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Mr. Lester Posada
Project Officer, Nuclear Processing Facilities Division
Canadian Nuclear Safety Commission
P.O. Box 1046, Station B
Ottawa, Ontario
Canada
K1P 5S9

**Subject: SRBT Response to CNSC Staff Review of 2019 Annual Compliance Report**

Dear Mr. Posada,

Thank you for your recent letter [1] summarizing CNSC staff comments on SRBT's 2019 Annual Compliance Report (ACR).

Each CNSC staff comment is repeated below, followed by our response.

***Comment:***

*SRBT chose to maintain the maximum dose target of ≤ 0.70 mSv, however has increased the average dose target to ≤ 0.060 mSv which is lower than the average this year.*

*It is noted that the average dose trend includes workers whose dose is zero. A more robust method of evaluating the program would look at the average of the non-zero doses.*

***Requested Action:***

*SRBT should consider providing trends for the average worker dose that excludes workers with zero dose values.*

The average dose figure presented in the 2019 ACR was generated as a product of the following process:

- SRBT records weekly calculated dose values to the nearest tenth of a µSv
- These values are totalled at the conclusion of the year
- The averaging calculation is applied
- The resultant average is rounded to the nearest hundredth of a mSv.

As such, the average dose of 0.065 mSv is based upon the doses of 45 NEWs who had 'quantified' doses (to the tenth of a µSv), ranging from 0.0005 mSv at the lowest, and on up to the maximum value of 0.5694 mSv.

For the purposes of this request, SRBT will treat all staff with annual effective doses less than 0.01 mSv (<1 mrem) as being a 'zero' dose.

Applying this logic to the 2019 data set, 25 persons have 'non-zero' doses for the year, and these individuals averaged 0.1149 mSv, with a minimum of 0.0101 mSv, a maximum of 0.5694 mSv, and a collective dose of 2.8721 p·mSv.

Going forth, future ACRs will include a similar statistical treatment of the effective doses of SRBT NEWs, with respect to 'non-zero' doses.

***Comment:***

*Airborne concentrations within the facility are monitored by stationary tritium-in-air monitors, with audible alarms triggered at conservative tritium concentrations.*

*A series of passive air samplers are located throughout the facility allowing for weekly averaging of tritium concentrations in key areas. No information is given on what these values are.*

***Requested Action:***

*SRBT is requested to define what is considered conservative tritium concentrations.*

*No values are provided for the increase in average low-level airborne tritium in the facility. As it is correlated to the increase in average and collective doses, more precise information should be included in the report. The actions taken to drive improvements in these areas should be described.*

With respect to alarm set points, stationary tritium-in-air monitors are set up in areas of the facility where there is the greatest potential for airborne tritium contamination. In Zones 1 and 2 of the facility, alarms sound at 5 $\mu Ci/m^3$, while in Zone 3, the alarms are set for 10 $\mu Ci/m^3$.

SRBT considers these alarm set points to be very conservative and effectively protective of our staff in the facility for several reasons:

- Applying the CSA N288.1-14 listed dose coefficient for tritium oxide for combined inhalation and absorption (3.0E-11 Sv/Bq), and assuming a person spends 2,000 hours of work at a respiratory rate of 1.2 $m^3$/hour in an environment of 10 $\mu Ci/m^3$, a person would accrue an effective dose of 26.64 mSv barring any intervention.

- In most circumstances, airborne contamination events at SRBT are dominated by molecular tritium gas ($T_2$), which exhibits a radiobiological effectiveness several orders of magnitude lower than tritium oxide (literature ranges between 10,000 – 25,000 times less impactful). As such, at equal concentrations, airborne tritium hazards at SRBT present a significantly lower level of risk to workers than, for example, a heavy water spill in a nuclear power generating station.

- Since stationary tritium-in-air monitors do not distinguish between molecular tritium gas and tritium oxide, using alarm set points that would be protective for the more limiting form of tritium is clearly a conservative measure.

- The above rationale does not account for the fact that our Radiation Safety Program mandates specific actions in the event of an alarm, in order to ensure effective doses are maintained ALARA at all times. All SRBT staff members receive a detailed review of these expectations every year during our annual 'all-staff' training session.

- Finally, the conservatism of these particular alarm set points is most clearly illustrated by reviewing the effective dose data of our workers over the years of facility operation. As stated on page 75 of our ACR, our Radiation Safety Program has achieved five consecutive years where no SRBT staff member has exceeded 1 mSv effective dose in any year, despite a consistently high rate of tritium processing and production over that time.

With respect to the data generated from our in-house passive air sampling array, it is important to note that this sample type can provide an increased sensitivity for low-level concentrations of tritium in air over stationary monitors.

SRBT began deploying this strategy of hazard monitoring in our program beginning in 2016, and it has since provided us with valuable quantitative and spatial data upon which to base ALARA strategies in the facility.

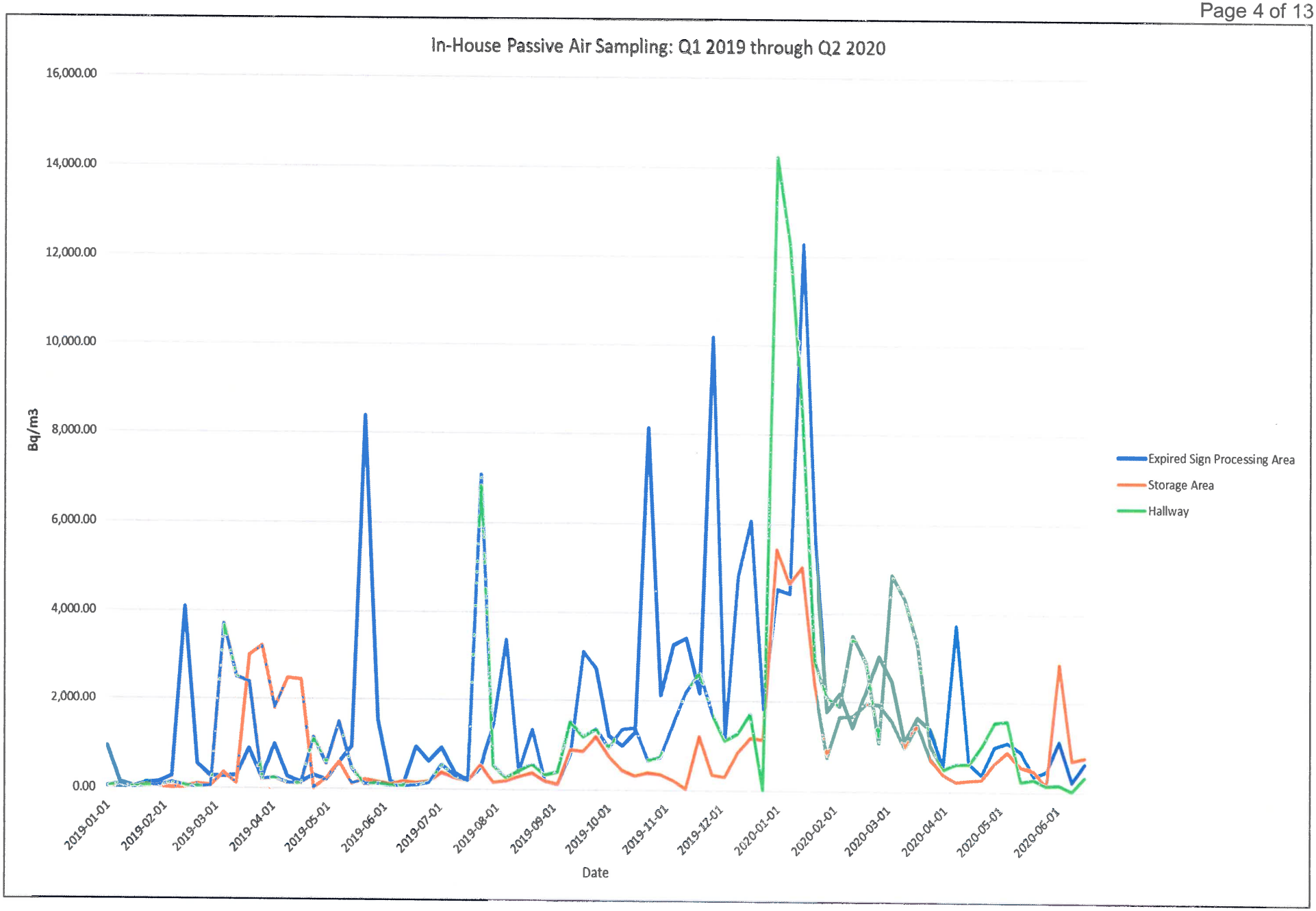
As stated on page 81 of our ACR, toward the end of 2019, SRBT experienced an increase in the volume of expired sign returns. The vast majority of such returns present no radiological hazard; however, on occasion signs may be returned by customers after having been damaged during building demolition / removal, or they may rarely become damaged during transport.

The hazard presented by these specific signs can vary, depending on the nature of the damage, and how long it has been since it was damaged. If such signs are delivered palletized, the initial radiological assessment of the shipment may not necessarily detect the hazard.

In most cases, the airborne contamination hazard is lower than what is detectable using monitoring instruments upon package receipt; however, the passive air samplers are generally sensitive enough that we can observe variances in the average airborne contamination levels in the facility and take corrective measures.

The graph on the following page shows the weekly average tritium concentration data for three indicator sampling stations (in units of $Bq/m^3$) that helped the Health Physics Team to take measures to ensure doses remained ALARA at all times. The values are average air concentrations at that particular sampler location over the course of the seven day sample period.

Week to week, there are always detected variations in any given sample, depending on facility processing rates and any other minor events such as light breakages; however, a clear trend developed beginning in September 2019 as stated in the ACR.


In-House Passive Air Sampling: Q1 2019 through Q2 2020
16,000.00
14,000.00
12,000.00
10,000.00
8,000.00
6,000.00
4,000.00
2,000.00
0.00
Bq/m3
2019-01-01
2019-02-01
2019-03-01
2019-04-01
2019-05-01
2019-06-01
2019-07-01
2019-08-01
2019-09-01
2019-10-01
2019-11-01
2019-12-01
2020-01-01
2020-02-01
2020-03-01
2020-04-01
2020-05-01
2020-06-01
Date
Expired Sign Processing Area
Storage Area
Hallway

As a point of comparison to illustrate the safety significance of this data, the peak average tritium concentration measured in the time frame illustrated by the above graph is equal to 14,250 $Bq/m^3$.

A hypothetical nuclear energy worker continuously exposed to this concentration of tritium oxide over one complete year of work at SRBT (~23.7% of a calendar year) would receive a calculated effective dose of approximately 0.85 mSv, a value which falls below the public dose limit of 1 mSv.

The annualized averages for 2019 for each of these three stations are significantly lower than this peak value: 1,695 $Bq/m^3$ (expired sign processing area), 647 $Bq/m^3$ (storage area), and 1,154 $Bq/m^3$ (hallway).

The Health Physics Team assessed this trend formally during their January 7, 2020 meeting, where non-conformance report NCR-784 was raised to document the action plan for missing the radiation protection-related targets for average worker dose, collective dose, and the facility contamination pass rate. The increased rate of expired sign throughput was determined to be one of a number of causes of these missed targets.

In order to improve this condition, additional resources were allocated to accelerate the rate of processing of these items, in order to minimize the number of signs being stored temporarily for prolonged periods. As well, a new process was implemented where each 'batch' of expired signs arriving on pallets would undergo a more detailed radiological screening shortly after delivery, in order to detect if there are signs that may be contributing to low-levels of airborne tritium in the facility. Any such signs are processed immediately in order to remove them as a source of chronic airborne contamination.

These actions have proven effective, as can be seen in the trend lines beginning in January 2020 on the graph presented. As well, the rate of expired sign processing has returned to more normal levels in the first and second quarter of 2020. Nevertheless, the actions taken to drive these improvements will be maintained going forth, as they have proven to be effective at keeping doses ALARA.

Future ACRs will have a more detailed discussion of any relevant or significant data generated by our in-house passive air sampling array.

***Comment:***

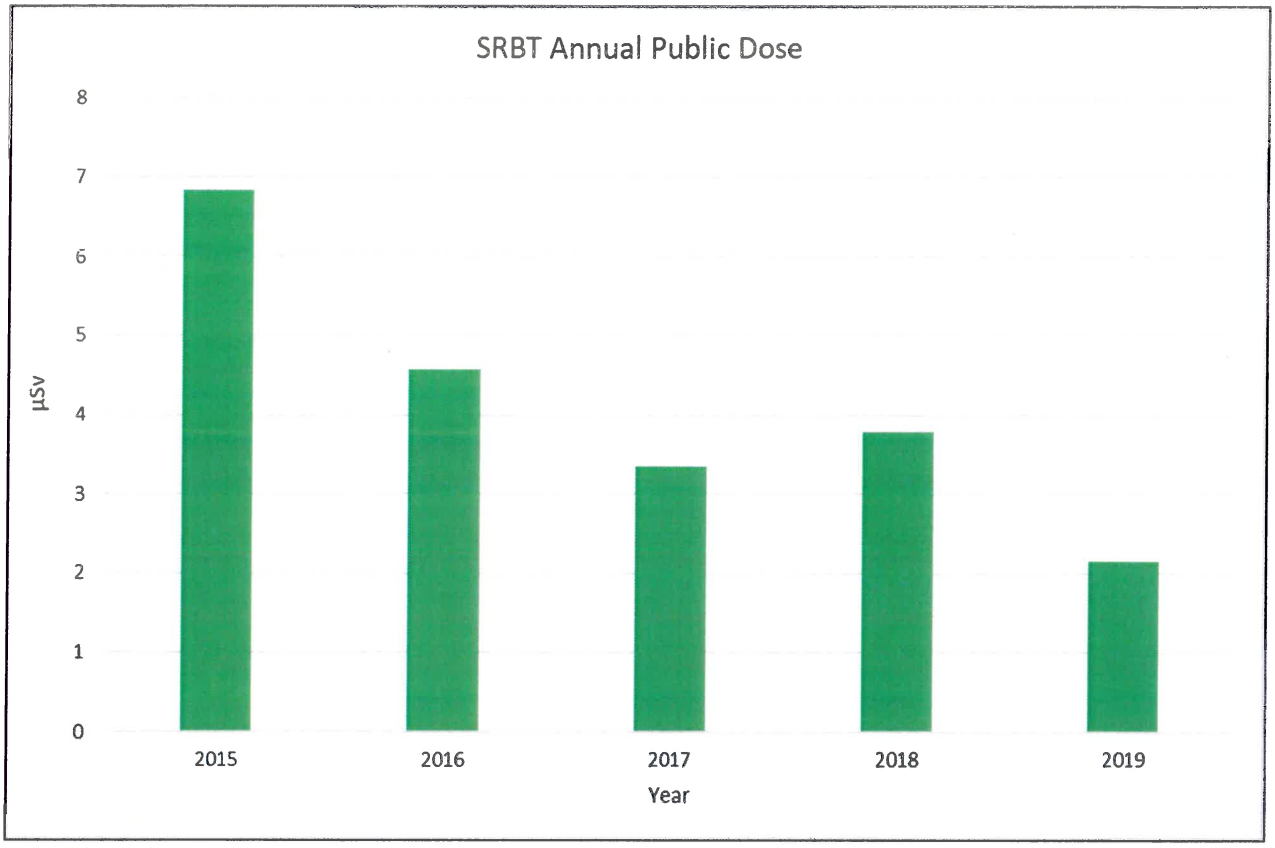
*Similar to the past few years, the dose to the pubic has remained low, the most exposed individuals receiving about 0.2% of the regulatory public dose limit. CNSC staff reviewed the calculations, which are derived from the same methodology as in the previous years.*

*The points in this section are addressed adequately, with the exception of a minor divergence: "a description of the trends from year to year, with comments on their significance, for a period of five years". The yearly trend is presented, but only for four years (2016 – 2019).*

***Requested Action:***

*SRBT should consider providing 5-year trend for the public dose values, in future reports.*

Future ACRs will include a full assessment of the five-year trend for this data, including a similar graphical depiction. The five-year trend is clearly illustrated in the bar graph presented below.




***Comment:***

*A discussion of the 2019 calculated doses to the public in relation to the prescribed limit of 1 mSv/year is not provided in the appropriate subsections (e.g., 4.3.5) under Section 4.3: SCA – Environmental Protection.*

*CNSC staff note that according to the executive summary of the 2019 ACOPR, the calculated public dose remained far less than 1% of the prescribed limit of 1 mSv, as derived from direct sampling and monitoring of the local environment. This conclusion should also be provided in the appropriate subsections under Section 4.3.*

***Requested Action:***

*SRBT should include a concluding statement at the end of the Public Dose section (Section 4.3.5), providing a comparison of the annual calculated radiation doses to the representative and/or critical group(s) against the regulatory public dose limit, in future reports.*

Future ACRs will include a clear statement in the appropriate section, comparing the derived public dose value reported for that year, and the regulatory limit of 1 mSv per year for any person who is not a nuclear energy worker (i.e. the public dose limit).

***Comment:***

*Appendix I (Receiving Waters Monitoring Results for 2019) – It was noted that the figure provided in Appendix I does not include any data for 2018. The figure ends at December 2018.*

***Requested Action:***

*SRBT is requested to update the River Monitoring figure in Appendix I to include data for 2019.*

The graph presented in Appendix I has been corrected to include the data obtained from sampling in 2019. Note that there were three months during the early part of the year where the river was frozen and a sample could not be safely obtained.

Appendix I – Corrected is included as an attachment to this letter.

***Comment:***

*Only the average of the groundwater tritium data are plotted to demonstrate the trend. Since the Commission has been showing interest in seeing the range (or confidence levels) of plotted data, CNSC staff recommend that in future annual compliance reports the minimum and maximum data be also plotted in the same figures.*

***Requested Action:***

*SRBT is requested to include the minimum and maximum data for figures displaying the tritium concentration trend in groundwater, in future reports.*

Figures 12 and 13 of the 2019 ACR summarize the annualized average tritium concentration measured at two of the key wells in our array, as measured over time since being put into service.

These figures have been consistently presented as part of our ACR for the past several years, in an effort to demonstrate the stability / recovery of the affected aquifer over the longer term.

Figure 12 – Revised and Figure 13 – Revised are included as attachments to this letter, and include trend lines for minimum and maximum data for each of the reported years.

Future reports will also include a trend line on both figures to show the annual maximum and minimum values, in addition to the average.

***Comment:***

*The average tritium concentration for downspout monitoring in 2019 (432 Bq/L) has more than doubled compared to the 2018 value (179 Bq/L). No explanation was provided in section 4.3.1.4 as to why the result has more than doubled. Additionally,*

- *For June 14, 2019 at DS-3, the result was higher than the other monitoring sample results collected during the three other precipitation events at DS-3.*
- *For September 26, 2019 at DS-6, the result was higher than the other monitoring sample results collected during the three other precipitation events at DS-6.*

*Similarly, no explanation was provided for the elevated sample results collected on June 14, 2019 at DS-3 and September 26, 2019 at DS-6.*

***Requested Action:***

*SRBT is requested to provide an explanation why the average concentration for downspout monitoring has more than doubled compared to 2018, as well as provide an explanation for the elevated tritium concentrations on June 14, 2019 at DS-3 and September 26, 2019 at DS-6.*

It is critical to understand that the practice of monitoring the water that is shed from the building rooftop drainage systems (the 'downspouts') is only a very brief snapshot in time of the conditions at the time of sampling.

It is also very important to understand the factors that influence the measured tritium concentration in any given sample. Some examples include:

- Significant rainfall after periods of time with elevated gaseous tritium-oxide releases tend to result in higher downspout concentrations being measured.

- How long has it been since a significant rainfall event has occurred? Drier periods with high rates of tritium processing, followed by a significant rainfall tend to result in higher measured concentrations.

- Was there any overlap between the time the rainfall event began and was detected, and the time it took to put tritium processing operations into a safe state? On occasion, quick onset of a heavy rainfall event can result in probable deposition from entrainment of any released tritium as processing operations are shut down.

- What is the rate of precipitation? Higher rainfall rates can lead to lower concentrations due to the sheer volume of water being drained; however, higher rates of rain can also cause rooftop ponding which will entrain surface tritium that may not have otherwise been taken up by a less intense rainfall.

- How soon after the onset of the precipitation event did sampling occur? When the sample is obtained can have a great influence on the measured results.

Weather factors during processing can influence deposition patterns as well. A rainfall that occurs after period of processing that has been dominated by west to east wind patterns has a greater impact on downspout results than a period that experience an opposing wind, since the active ventilation system plume will drift over the facility. As well, processing operations on hot, humid days are expected to result in a greater rate of deposition of oxide onto rooftop surfaces.

With so many factors and influences on the instantaneously measured result, it is difficult to control for all variables in order to confidently ascribe any given variation to a particular event or condition.

Downspout monitoring has always been used as a helpful qualitative measurement in support of our Environmental Management System, and associated protection and monitoring programs, and it provides us with some limited information on a specific pathway of the tritium that is released. If we decide to quantitatively compare 2018 and 2019 data, it is important to also assess the weather patterns for the time periods with respect to precipitation volume and frequency.

If we refer to Appendix N of the 2019 ACR, and compare the data for precipitation counts (as measured by the SRBT weather station), as well as the total monthly rain-equivalent accumulation of precipitation, we can see that 46% more precipitation occurred in 2019.

A higher rate of rain in 2019 may have resulted in the release of tritium deposited on the roof surfaces in previous years, leading to higher measured results; however, this is again a more longitudinal phenomenon, and would not explain any given instantaneous measurement. More rain may have also led to more lagging entrainment in cases where the onset of the precipitation was quick, as discussed earlier.

A review of processing, operational and gaseous effluent monitoring records near the periods in question does not lead to any individual potential event as a likely cause of the elevated results seen on June 14 at DS-3, nor on September 26 at DS-6.

On a macro level, as can be seen in Appendix P of the ACR, the emission of tritium oxide in 2019 began to become elevated as the warmer months arrived. This is an expected phenomenon that ultimately will also influence detected tritium in downspouts, simply due to the opportunity to sample them at that point in the calendar year.

In summary, it is very difficult to quantitatively analyze any given result from runoff water from facility downspouts due to the above-discussed factors. We fully expect to see a high degree of variance in the data we obtain through these samples.

Ultimately, SRBT has not measured greater than the Ontario Drinking Water Guideline value of 7,000 Bq/L in any downspout sample in more than a decade of operations. Coupled with the continued declining tritium concentrations being measured through our Groundwater Monitoring Program, SRBT maintains that tritium in downspout runoff does not present an unacceptable risk to the environment.

***Comment:***

*On April 3, 2020, SRBT requested to defer its emergency exercise due to the ongoing COVID-19 pandemic event [4]. CNSC staff requested for the following additional information [5]:*

- *Confirmation that Pembroke Fire Department will not be available to participate this year to participate in this exercise;*
- *Records regarding the training provided in January 2020 to off-site emergency responders (description, attendance, etc.);*
- *Information on how Section 11.2.4 Drills of CSA N393 Fire protection for facilities that process, handle, or store nuclear substances is being met.*

*SRBT responded on April 29, 2020 [6] with the requested information. CNSC staff reviewed the request and the supporting documentation provided to determine whether this requested deferral would increase the risk level at the SRBT facility, when it comes to fire response [7]. CNSC staff notes that the Pembroke Fire Department (PFD) continues to maintain full fire response capability to the SRBT facility, as needed.*

*CNSC staff expect SRBT to continue conducting their in-house Emergency Preparedness and Fire drills as per CNSC-agreed frequencies, as well as providing training to off-site Emergency Responders, as per their licence requirements.*

*CNSC staff conclude that from a technical safety standpoint, this request would not increase the fire response risk level at the SRBT facility. CNSC staff therefore concur with SRBT's request to defer conducting their full-scale emergency exercise from early autumn 2020 to the first calendar quarter of 2020.*

***Requested Action:***

*As per CNSC staff letter on May 4, 2020 [7], CNSC staff request that SRBT provide the CNSC with advance notice of the exercise date including information such as the scenario details, participant list and exercise schedule.*

Thank you for including this comment, which re-emphasizes previous agreements and discussions on this subject.

SRBT confirms that, as previously requested, we will provide CNSC staff with ample advance notice of the exercise date, planned for the first calendar quarter of 2021, including information such as the scenario details, participant list, and exercise schedule.

***Comment:***

*The section on Indigenous engagement does not provide sufficient detail.*

***Requested Action:***

*SRBT is requested to:*

*a) Identify which Indigenous groups have been contacted and which have replied.*

*b) Indicate how SRBT handled the response requesting cost coverage.*

*c) Provide information on communications with Indigenous groups in 2019.*

*In addition, please consider using the term "Indigenous" and including information that addresses the above comments in future reports.*

The comment on the assessed insufficiency of detail pertaining to the information presented on Indigenous engagement is noted; SRBT is committed to engaging with interested Indigenous groups, both as a matter of principle and best practice.

We believe that the applicable regulatory requirements of REGDOC 3.1.2, *Reporting Requirements, Volume I: Non-Power Reactor Class I Facilities and Uranium Mines and Mills* were met in full with the submission of our original report; however, additional clarification is provided as requested.

In response to your requested actions, the five indigenous groups originally contacted in 2018 were:

- Kitigan Zibi Anishinabeg (Chief Jean Guy Whiteduck) – no response received
- Metis Nation of Ontario (Margaret Froh) – responded (see discussion below)
- Algonquin Anishinabeg Nation (Martine Kistabish) – responded (see discussion below)
- Algonquins of Ontario (Megan Aikens) – no response received
- Algonquins of Pikwakanagan First Nation (Chief Kirby Whiteduck) – no response received

Two of the groups responded to SRBT - the Algonquin Anishinabeg Nation, and the Metis Nation of Ontario.

On January 9, 2019, Grand Chief Verna Polson of the Algonquin Anishinabeg Nation reached out to SRBT to indicate interest in a plant tour.

Over the course of the following months, six additional rounds of correspondence occurred, resulting in two mutually agreed upon times and dates for facility tours.

In both instances, Grand Chief Polson cancelled the tours at the last second due to scheduling conflicts.

On February 6, 2019, the Consultation Assessment Coordinator for the Metis Nation of Ontario noted interest, and that they require that all costs associated with the meeting be covered by SRBT.

As we are not familiar with the regulatory precedents, expectations or requirements relating to this type of transaction between licensees and Indigenous groups, and perhaps more significantly, did not budget for this type of expenditure during our 2019/20 fiscal year planning, no response was sent.

SRBT continues to incorporate Indigenous engagement as part of our overall communications strategies with the public. The comment on the use of the term 'Indigenous' is acknowledged. This term will be incorporated as part of future activities in this area, and we appreciate this advice.

As an additional point of interest, we have successfully connected with the Algonquins of Pikwakanagan First Nation (APFN) in 2020 as part of our Environmental Risk Assessment Process. We have also reached out to Grand Chief Polson on this project as well, with no response to date.

We are currently in advanced discussions with securing a collaborative relationship in the conduct of this assessment with the APFN; however, again we have been notified that there will be costs associated with this collaboration that are expected to be borne by SRBT.

At the time of writing of this letter, we are awaiting an estimate on the magnitude of these costs, which if prohibitive, may negatively impact our ability to engage with the APFN on this project.

With respect to the content of future reports, SRBT will make every effort to include sufficiently detailed information on this subject, in order for CNSC staff to verify if we have met our compliance requirements in this area.

***Comment:***

*CNSC staff conclude that the licensee has met CNSC requirements related to public information and disclosure.*

*SRBT again did not present to city council in 2019, nor did they conduct a public survey due to lack of public interest. They did however post the survey on their website.*

***Requested Action:***

*CNSC staff recommend that the licensee make a presentation to City Council in 2020 on their licensed activities, and that survey results gathered from their website be included in the next year's report.*

It is important to note that the President of SRBT frequently engages with the Mayor of the City of Pembroke, as well as municipal staff, on the subject of facility operations.

Facility updates are provided on a monthly basis during meetings of the Pembroke Economic Development and Tourism Advisory Council, one of three municipal committees to which the President of SRBT is a member.

Nonetheless, SRBT will explore the possibility of a presentation being made to the City of Pembroke in the near future. Note that due to the current global pandemic, this may potentially be delayed until the 2021 calendar year.

The posted survey on our website is available for all interested members of the public to complete and submit to our attention at any time; in 2019, no surveys were returned. Future ACRs will include details on the number of surveys that have been completed in the year being reported on, and the overall survey results if applicable.

We trust that with this letter and additional information, we have addressed CNSC staff comments on the 2019 edition of our ACR, and we look forward to incorporating the noted improvements into our future ACRs.

Should you require any additional information, please do not hesitate to contact me at any time.

Best Regards,

Stephane Levesque
President
SRB Technologies (Canada) Inc.

cc: C. Ducros, CNSC
R. Rashapov, CNSC
R. van Hoof, CNSC
R. Fitzpatrick, SRBT
K. Levesque, SRBT
J. MacDonald, SRBT

**References:**

[1] Letter from L. Posada (CNSC) to S. Levesque (SRBT), *CNSC Staff's Review of SRB Technologies (Canada) Inc.'s 2019 Annual Compliance Report,* dated June 29, 2019. (e-Doc 6327105)

**Enclosures:**

[A] Appendix I (Corrected), 2019 SRBT ACR
[B] Figures 12 and 13 (Revised), 2019 SRBT ACR

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**Subject: SRBT Supplemental Response to CNSC Staff Review of 2019 Annual Compliance Report**

Dear Mr. Posada,

Thank you for your recent message [1] noting that CNSC staff have reviewed SRBT's response [2] to CNSC staff comments and questions [3] on our 2019 Annual Compliance Report (ACR), and have no further comments on those aspects of the review.

The purpose of this letter is to provide a supplemental response to a question that had been left of the initial set of CNSC staff comments, as requested. The additional CNSC staff comment is repeated below, followed by our response.

***Comment:***

*The concentration of tritium in air has been increasing in the recent four year period. As summarized below the tritium concentration has increased from 33.44 Bq/m$^3$ in 2016 to 48.42 Bq/m$^3$.*

| *Reporting year* | *Tritium in air concentration (Bq/m$^3$)* |
|---|---|
| *2016* | *33.44* |
| *2017* | *38.85* |
| *2018* | *44.43* |
| *2019* | *48.42* |

*Although the risk to people and the environment remains low, it is of note that the tritium in air concentrations have increased by 15 Bq/m$^3$ in the past four years.*

*Different reasons have been provided for this trend (i.e., increase in facility emissions, increase in the amount of HTO released) however, there does not appear to be systematic evaluation of this trend.*

***Requested Action:***

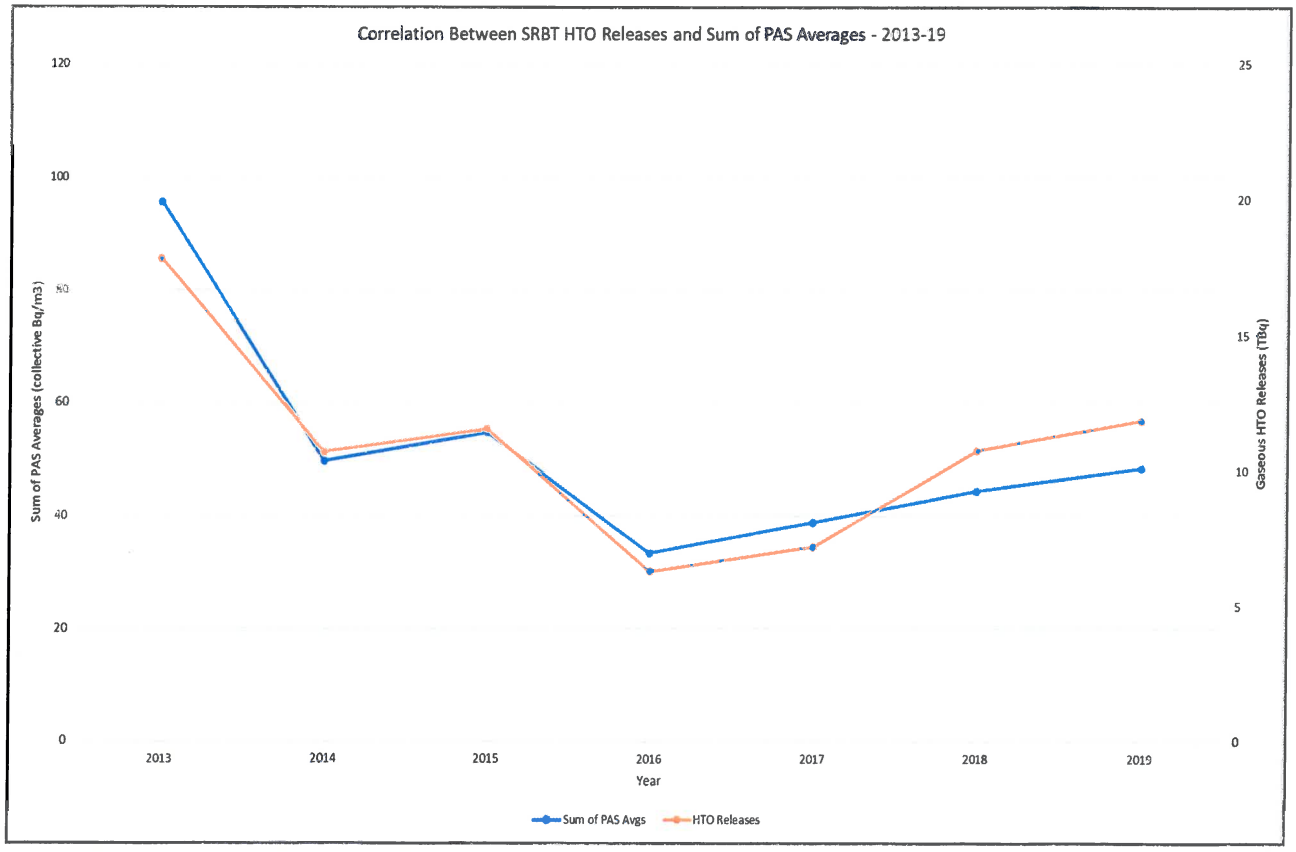
*Please evaluate the increasing trend of the tritium in air concentrations and determine if additional measures are required.*

## Evaluating the Identified Trend

The following table presents seven years of data on the cumulative total of the average air concentrations measured by our passive air sampler (PAS) array of 40 stations, as well as the amount of gaseous tritium oxide released from the facility in TBq. These values are compared in the fourth column as a ratio (PAS/HTO emissions).

| Year | PAS Cumulative Total | HTO Emissions (TBq) | Ratio |
|---|---|---|---|
| 2013 | 95.53 | 17.823 | 5.36 |
| 2014 | 49.74 | 10.701 | 4.65 |
| 2015 | 54.85 | 11.554 | 4.75 |
| 2016 | 33.44 | 6.293 | 5.31 |
| 2017 | 38.85 | 7.198 | 5.40 |
| 2018 | 44.43 | 10.751 | 4.13 |
| 2019 | 48.42 | 11.858 | 4.08 |

The trends of both measures are graphed below on separate axes, clearly demonstrating a close correlation between these two values.



In 2019, the PAS concentrations trended slightly upwards in comparison to the previous three years. Likewise, emissions of tritium oxide were higher in 2019 and trended the same over that period. Similar relative trends are seen in each of the previous years of data.

The ratio between these two values has remained relatively consistent, between 4.0 to 5.4, which considering the amount of variability that influences PAS results (wind speed, direction, etc.), is a very good sign that both programs are accurately assessing the presence of HTO in the environment.

It is understood that the magnitude of the collective average PAS air concentration has risen over the last four years, after having decreased significantly in 2016 from the previous values. The table above clearly demonstrates the correlation between gaseous HTO emissions and this data.

In summary, SRBT does systematically evaluate these trends every year as part of our management review and self-assessment processes, and the majority of this evaluation ends up being described to varying degrees in the ACR for that year.

As changes in facility HTO releases have been analyzed as part of our ACR each year, we do not believe that additional measures are required in response to the discussed trend in cumulative PAS average, as it is entirely expected, and directly correlated to gaseous HTO releases.

**Explanation of the Data Point Used**

It is very important that the data cited by CNSC staff as 'Tritium in air concentration' in the second column of their table is fully and clearly understood before attempting to assess any significant trends.

The values cited are a summation of the average tritium concentration in air measured by each of the individual passive air sampling stations deployed as part of our array of stations under the Environmental Monitoring Program.

The average for each sampler is taken over 12 monthly assessments. There are 40 individual sampler stations, for a grand total of 480 individual monthly assessments of the average tritium in air concentration at a particular point in the environment near the facility. As part of the ACR, we have traditionally calculated out the 40 averages for each station, and then added all of those average values together, giving us a grand total value.

As an analogy, this value is more akin to considering a collective dose of a population than determining the magnitude of hazard present at any station. The value of 48.42 $Bq/m^3$ for 2019 is in fact more accurately described as the average monthly *collective* air concentration. The reason that this statistic is helpful is two-fold.

First, it is a useful indicator of longitudinal changes in the amount of tritium oxide (HTO) that is released from SRBT to the environment. Typically, if more gaseous HTO is released to the environment over any given calendar year, this collective average air concentration value should increase. We clearly see this in the data presented earlier.

By using the averages, summed over the entire array, we can eliminate some of the significant monthly variability in individual sampler station results, allowing for a better understanding of trends over the course of longer periods of time (in this case, one calendar year).

Secondly, as part of annual self-assessment processes for the Environmental Management System, SRBT routinely uses this statistic to help analyze the relationship between our gaseous Effluent Monitoring Program (EffMP) and the EMP, with respect to HTO releases.

As noted, when comparing the results of HTO emissions from the gaseous EffMP, and the results of the passive air samplers surrounding the facility, it is expected that the HTO releases and the PAS concentrations should trend together, despite there being several other factors such as wind speed and direction, and the presence of duplicate sampling stations, that affect the cumulative results of the PAS in any given time period.

Traditionally this comparison has served as a good confirmatory measure of both metrics, and provides added confidence to the data generated from both of the programs.

**Future Impact of Operational Changes on this Data**

It is also important to note that beginning with the 2020 data set, we anticipate that the expected ratio between these two data points (traditionally between 4.0 to 5.4, as noted above) will change.

The reason for this is that the PAS cumulative total value calculated annually does not reject values that are lower than the minimum detectable activity (MDA). Instead, the value measured is taken to be equal to the MDA, and incorporated into the summation.

In 2020, SRBT began measuring PAS concentrations in-house, and no longer use a third party for this activity. The measurement process used by SRBT results in a higher MDA (typically in the range of 0.70 - 0.80 $Bq/m^3$) than that historically achieved by the third party (around 0.35 $Bq/m^3$).

As a result, since a significant proportion of monthly PAS measurements fall below MDA values, the value of the PAS cumulative sum of the averages is expected to rise artificially in 2020, which will influence the noted ratios calculated each year.

This increase will result in a higher calculated ratio, but it will not be an indication of a higher concentration of HTO in the environment in and of itself. The elevated sum of the averages, and the ratio, will at least in part be due to the way in which the statistic is derived.

We trust that with this letter and additional information, we have addressed CNSC staff comments on the 2019 edition of our ACR, and we look forward to incorporating the noted improvements into our future ACRs.

Should you require any additional information, please do not hesitate to contact me at any time.

Best Regards,

Stephane Levesque
President
SRB Technologies (Canada) Inc.

cc: C. Ducros, CNSC
R. Rashapov, CNSC
R. van Hoof, CNSC
R. Fitzpatrick, SRBT
K. Levesque, SRBT
J. MacDonald, SRBT

**References:**

[1] Email from L. Posada (CNSC) to J. MacDonald (SRBT), *RE: SRBT Response to CNSC Staff Review of 2019 Annual Compliance Report,* dated August 18, 2020.

[2] Letter from S. Levesque (SRBT) to L. Posada, *SRBT Response to CNSC Staff Review of 2019 Annual Compliance Report,* dated July 29, 2020.

[3] Letter from L. Posada (CNSC) to S. Levesque (SRBT), *CNSC Staff's Review of SRB Technologies (Canada) Inc.'s 2019 Annual Compliance Report,* dated June 29, 2019. (e-Doc 6327105).

**Directorate of Nuclear Cycle and Facilities Regulation**

File No.: 4.02.02
e-Doc 6371184

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September 3, 2020

Mr. Stephane Levesque
President
SRB Technologies (Canada) Inc.
320-140 Boundary Road
Pembroke, ON K8A 6W5

**Subject: CNSC Staff's Review of SRB Technologies (Canada) Inc.'s Response to CNSC Staff Comments to the SRBT 2019 Annual Compliance Report**

Dear Mr. Levesque,

Canadian Nuclear Safety Commission (CNSC) staff have reviewed SRB Technologies (Canada) Inc.'s (SRBT) responses [1][2] to CNSC staff's review [3][4] of SRBT's 2019 Annual Compliance Monitoring and Operational Performance Report (ACMOPR) [5]. CNSC staff conclude that the information provided is acceptable, and have no further comments.

Should you require any further information or have any questions regarding this letter, please do not hesitate to contact me.

Sincerely,

2020-09-03

X

Lester Posada

Signed by: Posada, Lester

Lester Posada
Project Officer
Nuclear Processing Facilities Division

c.c.: R. Fitzpatrick, J. MacDonald, K. Levesque (SRBT)
C. Ducros, R. van Hoof (CNSC)

**References:**

[1] Letter from S. Levesque (SRBT) to L. Posada (CNSC), subject: *SRBT Response to CNSC Staff Review of 2019 Annual Compliance Report*, July 29, 2020 (e-Doc 6351618).

[2] Letter from S. Levesque (SRBT) to L. Posada (CNSC), subject: *Supplemental Response to CNSC Staff Review of 2019 Annual Compliance Report,* August 26, 2020 (e-Doc 6367379).

[3] Letter from L. Posada (CNSC) to S. Levesque (SRBT), subject: *CNSC Staff Review of SRBT 2019 Annual Compliance Report,* June 24, 2020 (e-Doc 6327105).

[4] E-mail from L. Posada (CNSC) to J. MacDonald (SRBT), subject: *CNSC Staff Review of SRBT 2019 Annual Compliance Report,* August 17, 2020 (e-Doc 6371110).

[5] Letter from S. Levesque (SRBT) to L. Posada (CNSC), subject: *Submission of SRBT Annual Compliance and Performance Report - 2019,* March 31, 2020 (e-Doc 6270119).