2003 Annual Compliance Report

NSPFOL-13.00/2005

2003 Annual Compliance Report NSPFOL-13.00/2005

Part A

Facility:	**SRB Technologies (Canada) Inc.**
License Number:	**NSPFOL-13.00/2005**
Owner:	**SRB Technologies Inc.**
Reporting Period:	**January 1, 2003 through December 31, 2003**
Signing Authority:	**K. K. Shane MacDougall**
Title:	**Corporate Health Physicist, RSO**
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Part B

1. Operational Review

The facility described in the CNSC-issued Nuclear Substance Processing Facility Operating License; NSPFOL-13.00/2005 includes 12,000 sq. ft. of a Butler™ building located in a strip mall on the South edge of the city of Pembroke.

The facility has several ventilation systems that are maintained through a contract maintenance program with local contractors in conjunction with routine maintenance performed by qualified staff. All ventilation systems were maintained in fully operational condition with no system failures.

Equipment maintenance was performed under contract with a fully licensed maintenance and TSSA certified local HVAC contractor. The contract stipulates a quarterly maintenance program.

All process equipment is maintained by qualified staff and through contract with companies that specialize in process control systems. All process equipment has been maintained in fully operational condition with no equipment failures.

Reviews were submitted to CNSC staff during 2003 on the following:

- ❑ Valves, fittings and various components used in the processes,
- ❑ Liquid effluents,
- ❑ Handling of contaminated high-vacuum pump oils,
- ❑ Environment Monitoring Program,
- ❑ Facility ventilation systems.

2. Production

In accordance with Section IV of the Nuclear Substance Processing Facility Operating License-13.00/2005, SRBT:

i) manufactured gaseous tritium light sources, which consist of tritium gas ($^3H_2$) sealed in borosilicate glass tubes, and incorporating the sources into devices as described in the Radiation Safety Program (Rev. III).

ii) possessed, used, stored, and transferred nuclear substances necessary or incidental to the operations as described in i) above, that refers to Section N1, N2 and N3 of the license conditions. Procedures were reviewed by management and amended as required to ensure effective and efficient operations with respect to the safety of the operations. The maximum tritium activity possessed during 2003 did not exceed 5,550TBq, well below the possession limit of 11,000 TBq. At all times, unsealed source material was stored on uranium getter beds or in the handling volumes of the gas filling rigs.

iii) at no time imported more than 37 TBq within any two year period without applying for and receiving a license to import tritium issued by the CNSC. During 2003, SRBT applied for and received 5 individual import licenses to import tritium for the purpose of reclaiming the residual tritium in time-expired tritium devices to manufacture gaseous tritium light sources.

3. Modifications

During 2003 there were no modifications within the organization, administration and/or operating procedures that had any effect on licensed activities.

4. Health Physics

During 2003, SRBT maintained a Dosimetry Service License (DSL-1-1.0/2005) for the purpose of providing dosimetry services for the staff and visitors of SRB Technologies (Canada) Inc. The license was reviewed by staff of the CNSC and an Annual Compliance Report issued to the CNSC for the 2003 dosimetry year.

Dosimetry results were submitted to Health Canada for input to the National Dose Registry for 44 individual staff members.

The operating staff radiation exposure results were as follows:

Maximum effective annual dose:	4.54 mSv
Average staff (44) effective annual dose:	0.55 mSv
Zone 3 staff (8) average effective annual dose:	2.22 mSv
Zone 2 staff (8) average effective annual dose:	0.16 mSv
Zone 1 staff average (19) effective annual dose:	0.01 mSv
Administrative staff (9) average effective annual dose:	0.39 mSv
Collective annual effective dose:	22.91 mSv

The maximum effective annual dose of 4.54 mSv to a member of staff represents 9.08% of the CNSC regulatory annual dose limit of 50.0 mSv per year for NEW's.
The average staff effective annual dose of 0.55 mSv represents 1.10% of the CNSC regulatory annual dose limit of 50.0 mSv for NEW's.

Table Staff 2003 Radiological Dose

Dosimetry Program Dose Distribution (mSv/year)	Significance	Number of Staff
0.00 to 1.00		38
>1.00 to 2.00		0
>2.00 to 3.00		3
>3.00 to 4.00		2
>4.00 to 5.00		1
>5.00	SRBT NEW Annual dose limit	0
>50.00	CNSC NEW Annual dose limit	0

During 2003 there were no instances whereby a staff member's tritium body burden exceeded the administrative limit of 1000 Bq/mL.

In 2003, SRBT contracted out for a review of the DRL calculations to determine if it was necessary to revise the existing DRL calculations. The results of the review are expected early in 2004.

5. Environmental and Radiological Compliance

Data from the Environmental Monitoring Program are shown in **Appendix A**. Included in Appendix A are the tritium concentration results of locally grown vegetable and fruit samples. All vegetable, fruit and milk samples were analyzed by a laboratory approved for use by CNSC staff.

6. Facility Effluents

Liquid Effluent

During 2003 the Health Physics department performed sampling of effluent waters. A new procedure was established and submitted to CNSC staff for review and comment.

Gaseous Effluent

Gaseous effluent samples were taken on a weekly basis in accordance with operational procedures. The results of the stack emission analysis are shown in **Appendix B**.
Tritium emissions from the facility are determined by taking a known portion of sample continuously from the known quantity of exhaust of the ventilation systems and analyzing for tritium content. The results are assessed for emissions on a weekly basis to determine what

percentage of the regulatory limit a member of the public defined as that person who is most likely to receive the highest exposure due to any releases. The derived release limit (DRL's) calculations for the facility were performed in accordance with CAN/CSA-N288.1-M, 'Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities'. The DRL's were calculated for adult workers, non-adult workers and infants within the public domain.
The average weekly DRL results for 2003, based on weekly assessment, were as follows:

Adult Worker	0.20% DRL
Adult Non-worker	0.18% DRL
Infant	0.13% DRL

The SRBT action level is 2.5% DRL and the administrative level is 5.0% DRL.
Note that the CNSC-issued Class 1B Nuclear Facility license includes documents that refer to dose limits that were in force at the time of implementation of those documents. The annual public dose limit at that time was 5.0 mSv per year compared to the present dose limit of 1.0 mSv per year. Therefore, in accordance with the existing public annual dose limit, the action level is 2.5% as compared with 0.5% and the administrative limit is 5.0% as compared with 1.0% of DRL.

Precipitation Sampling

During 2003, SRBT, in accordance with CNSC staff request, took samples of precipitation (rain, snow) at several locations around the facility, at the four major points of the compass: N, S, E and W. The four points were approximately 70 meters from the central point from the air-handling unit exhaust stacks. The results of the sampling are shown in **Appendix B**.
Many results where tritium was measurable indicated a SQPI which is not indicative of tritium. It is known that the zinc sulfide powders used in the coating process are interfering with tritium measurements and resulting in higher than actual tritium concentrations. SRBT has researched methods for reducing and possibly eliminating the effects of the zinc sulfides during tritium assessments. Present methods involve distillation or vacuum filtration to remove the zinc sulfides. SRBT does not possess the laboratory equipment or the dedicated laboratory space for distillation and filtration.
The results for the precipitation sampling show essentially the direction of the wind during the sampling and the concentration of the liquid collected for that duration.

7. Waste Management

In 2003 there were three (3) shipments of waste material identified as Class 7, UN2915, Type A packages that were transferred to a CNSC licensed waste handling facility for decay storage.

WM-2003-001
Shipment WM-2003-001 included 10 x 200L drums of tritium contaminated crushed glass and 2 x 70L drums containing high-vacuum pumps contaminated with tritiated high-vacuum pump oil. Total H-3 activity was stated as 40.1 TBq.

WM-2003-002
Shipment WM-2003-002 included 8 x 200L drums of tritium contaminated crushed glass. Total H-3 activity was stated as 32.0 TBq.

WM-2003-003
Shipment WM-2003-003 included 7 x 200L drums of tritium contaminated crushed glass. Total H-3 activity was stated as 28.0 TBq.

All shipments were prepared in conformance with the requirements of the IAEA Safety Standards Series, Regulations for the Safe Transport of Radioactive Material, 1996 Edition (Rev.01), TS-R-1.

8. Facility Updates

Ontario Ministry of Labour

In 2003 a representative from the **Ontario Ministry of Labour** carried out a facility inspection and filed a report. In the report there were recommendations that required the following:

a) Install ventilation for the protection of the worker when performing vacuum mold forming and injection molding operations.

b) Enhance the ventilation characteristics of the ventilation system in the coating room to provide adequate airflow for the protection of the workers when carrying out coating operations.
c) Increase the airflow in the paint booth to provide adequate airflow for the workers when performing spray painting operations.
d) Enhance the silk screen cleaning booth to provide adequate air flow for the protection of the workers during silk screen cleaning operations.
e) Provide protective clothing for the worker performing the silk screen cleaning operations.
f) Enhance the ventilation system at the silk screening operations to provide adequate protection for the worker from the vapours of the inks used in silk screening operations.

All recommendations made by the representative of the Ontario Ministry of Labour were complied with as indicated in the letter from the Ministry.

Security Review

The **security program** for the facility has been reviewed by management taking into consideration the Designated Officer Order 01-D1. The Vulnerability Analysis and Threat Risk Assessment Analysis document was submitted to CNSC staff for review and comment. 'The Vulnerability Analysis and Threat Risk Assessment' was deemed to be acceptable by CNSC staff. All appropriate security precautions were performed for staff and contractors.

Quality Assurance

The **quality assurance** program has been submitted and reviewed by CNSC staff. Revisions have been made in accordance with a schedule as agreed between SRBT and CNSC staff.

High-vacuum Pump Oil

SRBT has been **researching** the use of an oil-free high vacuum pump. The pump is capable of achieving extremely low pressures, however, not as low as what can be achieved using an oil-sealed rotary vacuum pump.

Several staff members have been in contact with the supplier and manufacturer of pyrophoric uranium tritium traps (PUTT's) to ensure that the traps are able to withstand specified pressures as well as the vacuum pressure usually exerted on the traps.

Waste Management

Waste management activities are described in Section 7 (above).

The CNSC licensed waste handling facility has made changes to the method in which it handles low level waste material. In doing so there has been a tremendous increase in costs. SRBT has been reviewing the waste management program to determine the most efficient and effective method of preparing waste materials.

In the later part of 2003 AECL-CRL Waste Management has indicated that liquid wastes would not be accepted for waste storage. The new philosophy is to eliminate waste as opposed to storage of waste. The indicated method of disposal of waste radionuclide-contaminated oils is the submission to a waste oil handler for combustion.

Radiation Protection Training

All staff members received **Radiation Protection Training** as part of the ongoing employee training program. The training included information with respect to proper handling of tritium throughout the facility, WHMIS introduction, safety features within the facility, a briefing on TDG regulations, and open dialogue with a question and answer session.

9. Compliance with other Federal and/or Provincial Regulations

As a member of the manufacturing community, SRBT must maintain compliance with not only the CNSC regulations, but also several international, federal, and provincial regulations. **Internationally, federally, provincially** and for the purpose of packaging and offering for transport, shipments of product designated as dangerous goods, SRBT must comply with the requirements of the Transport Canada Dangerous Goods Act and Regulations, the US code of Federal Regulations 49, Transportation, IAEA Safety standard Series, Regulations for the Safe Transport of Radioactive Material, 1996 Ed. (Revised), and IATA Dangerous Goods Regulations, most current edition. Staff members involved with the packaging, offering for

transport and receipt of dangerous goods are given training in accordance with the applicable regulations and are issued certificates by the employer.
Provincially and for the purpose of operating a business within Ontario the dangerous goods used in manufacturing procedures were evaluated by the Ontario Ministry of the Environment for potential release from the facility and deemed acceptable. In accordance with Section 9 of the Environmental Protection Act, SRBT applied for the approval for emissions and in 2000 received from the Ministry of the Environment, the Certificate of Approval for Air, number 5310-4NJQE2.
Provincially and for the purpose of operating a business within Ontario whereby the number of workers is twenty or more, a Joint Health & Safety had been established and maintained in accordance with the Ontario Occupational Health and Safety Act and WHMIS Regulation. The committee consists of an employee representative and an employer representative. All staff members have received WHMIS training which includes pertinent information with respect to Material Safety Data Sheets and hazardous material handling.

10. Public Information Initiatives

SRBT has established a website which contains pertinent information with respect to product, people, services and environmental issues with respect to the operation of the facility.

Environment Monitoring Results

SRBT has sampled and submitted vegetable and fruit samples from the garden of one of the members of the public. The samples were submitted for tritium concentration assessment and the results were reported to the member of the public and to the CNSC staff.

Site Tours and Open Houses

SRBT has in the past opened the doors of the facility to visitors who wish to view the operations. However, in light of security issues following the September 11, 2001 terrorist actions that took place in the USA and further action taken by the USA and national and international authorities, tours of the facility have in 2003 been preempted at the request of the CNSC staff.

SRBT Participates in Community Events

SRBT continues to participate in community events and to support needs of the community with involvement in service groups, charitable organizations, and specialty group organizations. In our involvement we take the opportunity to relate the benefits of the life-safety products that we manufacture.

Staff members are active within nuclear science organizations and national and international organizations such as the Pembroke and Area chamber of Commerce, Canadian Radiation Protection Association, Canadian Nuclear Society, Health Physics Society, Bioassay and Analytical Environmental Radiochemistry, Measurements and Radiochemical Committee, Institute of Environmental Sciences and Technology, Ottawa Valley Manufacturers' Alliance, etc.

11. Forecast for Coming Years

As the population becomes more educated we hope for acceptance of the value of the products we manufacture, similar to the acceptance of smoke detectors and other devices that use nuclear material.
The products we manufacture are all related to life-safety, whether it is used to provide access to a safe exit during extreme life threatening situations or to provide illumination specific for military activities. The main purpose of the devices is to provide a life-safety aspect with the intent of saving lives.

It is our goal to continue to foster a trusting relationship with the vast majority of the public.

Part C

I hereby certify that I have reviewed the documents referred to in the Appendix A of the license and the facility has been operating in compliance with the license except as noted here:

Signature: Date: 2003 March 25

Name (print): K.K. Shane MacDougall

Title: Corporate Health Physicist, RSO

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Appendices

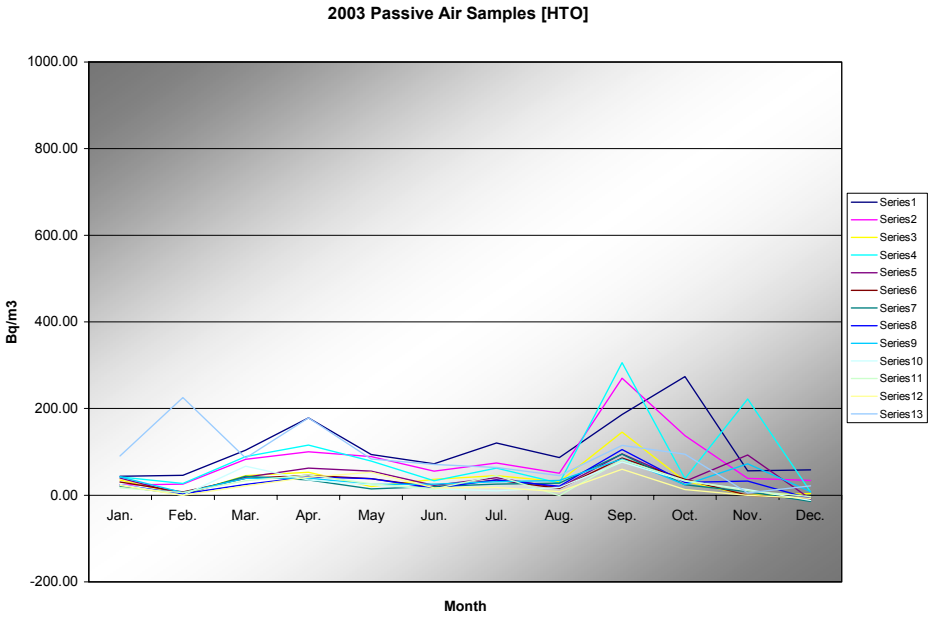
Appendix A: Environment Monitoring Program

Appendix B: Stack Emission Analysis Results

Appendix A: Environment Monitoring Program

2003 Passive Air Sampler Results												
	(Bq/m3)											
Sampler	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	43.8	45.7	104	178	93.8	72.7	120	86.4	186	274	56.3	58.4
2	23.1	25.7	82.8	100	88.8	55.3	74.1	50.7	270	138	38.5	34.0
3	35.0	1.4	44.8	53.3	20.0	36.7	45.3	31.4	146	32.7	0.0	3.8
4	41.9	27.1	89.0	115	78.8	33.3	62.4	27.9	306	38.2	222	7.6
5	40.0	2.1	41.4	62.7	55.6	22.7	40.6	17.1	95.5	31.5	93.3	0.0
6	30.0	7.9	38.6	46.0	38.1	18.7	35.3	15.7	85.8	36.4	*	0.0
7	21.2	2.1	43.4	35.3	15.0	20.0	25.3	27.9	94.2	24.2	8.2	0.0
8	24.4	2.9	24.8	42.0	38.1	16.0	35.3	20.7	106	29.7	32.6	0.0
9	41.9	5.7	38.6	39.3	25.0	25.3	31.2	34.3	83.2	24.2	72.6	8.6
10	25.0	0.0	66.9	35.3	24.4	14.7	10.0	17.9	76.8	32.7	13.3	0.0
11	16.7	5.7	33.1	46.7	26.2	14.7	45.3	0.0	81.3	34.6	9.6	0.0
12	22.5	0.0	21.4	41.3	53.1	16.7	17.6	8.6	60.0	13.3	5.2	0.0
13	90.6	225.	86.2	179	83.8	71.3	64.1	45.0	115	94.6	*	21.6

Note: '*' indicates sample not available for analysis.



2003 SRBT EMP

Vegetation Samples (Bq/L)

Sample #	Sample Description	Q1	Q2	Q3	Q4
0303001A	Zucchini	-	-	180.2	-
0303002A	Cucumber	-	-	24.5	-
0303003A	Tomato	-	-	35.4	-

Milk Samples (Bq/L)

Sample #	Sample Description	Q1	Q2	Q3	Q4
0301001B	Milk	42.9			
0302001B	Milk		42.6		
0303001B	Milk			39.8	
0304001B	Milk				*

Note: '*' denotes no sample as milk samples are submitted during the 3rd quarter of the year.

2003 Effective Annual Public Dose for 'Critical Group'

The calculation method used to determine the dose to the 'Critical Group' as defined in the SRBT Environment Monitoring Program is described in the EMP document.
The dose assessed for the Critical Group is a summation of:

a) Dose due to the tritium exposure deemed to occur at the place of residence for the time period allocated (128 hours/week),
b) Tritium uptake deemed to occur at the worksite (40 hours/week), and
c) Tritium uptake due to consumption of fruit, vegetables and dairy products.

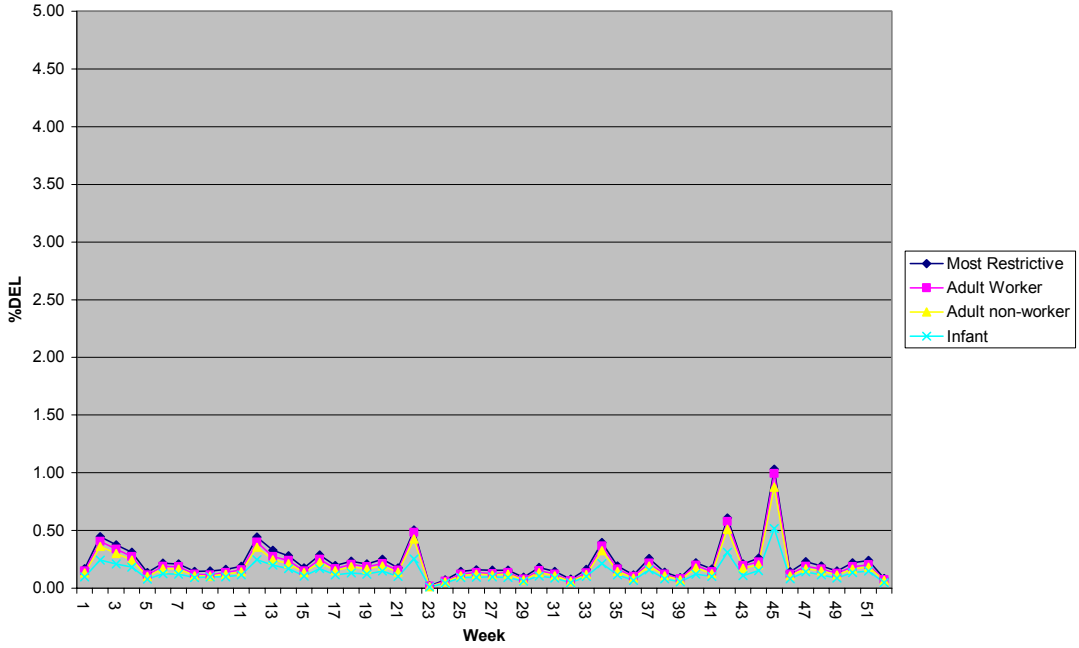
Using the results for the passive air sampler, located at or near 400 Boundary Road, as the place of residence for the critical group, and the average results for each of three passive air samplers (# 1, 2 or 13) that represent work sites near SRBT, the resultant exposure for the critical receptor, the values for dose due to exposure to tritium at each of the sites are as follows:
Using the average tritium concentration for locally grown fruit and vegetables procured from the local market, the annual dose due to tritium uptake by this means is **0.0002 mSv per year**.
Using the average tritium concentration for locally produced milk procured from the local market, the annual dose due to tritium uptake by this means is **0.0002 mSv per year**.

Summing the dose due to tritium uptake from inhalation and immersion in tritium (skin absorption) in the air at or near the home; at the workplace environment; from consumption of locally grown fruit and vegetables and locally produced milk equates to approximately **2.73e-02 mSv during 2003** to a member of the defined critical group as per estimates through the environmental monitoring program.

Appendix B: Stack Emission Analysis Results

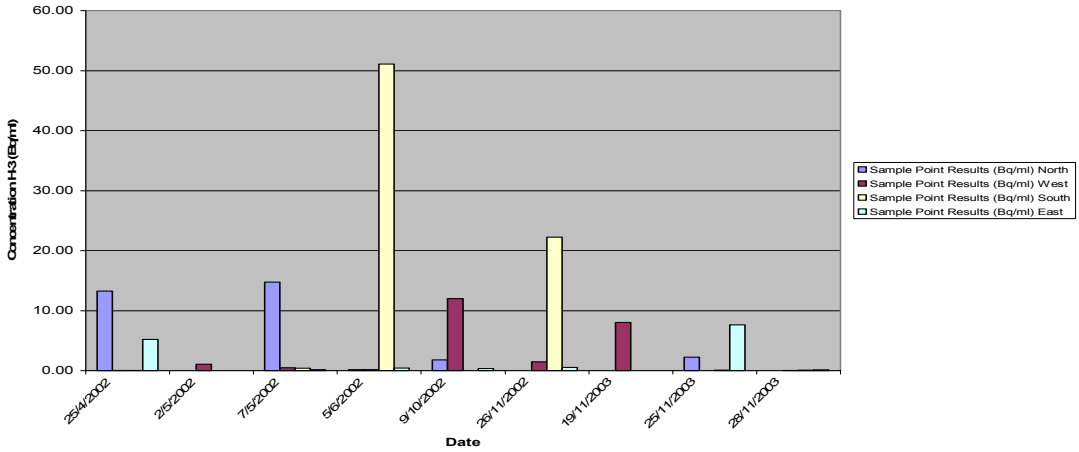
Stack Sampling						
Year: 2003						
Week #	HTO (GBq)	HT (GBq)	Total (GBq)	%DEL		
				Adult Worker	Adult non-worker	Infant
1	597.9	9000.7	9598.6	0.15	0.13	0.10
2	1661.9	18357.0	20018.9	0.41	0.36	0.24
3	1379.3	16973.7	18353.0	0.34	0.30	0.21
4	1083.2	17884.4	18967.6	0.27	0.24	0.18
5	448.1	8574.5	9022.6	0.11	0.10	0.08
6	743.2	12689.3	13432.5	0.19	0.17`	0.13
7	737.9	11209.9	11947.8	0.18	0.16	0.12
8	465.4	10826.2	11291.6	0.12	0.11	0.09
9	412.9	14565.7	14978.6	0.12	0.10	0.10
10	523.5	11361.4	11884.9	0.14	0.12	0.10
11	613.5	13525.3	14138.8	0.16	0.14	0.12
12	1623.8	20386.4	22010.2	0.40	0.36	0.25
13	1051.6	24087.4	25139.0	0.28	0.25	0.20
14	927.0	18855.1	19782.1	0.24	0.21	0.17
15	585.5	11315.5	11901.0	0.15	0.13	0.10
16	980.7	17215.3	18196.0	0.25	0.22	0.17
17	671.0	11626.2	12297.2	0.17	0.15	0.11
18	832.9	12103.7	12936.6	0.21	0.18	0.13
19	741.7	11150.3	11892.0	0.19	0.17	0.12
20	836.8	15844.5	16681.3	0.21	0.19	0.15
21	611.5	10012.1	10623.6	0.15	0.14	0.10
22	2059.2	9707.5	11766.7	0.48	0.43	0.26
23	63.2	1346.2	1409.4	0.02	0.01	0.01
24	227.1	5266.4	5493.5	0.06	0.05	0.04
25	453.2	11327.5	11780.7	0.12	0.11	0.09
26	515.7	11168.4	11684.1	0.13	0.12	0.10
27	469.7	13189.2	13658.9	0.13	0.11	0.10
28	535.9	8854.7	9390.6	0.14	0.12	0.09
29	298.0	7616.7	7914.7	0.08	0.07	0.06
30	592.1	11680.3	12272.4	0.15	0.14	0.11
31	465.8	10254.6	10720.4	0.12	0.11	0.09
32	246.1	6087.9	6334.0	0.07	0.06	0.05
33	495.5	12972.3	13467.8	0.13	0.12	0.10
34	1520.2	13909.8	15430.0	0.37	0.33	0.21
35	639.0	12703.7	13342.7	0.16	0.15	0.12
36	398.1	6426.8	6824.9	0.10	0.09	0.07
37	813.1	19889.6	20702.7	0.21	0.19	0.16
38	471.0	8762.5	9233.5	0.12	0.11	0.08
39	308.7	6158.4	6467.1	0.08	0.07	0.06
40	811.3	9822.8	10634.1	0.20	0.18	0.12
41	545.8	11624.9	12170.7	0.14	0.13	0.10
42	2451.9	13915.7	16367.6	0.58	0.51	0.31
43	829.7	5373.4	6203.1	0.20	0.17	0.11
44	903.8	14943.7	15847.5	0.23	0.20	0.15
45	4246.0	18053.9	22299.9	0.99	0.88	0.52
46	483.0	8487.4	8970.4	0.12	0.11	0.08
47	714.3	18024.4	18738.7	0.19	0.17	0.14
48	648.0	12261.7	12909.7	0.17	0.15	0.11
49	502.8	9501.0	10003.8	0.13	0.11	0.09
50	705.4	15812.4	16517.8	0.18	0.17	0.13
51	780.1	17328.4	18108.5	0.20	0.18	0.15
52	304.8	3760.9	4065.7	0.07	0.07	0.05
Average	808.2	12188.4	Ave. % DRL	0.20	0.18	0.13

2003 DEL's



The SRBT action level for emission of tritium based on stack sampling techniques performed on a weekly basis is 2.5% of the DRL. The DRL is calculated on the regulatory annual public dose limit of 1.0 mSv per year.
The SRBT administrative limit for emission of tritium based on stack sampling techniques performed on a weekly basis is 5.0% of the DRL.
Please note that in the CNSC-issued Class 1B Nuclear Facility license includes documents that refer to dose limits that were in force at the time of implementation. The annual public dose limit at that time was 5.0 mSv per year compared to the present dose limit of 1.0 mSv per year. Therefore, in accordance with the existing public annual dose limit, the action level is 2.5% as compared with 0.5% and the administrative limit is 5.0% as compared with 1.0% of DRL.

Precipitation Monitoring



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