
# 2005 Annual Compliance Report

## NSPFOL-13.00/2005 (Jan. 1, 2000 to Dec. 31, 2005)

## NSPFOL-13.00/2006 (Dec. 1, 2005 to Nov. 30, 2006)


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Approved by: _____
S. Levesque
President

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# 2005 Annual Compliance Report

## NSPFOL-13.00/2005 & 2006

### *Part A*

| | |
|---|---|
| Facility: | **SRB Technologies (Canada) Inc.** |
| License Number: | **NSPFOL-13.00/2005 & NSPFOL-13.00/2006** |
| Owner: | **SRB Technologies Inc.** |
| Reporting Period: | **January 1, 2005 through December 31, 2005** |
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## *Annual Compliance Report Requirement*

During 2005 SRB Technologies (Canada) Inc. operated under Canadian Nuclear Safety Commission issued Nuclear Substance Processing Facility Operating License, NSPFOL-13.00/2005 from January 1 to November 30, 2005. Following the license renewal process, SRB Technologies (Canada) Inc. operated under Canadian Nuclear Safety Commission issued Nuclear Substance Processing Facility Operating License, NSPFOL-13.00/2006 from December 1 to December 31, 2005.

Condition R2 of the Canadian Nuclear Safety Commission issued Nuclear Substance Processing Facility Operating License, NSPFOL-13.00/2005 reads:

*"R2. The licensee shall prepare and submit to the Commission an annual report that describes the operation of the facility in each calendar year, summarizing facility and equipment performance, occurrences described in condition R1, personnel radiation exposures, stack tritium releases, environmental monitoring results, and any changes in the licensee's organizational structure. The annual report shall be submitted by March 31 of the next calendar year."*

Condition 6.4 of the Canadian Nuclear Safety Commission issued Nuclear Substance Processing Facility Operating License, NSPFOL-13.00/2006 reads:

*"6.4 The licensee shall prepare and submit to the Commission or to a person authorized by the Commission by March 31 of each year, an Annual Compliance Report that covers the previous calendar year's operation prepared in accordance with Appendix E to this license."*

# *Part B*

## 1. Operational Review

The facility described in the CNSC-issued Nuclear Substance Processing Facility Operating License; NSPFOL-13.00/2005 and 2006 includes approximately 1186 square meters of a Butler™ building located in a strip mall on the South edge of the city of Pembroke, Ontario. The main product manufactured within the facility is gaseous tritium light sources that are used in gaseous tritium light devices to provide lighting without the requirement for an external source of power such as batteries, household electrical, etc. The gaseous tritium light sources may be placed in device housings that make up such devices as life-safety signs (exit and multi-purpose), safety aisle markers, special service lighting (aircraft dials and panels), special locators (personnel and route markers), and a variety of applicable lighting devices where electrical power supply is not a practical option.
The main focus for radiation safety and protection is the handling of tritium gas. Tritium does not require shielding as the decay of tritium poses only very low energy beta emissions. For the purpose of providing a safe working environment, the facility has several air handling units that provide supply air and protective ventilation.

**EQUIPMENT MAINTENANCE PROGRAM**

The facility air handling units are maintained through contract maintenance and service program with local contractors in conjunction with routine maintenance performed by qualified staff as described in the Tables 1.1 and 1.2 below.

**Table 1.1: Equipment Maintained**

| Qty | Type | Zone | Location |
|---|---|---|---|
| 1 | Heat Recovery unit | 1 | Mold area/Office |
| 2 | Makeup air units | 1 & 2 | Coating room, Assembly room |
| 4 | Exhaust fans | 1 & 2 | Coating, Assembly, Glass room, Paint Booth |
| 1 | HRV with reheat | 2 | Assembly room |
| 2 | Fan coils | 1 | Office, Mold area/Office |
| 2 | Condenser | 1 | Mold area/Office |
| 1 | Mid efficient gas furnace & central air | 1 | Stores |
| 1 | Mid efficient gas furnace | 1 | Receiving |
| 1 | Air handling unit (Rig Room) | 3 | Compound |
| 1 | Air handling unit (Trit Lab) | 3 | Compound |

**Table 1.2: 2005 Equipment Maintenance Information**

| | |
|---|---|
| **Major maintenance carried out in 2005:** | Install velocity cones<br>Replace electric motor and fan |
| **Quarterly Maintenance Schedule:**<br><br><br><br>**Contract:** Kool Temp/ Valley Refrigeration Ltd.<br>**Contract Term:** Feb. 1/2005 to Jan. 31/2006 | Feb. 17/2005<br>June 24/2005<br>October 24/2005<br>January 27/2006 |
| **Report of any weakening or possible failure of any components:** | None |

All ventilation systems have been maintained in fully operational condition with no system failures during 2005.
Equipment maintenance was performed under contract with a fully licensed maintenance and TSSA certified local HVAC contractor.
The contract stipulates quarterly service and maintenance program.
All process equipment is serviced and 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 during 2005.

**Significant Events**

During 2005 there was one significant event that required reporting to CNSC staff. An incident report was submitted to CNSC staff dated July 11, 2005 with respect to release of tritium that exceeded the administrative release limit of 2.5% DRL and also the action level of 5.0% DRL.
The release of tritium in excess of the action level occurred during the period from June 13 to June 20, 2005. The quantity of tritium released was estimated to be 19.52% DRL. The DRL is based on the most exposed member of the public (critical group) and the estimated maximum dose would be expected to be about 3.8uSv.
SRBT implemented corrective action by the revision of the procedure for operating the bulk splitting rig to prevent another occurrence of the same nature.

## 2. Production

In accordance with Section IV of the Nuclear Substance Processing Facility Operating License-13.00/2005 and 13.00/2006, 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) (presently under review).

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 2005 did not exceed 5.44 PBq, well below the possession limit of 11.00 PBq. The month-end tritium activity levels is described in Table 2 below.
At all times, unsealed source material was stored on uranium getter beds or in the handling volumes of the gas filling rigs.

**Table 2: Tritium Activity On-site**

| Month/ 2005 | Month-end H-3 Activity On-site (PBq) |
|---|---|
| January | 3.90 |
| February | 4.41 |
| March | 3.28 |
| April | 3.79 |
| May | 4.50 |
| June | 5.13 |
| July | 5.44 |
| August | 4.69 |
| September | 4.77 |
| October | 4.83 |
| November | 4.16 |
| December | 4.68 |
| ***Average*** | ***4.46*** |

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 2005, SRBT applied for and received 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.
SRBT maintained export licenses for a variety of countries worldwide for the purpose of exporting and supplying GTLS's and GTLD's to customers.

# 3. Modifications

During 2005 there were minor modifications in the SRBT organizational structure.

Historically all SRB safety programs were developed by the Corporate Health Physicist and Health Physics Technician with the use of consultants as required.
In recent months our company has been working diligently to address a number of issues that have been raised by CNSC staff by allocating more internal resources in addition to the increased use of independent third parties and will continue to do so in the future.
Programs are now and will continue to be developed by Members of the Health Physics team with the increased use of third party consultants. The Health Physics team is comprised of the Corporate Health Physicist, Health Physics Technician, General Manager and President. This team will soon be complemented with the hiring of an individual who will have technical expertise capable of further assisting with the continuous improvement of all safety programs. These programs are implemented by SRB's Management and Supervisory staff and audited on a regular basis by the Quality Manager and Quality Assistant who are in turn audited by our quality registrar BSI Management Systems.

During 2005 there were modifications to the operational procedures.

In accordance with CNSC-issued license NSPFOL-13.00/2006, CNSC staff agreed to SRBT proposals to operate under restricted conditions.

These restricted conditions included the following as per section 2.2 of NSPFOL-13.00/2006:

- The processing of tritium shall only occur between the hours of 700 and 1900.
- The processing of tritium shall only occur if the effective stack heights are at least 27.8 meters. The bulk splitting rig shall be operated only if the operator is in the presence of a qualified supervisor.
- The bulk splitting operation shall occur when there is no other tritium gas processing being carried out.
- The pyrophoric uranium tritium traps, excluding the bulk tritium cylinders, shall be loaded with no more than 111,000 GBq of tritium, at any time.
- At any one time, the licensee shall only use one of the following units: the reclamation unit or a betalight production filling rig to process tritium.
- Monthly maintenance of pitot tubes installed in the exhaust stacks performed by a third party.
- Weekly verification of stack exhaust flow rates shall be performed by a third party.
- All calculations related to the stack emissions shall be performed by a third party.
- The licensee shall have all activities related to the Environmental Monitoring Program conducted by a third party.
- The licensee shall submit on a monthly basis, the Environmental Monitoring Program results for the previous month, including all quality assurance and quality control records.
- Maintain a copy of documentation to ensure that the restrictions were followed.

In place of the 1996 DRL, in the license NSPFOL-13.00/2006, CNSC staff imposed a weekly release limit for tritium gas (HT) and tritium oxide (HTO). SRBT modified the weekly emissions monitoring program to indicate releases of HT and HTO as a percent of the weekly release limit.

The following procedures as shown in Table 3.1 were either initiated or revised to comply with the restrictions as proposed to CNSC staff by SRBT:

**Table 3.1: Procedure Changes**

| Procedure ID | Procedure Description | Initiated or Revised |
|---|---|---|
| ENG-005 | Plant Maintenance | Revised |
| ENG-014 | Effective Stack Height | Initiated |
| 400-001 | Tritium Filling of Betalights™ | Revised |
| 450-001 | Bulk Splitter Operation | Revised |
| 450-002 | Reclaim Rig Operation | Revised |
| RSP-024 | PUTT Decommissioning and Management | Initiated |

**Pitot Tubes on Stacks**

SRBT contracted to have new pitot tubes and air velocity meters installed on each of the two exhaust stacks on the main air handling units. The new pitot tubes and air velocity meters were installed in November 2005.
These pitot tubes and air velocity meters provide an accurate indication of the air flow through each of the two main exhaust stacks. The effective operation of the pitot tubes are ensured under a monthly maintenance program.

# 4. Health Physics

### Dosimetry Services

During 2005, SRBT maintained a Dosimetry Service License, DSL-1-1.2/2005 until May 31, 2005. SRBT applied for and received a new license, Dosimetry Service License 11341-3-10.0 for the purpose of providing in-house dosimetry services for the staff of SRB Technologies (Canada) Inc.
Dosimetry results on a quarterly basis were submitted to Health Canada for input to the National Dose Registry for 47 individual staff members.

### Staff Annual Dose Report

During 2005, the maximum dose received by any person employed by SRBT is well within the regulatory limit for a nuclear worker, which is 50.0 mSv per calendar year. The maximum annual staff dose of **3.61 mSv** represents only 7.2% of the annual NEW dose limit.

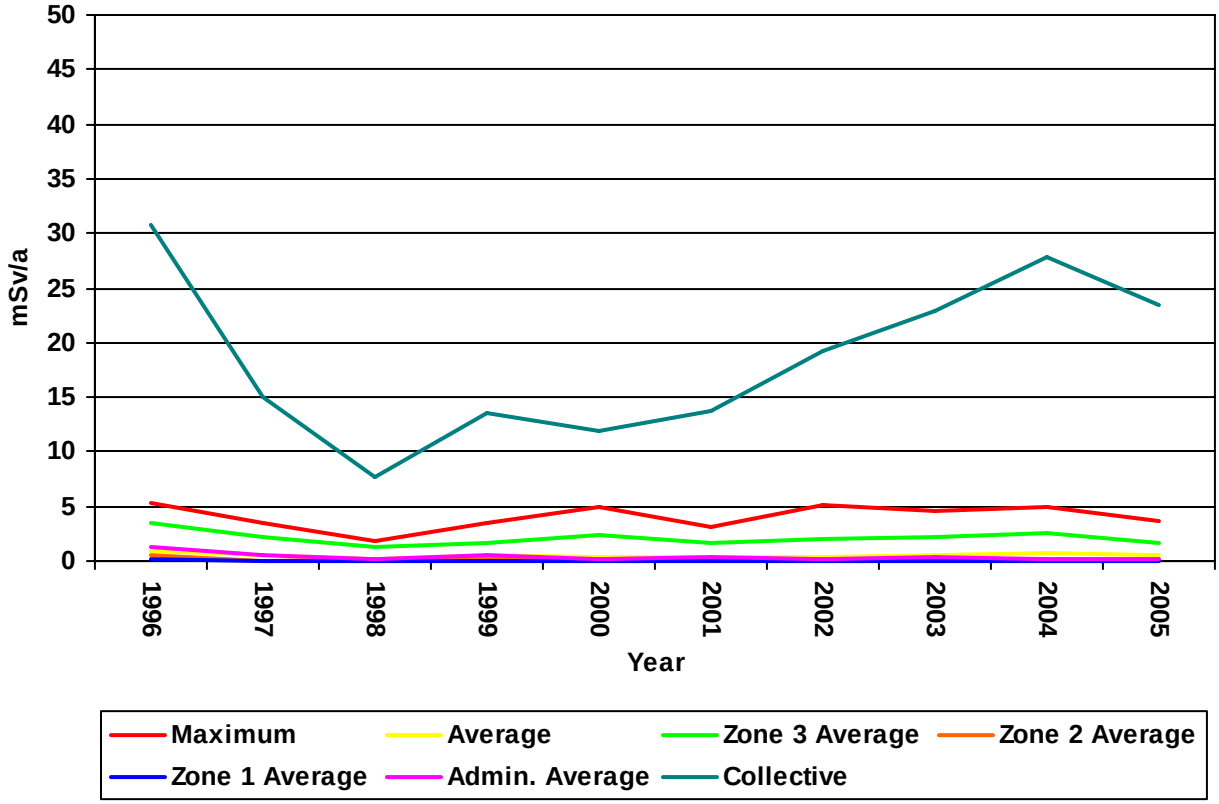
Table 4.1 and Chart 4.1 show the data for staff dose and provide a comparison to dosimetry results for the years 1996 to 2005. The dosimetry results indicate that the trend in Annual Collective Dose has been increasing until 2004 and then decreases in 2005. It is believed that the decommissioning of the oil-sealed high-vacuum pumps has contributed to the reduction in the collective annual effective dose and the Zone 3 and Administrative staff annual average effective dose. Also, to be taken into account is that SRBT ceased production for most of the month of December which would have a downward influence on personnel dose overall.

The effective staff annual effective dose for 2005 indicates a significant downward trend despite an increase in total number of staff members. SRBT strives to achieve ALARA.

**Table 4.1: SRBT Radiological Annual Dose Data (1996 – 2005)**

| Description | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2005 # of Persons | Ave. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Annual Maximum Dose (mSv)** | 5.29 | 3.55 | 1.91 | 3.48 | 4.89 | 3.11 | 5.08 | 4.54 | 4.90 | 3.61 | **1** | **4.04** |
| **Annual Average Dose (mSv)** | 0.88 | 0.52 | 0.24 | 0.46 | 0.38 | 0.29 | 0.40 | 0.55 | 0.67 | 0.50 | **47** | **0.49** |
| **Annual Average Dose Zone 3 (mSv)** | 3.43 | 2.12 | 1.26 | 1.62 | 2.30 | 1.70 | 1.94 | 2.22 | 2.58 | 1.61 | **12** | **2.08** |
| **Annual Average Dose Zone 2 (mSv)** | 0.55 | 0.07 | 0.12 | 0.11 | 0.15 | 0.08 | 0.18 | 0.16 | 0.18 | 0.12 | **11** | **0.17** |
| **Annual Average Dose Zone 1 (mSv)** | 0.17 | 0.08 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.00 | **12** | **0.03** |
| **Annual Average Admin. Dose (mSv)** | 1.26 | 0.61 | 0.17 | 0.60 | 0.12 | 0.31 | 0.11 | 0.39 | 0.24 | 0.12 | **12** | **0.39** |
| **Annual Collective Dose (mSv)** | 30.69 | 15.01 | 7.72 | 13.47 | 11.91 | 13.65 | 19.21 | 22.91 | 27.75 | 23.50 | **47** | **18.58** |
| **Dosimetry Range** | | | | | | | | | | | **Average** | |
| **0.00 – 0.99 mSv/a** | 29 | 23 | 29 | 28 | 33 | 43 | 43 | 39 | 30 | 39 | | **33.6** |
| **1.00 – 1.99 mSv/a** | 0 | 4 | 3 | 4 | 1 | 4 | 2 | 0 | 5 | 3 | | **2.6** |
| **2.00 – 2.99 mSv/a** | 3 | 1 | 0 | 0 | 1 | 1 | 2 | 3 | 2 | 3 | | **1.6** |
| **3.00 – 3.99 mSv/a** | 1 | 1 | 0 | 2 | 1 | 1 | 0 | 2 | 2 | 2 | | **1.2** |
| **4.00 – 4.99 mSv/a** | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 0 | | **0.6** |
| **> 5.00 mSv/a** | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | **<1.0** |
| **> 50.00 mSv/a** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | **0.0** |
| **Staff Members (no.)** | 36 | 29 | 32 | 34 | 37 | 49 | 48 | 45 | 41 | 47 | | **39.8** |

**Chart 4.1: SRBT Radiological Annual Dose Data (1996 – 2005)**




**Administrative Staff Dose Limit Excedences**

During 2005 there were no instances whereby a staff member's tritium body burden exceeded the administrative limit of 1000 Bq/mL. There was one case whereby one member of staff exceeded 500 Bq/ml. Resampling was performed to validate the initial result.

**Derived Release Limit Review**

In a letter from CNSC staff dated April 18, 2005 following a meeting between CNSC staff and SRB held on March 21, 2005 CNSC staff stated that it was necessary that SRB revise the DRL.

SRB supplied CNSC staff a detailed review by ECOMETRIX INC. on September 30, 2005. In this review ECOMETRIX INC. concluded that the existing DRL's were "defensible, and may in fact be justifiably increased".

CNSC's staff concluded that the ECOMETRIX INC. review and our proposal which was supplied on November 3, 2005 was unacceptable and did not meet staff expectations. The review supplied by CNSC staff provided much detail of what is expected by CNSC staff.

A productive meeting was held on November 18, 2005 between SRB, CNSC staff and ECOMETRIX INC. to discuss CSNC staff expectations and a path forward. During this meeting it was discussed that CSNC staff had the objective of not just a DRL but a greater objective of protecting the environment and the public for possible conditions at present and into the future and provide more transparency to allay public concerns.

This DRL will be completed by January 31, 2006 and supplied to CNSC staff for review.

In August, 2005, SRBT discovered that two errors existed in the Excel workbook for calculating weekly DRL. One error pertained to the quantity of air sampled. The error posed a 10X factor that indicated a lower than the true result. The other error was due to the use of the DRL value for HT for an Adult Non-worker rather than the value for an Adult Worker. This error created an underestimation in effective dose for the Adult worker at a value of 3%. A report of the errors was immediately reported to CNSC staff by fax on August 25, 2005.

# 5. Environmental and Radiological Compliance

## Environment Monitoring Program Data

### Passive Air Samplers ($P_{(i)19}$ & $P_{(e)19}$)

SRBT revised the Environmental Monitoring Program for July of 2005. The revision presented 41 passive air samplers versus the previous compliment of 13 samplers. The passive air sampling array was set up to cover the 8 compass sectors at distances of 250, 500, 1000 and 2000 meters from the facility. Several other passive air samplers from the previous array remained in place to take account of the described critical group.

Data from the Environmental Monitoring Program are shown in Table 5.1.
In the tables, any sample result designated as '0' is a result that is less than the detectable limit of 1Bq/$m^3$. The use of '0' enables the inclusion for calculating the result in the column and the row in the MS Excel program. Results for individual sample positions are shown as well including trend lines.
During Nov. and Dec. passive air samples were evaluated by AECL-CRL laboratories, with a detectable limit of 0.20 Bq/m3.

**Loss of Data**
There was no loss of passive air sampling data for the passive air monitoring during 2005.

**LLD (lower limit of detection)**
The lower limit of detection for passive air monitoring results analyzed by SRBT is 1.0 Bq/$m^3$.
The LLD for AECL-CRL analysis of passive air samples is 0.20 Bq/m3.

### Forage and Crops ($P_{49}$) Data

Included in Table $P_{49}$ are the tritium concentration results of produce (forage and crops) samples locally grown (critical group location and local market) and locally processed milk.
All produce and milk samples were analyzed by a laboratory approved for use by CNSC staff.
Several samples of each of zucchini, cucumber and tomato were submitted for analysis as market supplied produce.
Produce samples were submitted from several gardens located on residential properties at or near the location of the critical group.

### Animal Produce ($P_{59}$) Data

Dairy samples were purchased from a local supplier which represents the usual consumption habits of the area.
The dairy product identifiers (Sample #) indicate the year, the quarter and the designation of sample submitted.

### Well Water ($P_{29}$)

Well water was not a pathway that was considered in the 1996 DRL calculations; however, it will be considered in the 2006 DRL calculations. SRBT sampled several wells located near the facility. The wells that were sampled were used to assess the concentration of tritium for the ingestion pathway, $P_{29}$. The dose due to consumption of well water is calculated into the dose calculation for the member of the critical group.

### EMP versus Stack Monitoring Data

SRBT had reviewed the EMP and Stack Monitoring data and in discussion with CNSC staff members agreed that the ratios had a tendency to be at about 10X. The EMP results indicated a greater annual effective dose to the critical group than did the weekly DRL assessments. For 2005 a comparison of the EMP and Stack Monitoring data indicates approximately 3 to 1 ratio.
It was observed that the Passive Air Sampler results may have been indicating higher than true values due to elevated levels of tritium in the sample preparation materials.
The observation was obvious when Atomic Energy of Canada, Limited, Chalk River Laboratory results were first issued for the sampling of the passive air samples.

### Good Laboratory Practices

During the sampling of the Passive Air Monitoring system good laboratory practices were employed to ensure that samples are not subject to cross contamination and are properly identified.
SRBT has contracted a third party for the management of the Passive Air Samplers until such time as the elevated background results can be resolved.

### Emissions and EMP Data Discussion

#### Passive Air Samplers (PAS)

The following samplers are included in the passive air sampler array for the EMP:
**PAS #1** is located approximately 94.1 meters west of the point of release and represents the potential exposure to HTO by the adult worker at BOC Gases for a 2000 hour work year.
**PAS #2** is located approximately 52.8 meters SW of the point of release and represents the potential HTO exposure for the adult worker at Med-Eng for a 2000 hour work year.
**PAS #3** is located near the Pem-Ice II arena and represents the potential exposure to HTO for the adult worker.
**PAS #4** is located 222 meters north-west of the point of release and represents the critical group for the adult non-worker, worker and infant which are located 240 meters North West of the point of release.
**PAS #5** is located near the municipal sand and salt storage building on International Street and represents the potential HTO exposure for the adult worker at that facility.
**PAS #6** is located near the Irving Big Stop at the corner of the Trans Canada and Paul Martin Drive and represents the potential exposure to HTO for the adult worker.
**PAS #7** is located at 209 Market Street and represents the potential HTO exposure for the adult non-worker, worker and/or infant.
**PAS #8** is located on Boundary Road 1050 meters from the point of release and represents the potential exposure to HTO for the adult non-worker, worker and infant.
**PAS #9** is located at the KI Pembroke facility and represents the potential HTO exposure for the adult worker.
**PAS #10** is located at a residence in the Alice Fraser Township 6.7 kilometers south-west of the point of release and represents the potential exposure to HTO for the adult non-worker, worker and adult. This sample point is located in a direction normally out of the prevailing wind directions and effectively downwind and approximately the same distance as the SRBT facility from another CNSC licensee and therefore was considered as the background value.
**PAS #11** is located 356 meters south of the point of release near the Renfrew County Health Unit building on International Street and represents the potential exposure to HTO for the adult worker.
**PAS #12** is located at the Saar Dairy Farm 1450 meters South West of the point of release and represents the potential exposure to HTO for the adult worker, worker and infant at that residence.

**PAS #13** is located approximately 61.5 meters south of the point of release and represents the potential exposure to HTO for the adult worker at the Brewers' Edge.

**PAS #1, 2, 3, 5, 6, 9, 11, and 13** all represent the workplaces for the adult workers for a 2000-hour work year.
**PAS #4, 7, 8, 10, and 12** represent the adult non-worker, worker and infant at the place of residence. The adult non-worker and infant occupy these points for 8400 hours per year whereas the adult worker occupies these points for 6400 hours per year based on 50 weeks per year.

### Revised EMP & Passive Air Sample Array

A new array for the Passive Air Samplers was instituted commencing in July 2006. The revised array was set up to cover 8 sectors at distances from the facility of 250, 500, 1000, and 2000 kilometers; plus several of the sampling positions from the previous array remain in place as indicators for the assessment of the critical group as defined in the 1996 DRL calculations. Including samples for QA/QC assessment there are 41 passive air samplers in place and changed out on a monthly basis. The QA/QC elements include duplicate samplers at various sample points, samplers at distant locations from the facility, and a trip blank which is prepared with and placed with a sample at a distant location. These samples are changed out on a monthly basis.

SRB evaluated the program and improved the analytical counting procedures.

On our own accord, to address public concerns SRB decided to incorporate sampling of local wells, pools and urine supplied by members of the public into the EMP.

### Critical Group Annual Dose Due to Inhalation ($P_{(i)19}$) and Skin Absorption ($P_{(e)19}$) of HTO

The results of the monthly passive air monitoring sampling are each averaged for the year. The results of Pas # 1, 2, and 13 are averaged and used to express the average HTO in air concentration at the work place for the adult worker for a 2000 hour work year. The HTO inhaled and absorbed is determined by the average breathing rate, occupancy time and HTO in air concentration at that place.
The HTO absorbed through the skin is taken as the same as the value for inhalation.
The result for PAS #4 is used to express the HTO in air concentration for the place of residence for the adult worker, the adult non-worker and the infant. The HTO inhaled and absorbed is determined by such factors as the breathing rates, occupancy time and HTO in air concentration.

### Contract Laboratory Services

#### Ontario Power Generation

SRB Technologies (Canada) Inc. has entered into contract with Ontario Power Generation Health Physics Laboratories to analyze produce and dairy samples submitted for the Environmental Monitoring Program. The OPG report indicates the $L_d$ for tritium analysis, the QC result for the expected value for NIST traceable reference standards used in the analysis, and the acceptable QC range for sample analysis results reporting.

#### Atomic Energy of Canada, Limited/ Chalk River Laboratories

SRB Technologies (Canada) Inc. has entered into contract with Atomic Energy of Canada, Limited, Chalk River Laboratories for the supply of passive air sampler materials, routine change out of samples, analysis of the samples and provision of reports on analysis.

**Passive Air Sampler Results Assessments**

It can be seen in the November and December values that the activity concentrations in all passive air samplers has dropped significantly. SRBT has reviewed the information and has compared the results to the previous analysis results.
A conclusion that has been made is that there has been an influence on the background sample results as well as the other passive air sample results giving an increase in the detected tritium oxide in air concentration. The cause of the increase in tritium oxide concentration is believed to be a result of the storage of certain components used in the preparation of the environmental samples. Such components as the demineralized water and the polyethylene vials have been stored on sight for a few years and have been exposed to ambient levels of tritium in air within the facility.
SRBT has contracted an outside agency to provide the sampling equipment and the analysis until such time as the issue of elevated background can be overcome.

It was observed that the tritium oxide in air concentrations for sampler 3 in the month of May and 13 in the months of March and May, 2005 indicated higher than usual levels. These samples were reanalyzed to assure the results were correct. The results do not reflect the results from other samplers nor do they reflect the emissions assessments for that time period.

**Quality Assurance and Quality Control**

The quality assurance for the revised passive air sampling array of the Environmental Monitoring Program has included duplicate samples at various sampling points. There are duplicate passive air samplers at the NW, NE, SW, and SE sectors at 250 meters from the facility. There are duplicate passive air samplers at the sample point located 5690 meters to the SW of the facility.

The analysis has been performed by AECL-CRL commencing in November of 2005 and the QA/QC programs are to be submitted to CNSC staff in 2006.

SRBT has been analyzing the samples as a method of comparing sample analysis results. This information should be available in 2006.

All liquid scintillation counting is performed in accordance with the SRBT LSC-QA program document. The QA data obtained during liquid scintillation counting has not indicated abnormal results for background and reference standard evaluations compared to the analyses criteria requirements.

In collaboration with contract laboratories, SRBT will have the opportunity to perform research into the causes for the elevated background results observed in the passive air sampling. Through intercomparison analysis SRBT will be able to show that sampling analysis methods are acceptable for environmental monitoring assessments.

**2005 EMP Passive Air Sampler Graphical Representation**

The following table and graphs show the HTO concentrations at each of the sampling points as described in the SRBT EMP during the year 2005.

**MDA (minimum detectable activity)**
The MDA as determined statistically for the months January through October is 1.0 Bq/$m^3$. The MDA as reported by AECL-CRL for the analysis performed for the months of November and December is 0.2 Bq/$m^3$.

The graphs also indicate the trending by way of trend lines.

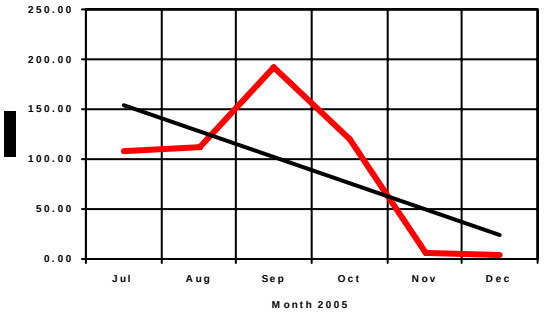
The table and graphs on the following pages show the results of the environmental monitoring program as it was amended in July 2005. The table and graphs indicate the use of the sample positions from the Passive Air sampling array which took into account the locations of the member of the critical group as defined in the 1996 DRL calculations. In July 2005 a revised Passive Air sampling array was introduced which ranges in distances in 8 sectors from 250 meters to 2000 meters from the facility. Several Passive Air samplers remained from the previous array including Passive Air sampler number 1, 2, and 13. Passive Air sampler number 4, 8, and 12 are incorporated into the revised array.

Passive Air samplers were positioned at distances ranging from 6690 meters to 16000 meters from the facility. These Passive Air samplers are used to help determine if there exists any possible influence other than the SRBT facility.

## Table5.1: $P_{(i)19}$ and $P_{(e)19}$: 2005 Passive Air Sampler Results

| 2005 Environment Monitoring Program<br>Passive Air Sampling System | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Bq/m3) | | | | | | | | | | | | | Average |
| Sampler No. | Sampler ID | Location | Dist. to SRBT | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov* | Dec** | (Bq/m3) |
| 1 | N250 | N 45º 48.486' W 077º 07.092' Elev. 137m | 322m | | | | | | | 107.4 | 111.4 | 191.6 | 119.4 | 5.8 | 3.4 | **89.8** |
| 2 | N500 | N 45º 48.572' W 077º 07.008' Elev. 134m | 493m | | | | | | | 104.1 | 102.1 | 130.8 | 95.1 | 18.9 | 3.4 | **75.7** |
| 3 | N1000 | N 45º 48.869' W 077º 06.997' Elev. 135m | 1040m | | | | | | | 92.2 | 74.0 | 108.6 | 92.5 | 2.1 | 1.6 | **61.8** |
| 4 (PAS #4) | NW250 | N 45º 48.412' W 077º 07.189' Elev. 137m | 222m | 108.2 | 38.8 | 51.7 | 101.9 | 106.0 | 15.3 | 104.3 | 123.1 | 235.9 | 115.5 | 6.8 | 4.2 | **84.3** |
| 5 | NW500 | N 45º 48.577' W 077º 07.382' Elev. 134m | 615m | | | | | | | 95.7 | 101.5 | 143.7 | 101.3 | 2.8 | 3.4 | **74.7** |
| 6 (PAS # 8) | NW1000 | N 45º 48.754' W 077º 07.599' Elev. 130m | 1050m | 81.5 | 17.5 | 39.2 | 66.7 | 10.3 | 4.0 | 115.6 | 8.9 | 117.9 | 98.3 | 2.2 | 1.7 | **47.0** |
| 7 | NW2000 | N 45º 49.141' W 077º 08.090' Elev. 139m | 2000m | | | | | | | 117.8 | 81.4 | 101.3 | 117.1 | 16.9 | 1.4 | **72.6** |
| 8 | W250 | N 45º 48.300' W 077º 07.323' Elev. 138m | 297m | | | | | | | | 110.3 | 108.7 | 129.1 | 14.6 | 5.2 | **73.6** |
| 9 | W500 | N 45º 48.288' W 077º 07.393' Elev. 137m | 389m | | | | | | | | 85.5 | 105.4 | 120.9 | 16.5 | 4.0 | **66.5** |
| 10 | W1000 | N 45º 48.306' W 077º 07.630' Elev. 134m | 691m | | | | | | | | 97.2 | 96.0 | 101.3 | 2.1 | 3.3 | **60.0** |
| 11 | SW250 | N 45º 48.251' W 077º 07.204' Elev. 136m | 183m | | | | | | | 110.3 | 121.0 | 105.9 | 115.1 | 11.5 | 2.4 | **77.7** |
| 12 | SW500 | N 45º 47.896' W 077º 07.307' Elev. 148m | 839m | | | | | | | 117.8 | 75.4 | 100.3 | 96.5 | 12.1 | 0.5 | **67.1** |
| 13 | SW1000 | N 45º 47.599' W 077º 07.543' Elev. 149m | 1470m | | | | | | | 122.6 | 78.9 | 107.3 | 93.3 | 0.3 | 0.5 | **67.2** |
| 14 | SW2000 | N 45º 47.408' W 077º 07.866' Elev. 155m | 2110m | | | | | | | 147.1 | 76.2 | 92.5 | 94.8 | 0.2 | 0.3 | **68.5** |
| 15 | S250 | N 45º 48.129' W 077º 07.014' Elev. 131m | 356m | | | | | | | | 86.8 | 113.1 | 199.0 | 9.3 | 8.7 | **83.4** |
| 16 | S500 | N 45º 48.029' W 077º 07.110' Elev. 143m | 532m | | | | | | | 106.0 | 83.5 | 98.3 | 106.8 | 14.1 | 2.2 | **68.5** |
| 17 (PAS # 12) | S1000 | N 45º 46.466' W 077º 07.441' Elev. 158m | 1450m | 72.6 | 22.1 | 20.0 | 59.1 | 2.7 | 1.0 | 121.3 | 78.5 | 83.7 | 91.9 | 0.2 | 0.3 | **46.1** |
| 18 | SE250 | N 45º 48.251' W 077º 07.204' Elev. 136m | 365m | | | | | | | 111.1 | 104.3 | 50.2 | 165.5 | 7.0 | 8.7 | **74.5** |
| 19 | SE500 | N 45º 48.108' W 077º 06.783' Elev. 123m | 554m | | | | | | | 105.0 | 95.5 | 128.2 | 118.6 | 5.7 | 5.2 | **76.4** |
| 20 | SE1000 | N 45º 47.894' W 077º 06.501' Elev. 120m | 1090m | | | | | | | 103.6 | 74.1 | 99.8 | 109.6 | 2.0 | 1.6 | **65.1** |
| 21 | SE2000 | N 45º 47.505' W 077º 05.978' Elev. 137m | 2080m | | | | | | | 119.0 | 77.6 | 101.2 | 95.5 | 10.1 | 0.9 | **67.4** |
| 22 | E250 | N 45º 48.234' W 077º 06.807' Elev. 131m | 401m | | | | | | | 109.4 | 113.0 | 141.4 | 156.3 | 23.2 | 5.9 | **91.5** |
| 23 | E500 | N 45º 48.333' W 077º 06.693' Elev. 132m | 520m | | | | | | | 102.0 | 96.0 | 104.1 | 126.3 | 7.3 | 3.1 | **73.1** |
| 24 | E1000 | N 45º 48.303' W 077º 06.260' Elev. 143m | 1080m | | | | | | | 99.3 | 89.9 | 117.1 | 104.9 | 21.0 | 1.5 | **72.3** |
| 25 | NE250 | N 45º 48.251' W 077º 07.204' Elev. 136m | 198m | | | | | | | 130.4 | 154.4 | 115.3 | 176.0 | 4.1 | 19.5 | **100.0** |
| 26 | NE500 | N 45º 48.421' W 077º 06.732' Elev. 131m | 508m | | | | | | | 95.1 | 86.9 | 89.5 | 133.9 | 2.1 | 5.2 | **68.8** |
| 27 | NE1000 | N 45º 48.683' W 077º 06.441' Elev. 148m | 1100m | | | | | | | 84.0 | 90.8 | 97.7 | 98.9 | 12.3 | 2.6 | **64.4** |
| 28 | NE2000 | N 45º 49.116' W 077º 05.843' Elev. 156m | 2200m | | | | | | | 12.8 | 75.1 | 88.7 | 89.8 | 5.1 | 1.8 | **45.5** |
| **Pre-Sample Points** | | | | | | | | | | | | | | | | | |
| BOC Gas (PAS #1) | | N 45º 48.287' W 077º 07.123' Elev. 129m | 94.1m | 108.2 | 197.1 | 110.8 | 181.0 | 175.7 | 160.7 | 120.4 | 289.7 | 155.7 | 192.4 | 10.4 | 2.5 | **142.0** |
| Brewer's Edge (PAS #2) | | N 45º 48.325' W 077º 07.132' Elev. 132m | 52.8m | 156.3 | 37.9 | 103.3 | 168.6 | 162.2 | 83.3 | 103.5 | 133.8 | 344.4 | 194.9 | 45.6 | 9.1 | **128.6** |
| Med-Eng (PAS #13) | | N 45º 48.262' W 077º 07.093' Elev. 132m | 61.5m | 88.2 | 41.3 | 377.5 | 179.1 | 338.9 | 140.0 | 132.1 | 235.1 | 218.1 | 329.8 | 16.1 | 8.2 | **175.3** |
| **Replicates** | | | | | | | | | | | | | | | | | |
| 4-2 | NW250 | N 45º 48.412' W 077º 07.189' Elev. 137m | 222m | | | | | | | | | 238.7 | 118.4 | 7.3 | 4.5 | **92.2** |
| 11-2 | SW250 | N 45º 48.251' W 077º 07.204' Elev. 136m | 183m | | | | | | | | | 100.8 | 118.2 | 9.9 | 2.2 | **57.8** |
| 18-2 | SE250 | N 45º 48.251' W 077º 07.204' Elev. 136m | 365m | | | | | | | | | 146.1 | 168.6 | 18.8 | 8.2 | **85.4** |
| 25-2 | NE250 | N 45º 48.251' W 077º 07.204' Elev. 136m | 198m | | | | | | | | | 109.9 | 179.3 | 9.9 | 22.5 | **80.4** |
| **Background Samples** | | | | | | | | | | | | | | | | | |
| Maika (PAS # 10) | SW | N 45º 46.367' W 077º 11.447' Elev. 149m | 6690m | 75.6 | 17.5 | 32.5 | 52.4 | 10.3 | 2.7 | 130.6 | 80.1 | 86.0 | 108.3 | 4.7 | 0.2 | **50.1** |
| Maika | Duplicate | Same as above | | | | | | | | | | 102.9 | 113.3 | 0.5 | 0.2 | **54.2** |
| Fitzpatrick | SE | N 45º 44.818' W 076º 59.822' Elev. 159m | 11400m | | | | | | | | 94.4 | 73.7 | 103.5 | 0.5 | 0.2 | **54.4** |
| Petawawa | NW | N 45º 51.497' W 077º 12.828' Elev. 149m | 9480m | | | | | | | 103.7 | 100.2 | 90.2 | 92.6 | 2.8 | 0.5 | **65.0** |
| Farm | NE | N 45º 53.071' W 076º 56.768' Elev. 142m | 16000m | | | | | | | | 78.1 | | 91.3 | 4.7 | 1.0 | **43.8** |
| **Samplers from Previous Array** | | | | | | | | | | | | | | | | | |
| PAS-3 | | | | 92.6 | 25.8 | 59.2 | 91.4 | 769.2 | 36.0 | | | | | | | **179.0** |
| PAS-5 | | | | 97.0 | 30.4 | 41.7 | 60.0 | 14.1 | 3.3 | | | | | | | **41.1** |
| PAS-6 | | | | 83.0 | 31.7 | 40.8 | 59.1 | 30.3 | 1.0 | | | | | | | **41.0** |
| PAS-7 | | | | 80.0 | 23.3 | 31.7 | 66.7 | 9.2 | 2.0 | | | | | | | **35.5** |
| PAS-9 | | | | 91.1 | 32.1 | 53.3 | 48.6 | 20.5 | | | | | | | | **49.1** |
| PAS-11 | | | | 85.2 | 25.8 | 39.2 | 62.9 | 22.7 | 1.0 | | | | | | | **39.5** |
| * SRBT samplers and chemicals; AECL analysis | | | | | | | | | | | | | | | | | |
| ** AECL samplers, chemicals and analysis | | | | | | | | | | | | | | | | | |

**N250**

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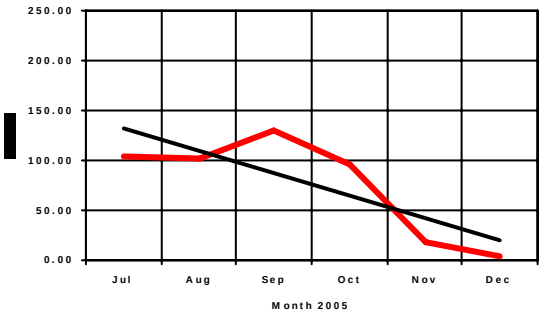


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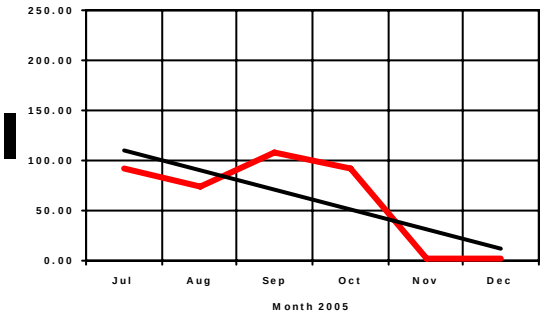


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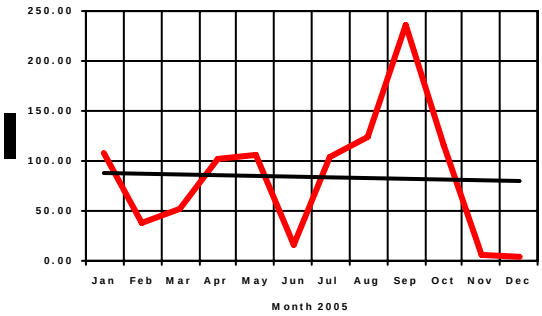


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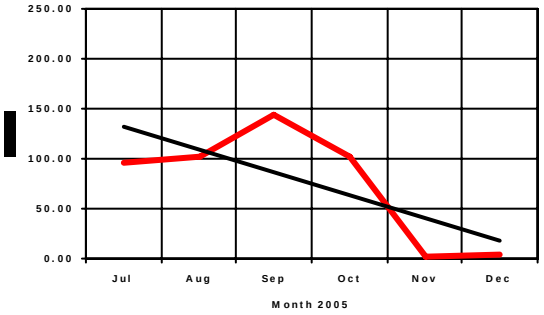
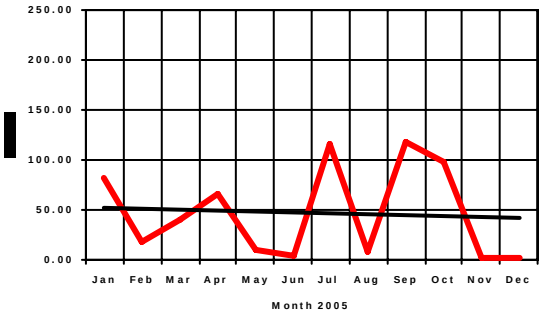



**NW1000 (also previous #8)**

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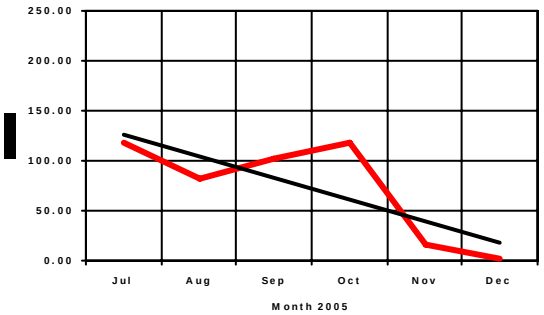


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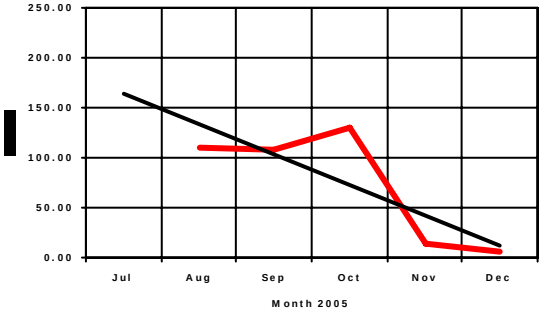

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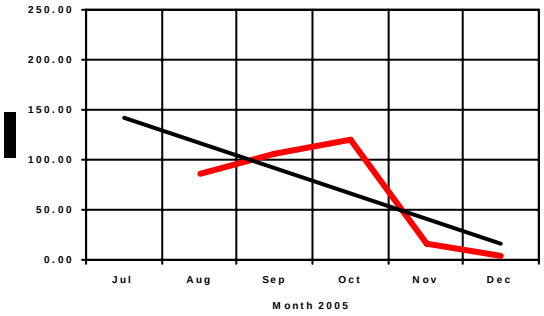


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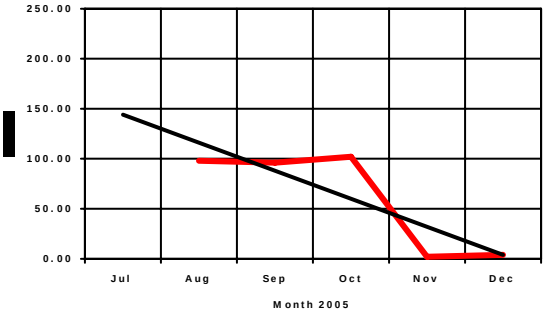


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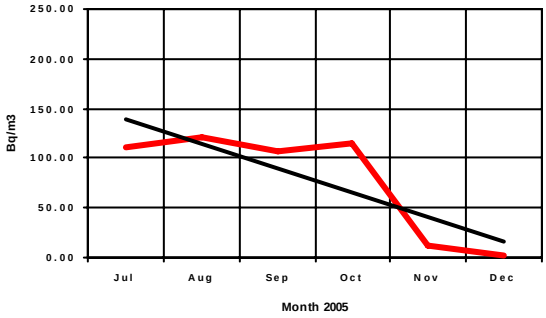


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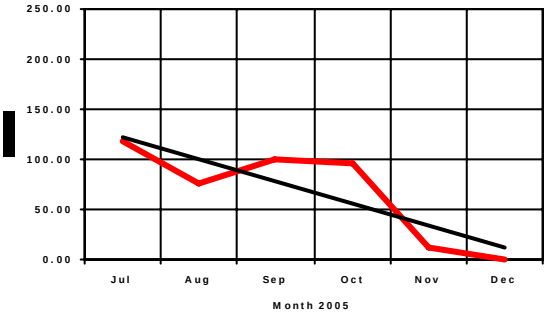


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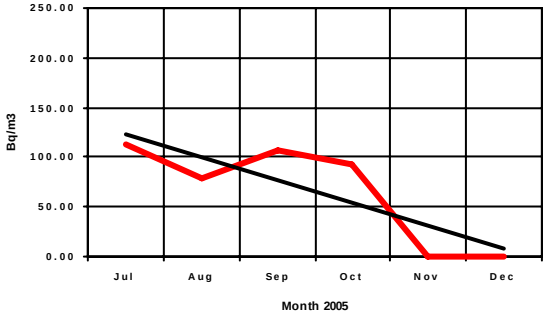


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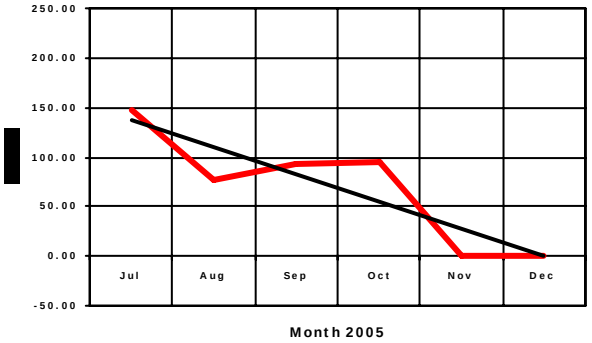


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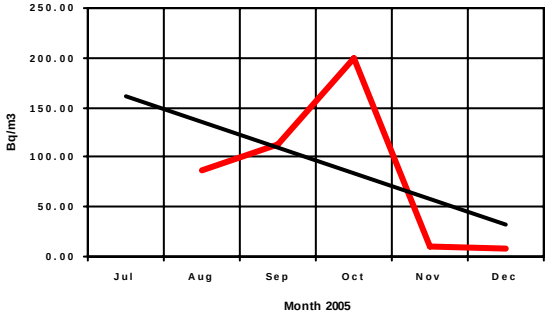


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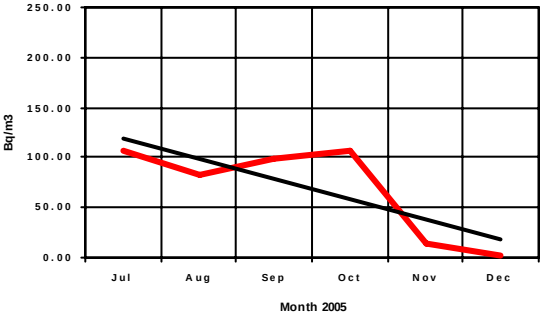

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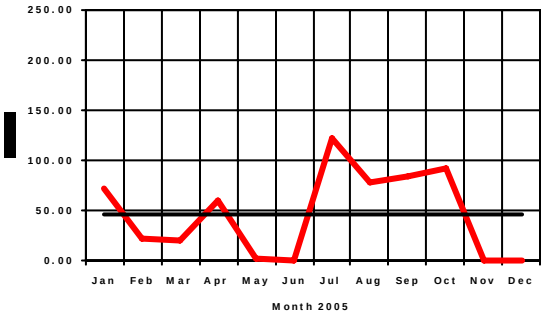


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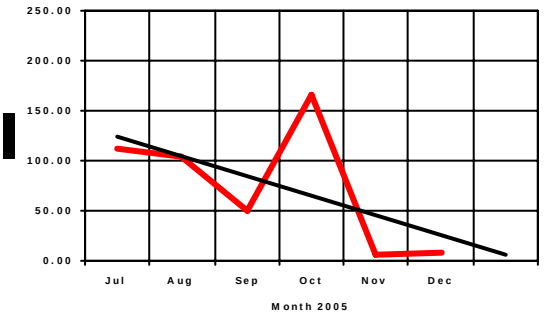


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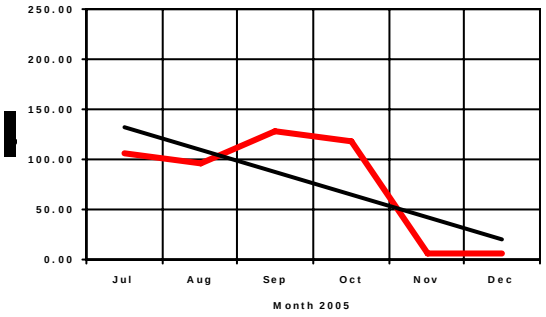


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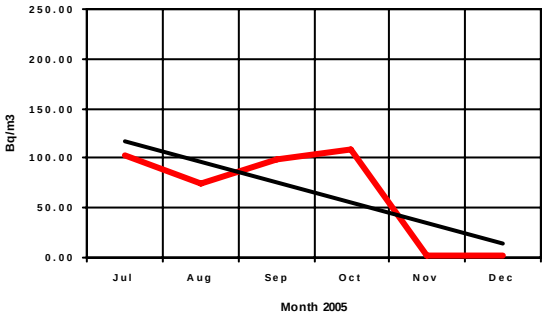
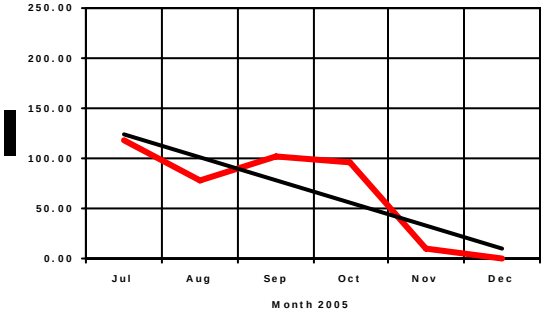



SE2000

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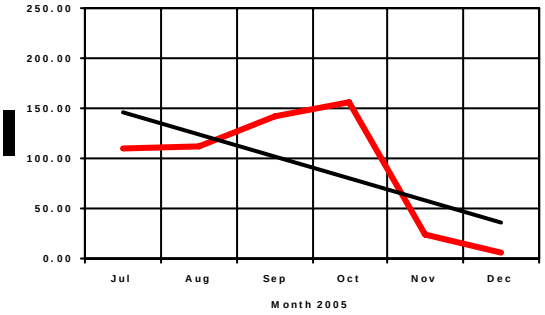


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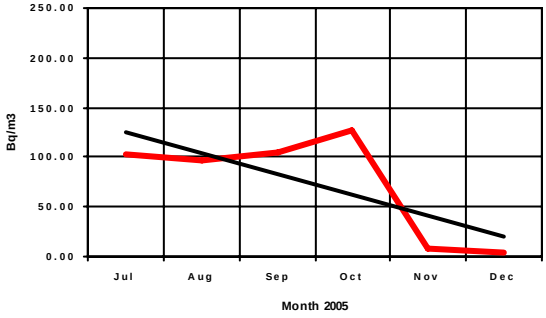


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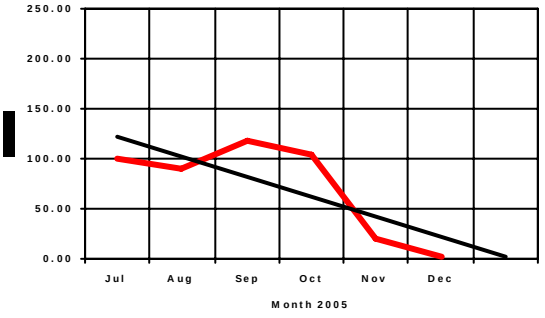

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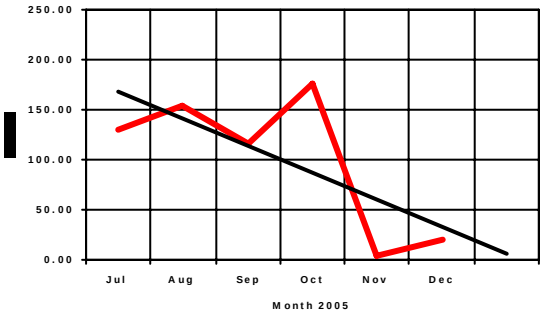


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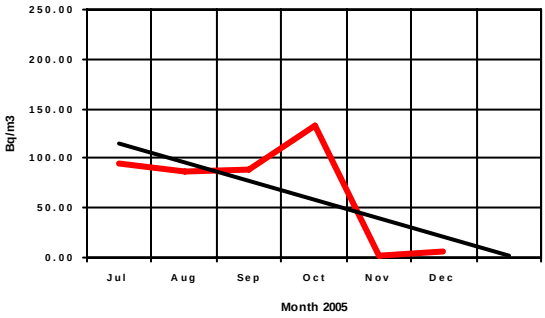


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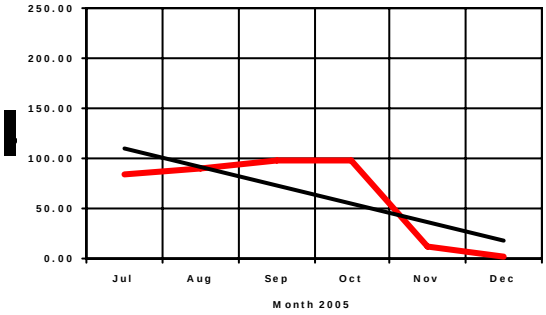


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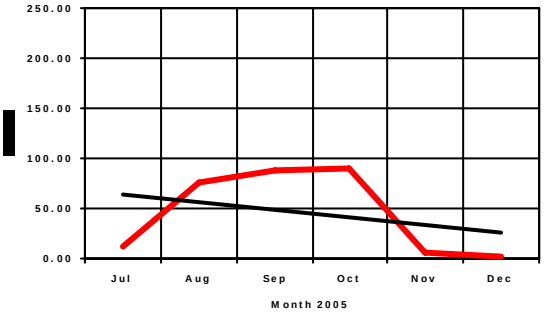
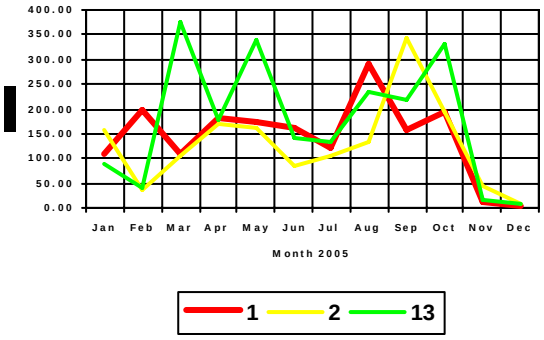
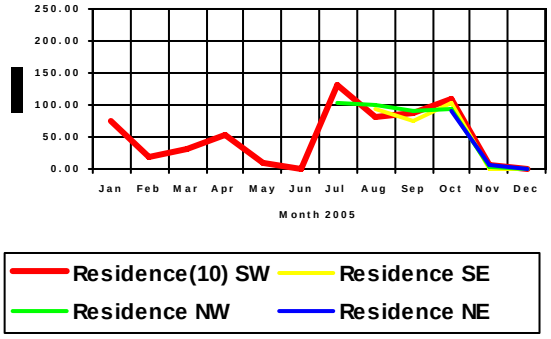


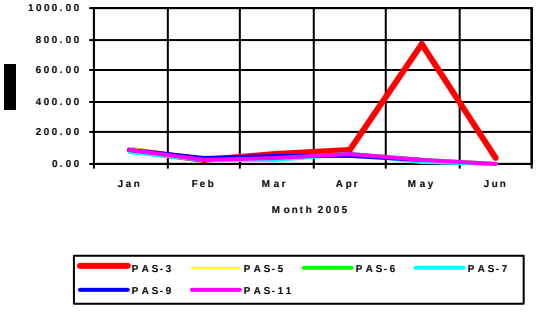

Samplers 1, 2, 13




Background Samples




Passive Air Samplers: Previous Array



**Environmental Monitoring Data for the Years 2000 to 2005**

The following table and graphs show the average HTO concentrations at each of the sampling points as described in the SRBT EMP during the years 2000 to 2005. The graphs also indicate the trending by way of trend line on each graph.

The table and graphs on the following pages show the results of the environmental monitoring program as it was amended in July 2005. The table and graphs indicate the use of the sample positions from the previous sampling array which took into account the locations of the member of the critical group as defined in the 1996 DRL calculations.

It was observed that the tritium oxide in air concentrations for sampler 3 in the month of May and 13 in the months of March and May, 2005 indicated higher than usual levels. These samples were reanalyzed to assure the results were correct. The results do not reflect the results from other samplers nor do they reflect the emissions assessments for that time period.

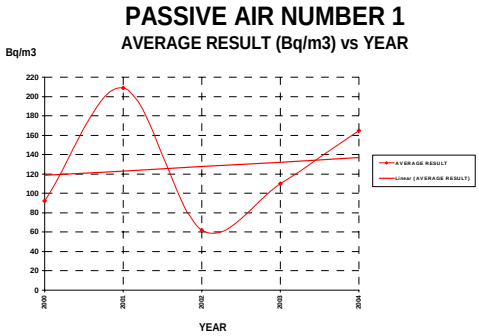
**Table 5.2: Environmental Monitoring Data 2000 to 2005**

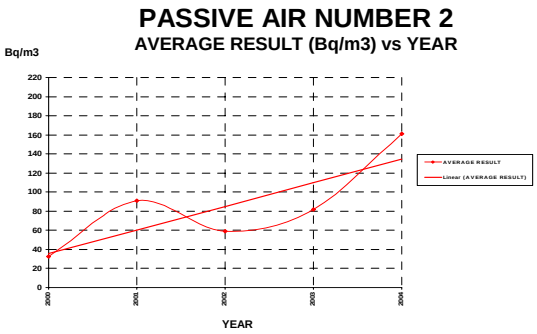
| SRBT | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SRBT Environmental Monitoring Program Results from 2000 - 2005 | | | | | | | | | | | | | | |
| Monitorn | Year | | Analysis Results, Bq/m3 | | | | | | | | | | | |
| # | Monthh | Jan | Feb. | Mar. | Apr | May | Jun. | Jul. | Aug | Sep. | Oct. | Nov | Dec. | Ave. |
| | 2000 | | | 110.8 | | | 101.3 | | | 76.5 | | | 80.0 | 92.2 |
| | 2001 | | | 61.3 | | | 126.2 | | | 164.8 | | | 484.3 | 209.2 |
| | 2002 | <1.0 | <1.0 | <1.0 | 16.0 | <1.0 | 137.9 | | 276.4 | 101.4 | 80.6 | 31.6 | 39.3 | 62.1 |
| | 2003 | 43.8 | 45.7 | 104.1 | 178.0 | 93.8 | 72.7 | 120.6 | 86.4 | 185.8 | 273.9 | 56.3 | 58.4 | 110.0 |
| | 2004 | <1.0 | 33.6 | 45.5 | 138.8 | 230.9 | 252.6 | 263.1 | 409.2 | 52.4 | 76.1 | 370.0 | 107.8 | 165.0 |
| 1 | 2005 | 108.2 | 197.1 | 110.8 | 181.0 | 175.7 | 160.7 | 120.4 | 289.7 | 155.7 | 192.4 | 10.4 | 2.5 | 142.0 |
| | 2000 | | | <1.0 | | | 54.9 | | | 35.5 | | | 39.1 | 32.4 |
| | 2001 | | | 58.5 | | | 130.0 | | | 90.1 | | | 84.2 | 90.7 |
| | 2002 | 24.7 | 28.6 | 11.6 | 42.7 | 14.5 | 242.8 | 63.1 | 74.6 | 49.3 | 85.8 | 18.7 | 52.9 | 59.1 |
| | 2003 | 23.1 | 25.7 | 82.8 | 100.0 | 88.8 | 55.3 | 74.1 | 50.7 | 270.3 | 137.6 | 38.5 | 34.1 | 81.7 |
| | 2004 | 56.0 | 76.8 | 149.7 | 65.0 | 332.6 | 171.9 | 324.4 | 289.2 | 48.7 | 152.3 | 153.5 | 112.2 | 161.0 |
| 2 | 2005 | 156.3 | 37.9 | 103.3 | 168.6 | 162.2 | 83.3 | 103.5 | 133.8 | 344.4 | 194.9 | 45.6 | 9.1 | 128.6 |
| | 2000 | | | | | | 34.8 | | | 18.9 | | | 20.9 | 24.9 |
| | 2001 | | | 22.1 | | | 53.2 | | | 74.7 | | | 90.3 | 60.1 |
| | 2002 | 10.3 | <1.0 | <1.0 | 32.0 | 9.7 | 66.2 | 178.3 | 102.8 | 158.6 | 113.5 | 17.4 | 40.6 | 60.8 |
| | 2003 | 35.0 | 1.4 | 44.8 | 53.3 | 20.0 | 36.7 | 45.3 | 31.4 | 145.8 | 32.7 | <1.0 | 3.8 | 37.5 |
| | 2004 | 7.2 | 19.4 | 38.6 | 8.1 | 33.7 | 126.7 | 121.9 | 199.2 | 11.9 | 102.6 | 62.5 | 87.0 | 68.2 |
| 3 | 2005 | 92.6 | 25.8 | 59.2 | 91.4 | 769.2 | 36.0 | ** | ** | ** | ** | ** | ** | 179.0 |
| | 2000 | | | 131.9 | | | 37.0 | | | 22.8 | | | 34.2 | 56.5 |
| | 2001 | | | 105.3 | | | 128.2 | | | 44.0 | | | 103.6 | 95.3 |
| | 2002 | 24.7 | 22.8 | <1.0 | 48.0 | 10.3 | 82.8 | 59.4 | 33.9 | 88.6 | 90.9 | 16.1 | 34.8 | 42.7 |
| | 2003 | 41.9 | 27.1 | 89.0 | 115.3 | 78.8 | 33.3 | 62.4 | 27.9 | 305.8 | 38.2 | 222.2 | 7.6 | 87.4 |
| | 2004 | 16.0 | 49.0 | 260.0 | 50.0 | 84.0 | 168.9 | 184.4 | 203.9 | 34.1 | 59.4 | 103.0 | 90.4 | 108.6 |
| 4 | 2005 | 108.2 | 38.8 | 51.7 | 101.9 | 106.0 | 15.3 | 104.3 | 123.0 | 235.9 | 115.4 | 6.8 | 4.2 | 84.3 |
| | 2000 | | | | | | <1.0 | | | 5.7 | | | 9.0 | 4.9 |
| | 2001 | | | 13.6 | | | 15.0 | | | 24.2 | | | 30.4 | 20.8 |
| | 2002 | <1.0 | <1.0 | <1.0 | <1.0 | 5.4 | 60.7 | 14.6 | 27.1 | 64.3 | 81.3 | 8.4 | 29.0 | 24.2 |
| | 2003 | 40.0 | 2.1 | 41.4 | 62.7 | 55.6 | 22.7 | 40.6 | 17.1 | 95.5 | 31.5 | 93.3 | <1.0 | 41.9 |
| | 2004 | 33.6 | 67.1 | 34.5 | 5.0 | 48.0 | 91.1 | 74.4 | 97.7 | <1.0 | 43.2 | <1.0 | 134.8 | 52.4 |
| 5 | 2005 | 97.0 | 30.4 | 41.7 | 60.0 | 14.1 | 3.3 | ** | ** | ** | ** | ** | ** | 41.1 |
| | 2000 | | | | | | | | | 12.2 | | | 10.9 | 11.6 |
| | 2001 | | | 13.2 | | | 6.5 | | | 4.4 | | | 19.8 | 11.0 |
| | 2002 | | <1.0 | | <1.0 | <1.0 | <1.0 | 19.4 | 20.4 | 72.8 | 58.1 | 5.2 | 31.0 | 20.7 |
| | 2003 | 30.0 | 7.9 | 38.6 | 46.0 | 38.1 | 18.7 | 35.3 | 15.7 | 85.8 | 36.4 | <1.0 | <1.0 | 29.4 |
| | 2004 | 20.0 | 16.1 | 24.8 | 1.3 | 16.6 | 64.4 | 23.8 | 100.8 | <1.0 | 29.0 | 32.5 | 71.3 | 33.4 |
| 6 | 2005 | 83.0 | 31.7 | 40.8 | 59.1 | 30.3 | <1.0 | | ** | ** | ** | ** | ** | 40.8 |

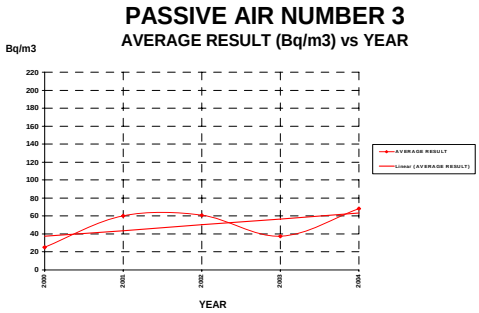
| SRBT | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SRBT Environmental Monitoring Program Results from 2000 - 2005 | | | | | | | | | | | | | | |
| Monitorn | Year | | Analysis Results, Bq/m3 | | | | | | | | | | | |
| # | Monthh | Jan | Feb. | Mar. | Apr | May | Jun. | Jul. | Aug | Sep. | Oct. | Nov | Dec. | Ave. |
| | 2000 | | | <1.0 | | | <1.0 | | | <1.0 | | | <1.0 | <1.0 |
| | 2001 | | | <1.0 | | | 11.0 | | | 4.4 | | | 9.4 | 6.2 |
| | 2002 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 24.3 | <1.0 | 55.7 | 32.9 | <1.0 | 26.4 | 11.6 |
| | 2003 | 21.3 | 2.1 | 43.5 | 35.3 | 15.0 | 20.0 | 25.3 | 27.9 | 94.2 | 24.2 | 8.2 | <1.0 | 26.4 |
| | 2004 | 2.4 | 3.9 | 13.1 | <1.0 | 4.6 | 75.6 | <1.0 | 98.5 | <1.0 | 25.8 | 34.0 | 64.4 | 26.8 |
| 7 | 2005 | 80.0 | 23.3 | 31.7 | 66.7 | 9.2 | <1.0 | ** | ** | ** | ** | ** | ** | 35.1 |
| | 2000 | | | <1.0 | | | <1.0 | | | <1.0 | | | 2.9 | <1.0 |
| | 2001 | | | <1.0 | | | 6.5 | | | 6.6 | | | 29.2 | 10.6 |
| | 2002 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 9.1 | <1.0 | 55.7 | 75.5 | 5.2 | 27.7 | 14.4 |
| | 2003 | 24.4 | 2.9 | 24.8 | 42.0 | 38.1 | 16.0 | 35.3 | 20.7 | 105.8 | 29.7 | 32.6 | <1.0 | 31.0 |
| | 2004 | <1.0 | 5.8 | 31.0 | <1.0 | 2.9 | 105.9 | <1.0 | 107.7 | <1.0 | 30.3 | 34.5 | 74.8 | 32.7 |
| 8 | 2005 | 81.5 | 17.5 | 39.2 | 66.7 | 10.3 | 3.3 | 115.6 | 8.8 | 117.8 | 98.3 | 2.2 | 1.7 | 46.9 |
| | 2000 | | | 15.8 | | | 8.4 | | | 10.2 | | | 10.9 | 11.3 |
| | 2001 | | | 8.7 | | | 19.0 | | | 17.6 | | | 29.6 | 18.7 |
| | 2002 | <1.0 | <1.0 | <1.0 | 5.3 | <1.0 | <1.0 | 36.6 | 13.6 | 67.8 | 55.5 | 7.1 | 40.0 | 18.8 |
| | 2003 | 41.9 | 5.7 | 38.6 | 39.3 | 25.0 | 25.3 | 31.2 | 34.3 | 83.2 | 24.2 | 72.6 | 8.7 | 35.8 |
| | 2004 | 24.0 | 11.0 | 18.6 | <1.0 | 16.6 | 82.2 | 61.3 | 120.8 | <1.0 | 44.5 | 95.0 | 79.1 | 46.1 |
| 9 | 2005 | 91.1 | 32.1 | 53.3 | 48.6 | 20.5 | | ** | ** | ** | ** | ** | ** | 49.1 |
| | 2000 | | | 5.5 | | | 2.6 | | | 3.5 | | | 10.1 | 5.4 |
| | 2001 | | | 3.1 | | | <1.0 | | | <1.0 | | | 8.8 | 3.0 |
| | 2002 | 18.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 9.1 | 33.9 | 67.8 | 56.8 | 13.6 | 22.6 | 18.5 |
| | 2003 | 25.0 | <1.0 | 66.9 | 35.3 | 24.4 | 14.7 | 10.0 | 17.9 | 76.8 | 32.7 | 13.3 | <1.0 | 26.4 |
| | 2004 | 3.2 | <1.0 | 8.3 | <1.0 | 2.9 | 71.9 | <1.0 | 83.9 | <1.0 | 24.5 | 25.5 | 73.0 | 24.4 |
| 10 | 2005 | 75.6 | 17.5 | 32.5 | 52.4 | 10.3 | <1.0 | 130.6 | 80.11 | 86.0 | 108.3 | 4.7 | 0.2* | 49.8 |
| | 2000 | | | <1.0 | | | <1.0 | | | <1.0 | | | <1.0 | <1.0 |
| | 2001 | | | <1.0 | | | 3.8 | | | 4.4 | | | 23.2 | 8.0 |
| | 2002 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 9.2 | 13.6 | 80.0 | 56.8 | 5.2 | 27.7 | 16.0 |
| | 2003 | 16.9 | 5.7 | 33.1 | 46.7 | 26.3 | 14.7 | 45.3 | <1.0 | 81.3 | 34.6 | 9.6 | <1.0 | 26.2 |
| | 2004 | 7.2 | 1.9 | 28.3 | <1.0 | 7.4 | 80.7 | 1.9 | 114.6 | <1.0 | 44.5 | 38.0 | 67.8 | 32.7 |
| 11 | 2005 | 85.2 | 25.8 | 39.2 | 62.9 | 22.7 | <1.0 | ** | ** | ** | ** | ** | ** | 39.3 |
| | 2000 | | | <1.0 | | | <1.0 | | | <1.0 | | | <1.0 | <1.0 |
| | 2001 | | | <1.0 | | | <1.0 | | | <1.0 | | | 19.2 | 4.8 |
| | 2002 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 54.0 | 12.8 | 80.7 | 71.0 | <1.0 | 29.7 | 20.7 |
| | 2003 | 22.5 | <1.0 | 21.4 | 41.3 | 53.1 | 16.7 | 17.7 | 8.6 | 60.0 | 13.3 | <1.0 | <1.0 | 21.2 |
| | 2004 | 5.6 | <1.0 | <1.0 | <1.0 | <1.0 | 70.4 | <1.0 | 85.4 | <1.0 | 31.6 | 28.0 | 69.6 | 24.2 |
| 12 | 2005 | 72.6 | 22.1 | 20.0 | 59.1 | 2.7 | <1.0 | 121.3 | 78.5 | 83.7 | 91.9 | 0.2* | 0.3* | 46.0 |
| | 2000 | | | <1.0 | | | 61.2 | | | 25.9 | | | 25.9 | 28.3 |
| | 2001 | | | 9.0 | | | 88.0 | | | 257.1 | | | 396.7 | 187.7 |
| | 2002 | 3.3 | 5.7 | 5.2 | 48.0 | 38.8 | 77.2 | 73.5 | 154.3 | 76.4 | 73.6 | 9.0 | 30.3 | 49.6 |
| | 2003 | 90.6 | 225.0 | 86.2 | 178.7 | 83.8 | 71.3 | 64.1 | 45.0 | 114.8 | 94.6 | 5.2 | 21.6 | 90.1 |
| | 2004 | 27.2 | 22.6 | 132.4 | 91.3 | 114.3 | 205.2 | 219.4 | 338.5 | 73.5 | 118.7 | 164.0 | 130.4 | 136.4 |
| 13 | 2005 | 88.2 | 41.3 | 377.5 | 179.1 | 338.9 | 140.0 | 132.1 | 235.1 | 218.1 | 329.8 | 16.1 | 8.2 | 175.4 |

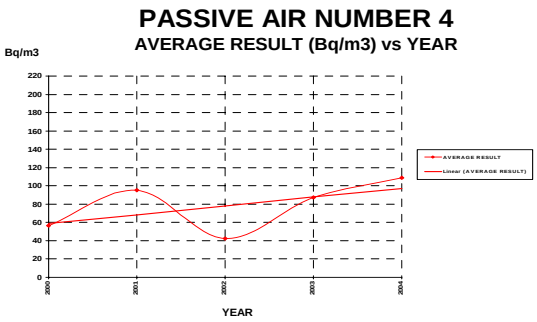
Note: * denotes analysis performed by AECL/CRL.
** denotes that Passive Air sample position was no longer part of revised sampling array.

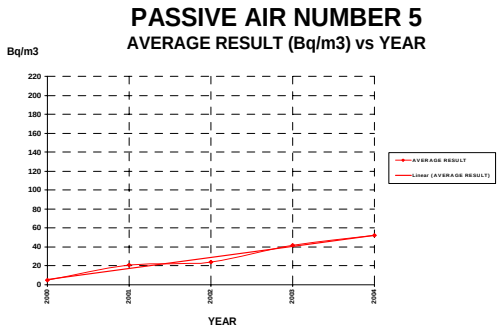
## Graph 5.2: 2000 to 2004 Passive Air Sampler (1-13) Results

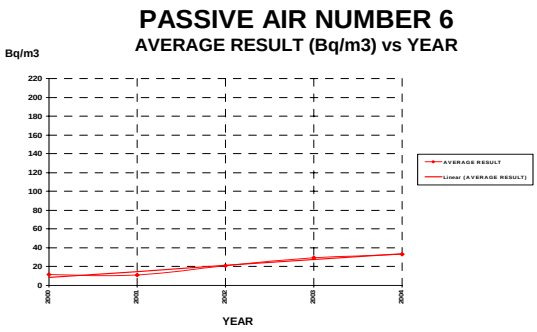


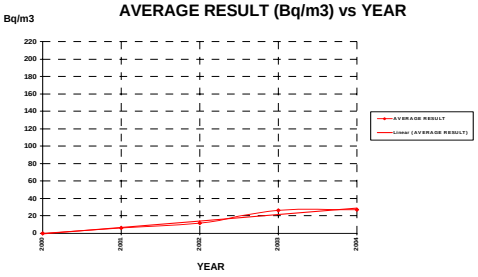



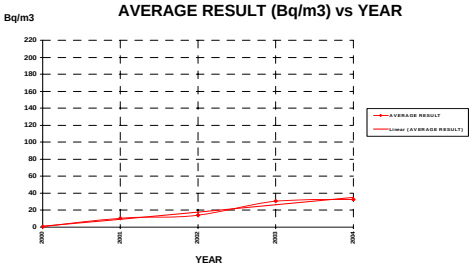



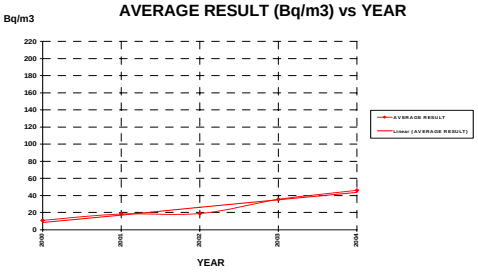
## PASSIVE AIR NUMBER 7
AVERAGE RESULT (Bq/m3) vs YEAR



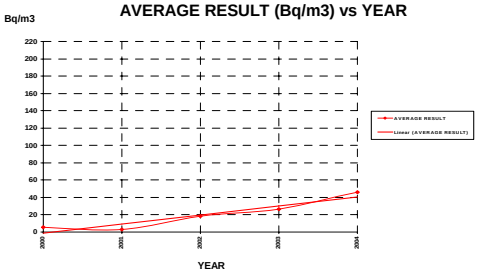

## PASSIVE AIR NUMBER 8
AVERAGE RESULT (Bq/m3) vs YEAR



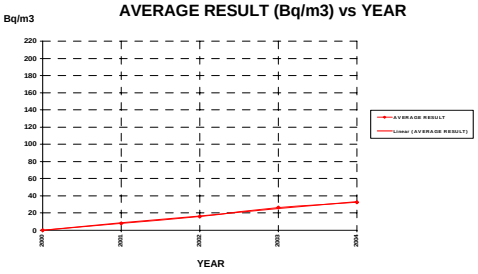

## PASSIVE AIR NUMBER 9
AVERAGE RESULT (Bq/m3) vs YEAR



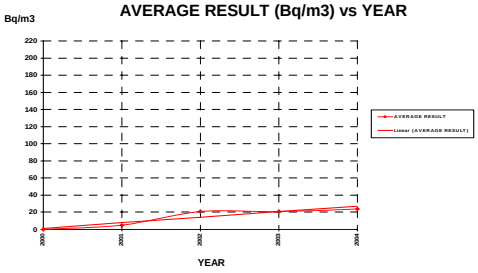

## PASSIVE AIR NUMBER 10
AVERAGE RESULT (Bq/m3) vs YEAR




## PASSIVE AIR NUMBER 11
AVERAGE RESULT (Bq/m3) vs YEAR




## PASSIVE AIR NUMBER 12
AVERAGE RESULT (Bq/m3) vs YEAR




## PASSIVE AIR NUMBER 13
AVERAGE RESULT (Bq/m3) vs YEAR

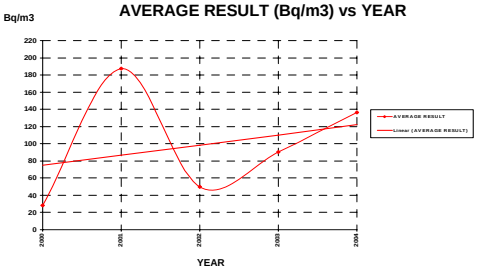


**Table $P_{29}$: Well Water Sample Results (Bq/L)**

| Location | Date | [HTO] (Bq/L) | Average (Bq/L) |
|---|---|---|---|
| 413 Boundary Rd. | 22 Nov. 2005<br>19 Dec. 2005<br>29 Dec. 2005 | 1811<br>1931<br>1884 | 1875 |
| 183 Boundary Rd. | 22 Nov. 2005<br>19 Dec. 2005<br>29 Dec. 2005 | 430<br>348<br>395 | 391 |
| 185 Boundary Rd. | 29 Dec. 2005 | 354 | 354 |
| 40925 Hwy. 41 | 29 Dec. 2005 | 123 | 123 |

**Table $P_{49}$: Forage and Crops (Bq/L)**

| Description | Sample # | Produce | 2005-Q3 | Average |
|---|---|---|---|---|
| Market Produce | 0409001A | Zucchini | 326.2±9.6 | (326.2+400.1+491.0)/3 = **405.7** |
| | 0409002A | Cucumber | 400.1±10.5 | |
| | 0409003A | Tomato | 491.0±11.6 | |
| Local Produce | Local Gardens: | Tomato | 3143.7±29.0 | (3143.7+2955.0+2434.7 +2551.9+1087.1)/5 = **2434.5** |
| | | Potato | 2955.0±28.1 | |
| | | Tomato | 2434.7±25.5 | |
| | | Onion | 2551.9±26.1 | |
| | | Cucumber | 1087.1±17.1 | |

**Table $P_{59}$: Animal Produce (Bq/L)**

| Sample # | Description | 2004-Q4 | 2005-Q1 | 2005-Q2 | 2005-Q3 | Average |
|---|---|---|---|---|---|---|
| 0301001B | Milk | 44.5±4.1 | | | | (44.5+47.2+43.7+44.4)/4 = **45.0** |
| 0302001B | Milk | | 47.2±4.2 | | | |
| 0303001B | Milk | | | 43.7±4.1 | | |
| 0304001B | Milk | | | | 44.4±4.0 | |

**2005 Estimated 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), (P(i)19 and P(e)19)
b) Tritium uptake deemed to occur at the worksite (40 hours/week), (P(i)19 and P(e)19), and
c) Tritium uptake due to consumption of produce (P49) and dairy products (P59).

**Tritium in Air Concentration at Passive Air Sampler #4, P(i)&(e)19**

Passive air sampler #4 is located on a hydro pole approximately 220 meters from the point of release for tritium in gaseous and oxide forms. The passive air sampler, which is in place for about 1 month at a time, has an affinity to trap tritium in oxide form. The passive air sampler allows air to diffuse through the orifice at a rate of 5 liters per day. The tritium oxide contained in that air is absorbed into the liquid contained within the sampler. This liquid is a 50/50 mixture of lab grade glycol and water. The purpose of the glycol is to reduce the possibility of evaporation during the warmer season and freezing during the colder

season. At the end of the sampling period the collection liquid is sampled and then analyzed for tritium content. The tritium content is then used to determine the tritium oxide in air concentration at that sample point.
The average annual concentration of tritium oxide in air at **Passive Air Sampler #4** has been determined to be **84.3 Bq/m3**. The closest residence to Passive Air Sampler #10 is located at 400 Boundary Road and is approximately 240 meters from the point of release.

**P(i)19: Dose Due to Tritium Uptake at Place of Residence**

$H_{inh,res}$ =[$H\text{-}3_{air}$] (Bq/$m^3$) x Time (h/a) x Breathing Rate ($m^3$/h) x DCF for H-3 (uSv/Bq)

84.3Bq/$m^3$ x 6,400h/a x 1.0$m^3$/h x 1.8E-05uSv/Bq = **9.7uSv/a**

**P(i)19: Dose Due to Uptake of Tritium at Place of Work**

The average tritium oxide concentration for Passive Air Samplers #1, 2, and 13 equals **148.6Bq/$m^3$**.

$H_{inh,w}$ = [$H\text{-}3_{air}$] (Bq/$m^3$) x Time (h/a) x Breathing Rate ($m^3$/h) x DCF for H-3 (uSv/Bq)

148.6Bq/m3 x 2,000 h/a x 1.0m3/h x 1.8E-05uSv/Bq = **5.4uSv/a**.

**P49: Dose Due to Consumption of Produce**

The tritium uptake due to consumption of produce, both locally purchased and home grown is calculated as follows:
(a) the average tritium concentration of **405.8 Bq/L** for locally grown fruit and vegetables purchased from the local market and consuming 90% of the annual total;
(b) the average tritium concentration of **2434.5 Bq/L** for home grown produce and consuming 10% of the annual total; and
(c) the annual consumption rate for produce ($M_{prod}$) of 150kg/a,

Using this data we can calculate the tritium uptake due to consumption of produce as follows:

P49 = $H_{prod}$ = [[$\mathbf{H_{prod,market}}$] + [$\mathbf{H_{prod,res}}$]] x 1.8E-05uSv/Bq

[[$H\text{-}3_{veg}$] (Bq/L) x $M_{prod}$(kg) x 0.9] + [$H\text{-}3_{veg}$] (Bq/L) x $M_{prod}$(kg) x 0.10]] x 1.8E-05uSv/Bq

[[405.8Bq/L x 150kg/a x 0.9] + [2434.5Bq/L x 150kg/a x 0.1]] x 1.8E-05uSv/Bq = **1.6uSv/a**

**P59: Dose Due to Consumption of Dairy**

The average tritium concentration for locally produced milk procured (**45.0Bq/L**) from the local market and using the daily average consumption rate of 0.3L/da., we can calculate

P59 = $H_{dairy}$ = $[H\text{-}3]_{dairy}$ x M x 1.8E-05uSv/Bq

= [45.0Bq/L] x 0.3L/da x 365 da/a x 1.8E-05uSv/Bq = **0.1uSv/a**

**P29: Dose Due to Consumption of Well Water**

Several values for tritium concentration in well water have been displayed in Table P29. According to the Handbook of Health Physics & Radiological Health the average human consumes about 0.15 L/da of tap water, which equals about 55 L/a. The average values for the wells sampled between November 22 and December 31, 2005 were 1875, 391, 354 and 123 Bq/L.

The well that was evaluated at 1875 Bq/L was also analyzed for various ion contents. The results indicated the possibility of a breach in the well casing that would allow the infiltration of surface water. Such a well would not meet with Ontario Ministry of the Environment requirements for a well as a potable water source. Such a well would also not be indicative of a typical well that would be approved for use in a new construction.
If we do use the well sample results with an average value of 1875 Bq/L, we can calculate the probable annual effective dose due to consumption as:

$P29 = H_{well}$ $= [H\text{-}3]_{well} \times M \times 1.8E\text{-}05 uSv/Bq$; where M = mass of water consumer per year = 54.75L/a

Therefore, $H_{well}$ = 1875 Bq/L x 54.75L/a x 1.8E-05uSv/Bq = **1.8uSv/a**

If we use the well sample results with an average value of 391Bq/L, we can calculate the probable annual effective dose due to consumption as:

$P29 = H_{well}$ $= [H\text{-}3]_{well} \times M \times 1.8E\text{-}05 uSv/Bq$; where M = mass of water consumer per year = 54.75L/a

Therefore, $H_{well}$ = 391Bq/L x 54.75L/a x 1.8E-05uSv/Bq = **0.4uSv/a**

**Total Maximum Hypothetical Annual Public Dose Due to Tritium Uptake**

The total dose ($\mathbf{H_{total}}$) 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 **33.7uSv** during 2005 to a member of the defined critical group as per estimates through the environmental monitoring program.

This public dose is based on a hypothetical individual that works at or near the SRBT facility for 2000 hours per week for 50 weeks of the year and lives at 400 Boundary Road. This hypothetical person also consumes 150 kilograms of produce per year whereby 10% comes from a garden at his place of residence and 90% is purchased from a local market.
The total estimated dose to a hypothetical member of the public is determined in the following equation:

$$H_{total} = H_{inh,w} + H_{abs,w} + H_{inh,res} + H_{abs,res} + H_{prod,market} + H_{prod,res} + H_{dairy} + H_{well}$$

or

$$Ptotal = (P(i)19 + P19(e)) \times 2) + P29 + P49 + P59$$

**Table A1: Annual Dose Due to Uptake of Tritium via Inhalation, Skin Absorption and Consumption of Dairy and Produce for an Adult Worker**

| | Dose Contributor | Annual Dose (uSv/a) |
|---|---|---|
| Annual dose due to inhalation of HTO at work | $\mathbf{P_{(i)19} = H_{inh,w}}$ | **5.4** |
| Annual dose due to skin absorption of HTO at work | $\mathbf{P_{(e)19} = H_{abs,w}}$ | **5.4*** |
| Annual dose due to inhalation of HTO at residence | $\mathbf{P_{(i)19} = H_{inh,res}}$ | **9.7** |
| Annual dose due to skin Absorption of HTO at residence | $\mathbf{P_{(e)19} = H_{abs,res}}$ | **9.7*** |
| Annual dose due to consumption of well water at 1875 Bq/L | $\mathbf{P_{29} = H_{well}}$ | **1.8** |
| Annual dose due to consumption of produce | $\mathbf{P_{49} = H_{prod}}$ | **1.6** |
| Annual dose due to dairy consumption | $\mathbf{P_{59} = H_{dairy}}$ | **0.1** |
| **Total Annual Dose due to Tritium Uptake** | $\mathbf{P_{total} = H_{total}}$ | **33.7** |

* The dose applied is based on ICRP estimates for tritium absorbed through the skin due to immersion in a cloud of tritium with a concentration in air value as defined by the Environmental Monitoring Program passive air sampler array.

# 6. Facility Effluents

## Liquid Effluent

In the CNSC issued license NSPFOL-13.00/2006, Appendix C, the limit for release of HTO to the municipal sewer system is regulated at 200 GBq per year.
SRBT monitors the liquid effluent in accordance with operational procedure RSO-013. The procedure includes the sampling and assessment for HTO concentration and volume for the waters used in the betalight scintillation assessments, emissions monitoring assessments, and cleaning wash waters.
SRBT has assessed the liquid effluent concentrations and has determined that the total activity released to the municipal effluent system during 2005 was approximately 40GBq, or about 20% of the 200GBq per year limit.

### Liquid Effluent Release of HTO

| Description | Quantity |
|---|---|
| Liquid Effluent to Municipal Sewer | 40 TBq, equal to 20% of Annual Limit |

## Gaseous Effluent

**Gaseous effluent** samples were taken on a weekly basis in accordance with operational procedure RSO-006.
Tritium emissions from the facility are determined by continuously drawing a known volume of sample from the known volume of exhaust gas from 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 critical group, defined as that individual that is most likely to receive the highest exposure due to any releases, would receive based on the 1996 DRL calculations as defined in NSPFOL-13.00/2005 up until November 30, 2005; or the percentage of the weekly release limit for HT and HTO as defined in NSPFOL-13.00/2006 commencing December 1, 2005. The emissions and calculated DRL's for an adult worker, adult no-worker and infant as per the 1996 DRL calculations and the weekly release limits for HTO and HT as per NSPFOL-13.00/2006 are shown in Table 6.1 and Chart 6.1 below.

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 report data for gaseous emissions was revised in late 2005 based on the recognition of errors found in the excel program used to calculate weekly releases of Ht and HTO.

SRBT contracted to Atomic Energy of Canada, Limited, Chalk River Laboratories, in November 2005 to perform gaseous emissions system verification tests. The test results and verification report is to be submitted to CNSC staff for review and comment in 2006. In a letter from CNSC staff dated April 18, 2005 following a meeting between CNSC staff and SRB held on March 21, 2005 CNSC staff stated air monitoring data indicated a 14 fold non-conservative discrepancy between measured values and the values predicted from atmospheric modeling used for the DRL calculation.

SRB initially believed this error was due to a discrepant DRL. When a 10 fold error was found in the calculation of the emissions on August 24, 2005 SRB on its own initiative began a full review of the stack monitoring equipment and determined that discrepancies between

environmental monitoring results and calculated stack emissions may be due to equipment accuracy issues not previously identified.

In the past SRB had taken steps to ensure the verification of the stack involving performance assessment of the ventilation system and individual components of the monitoring unit. We now believe that these efforts only constituted part of a complete solution. The accuracy of reported tritium releases had to be verified in order for any meaningful correlations to be drawn as they relate to environmental monitoring. An independent third party will assess existing bubbler performance.

The majority of equipment used in emissions analysis is in the process of being upgraded to more modern standards, in order to provide better assurance of accuracy.

Pitot tubes have permanently been installed on the stacks, and will be maintained by a third party on a monthly basis to ensure stack airflow nears design requirements. This essentially will allow an independent third party by December 31, 2005 to perform weekly stack verification in addition to more detailed annual stack verification already performed by an independent third party.

An independent third party has reviewed all emission calculations and trained SRB staff to perform emission calculations.

SRB has also increased the rate of stack maintenance by an independent third party from quarterly to monthly, in order to ensure good performance of the ventilation system and minimize airflow reductions from the beginning to the end of the maintenance cycle which could also contribute to erroneous results.

The average weekly DRL results for 2005, based on weekly assessment, were as follows:

**2005 Gaseous Emissions as %DRL (1996 DRL Calculations)**

| | |
|---|---|
| Adult Worker | 1.11% DRL |
| Adult Non-worker | 0.98% DRL |
| Infant | 0.57% DRL |

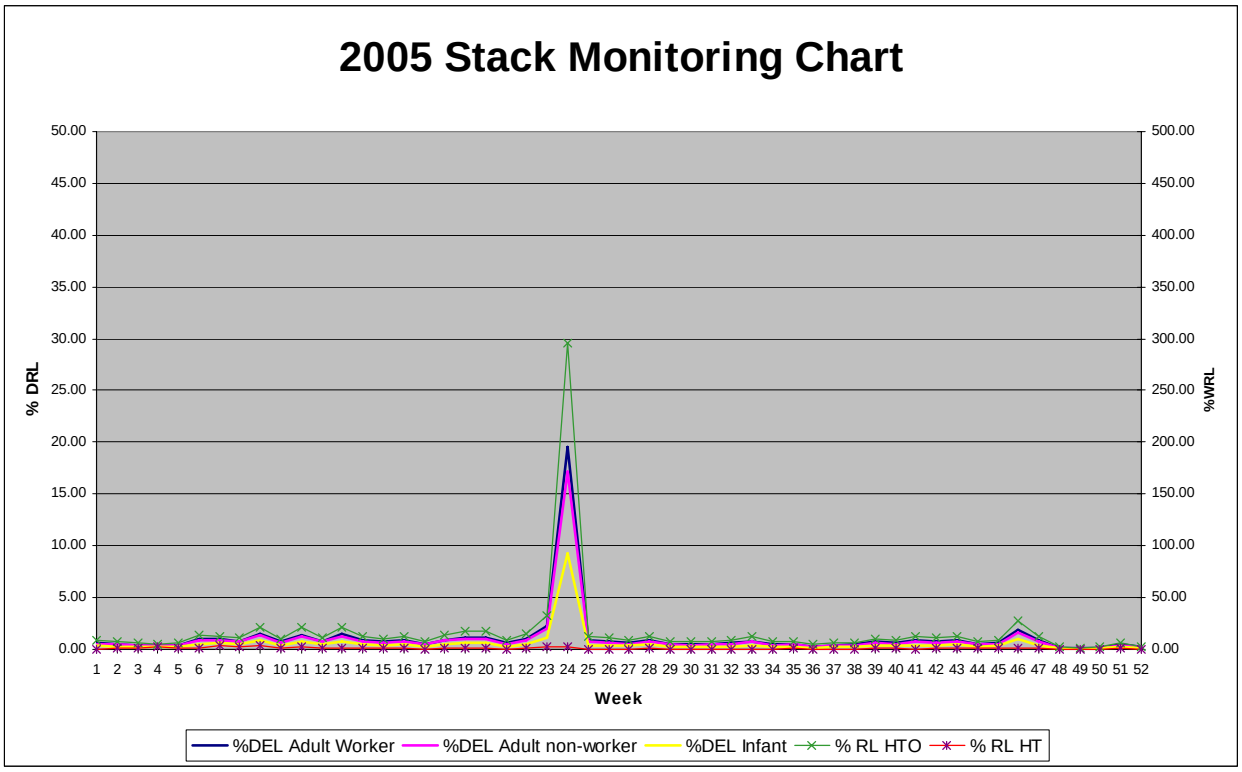
The SRBT administrative level is 2.5% annual DRL and the action level is 5.0% weekly DRL.

**Table 6.1: 2005 Stack Emissions Data, Weekly DRL's and %WRL**

| Stack Emissions: Year: 2005 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Week # | HTO (GBq) | HT (GBq) | Total (GBq) | %DEL | | | % WRL | |
| | | | | Adult Worker | Adult non-worker | Infant | HTO | HT |
| 1 | 2593.9 | 10127.0 | 12720.9 | 0.61 | 0.53 | 0.31 | 8.94 | 0.56 |
| 2 | 2264.3 | 12630.5 | 14894.8 | 0.53 | 0.47 | 0.29 | 7.81 | 0.70 |
| 3 | 1762.6 | 24238.8 | 26001.4 | 0.44 | 0.39 | 0.28 | 6.08 | 1.35 |
| 4 | 1475.1 | 39299.9 | 40775.0 | 0.40 | 0.35 | 0.30 | 5.09 | 2.18 |
| 5 | 1731.9 | 17965.6 | 19697.5 | 0.42 | 0.37 | 0.25 | 5.97 | 1.00 |
| 6 | 4161.1 | 26060.0 | 30221.1 | 0.99 | 0.87 | 0.54 | 14.35 | 1.45 |
| 7 | 3762.3 | 75662.9 | 79425.2 | 0.97 | 0.87 | 0.68 | 12.97 | 4.20 |
| 8 | 3174.6 | 37328.4 | 40503.0 | 0.78 | 0.69 | 0.48 | 10.95 | 2.07 |
| 9 | 6357.6 | 63978.6 | 70336.2 | 1.54 | 1.37 | 0.91 | 21.92 | 3.55 |
| 10 | 2955.9 | 24997.8 | 27953.7 | 0.71 | 0.63 | 0.41 | 10.19 | 1.39 |
| 11 | 5997.6 | 44674.1 | 50671.7 | 1.43 | 1.27 | 0.80 | 20.68 | 2.48 |
| 12 | 3351.2 | 26971.4 | 30322.6 | 0.80 | 0.71 | 0.46 | 11.56 | 1.50 |
| 13 | 6245.3 | 23735.7 | 29981.0 | 1.46 | 1.29 | 0.75 | 21.54 | 1.32 |
| 14 | 3785.5 | 26011.5 | 29797.0 | 0.90 | 0.80 | 0.50 | 13.05 | 1.45 |
| 15 | 3044.8 | 27013.2 | 30058.0 | 0.73 | 0.65 | 0.42 | 10.50 | 1.50 |
| 16 | 3711.5 | 13407.1 | 17118.6 | 0.86 | 0.76 | 0.44 | 12.80 | 0.74 |
| 17 | 2234.8 | 9305.9 | 11540.7 | 0.52 | 0.46 | 0.27 | 7.71 | 0.52 |
| 18 | 3994.9 | 17591.7 | 21586.6 | 0.94 | 0.83 | 0.49 | 13.78 | 0.98 |
| 19 | 4992.9 | 17067.3 | 22060.2 | 1.16 | 1.02 | 0.59 | 17.22 | 0.95 |
| 20 | 5080.6 | 14500.8 | 19581.4 | 1.18 | 1.04 | 0.59 | 17.52 | 0.81 |
| 21 | 2448.1 | 8271.7 | 10719.8 | 0.57 | 0.50 | 0.29 | 8.44 | 0.46 |
| 22 | 4367.3 | 17643.6 | 22010.9 | 1.02 | 0.90 | 0.53 | 15.06 | 0.98 |
| 23 | 9520.5 | 35644.3 | 45164.8 | 2.22 | 1.96 | 1.14 | 32.83 | 1.98 |
| 24 | 85606.8 | 42696.0 | 128302.8 | 19.52 | 17.19 | 9.27 | 295.20 | 2.37 |
| 25 | 3653.8 | 10562.5 | 14216.3 | 0.85 | 0.75 | 0.43 | 12.60 | 0.59 |
| 26 | 3320.2 | 6552.3 | 9872.5 | 0.76 | 0.67 | 0.38 | 11.45 | 0.36 |
| 27 | 2664.1 | 8641.8 | 11305.9 | 0.62 | 0.55 | 0.32 | 9.19 | 0.48 |
| 28 | 3746.1 | 11291.5 | 15037.6 | 0.87 | 0.77 | 0.44 | 12.92 | 0.63 |
| 29 | 2354.7 | 6978.7 | 9333.4 | 0.55 | 0.48 | 0.28 | 8.12 | 0.39 |
| 30 | 2118.0 | 6937.3 | 9055.3 | 0.49 | 0.43 | 0.25 | 7.30 | 0.39 |
| 31 | 2357.5 | 2948.7 | 5306.2 | 0.54 | 0.48 | 0.26 | 8.13 | 0.16 |
| 32 | 2445.9 | 5160.9 | 7606.8 | 0.56 | 0.50 | 0.28 | 8.43 | 0.29 |
| 33 | 3455.7 | 11157.8 | 14613.5 | 0.80 | 0.71 | 0.41 | 11.92 | 0.62 |
| 34 | 2100.9 | 10899.2 | 13000.1 | 0.49 | 0.44 | 0.26 | 7.24 | 0.61 |
| 35 | 2191.7 | 12132.5 | 14324.2 | 0.52 | 0.46 | 0.28 | 7.56 | 0.67 |
| 36 | 1330.2 | 6246.0 | 7576.2 | 0.31 | 0.28 | 0.16 | 4.59 | 0.35 |
| 37 | 1702.5 | 8017.3 | 9719.8 | 0.40 | 0.35 | 0.21 | 5.87 | 0.45 |
| 38 | 1984.2 | 9196.9 | 11181.1 | 0.47 | 0.41 | 0.25 | 6.84 | 0.51 |
| 39 | 3025.7 | 18232.5 | 21258.2 | 0.72 | 0.63 | 0.39 | 10.43 | 1.01 |
| 40 | 2589.5 | 23809.4 | 26398.9 | 0.63 | 0.55 | 0.36 | 8.93 | 1.32 |
| 41 | 3595.4 | 10150.4 | 13745.8 | 0.83 | 0.73 | 0.42 | 12.40 | 0.56 |
| 42 | 3129.4 | 27359.1 | 30488.5 | 0.75 | 0.67 | 0.43 | 10.79 | 1.52 |
| 43 | 3563.0 | 20922.8 | 24485.8 | 0.84 | 0.74 | 0.46 | 12.29 | 1.16 |
| 44 | 2191.1 | 19012.1 | 21203.2 | 0.53 | 0.47 | 0.30 | 7.56 | 1.06 |
| 45 | 2551.7 | 22478.1 | 25029.8 | 0.62 | 0.54 | 0.35 | 8.80 | 1.25 |
| 46 | 8149.8 | 24157.7 | 32307.5 | 1.89 | 1.67 | 0.96 | 28.10 | 1.34 |
| 47 | 3537.8 | 14330.2 | 17868.0 | 0.83 | 0.73 | 0.43 | 12.20 | 0.80 |
| 48 | 760.9 | 762.4 | 1523.3 | 0.17 | 0.15 | 0.08 | 2.62 | 0.04 |
| 49 | 291.7 | 109.8 | 401.5 | 0.07 | 0.06 | 0.03 | 1.01 | 0.01 |
| 50 | 663.5 | 1293.2 | 1956.7 | 0.15 | 0.13 | 0.08 | 2.29 | 0.07 |
| 51 | 1995.2 | 12177.9 | 14173.1 | 0.47 | 0.42 | 0.26 | 6.88 | 0.68 |
| 52 | 880.7 | 9097.6 | 9978.3 | 0.21 | 0.19 | 0.13 | 3.04 | 0.51 |
| **Ave.** | **4749.5** | **18796.9** | **23546.4** | **1.11** | **0.98** | **0.57** | **16.38** | **1.04** |

In accordance with the 1996 Canatom Revised DEL calculations the CNSC issued license NSPFOL-13.00/2005 requires that SRBT use atmospheric release limits to atmosphere at 4.4E+14 Bq/week for HTO and 6.4E+16 Bq/week for HT.
Commencing December 1, 2005 (week 48), the CNSC issued license NSPFOL-13.00/2006, in Appendix C, requires that SRBT use atmospheric release limits to atmosphere at 2.9E+13 Bq/week for HTO and 1.8E+15 Bq/week for HT.

**Chart 6.1: 2005 Emissions Monitoring**

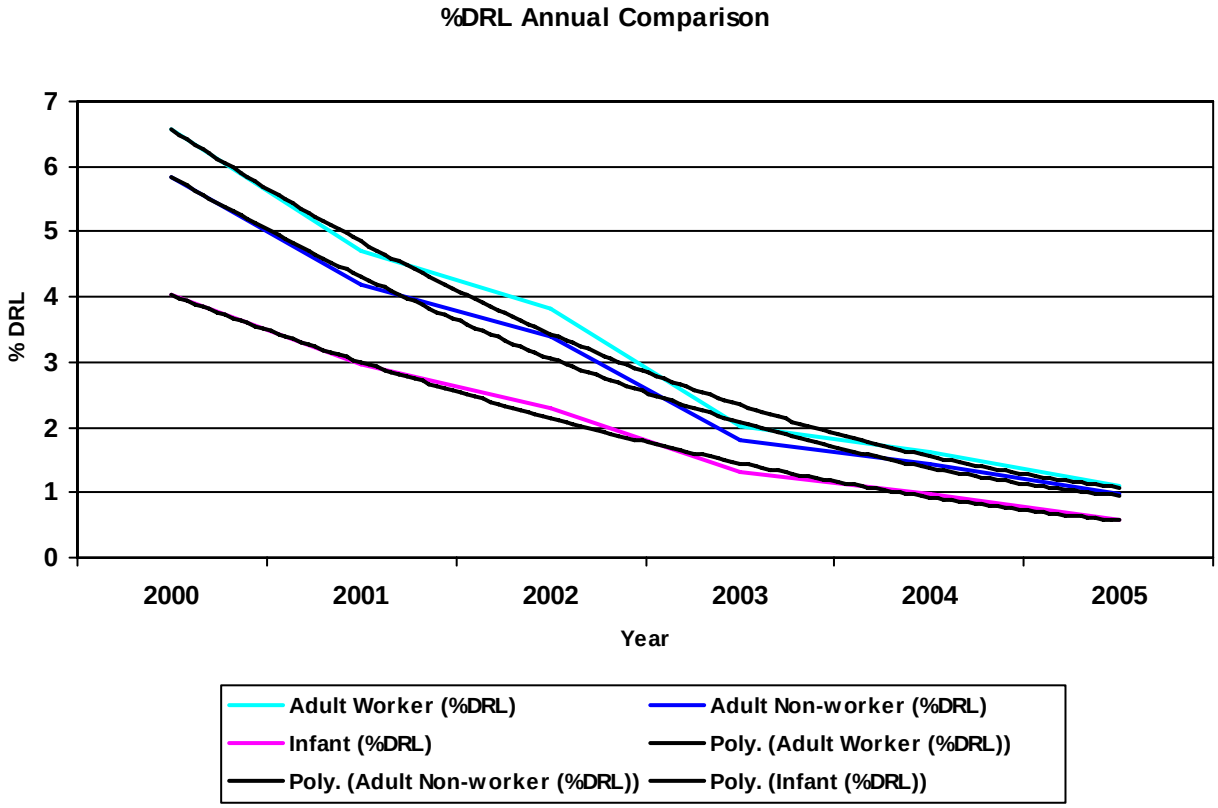



NOTE:
The SRBT annual administrative limit for emission of tritium based on stack sampling techniques performed on a weekly basis is 2.5% of the DRL. The DRL is calculated on the regulatory annual public dose limit of 1.0 mSv per year.
The SRBT weekly action level for emission of tritium based on stack sampling techniques performed on a weekly basis is 5.0% of the DRL.

**Table 6.2: Stack Monitoring Data 2000 to 2005 Comparison**

| Stack Sampling | | | | | | |
|---|---|---|---|---|---|---|
| YEAR | HTO | HT | Total | %DRL | | |
| | (GBq) | (GBq) | (GBq) | Adult Worker | Adult non-worker | Infant |
| **2000** | 26732.0 | 319223.0 | 345955.0 | 6.56 | 5.83 | 4.03 |
| **2001** | 19124.0 | 247597.0 | 266721.0 | 4.72 | 4.20 | 2.95 |
| **2002** | 15655.0 | 166838.0 | 182493.0 | 3.81 | 3.38 | 2.28 |
| **2003** | 8082.3 | 121884.2 | 129966.4 | 2.02 | 1.80 | 1.31 |
| **2004** | 6580.7 | 76404.9 | 82985.6 | 1.61 | 1.43 | 0.98 |
| **2005** | 4749.5 | 18796.9 | 23546.4 | 1.11 | 0.98 | 0.57 |
| **Ave.** | **20503.7** | **244552.7** | **Ave. % DRL** | **3.31** | **2.94** | **2.02** |

**Chart 6.2: Stack Monitoring Data 2000 to 2005 Comparison**



## Hazardous Substance Releases

### Ontario Ministry of the Environment Certificate

Ministry of the Environment / Ministère de l'Environnement

Ontario

*CERTIFICATE OF APPROVAL*
*AIR*
*NUMBER 5310-4NJQE2*

SRB Technologies (Canada) Inc.
140 Boundary Road, Unit 320
Pembroke, Ontario
K8A 6W5

Site Location: 140 Boundary Road, Unit 320
Pembroke City, County Of Renfrew
K8A 6W5

*You have applied in accordance with Section 9 of the Environmental Protection Act for approval of:*

an exhaust system serving a tube washing process, complete with a fume hood, fiber filter, ductwork and a fan, discharging into the atmosphere at a volumetric flow rate of 0.74 actual cubic metre per second, through a stack, having exit dimensions of 0.61 metre by 0.61 metre, extending 0.91 metre above the roof and 5.48 metres above grade,

- an exhaust system serving a tube coating process, complete with four (4) fume hoods, fiber filter, ductwork and a fan, discharging into the atmosphere at a volumetric flow rate of 0.74 actual cubic metre per second, through a stack, having exit dimensions of 0.61 metre by 0.61 metre, extending 0.91 metre above the roof and 5.48 metres above grade,

- an exhaust system serving a silk screening process, complete with a fume hood, fiber filter, ductwork and a fan, discharging into the atmosphere at a volumetric flow rate of 1.47 actual cubic metres per second, through a stack, having exit dimensions of 0.71 metre by 0.61 metre, extending 0.91 metre above the roof and 5.48 metres above grade,

- an exhaust system serving a silk screening process, complete with a fume hood, fiber filter, ductwork and a fan, discharging into the atmosphere at a volumetric flow rate of 0.55 actual cubic metre per second, through a stack, having exit dimensions of 0.51 metre by 0.2 metre, extending 3.05 metres above grade,

all in accordance with the application for a Certificate of Approval (Air), and all supporting information dated May 12, 2000 and signed by Stephane Levesque.

*For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:*

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!) "Act" means the *Environmental Protection Act;*

(2) "Certificate" means this Certificate of Approval issued in accordance with the Act;

(3) "Company" means SRB Technologies (Canada) Inc.:

(4) "Equipment" means the exhaust systems described in the Company's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate; and

(5) "Manual" means a document or a set of documents that provide written instructions to staff of the Company.

*You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:*

**TERMS AND CONDITIONS**

**OPERATION AND MAINTENANCE**

1. The Company shall ensure that the Equipment is properly operated and maintained at all times. The Company shall:

   (1) prepare, not later than three (3) months after the date of this Certificate, and update as necessary, a Manual outlining the operating procedures and a maintenance program for the Equipment, including:

      (a) routine operating and maintenance procedures in accordance with good engineering practices and as recommended by the Equipment suppliers;

      (b) emergency, spill prevention and spill clean-up procedures;

      (c) procedures for any record keeping activities relating to operation and maintenance of the Equipment.

   (2) implement the recommendations of the operating and maintenance Manual; and

   (3) retain, for a minimum of two (2) years from the date of their creation, all records on the maintenance, repair and inspection of the Equipment, and make these records available for review by staff of the Ministry upon request.

*The reasons for the imposition of these terms and conditions are as follows:*

Condition No. 1 is included to emphasize that the Equipment must be maintained and operated

according to a procedure that will result in compliance with the Act, the regulations and this Certificate.

In addition the Company is required to keep records and to provide information to staff of the Ministry so that compliance with the Act, the regulations and this Certificate can be verified.

*In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written Notice served upon me, the Environmental Appeal Board and in accordance with Section 47 of the Environmental Bill of Rights, S.O. 1993, Chapter 28, the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Board. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:*

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

*The Notice should also include:*

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

*And the Notice should be signed and dated by the appellant.*

*This Notice must be served upon:*

| | | | | |
|---|---|---|---|---|
| The Secretary*<br>Environmental Appeal Board<br>2300 Yonge St., 12th Floor<br>P.O. Box 2382<br>Toronto, Ontario<br>M4P 1E4 | AND | The Environmental Commissioner<br>1075 Bay Street, 6th Floor<br>Suite 605<br>Toronto, Ontario<br>M5S 2B1 | AND | The Director<br>Section 9, *Environmental Protection Act*<br>Ministry of the Environment<br>2 St. Clair Avenue West, Floor 12A<br>Toronto, Ontario<br>M4V 1L5 |

*** Further information on the Environmental Appeal Board's requirements for an appeal can be obtained directly from the Board at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

*This instrument is subject to Section 38 of the Environmental Bill of Rights, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ene.gov.on.ca, you can determine when the leave to appeal period ends.*

*The above noted works are approved under Section 9 of the Environmental Protection Act.*

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DATED AT TORONTO this 31st day of August, 2000

Steve Klose, P.Eng.
Director
Section 9, *Environmental Protection Act*

ZT/
c: District Manager, MOE Ottawa
Stephane Levesque, SRB Technologies (Canada) Inc.

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Table 6.2, below, describes the information submitted to the Ontario Ministry of Environment.

**Table 6.2: Emission Summary Table**

| EMISSION SUMMARY TABLE | | | | | |
|---|---|---|---|---|---|
| CONTAMINANT | GAS | EMISSION RATE (g/s) | POI CONCENTRATION ($\mu g/m^3$) | MOEE CRITERIA ($\mu g/m^3$) | PERCENTAGE OF CRITERIA |
| ACETONE | 67-64-1 | 0.140 | 42.69 | 48 000 | 0.09% |
| HYDROFLUORIC ACID | 7664-39-3 | 0.01452 | 4.43 | 8.6 | 51.51% |
| DIETHEL ETHER | 60-29-7 | 0.016 | 4.88 | 30 000 | 0.02% |
| ETHANOL | 64-17-5 | 0.0004 | 0.12 | 19 000 | 0.0006% |
| ORTHOPHOSPHORIC ACID | 7664-38-2 | 0.0146 | 4.45 | 100 | 4.45% |
| TOLUENE | 108-88-3 | 0.01119 | 3.41 | 2 000 | 0.17% |
| METHYL ETHYL KETONE | 78-93-3 | 0.01119 | 3.41 | 31 000 | 0.02% |
| METHYL ALCOHOL | 67-56-1 | 0.01119 | 3.41 | 84 000 | 0.004% |
| GLYCOL ETHER DB | 112-34-5 | 0.01224 | 3.73 | 65 | 5.74% |
| METHYL-PYRRODONE | 872-50-4 | 0.00143 | 0.44 | Not available | Not available |
| GLAUTINE LAURATE GLYCOLS | 111-46-0 | 0.00265 | 0.81 | Not available | Not available |
| EMULSIFIER | 803-11-8 | 0.00102 | 0.31 | Not available | Not available |
| PETROLEUM DISTILLATE | 64742-47-6 | 0.00408 | 1.24 | Not available | Not available |
| ALKYLPHENOL-ETHOXYLATE | 9016-45-9 | 0.001657 | 0.51 | Not available | Not available |
| SODIUM METAPERIODATE | 7790-28-5 | 0.00078 | 0.24 | Not available | Not available |
| SODIUM HYDROXIDE | 1310-73-2 | 0.001455 | 0.44 | 20 | 2.2% |
| SODIUM CHLORIDE | 7647-14-5 | 0.001455 | 0.44 | Not available | Not available |
| SODIUM HYPOCHLORITE | 7681-52-9 | 0.001455 | 0.44 | Not available | Not available |
| ISOPHORONE | 78-59-1 | 0.00435 | 1.33 | 28 000 | 0.005% |
| SHELL CYCLOSOL-63 | 64742-96-8 | 0.00435 | 1.33 | Not available | Not available |
| GLYCOL ETHER ACETATE | 123-07-2 | 0.000725 | 0.22 | Not available | Not available |
| DIACETONE ALCOHOL | 123-42-2 | 0.001455 | 0.44 | 990 | 0.05% |
| BUTYROLACTONE | 96-48-0 | 0.001455 | 0.44 | Not available | Not available |
| GLYCOL ETHER EB | 111-76-2 | 0.00236 | 0.72 | 350 | 0.21% |
| PUMICE-POWDER | Not available | 0.000217 | 0.07 | Not available | Not available |

# 7. Waste Management

In 2005 there were two (2) 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-2005-001: Ship Date: March 14, 2005**

Shipment WM-2005-001 included 11 x 200L drums of tritium contaminated crushed glass. Total H-3 activity of the consignment was 44.0TBq.

**WM-2005-002: Ship Date: July 28, 2005**

Shipment WM-2005-002 included 5 x 200L drums of tritium contaminated crushed glass. Total H-3 activity was stated as 20.0TBq.

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.

**Waste Management Program**

SRBT has been working to develop the waste management program to include all waste handling activities on site and not solely the handling of radioactive materials for transfer to a waste management facility. It is expected that the Waste Management Program will be submitted to the CNSC for review and comment by mid 2006.

# 8. Facility Updates

### Ontario Ministry of Labour

During 2005 there was one (1) facility visit by a representative of the Ministry of Labour.
The SRBT Joint Health & Safety Committee met quarterly during 2005 to discuss health and safety issues and facility inspections.
During 2005 there were 16 minor incidents reported to the SRBT Joint Health & Safety Committee. The 16 reported incidents included 2 thermal burns, 1 chemical burn, 8 cuts by sharps, 1 chemical solvent splash, and 4 bodily injury type incidents. Of the 16 reported incidents, one (1) involved lost time.

### Security Review

The security program for the facility has been reviewed by CNSC staff. CNSC staff performed a security inspection on June 28, 2005.

### Emergency Preparedness

SRB Technologies (Canada) Inc. has various components to deal with emergency situations dealing with tritium incidents and fire scenarios.

### 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. SRBT has performed in-house audits of all processes in accordance with ISO9001:2000.

All liquid scintillation counting has been performed in accordance with the document SRBT LSC-QA Program.

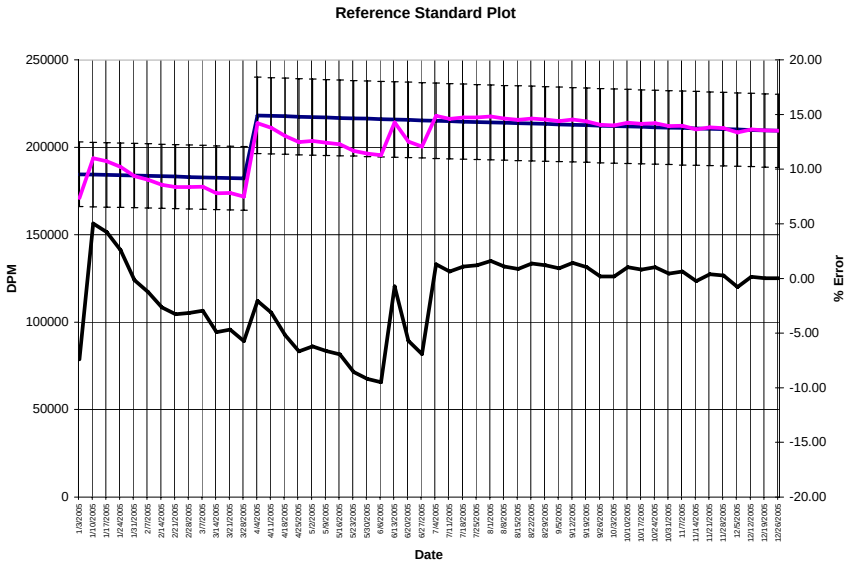
#### Results of the Quality Assurance Program

The QA program included:

a) weekly instrument efficiency checks using NIST traceable standards of a blank, H-3 and C-14 standards,
b) weekly program performance checks using NIST traceable reference standards set in a matrix very similar to the samples being prepared for analysis,
c) annual preventative maintenance carried out by contract to Fisher Scientific on each of the two LSC instruments: Wallac 1215 and Wallac 1409, and
d) participation in the Health Canada, National Calibration Reference Centre for Bioassay, 2005 Tritium Urinalysis Intercomparison program.

Chart 8.1 below shows the results of the weekly instrument performance assessment.
The reference standard used in the weekly instrument performance assessments is Perkin-Elmer product number 1210-120 $^{3}$H for Organic Solvents ($^{3}$H-O).
The absolute activity of the capsules is calibrated by comparison with the reference standards of tritiated toluene supplied by the National Institute of Standards and Technology (NIST), USA. The Standard Reference Material (SRM) is certified to have an estimated accuracy of ± 1.2%.

**Chart 8.1: 2005 Weekly Instrument Performance Report for Wallac 1409 LSC**




### Production Equipment

SRBT has replaced all oil-sealed high-vacuum pumps units with high-vacuum scroll type pumps. As a result there are a number of pumps in storage that contain a quantity of tritium contaminated oil. SRBT has been working with a contract group to handle the pumps and the oil.
Production took an inventory of the oil-sealed high-vacuum pumps on site and concluded as follows:

| Description | Quantity | Summary of Oil Content |
|---|---|---|
| Oil-sealed high-vacuum | 17 | 6 drained of oil<br>11 containing small quantity of oil |
| Oil diffusion | 6 | 2 with ~75 ml of oil<br>4 with small <75 ml of oil |

### Research and development

All product sold by SRB to end users in Ontario and Canada are not one-off custom designed and were originally designed in England and have since received certification by CNSC staff pursuant to the Nuclear Safety and Control Act (NSC Act) and the Nuclear Substances and Radiation Devices (NSRD) Regulations. The only modifications to product that may take place are of an esthetic nature, for example changing the legend of a sign, or the color of components.
These changes do not require the use of engineering principles and are therefore authorized by the President and other approved staff members.

Other product sold in Canada to CNSC licensed facilities that are manufactured to customer drawing; therefore, no engineering design is required of SRB.

Products sold in the rest of the world are made following historical designs of the company or based on customer requirements. Changes to designs are made taking into account the customer and relevant regulatory requirements.

**Waste Management**

Waste management activities are described in Section 7.

**Fire protection**

**Third party inspections and reviews**

In an effort to assure compliance with CNSC directives, in 2005, it was decided that all future modifications relating to Fire Protection will be reviewed by both the Pembroke Fire Department and an independent third party with professional experience in dealing with fire protection issues with other CNSC licensees.

In 2005, yearly fire protection inspections performed by both the Pembroke Fire Department and Nadine International Inc. have been instituted.

An inspection was performed by the Pembroke Fire Department on March 3, 2005 with a number of findings which were also rectified in 2005.

Nadine International Inc. also performed an inspection of the facility on November 27, 2005 with the main focus on providing recommendations in order to close all outstanding directives raised by the CNSC.

**CNSC Fire Safety Inspections**

CSNC staff performed a thorough inspection of the facility on October 25, 2005 and provided a draft report detailing their findings on November 8, 2005.
In response, on November 17, 2005 SRB presented an action plan to resolve outstanding issues.

By the end of 2005, 5 (five) directives identified during CNSC staff inspections in 2000, 2004 and 2005 remained open requiring further work or third party verification. These directives are as follows:

SRB-200401-D002

*Spray coating operations must comply with National Fire Code of Canada (NFCC).*

In 2005, SRB has made considerable progress in installing a 2 hour fire separation, such as fire-rated walls and door. However, as pointed out by CNSC staff the ventilation and exhaust system must also be compliant with the NFCC. The required modifications will be in place by March 31, 2006 and an independent third party review will be undertaken in order to ensure compliance with this CNSC directive, and the NFCC. Until such time that this directive is closed, spray coating has, and will continue to be prohibited on site.

SRB-200401-D003

*Dispensing and handling of Flammable Liquids did not comply with the NFCC and the licensee is required to ensure the operation meets the requirements of the applicable codes and standards.*

The specific issues raised during 2000 and 2004 inspections were addressed but additional issues were identified by CSNC staff during 2005 inspections. The required modifications will be in place by March 31, 2006 and an independent third party review

will be undertaken in order to ensure compliance with this CNSC directive, and the NFCC.

SRB-200401-D005

*Modifications to the facility to provide a ¾ hour fire separation between the main and second floor or alternative measures to achieve an equivalent level of protection shall be implemented as required.*

Modifications were made but CNSC staff found the modifications did not fully comply with the NFCC. The required additional modifications will be in place by March 31, 2006 and an independent third party review will be undertaken in order to ensure compliance with this CNSC directive, and the NFCC.

SRB-200401-D009

*Rooms used for the storage of combustible waste materials are required to be separated by a 1 hour fire separation and sprinkler protected in conformance with the NFCC and the NBCC.*

On July 27, 2005 SRB proposed an alternative measure which was accepted by CNSC staff under the NFCC. During the October 25, 2005 inspection, it was observed that the alternative measure did not fully meet the requirements of the NBCC. The required modifications will be performed by March 31, 2006 and a third-party review will be undertaken in order to ensure compliance with this CNSC directive, the NFCC and NBCC.

SRB-200501-D001

*Dangerous goods are used in the coating room power vented enclosures and therefore the ventilation system is required to be alarmed in accordance with NFCC.*

Modifications to fume hoods were made in 2005 and reviewed by Nadine International Inc. in order to ensure compliance with this CNSC directive, and the NFCC and NBCC.

**Emergency responder training**

Full time and volunteer personnel for the Pembroke Fire Department received training from SRB in how to address incident scenarios at our facility. 10 members received this training on May 24, 2005 and another 12 on June 14, 2005. The training included information with respect to the hazardous materials used and in storage at the SRBT facility.

**Fire extinguisher training for staff**

On May 24, 2005 SRB staff received fire extinguisher training by the Pembroke Fire Department. Training included the PASS principal for the use of ABC type fire extinguishers. Type ABC fire extinguishers are generally used throughout the facility with the exception of a type D which is in service due to the use of a pyrophoric metallic substance.

**Fire protection program**

SRB submitted to CNSC staff on October 26, 2005 an initial copy of our Fire Protection Program. On November 28, 2005 a draft copy of the review of the Fire Protection Program was presented to SRB by CNSC staff. Comments by CNSC staff will be addressed in the next revision of the document which will be written in conjunction with Nadine International Inc.

**Fire safety plan**

On July 27, 2005 SRB submitted to CNSC staff and the Pembroke Fire Department a revised copy of our Fire Safety Plan.

**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.
A follow up written test was provided to all participants to determine if any further training was required for individuals who obtained a mark of 70% or less. All participants had successful results.
New employees receive an indoctrination training course prior to working in either Zone 2 or Zone 3. The training is a two hour introduction to the SRBT facility, the responsibilities for employees and employer, and significant information with respect to Canadian Nuclear Safety Commission radiation protection requirements and information with respect to the SRBT radiation safety program.

**Tritium Mitigation**

SRBT has contracted to Kinectrics Inc. to study the possibility of capturing tritium oxide that is presently released to the environment through the ventilation systems.
On December 21, 2005, Kinectrics staff had installed a device designed to capture tritium oxide. This device is to later removed and evaluated for effectiveness and efficiency as a device to mitigate the tritium oxide releases from various production apparati.

**Preliminary Decommissioning Program**

SRB submitted to CNSC staff the third revision of the Preliminary Decommissioning Plan on August 15, 2005.

On November 3, 2005 CNSC staff provided a much detailed review of the PDP stating that the PDP was found to be unacceptable in several areas.

As CNSC staff recommended, in order to expedite the completion of the document, SRB will have the next revision of the PDP completed by CANDESCO RESEARCH CORPORATION, an independent third party with experience in providing advice in this field to CNSC licensees.

# 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 one employee representative and one employer representative, each with Part I and II certification.
All staff members have received WHMIS training which includes pertinent information with respect to Material Safety Data Sheets and workplace hazardous material information system training.

# 10. Non-Radiological Health & Safety Activities

In accordance with Section 9 of the Ontario Occupational Health and Safety Act, SRB Technologies (Canada) Inc. maintains a Joint Health & Safety Committee.

**Joint Health & Safety Committee**

The committee is comprised of a representative on behalf of the workers and a representative on behalf of the employer. The representatives have received Part I and II certification.
The committee meets at least once every quarter.

# 11. Public Information Initiatives

### Public Information Program

On August 15, 2005 SRB provided CNSC staff with a revised PIP developed in accordance with the REGULATORY GUIDE, Licensee Public Information Program G-217.

This iteration of the PIP was developed to provide information to a larger target audience in a more proactive manner.

SRB developed some communication tools for the PIP:

**Web site**

On the web site the public could find information on company products, manufacturing process, download of annual compliance reports, SRB emissions in perspective, information on company fundraising and sponsorship of various charitable events. The web site also provided contact information for anyone with any questions regarding the company.

**Pamphlet**

A pamphlet was also developed intended for distribution to approximately 8 000 residences every year.
The pamphlet provided information on:

- •Company background
- •Description of manufacturing processes
- •Outline of company products
- •Tritium
- •Safety of product
- •Monitoring
- •Emissions and effects on the environment in perspective
- •Public dose in perspective
- •Contact information

**Brochure**

In 2005, our company has also developed a brochure with respect to the effects of the products on health and safety and on the environment. The document described and explained various aspects of tritium, various lighting applications of gaseous tritium light sources, the life cycle of tritium, health, safety and environmental aspects related to tritium, various products, contact information, and a one-page question and answer insert.

On October 28, 2005 CNSC staff provided SRB with a detailed review of the PIP submitted by SRB on August 15, 2005. In this review CNSC staff noted that the program had improved but still had not addressed some key information gaps or fully taken into account local concerns.

SRB revised the PIP to include the details outlined in the review provided by staff CNSC and supplied it to CNSC staff on December 12, 2005.

As requested by CNSC staff, in the revision, SRB expanded their target audience to include local special interest groups, local media, commercial neighbours, and local businesses.

In the revision SRB also proposed to schedule at least one public meeting per year where all members of the public will have the opportunity to ask questions of SRB officials directly.

SRB also proposed to schedule regular meetings with local special interest groups.

SRB was also asked to revise the brochure, pamphlet and web site in order to reflect updated information as well as address how the activities at our facility could affect the environment as well as the safety of people and workers.

**City Council Presentation**

On September 6, 2005 the first of an annual report provided to City Council supported by a presentation at a session of Council open to the public was held. This presentation was advertised in advance in a local newspaper by SRB and was to be televised on local television. The report is publicly available through the City of Pembroke. The report and presentation provided City Council members and the public the following:

- •Emissions from the facility for the year
- •Environmental monitoring data for the year
- •Public dose for the year
- •General update on licensing activity
- •Update on other business matters

**Addressing the needs of local special interest groups**

On November 7, 2005 SRB met with members of the Concerned Citizens of Renfrew County and LEAD Environmental Awareness Detection at the Best Western in Pembroke to discuss their concerns. On September 22, 2005 SRB attended an open forum arranged by the Concerned Citizens of Renfrew County, SRB made a presentation and answered questions directly from the public. To be more transparent SRB also supplied various documents to local interest groups when requested.

**Door to door survey**

During September 2005, SRB carried out a door to door survey of 100 homes closest to the facility.

**Environment Monitoring Results**

SRB has sampled well water and garden produce from members of the public. The samples were submitted to a contract laboratory for tritium concentration assessment and the results were reported to the members of the public and are shown in **Appendix A.** This data was used in the calculations for critical group annual estimated dose for 2005.

**Communication with emergency responders**

In 2005, our company continued to frequently communicate and maintain a good rapport with emergency response personnel defined as the local Police and Fire Departments.

**Participation in Community Events**

SRB continues to participate in community events and support charitable organizations. In our involvement we take the opportunity to relate the benefits of our products and the effects on the health of the public and the environment caused by our operations.

# 12. Forecast for Coming Years

### Overall Commitment In The Future

We are committed to continue to work with the CNSC to have all our programs and documentation exceed regulatory requirements and meet staff expectations.

We will maintain this commitment to continuous improvement. We will strive to achieve higher grades with increasing trends in all areas and will not be satisfied until this is achieved.

We clearly understand and recognize that the onus is on our company to analyze our programs and identify deficiencies and be responsive to correct problems.

To achieve this goal we have increased our efforts and allocated more internal resources in addition to the increased use of independent third parties and will continue to do so in the future to ease CNSC staff concerns and to allow reduction of regulatory oversight.

### Environmental Protection

We are committed to the approval of a DRL with the objective of protecting the environment and the public for possible conditions at present and into the future.

SRB is also committed to the continuous improvement of the Environmental Monitoring Program (EMP) to ensure that the EMP provides appropriate and adequate information for calculating the dose to the public. We will ensure that results are carefully analysed, interpreted and understood in relation to stack emissions and operational changes.

Periodic stack emission verification will be performed, where the entire system, rather than individual components will be assessed for measurement accuracy to ensure that air monitoring data is conservative compared to the values predicted from atmospheric modeling used for the DRL calculation.

SRB has, and will continue to dedicate much time and effort to identify tritium mitigation measures that reduce tritium emissions and contribute to the reduction of the dose to the public while at the same time not imposing additional risks to staff at the facility.

### Public Information Program (PIP)

We will strive to have a proactive approach with the public and provide them with information on the operations as well as to reassure the public of their health and safety.

SRB will significantly increase its transparency, visibility and openness and will hold regular face to face meetings with the general public and special interest groups.

On an annual basis we will evaluate the effectiveness of the program and will amend the program to address specific area of concern.

### Product Acceptance

The products we manufacture provide illumination to indicate a safe exit or for many other safety applications. We will attempt to educate the public to achieve acceptance of the value of the products we manufacture, similar to the acceptance of smoke detectors and other devices that use radioactive material.

## *Part C*

I hereby certify that I have reviewed the documents referred to in the Appendix A of license NSPFOL-13.00/2005 and Appendix E of license NSPFOL-13.00/2006 and do believe that SRB Technologies (Canada) Inc. has operated in compliance with the license conditions except as noted herein:

Signature:_____ Date:_____

Name (print): Stephane Levesque

Title: President

Address: 320-140 Boundary Road, Pembroke, Ontario, K8A 6W5

Phone Number: (613) 732-0055 Fax Number: (613) 732-0056

Other approvals, as required:

| Name (Signature) | Title | Date |
|---|---|---|
| Ross Fitzpatrick | General Manager | |
| K.K. Shane MacDougall | Corporate Health Physicist | |

## *Contact Information:*

**For radiological information regarding Betalights™ :**

| | |
|---|---|
|  | **K.K. Shane MacDougall**<br>**Corporate Health Physicist**<br>**Radiation Safety Officer**<br>**SRB Technologies (Canada) Inc.**<br>**Phone: (613) 732-0055**<br>**Fax: (613) 732-0056**<br>**Email: shane@betalight.com**<br>**Web: www.betalight.com** |

## *Other Information:*

| | |
|---|---|
|  | **SRB Technologies, Inc.**<br>**2580 Landmark Drive**<br>**Winston-Salem, North Carolina, USA**<br>**27103**<br>**Phone: (336) 659-2610**<br>**Fax: (336) 768-7720**<br>**Email: sales@srbtechnologies.com**<br>**Web: www.srbtechnologies.com** |
|  | **SRB Technologies (Canada) Inc.**<br>**320-140 Boundary Road**<br>**Pembroke, Ontario, Canada**<br>**K8A 6W5**<br>**Phone: (613) 732-0055**<br>**Fax: (613) 732-0056**<br>**Email: sales@betalight.com**<br>**Web: www.betalight.com** |