculation is more conservative than was previously used.

Figure 8



Gamma Monitoring

In order to ensure that doses to local residents/critical receptors are ALARA and do not exceed the annual public dose limit of 1 mSv as defined in the Radiation Protection Regulations, environmental OSL dosimeters are strategically placed (at chest height) around the exterior perimeter of the licensed facility. The OSL dosimeters are deployed on a monthly basis. Gamma dose is measured in mSv which is converted into a dose rate in µSv/h. Eighteen locations at Site 1 (including main site and Centre Pier) and six locations at Site 2 have been selected around the fenced perimeter to cover all potential receptors in the public.

As per the 2016 ORL, dose to the public is calculated for both sites 1 and 2 using specific gamma fenceline monitoring locations. The results at stations 2 and 13 are used for Site 1 public dose calculations and the results at stations 2 and 21 are used for Site 2 public dose calculations. The results at these locations for this quarter are summarized and compared with regulatory action levels in Table 13.

No monthly gamma radiation action levels were exceeded during the fourth quarter at any fenceline monitoring locations.

Table 13

Fourth Quarter 2017 Public Dose Gamma Monitoring Results					
Station Number	**October**	**November**	**December**	**Action Level (µSv/h)**	**Licence Limit (µSv/h)**
2	0.15	0.17	0.19	0.400	0.570
13	0.03	0.02	0.01	0.100	0.400
21	0.05	0.04	0.01	0.250	0.260

Air Emissions

A stack monitoring program is used to determine the airborne uranium emission rates on a daily basis from the main stacks of the UF_6 and UO_2 plants.

Source emission action levels and maximum limits are indicated in the appropriate tables and figures throughout this report.

The quarterly average and maximum stack emissions from the UF_6 plant main stack and the UO_2 plant main stack are presented in Table 14 and Figures 9 through to Figure 12.

No licensed action levels were exceeded for uranium emissions from the UF_6 plant main stack in the quarter. Results for the quarter were comparable to previous quarters.

No licensed action levels were exceeded for uranium emissions from the UO_2 plant main stack in the quarter. Results for the quarter were comparable to previous quarters.

Fluoride emissions from the UF_6 main stack are sampled and analyzed on a continuous basis using an on-line analyzer and the data is collected on the plant computer system.

No licensed action levels were exceeded for fluoride emissions from the UF_6 plant main stack in the quarter. The UF_6 main stack average and maximum fluoride emission rates were comparable to previous quarters.

The UO_2 main stack is also continuously sampled for ammonia. No licensed action levels were exceeded for ammonia emissions from the UO_2 plant main stack in the quarter. The UO_2 main stack average ammonia emission rate is comparable to previous quarters.

The depleted circuit was non-operational in the fourth quarter 2017.

All other stacks are sampled on an occasional or as requested basis.

Table 14

Daily Main Stack Emissions by Quarter									
Plant	**Parameter**	**Licence Limit**	**Action Level**	**Value**	**Q4 2016**	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**
UF_6	Uranium g U/h	280	40	Avg	1.0	1.5	1.4	< 0.1	1.7
				Max	6.0	4.3	5.3	0.7	15.3
	Hydrogen Fluoride g HF/h	650	230	Avg	5	19	29	7	28
				Max	37	168	89	23	209
UO_2	Uranium g U/h	240	7	Avg	1.0	0.6	0.4	0.3	0.5
				Max	5.2	2.7	0.9	0.8	1.1
	Ammonia kg NH_3/h	58	13	Avg	1.5	1.3	1.6	1.2	1.4
				Max	3.4	4.0	3.7	3.7	2.8

Figure 9

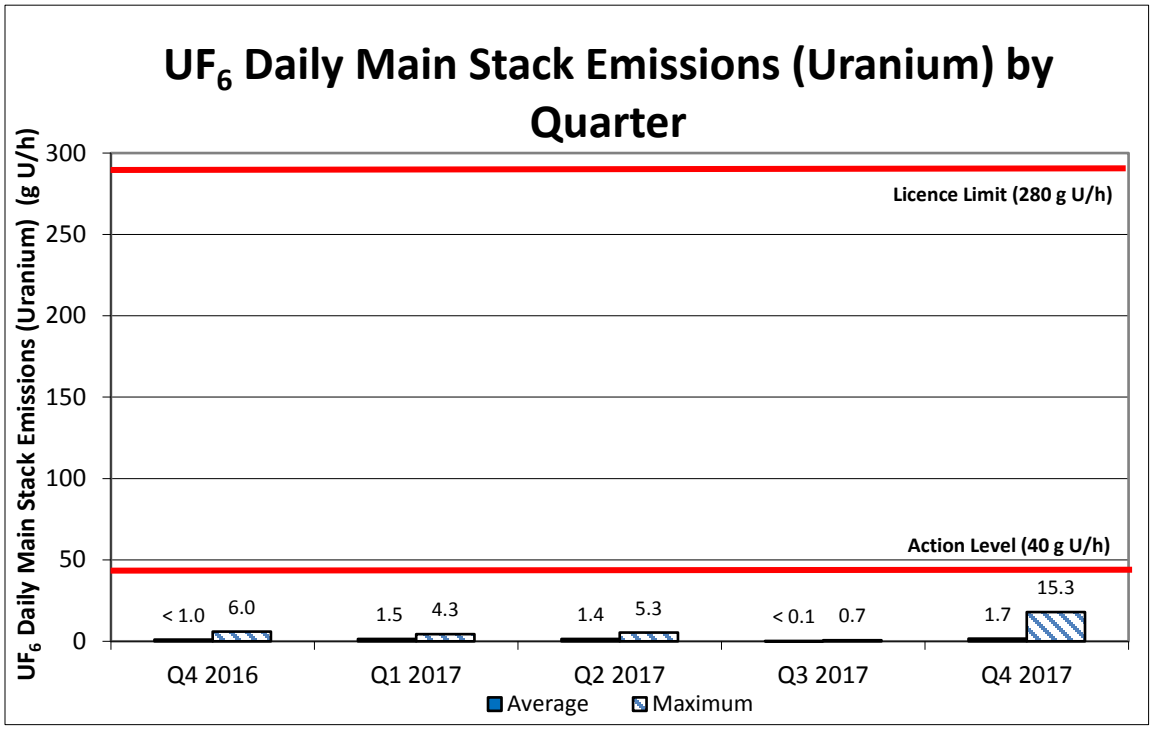


Figure 10

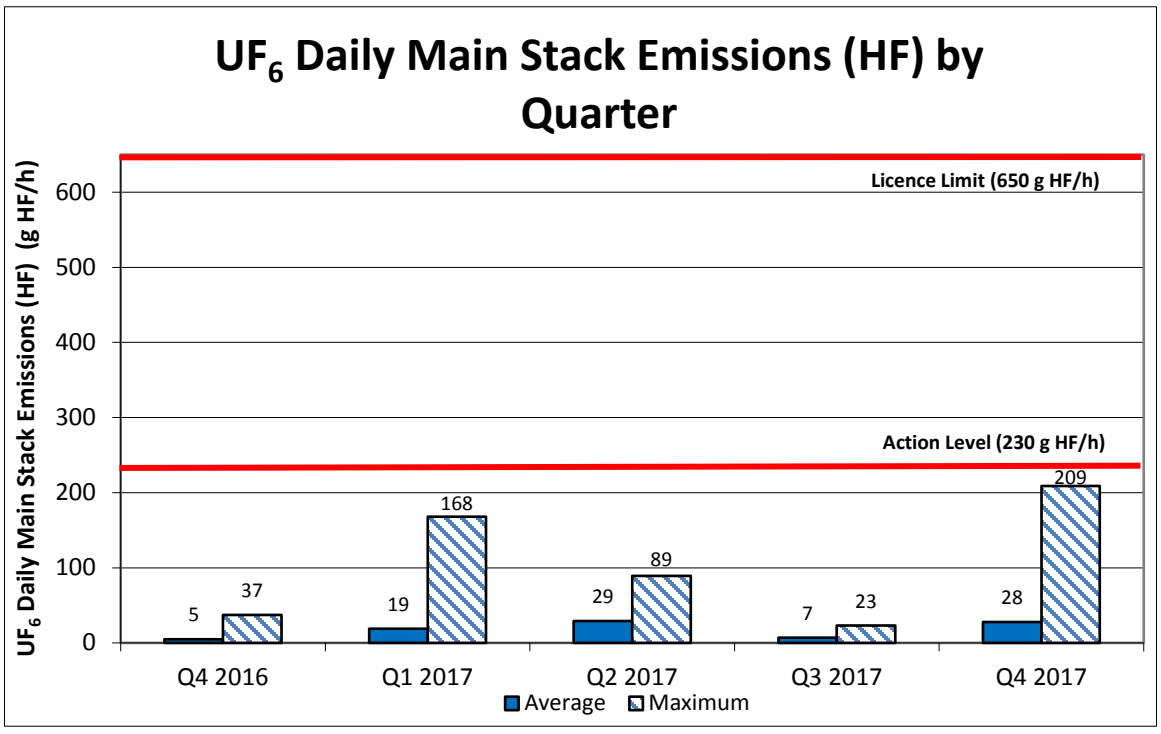


Figure 11

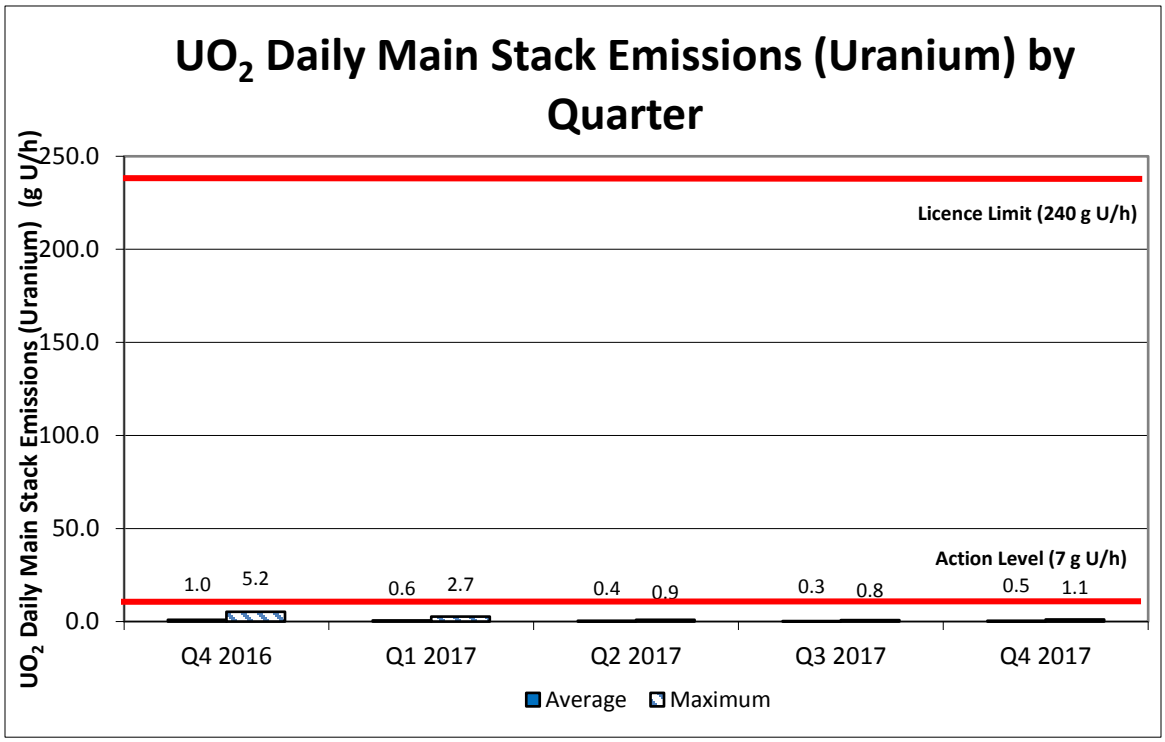
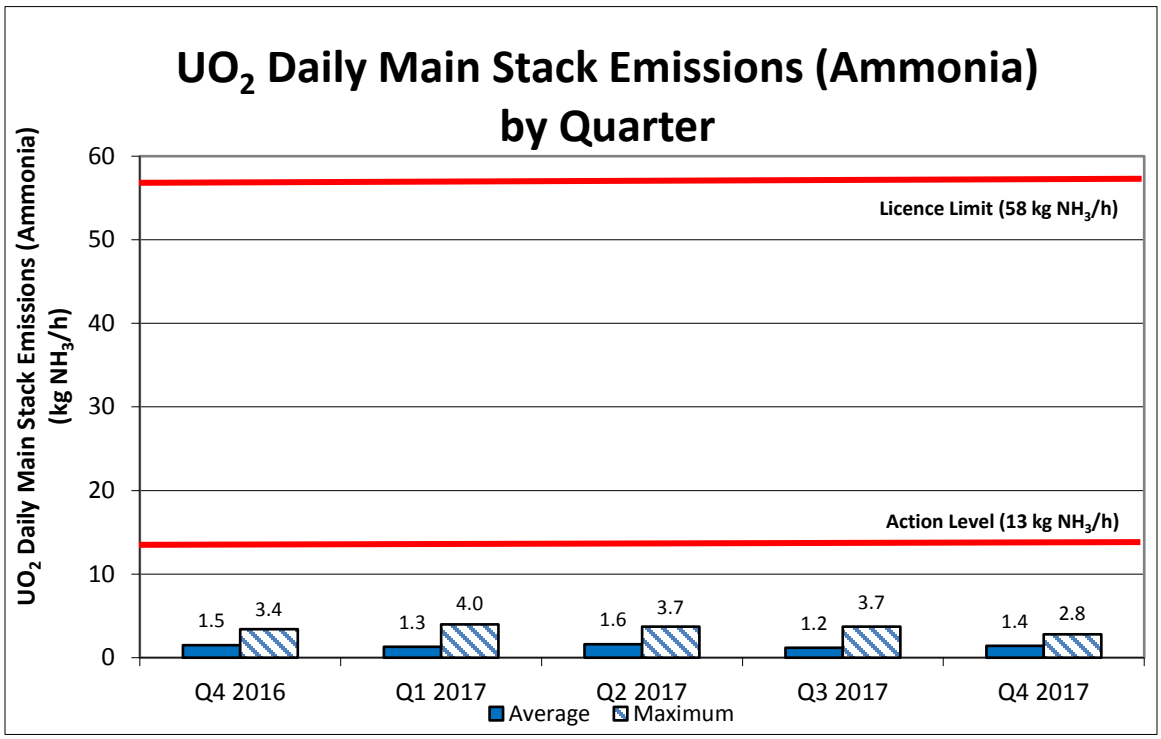


Figure 12



Liquid Discharges

This section summarizes the PHCF liquid discharges and associated monitoring programs.

There are currently three types of liquid point source discharges from the PHCF operations that are routinely monitored: cooling water returns; the combined sanitary sewage discharge; and the combined cooling water intake filter backwash (FBW) stream. Facility storm water discharge data is not summarized herein.

The FBW stream consists of water used to back flush the travelling screens and downstream equipment associated with the facility cooling water intake mechanical pre-treatment operations.

Most of the PHCF cooling water requirements are met by the facility cooling water intake, located at the entrance to the Port Hope harbour, and the remaining cooling water requirements are met by municipal potable water. A once-through non-contact cooling water system is used.

The PHCF cooling water works operations are regulated by the Ontario MOECC under a Permit to Take Water (PTTW), an Environmental Compliance Approval (ECA) and Ontario Regulation 560/94. ECA 4998-9CKL7F requires specific sampling of the cooling water works discharge points UO_2N and UO_2S, among other items. Moreover, the ECA stipulates added monitoring requirements beyond baseline Municipal/Industrial Strategy for Abatement (MISA) cooling water sampling and flow monitoring requirements in some cases.

Cooling water discharge quality data is summarized in Table 15 and Table 16. The UF_6 Plant/Building 2 (UO_2N) and UO_2 Plant (UO_2S) cooling water returns have displayed reasonably consistent uranium, nitrate and pH results over the previous five quarters. Exceptions to note include the fourth quarter ammonia mean and maximum cooling water return results. Production plant cooling water return quality is influenced by cooling water supply quality and seasonal fluctuations thereto. To that end, the noted fourth quarter cooling water return ammonia results were directly influenced by cooling water supply quality.

Flow data is summarized and discussed in the Annual Compliance Monitoring and Operational Performance Report.

An overview of ECA monitoring results with comparison to effluent objectives and limits, among other items, is compiled in a separate annual performance report to fulfill additional ECA reporting requirements. Annual performance reports are submitted to the MOECC within 90 days of the end of each calendar year.

The municipal sewage treatment plant processes the sanitary sewer discharges from the PHCF. The principal sources contributing to the combined PHCF sanitary sewer discharge are standard domestic stream contributions from throughout the facility, liquid discharges from the Powerhouse (such as boiler blowdown) and contributions from showering facilities. All sanitary sewer sources merge into a common sanitary sewer line within the PHCF prior to discharging to the municipal sanitary sewer system. It should be noted that a portion of the sanitary sewer discharge from PHCF originates upstream of the facility, primarily from the municipal water treatment facility.

The combined PHCF sanitary sewer discharge is sampled on a daily basis for uranium and pH. Table 17 summarizes and Figure 13 illustrates summary uranium concentrations and pH values observed during the fourth quarter.

In 2016 and early 2017, as part of the relicensing process, a daily sanitary sewer discharge action level of 100 µg/L and a monthly mean release limit of 275 µg/L were developed and accepted. On October 9, 2017, the sanitary sewer discharge action level was exceeded and attributed to groundwater infiltration associated with a significant precipitation event (50+ mm). An exceedance of an action level does not pose a risk to people or the environment.

Table 15

UO_2N Water Quality Data by Quarter							
Parameter	**Units of Measure**	**Value**	**Q4 2016**	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**
Uranium	µg U/L	Average	2.3	3.8	3.2	3.1	2.9
		Maximum	4.0	6.0	8.6	7.4	4.8
Fluoride	mg F/L	Average	0.16	0.17	0.21	0.18	0.21
		Maximum	0.20	0.21	0.33	0.22	0.31
Ammonia & Ammonium	mg N/L	Average	0.15	0.15	0.075	0.094	0.25
		Maximum	0.42	0.27	0.13	0.30	0.44
Nitrate	mg N/L	Average	0.82	1.4	0.93	0.66	0.98
		Maximum	1.2	2.2	1.6	1.0	1.3
pH	-	Minimum	7.60	7.46	7.59	7.48	7.31
		Maximum	8.24	8.30	8.39	8.43	8.20

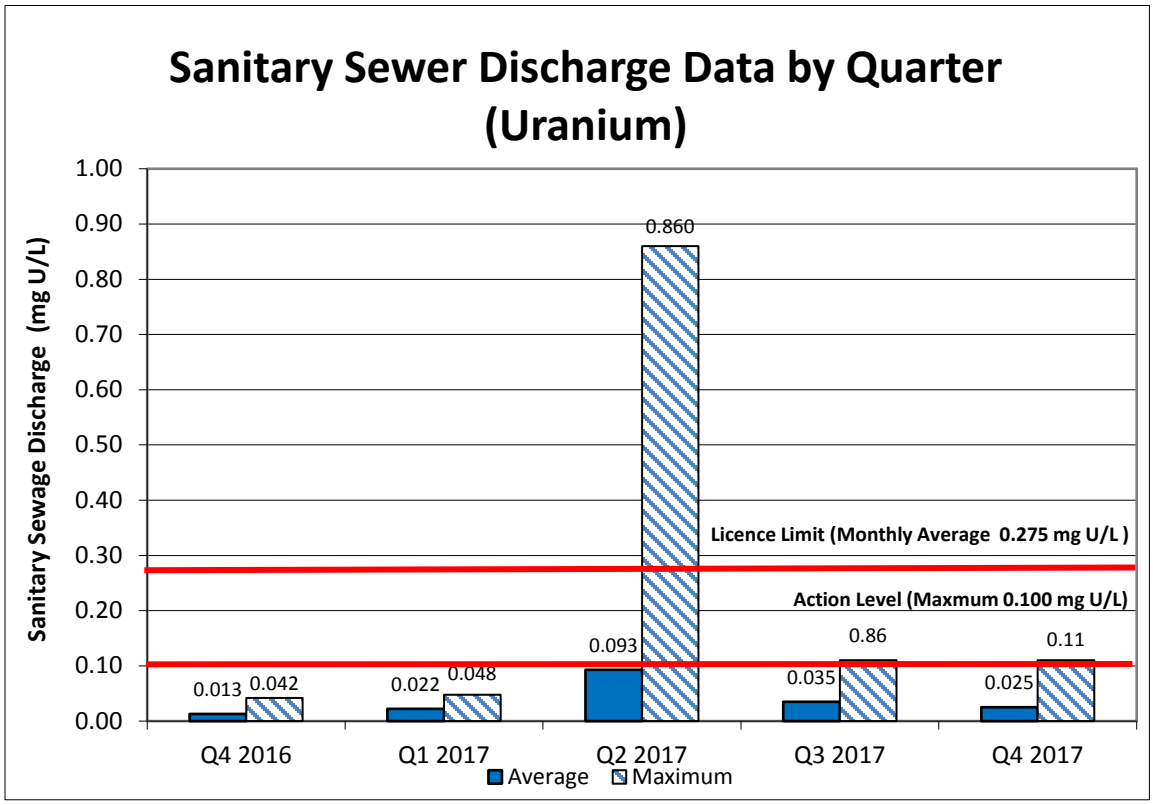
Table 16

UO_2S Water Quality Data by Quarter							
Parameter	**Units of Measure**	**Value**	**Q4 2016**	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**
Uranium	µg U/L	Average	2.3	3.9	3.3	3.1	3.0
		Maximum	5.3	5.5	8.5	7.4	6.0
Ammonia & Ammonium	mg N/L	Average	0.11	0.14	0.082	0.12	0.23
		Maximum	0.20	0.24	0.12	0.36	0.42
Nitrate	mg N/L	Average	0.84	1.5	0.98	0.67	1.0
		Maximum	1.3	2.2	1.6	1.1	1.3
pH	-	Minimum	7.65	7.46	7.63	7.53	7.37
		Maximum	8.29	8.36	8.43	8.47	8.20

Table 17

Sanitary Sewer Discharge Data by Quarter							
Parameter	**Units of Measure**	**Value**	**Q4 2016**	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**
Uranium	mg U/L	Average	0.013	0.022	0.093	0.035	0.026
		Maximum	0.042	0.048	0.86	0.11	0.11
pH	-	Minimum	7.22	7.03	7.23	7.17	6.84
		Maximum	8.48	8.49	8.92	8.33	7.92

Figure 13



Ambient Air Monitoring

In support of the source sampling program, an ambient air program has been established to measure air quality near the PHCF. Samples from the site and the community are collected and analyzed for a variety of parameters. The facility's fluoride and uranium emissions have the greatest potential environmental impact and therefore, are the major focus of the ambient air monitoring program.

Cameco monitors ambient uranium concentrations in the field using dustfall jars, high volume air samplers (hi-vols) and soil samples. The results from dustfall jars and hi-vol programs are provided below. Soil sampling is currently conducted on an annual basis and the results are discussed in the Annual Compliance Monitoring and Operational Performance Report.

Dustfall monitoring is a measurement of deposition rate and is obtained by collecting particulate matter in a container, termed a dustfall jar. The particulate matter is collected over a one-month period, and analyzed to determine the uranium deposition rate. There is no regulated standard for uranium content in dustfall. Cameco has established an internal administrative screening level of 10 mg U/m^2/30 days that would be indicative of abnormal conditions.

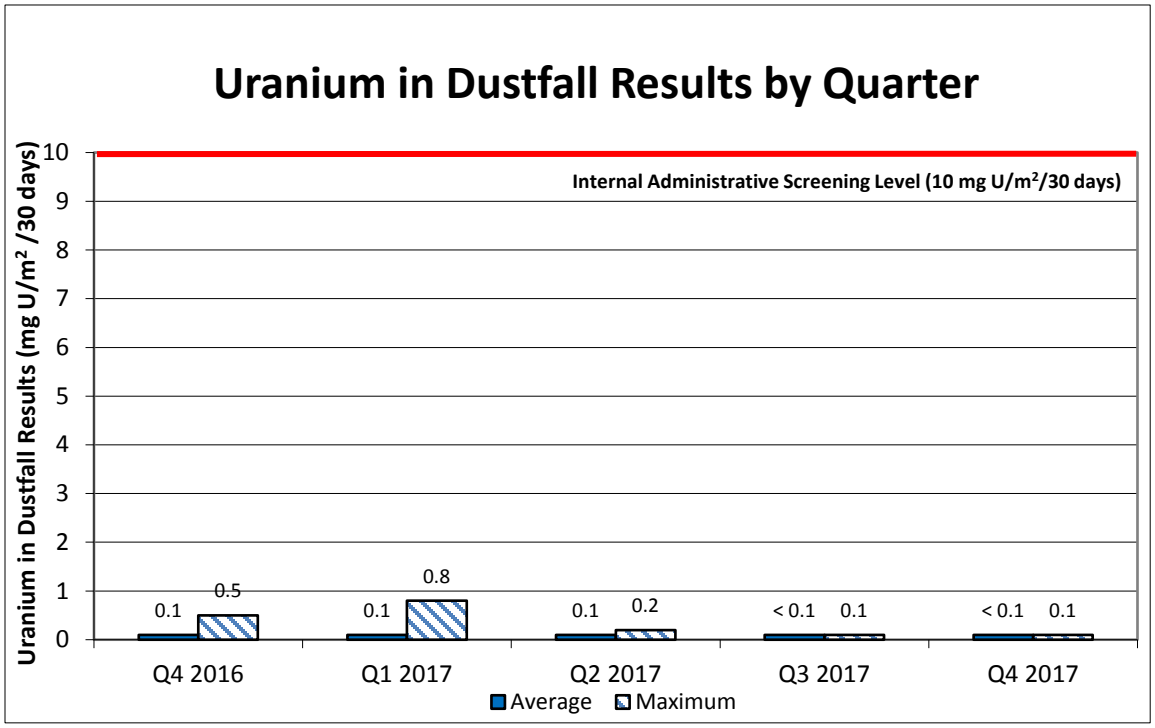
No uranium dustfall results exceeded the internal administrative screening level in the fourth quarter. The average uranium in dustfall results in the fourth quarter of 2017 were consistent with the uranium in dustfall averages during the previous four quarters.

Table 18 and Figure 14 show the quarterly all-station average and maximum uranium dustfall results from the fourth quarter of 2016 through to the fourth quarter of 2017.

Table 18

Uranium in Dustfall Results by Quarter (mg U/m^2/30 days)					
Value	**Q4 2016**	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**
Average	0.1	0.1	0.1	< 0.1	< 0.1
Maximum	0.5	0.8	0.2	0.1	0.1
Internal Administrative Screening Level = 10 mg U/m^2/30 days					

Figure 14



The hi-vol air-sampling program monitors the concentration of uranium suspended in the air near the facility. There are four monitoring stations located at Marsh Street at the fence line just south of the UF_6 plant, east of the Port Hope Waterworks, Hayward Street and Shuter Street.

Approximately 40 cubic feet per minute of air is passed through the hi-vol sampler and collected on a filter in a 24 hour period.

There is no regulated standard for uranium content in hi-vol monitoring. Cameco has established internal administrative screening levels of 1 µg U/m^3 (24 hours) or 0.1 µg U/m^3 single station monthly geometric mean that would be indicative of abnormal conditions.

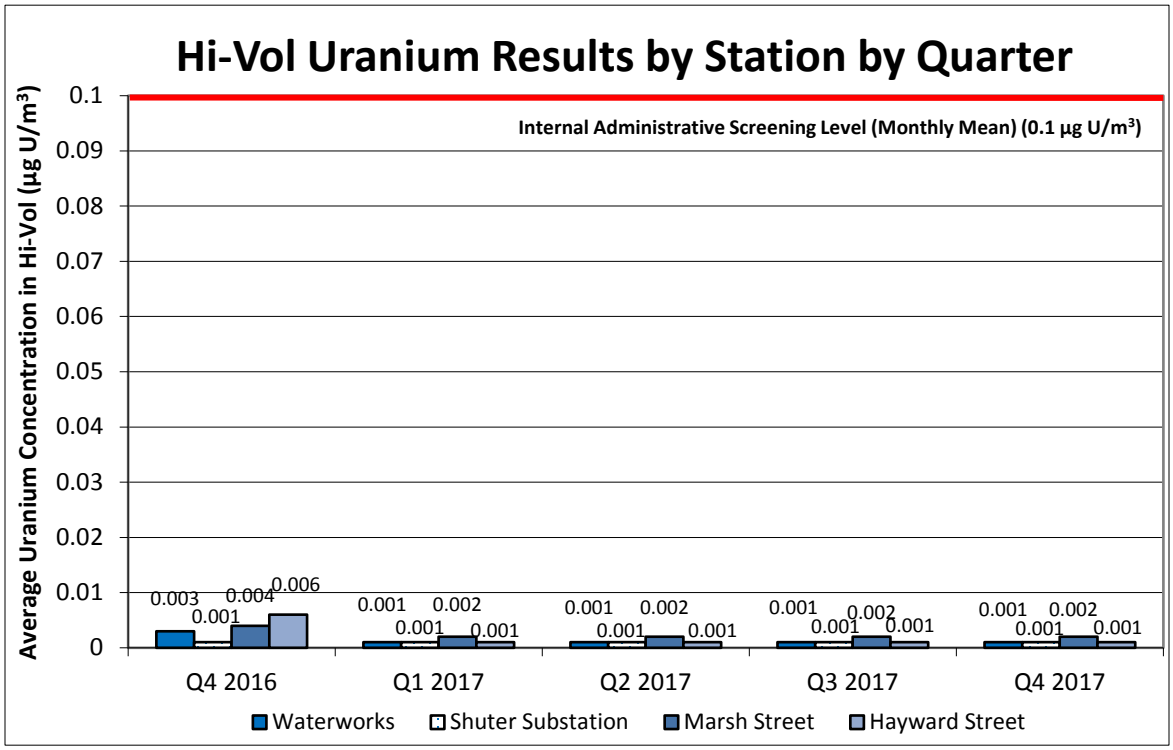
Table 19 summarizes the average and maximum uranium hi-vol results from the fourth quarter of 2016 through to the fourth quarter of 2017.

Figure 15 show the average uranium hi-vol results from the fourth quarter of 2016 through to the fourth quarter of 2017. Average and maximum results for the quarter are comparable to levels observed in the previous four quarters.

Table 19

Uranium-in-Air Concentration at Hi-Vol Stations by Quarter (µg U/m^3)					
Quarter	**Result**	**Waterworks**	**Shuter Substation**	**Marsh Street**	**Hayward Street**
Q4 2016	Average	0.003	0.001	0.004	0.006
	Maximum	0.054	0.005	0.076	0.121
Q1 2017	Average	0.001	0.001	0.002	0.001
	Maximum	0.010	0.004	0.008	0.006
Q2 2017	Average	0.001	0.001	0.002	0.001
	Maximum	0.005	0.004	0.009	0.005
Q3 2017	Average	0.001	0.001	0.002	0.001
	Maximum	0.015	0.004	0.008	0.007
Q4 2017	Average	0.001	0.001	0.002	0.001
	Maximum	0.005	0.007	0.008	0.005
Internal Administrative Screening Level = 1 µg U/m^3 (24 hours) or 0.1 µg U/m^3 single station monthly geometric mean					

Figure 15



The concentration of fluoride in the ambient environment is monitored in the field using dustfall, lime candle and vegetation sampling. The results from the dustfall and lime candle programs are provided below. The results for the vegetation sampling program are provided in the Annual Compliance Monitoring and Operational Performance Report.

In addition to the uranium analysis discussed above, the fluoride content of the collected dust provides information on the amount of fluoride in air near the facility. There is no regulated standard for fluoride content in dustfall. However, Cameco has established an internal administrative screening level of 20 mg F/m^2/30 days that would be indicative of abnormal conditions.

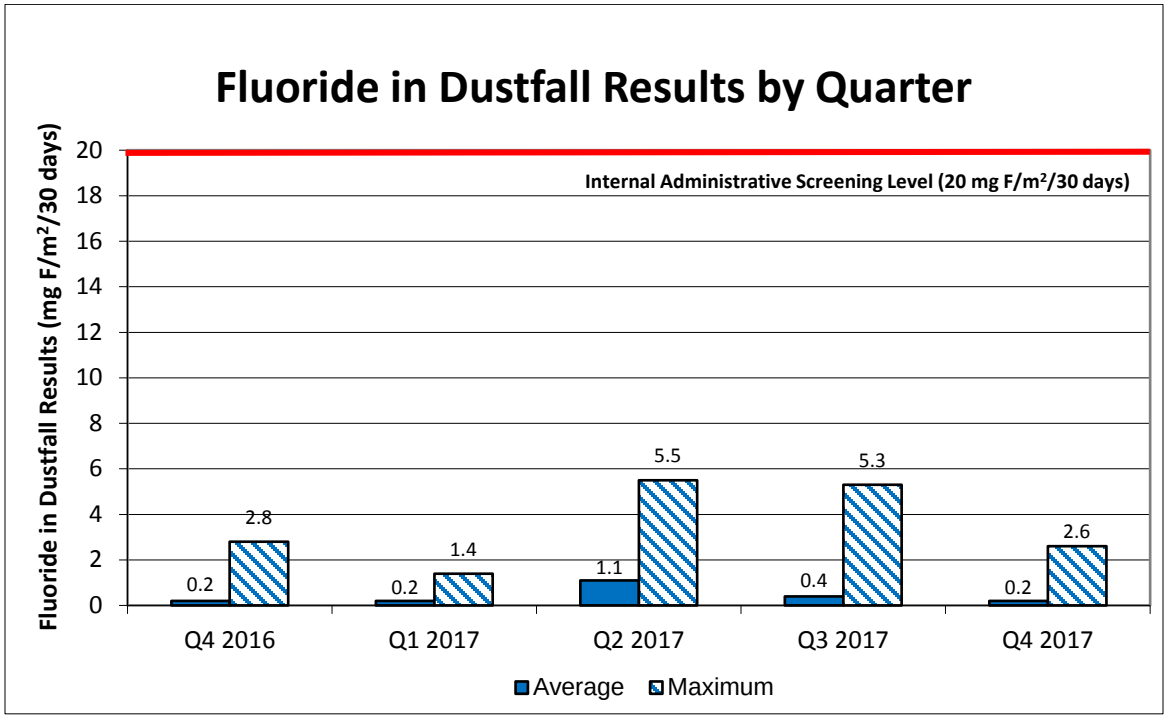
The average fluoride in dustfall results in the fourth quarter of 2017 is consistent with the fluoride in dustfall results observed in the previous four quarters.

Table 20 and Figure 16 show the quarterly all-station average and maximum fluoride dustfall results from the fourth quarter of 2016 through to the fourth quarter of 2017.

Table 20

Fluoride in Dustfall Results by Quarter (mg F/m^2/30 days)					
Value	**Q4 2016**	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**
Average	0.2	0.2	1.1	0.4	0.2
Maximum	2.8	1.4	5.5	5.3	2.6
Internal Administrative Screening Level = 20 mg F/m^2/30 days					

Figure 16



Fluorination rate is an indirect measurement of the gaseous fluoride concentration in the ambient air. An established method for measuring the fluoride concentration in ambient air is to expose lime coated filter papers, commonly called lime candles, for a fixed period of time. The fluoride reacts with the lime and the analysis of the lime candles provides a time-averaged fluoride concentration. Lime candles consist of a 10 cm x 10 cm filter paper that is soaked with a saturated calcium oxide (CaO) solution housed in a louvered shelter sampling station with a hinged top.

The lime candles are prepared, deployed and collected on a specified frequency and are submitted to the analytical group for fluoride analysis. The period of time is normally 30 days; however, weekly periods are also used. These shorter-term results are used to assess impact in a timelier manner. Monthly and weekly lime candles are operated

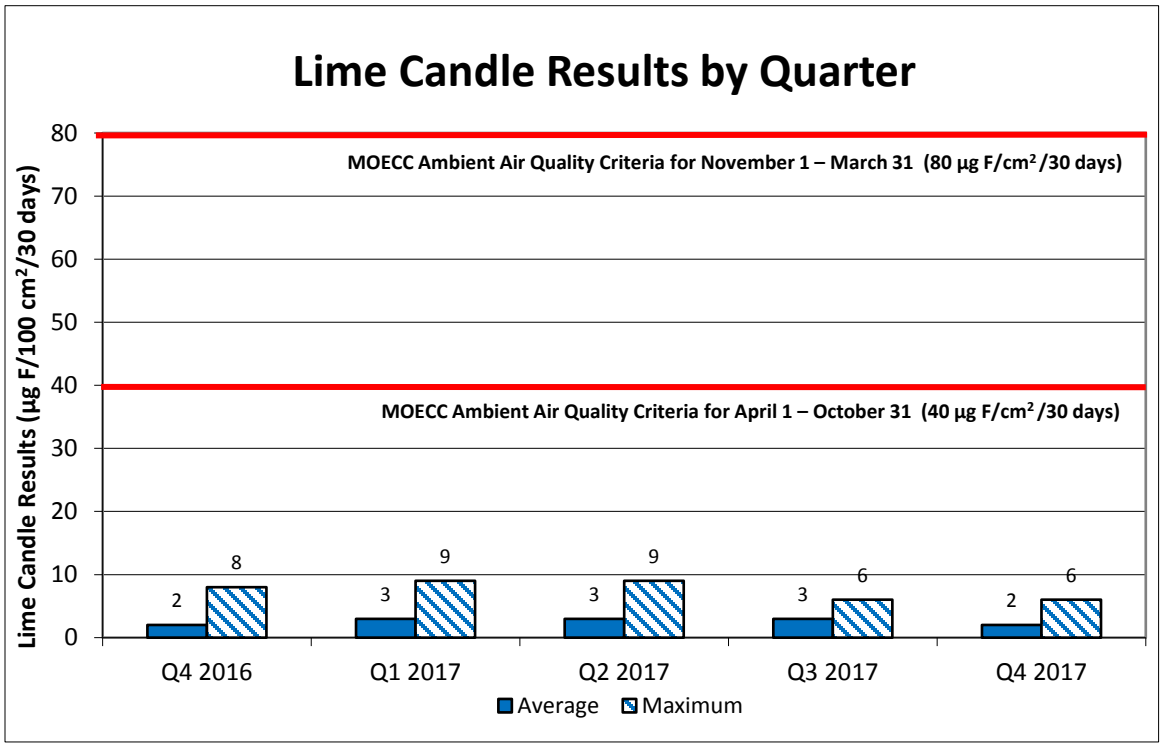
throughout the year. The MOECC Ambient Air Quality Criteria (AAQC) for fluoridation are 40 µg F/100 cm^2/30 days for April 1 to October 31 and 80 µg F/100 cm^2/30 days for November 1 to March 31. These criteria are based on the protection of foraging animals.

Table 21 and Figure 17 show the average and maximum lime candle results from the fourth quarter of 2016 through to the fourth quarter of 2017. Average results are comparable to levels observed in the previous four quarters.

Table 21

Monthly Lime Candle Results by Quarter (µg F/100 cm^2/30 days)					
Value	**Q4 2016**	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**
Average	2	3	3	3	2
Maximum	8	9	9	6	6

Figure 17



Terrestrial Monitoring

The terrestrial monitoring program, including soil and vegetation sampling, is performed at frequencies specified in the individual procedures. The data collected is useful for evaluating the potential effects of the facility operations on the surrounding environment

and may be used to supplement results from the air emission monitoring program. Results from the terrestrial monitoring program are summarized and discussed in the Annual Compliance Monitoring and Operational Performance Report.

Ambient Water Quality Monitoring

The ambient water quality monitoring program is established to monitor and assess potential impacts of PHCF operations on the local watercourse.

Liquid discharges to the Port Hope harbour are from the three source discharge types outlined previously, storm water discharges and groundwater flow through the site.

The surface water monitoring program consists of sampling 13 monitoring locations on a quarterly basis. At each location, samples are obtained just below the water surface and just above the harbour sediment layer. The fourth quarter 2017 surface water sampling took place on October 10, 2017. Sampling locations in the vicinity of the west turning basin harbour wall have been adjusted in response to the installation of a silt curtain by the Municipality of Port Hope.

The PHCF long-term groundwater monitoring program includes groundwater level monitoring and groundwater sampling. Groundwater level monitoring of select wells is completed on a quarterly or annual basis.

Groundwater is sampled under three separate schedules: monthly sampling of the operating pumping wells; quarterly sampling of overburden monitoring wells covering five key areas of the site; and annual sampling of bedrock monitoring wells. The five keys areas of the site include: the refinery wells; the east plume associated with the UF_6 plant; the south plume associated with the UF_6 plant; the former UF_6 plant area; and the UO_2 plant area.

Twelve pumping wells were in operation during the fourth quarter. Pumping well TW7 to the south of the UF_6 plant is no longer operated under baseline conditions. Additional groundwater and surface water monitoring program details are provided in the Annual Groundwater and Surface Water Review Report.

As the south cooling water intake (SCI) is located near the harbour's exit point to Lake Ontario, the associated water quality data provides a reasonable indication of the mean water quality in the Port Hope harbour.

A summary of SCI water quality data is presented in Table 22. Notwithstanding the fourth quarter ammonia mean and maximum results, the SCI has displayed reasonably consistent uranium, fluoride, nitrate and pH results over the previous five quarters. Minor variations in water quality parameters are primarily attributed to seasonal variations in surface water quality, as was the case regarding.

Table 22

SCI Water Quality Data by Quarter							
Parameter	**Units of Measure**	**Value**	**Q4 2016**	**Q1 2017**	**Q2 2017**	**Q3 2017**	**Q4 2017**
Uranium	µg U/L	Average	2.4	3.9	3.3	3.1	3.0
		Maximum	4.0	5.6	8.6	8.8	5.8
Fluoride	mg F/L	Average	0.15	0.17	0.21	0.18	0.20
		Maximum	0.22	0.20	0.26	0.22	0.29
Ammonia & Ammonium	mg N/L	Average	0.13	0.16	0.17	0.14	0.24
		Maximum	0.23	0.26	0.22	0.32	0.40
Nitrate	mg N/L	Average	0.84	1.5	0.98	0.66	1.0
		Maximum	1.3	2.2	1.6	1.0	1.7
pH	-	Minimum	7.67	7.53	7.68	7.31	7.32
		Maximum	8.26	8.32	8.47	8.56	8.29

2.3.4 Emergency Management and Response

This safety and control area covers the fire protection program, emergency plans and emergency preparedness programs. These procedures must exist for emergencies and for non-routine conditions. This also includes any results of emergency exercise participation.

The PHCF continues to maintain its emergency preparedness and response program while looking for opportunities to further improve. This activity and associated records are subject to various audits and are incorporated into the PHCF annual management review.

There were 10 emergency response exercises carried out in the fourth quarter of 2017:

- On October 3, 10, 17 and 24 the Emergency Response Team (ERT) conducted live fire training Eastern Ontario Emergency Training Academy (EOETA) in Norwood, Ontario focusing on search and rescue;
- On October 31, November 7, 14 and 21 the ERT conducted rapid intervention and confined space training at the EOETA;
- On October 18 a fire drill was conducted in the UF_6 plant; and,
- On November 21 an ERT joint exercise was conducted with Port Hope Fire and Emergency Services to extinguish a mock 35,000 gallon grade 2 bunker fuel fire.

During the fourth quarter there were four 10 hour training days and eight 4 hour practical training days consisting of:

- Four 10-hour sessions of live fire training at the EOETA;
- Four 4-hour sessions of rapid intervention training at the EOETA; and,
- Four 4-hour sessions of confined space training at the EOETA.

All drills and exercises are documented and deficiencies are tracked to ensure that appropriate corrective actions are taken.

2.3.5 Waste and By-product Management

This safety and control area covers internal waste and by-product-related programs which form part of the facility's operations, up to the point where the waste is removed from the facility to a separate waste and by-product management facility. This also covers the ongoing decontamination and planning for decommissioning activities.

Solid wastes contaminated by uranium are reprocessed, recycled and re-used to the extent possible. Waste materials that cannot be reprocessed, recycled or re-used are safely stored on-site until appropriate disposal options are available.

Wastes generated at the facility are segregated at the point of generation into contaminated and non-contaminated. Non-contaminated waste is either recycled or disposed of at an appropriate facility. Contaminated waste is stored in appropriate containers pending assessment of recycling or disposal options.

In the fourth quarter, 6.6 tonnes of non-contaminated wastes were sent to a local landfill. A total of 10.7 tonnes of non-contaminated materials were sent to appropriate recycling facilities for recovery.

The PHCF produces two by-products at the facility. These include ammonium nitrate, which is sold to a local fertilizer company, and fluoride product, which is sent for uranium recovery at a licensed facility. The amount of ammonium nitrate recycled in the quarter was 559 m^3. A total of 520 drums of fluoride product were generated in the quarter.

PHCF generated 12.7 tonnes of contaminated combustible materials (CCM) in the quarter, all of which was shipped to the BRR for incineration. During the same period, a total of 15.8 tonnes of contaminated non-combustible materials (CNC) were generated and shipped to appropriately licensed hazardous waste facilities.

PHCF recycled 36.0 tonnes of metal after decontamination to free release criteria in the fourth quarter.

2.3.6 Nuclear Security

This safety and control area covers the programs required to implement and support the security requirements stipulated in the General Nuclear Safety and Control Regulations, the Nuclear Security Regulations and other CNSC requirements.

PHCF maintains a comprehensive security program which meets the requirements of the General Nuclear Safety and Control Regulations, the Nuclear Security Regulations and other CNSC requirements.

2.3.7 Safeguards and Non-proliferation

This safety and control area covers the programs required for the successful implementation of the obligations arising from the Canada/IAEA Safeguards and Non-proliferation Agreement.

The PHCF participated in one Safeguard inspection/activity in the fourth quarter:

- A Short Notice Random Inspection was held between December 18 and 29. There are no actions reported to date.

2.3.8 Packaging and Transport of Nuclear Substances

This safety and control area covers the packaging and transport of nuclear substances and other nuclear materials to and from the licensed facility.

UO_2 is produced, packaged in drums and transported by road from the PHCF to Cameco's Fuel Manufacturing Facility in Port Hope and/or other domestic fuel manufacturing facilities. UO_2 is also packaged in drums and transported by road and marine overseas to Japan and Korea. There is also a small amount of material transported by air for customer evaluation purposes. The drums used for air transport meet the Type IP-3 packaging requirements; all other drums meet the Type IP-1 packaging requirements as specified in the CNSC Packaging and Transport of Nuclear Substance Regulations.

UF_6 is produced and transported in Type H(M) and H(U) cylinders certified by the CNSC by road or marine from the PHCF to the USA or overseas, including but not limited to, the United Kingdom, France, Germany, Holland and Japan.

In addition to UO_2 and UF_6, uranium scraps and bi-products are transported by road from the PHCF to Cameco's Key Lake operation or to the USA for uranium recovery.

There were no reportable transportation events which occurred at the PHCF in the fourth quarter.

3.0 OTHER MATTERS OF REGULATORY INTEREST

3.1.1 Public Information Program

For the fourth quarter of 2017, PHCF continued to meet the requirements of CNSC RD/GD 99.3, Public Information and Disclosure programs.

Public Engagement

In the fourth quarter, Cameco had great opportunities to engage the public. For the first time, Cameco had a booth at the Ontario Power Generation Darlington Refurbishment Open House. The open house started on Friday, November 17, where grade nine and ten students from local high schools as well as local indigenous people toured the mock-up reactor and visited the booths, including Cameco. They asked questions about how reactors work, how fuel bundles were made, and what type of trades or other positions are available at Cameco. A team of three employees were on hand to answer all of their questions and educating them on the benefits of nuclear power and its positive effects on climate change.

The open house continued on Saturday, November 18 and was opened to the public. More than 2,000 people walked through the mock-up training center and visited our booth.

Cameco had a 10 x 10 booth inside the mock-up training area, had a charging station for cell phones, a TV showing the Discovery Channel's "How it's Made" video of Cameco's processes, a display bundle, and positive nuclear and Cameco facts. The booth also had pens as giveaways and information to handout. The biggest draw was the fuel bundle. People were surprised at how small it was, in comparison to how much energy it can produce. This feedback was reassuring that we were educating people on nuclear and its advantages as a source of power generation.

Cameco held a public community forum on November 23 in the evening at the Carpenter's Union Hall in Port Hope. The topic for this forum was chosen to educate the public on how nuclear is used in healthcare and Cameco's specific involvement along with Nordion and Bruce Power. This community forum was a follow-up to a media event held in Cobourg. The media event was an invite-only event to promote the collaboration between Cameco, Nordion and Bruce Power to supply the world with a reliable source of Cobalt-60 and was attended by Kim Rudd, Lou Rinaldi, other nuclear industry dignitaries, and local media. You can find the news release on our community website.

Dale Clark gave an update on our local operations at the forum, and our guest speakers from Bruce Power and Nordion spoke about nuclear medicine, its uses and benefits.

During the last quarter of 2017, Cameco had two inquiries from the public through our general inquiries email on the community website. A member of the public was inquiring about a street sweeper she had seen driving up and down Hayward Street at the Port Hope Conversion Facility fenceline. We responded to her concern and led her to the September 11 web posting that referenced the street sweepers and the reason for its presence. The other member of the public was inquiring about the buildings on Centre Pier and when they will be taken down. Both inquiries were managed and questions were answered.

Social Media and Website

We are now in our fifth year of Cameco Ontario being present on social media and our numbers are gradually increasing. At the end of the fourth quarter, the Cameco Ontario page had 408 visitors, a five percent increase from the third quarter. During the fourth quarter approximately 44 posts were made on Facebook and Twitter including a job posting in our Port Hope offices that reached approximately 2,200 Facebook users.

Our posts ranged from community investment initiatives within Northumberland, the release of our newsletter, Energize, our community forum advertisement and Cameco's presence at the OPG refurbishment open house.

Cameco announced its support for Ontario's Long-Term Energy Plan that was presented by the government to the public on October 26. Cameco posted on social media channels as well as the Cameco community website, camecofuel.com. In November, the Ontario's Financial Accountability Officer declared nuclear power to be the best option to meet Ontario's future electricity needs. Cameco was pleased to share this with their own news release which was also sent out on social media and posted on the Cameco community website, camecofuel.com.

In November, Cameco posted a news release on the community website camecofuel.com to publicize the successful collaboration between Cameco, Nordion and Bruce Power to ensure a stable and reliable supply of Cobalt-60 for use in healthcare. This news release was part of the media event and the community forum, all of which were posted on social media and the community website.

Relationship with Municipality of Port Hope

There was no contact the municipality during the fourth quarter but our relationship remains open and strong with council and key members of the municipality.

Media Analysis

Media analysis of the fourth quarter was recorded and Cameco received positive coverage on the collaboration between Nordion, Cameco and Bruce Power. Multiple ads were run throughout the fourth quarter for the community forum, our environmental ads promoting nuclear, our employee giving results and an ad for Remembrance Day.

Other Initiatives

During the fourth quarter, Cameco engaged in a number of other community outreach activities, including:

- Donated advertising time on the local radio station (93.3 MyFM) to the following three charities:
    - Salvation Army (October)
    - Northumberland United Way (November)
    - Northumberland Hills Hospital (December)

In the third quarter Cameco purchased a mobile cell phone charging station. This station was originally used for the Port Hope Fair booth but was also donated to the Port Hope Chamber of Commerce Home and Community show as a part of Cameco's sponsorship. It went over very well and people saw the Cameco Energizing your cell phone poster with our logo.

Cameco was present at the Santa Clause parade in Port Hope with the Cameco float decorated with the theme Christmas Beach Party. Cameco had almost 30 volunteers including employees, their friends and family. They handed out candy, walked alongside the float or rode on the float.

Cameco employees also attended or participated in the media event for Partners in Education, the Northumberland Land Trust Gala, Food for Thought in our honour for sponsoring the program, the Northumberland Hills Gala and laying of a wreath for Remembrance Day ceremonies in Port Hope.

3.1.2 Site - Specific

The nuclear criticality safety program at the PHCF follows the criticality control principles as described in Radiation Protection Program Manual. In summary, processing of any amount of enriched material at the PHCF is governed by a criticality control committee (CCC) as described in the Nuclear Criticality Safety Program Manual.

The PHCF met all other site-specific reporting requirements.

Vision in Motion (VIM) detailed design activities continued through to the end of the year and will continue in 2018 as part of a rolling wave approach to detailing future work. During the fourth quarter, design work continued for the new liquid hydrogen station and site-wide infrastructure, including deliverables required for the MOECC application for the storm water system. Cameco met with the Ganaraska Region Conservation Authority to present the updated design deliverables for the storm water system and plan for their detailed review. Detailed design and some early procurement activities were initiated for temporary construction facilities, accumulated waste processing, removal of hazardous materials from the former UF_6 plant and demolition of the Centre Pier buildings. Funding approval packages for key work in 2018 were prepared based on this design effort.

The Cameco/Canadian Nuclear Laboratories (CNL) working groups continued to coordinate future activities and detailed design work. The CNL schedule for the Long Term Waste Management Facility (LTWMF) to be ready to receive off-site wastes was delayed to approximately March 2018. Resulting adjustments required to the schedule for removal of the temporary storage site from the Centre Pier will drive a need for concurrent Cameco and CNL activities on the Centre Pier and a revision to the work island is being developed to mitigate delays. Cameco and CNL met with CNL contractors to begin co-ordination of waste transfers to the LTWMF. Legal agreements with CNL to support the temporary storage site removal work, waste acceptance criteria and shared work continue to be in-progress.

Per the Supplemental Environmental Monitoring Plan, proposed locations for the additional hi-vol stations were agreed to with the Municipality of Port Hope. Cameco initiated design work for the agreed locations and an analysis of radionuclides in hi-vol dust samples was completed to provide a good environmental monitoring baseline.

In follow-up to written requests to the Municipality of Port Hope (MPH) to move forward with the design of the Choate Street extension per the Road Construction Agreement and an in-camera meeting with municipal council in August, in October MPH accepted the required design deposit and initiated preparation of a tender for the design and municipal

environmental assessment. Purchase of the former waterworks property from MPH was completed in November.

The first phase of activities in the former UF_6 plant involving removal of asbestos and installation of electrical upgrades continued throughout the fourth quarter utilizing contractors. This work will support future equipment and material removals from the building in 2018.

3.1.3 Improvement Plans and Future Outlook

The 2017 improvement plans and future outlook for the PHCF are discussed in section 3.1.3 Improvement Plans and Future Outlook of the 2016 Annual Compliance Monitoring and Operational Performance Report, which was issued on March 31, 2017.

3.1.4 Safety Performance Objectives for Following Year

The 2017 safety performance objectives for the PHCF are discussed in section 3.1.4 Safety Performance Objectives for Following Year of the 2016 Annual Compliance Monitoring and Operational Performance Report, which was issued on March 31, 2017.

4.0 CONCLUDING REMARKS

Cameco is committed to the safe, clean and reliable operations of all of its facilities and continually strives to improve safety performance and processes to ensure the safety of both its employees and the people in neighbouring communities.

In the fourth quarter of 2017, PHCF did not exceed any CNSC regulatory limits. As a result of the effective programs, plans and procedures in place, the PHCF was able to maintain individual radiation exposures well below all regulatory dose limits. In addition, environmental emissions continued to be controlled to levels that are a fraction of the CNSC regulatory limits, and public radiation exposures are also well below the regulatory limits.

Cameco's relationship with local residents remains strong and we are committed to maintaining the strong support and trust we have developed over the past several years.