Canadian Nuclear Safety Commission

Commission canadienne de sûreté nucléaire

Public Hearings

Audiences publiques

August 28, 2006

Le 28 août 2006

Public Hearing Room
14th floor
280 Slater Street
Ottawa, Ontario

Salle d'audiences publiques
14e étage
280, rue Slater
Ottawa (Ontario)

Commission Members present

Commissaires présents

Ms. Linda J. Keen
Dr. Moyra McDill
Mr. Alan Graham
Dr. Christopher Barnes
Mr. James Dosman

Mme Linda J. Keen
Dr. Moyra McDill
M. Alan Graham
Dr. Christopher Barnes
M. James Dosman

Secretary: Mr. Marc A. Leblanc

Secrétaire: M. Marc A. Leblanc

General Counsel : Jacques Lavoie

Conseiller général : Jacques Lavoie

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Ottawa, Ontario

--- Upon commencing on Monday, August 28, 2006
at 10:38 a.m.

Opening Remarks

M. LEBLANC: Bienvenu à cette procédure de la Commission canadienne de sûreté nucléaire. The Canadian Nuclear Safety Commission is about to start a proceeding.

Mon nom est Marc Leblanc. Je suis secrétaire de la Commission et j'aimerais aborder certains aspects touchant le déroulement de cette procédure.

If you would, please keep the pace of speech relatively slow so that translators have a chance of keeping up.

L'audience est enregistrée et transcrite textuellement. La transcription se fait dans l'une ou l'autre des langues officielles compte tenu de la langue utilisée par le participant de l'audience publique.

En fait, I wanted to say "transcripters" can keep up because we don't have any translators today. Our notice indicated there would be interpretation services upon request and there was no such request.

L'audience est enregistrée et transcrite textuellement. La transcription se fait dans l'une ou l'autre des langues officielles compte tenu de la langue utilisée par le participant à l'audience publique. La transcription sera disponible sur le site web de la Commission dès la semaine prochaine. To make the transcript as meaningful as possible, please identify yourself clearly before speaking.

As a courtesy to others in the room, please silence your cell phones.

Madame Keen, présidente et première dirigeante de la Commission will preside today's proceeding.

Madame Keen.

THE CHAIRPERSON: Good morning and welcome to this proceeding of the panel of the Commission on the opportunity to be heard by SRB Technologies Canada Inc. on the Designated Officer Order issued to SRBT on August the 15th, 2006.

I would like to begin by introducing the members of the Commission that are with us today.

On my right is Dr. Moyra McDill and Dr. Christopher Barnes. On my left is Mr. Alan Graham and Dr. James Dosman.

As well as the Secretary of the Commission,

Mr. Marc Leblanc, we also have the General Counsel to the Commission, Jacques Lavoie, with us on the podium today.

I would like to note that the Commission is still on enhanced security status and, as such, I will ensure that matters of a sensitive nature, security matters, are not discussed in public and I will, if necessary, take us in camera to make sure that those matters are not discussed in public.

On August the 15th, 2006, SRB Technologies Canada Inc., or SRBT, was issued an Order by CNSC Designated Officer. Pursuant to subsection 37(6) of the *Nuclear Safety and Control Act*, the Designated Officer referred the Order to the Commission for review and the Commission shall confirm, amend, revoke or replace the Order.

Pursuant to paragraph 41(d) of the *Nuclear Safety and Control Act* the Commission shall provide an opportunity to be heard to any person named in or subject to the Order.

The procedure for today's proceeding is set out in Part VI of the CNSC Rules of Procedure. SRBT and CNSC Secretariat officials agreed on a date to conduct the opportunity to be heard. SRBT was formally notified on August the 21st, 2006 of its opportunity to be heard scheduled for today. A public notice was published to

that effect on August the 23rd.

The purpose of today's proceeding is solely for the Commission to review the Order. Licensing matters are to be addressed in the context of a licensing hearing to take place later.

We will conduct the opportunity to be heard today in the following manner. First, SRBT will be provided the opportunity to present its submission. In this context, SRBT also has the opportunity to raise questions as to the Order, its contents or related issues that it wishes to be addressed in the context of this proceeding.

Secondly, the Commission will have an opportunity to ask questions to SRBT or seek clarifications. The Commission will have the opportunity to direct questions raised by SRBT to CNSC staff for response. The CNSC staff will not make a presentation on the DO Order but may be asked to respond to questions from the Commission.

For the record, it should be noted that the Commission received a written submission from SRBT staff on Friday, August the 25th, but this submission will not be considered as part of the proceeding today.

It should also be noted that Concerned Citizens of Renfrew County have filed a request to have an

opportunity to be heard in this matter. The Commission has considered this request and has determined that the submission will not be considered in the context of this proceeding. The Reasons for Decision will elaborate on the Commission's determination regarding these requests.

On that basis, knowing how this proceeding will happen today, I am now ready to turn to SRB Technologies (Canada) Inc. and confirm that they are ready to proceed.

Welcome, Mr. Levesque, today and the floor is yours, sir.

SRB Technologies
(Canada) Inc. (SRBT):
Opportunity to be heard on
the Designated Officer Order
issued to SRBT on August
15, 2006

06-H144.1
Oral presentation by
SRB Technologies (Canada) Inc.

MR. LEVESQUE: Thank you. Stephane Levesque, for the record.

I'm the President of SRB Technologies.

Today I'll be making this presentation, followed by additional statements from some of our independent third parties, Mr. Neil Morris, Senior Scientist from EcoMetrix, Dr. Ron Nicholson, Senior Hydrogeolist from EcoMetrix and Dr. Richard Osborne from Ranasara Consultants. I'm also joined here today by our Radiation Safety Officer, Shane MacDougall, and our General Manager, Ross Fitzpatrick who will help me answer some questions.

First, I would like to thank the Commission and the Commission Secretary for allowing us to be heard on such short notice.

On August 15, 2006, Dr. Thompson issued our company an Order. The issuance of the Order and the stipulations of the Order came as a shock to SRB and the independent consultants who have been working closely with SRB.

We intend to demonstrate today the reasons why SRB and our independent consultants feel so strongly that the issuance of an Order and its stipulations are not justified.

As the Commissioners are aware, we were scheduled to be heard on our Day One Hearing on August 17th. Instead, we are here today to respond to this Order. The Order shuts down our company for all practical purposes.

As you may know, SRB has been working and taking direction from CNSC staff for years with respect to issues relating to tritium emissions. We have made concrete and substantial efforts, have complied with the directives given to us and operated within the expectations and constraints placed upon our operations by CNSC staff.

Over the past several years, those expectations have resulted in gradually lowering our average weekly emissions further below the regulatory limit to less than 3 per cent of what they were in 2000. It was not an easy task given our concurrent increase in production output, but our company, management and employees made a commitment to work hard and spend the resources necessary to achieve those goals even if on occasions we felt that expectations were not always consistent with those placed on other facilities who emit tritium.

CNSC staff have intimately been involved with us, studying the presence of tritium on and off site.

We propose to proceed today by first giving you an overview of the issues and then by making more detailed submissions on those issues.

There are three key reasons why we are asking you to revoke or amend the Order to allow our

company to stay in business and operate. We feel there is no rational connection between the Order and the issue it seeks to remedy. The Order is motivated by a concern about tritium concentrations in groundwater in the immediate vicinity of the stacks. Those concentrations arise directly from atmospheric emissions of tritium that have consistently been well within the regulatory limits. Our emissions have always been dramatically reduced as a result of cooperation with the staff.

The result of the emission reductions in soil and groundwater cannot be expected to be immediate. The half life of tritium is approximately 12 years and vertical infiltration from surface to bedrock, where lateral travel may occur, could take approximately 140 years.

Over such a timeframe, higher concentrations and source moisture entering in the stack area will be reduced by decay alone to levels below drinking water guidelines.

Dilution by a relatively clean source of water will also contribute, further reducing the concentrations below the water guideline. Owing to the time required for downward infiltration the levels of tritium observed in groundwater today are largely reflective of historical emissions and these levels and

concentrations are not being increased in any material way as a result of continued operations which again are less than 3 per cent of what they were in 2000.

We have initiated a study of the onsite and offsite concentrations of tritium in soil and groundwater and everything; leading experts and environmental and health risk assessment. Those experts have assisted us with characterizing the risk of the tritium concentrations present in soil and groundwater in accordance with CNSC regulatory requirements, Health Canada Guidelines, international guidance from the IAEA, ICRP and the best available science.

We were very careful not to rely on our own assessment and judgment of the issue, knowing that there is great value in objectivity. We especially set out to retain experts with a long history of experience and great depth of expertise in issues of radiation protection, environmental protection and health risk analysis. We told our experts to make sure that CNSC staff and, most importantly, the public understand that our company is committed to protection of the public and the environment.

All those analyses have demonstrated that the concentrations of tritium offsite are well below the standards that have been conservatively set by good science, national and international guidelines. The

highest offsite concentration is 25 per cent of the Health Canada drinking water guidelines which are being established on the basis of maintaining public dose below .1 milliSievert. CNSC staff have concurred with our experts and risk analysis for offsite issues.

Our company and I personally have valued the relationship that we have built with CNSC staff especially in the last year and have been respecting and addressing staff's concerns and comments. I therefore do not take lightly the comments that I am forced to convey to you today.

The real effect of the Order and the germane licence hearing has essentially removed the licence hearing and decision from the Commission. The same issues that have become before you with a licence hearing have been presented in a dramatic and negative light in a manner that has been breathtakingly unfair. There is a procedure that has been laid down by the Commission to ensure fairness by ensuring that positions of the staff and the licensee are communicated effectively and in a timely manner. That procedure, we feel, is not being followed. Also, requirements of fairness and natural justice resting upon staff that should be met before staff issue an order; we feel those procedures have also not been followed.

We were not given any opportunity to seek counsel and expert assistance and make our position known to the persons issuing the Order to avoid the very difficult position in which we have been placed in today. Our counsel, Mr. Shepherd, specifically asked for those rights to be respected and his request was ignored. I am advised that the duty of fairness and rights of natural justice are rights and duties have been very well established and have been laid down by the Supreme Court of Canada and the Federal Court of Appeal and are routinely enforced by the courts and respected, but they were not in this instance.

In conjunction with issuing the Order, Dr. Thompson said that we would have an opportunity to be heard after the Order is issued, which in our view missed the point. The law requires a hearing before the punishment and it’s not acceptable to defer it until the punishment is levied. One can only attempt to defend themselves in an appeal. The damages covering our licensing hearing in declaring us guilty has already been done.

With all due respect to staff, there are no recent events or revelations that are so far out of keeping with the information base and expectations that we had before to justify such a radical change of direction.

There is also no evidence of any immediate, short or long-term threats to the environment. The history that I alluded to in my earlier remarks and on which I will elaborate later in my submission, shows the following to be the case.

The fact that tritium is present in soil and groundwater has been known to staff for many years from the result of numerous measurements taken in the general area and from the results of the study that were submitted by EcoMetrix on March 31st and from additional samples taken by CNSC staff of the stack area soil on May 4th.

Rightly so, as a minor priority, everyone's focus including that of the company and CNSC staff, we believe, has been on studying offsite impacts and ensuring that the community was not in any way at risk as a result of offsite concentrations in soil and groundwater.

We, our experts and staff, have always known that the principles of fate and transport for airborne substances and those in groundwater dictate that there will always be a concentration gradient. That means; for example, as in the case with our situation, at 400 metres away from the source you may have concentration at a 25 per cent of the drinking water guidelines and at concentrations further decline at increasing distances

from the stack.

It is self evident that the closer you get to the source the higher the concentrations will be with the highest concentrations being found at the earliest point of impact. This has been known and expected. We have not hidden this fact and CNSC staff have or should have been well aware of this. It can easily be demonstrated that the stack emissions are the only significant source of tritium found in groundwater and that there is a consistent relationship between levels of tritium in air and in groundwater even in close proximity to the stack.

The fact that higher concentrations are being found in the immediate vicinity of the stack is not an unexpected event and does not constitute an immediate short or long-term risk to the health of the public or the environment. These concentrations do not result in levels of tritium that currently exceed appropriately considered limits for the environment. Given that the concentrations of tritium in groundwater are directly associated with those in air, the significant and continuous reductions in tritium releases to air from SRB will be mirrored in groundwater in the future.

The Order came after staff initially issued a CMD on July 24th in which an 18-month licence was

recommended. A supplementary CMD was then issued on August 4th in which staff confirmed the 18-month licence recommendation.

We have worked very hard for our readiness for the Day One hearing but, at about 4:20 p.m., on Friday on August 11, we received a call from CNSC staff ordering our presence at a meeting on Monday, August 14th at two o'clock. During that conversation I requested the purpose of the meeting but was told I could not be provided that information until the meeting, but was told that it related to new information regarding the groundwater. Obviously, to reducing ensuing anxiety to myself; Mr. Fitzpatrick, our General Manager; and others who were aware of the call, I asked if the meeting could be made any earlier but was told that it was not possible.

On that Monday we attended the meeting as scheduled to be informed that SRB would be issued an Order which may require us to implement measures which may lead us to the shutting down of our operations. At that point we were already in total shock. Dr. Thompson then proceeded to provide facts regarding the groundwater issue and asked if we had any questions regarding these facts. We requested that we be provided the details of the Order and the stipulations while asked to further comment. These, we were told, were not finalized and could not be

shared at that time. Only a sheet of factual background notes was provided for comment which I have included in your submission in Appendix 5. We stated that we did not understand why tools other than orders were not used as we had always demonstrated our willingness to work with staff to resolve issues.

During this meeting we were also asked for our support for the adjournment of the Day One hearing but, obviously still baffled about the situation, I thought that I shouldn’t consider that until I was provided the details of the Order and the stipulations.

On that night our lawyer sent correspondence to staff by email, phone and by fax the next morning to remind them that we were entitled to an opportunity to be heard and to answer the case against us before an Order was actually issued. This letter then made the point that it was essential that staff provide SRB with sufficient detail of the Order’s nature, basis and timeframe for compliance so that SRB could be provided with a reasonable opportunity and time to provide feedback before any such Order was issued. None of this correspondence was responded to and an Order was issued which was received by SRB by fax on August 15 just after 2:00. Again, it was a shock because the issuance of an Order required us to immediately cease tritium processing,

which was a little bit different from what we were told the day before. The extent of its severity had a devastating effect on all our staff and their families.

The issuance of the Order also had a devastating effect on our ability to meet our planned commitments to our customers and our reputation with these customers, suppliers and other members of the community.

SRB understands its responsibility for protection of the environment but, as with other licensees in Canada, SRB would like to be provided the opportunity to continue our work to further define groundwater conditions onsite and be provided the time necessary to address CNSC staff's new concerns and identify and implement measures to prevent or mitigate further contamination of groundwater under the stacks or elsewhere while operating.

Our company and the type of industry adds great value to Canada and it's definitely worth having in Canada. Our company produces a product that saves lives all over the world in situations where failsafe illumination is required. We use in our products as a raw material tritium, which would otherwise be left as a waste from the operation of reactors. It's crucial for our customers that we be allowed to process tritium in order to provide the products they so desperately need for their

safety and security.

We are the sole supplier for many products and currently have orders in house for use by many aircraft manufacturers; Special Forces; NATO peacekeeping troops currently in Iraq and Afghanistan.

The issuance of this Order is strictly related to the Groundwater Study and related work that has been performed to date by SRB and its independent consultants. The Order reflects a concern regarding contamination that allegedly represents a risk to the environment.

Previously, on November 16, 2005, CNSC; Dr. Thompson, issued an Order to SRB requiring SRB to comply with specific actions and measures to have an independent third party define the extent and magnitude of groundwater contamination on and around the property where the licensed activity is carried out; characterize and confirm all sources and causes of groundwater contamination by tritium; identify any continuing sources of contamination and assess potential adverse impact to the contamination of groundwater on human health, the environment and land use.

That initial Order also came as a surprise to SRB as some of the basis for the Order lists two measurements of tritium in groundwater well below the

Ontario drinking water guidelines and the fact that we previously received statements in the letter from CNSC staff dated April 25th.

If I could please turn your attention to Appendix 7 on page 6 -- so Appendix 7 on page 6. And we have highlighted where it essentially says that:

> "No further precipitation monitoring is warranted as part of the ongoing Environmental Monitoring Program. All together, tritium levels in drinking water do not justify a routine program to monitor residential wells in Pembroke."

And on page 7:

> "Given the wide range of expected values for surface water and tritium measurements, results do not justify surface water monitoring as part of the Environmental Monitoring Program."

That was only a few months before that Order was issued.

The general conclusion that tritium in surface water is not a concern is consistent with conclusions previously reported by staff, including an assessment done on September 29, 2003 and several other

previous assessments, one of which I have included in Appendix A.

Understandably, SRB at that time also believed that the issuance of the Order conveyed a different message than was previously communicated regarding the issue. SRB, however, respected CNSC staff's new concerns and was committed to complying with the Order.

The Order was replaced by a licence condition to perform the work in our current licence. We hired an independent third party, EcoMetrix, with expertise in performing assessments in nuclear and radiation issues including assessments of tritium in groundwater for other CNSC licensees; Ontario Power Generation, Bruce Power, New Brunswick Power, Hydro Quebec and AECL.

EcoMetrix prepared a detailed Terms of Reference for the study and submitted that Terms of Reference to staff for review prior to initiation of any study-related tasks. Following discussion of the Terms of Reference between CNSC, SRB and EcoMetrix, the Terms of Reference were finalized following my new modifications. The study was then initiated and ultimately completed in accordance with the finalized Terms of Reference.

Progress reports, which I have included in

Appendix 10, were also sent to staff without comment and we have sent one on January 20th and another one, I believe, on February 9th.

We have also hired Dr. Richard Osborne, Ransara Consultants, to provide comment on the study and advise on future public interaction because we understood that groundwater is such a serious and controversial issue we wanted to get different opinions in the industry.

In keeping with procedures developed in consultation with the CNSC as part of the Terms of Reference and the very short timeline, approximately three months, the Groundwater Study thoroughly examined the resource -- the sources, sorry -- and distribution of tritium in groundwater.

The study included the following specific activities to provide a detailed and complete understanding of tritium in groundwater in the vicinity of the facility: Review and inspection of the physical facility and operational procedures and all data and information describing tritium releases from SRB; review of all available monitoring data regarding levels of tritium and atmospheric releases and in the environment; the installation of seven new monitoring wells in key locations near the facility; the collection and analysis of groundwater sample in these seven wells, five other

existing monitoring wells and seven local residential wells; the characterization of underground environment with respect to the factors that affect the speed and direction of groundwater movement; assessment of the reliability of the model used to calculate the public doses associated with drinking -- excuse me -- associated with tritium releases from the facility and subsequent exposure via the residential use of groundwater and the development of area maps and figures.

If I can please take you to Appendix 11, just so you can see a little bit of a map of the facility and where the wells were located? I think it's a better map than what maybe has been supplied before. It gives a little bit more of an area and you can see the MWO6-01, the closest well to the stack. Basically, the centre of the map is the stack area; MW06-02 onsite as well and MW06-03. Then, just across the street from Boundary Road you see five monitoring wells.

The following map just gives you a slightly greater view where you can see more the wells that are being drilled and monitored.

And the third diagram basically gives you all the wells that were done as part of the study.

The various efforts comprising this study have provided reliable and sufficient information that

serves to understand the influence of SRB operations on local groundwater resources. In summary, the study found the following:

There is no evidence of a source other than stack emission that is resulting in tritium-bearing groundwater emanating from the facility; no significant liquid sources of tritium were identified and the data from direct measures of tritium in groundwater are very consistent with the expectant influences of stack emissions to air.

The tritium occurring in residential well water as a result of these emissions is well below the Canadian drinking water guidelines, the 7,000 becquerels per litre set by Health Canada. This is a conservative value selected so that all the water consumed by an individual in a year comes from a supply and a concentration. The dose to that individual in a year will be no greater than 10 per cent of the annual public dose limit to the general public.

The level of tritium in monitoring wells: All monitoring wells are well below the Ontario drinking water guidelines except for monitoring well number one (1). The level in this well was approximately 60,000 becquerels per litre. This is located on the SRB site and is closer than any other well to the stack of the facility

and it is likely that concentrations in this well are influenced by surface runoff or precipitation; soil composition that was disturbed as the result of groundwater.

Tritium wells in all wells including MWO6-01 were also well below the screening criteria that have been previously used for assessment of tritium in groundwater that is not used as drinking water. All results have been tabulated. If you see on Appendix 12, just included is a very brief table that shows you all the monthly results that we have gotten as part of the study and since the study, and you can see that the only level, obviously, is in the one well located onsite. If you see a discrepancy in distance it’s because some maps locate the distance from the facility and others it’s distance from the stack.

Following a review of the study, in a proactive manner SRB took several actions which were reported to CNSC staff in a letter dated May 15th before we have had any comment yet from the study from CNSC staff. In this letter SRB committed to continue to gather data and supply staff with other sampling results. Sampling results include a continual monthly testing of wells, routine monitoring of snow ditch surface water around the facility to determine the distribution in the

environment and routine swipe measurements outside the facility. SRB also reported that it would formalize these actions in the plan and provide staff by March 31st, 2007 a comprehensive report of the results to assess the possible impacts on the environment and to make recommendations on any future changes or testing that may be required.

If I can take you to Appendix 13?

And the reason we basically did this is we wanted to better understand conditions onsite because we saw, obviously, discrepancies between some of the wells, between monitoring well 1, 2 and 3. This wasn't asked of us. We decided to do again the sampling of wells, the sampling of snow ditch surface water, and we thought it was very important to do that over several seasons because there can be fluctuations from season to season depending on snow ploughing, snow precipitation, temperature and so on and so forth.

We also wanted to see what impact the rain and snow had on the environment and the premises of our facility so we undertook to take swipe measurements. We also had passive air samplers located right at the stack area because up to that point we had some approximately 200-250 metres away from the facility. So we wanted to see what the levels would be closer to the source.

We hired Dr. Osborne to provide us, again, with another opinion on the study, another result that we would get and, again, we committed to put all these results; do some analysis determining the potential impact and see if any changes to the facility, testing or any changes would be required by March 31st.

SRB then installed passive air samplers in close proximity to the stack and reported these results on June 2nd and 3rd to the staff which really confirmed that tritium and air concentrations decrease with distance from the stack consistent with results of the Groundwater Study.

On June 30th, staff provided their review of the study where staff stated that the study identified the magnitude and extent of groundwater contamination by tritium beyond the borders of SRB and confirmed that there is no immediate health risks to persons living in the area. Staff also stated that the interpretation of stack emissions from SRB is the source of offsite concentration of groundwater for distances greater than 200 metres from the facility. Staff also stated that the possibility of a groundwater tritium plume of limited size leaving the facility could not entirely be rejected and that work had to be undertaken by SRB onsite.

Staff came to SRB on July 11th and met to

discuss the comments in their letter and the path forward. The additional work included a continuation of the work where it had already begun after our review of the study, including rates of infiltration at each well, the measurement of water level rise as a result of precipitation, soil sampling survey, et cetera.

If I can please draw your attention to Appendix 15 where the CNSC staff letter from June 30th is there? If I can specifically draw your attention to page 3 of that letter -- I'm sorry, page 2. I apologize.

Under "Additional Work" there are four items. The first item was that:

> "SRB should submit a discussion of potential limitations on future use of the land contaminated by tritium including a description of the options and measures that are possible for reducing those limitations; notice on land use; restrictions on development."

As part of the study we had submitted information on current use of land but not future. So we undertook immediately to take that step and it's been since completed and it's supplied to staff.

Number two:

"SRB should implement measures to reduce the emissions of tritium through their stacks in order to reduce the offsite impacts arising from stack emissions."

This is something that we are continuously working on, and I'll tell you a bit about later on today.

Number three:

"SRB should implement measures to identify and control contaminated runoff from the site."

Number four:

"SRB should undertake to identify future emissions of tritium from the facility that may be a source of onsite and near offsite contamination."

If I take you to the following page, page 3, "Implementation and Recommendations" where you see Item I to V or VI, in Roman numerals -- implementations and recommendations are three; then should include "I" as a one-time tritium concentration soil survey.

When we met CNSC staff on the 11th we felt that it would probably be more appropriate to actually do more than one because there may be differences according

to seasons and it's something that we wanted to talk to our consultants about as well. That has not yet been done but arrangements are being made to get that complete.

Number 2: "Measuring a tritium concentration at site runoff."

That had already been initiated following the study in March and we already had a number of results regarding that by that date.

(3): "A one-time survey to quantify contamination by tritium on the surface's structure."

We didn't think a one-time survey would be acceptable and we had already been doing it for weeks. We think that because, depending on different temperatures, depending on different precipitation, that there would be fluctuations. We had already undertaken work to do that.

Number 4: "Monitoring at appropriate frequency the rate of infiltration at each well."

Basically based on rainfall. We immediately started doing that the following day, following that meeting, so on July 12th.

Number 5: "Measuring at appropriate frequency the water level rise and fall, response infiltration events at

each MW and CN wells."

We don't currently have free access to the CN well property. We don't own that property, but the MW wells is something that we immediately started doing the day after that meeting. Next:

"To measure the tritium concentrations in groundwater and monitoring wells."

We had already started doing that on a monthly basis without anybody telling us.

A little bit further on in that paragraph you'll see that the CNSC confirmed there that -- and it's about the fifth line -- that this should continue for a number of storms of differing intensity, possibly over the summer and autumn. We actually felt that over the four seasons would be more appropriate to give us more data, not to delay any remedial action or any action that we wanted to take, just to fully understand what the groundwater conditions onsite were before we initiate full steps on what we were doing.

If I take you back to my presentation, during that meeting on July 11th, SRB first supplied the results that they already had, which included the highest concentration monitor in only a small 50 millimetre sample to date of 59 mega-becquerels. The next highest

concentration monitor was 4.7 mega-becquerels. In fact, of the eight measurements exceeding the one mega-becquerels of one million to date, six were reported on July 11th, and these are listed on the Order, I believe.

After discussion with staff following that meeting, it had been agreed on July 17th that SRB would formulate an action plan by August 31st to perform all the additional work that we had already started plus the new work. On July 21st staff also issued, following some discussions, a request pursuant to section 12 to install three additional wells onsite.

On July 28th, SRB agreed to perform the work in the request but needed some clarifications on certain issues, and we haven't had a response to date, and that's found in Appendix 17.

On July 24th, CNSC issued their CMD again proposing the 18-month licence but with an emission limit to allow for the sustainable use of groundwater resource. The emission limit was basically based to ensure that levels for monitoring Well 1 long term would reach only 25 per cent of the drinking water guideline. This was a bit of a surprise. We didn't realize this, but they came to us with that and the proposed emission limit only represented a small fraction of the reduced limit that we were already operating under since our restricted

operations. The proposed total limit is about .37 per cent of the existing limit for gas and 5.63 per cent of the existing limit for oxide.

Then the derivation of this limit with the details were provided on August 4th. Our company was committed to the protection of the environmental protection of groundwater resources and we looked at these numbers carefully, and based on the reduction of emissions achieved over the last few years and the recent introduction of additional measures, we were hopeful that we could operate within this emission limit.

Our tritium oxide emissions, I would like to point out, have been below the proposed cap since essentially the end of May -- gradually, right up to the end of May.

On July 26th, as part of the work required in the June 30th letter, SRB submitted staff detailed discussions on potential limitations on future use of land contaminated by tritium. These discussions confirmed that the City of Pembroke has a zoning bylaw requiring all buildings in Pembroke to be serviced by municipal water. In these discussions, the City of Pembroke also confirmed that any development or redevelopment of the property would require the site plan agreement, and that if the property was to be developed in the future for a

residential subdivision, that a re-zoning of the site would be required, which also requires that an environmental site assessment be conducted of the site and that all recommendations of this assessment be followed prior to the issuance of a building permit.

The landowner agreed in writing to these terms and conditions and signed an agreement that would restrict excavation or modification of the site until an assessment was performed to ensure that the work undertaken would not result in a risk to a worker performing such work.

Our landlord has always been aware of the groundwater issues, so has the city. They have been involved intimately with us, not just on July 26th but from very early on.

On August 9th we understand that staff also sent the Mayor of Pembroke a letter confirming that levels of contamination by tritium did not pose a risk to the groundwater in the vicinity of the SRB facility as it is not currently being used as a source of potable water.

The letter also confirmed staff's understanding of the zoning bylaw requiring all buildings, including residential dwellings in the City of Pembroke, to be connected to municipal pipe service.

We then later advertised on local

television, local radio and newspaper a public information session which was held on August 9th in Pembroke. We also informed members of the community who had shown concerns over our facility in the past. We contacted them individually to ensure they were aware of this meeting. During that session we presented information on our operations, monitoring results, including the findings from the groundwater study and we gave everybody a handout regarding the groundwater study specifically, in addition to other data from the operations. The session was moderated by our local MP and other than our staff and other supporters, 14 members of the community attended the meeting and all 21 questions that were raised during the session were answered by SRB and our consultants, the same who are here today.

Since a completion of the study earlier in March, we also provided a copy of the study to the City of Pembroke, the Concerned Citizens of Renfrew County, to one of our commercial neighbours, our landowner and other individuals.

Although the work that is being undertaken is not yet complete, a simple assessment of onsite levels has been conducted and discussed below.

In close proximity to an atmospheric source, there are many factors that influence a transfer

of tritium from atmosphere to groundwater and significantly influences patterns of variability in tritium levels and shallow groundwater. Factors would include the presence of impermeable surfaces, buildings, pavement, the intensity of rainfall and the manner in which rainwater collects and discharges from the site, eavestroughs, downspouts. The wind and temperature patterns that affect the rise and fall of the stack releases and the direction in which they travel and the nature of the overburden, soils, rock onsite.

Due to the complex interplay of all these sources, it’s not possible to precisely predict tritium levels at specific locations in close proximity to the source of emissions to air.

However, there is sufficient data on some coarse approximations that can provide general and reliable indication that general levels of tritium in surface water or shallow groundwater that may be encountered onsite, very close proximity, within about tens of metres from the facility to the stacks. That’s why we undertook to take all the work, because of all these variables, to ensure that we knew exactly what was going on everywhere on site.

The levels of tritium in rainwater that falls through our plume of treated water can be estimated

using a standard and widely validated scientific model. Using stack emission data from 2006 to date, the typical rates of release of tritium oxide HTO are in the order of 2,000 gbq per week, which is less than 7 per cent of the weekly release limits of 29,000 gbq imposed by the CNSC last November. This translates to an average concentration at the immediate point of exit from the stack in order of about 500,000 Becquerel's per m^3.

This concentration of HTO in air can conservatively be converted to a concentration of HTO that would be found in rainwater at the exact same location simply by applying the standard washout ratio. Doing so in a theoretical concentration of tritium in rainwater of approximately 50 megabecquerels immediately at the point of release from the stack, realistically, the plume undergoes immediate and significant atmospheric dilution, as evidenced by long-term monitoring data which showed that concentrations of HTO in air declined to an average of about 100 Becquerel's per m^3 or less, representing a decrease in air concentration of more than 5,000 times 30 to 60 metres away from the stack.

At this level of atmospheric tritium, theoretical concentrations in rainfall would be approximately 10,000 becquerels per litre, even lower in snow. Assuming that delivery through rainfall is at least

a partial determinant of the concentration expected in groundwater, the range of theoretical bounds and precipitation on site could be 10,000 to 50 million becquerels per litre. This can be taken as an indicator of what could be found in very isolated samples of shallow groundwater.

Analysis of standing water collected at SRB has revealed a similar range of concentration that have been measured at other facilities in Canada that emit tritium. All air concentrations measured to SRB today have been measured by taking small 50 millilitres samples of water, this size (indicating), for those who don't know what 50 millilitres is, very small samples, not large samples of water dripping from either stack, not standing water, water dripping from either stacks which are located in a secure fenced area which is considered part of our facility. These values, again, were not associated with significant sample volumes. Again, the small 50 millilitres are flows of water and do not likely represent the average concentration that would represent reasonable source terms in terms of the environment.

The more representative concentrations would be developed in the soil or shallow groundwater that has a tendency really to average out the short-lived term spikes that can occur in small volumes of water that vary

a few times an hour because we complete a few processes three to four times an hour, and that's usually when the releases occur.

It's also important to remember that the majority of the tritium releases occur during our processing. On average, tritium processing occurs for only 25 per cent of the total hours available in a week, 40 hours a week of 168, with precipitation only constituting a fraction of this period.

Eighty-three (83) per cent of the measurements that were taken while processing indicated that the total water entering the soil was much lower in concentration on average.

There has also been significant variability in the rainwater measurements, even when collected at that same location. So if you look at the table, you can see that we've taken only 77 samples from the precipitation and you can see the average, which gives you an indication, basically, of what's going to groundwater only while we're operating.

Soil and groundwater samples taken by EcoMetrix on January 13th as part of the study and submitted on March 31st showed essentially that the soil samples collected were all indicative of what you could find in groundwater.

Other random soil samples which were collected by staff, tritium levels and soil moisture showed the following: 560,000 becquerels per litre right between the stack and a fenced area; approximately two metres right from the stack unit, 110,000; approximately three metres from the bulk stack unit, because we have two stacks, 95,000; and other samples near the property line, 12,000 and 2,300.

From the samples of soil and standing water collected in the stack area, there is no indication that levels found in groundwater would exceed the average value of water dripping from the stacks of 2.2 million becquerels per litre. In fact, again, this value was measured during operation which only constitutes 25 per cent of the total time in a week. The assumption could be made, on average, that the water entering the soil would only constitute 25 per cent of that number, so 574,000, which is very similar to the 560,000 that was found in soil from CNSC staff.

Considering the vertical travel time, soil constitution, dilution and decay of tritium, the concentration is certain to be much lower by the time it enters the water table.

All measures and predictions for offsite residential wells indicate that the levels today have

remained well below the drinking water guideline.

Collectively, the information suggests that tritium concentrations in shallow groundwater within the facility boundary are likely to exhibit high spatial variability based on the numbers we have to date. Although these levels are high relative to those encountered offsite, they're still likely to be less than the conservative screening criteria that have been developed for groundwater that does not serve as drinking water.

From what we understand from the Records of Proceedings, staff assesses water based on its intended use, and this water on site does not constitute drinking water.

Those criteria have ranged from a hyper-conservative 3 million becquerels per litre to higher proposed values. A conservative benchmark of approximately 23 million becquerels per litre can also be derived directly from the Priority Substance List Assessment Report prepared under the *Canadian Environmental Assessment Act*.

In the absence of any regulatory limit, research was undertaken by SRB and its consultants to ascertain values that had been applied as criteria for ensuring that tritium would not cause any detrimental

effects on the environment.

Various assessments known and approved by CNSC staff and discussed in past licence hearings for other facilities have been performed to establish benchmarks of becquerels per litre from non-potable water, representing the no-effect value for non-human biota.

If you look at Figure 1, we basically listed four of the most used ones that we've been able to find: Jacques Whitford at 3 million; the one that was used for the supporting document for the PSL which was 10 million; AECL, 12 million; Environment Canada, 23 million. Just for comparison, we've shown the numbers that you may expect on groundwater below the stacks of .56 or 560,000 becquerels per litre; .06 megabecquerels per litre for the well located on site or 60,000 becquerels per litre.

The question of interest is therefore what is the significance of what the levels on site may be? The answer lies in the following consideration. The drinking water guideline is only applicable in instances where water is deemed potable and potentially used as drinking water.

The use of groundwater as a source of residential water supplies in Pembroke is controlled through local zoning. Zoning bylaw 97-38 requires that all buildings, including residential dwellings in the City

of Pembroke, be connected to municipal pipe service. Residential wells are also governed by the MOE for well installation and maintenance.

As a result of these limitations and the locations of residential areas relative to SRB, there is no reasonable expectation that the establishment of drinking water supply wells enclosed on grade in proximity to SRB.

Mr. Nicholson will further go through what I'm going to go through now in a very general sense, but I'll give you really generally, if you look at Figure 3, essentially the direction of flow in groundwater on the site of the facility is first downward to the clay overburden or clay soil, and then laterally towards the river.

The downward migration of water will require many decades to reach the top of the bedrock before the water can move laterally. It has been estimated that this vertical migration will represent more than 10 half lives for tritium decay and at this time it's sufficient to prevent levels above the drinking water of 7,000 becquerels per litre.

At the top, sources and shallow groundwater have concentrations as high as 20 million becquerels per litre.

So if we look at this 20 million, in our stack area, while operating, we were getting 2.2 million with the numbers we have and, again, if we assume that it obviously rains when we're not operating and we estimate those levels at 570,000 it's a far cry from the 20 million becquerels per litre.

The half life of tritium being 12.3 years, a vertical travel time for infiltration from the surface could take approximately 142 years. And if you look at Figure 3, you can see that to travel through clay soil, the first five metres would take approximately 15 years. The average velocity is .33 metres a year. Then to travel onwards to the 20 metres would take approximately 127 years at .16 metres a year. Mr. Nicholson will go through a lot more detail with that in his submission.

At most wells the tritium level is less than 10 per cent of that productive standard. Overall, the levels of tritium currently occurring in groundwater either onsite or offsite are not a concern with respect to human health or the environment.

In considering SRB's practices, continuously reducing emissions and to maintain emission levels as low as reasonably achievable, it is expected that these already acceptable levels will decline in the future since they are related to past releases that were

higher than those at present and those that are expected in the future.

The current understanding of the levels of tritium in groundwater near SRB suggest that patterns seen in Pembroke are very similar to patterns seen in proximity to other facilities with similar atmospheric releases of tritium. At such facilities, monitoring data show that concentrations in onsite runoff, shallow groundwater and precipitation are highly variable. Corresponding offsite measurements reveal that tritium levels in wells are consistent with the expected atmospheric concentration in the vicinity of such operations.

Any of the values measured on site are below even the most conservative criterion for ensuring that tritium would not cause any detrimental effect to the environment.

A recent assessment of the risk of tritium in groundwater at the facility was performed to confirm the applicability of the most hyper-conservative criteria. Mr. Neil Morris from EcoMetrix, in Appendix 21, just -- we wanted to make sure that the criterion that were already out there were applicable to our facility, and he’s performed a small risk assessment that you can see in Appendix 21, and you may ask him questions on that later.

The performance of SRB in reducing tritium

emissions. Item 15 and 16 of Part III of the Order, which the Order is based on, are untrue. SRB strongly feels that over the years, the company has taken all the reasonable precautions to protect the environment and the health and safety of persons from tritium that is contributing to the contamination of groundwater by continuing to find ways to reduce emissions to levels well below those imposed by the CNSC.

The result has been a lowering of our average weekly emissions, as low as reasonably achievable, to less than 3 per cent of what they were in 2000. We've shown that emissions to air are the sole source of tritium in surface and groundwater.

SRB also strongly feels that over the years, it has taken all reasonable precautions to control the release into the environment of any tritium that is contributing to the contamination of the groundwater by introducing a number of emission reduction initiatives. These initiatives have resulted in the continuous reduction of emissions which are the sole source of tritium in groundwater.

In addition, since SRB has been in operation, radiation doses to the public have been well below the public dose limit of 1 milliSievert and have not caused an unreasonable risk to health of the public.

Based on monitoring results, at maximum the dose to a child or adult due to SRB will be less than .2 milliSieverts, 20 per cent of the limit. This estimated dose assumes that this individual resides very close to SRB, is breathing air due to the stack emissions from SRB, is drinking water from the backyard well or formula mixed with that well water and eats 100 per cent of their diet from their home garden.

The monitoring of air emissions is used as a performance assessment to ensure that provisions to protect the environment are adequate. Figure 3, that you can see there, shows that the tritium weekly total activity released in 2006 has continued to decrease gradually from the start of the year to our last full week of operation two weeks ago with both HT and HTO decreasing.

Again, for the last 10 weeks of operation the HTO releases were within the cap that was proposed in the July 24th CMD.

These ongoing reductions during 2006 are a clear indication of SRB's commitment to continual improvement and actions taken as reasonable precautions to control the release of tritium into the environment in compliance with the General Nuclear Safety and Control Regulations, paragraph 12(1)(c).

Reduction in emissions is directly related to reductions in potential source of tritium to groundwater and, therefore, these actions have also resulted in additional protection to groundwater from exposure to elevated tritium levels in the atmosphere.

Figure 4 basically demonstrates the decrease in tritium released on the facility in TBqs, indicating the 97 per cent reduction from 2000. In fact, looking at that graph and the data, the 2006 emissions are only 31 per cent of what they were in 2005. In 2005 they were only 29 per cent of what they were in 2004. In fact, of all the years you're looking at, the smallest reduction was 23 per cent in 2000.

As part of the last licensing process last November, the CNSC decided until the DRLs were reviewed that the release of tritium from the facility be managed under stricter controls in order to ensure protection of the environment. Staff proposed a reduced weekly release limit in the current licence which constituted only 6.66 per cent of the old limit. The proposed emission limit for the new licence, the one that was recommended on July 24th, constituted only .37 of the existing limit for gas and 5.63 for oxide.

If you look at Figures 5 and 6 you can essentially see between '97 and 2005 what weekly limits we

had, what our current licence has and what the proposed licence at the time had for HT and HTO. We have never exceeded any of those limits.

Just pictorially, in Figures 7 and 8 I basically wanted to use the limit that we are working to right now, although it's a lot lower than what we were operating under before. I decided to show where the HT or gas emissions had been compared to that limit since 2000.

Figure 8, I have done the same. I have done it for HTO, or tritium oxide.

One of the reasons for reducing the emissions -- success in reducing our emissions are a direct result of initiatives that we've taken both in our procedures and technology despite increased production output. Operational procedures were improved over the years to reduce the releases of tritium in air. All pump oils were removed from service gradually until completion in November 2005 and this we've assumed, eliminating the oil reduces the amount of oxide released in the facility.

Pyrophoric units, or PUs, are used in production for our filling reclamation and bulk splitting operations. Our PUs' ability to absorb tritium diminishes with the number of heating cycles it's being subjected to so in November of 2005 we implemented a reduction in heating cycles by approximately 30 per cent before the PUs

would be decommissioned. We also recently implemented a further reduction in the heating cycles of 25 per cent. A tritium oxide trap was also installed but the results were insignificant compared to other mitigation measures that were introduced.

In early July SRB also installed a system that allows inert gas to approach the system which is expected to reduce tritium oxide emissions and the dose to the public and the levels in groundwater.

Further mitigation efforts: The results and observations resulting from the introduction of various mitigation measures introduced today we used to draw conclusions where possible and to help define further mitigation commitments which will be taken by SRB.

On July 18th SRB reported to staff that when a filling rig run is performed that a small amount of tritium gas remains in the system and capable of being reabsorbed by the trap and subsequently released. The amount of gas in the system is proportional to the volume of the system. We are currently identifying ways to reduce the volume in the system to do a design in order to reduce emissions and that committed to report our findings to staff on September 15th.

In addition, we also investigated the introduction of an additional tritium trap on our

equipment which may allow for further absorption of residual tritium and committed staff to respond to that by January 30th, ’07.

SRB has begun a program to identify possible mitigation measures to further reduce emissions on a yearly basis as part of the Annual Compliance Report. SRB will report on this research and feasibility of introducing any new measures.

In addition, in our current licence, CNSC to ensure further protection of the environment implemented reduced weekly release limits as I discussed earlier and imposed several new licence conditions. These have all been complied with and verified during two separate unannounced inspections performed by staff on January 10th and May 4th. The processing of tritium shall only occur between 7:00 in the morning to 7:00 at night. The processing of tritium shall only occur if the effective stack heights were at least 27.8 metres, that the bulk splitting rate shall only be operated in the presence of a qualified supervisor, that the bulk splitting operation shall only occur when there is no other tritium gas processing occurring, that the pyrophoric units tritium traps or PUs, as we call them, excluding the bulk cylinders, be loaded with no more than 111,000 TBqs at any time; that at any time the licensee

only use one of the following units: reclamation unit, the light production filling rig; that we perform monthly maintenance of pitot tubes installed in the stacks and that we have a weekly verification of stack exhaust, and that all activities related to the EMP, or Environmental Monitoring Program, be conducted by a qualified third party.

Our emissions results are used as our performance indicators. As you can see from Figures 3, 4, 7 and 8, have clearly shown our commitment to protection of the environment by drastic reduction of our emissions.

We are also aware that staff engaged in some discussion regarding SRB doing a hearing for another licensing on June 28th. In these discussions, staff acknowledged that our company had been making progress in terms of looking at measures to reduce the amount of tritium being released in the environment.

In CMD 06-H16, dated July 24th, staff concluded that SRB had made major improvements in terms of stack performance; effluent monitoring; environmental monitoring; with an increasing trend in environmental protection. CNSC staff also concluded that if the licence was renewed with the limits for atmospheric tritium proposed that the continued operation of the facility would not pose an unreasonable risk to the protection of

the environment.

I urge Commission Members to look at the staff's submission at the CMD and the comments that are made.

In addition, we have also negotiated a settlement with the Concerned Citizens of Renfrew County for the judicial review, which included a further control on our facility to ensure further controls on potential loss of controls.

Before the issuance of an Order under section 321 of Regulatory Guide G273 staff are required to use methods such as recommendations, warnings, letters, discussions or licence amendment to achieve compliance. Such methods have not been used in this instance.

Further, during the meeting where the issuance of an Order was discussed, no stipulations of the actual Order were provided to allow SRB to comment. SRB was not provided any information which would allow us to get feedback regarding problems or issues that may arise from complying with the Order.

Furthermore, the short timeframe for issuing the Order without additional consultation appears incongruous with the timeframe associated with the alleged issue of concern for groundwater contamination. It's well known that the timeframe for groundwater movement and

transporter potential contaminants is in years to decades and the criteria used by other facilities and site-specific data shows that there is no immediate threat to the environment.

After the submission of the Groundwater Study, SRB, as you saw today, in a proactive manner reported to the CNSC in a letter dated May 15th that we would continue to gather data and supply staff with other sampling results. SRB reported that it intended to formalize these actions in the plan and provide CNSC staff by March 31st a comprehensive report of the testing results; assess possible impacts on the environment and make recommendation of the future changes or testing that may be required.

SRB has demonstrated its commitment in the past year especially by meeting or exceeding every commitment on the action plan in our current licence. At no time did SRB through communication with staff show an unwillingness to perform the work or actions proposed by the CNSC. SRB has been committed to fulfilling all CNSC demands as confirmed by CNSC both verbally and in their recent CMD.

We understand our responsibility for our protection of the environment but, as with other licensees in Canada, we must be provided the time and opportunity to

continue our work to further define groundwater conditions onsite and the time necessary to address CNSC staff's new concerns and identify and implement measures to prevent and mitigate further contamination of the groundwater under the stacks while operating.

SRB would like to respectfully request that the Commission revoke or amend the Order on the basis that first and foremost it can be readily demonstrated that levels of tritium in groundwater do not currently pose any unreasonable risk to the environment; the continued operation of the facility at its current rate of emissions which have greatly reduced over the past years will not result in an increase in the concentrations of tritium in groundwater. Thus, the continuation of operations as proposed poses no unreasonable risk to the environment.

The conditions of the environment and, more particularly, the extent of contamination of the groundwater under the stacks are in line with conditions encountered at other facilities in Canada that emit tritium as documented in various conservative assessments known and approved by staff. The levels in groundwater at SRB are also well below the conservative screening criteria that are well known to CNSC staff and that have been developed for groundwater that does not serve as drinking water.

The data collected from the EMP, the Groundwater Study, and recent special efforts collectively and reliably indicates that facility stack emissions are the source of tritium that is present in groundwater at and near the SRB facility. These results do not serve as a basis for concluding that the origin and magnitude of tritium loads to groundwater are misunderstood or that those emissions pose an unreasonable risk to the environment.

SRB will continue to be proactive in its effort to reduce stack emissions which are understood to be the sole significant source of tritium found in groundwater. In addition, we will work to identify further mitigation measures on processes that occur subsequent to discharge from the stack.

SRB can operate under its licence while an action plan can be developed to address CNSC’s new concerns and continue the work it has already begun to further define groundwater conditions onsite.

While completing its comprehensive report of the testing results to further define groundwater conditions onsite, the company and its independent consultants will make and implement recommendations on future testing or changes to prevent or mitigate contamination of further groundwater contaminations under

the stack by March 31st, 2007 as we had already said.

Without the ability to operate, SRB will not have the necessary financial resources to complete the action plan to address groundwater issues, meet its licensing obligations and fully fund its decommissioning activities and meet its commitment to customers who are relying solely on our product.

I'd like to end my part of the presentation by saying that if CNSC staff had contacted me on the 14th and they would have told me there and then that they had new concerns, they had a change in mind based on new information, new analysis; if they had been willing to work on a plan with us or allow us the opportunity to work on a plan to allow us to further operate, I would have taken any reasonable measure to do that, but we were never provided the opportunity to discuss it or put anything before the Order was issued to stop operations. We have always been willing to work with them.

I'd like to now pass my part of the presentation to Mr. Morris who would like to say a few statements.

THE CHAIRPERSON: Just if I may just check, realizing that we've been sitting here now for about an hour and a half, if I could just check with you with regards to the length of the presentation just so that I

know when we should take a break?

MR. MORRIS: The presentation is quite brief. You'll see it under Tab 2. It'll take me three minutes to read through.

THE CHAIRPERSON: Thank you, and then we'll take a break after that for all those that are waiting for that.

MR. MORRIS: My name is Neil Morris. I'm a Senior Scientist and Principal of EcoMetrix Incorporated. I have been providing environmental services to members of the nuclear industry for 15 years and I have an excellent knowledge of the fate, transport and impacts of radionuclides, particularly tritium, in the environment.

Please accept this summary of my professional opinion regarding the risks and impacts associated with the presence of tritium in groundwater in the area of the SRB facility in Pembroke, Ontario.

This opinion is based on the following: My direct and detailed understanding of the abundance and distribution of tritium in groundwater, gained primarily through my role as the principal investigator and author of the Groundwater Study prepared by EcoMetrix this year; my direct and detailed understanding of the public exposure and dose implications of tritium releases from SRB, gained primarily through my role as the principal

author of the recently-revised “Derive Release Limit” document prepared for SRB and my professional experience in completing public dose calculations, pathways analyses, ecological risk assessments and groundwater assessments at CANDU facilities in Canada; for example, Chalk River, Bruce, Pickering, Darlington, Point Lepreau and G2 in Quebec.

In summary, I have considered all data in a weight of evidence manner that are relevant to tritium in groundwater that have been compiled to date at SRB. Those data strongly indicate to me that the presence of tritium in groundwater is a direct and exclusive result of tritium emissions from the facility stacks. The concentration of tritium in groundwater has a consistent and quantifiable relationship with the concentrations in air. The level of exposure of humans and non-human biota to tritium in groundwater can be reliably estimated.

Based on such estimates and also on a series of direct measures, the levels of tritium in groundwater at and near the SRB facility are demonstrated to be well below acceptable levels in terms of human and environmental exposure and dose. There is no body of data that indicates that this state will change. In all likelihood, as SRB continues to reduce rates of emission of tritium to air, the levels of tritium in groundwater

will themselves decline in time. Overall, there is no unacceptable risk associated with the presence of tritium in groundwater at or near the SRB facility.

Further, in my opinion, there is no factual basis that justifies the decision to order the cessation of operations at SRB. Current levels of tritium released to air are in the order of 10 times lower than they were several years ago. The fate and transport of tritium in groundwater is such that the currently observed levels still reflect the influence of those former higher releases. Over time, complete operation at the current and expectedly lower emission rates is likely to result in a decrease in levels of tritium and groundwater of a magnitude proportional to the magnitude of the atmospheric emissions reductions.

THE CHAIRPERSON: Mr. Levesque, would you like to sum up now or would you like us to take a break and come back and offer you a further opportunity?

MR. LEVESQUE: There is two small presentations left by our consultants so maybe if you'd like to take a break that's fine.

THE CHAIRPERSON: Okay. We'll take a 10-minute break.

It is 11:53. We'll take 10 minutes and if you could be back in your seats and we'll resume with

SRBT.

Thank you.

--- Upon recessing at 11:53 a.m.

--- Upon resuming at 12:09 p.m.

THE CHAIRPERSON: If everyone could take their seats, please, we are ready to resume.

Mr. Levesque, the floor is yours again. Thank you.

MR. LEVESQUE: Thank you very much.

I will pass the microphone to hydrogeologist Ron Nicholson from EcoMetrix, who has a short presentation for you.

DR. NICHOLSON: Thank you very much.

My name is Ron Nicholson. I'm a Senior Scientist with and am President of EcoMetrix Incorporated.

For the record, my CV is attached. It follows my memo of presentation.

My professional training has been as a geologist, a hydro geologist and a geochemist, and I have more than 20 years experience in consulting, teaching and research. My first degree was in geology in 1977. I completed my Masters or MSc and PhD degrees in earth sciences in the Department of Earth Sciences at the University of Waterloo, that Dr. Barnes might be familiar with. I think he was the Chairman of the Department

during my early tenure there.

Since that time, I've worked as a consultant university professor, a research scientist and have been a principal investigator on a variety of hydrogeologic studies involving contaminated site assessments, geochemical evaluation of contaminant behaviour and modelling of contaminant migration in the subsurface.

I have been involved in groundwater assessments at other nuclear facilities, including Bruce Nuclear Generating Station and Port Hope facilities.

My project experience also includes a principal investigative role on numerous projects at uranium mines, at mills and other nuclear facilities to assess transport of radionuclides in the environment and to assess radiological risk to ecosystems.

I have also provided senior review on numerous projects involving groundwater contamination assessment.

In addition to my current consulting activities, I hold a part-time appointment on faculty as an associate research professor at the University of Waterloo, where I teach several courses on geochemistry and hydrogeology by distance education. I taught university courses at the undergraduate and graduate

levels in the Department of Earth Sciences at the University of Waterloo for about 10 years. I have also taught a number of professional short courses on assessment of groundwater contamination and geochemical sampling and have presented extensively to the public and other interest groups on groundwater resources and contamination issues.

I am co-author on the CCME 1993 publication entitled Subsurface Assessment of Contaminated Sites.

The CNSC has expressed concern for levels of tritium in the subsurface water, groundwater, at and near the SRB facility at Pembroke. It appears that the major issue is related to the elevated tritium concentrations in water at the facility and the potential for lateral groundwater transport of water with tritium levels above the drinking water guideline to local wells where the water may be ingested by humans.

In order to address the concerns for tritium migration in groundwater at the facility, additional analyses of the existing data were undertaken by myself.

It is my opinion that the continued operation of the SRB Technologies (Canada) Inc. facility at Pembroke, Ontario does not represent a risk to humans from drinking water in local wells. Specifically, from my

assessment of the data on tritium concentrations in water above ground surface, in soil moisture and in groundwater, I conclude that the groundwater that could be a source of drinking water from local wells has not exhibited tritium levels that exceed the drinking water guideline value and will continue to remain at levels below the drinking water guideline into the future.

The data from a groundwater study completed by EcoMetrix in March 2006, referred to here as the Report, were re-evaluated to demonstrate that for realistic conditions, there is sufficient travel time during migration vertically through the clay units to allow decay of the tritium to levels that will be well below the drinking water guideline of 7,000 becquerels per litre before the groundwater reaches the bedrock.

The water that migrates to the bedrock is effectively the only groundwater that can be transported laterally from the site for any significant distance from the SRBT facility. The decay to levels less than the drinking water guideline occurs even immediately at the building where the highest concentrations of tritium have been observed in local precipitation, in standing water and in soil moisture. The vertical travel of water from the surface, through the clay soils to the bedrock is important because it protects the underlying groundwater

in the bedrock that can migrate away from the SRBT site.

The prediction of groundwater flow laterally through the bedrock is more complicated and can include uncertainties related to fracture porosities and other variables that can control groundwater velocities.

In contrast, the vertical transport through porous media, clay soils in this case, is more predictable with greater certainty in the predictions. Even when porous media such as clays may be fractured near ground surface, constituents like tritium are attenuated to porous media flow rates by matrix diffusion, a process that is well known in contaminant transport theory. Matrix diffusion from fractures results in transport similar to that in unfractured porous media.

Therefore, fractures in a clay unit, especially for the under-consolidated and plastic clays in the Pembroke region, is not an issue that needs to be considered for tritium transport. In other words, it doesn’t represent a complicating factor here.

Therefore, simple porous media transport velocities vertically through the overburden were reassessed for realistic assumptions to demonstrate that this pathway alone is adequate to attenuate tritium to levels below the drinking water guideline.

The most recent elevated concentrations of

tritium in water running off the ventilation stacks and in soil moisture from samples immediately at the base of the stacks were also considered in this evaluation.

The groundwater study noted above, the one completed by EcoMetrix in 2006, clearly identified low permeability clay that overlies the bedrock in the region. The unit was observed in all bore holes and is consistent with findings and other studies in the area that identified clay units that have an average thickness of about 25 metres above the bedrock.

The hydraulic conductivity tests were attempted during the original study in January 2006 in all newly installed monitoring wells -- these are the MW06 series -- and these tests were performed by single well recovery methods, standard methods and hydrogeology.

However, because of the low permeability, only four of the seven wells yielded results for the short-term recovery tests that were on the order of hours to days. The wells that recovered more slowly and did not provide immediate results included MW06-3, -4D and -5. The slower recovery to quasi-static water levels are shown in the water level trends in Figure 3.1 of the Report.

The longer term recoveries shown in Figure 3.1 of the Report were therefore used to estimate the hydraulic conductivities using the method which is

described in section 3.2.2 of the Report for those wells. It was assumed that the near-steady water levels attained in late January 2006 represented the static water levels that would occur as the water rose in those wells, and the earliest measured water level represented the start of the recovery test. This is a standard approach to longer term recovery in wells.

A summary of the revised test results is shown in the following table. In that table I show a number of values now for some of the wells that did not previously have reported values for hydraulic conductivity.

The important point here is that the geometric mean of all these values is 1.1 times 10 to the minus 8 metres per second. This is a value that is consistent with clay materials.

The geometric mean is a reasonable estimate of the central tendencies in hydraulic conductivity values that are typically logged and normally distributed.

It should be noted that the highest value that was reported of 5.1 times 10 to the minus 7 metres per second was at MW06-7 and is represented by only one well south of the Muskrat River and may not be representative of the local conditions at the SRBT facility, ignoring that one low value which yielded

geometric mean of 6 times 10 to the minus 9 metres per second, or a factor of two smaller than the value when -7 well is included. Nonetheless, the geometric mean of 1.1 times 10 to the minus 8 metres per second was used here as the basis of this re-evaluation with the new hydraulic conductivity data in order to remain conservative.

With hydraulic conductivity values in the overburden that are in this low range and the estimated hydraulic conductivity of the upper bedrock or fractured bedrock on the order of 10 to the minus 3 metres per second, it is evident that water that enters the soil surface as precipitation will migrate downward toward the bedrock and will not migrate laterally through the clay for any significant distance. This is a classical groundwater recharge scenario that occurs in areas with low permeability surficial materials.

Once the water has migrated from the surface to the bedrock downward, then it will migrate laterally through the higher permeability bedrock toward the Muskrat River. The travel velocity downward through the clay will be much slower than the lateral velocity through the fractured bedrock.

The focus of this discussion is therefore limited to the travel times that would be expected for water that moves from the soil surface downward vertically

to the bedrock.

The travel velocities and travel times for vertical flow are estimated from several variables, of which the hydraulic conductivity is the most important.

The other factors or variables include vertical hydraulic gradient. The maximum observed gradient was 0.9 at Well-4S and -4D, and this value is close to the maximum possible value of 1 if there is no ponding of water at surface. The value of .9 was used here in the velocity calculations. This high vertical gradient is the best indication also that the vertical hydraulic conductivity of the unconsolidated clay unit is very low. In other words, these high gradients develop because the material is very resistive to groundwater flow downward.

Such gradients only develop in temperate regions because of the resistance to flow represented by the low permeability layer or the clay in this case. The resistance is very high. The high vertical gradient is also an indicator that flow direction is near vertical and is downward as water takes the path of least resistance to migrate to a more conductive unit, probably represented by the top of the fractured bedrock in this case.

Another variable is porosity. Values in unconsolidated clays can be as high as .6 or more,

especially in under-consolidated clays like the clays we see in this area, but a value of .45 was used here and is assumed to be conservative.

The ratio of horizontal to vertical hydraulic conductivity or KH/KV is referred to as anisotropy and can be very significant in stratified, unconsolidated units such as these clay layers.

Previous calculations in the EcoMetrix 2006 Report ignored this to provide ultra-conservative estimates of travel times vertically. The recovery test results provide an indication of the horizontal hydraulic conductivity, but anisotropy factors up to a value of 10 are possible in this geologic environment. In other words, the recovery tests give us the horizontal hydraulic conductivity, but not the vertical hydraulic conductivity.

In fact, the vertical hydraulic conductivities can be lower than the horizontal values by a factor of 10.

The anisotropy was estimated by calculating the vertical hydraulic conductivity from the estimated travel time required for water to travel downward between two well screens located at MW06-4. The vertical travel time was estimated by calculating the decay of tritium between the shallow screen and the deep screen at that well location, and those screens are separated by about

eight metres in distance.

The travel time for water to move vertically from MW06-4S and MW06-4D was evaluated for the following assumptions. It was assumed that all water migrates vertically downward in the vicinity of the wells, and this is reasonable for the low hydraulic conductivity units for which groundwater takes the path of least resistance to travel toward a higher hydraulic conductivity unit.

It was assumed that the difference in tritium levels between the wells is due to decay only. The tritium levels in either of these wells is not likely to be associated with SRBT activities, but this assumption is valid if other sources of tritium were present in the region in the past at levels of a few hundred becquerels per litre. This assumed source is consistent with bomb tritium in the atmosphere after 1953 that has been used as a tracer in many other groundwater systems.

It was also assumed that the values noted above for hydraulic gradient and porosity applied to the calculation.

The average tritium concentration for MW06-4S for January 12th and for February 12th and 24th, 2006 was 215 becquerels per litre and the average tritium concentration in the deeper well was 14 becquerels per

litre on those same dates. The relative concentration is therefore .065 or 14 over 215, representing about 3.9 half lives for tritium decay. This represents a travel time of about 48 and a half years between the two well screens. The distance between the well screens is 7.7 metres and this leads to a travel velocity of 0.16 metres per year or 16 centimetres per year.

If we convert this value to a hydraulic conductivity by considering the vertical gradient and the porosities that I discussed previously, we get a value of 2.5 times 10 to the minus 9 metres per second. This value is about 4.4 times lower than the geometric mean calculated from the single well recovery tests that I mentioned previously. The value of 4.4 represents a very reasonable anisotropy that could be expected to be in the range of 2 to 10 that is typical for stratified, unconsolidated units, as shown in the textbook Frieze & Sherry, 1979.

If a vertical hydraulic conductivity of 2.5 times 10 to the minus 9 metres per second is considered to be representative in the vicinity of the SRBT facility, then a travel time for infiltration from the surface to the bedrock can be calculated. The average depth to bedrock was estimated to be 25 metres. The linear velocity is 5 times 10 to the minus 9 metres per second or

0.16 metres per annum.

If the water table occurs at an average depth of about five metres below ground surface, then the saturated zone below the water table will be about 20 metres thick. The travel time vertically downward, below the water table, would be on the order of 127 years in that zone. In addition, the vadose zone, or the zone above the water table, that is assumed to be about five metres thick, has an infiltration rate of about 0.33 metres per year and would require an additional travel time of 15 years, for a total travel time for tritium from the surface to the bedrock of about 142 years.

With a half life of 12.3 years, tritium will decay over 11 half lives and will reduce the tritium concentrations to about 0.0034 per cent of the initial concentration that enters the soil at the ground surface as precipitation.

A derived concentration for soil moisture that is the source of tritium concentrations in groundwater can be estimated by calculating an initial concentration of tritium that would produce a benchmark concentration at the top of the bedrock after a travel time of 11 half lives. The derived concentration calculated for a desired concentration of 7,000 becquerels per litres, which is the drinking water guideline, at the

top of the fractured bedrock would be 20 million becquerels per litre based on this time for decay.

In other words, we could have 20 million becquerels per litre in water at the surface, and by the time it arrived at the bedrock, it would be 7,000 becquerels per litre or the drinking water guideline. This calculation clearly shows that the derived concentration limit is much higher than any historical concentration in soil moisture observed at site or more recent values in snow and runoff or standing water on the ground immediately at the site.

The CNSC have identified several elevated tritium concentrations in the Order to SRBT dated 15 August 2006. The focus of the Order was on maximum observed tritium levels. The maximum concentrations observed in water at the SRBT facility were measured by SRBT in samples of washed down water that trickled down the outside of the stacks during rainfall events. This water would be expected to have the highest concentrations on site because it would have come in contact, direct contact, with the tritium at the top of the stack that has not yet undergone any dispersion or dilution in the atmosphere.

The measured concentrations over several rainfall events were reported to have a range from about

2,000 becquerels per litre to about 50 million becquerels per litre with an average of about 2,300,000 becquerels per litre.

The facility releases tritium only 25 per cent of the time and a representative average concentration for all wash-down on the stack during rainfall events would be about one-quarter of the measured average or close to about 600,000 becquerels per litre.

The average tritium value in the wash-down water at the stacks is consistent with the maximum values of tritium in soil moisture measured by CNSC immediately between the stacks that had a reported value of about 600,000 becquerels per litre. This was the highest tritium level found in soil moisture and this location, so close to the base of the stack, is expected to represent the highest potential tritium concentrations in soil or groundwater.

The soil moisture concentration is also important because soil moisture represents a time moving average of atmospheric concentrations at any specified location, with shallow soil moisture having an average residence time of about one year. In the same way, the soil moisture at the base of the stacks likely represents average concentrations that have developed as a result of the small trickle of wash water from the stacks over a

similar period and the concentrations in the soil at the base of the stacks would be expected to have the highest soil moisture tritium levels anywhere near the facility because all other soil moisture would only be affected by atmospheric washout that will be much lower than the concentrations at the top of the stack.

If the maximum tritium concentrations in soil moisture on the order of 600,000 becquerels per litre, then a downward travel time of about 80 years or 6.5 half lives for tritium decay would be required to reduce the concentrations to 7,000 becquerels per litre.

At the vertical travel velocity of .33 metres above the water table and 0.16 metres below the water table, the tritium concentrations would be less than 7,000 becquerels per litre after travel through only about 16 metres of this clay material or almost 10 metres less than the average thickness of the clay overburden anticipated at the site.

Direct evidence of decreasing concentrations with distance from the stack was also presented in the CNSC order. Soil samples collected within a few metres of the stacks exhibited tritium concentrations that were noted by CNSC to be in the range of 9,500 to 110,000 becquerels per litre. Again, the soil moisture at that location would represent averages over a

period of about one year and would therefore incorporate all inputs from precipitation over that period. The maximum value of about 110,000 becquerels per litre in soil a few metres from the stack is less than 20 per cent of the maximum value immediately at the base of the stack where wash-down from the stack occurs. This shows that the tritium values in soil moisture decline significantly within a few metres of the stack and that the concentrations are also expected to decline as the atmospheric concentrations decline with distance from the stack.

The application of a demonstrable, conservative model indicates that only locations that may have concentrations of tritium above 5,000 becquerels per litre in groundwater or soil moisture that reflects precipitation values are within a radius of about 500 metres of the SRBT facility. No predicted concentrations in soil moisture exceed the 7,000 becquerels per litre drinking water guideline at a .5 kilometre or 500 metre radius from the site, as shown in table 3.9 in the report and, therefore, there is no potential for wells to exhibit tritium concentrations exceeding 7,000 becquerels per litre outside of the 500-metre radius.

Only one location, MW06-1 exhibited tritium concentrations in soil moisture and groundwater that are

contrary to the expected trends. Concentrations in groundwater and soil moisture at that location were on the order of 60,000 to 80,000 becquerels per litre. The MW06-1 well is located at the front of the SRBT facility parking lot at the ditch where runoff from the parking lot, including water from the roof drains collects. Water has been observed to pond at that location. The ponded water is likely representative of roof runoff that can originate near the stacks. The roof drain water has been sampled and has exhibited tritium concentrations as high as 93,000 becquerels per litre. The concentrations in water at MW06-1 are consistent with water that is runoff from the closer proximity of the stacks.

However, this water would report as either water to the local storm sewers or will infiltrate the clay and will travel vertically through the clay to the top of the bedrock, similar to the behaviour at other locations. The observation of tritium concentrations of about 60,000 becquerels per litre in the water from shallow well screen at MW06-1 is consistent with short-circuiting of water through the disturbed surface soil that is associated with construction activity related to the parking lot and the roadway near the well. It is therefore not surprising that the tritium levels at well MW06-1 are elevated and reflect concentrations that would

be expected closer to the stacks.

However, the water running off the parking lot will be routed either to storm sewers or will infiltrate with adequate decay time so that the water at that location will not represent a threat to the local groundwater. It is also evident that stack emissions are the source of the tritium in well MW06-1. In this case, it appears that the role of tritium in the air as a source is preserved, but facility infrastructure has altered the local pathway of delivery from this source to the groundwater.

The only concentrations in excess of 70,000 becquerels per litre or 10 times the drinking water limit are within the immediate vicinity of the SRBT facility. However, the derived release concentrations, based on the vertical travel velocity for a hydraulic conductivity of 2.5 times 10 to the minus 9 metres per second, is on the order of 20 million becquerels per litre, for a travel distance of 25 metres to the bedrock. Only 40 years of travel time are required to reduce tritium concentrations from 70,000 to 7,000 becquerels per litre. This represents a vertical travel distance of only about nine metres from the ground surface and, therefore, the concentrations observed in MW06-1 well samples will not pose any threat to local groundwater that could be a

source of well water in the area.

It is therefore concluded that elevated tritium levels will not exceed the drinking water guideline of 7,000 becquerels per litre at the bedrock and therefore will be lower than that limit everywhere at the bedrock and down gradient of the SRBT facility, as groundwater travels horizontally toward the Muskrat River. The risk of exceeding the drinking water limit in local wells that is an apparent basis of concern expressed by CNSC is not significant.

The existing monitoring data support these conclusions as shown in the EcoMetrix 2006 report.

Thank you very much for your attention.

MR. LEVESQUE: I'd like to extend the microphone to Dr. Osborne for his part of the presentation.

DR. OSBORNE: Thank you. I am Richard Osborne at Consulting Radiological Protection.

I have been in this field since 1959, first at the issue of Cancer Research in London, England and then for 35 years I was with AECL at Chalk River from where I retired in 1998 as Director of Health and Environmental Sciences.

I have worked with a variety of international agencies. For 16 years I was a member of

the Committee of the International Commission on Radiological Protection concerned with the practical applications of the Commission's recommendations. I have been the Canadian representative to the United Nation's Scientific Committee on the Effects of Atomic Radiation, UNSCEAR they call it, and have worked for the International Atomic Energy Agency and for NEA in Paris. I have worked for them on many advisory groups both as a member and as a consultant responsible for writing and editing the reports.

I have founded and was first President of the Canadian Radiation Protection Association. I have been Vice-President of the International Radiation Protection Association and I am a fellow of the United States Health Physics Society.

My background in topics related to tritium as follows:

I was directly involved in R&D related to tritium health physics during the early part of my career at Chalk River which resulted in many papers on topics relating from biokinetics through instrumentation to operational protection.

In my subsequent career at AECL I was responsible for directing research programs in dosymmetry, environmental research and radiobiology. Research has

included research specifically on tritium dosymmetry and tritium in the environment and on the radiobiology of tritium. I was also for some of the time the authority responsible for the Radiation Protection Programs that includes protection against tritium.

My involvements internationally with tritium-related topics include contributing to the report of the United States National Council Committee on Radiation Protection of Measurements on Tritium Measurement Techniques, chairing and editing an IAEA report on handing tritium-bearing effluents, contributing and editing an NEA report on the significance and management of effluents including tritium carbon-14, tritium 85 and Iodine-129 which were arising from the nuclear fuel cycle, and being task leader for the International Energy Agency’s program on tritium safety and environmental effects through the implement and agreement on environmental safety and economic aspects of the fusion power.

Most recently, I’ve been a contributor to and a report editor for the U.S. Agency for Toxic Substances and Disease Registry which is part of the Centre for Disease Control in their evaluation of environmental tritium at the Savannah River site and the Lawrence Livermore Laboratory which, as you realize, are

the major tritium laboratories in the United States.

I should also note that in 2002 I prepared for the CNSC under contract a primer on tritium in the Canadian environment, its levels and effects, for use by the CNSC staff in its public interactions.

Last year I was asked by the Concerned Citizens of Renfrew County to give them some background on tritium and ultimately to present a talk on tritium and its hazards to a meeting in Pembroke that they had organized for the general public. Subsequently, Mr. Levesque of SRBT, who attended that meeting, invited me to look at the SRB facility and to advise them on any tritium-related matters as seemed appropriate. I was asked to review the report on the Groundwater Study and also the SRB and the CNSC documents related to the SRB licence application including the results of measurements of emissions. Most recently, I was asked to review the documents related to this Order, including the presentation by Mr. Levesque today.

My overall conclusion, based on my interactions with the staff at SRB and from the documents I have reviewed, and I have reviewed them in fair detail, is that the staff of SRB are conscientiously applying the ALARA principle in their operations and we have seen that, I believe, in the reduction of emissions they have

obtained. I fully concur with the position presented by Mr. Levesque this morning; namely, that the continued operation of SRB does not pose an unreasonable risk to either the public or to the environment.

Thank you.

MR. LEVESQUE: This will conclude our presentation.

May I ask a question of the Commission; just a clarification, earlier on a submission of August 25th that will not be accepted today, is this our submission?

THE CHAIRPERSON: No, your submission is accepted.

MR. LEVESQUE: Okay.

THE CHAIRPERSON: On this basis we are going to take a 45-minute break for lunch and then we'll start with the questioning.

Thank you.

--- Upon recessing at 12:41 p.m.

--- Upon resuming at 1:38 p.m.

THE CHAIRPERSON: If you could take your seats, ladies and gentlemen?

Thank you.

We are going to open the question period right now. I just wanted to make a couple of statements

before we commence with the period of questioning from the Commission Members.

First of all, I'd just like to reiterate that the purpose of today's proceeding is solely for the Commission to review the Order; that the licensing matters are to be addressed in the context of a licensing hearing to be taking place later. So it's clearly with regards to the Order.

The second is that the Commission wishes to acknowledge that there are clearly socioeconomic consequences of this Order. The Commission is aware of this and while acknowledging these consequences, it is also important to note that the Commission is bound by the mandate of the *Nuclear Safety and Control Act* and so, therefore, will be directing its questions and will be certainly making its decision based on that Act rather than broader considerations which we acknowledge some people have in their mind and in their context as such.

Thirdly, I'd just like to acknowledge that Commission Members did receive some documents earlier from SRB Technologies and we also received a summary of documents from the staff that were available before, and we have received these documents last week, later last week. So we have had some opportunity and these documents were reflected in the presentations that SRBT gave to us

as well. So we do have some information there but they were received quite recently.

So the way that I intend to go about this is to open the floor to questioning from the Commission Members. At some time later, as SRBT may wish to have questions directed to the staff that they wish to clarify, as such if you could record -- make a list of those questions and they will be directed through me. So I will be deciding if those questions are to be forwarded and we will give you an opportunity to do that, so if you do have some questions. But the first rounds will be for the Commission Members, if that’s clear.

So on that basis, then, I would like to acknowledge that on the right is the CNSC staff and the staff representatives are led by Dr. Patsy Thompson who is the Designated Officer with regards to this Order and also, at this time, Acting Director General of the Directorate, Nuclear Cycle and Facilities Regulation.

Dr. Thompson and the CNSC staff are to the right, for the benefit of the transcripts and for those who are in the room and who are not in the room.

On that basis, then, I am going to open the floor for questions and I will start with Dr. Barnes, please.

MEMBER BARNES: Thank you, Madam Chair.

Maybe just a few comments to start off with, which indicate the kinds of questions I'll be trying to pursue.

It seems that over the years SRB has assumed and continues to assume primarily that the source of tritium is coming from the stacks and therefore have based a lot of their modelling on potential contamination in the area and outside of the site itself on the atmospheric model. The new information that came up primarily this summer which has caused concern of the Canadian Nuclear Safety Commission are the levels of contamination up to 59 million becquerels per litre in the liquid dripping off the stacks which, together with the well MW60-01, MW06-01, on the edge of the site which have these values of; again, 59,000 becquerels a litre which did not suggest that the contamination was solely an atmospheric condition.

And so the concern is, as I read it, that there may be then additional point sources of tritium contamination particularly into the groundwater and the potential for a plume coming from the site itself, and whether there is sufficient control points and sufficient scientific information to determine whether there is such a plume and how serious that plume might be and its migration rates should there be one. And we were provided then with quite a lot of information in the documents for

today and some of it, I guess, will come back on the licensing issue. I'd like to just keep my points focused on the current documents.

But a lot of this goes then into the general consideration of groundwater flows and there was clearly a disagreement on issues of hydraulic conductivity between the consultant's report, the so-called Groundwater Study, and the analysis and estimates by staff; Mr. Favelle's memo specifically, which to me were not really addressed specifically in the presentation today except that Dr. Nicholson's document and report that you read did provide some significant, I think, new information relative to the Groundwater Study that was done earlier.

And I would like to get a minute to ask also staff if they would comment whether they see now much disagreement on issues like hydraulic conductivity between what the additional information that Dr. Nicholson has provided on behalf of the licensee and the estimates where -- that staff were preparing.

But then, I think, a key document that we are asked to base a lot of this scientific information comes from the EcoMetrix study on the so-called Groundwater Study, and an issue really is that there is an assumption here that the clays that underlie the area are of sufficient thickness to provide a barrier, time barrier

basically, such that the groundwater flow does not penetrate into the underlying bedrock which has a higher flow and which would then lead those ground waters into the Muskrat River and other sources like that.

I think an issue in this kind of struggle to get at potentially the truth and to try and assess the risk and limit the risk, and for the licensee to demonstrate, which you have to as opposed to the staff -- that there is no significant risk here to the environment or to the health and safety of individuals, both on the plant and outside in the surrounding community; that you have enough control points to prove the assertions of both the atmospheric model and your assertions as to groundwater flow.

Where I have a little difficulty, and which I think the report from staff showed, is that there is a limited number of wells particularly onsite and three new wells have been penetrated there, which is numbers 1, 3 and 2 as shown on your map and other wells are much more distant. But none of these wells -- I think it’s fair to say none of them actually penetrate to bedrock. The estimate is that the clay overburden is of the order of 25 metres as referred to, again, by Dr. Nicholson as though it’s a sort of a uniform blanket, and that it has a hydraulic conductivity which you make some estimates.

But as I see the information on the wells which is in Table 2.1, the well later, nearly all the wells only penetrate to the order of five metres or so. There's one going to 12 metres, another one at seven, but the rest are four, five and six metres. So they are basically only penetrating the upper quarter of the estimated 25 metre thickness.

There is also reference to the problem of the groundwater flowing eventually into the Muskrat River. There is information given in the documents that the difference in elevation between the site itself and the Muskrat River is 11 metres. I think that's correct. But we're also told in the document, but without being exactly precise that bedrock outcrops in the river, the rock cliff formation which suggests that the -- at least at some distance to the east in the Muskrat River, the bedrock is in fact coming to a level that is only 11 metres below the elevation of the site, not 25 metres.

It's a reality of the geology of this area that we are in the so-called Ottawa-Bonnechere Graben, and if you look at the hydrogeology report I would say it's notably weak on its geology component. It's almost as an afterthought. The references that are given are that the geology information -- the geology has been derived from two references that have been cited. One is looking at

soils by the federal and provincial ministries of agriculture and the second is the Golder Report which is a regional study of groundwater. I mean lots of references on the geology.

The reality is that we're in a risk system and that there is an irregular topography of bedrock with either the ordination of limestone or the Cambrian coming up at odd levels and so -- and yet, this document assumes that there is a uniform 25 metres of clay.

So this may be the case in this area. All I'm trying to say is that from a scientific viewpoint we have very few wells that demonstrate that.

And so I would start then my question to the licensee, why in putting these wells do you only go down to the order of five, six, seven metres?

MR. MORRIS: Yes, I'd like to answer that question part and also I'll be asking Dr. Nicholson to speak on this issue.

I'll explain -- partly answer this by explaining the rationale of the study as it progressed because we're looking at one small piece of the overall study rationale.

We initially reviewed all information for the area which was more than just the Golder Regional Report. It was boreholes collected from two or three

previous groundwater examinations or soil examinations onsite or immediately adjacent to the site. So there is more information than just the regional study. We also have our own borehole excavations available to us to characterize the overburden and the presence of bedrock and so and so forth.

The weight of evidence of that information was that you were looking at a fairly uniform overburden layer in the area -- you know, we're talking about onsite conditions here that are now the concern of staff and onsite immediately adjacent to site. All the information we had which included detailed records from other studies suggested that there was a fairly uniform overburden layer.

The selection or the reason for having ---

MEMBER BARNES: Could I ask in the area of the maps that you show how many boreholes or how much information do you have on the depths of bedrock?

MR. MORRIS: I cannot recall the exact number but it's probably in the order of 35 boreholes, something to that effect.

The rationale for the depth of the wells is associated with the understanding that -- understanding what happens in the shallow groundwater. In this case it's not a foregone conclusion but with other information

that we have available, including ones that have deep wells and monitoring records from other wells, residential wells that are deep or described as deep we can fairly confidently assume -- or not assume but demonstrate that the travel path is downward and if we understand what's happening in the shallow groundwater can demonstrate that the levels of tritium in shallow groundwater are all well within applicable standards, there is no need to go deeper.

This was a phased investigation where we developed information in a logical progression. Had we discovered certain things that showed us that we were looking at numbers that were very high, that bore a need to look into this further, we probably would have subsequently installed deeper wells, but we had three months to do it and we did all that we could within that timeframe.

MEMBER BARNES: On the basis of what you have done, though, the point that Dr. Nicholson was making, a very important one, is that the migration that we need to worry about is essentially vertical migration, right; forget the lateral distribution. It's vertical.

On your Figure 3 which is on page 12 of the licensee's presentation today which is the diagram of the clay soil or the water table and so on, and then the

bedrock, the top of the water table is essentially taken at five metres, right, so most of your wells have essentially gone down to the water table.

What you're trying to argue is that -- is to give us some numbers which are either 143 or they are 43 years or 48 years or so for the migration route, right? But I still would argue that you're basing this on wells of the top five metres, not 25 metres, and it's also based on certain assumptions of the quality of these clays and, yet, in the boreholes that you -- which you have as some -- it's not always easy to see which borehole is -- to me, which is which, but on the strategic figure that's recorded in the field boring logs there is actually a fair bit of variation. These are not all clays. There is sands and sandy tills that are reported in these.

So there is a fair bit of variation but, again, only in the top five metres or so and, yet, you're going to come up with a number that is -- you interpret will be applicable through 25 meters in order to convince the Commission that there is such a long travel time for tritium that we don't have to worry about it.

So it seems to me that if you were trying to prove that -- I'll put it another way -- because you were asked to do this on the basis of a few months and therefore you needed X number of additional wells but

therefore because of the time you could only punch them down to five metres, is it then your recommendation that in the somewhat longer term in order to properly understand this, you would advocate deeper wells, at least some of them going into bedrock in such a way that you could monitor the extent of tritium deeper in the subsurface?

MR. MORRIS: That's not an unreasonable suggestion. I do feel confident with the information that we have that that will only confirm what we're thinking. It's something that could be discussed. I don't think, though, that the information you're going to gain from that is going to radically alter the conclusion. It may tell you something in the effect that, okay, travel is twice as fast as we thought it was.

However, given the numbers that we are seeing at source, and given even that consideration which may be revealed, you're still not looking at ultimate concentrations in water that may be accessed as drinking water and won't be if it's properly managed that are going to exceed any applicable criteria.

So I don't want to say it's a moot point and it bears further investigation, but it is not indicative of any situation at present that is a risk.

MEMBER BARNES: In trying to provide your

estimates of hydraulic conductivity you also made an assumption of porosity which you took as 45 per cent. Could you justify why you took a number of 45 per cent in velocities that you would otherwise attribute to clays?

DR. NICHOLSON: I would say -- Ron Nicholson here -- I would say that the choice of that number, it could be anywhere between 30 and 60 per cent and some of these clays are under-consolidated Leda-type clays. So the porosities can be quite high; 45 per cent. I could have used the number of 30 per cent. I think, in fact, one of the comments from CNSC staff was that 30 per cent might have been a more conservative number. I don't disagree with that. Ultimately, it doesn't change the velocities a lot. We can see maybe a 30 per cent increase in travel velocities.

May I possibly just backup to your previous question, however, and I would like to make the comment that I agree with you that we can't say that overall the area is a blanket 25 metres thick, and that's why I went through some of the calculations to show that to reduce the 70,000 down to 7,000 would only be nine metres of travel distance and to reduce the half-million would need 16 metres of travel distance.

I don't think what we are trying to do here is to show that we know precisely what those numbers are

everywhere on the property but to develop a line of evidence that suggests that adequate time is available for decay of the tritium that occurs at elevated concentrations in the soil water.

The major concern about a groundwater plume that was -- that is suggested by the Order and the concerns of the CNSC staff, I wanted to try to address that by showing that 25 metres of clay, which is an average in there, would be more than adequate to allow time to decay of the highest concentrations that were found right at the stacks.

So your comment about not having rock -- wells down to bedrock is very valid and I agree with it. We have not done that but, as Mr. Morris has said, the program that we instituted was an iterative one and we wanted to make sure that we understood what was going on in the shallow groundwater system and the data clearly show except for one well that the tritium concentrations are quite low in the shallow groundwater. If they are low in the shallow groundwater they can’t be any higher in the deeper groundwater unless they’ve broken through somewhere. And I think my memo tries to address the concept that that breakthrough will not occur at the bedrock even at the location of the stacks. So that was the purpose.

If you asked whether I would recommend that we go and put on well down to bedrock I would say it would be something I could recommend to the client, to do that at the location of the stacks to verify what depth of clay we have down in that area.

MEMBER BARNES: But it's not just to verify the depth and the nature of the clay or the stratigraphy, it's also to understand the nature of that bedrock, right; as you point out, often the upper surface of the bedrock has a higher permeability than more typical bedrock that you might penetrate into, right? So (a) I don't think we know the age of the bedrock immediately below that or its depth precisely or its capacity to move fluid once that fluid gets to that level?

DR. NICHOLSON: I agree with that. However, I don't think that's the important question here because if the tritium will decay to levels of no concern, by the time water reaches the bedrock we don't care where the water does when it gets to the bedrock.

So that's why I try to introduce in my memo and my presentation here today the idea that predicting groundwater flow in fractured bedrock, and I assume it would be fractured to some extent, would be very difficult, would be very uncertain. But I don't think we even have to address that uncertainty because we can show

that the tritium levels will be of no concern when they get down to that depth.

MEMBER BARNES: Okay, but based on a number of assumptions that you have made and on a limited database of wells.

So could I turn to staff and ask if you have any comments on those responses that you've just heard but specifically whether the difference of opinion as I read it between the Groundwater Study of March and the one that staff produced in a memo by Mr. Flavelle and then the additional information provided today by Dr. Nicholson, whether there is a sort of a closure on the understanding and particularly Dr. Nicholson's last comment that we don't have to worry about it? Would you like to make a comment on that?

DR. THOMPSON: Patsy Thompson.

I will ask Peter Flavelle to deal with that question.

MR. FLAVELLE: For the record, I'm Peter Flavelle.

You are extremely correct in that one of issues is we do not know what the surface of the bedrock is like. We're not aware of the depth of the overburden on the site. There are measurements produced from the groundwater study which show that the average depth to the

water table are only about two metres, not five. One of the wells at one corner of the site, well MW06-3 was drilled to refusal at about 5.3 metres, but it could not be determined if that was refusal to bedrock or to some other strata.

Some of the information cited in the Groundwater Study Report refers to 13.7 as the depth to bedrock in the adjacent property. So it's unclear just what the shape of the bedrock is and what its hydraulic properties would be. There are the CN wells across Boundary Road from the site in which they measured much higher hydraulic conductivities and flows, very high vertical gradients. The tritium in the shallow wells is about the same as in the deep wells in the two pair of wells on the CN site, which would imply that there is rapid downward migration of groundwater.

So it's unclear whether the wells at the CN site at 80 to 120 metres away from the stack or the wells that EcoMetrix analyzed, MW06-4, shallow and deep, at about 420 metres away from the stacks, which one is more applicable to the site.

In all fairness, there's no information about the CN wells other than the depth measurement. It's not known, as far as I'm aware, of what the construction is like, what the stratigraphy is like where the wells

were put in and what might be governing from underneath this apparent rapid downward migration of groundwater, much faster there than at the well that's on the other side of the facility. So it's necessary, I believe, to do some more investigations on site to determine this, and whether that is done with a well to bedrock or multilevel piezometer to bedrock or whether it's done through the use of remote sensing techniques like ground-probing radar to get a shape of the surface is not within our authority, I think, to try to impose on the licensee, but we definitely do need, I believe, more information on the condition of the bedrock surface and the potential for tritium contamination within the groundwater at that bedrock surface.

MEMBER BARNES: I wonder if I could follow up on a related aspect, Madam Chair, and that is the issue of the potential point sources which appear to be the runoff or wash-off from the stack itself, and we again refer to the values of water dripping off them at 59 million becquerels per litre, also source samples between the stacks of 560,000 becquerels per litre.

It's not clear to me, in reading the documents, in a sense, what volume of water this level of contamination is penetrating subsurface. We know that, at least from what I read, it's not asphalt; it's "unpaved

gravel surface". So I assume the stacks themselves are on some perhaps concrete pad or something, but that's perhaps limited to the site of the stack, and then between the stacks it's a gravel surface which is part of the manufactured sort of construction and, therefore, I presume, contaminated water could move quite quickly and easily away under the site itself, perhaps towards the well with higher contamination and in other directions, at least of the site that's been disturbed.

But the degree of infiltration, the amount of infiltration is not particularly evident. If I take the licensee's view, it's that we shouldn't worry too much; it only tends to occur at those levels when it's operational for 25 per cent of the time, although I think you've asked before to increase the amount of material being processed and therefore the potential for that too, to increase perhaps in the future with higher levels of activity in the plant.

But if we also look back at the records that you've given us when -- as you've indicated, you have reduced the contamination over a period of time, I guess I would ask the question -- you've indicated you've reduced significantly the release of tritium over the activity of the last five years from 2000 to the present day in the curves that you've provided. I guess I would have to ask

the question, had we made the same measurements in the year 2000 or five years before that, would the values of 59 million or 560,000 be the same or could they have been significantly higher? In other words, is there a potential for -- if we're looking at a plume, it's not just today's plume. It's potential for a legacy plume as well.

So again, I'm not persuaded that we have very much data that we understand the potential for the point source around the stacks, because in the past, the licensee, and I think the CNSC staff have been more concerned with simply the air -- with tritium coming out, its dispersal regionally and it's affecting communities one or two kilometres away from the site itself.

Here now we're being asked to focus, because we recognized it this past summer, on significant levels of contamination around the stacks and so on. So could I ask both the licensee and a response from CNSC to what extent these values are normal within degrees of measurements that we've -- that are reported in here? Do you think that 59 million becquerels per litre is the maximum that we would anticipate? Do you think that 560,000 in the soil samples has been there for five or ten years? Where does it lie? These are figures that we're being asked as a sort of baseline and, therefore, in a

sense, one side, I don't worry about it. On the other, I'm not sure that we have much of a track record of these figures. These are the figures that were particularly alarming to CNSC staff, the amount of tritium that was not being part of the atmospheric issue.

MR. MORRIS: Yes, Neil Morris for the record.

I would like to make one point that I think is very consistent with what you're saying, but if interpreted in a different light, it may very much change the way you think about this subject.

I would suspect that if we had made the same measurements five or six years ago at the peek of what we know to be the rates of emission of tritium from the facility, you would have seen higher numbers.

That being said, those numbers are still very much reflected in what we're seeing in groundwater today. So what we're seeing at present in groundwater is reflective of those former higher releases.

If anything, if you allow conditions to continue as they are today at the much lower releases, given time for equilibrium, the numbers will come down tenfold. That's the logic of how that process works. I think it's important to understand that.

In terms of magnitude of source, you have

to remember that that 59 million is a single number, and by conventional standards of calculating what it could be in theory, I've prepared a document that says, "Yes, you know what; we could see numbers in isolated samples of moisture near the ground surface that would reach 50 million." And that fits quite nicely with what we're seeing now, based on current emissions. That's not representative of what's going to be in groundwater. It's not even representative of what ends up in soil water. It's one of many sources. It's only a small amount of water, very small, and even if you took the full area of non-paved surface, the amount of water that would drain in, and on average we estimate that it's at maximum something in the order of 2 million becquerels per litre. The amount of water is a very small amount, just limited on the size of the area and amount of rain that falls from the sky and evaporation and other things. It's not a large amount of water even with those concentrations.

So as a source, you don't have to just consider the absolute concentration. Yes, 59 is a high number, but it's within what we expect. You also have to consider the volume of water that's going to infiltrate and what happens to it subsequently, and when you do all of that, the only conclusion you can reach is that this number is going to be well below numbers that are

reasonable for the site.

DR. NICHOLSON: Perhaps I could draw your attention, Dr. Barnes, to Tab 14, just so you can have a view of the stacks. There's a picture in there that actually shows them.

If you go to Tab 14 and then go to the third -- fourth page in, you see the picture. That picture shows the stacks with the unpaved area around the stacks. To relate this to your question about the 59 million dripping down the stacks or liquid dripping down the stacks, what I tried to do in my presentation was to bring attention to the soil samples that were taken in between those stacks by CNSC staff. Those soil samples were taken right in the place where those high numbers would have dripped down into the soil and the soil is an area where it would average over time the actual concentrations that have come in contact with that soil, and those averaging times are around a year. The soil moisture would stay at the top surface of about a year. So you're looking at collecting all that water that fell there. We didn't see 59 million. We saw closer to 600,000.

So we're going from what we see as a potentially very, very high number in that little trickle of water, and when it averages out getting into the soil

at that place, it's down to -- instead of 59, it's down to .5. So we've talked about -- you're really talking about a factor of 100 there to decrease in concentration in the soil. So we're not really dealing with that 59 million as a potential source because the only source for groundwater is what's in that soil moisture that will then move downward.

DR. THOMPSON: Patsy Thompson, for the record.

Essentially, there's a number of points on which the Order was issued, and I guess the first point to make is the Groundwater Study Report was reviewed by staff and staff concluded that the source of tritium in groundwater underlying the facility and on the property where it is located, and any plume that might exist in the groundwater has not been identified. I think that has been again today demonstrated by the uncertainties and the lack of knowledge that we have on the site. That's one factor.

Currently, there is not enough information to determine exactly what is going on on the site and at what rate any contaminated groundwater could leave the site.

The second issue is the 560,000 that has been measured on surface soils is in the vicinity of the

stacks where the average concentrations of water dripping off the stack were in the order of 2 million with the high value of 59 million. The measurements a few metres away from that part fell to about 100,000. And so we know there is a localized source. We know there is a source. It results in high levels of tritium in the soil moisture that are available to move down to groundwater.

We also know -- and one of your questions was what is it compared to historical values, for example. The only information we have is from an inspection report that was done in ’96 where the inspectors -- CNSC inspectors at the time took water samples from water that had accumulated in an excavation close to the stacks and the concentrations of tritium and water in that sample were about 279,000 becquerels per litre. That was in ’96.

Essentially, the situation we’re in is that the way the stack was expected to function, and has been modelled by SRB and this morning they indicated that the stack is relatively high. The exhaust velocity is also relatively high. And so the expectation is we would have a homogenous mixture essentially leaving the stack and being dispersed.

What the information is in terms of the spatial variability in terms of the water droplets that were collected at the base of the stack is that the

degree, the location and the non-uniform pattern of contamination at the base of the stacks is not what one would expect given the height of the stack and the exit velocity.

So that essentially leads us to believe that there are sources or a source of contamination other than what we would normally consider gaseous emissions through the top of the stacks that may be contributing to that contaminated water dropping off the stacks. This mechanism is unexpected. It's not well understood and it's a combination of these elements that essentially led to the conclusion that this is posing an unreasonable risk on the environment because it is a source that has not been recognized in the facility, for example, safety analysis, and none of the licensing documentation on which environmental monitoring programs or action levels or facility controls were designed for.

The facility currently is not able to collect and treat that water and prevent that source of contamination to groundwater, and that is the basis for the order, essentially mitigating that source of contamination to the groundwater, recognizing that there are uncertainties in terms of what happens to the contaminated water once it gets into the ground.

MEMBER BARNES: Maybe just a couple more

and then I'll pass.

That was an issue, Dr. Thompson, that I found surprising in the comments to the licensee, that there is recognized significant levels, and you're then trying to address whether or not there's a plume, which involves quite expensive drilling, particularly if you want to go deeper, to have enough drill holes to be able to demonstrate the rate of vertical migration, et cetera. I haven't seen anything to suggest -- and we're referring back to Dr. Nicholson said "Look at the stacks." The stacks are fairly modest dimensions, and if that is a principal source, maybe not the only one of this level of contamination, I haven't heard anything about trying to essentially contain those higher levels, those fluids that are coming off at those levels.

If in fact most of the high levels of 59 million and up to there are due to times at which you're processing it -- actually, no, the stacks are in full operation -- combined with when it's raining, so you surely must have a system here that allows you to test various things, right, when the stacks are on? You have times when the stacks are basically off. You have times when it's raining and when it's not raining, where you're in a position to try and assess the variation in tritium levels around the stacks themselves, raining mildly versus

torrential thunderstorms, et cetera.

Is there not some capability then of trying to assess to what extent it's simply washing down off the stacks or, as Dr. Thompson has just implied, there may be other factors?

So this is not an easy situation, but it seems to me that you have a system in there in which you should be able to have some more data without being incredibly expensive in which you should be able to test some of these suggestions that are coming out of CNSC staff.

Could I ask the licensee; have you given any thought to trying to contain these liquids, water with tritium, on site, whether it be runoff from the building, runoff from the asphalt and try and treat it there as opposed to letting it get into the groundwater, in which case they may be having to take all these other actions which also have a cost in order to prove that in fact it's not a contaminant when you can easily see in well MW06-1 that there is a contamination taking place?

So in a sense, if there is that contamination, there is some responsibility to stop that contamination. It's better to stop it at the source as opposed to trying to contain it later, especially if it develops into some kind of plume.

MR. MORRIS: Neil Morris, for the record.

In all of the evidence that we see there are acknowledged uncertainties. There are reasons to believe that if you were to apply the model as it's meant to apply at distance -- this is the atmospheric dispersion model and the understanding of how tritium gets from air into groundwater -- if you apply that close into the stack, there are factors in close proximity that will alter the way things behave in context of that model, but if you understand the basic principles of it, these are not unexpected numbers. Numbers of 50 million, that's within expectations.

It has always been the understanding of SRB, or at least in my involvement with them, that management of emissions from the stack, by direct inference, manages what goes into groundwater, and they have demonstrated in recent years that they have done a very good job at that, reducing their stack emissions by more than tenfold.

It's been stated by CNSC staff that they think that there may possibly be a source because there's some uncertainty. It does beg the question: Would SRB take mitigative measures if there is no certainty that there is a source there at all?

My understanding, and based on everything

that I know, is that the tritium that's in groundwater beneath the stack is coming from the top of the stack.

Yes, you could secondarily put in controls to collect whatever rainwater falls through. It's not an unreasonable thing to do, but up until this point in time, nobody has demonstrated that those levels are leading to any significant concentrations of tritium in groundwater. There is no demonstrable or obvious need to do it.

Yes, there are uncertainties, but it would be far more prudent for SRB to understand that further rather than looking at one number of 59 million and saying, "We've got a problem here." It would be much smarter and more efficient and a better protection of the environment to further investigate the issue.

As I said, the current emissions, in all my estimations, don't pose any unreasonable risk. So take the time to understand the problem properly, answer the questions that CNSC staff may have and deal with the issue when you fully understand what the source is.

MR. LEVESQUE: Stephane Levesque for the record.

If I could add to that, the work that we had undertaken after the submission of the groundwater study was to exactly define what was happening on site so that if need be, we would take measures, and that's what

we’re in the midst of doing is to define exactly what happens on site, because I feel that from the measurements we’ve had today, it’s not enough to fully explain what happens on site. We haven’t done it over various seasons. We haven’t done it over enough storms, and that’s what we’re trying to identify, exactly what things -- what’s happening so that we can determine what and if anything could be done to further reduce it and if there’s any means to do that and that’s what, if we’re allowed to operate, we’ll be doing in the end.

MEMBER BARNES: One final comment on that. That refers to Table D-1, which is Appendix D which is your stack attributes. It’s on page D-3. And these are the data from ’96 to 2005. It’s at the back of Tab 5. So it’s Appendix D.

Coming back to the issue, if the contaminants of tritium are coming up through the stack and most of the time what you’re giving here is the exhaust temperature, which is 20 degrees Celsius, and if you look at the last line, the average annual air temperature at the stack in Pembroke is a mere 5.6 degrees Celsius. It seems kind of low to me, but let’s say you have a very cold -- well, that’s what it is, the last line here -- very cold winters, but we also know you have very warm summers that are certainly more than 20 degrees

Celsius. So in a cold winter, it's going up and presumably dispersed, but then in the summer, when you've got warmer air, you're putting a colder exhaust into that air, I would expect that then to sink pretty rapidly around the site, more envelop the stack itself and, again, getting back to a testable hypothesis here that you should be able to look at the different values, winter versus particularly summer to see whether there's extra tritium being precipitated close to site again during mild storms or during no storms. But again, I find some of this information is in here, but it's not being used to properly address and provide some testable hypotheses here as opposed to just say that we've got a problem and we don't have to worry too much about it.

It's not that the degree of tritium is migrating so slow that it's going to distant houses and we don't have to worry in terms of the drinking water or that the City of Pembroke is going to be on wells. Nevertheless, there's a potential here for contaminating the environment, and I think this is something which we're wanting to see addressed by the licensee to control the sources, to understand the systems, to understand the type of contamination, where it's coming from and where it's going, and I think there are ways.

In the information you've given us, you

haven’t linked these together to work out some new strategies of solving the problem as opposed to just drilling more holes or deeper holes.

THE CHAIRPERSON: Perhaps I may just take this opportunity while Dr. Barnes is on this area. I think that it’s going to be important for us today to specifically address the issues that were in the Order, and I think what Dr. Barnes has said is that if we look at the Order, specifically it talks about the issues to do with the environment. It makes it quite clear that the Order that Dr. Thompson has issued has talked about the issue in terms of the effect on the environment per se. It doesn’t say what is suitable or not suitable or what could go some other way. It said that there is a responsibility on the part of the licensee to ensure the protection of the environment in this case with or without the issues.

So it’s going to be important for us to address this information in order for us, as a Commission, to be able to look at the Order and look at the reasonableness of the Order and to look at the issues with regards to our responsibilities under the Act which include the protection of the environment. It includes other things, but it doesn’t include the environment, which is rated here.

As such, perhaps I could just ask a supplementary to the question that Dr. Barnes raised, and it's coming back again to the fact that in your presentation from the licensee's point of view, you didn't address the memo that came from Peter Flavelle that is of June 14th, 2006 to you, and in that memo it specifically addressed issues -- that's last June -- that had to be looked at, and one of the specific issues that you've alluded to a little bit is to do with the model.

And so in this note from Peter Flavelle, it specifically says that there are questions with regards to the model that's being used, and this would, in my mind, add to the questions that Dr. Barnes had with regards to understanding the processes that are going on here.

I don't see any answer either in your documents or any other documents specifically to this June 14th memo with regards to that aspect of the model precisely. Could you please address that?

MR. MORRIS: Neil Morris for the record.

I will first explain the purpose of the use of the model in the original groundwater study. It was not applied to give a precise indication of concentrations of tritium in groundwater or in soil water or in any other liquid medium, on a spatial scale, anything less than tens of metres. There is no model, to my knowledge, and I

could ask this question of Peter Flavelle, if he is aware of such a model that would work in that way.

The model was designed to give us an understanding of what we expected to see in terms of tritium in shallow groundwater offsite, given that most of the rationales supporting ---

THE CHAIRPERSON: I'm sorry; perhaps I need to -- what we're talking about at Appendix D is the model with regards to dispersion of the stack plume.

MR. MORRIS: Yes.

Yes, and it is the plume as we mentioned a number of times that affects what you see in groundwater and we have agreement with that, certainly offsite what's in groundwater has come from what's in air. It's, as I said, in my mind virtually impossible to develop a model that would satisfy the requirements that are being put on the table here. Direct measurements are something else that we have considered in addition to the model to develop our understanding plus theoretical constraints done in a conservative manner. It's only part of the equation.

The issues that have been raised with respect to the model and its potential to not quite be representing what's going on in the site are based on, as far as I understand anyway, I think it must be the

readings at well MW06-01 which, when you apply the model for atmospheric dispersion and subsequent delivery to groundwater, what you're measuring in groundwater at that location is higher than what we predicted by the model. It's not orders of magnitude higher. It's percentages higher.

If you take into account the fact that that groundwater is under the influence of historical releases, you start to narrow that gap. If you were to consider that, you know, all things being imperfect in the modelling world, there is a short circuiting. Rain washes off the roof, flows across the tarmac and then goes into groundwater instead of going in directly at site. It does not alter our understanding that the tritium came from the atmosphere. It says there is subtle variability over a small spatial scale but it's not telling us any different than what we expect, and an application of some components of that model in a memo that I provided to Stephane Levesque, and he subsequently forwarded to CNSC staff, I used the same principles that underlie that model to indicate that we could see numbers as high as 50 million right in close proximity to the stack. Sure enough, that's the highest number that's been measured to date.

So I think the evidence that's out there very strongly supports the model, notwithstanding subtle

variations that ultimately are meaningless in terms of public exposure or environmental exposure.

THE CHAIRPERSON: Okay. But to cut to the chase here, when we look at the Order, part 3 of the Order, “Information on Which the Order is Based”; Items 3 and 5 specifically address the material put forward, the information put forward by Peter Flavelle with regards to these issues.

Do you, I guess, do you agree with the statements or could you succinctly put forward on Items 3 and 5 what is the position of the licensee on Items 3 and 5 so that we can, at the end of the day, have some solid evidence here?

MR. MORRIS: Yes, if you’ll just allow me a couple of seconds to read through it and collect my thoughts? Thank you.

(SHORT PAUSE)

MR. MORRIS: In reviewing Item No. 3 and the final statement that:

> “The source of tritium in groundwater underlying the facility and the property on which it is located and any plume that might exist in the groundwater has not been identified.”

It presupposes that there is a plume and

there is no solid evidence that there is a plume, notwithstanding unavailable data or uncertainties. It also assumes that there is an existing source. We have seen no evidence to suggest that there is any other source other than the outlet of the stack. At the onset of the Groundwater Study, I conducted a facility review in accompaniment with Stephane Levesque and other staff at SRB.

During an investigation of the site I did a review of documents that describe the site operations prior to that. In all of that investigation there was no evidence that there was any source, significant source. There were things previously identified such as air conditioner drippings which upon my review at this facility, I found that those were discontinued. So in terms of significant stores at present there’s no indication of any kind, no solid evidence whatsoever, that there is anything other than emissions coming from the exit of the stack, the exit point.

And if Ron Nicholson would like to address point 5?

DR. NICHOLSON: Ron Nicholson.

Point 5 is what we were -- I think, Madam Chair, what you referred to there in terms of underestimating the concentrations of MW06-01, and I think

we have addressed that and acknowledged that those numbers in that well are not consistent with the air dispersion model but are certainly consistent with the short circuiting that would have taken place with surface runoff to that area of the ditch where the well is, and I think that it's easily explained and also that those numbers in that well do not mean a widespread short circuiting. It means that we have some runoff from the facility that will migrate to the edge of the property at the ditch but we don't expect that to go any further.

THE CHAIRPERSON: And number -- I should have added this earlier, but number 13 as well which relates to the same?

(SHORT PAUSE)

MR. MORRIS: Neil Morris for the record.

Yes, again, I will agree that the model as applied for certain purposes is not ideal for predicting what's going to be at the base of the stack. Again, no such model exists and I would challenge anybody to put one in front of me that I could review and say, yes, I agree that that would work.

It's also important, very important to remember that; again, that all of the information that we have suggests that the tritium that is being found at the base of the stack is coming from the exit of the stack.

There is a supposition that that constitutes a separate and distinct source and requires separate and distinct approaches to deal with it. It is, as far as we understand it, and maybe we need to do some more investigations to confirm this to CNSC staff's satisfaction but, as far as we understand it, the stack is the source of that tritium.

THE CHAIRPERSON: Would CNSC staff wish to comment?

DR. THOMPSON: Patsy Thompson for the record.

In essence, the conclusion that I reach as the Designated Officer who signed the Order was that given the information you have just pointed to, the inability to essentially use a model to predict concentrations of groundwater at points where it would be needed to determine emission limits that would protect groundwater on the site, are understanding and it confirms what EcoMetrix has just said. There are currently no air dispersion models, even the more refined models that are appropriate for locations within about 100 metres of a stack of a point of discharge. And so models can be used to predict concentrations and therefore calculate an emission limit. That's one point in relation to Well 06-01.

The other point is the phenomenon that is being observed at the base of the stack is not one that is expected. It's not one that has ever been brought forward by SRB in terms of what would be happening during their normal operating conditions.

There is currently no way of capturing that tritiated runoff and preventing it from entering the groundwater. That is the information on which the Order is based and for which essentially we put forward that the measures necessary to protect the environment were to cease the processing of tritium until something can be put in place to either mitigate that source or prevent it. That is the basis of the Order.

In terms of this is something that is expected at this kind of stack, CNSC staff has over the years done a lot of work in terms of tritium behaviour at a variety of facilities. There was extensive work done in the late nineties, early 2000, because of contamination that had been found at the sites that are mentioned in SRBT's Attachment 21, I believe, and that's the Pickering site and the Bruce site. At that time there were several investigations because high levels of tritium had been found in groundwater at various places in these sites.

This led to a number of initiatives and some of those initiatives were very detailed studies in

terms of precipitation, tritium and precipitation at close distances from the sources and using models to see if the concentrations observed in rainwater could be predicted or estimated.

That work led to the conclusion on the Pickering site that atmospheric washout could not explain the high concentrations of tritium in groundwater. The high concentrations of tritium in groundwater were attributed to events, past practices, malfunctions like cracks, operational difficulties with the upgrading plant. And so that was a very clear conclusion that the atmospheric washout could not explain those high concentrations of tritium.

Staff has also essentially compared the situation between Pickering in 2000 and SRBT in 2005 because the amount of tritium released to the atmosphere is quite similar for those two facilities. The highest concentration of tritium in precipitation that was measured at Pickering close to the source is about 25,000 becquerels per litre in rain.

If we look at the differences in stack height and exit velocity between Pickering and SRB, we estimate that there would be a ratio of about 4 between the ability to disperse and the concentrations that would be expected in rainwater. So that gives us essentially a

very, very high value of about 100,000. That's the most that we could expect and that's certainly way lower than the water being measured at the base of the stacks which, on average, is about 2 million and with the 59 million high value.

The calculations that are provided in the information submitted by SRB essentially explain these values by a mechanism that is highly unlikely that you would have a source of undiluted exhaust essentially being washed to wash down to the soil and then trained.

The air samplers that SRB put within the fenced area where the stacks are indicate for two periods in May essentially, May 12th to the 23rd and then 23rd to May 30. The air concentrations varied between about 18.8 becquerels per cubic metre and 422 becquerels per cubic metre. This would give rain values of 1,800 becquerels per litre to about 42,000 becquerels per litre. Again, this is way lower than the concentrations in about 2 million, on average, that are being measured at the base of the stack.

And so we believe that the discharge of tritium through the stack is not a process that can explain those high values.

And given that uncertainty and the inability to make predictions and to take measures to

correct the situation, the Order was issued essentially to be able to mitigate the source to prevent this from entering the environment, recognizing that it's very difficult to rationalize the observations based on -- or knowledge of other sites or knowledge of the tritium behaviour and what has been expected at that site. There has never been any cases until very recently, essentially early August, where these numbers have been put forward as the expected conditions at SRBT.

THE CHAIRPERSON: Mr. Levesque, would you like to comment?

DR. NICHOLSON: I guess a comment has been made that we can't model the tritium concentrations at the stack, and that seems to be problematic, but we should also remember we can make measurements, and when we make measurements, we're actually monitoring and trying to understand the problem or the issue that is occurring. And at the stack it's very clear that SRB have been very diligent about making numerous measurements, and when they were operating, they were making those measurements, and I think Mr. Levesque indicated that they were making those measurements over time, which had been a suggestion from a Commission member. And so they were looking at those numbers and trying to resolve an issue, something that we can't model, but when we get measurements, in fact,

measurements carry much more weight than many models do, and I think that should be also very clear.

I think we should understand that even though the model can't explain the concentrations at the base of the stack, we have numbers of this trickle wash down from the stack. When we work out those numbers and see what the average numbers should be, those come out very, very consistently with what the soil moisture is measuring at the base of those stacks. So there's a very consistent relationship, and even though we may not be able to model it, we can measure it. And when we measure it, we find those concentrations go from 59 million down to half a million, and that half a million becquerels per litre at a very small location represents the largest source concentration at present. So I think we should understand those things, that even though we can't model it, we are measuring it and we are monitoring it and we understand at that level what's happening because we have those numbers.

So I just want to make sure that it's understood just because we can't model those numbers, that I think the one step better and the steps that have been taken here are that we're actually providing measurements and those measurements should provide us with a comfort level that we're not seeing 59 million becquerels per

litre going into the groundwater. That's not the case here.

THE CHAIRPERSON: Mr. Levesque, Dr. Thompson used the words how to mitigate and prevent, and the discussion that's been just heard by Dr. Nicholson didn't talk about how to mitigate and prevent. It talked about how to measure.

So would you like to comment on the issues of mitigation and prevention?

MR. LEVESQUE: The approach that we've taken, until we can fully define the groundwater condition and mechanism is to reduce our emissions as low as reasonably achievable, and we have demonstrated that we've done that over the years, even in 2006, and again, as I said, they keep going down week by week. The last 10 weeks, again, they've been well below the emission cap that has been proposed by the staff and we're not going to stop at where the caps or the limits are. We're going to keep going as low as reasonably achievable, as we know that that's the contributor to the numbers that we're seeing around the stack.

Dr. Thompson referred to some other numbers that we provided, not in August, but in early June regarding the passive air samplers and on July 11th regarding the 59 million and so on. We've since had other

numbers of passive air samplers which show a different analysis. So that's why it's really important to do measurements before conclusions can be drawn, and we weren't really allowed to share those numbers or given the opportunity to do that before the Order was raised.

THE CHAIRPERSON: I apologize, Dr. McDill. Questioning over to you.

MEMBER McDILL: Thank you.

I would like to back up a little bit, if I may, and I'll address this to staff first.

THE CHAIRPERSON: I'm sorry, we'll have to do it directly to the ---

MEMBER McDILL: Okay. That makes it more tricky.

In the submission by SRB, they raised the question of whether other tools could have been used to deal with this situation.

May I ask the Chair to pose that question?

THE CHAIRPERSON: From SRB's point of view, you talked about the Order being an unsuitable tool.

What would you propose would be some of the other tools? And then Dr. McDill wishes to ask the staff, did they investigate other tools other than the Order to be used to get the result that is necessary to protect the environment.

So Mr. Levesque.

MR. LEVESQUE: Well, first, I think a discussion would have been a tool that could have been used which could have led to letters, recommendations, warnings, which we probably would have followed the direction right from a discussion and wouldn't have needed even to step it up to a request or a further tool.

Mr. Morris, if you'd like to ---

MR. MORRIS: Yes. In all aspects of environmental management the level of effort levied should be at least based on the perception of the significance of potential impact or risk.

Up until this point in time, based on a fairly detailed and state of the science understanding of what's happening at the site, we have yet to see any direct measures of levels of tritium in groundwater that are unacceptable. They just don't exist. So when you are talking about the necessary steps that should be taken to address the issue, in taking the approach as low as reasonably achievable within allocation of resources to all other manners of environmental protection that SRB undertakes, it doesn't make sense for them to try and address a groundwater issue that has yet to be identified as anything of a significant concern. It's a potential hypothetical possibly in the future concern but it doesn't

exist at this point in time.

Since it is something that exists in the future, you would take a more protracted path to understand it fully, investigate the problem correctly. If there is a suspected, and I emphasize “suspected”, secondary source of tritium emissions, then it would make sense to me to investigate that possible source and understand its implications rather than undertaking to put in mitigative measures that may have absolutely no benefit whatsoever.

THE CHAIRPERSON: Should we ask the staff now?

MEMBER McDILL: I would be grateful if the staff could respond to that.

DR. THOMPSON: Patsy Thompson for the record.

Essentially, the Order was issued because the measurements we were being provided and the assessments we were doing indicated that there was a source of contamination at the base of the stacks that needed to be mitigated. So the Order was issued because a measure was necessary to protect the environment essentially because the SRBT facility does not currently collect or treat tritium-contaminated water that may be contributing or is contributing to groundwater

contamination at the base of the stacks. This is the only available measure, the only available measure at this time, to mitigate the source, in the absence of the ability to collect it, is to cease the processing of tritium.

The other means or other methods of achieving compliance, and Mr. Levesque has listed some of them, that are named in the Regulatory Guide G273 were not considered appropriate. Essentially, the letters and warnings are appropriate for essentially dealing with a recalcitrant licensee, someone who is not essentially doing what has been asked.

We have commented on several occasions and have recognized essentially the improved performance of SRBT. We have mentioned on several occasions that they have met all the commitments they have made. They have met the action plans that were part of the license conditions in the current licence. So the Order was not used in a graduated enforcement framework. We weren’t increasing enforcement measures because SRBT was refusing to do certain things.

I don’t believe that, and a decision was made that, writing a letter essentially asking SRBT to cease voluntarily to process tritium would not have achieved a measure which I felt was necessary to protect

the environment. I believe that it would have led to an exchange of information, discussions, that would have delayed the implementation of a measure I judge to be necessary.

MEMBER McDILL: To SRBT.

The issuance of an Order like this by its nature indicates that staff perceives this to be a severe and urgent problem. There seems to be a big gap between the positions of the two parties. Certainly, in the near field there seems to be a huge gap. Medium to far field I think it sounds like measurements are matching or there is at least agreement.

If SRBT were to apply all of the comments made by staff on June 14 in Tab 9 in that binder, what would change? Would anything significant change in the medium to far field? Let’s leave the near field, so the porosity differences, the conductivity differences. In rough numbers, if all of those differences in the medium to far field were applied, do you have any feeling for how your numbers would change in terms of years or time to reach Muskrat River, that sort of thing? Has that been looked at all?

MR. MORRIS: Neil Morris for the record.

When we undertook to do the groundwater study it was the approach all along to go on a graded

manner, a tiered manner, working with as broad and protective information as we could and working our way downward.

We have taken it sufficiently far in our mind that even with all of those various points of disagreement, conceding or capitulating would not alter the conclusion of the report. That is actually verbatim the conclusion of Peter Flavelle in terms of offsite facts. So I don't see that as being an issue certainly medium to far field.

MEMBER McDILL: Would staff agree to that, that the differences in porosity and conductivity raised in the June 14, 2006 Tab 9 letter – I realize I'm generalizing here – would the medium to far field agree, be in rough agreement?

MR. FLAVELLE: For the record it's Peter Flavelle.

Yes. Basically, the modelling that was done with the atmospheric dispersion modelling leading to tritium entering the groundwater basically over-predicts the measurements that were made in 2006 for the wells beyond 200 metres from the site. Of course the potential use of modelling is to gain an understanding into the mechanisms of what is actually happening in reality so that if you need to you can develop some potential

mitigation measures.

The analysis that Ecometrics did and that I reviewed basically had difficulty in matching the observations that were made very close to the site. That is where the contentious issues arise from, coupled with the size of the licensed area and the area of land under their immediate control.

MR. MORRIS: I would like to add to that very briefly just a point of correction.

There were three wells installed close to the site. We over predicted at two, we slightly under predicted at one, just to make sure we understand that the model is not grossly under predicting close proximity to the site.

MEMBER McDILL: I will just ask staff to confirm that.

MR. FLAVELLE: Peter Flavelle again.

Mr. Morris is correct, the comparisons that they did between the modelling and the measurements, they used the last six years of data that they simulated to compare with the one year of measurement that was done in 2006. On average, two of the wells at the edge of the site were over-predicted when you compare their averages over that period of time.

Unfortunately, we do not have good

information on the response to the groundwater to the atmospheric inputs in terms of how long it will take tritium and just plain water flow to reach the water table and have an effect on what we would see in a well. So it's not clear if we should be using the last year of their calculations, the last three years averaged or the last 10 years averaged. The best we can do is look at what we measure now and what the overall pattern of the modelling tells us.

MEMBER McDILL: Thank you.

Given that there is loose agreement beyond 200 metres, which I think is fairly clear, how does SRB propose to deal with this level of uncertainty which is causing this Order to have been placed?

MR. LEVESQUE: We thought that the letter that was sent to us on June 30 by the CNSC to ask us for additional work on site was going to address that uncertainty. We were in the midst of doing that by the time we even got the letter and we complemented the work that we were doing with the additional work requested in that letter, nothing other than soil sampling, which we were going to perform, was going to basically define that uncertainty.

In addition, in late July we were asked for yet more additional work, which was three more wells

located on site. Again, we agreed to comply with that. We thought again that was going to deal with that uncertainty and we were in the midst of doing that.

DR. NICHOLSON: May I just add to that? Ron Nicholson.

Trying to deal with the uncertainty was also part of the purpose of my presentation in showing that the highest possible concentrations really focused at the stacks. Those were the highest potential concentrations that we would see anywhere on site or off site. In doing the calculations, the re-evaluation that I did for that, for the vertical travel time through the soils, the purpose was to show that there is plenty of time for the tritium to decay to low levels even from those very high levels that we might expect immediately at the main area of concern, at the stacks.

I think it should also be remembered that an ancillary purpose of that, of that presentation, was to show that we have plenty of time here to evaluate what the situation is. This is not like an oil spill where oil will travel off in a matter of minutes or hours and cover shorelines. If there were concerns about these levels, these are moving at groundwater, at soil water, rates and I think any hydrogeologist can tell you that these rates are relatively slow, that the timelines we are talking

about for the movement are on the Order of years to decades.

In this case, because we have such low conductivity material, we are looking at many decades so that there is no imminent risk of this water going off into the groundwater at depth and in any time within a timeframe that we are interested in, not in the next year, not in the next two years. We are certainly looking at a lot of time here to be able to deal with this issue and better define the issue.

MR. MORRIS: I would like to add one additional thought for consideration in that line of thinking too.

In terms of uncertainty we can get a beat on what we expect to be the highest possible concentration of tritium in moisture that’s in the soil. That’s not groundwater; that’s moisture that’s in the soil. As far as we know to this date, that is somewhere in the Order of 50 million, in a very isolated area.

The important question is, what level is an acceptable level and therefore are we 10,000 times higher than that level or are we 10 per cent over? That would greatly dictate sort of the urgency and the allocation of resources and the time for addressing the issue. I have yet to hear any indication of what specific criterion has

been used by CNSC staff as the basis for their judgment that even that number of 59 million -- which has not been seen in the soil, it has been seen in drips coming off the stack -- what is the number that is an okay number basically.

MEMBER McDILL: My last question for this round will close this, I think.

Staff clearly doesn't agree that there are years here in Order to deal with this uncertainty. I am assuming that, I believe by what Dr. Thompson said, it's the number when compared to other studies in the past -- Dr. Thompson suggested Pickering – that has been the concern.

Perhaps I could ask staff, with respect to this uncertainty which has caused the Order to be put in place, do they agree that there is time to assess what that uncertainty is and how to deal with it?

DR. THOMPSON: There are two issues related to your question. One is in relation to statements that Mr. Morris has just stated on behalf of SRBT. Essentially, those statements equate to using the environment as a containment measure. In our view, this is not appropriate because once contamination is in the groundwater it is no longer in the control of the licensee and it certainly does not meet the expectations of section

12(1)(f) of the general Nuclear Safety and Control Regulations. That is the first point. That is the basis for the Order, that measures need to be taken to prevent this direct source of contamination to groundwater under the stacks.

The second point in terms of is there a time, the position and the fact that the Order was issued was on the basis that the measures were necessary to protect the environment because this is a source that has been identified. There is currently no way of controlling it. The issues that need to be resolved and that have been discussed today are complex and would not be resolved quickly and so the Order was drafted in terms of a cease and desist until a full knowledge and full understanding of the facility operations and its behaviour are understood. It was essentially a measure to protect the environment and once measures are implemented to control this direct input of contamination to groundwater the intent of the Order would have been met.

In terms of what would constitute acceptable levels, we can answer that question if the Commission wishes.

MEMBER McDILL: Yes, the Commission wishes.

DR. THOMPSON: Give me a minute.

(SHORT PAUSE)

DR. THOMPSON: Patsy Thompson.

In terms of levels that are acceptable, CMD 06-H16 spoke of the approach that staff was using in terms of assessing whether the risks were reasonable and it was based on a fraction, 25 per cent, of the drinking water guideline. Essentially, that approach is consistent with approaches that have been used in other jurisdictions to either design and site waste management facilities like landfills. On other occasions it has been used in terms of managing risks from contaminated sites. Essentially, it is based on protecting a resource and by setting an objective lower than the drinking water guideline then you account for uncertainties in groundwater modelling, some of the uncertainties that have been discussed this morning, and it provides some assurance that the resource will be protected.

That's the basis of what we would normally use.

In this case, we recognize that the levels of tritium in groundwater have already exceeded those levels and the approach is one of curtailing essentially a direct input of contamination to the groundwater.

In Appendix 21 of SRBT's submission, essentially Mr. Morris conducted a site-specific assessment using so-called generic screening criteria for

non-potable groundwater. Mr. Morris essentially indicated that these generic screening criteria have been reviewed and approved by CNSC staff for use at nuclear power stations in Ontario.

Essentially, we do agree that staff has reviewed and agreed the generic screening criteria but not for the purposes for which they have been used in Appendix 21. The generic screening criteria were developed following the events I have mentioned a bit earlier today where high levels of groundwater contamination were found on the Pickering site and were due to historical events and malfunctions and the like.

The GSC, the generic screening criterion, is not intended to be used under normal operating conditions as a level indicating what is an acceptable or reasonable level of environmental protection. In fact, CNSC staff wrote a letter on July 21, 2001 to OPG specifying the conditions under which the generic screening criterion was to be used. The letter essentially states very clearly that the generic screening criterion is not meant to be used under normal operating conditions. The generic screening criterion is intended only for historical contamination at which a site-specific assessment must be done to determine whether or not remediation is necessary if the generic screening

criterion is exceeded.

The letter goes on to say that for cases where tritium is below the generic screening criterion, CNSC staff expects the licensee to take appropriate actions to identify and mitigate or eliminate any ongoing sources of tritium contamination. That is essentially the context under which the generic screening criterion have been used.

In other contexts for other licensees where measures were being taken to ensure that groundwater would not be contaminated, the licence includes, the licensing documentation, essentially includes action levels, for example, in groundwater. An example that the Commission may be familiar with or may remember is the action level in monitoring wells very close to waste storage buildings at the Western Waste Management Facility where the action level is 10,000 becquerels per litre, and that is a very short distance away from the storage building.

That is the normal approach we use in terms of managing the inputs of tritium into groundwater. It is certainly not on the basis of a generic screening criterion developed for determining whether or not an area that has been contaminated needs to be remediated. The Order does not require SRBT to remediate the site and so we have not used the generic screening criterion as an

approach or as a basis for the Order.

MEMBER McDILL: Thank you.

THE CHAIRPERSON: Just before the break, does SRBT have any comments with regards to Dr. Thompson's comments?

DR. OSBORNE: Thank you, Madam Chairman. Richard Osborne.

I do have some concerns. Perhaps it is because I am slightly confused as to what is trying to be achieved here.

THE CHAIRPERSON: I'm sorry, I'm not asking for sort of a philosophy I guess. The issue was raised with regard to what is the appropriate level by Mr. Morris. There was a reply. I guess what I am asking is -- again, I'm trying to focus on the Order here, so if we could have any -- what I'm talking about is discussion with regard to the science, just to be specific here.

To be polite, I'm not really concerned whether you are confused. I am concerned about whether there is evidence on the table here. Thank you.

DR. OSBORNE: Thank you. Richard Osborne. I'm sorry, I will try and cover up my confusion.

We are talking about protecting the environment and public health. It is very clear in the regulations and in your documents that there are both

these. The interpretation I have of protecting the environment is that we are interested in protecting biota or avoiding contamination. If we think of it in terms of radioactivity, then we are protecting biota and there are some screening guidelines from PSL2 and other documents and on the appropriate concentrations of tritium. So that is one aspect.

If we are thinking it's just not a good thing to have tritium there period, thinking of it as just a contaminant, then I think we have to bear in mind that at something like the drinking water guidelines we are talking about one part in 10 to the 15. The concentration is very low. As a contaminant of the environment it disappears into insignificance other than for the radioactivity.

So if it is neither of those then, as it would appear now, we are talking about an acceptability in terms of public health because the criterion seems to a fraction of the drinking water guideline, which is in effect about a fortieth of the public dose limit.

Are we now looking at, as a basis of this Order and subsequently, an emission limit which is based not on the clear regulatory limit of one millisievert per year but one which is a fortieth of that? That's where I have a little difficulty with seeing an approach that

follows this route when we are really down in the ALARA sort of region of trying to sort of balance the resources one puts into lowering doses, which are already down in the microsievert level now, and certainly would be very much lower than that in the future.

So there seems to be a disconnect, Madam Chairman, between this rather sudden action and what is really about to be achieved.

THE CHAIRPERSON: Thank you. We are going to just take a 10-minute break.

I have been reminded that, Mr. Levesque, because this is SRB's right to be heard, I just would like a sense from you that when the consultants speak they are speaking for you and if you disagree at any time with the fact that that's SRBT's position, it is important for you to register that, otherwise we will assume, en masse, that everyone represents SRBT. Is that correct?

MR. LEVESQUE: Yes.

THE CHAIRPERSON: Thank you very much.

We will just take a 10-minute break. Thank you.

--- Upon recessing at 3:10 p.m.

--- Upon resuming at 3:32 p.m.

THE CHAIRPERSON: Please take your seats.

Mr. Graham.

MEMBER GRAHAM: Just as a preamble, SRB has been before us and we as a Commission probably have four options: revoke, amend, confirm or replace. You only talked about revoking. My question to SRB, first of all to start off with, is as far as amending or as far as finding compromises you haven't made, in my mind, a clear suggestion.

This leads into my first question which is with regard to No. 14 of the Order in which we are talking about the not collecting the tritium contaminated water. My question is, first of all, has there been a study or has there been any review of where is the contamination coming from on the stack? Is it coming from the top? Are there leaks in the stack? It is not a closed circuit operation. Has there been any review of other places of possible contamination from the stack?

That would be my first question.

MR. LEVESQUE: Thank you. First, we didn't just give the option of revoking, we also said amending. That was in my statement ---

MEMBER GRAHAM: It was? Okay.

MR. LEVESQUE: --- just to make clear what our -- just to get that out of the way first.

The amendment that we wanted is to be allowed to operate while we find a solution to be able to

address this issue.

Referring to what you are talking about and the numbers that we have been finding around the stack, the stacks have been sealed on a routine maintenance basis. We are trying to see if certain different areas of the stack would give us different numbers. That's what we needed time to investigate while operating because we can't do that when we are not operating because we are not going to see anything coming from them. We don't know exactly if at the place we have been taking them if: (a) that it is only in those places that they are high, are they higher in other places; or is it if you left a small 50 millilitre vial and you took another sample 15 minutes later would that be much lower, would it be near zero? Those are the things that we are trying to determine to see how much volume we are talking about, what type of activity we are talking about and where we are talking about.

Before we can identify the exact right measure to eliminate this issue we need to know exactly where the levels are. That is what really our work was centred around was to see where. Now we know it's more prevalent in the stack area, where in the stack area, because there are different types of collection systems you can put in place, different types of treatment systems

you can put in place, different sizes, different ways to incorporate them, and we really need to know where the issue of concentration is. We haven't yet defined that with the little amount of time we have had in doing the research since the end of March.

MEMBER GRAHAM: Did you have any or did you put together any type of plan to seal off around the stacks not to permit the water coming off the stacks to get into the ground and collect that water and treat it? Have you a plan for that?

MR. LEVESQUE: Not yet, we don't have one, but that's what we want to work on and we had given that date of March 31, 2007 or earlier.

MEMBER GRAHAM: But before that you hadn't put together any model or any plan. You haven't done any preliminary plans or anything else of how easy it would be or how difficult it would be to seal off the water from getting into the ground to cause any ground contamination on an area, whether it a five metre or 15 metre or a 20 metre diameter from around those stacks.

MR. LEVESQUE: We have discussed it and we have looked at different ways of doing it. We haven't really had a chance to do it fully as a result of this Order now.

Ron, maybe you would like to...

DR. NICHOLSON: Ron Nicholson.

As I see it, the measurement program that was undertaken was part of the plan to find out how to effectively see where the water is coming from. What is the tritiated water coming from? Now if there is an understanding that it is this drip down or wash down on the stacks, then the next step would be to find out how to effectively collect that.

MEMBER GRAHAM: I don't think you need to study to death where the water is coming from. You have drippings off the stack and there is water around the stack. I think the pressing issue would be the collection and treatment. You know, that shouldn't, or I would hope that that wouldn't, require a lot of detailed study as far as finding a method of collection and treatment.

THE CHAIRPERSON: That should be a question. That is a worded question.

MEMBER GRAHAM: Wouldn't that be the proper step, rather than studying where the water is coming from?

MR. LEVESQUE: Yes, it is definitely a step to take and that is what we were going to do. That is what we were in the middle of discussing but we got stopped abruptly.

MEMBER GRAHAM: Maybe Dr. Thompson might like to comment or CNSC staff as to at what stage those

discussions were.

DR. THOMPSON: If you could give me a minute I will check my notes.

MEMBER GRAHAM: Certainly.

THE CHAIRPERSON: We will give Dr. Thompson time.

(SHORT PAUSE)

DR. THOMPSON: My understanding is the action plan and the measures that were discussed by SRBT were a program of measurements.

To my knowledge, the CNSC has never received any plan to deal with the contaminated water before it gets into the soil.

MEMBER GRAHAM: Would SRB care to comment?

MR. LEVESQUE: We believe that our May 15 letter, where we describe in detail the measurement regime that was going to take place, also identified in the last paragraph that also we would look at changes and other testing. So changes definitely was separate from testing.

In addition to that, before this Order was issued we were due to give another plan by August 31st to staff to basically tell them what we intended to do as a result of the work from the June 30 letter because remember my May 15 letter was something that we have done ourselves before they gave us the June 30 letter. The

August 31 letter that we were going to submit was going to address in more detail what was going to be done but again we never got to that.

MR. MORRIS: Neil Morris. I would like to add something to that.

Again, I think it is easy to lose track of the notion that just water dripping from the stack, albeit containing high concentrations of tritium, there is no substantive demonstration that this is contributing tritium to the environment in an amount that is of concern. Nobody has done that yet. That being the case, if you were SRB, putting yourself in their shoes, would you undertake to mitigate it? Personally, I would not, but that is just my point of view.

MEMBER GRAHAM: My question would be you say you would not, but in prudence the concentration of tritium in the drippings coming off that stack, does that not raise alarm bells as to -- the drop has got to go somewhere and I would presume it would go down, if it’s like anywhere else, and it would soon soak into the ground. Would that not be a prudent way of stopping or mitigating some of the problem? It may not mitigate at all but it may start to mitigate some of the problem.

MR. MORRIS: There is no question that collecting the drippings would lessen the load to the

environment, but when you are thinking of the environment on a slightly larger scale as opposed to, you know, a few square inches where there are drips, attacking it at the point of emissions is the most sensible thing to do. If you have a limited amount of budget and you are operating within the ALARA principle, you are going to direct your efforts and your resources towards the main source, which is the top of the stack.

MR. LEVESQUE: There are certain things that we had undertaken again for a drastic reduction in emissions. We had discontinued the use of the air conditioners that would basically raise some condensate. We were disposing of that condensate through our liquid effluents limit.

Another thing that we have considered is also not operating while it rains and, as crude as it may sound, if that is a measure that could be taken that would put everyone’s mind at ease that’s something we are willing to take in the interim until a collection system can be put in place.

At the end of the day what we are looking at is the Order and are the levels that we are operating at right now increasing the concentration that’s already there. I think everyone understands, including staff, that it isn’t so could we be allowed to continue operating

while we develop this system by a certain deadline. I guess if I wasn't clear enough in my presentation I'm sorry for that, but what I'm really meaning by "amend or revoke the Order" is for us to have a commitment that by a certain date while operating we can put this plan in place to have a collection system or a way to mitigate this. I don't want to say a collection system because I don't know at this point that that's the best method. I would have to talk to people in the industry that have experience with that.

If it means not operating while it rains in the meantime to raise a further level of comfort, we are willing to do that, but we never got to those discussions.

I find it a little bit astounding when I heard that because I have met all my action plans, all the dates, all the commitments that the only resort was to issue an Order. To me that's astounding. We have been willing to work with CNSC staff, willing to do anything, and if operating while it doesn't rain, if finding a further way to mitigate things until then we will do that, but not to stop operation. That is really our issue with the Order.

MEMBER GRAHAM: One other question I have, Madam Chair, and that is on July 21 Barclay Howden wrote you a letter and set out different requirements. I

understood in your comments earlier that the wells were a go or you were going to proceed with those, but are the other requirements in that letter well underway at being looked at and proceeded with?

MR. LEVESQUE: At this point, we sent a letter to CNSC staff asking for their comment on what we wrote because we wanted to further clarify what they wanted. As soon as we get a response we are ready to proceed. We have had people look at this and they are ready to perform the work.

THE CHAIRPERSON: Perhaps we could ask the staff to comment on that.

MEMBER GRAHAM: That was what I was going to do, Madam Chair, have staff comment because there are some timeframes there dated July 31 and also October 2.

Would staff care to comment?

DR. THOMPSON: Patsy Thompson for the record.

Essentially, we have done a detailed review of SRBT’s response to the 12(2) request and we are prepared to provide feedback to SRBT on this, but with the issuance of the Order we felt that it would be putting a lot of additional work on SRBT and we felt it was I guess more appropriate to let them focus on dealing with being prepared for today rather than dealing with additional

information from CNSC staff. But as soon as is reasonable we are prepared to move forward.

THE CHAIRPERSON: Further questions at this time?

MEMBER GRAHAM: I had a question to staff, but I guess it is not supposed to go that way so -- I will try it and if I am out of Order, Madam Chair, let me know.

The two major issues, I gather, are the emissions around the stack or at the stack of tritium and the amount of tritium and also the groundwater and what is happening with the groundwater, the unknowns of the groundwater movement and so on. Is that correct?

DR. THOMPSON: That's correct.

MEMBER GRAHAM: But those are the two major issues that need to be addressed before anything else can happen. Is that correct?

DR. THOMPSON: Patsy Thompson for the record.

Essentially, the Order focused on one aspect, that is, mitigating or preventing the contaminated water from entering the groundwater. That is the focus of the Order only.

The other issues were being dealt with in a normal action plan by the licensee.

THE CHAIRPERSON: If I might, Mr. Graham.

You raised a couple of points and SRB replied in a couple of areas that I thought I might want to pursue.

One is, SRB mentioned that if it was necessary to stop the facility when it rained they would be willing to do that. Has staff got a comment with regard to the efficacy of that approach? Do you have a sense of what that would do or not do?

(SHORT PAUSE)

DR. THOMPSON: Patsy Thompson for the record.

We had discussions before finalizing the drafting of the Order along those lines. Staff's sense was that the rain events are not always predictable. We were concerned that this would be a very difficult condition of operation to comply with and also to verify compliance with.

Essentially, the evidence really is during rain events of contaminated water being available to contaminate the soil and the groundwater. The measurements that staff have made of soil within the fenced area, in the area of the stack, was taken on May 4 after a fairly dry period and the levels were then, you know, in the range of 500,000 to about 100,000, you know, within about a 10 metre radius.

So certainly the intent of the Order in

terms of managing the contaminated water would be dealt with. In terms of managing the operation and managing compliance with that condition we believe would be very difficult.

THE CHAIRPERSON: Does SRBT have any comment on that?

MR. LEVESQUE: As far as being hard for SRB to be able to manage it, it's a lot easier than not operating. We have five departments and we could reallocate the staff within the department that processes tritium to other departments as it rains.

As far as compliance, we can have records to show when we stopped operating and started operating again. Again, it's much better than not operating at all.

THE CHAIRPERSON: Dr. Dosman, thank you for your patience, sir.

MEMBER DOSMAN: Thank you, Madam Chair. It's been a very fruitful discussion today and I don't wish to repeat questions that have been asked. I have sort of one summation question then I have another of specific items, really a number of details, and I'm trying to stick to the core of the discussion. Please guide me if I wander.

If you cut to the quick and go through all the discussions that SRBT and its consultants maintain,

that they do not see evidence of significant drinking water contamination from the point source and point to the decay in tritium with the time taken for the water to move down to the bedrock and so on, I take it, I ask SRBT, if that is your position?

MR. MORRIS: Neil Morris for the record speaking on behalf of SRB.

The work that we have done leads us to conclude with great confidence that the emissions currently coming from SRB, and all direct measures of tritium in the environment that reflect historical emissions at present, show that there is no risk of tritium showing up in drinking water supplies at levels that approach or exceed unacceptable levels.

MEMBER DOSMAN: Madam Chair, I take it that CNSC staff has issued this Order, from what I take it, from the point of view that the concentrations of tritium entering the earth, the ground if you like, from the facility are unacceptably high. Do I take it that that's the jam of the Order?

DR. THOMPSON: Patsy Thompson.

The basis for the Order is that there is essentially a source of contamination to the environment that was not expected, that has not been considered in terms of controls, regulatory controls on that licence.

The facility is not designed to capture and treat appropriately that source of release into the environment essentially. It is not an authorized point of discharge into groundwater. It's those elements, in relation to section 12(1)(f) of the general regulations that require the licensee to take precautions to prevent the release of nuclear substances into the environment that has led to the issuance of the Order.

Once the contamination is in the soil, and we have evidence of contamination in the soil within about a 100-square metre area, then it is no longer under the control of the licensee. Essentially, containment by the environment is not an appropriate means of meeting the objects of the regulations in the Act.

MEMBER DOSMAN: Madam Chair, now more specific questions on the Order.

In Part II, No. 6, I would just like to ask for some clarification on what that statement means. What is it that SRBT would be allowed to do in the context of the Order given what the statement says in No. 6 of Part II of the Order?

Madam Chair, I ask that of CNSC staff.

THE CHAIRPERSON: Perhaps we could start out with the SRBT in terms of their comments with regard to No. 6 and then move to the staff.

MR. LEVESQUE: Just to understand the question, what, as far as we are concerned, No. 6 allows us to do?

MEMBER DOSMAN: Yes, Madam Chair. What is it that SRBT interprets that they can do given the comment in No. 6?

MR. LEVESQUE: It is to do everything that we were doing under our licence except for the processing of tritium as outlined in paragraph 1, which to us is the vital part of producing our product. Without part one we cannot complete the product full cycle.

MEMBER DOSMAN: Thank you.

May I ask, Madam Chair, CNSC staff's interpretation of No. 6?

DR. THOMPSON: Staff concurs with SRBT's interpretation. That was essentially the activities other than processing of tritium that the current licence authorizes and which were not contributing to the impact on the environment that the Order is meant to address.

MEMBER DOSMAN: Thank you.

Madam Chair, my next question, I would just ask you, am I permitted to use information from CMD 06-H16 in my question?

THE CHAIRPERSON: Why don't you start and then we will see.

MEMBER DOSMAN: I would like to ask SRBT, on page 4, item 3.3.1 of the overall rating of SRBT's performance ---

THE CHAIRPERSON: No. Sorry, I don't think that's ---

MEMBER DOSMAN: No?

THE CHAIRPERSON: No.

MEMBER DOSMAN: Okay. Thank you. I will let that one go.

To SRBT. On page 9 of your presentation, Mr. Levesque, you indicate that you thought that the sample volumes of 50 mL of water possibly would not be valid samples. I'm just wondering if you might enlarge on that view.

MR. LEVESQUE: Looking back at the ramifications that having these very small samples has led to we now know that had we collected larger samples that the concentrations would have been much lower than what we saw in these small isolated samples and I think would have had a lot different perception from CNSC staff than we have had having one sample that was at 59 million while the next highest was at 4.7 million. We probably would have had an average value of 2.2 million or less.

MEMBER DOSMAN: Thank you.

Madam Chair, may I ask CNSC staff their

views as to the acceptability of the volume of 50 mL in obtaining these samples?

DR. THOMPSON: Patsy Thompson.

The assumption we made was essentially that SRBT collected samples for regulatory purposes, submitted them to the CNSC as part of actions they were taking to address issues and that they were taken appropriately.

Having said that, we have used essentially a balance of the information in terms of these values and the soil data under the stacks and around the stacks that confirm that there is a source of tritium that is much higher than what had been expected and what is reasonable for the operation of the facility.

MEMBER DOSMAN: Thank you.

Madam Chair, if I might ask the company, Mr. Levesque or his consultants, are you confident that this contamination is coming from issues around the stack or could you see any other point in your operation in which you might have a leak or another source that you haven’t identified?

MR. LEVESQUE: Other than what was identified with the air conditions I can’t see any other source of tritium that is in any way significant compared to what we have seen from the stack, or insignificant.

MEMBER DOSMAN: Madam Chair, if I might ask

CNSC staff their view as to whether there could be an alternate source given what you know from on site inspections and so on?

DR. THOMPSON: Staff doesn't see any other source related to the operation of SRBT or any other reason essentially. It is the processing of tritium and a mechanism related to stack behaviour that is leading to the levels of contamination that are being seen under the ventilation stacks.

MEMBER DOSMAN: Thank you.

May I ask SRBT, do you think it is possible that when you are processing tritium and the emissions are at times quite high with certain environmental conditions such as rain or so on you might be getting extensive, if you like, fallout from tritium not just along the sides of the stacks but in the immediate vicinity of the stacks as the tritium is coming out of the stacks?

MR. MORRIS: Neil Morris for the record.

Absolutely, we would expect that. We would expect, based on our well-developed understanding of how the stack emissions affect the atmosphere and subsequently affect groundwater that you would have that exact event occurring from time to time, i.e. heavy rainfall events dripping out tritium from the plume and depositing it directly to groundwater or directly to soil. That's not

unexpected in our estimation and it's not inconsistent with what happens at other sites, and I can elaborate on that if you wish.

MEMBER DOSMAN: Madam Chair, by the word "plume" the consultant is meaning of course the emissions into the air.

MR. MORRIS: To clarify, atmospheric plume, yes.

MEMBER DOSMAN: Yes.

And given what you know of maximum use of the processing facility at SRBT and so on and the amount of emissions that would come out, how large a radius do you judge would be exposed to extensive fallout, you know, immediate deposition, what kind of radius on say a day that is humid or if there is lots of rain and so on?

MR. MORRIS: That's actually a very interesting question. I think it might help understand this in a bigger picture. What happens right at the stack is the exact same thing as happens 10 kilometres from the stack. It's just that you are looking at much higher concentrations immediately at the point of the stack, much lower concentrations obviously at some distance.

We know from direct monitoring of tritium in air that the decrease is very, very rapid. By the time you get to the closest air monitoring stations that are

established on SRB, or immediately adjacent to SRB's facility, you can see a thousand, a 10 thousand-fold decrease in the amount of tritium that is in the atmosphere, all things being equal with respect to wind direction and everything.

So the radius, it's going to be a steadily decreasing and sharply decreasing concentration in rain or in wash-off water, barring any sort of gutter runoff, that sort of thing. We expect that to happen.

MEMBER DOSMAN: So ballpark, on average, what kind of radius would encompass 90 per cent of the deposition? Would it be 50 metres, 100 metres, 500 metres?

MR MORRIS: That's a very tricky question to answer. I think part of the answer necessitates that you think of it in time average conditions.

A single rainfall event is virtually meaningless in this context. Groundwater doesn't respond to a single rainfall event. It is an aggregate reflection of what's been happening in the environment over a long period of time.

What we see in terms of the measurements that we have collected shows that as soon as you get any distance, like several hundred metres from site, not that we have wells at every location but as soon as you get

more than a couple of hundred metres from site what's in groundwater as a result of these atmospheric influences on a time averaged basis is well below the drinking water standard. I can't pinpoint where that cut-off line is for you any better than that.

MEMBER DOSMAN: I guess, Madam Chair, what I'm trying to get an idea of is, and perhaps it is not possible, is some sort of estimation or a guess -- and I'll ask the same question to CNSC staff – of what proportion of the immediate tritium would you be catching if you caught the runoff from along the stack as opposed to if you, I don't know, had a paved parking lot for 100 metres or 50 metres? Do you know what I mean?

THE CHAIRPERSON: I will let this questioning go a little bit further, but the word "guess" is not one that I assume I would accept here.

MR. MORRIS: As quick and as best a response as I can give.

That is, actually, a very critical question in understanding how you go about controlling this issue. Do you put your runoff collection efforts at the base of the stack or do you try and devise something that is more appropriate on a site-wide basis? The answer is I don't think anybody can tell you what proportion gets stripped out in a rainfall event. As a conservative measure when

we do public dose calculations, we assume that there is no stripping out, that it stays in the air.

So I can't give you any precise answer, but I know that the number decreases very rapidly in terms of the concentration in the rainwater.

MR. LEVESQUE: So if you don't mind, if I can just conclude on that?

And that's exactly what the studies that we were undertaking were going to tell us, is by doing the soil samples that we were going to take as spatial variability and the water that we were taking, it was going to tell us exactly what profile we were expecting and what areas we should focus on, because we didn't want to put something half shift and have to change it a little bit later. We wanted to do a good job at something appropriate and that's why we needed the time to complete the study.

MEMBER DOSMAN: Thank you, Madam Chair. I'm just wondering if CNSC staff has any comment at all on this last series of questions and responses?

DR. THOMPSON: Patsy Thompson for the record.

Trying to answer the question you posed would essentially be speculating. We don't have the information with which to provide such an answer. The

only thing we can say is that the existing models with essentially the database of information that supports the models, both generically and for tritium, essentially what we know is that the models cannot predict what will happen within a 100 metres of the stack and so that's the information we have.

MEMBER DOSMAN: Thank you.

THE CHAIRPERSON: Thank you.

I've got just some questions and then we'll do another round here.

One of the issues, I think, from my point of view is perhaps there isn't a clear understanding of the Regulatory Policy P-223, Protection of the Environment, which CNSC has put forward. I think in this case, I think it's important for me to state and to ask for any comments from the licensee on this policy statement because it, clearly in my mind anyway, having been the Chair when this was put in place, clearly demonstrates that the applicant must demonstrate through performance assessments, monitoring or other evidence that the provisions to protect the environment are adequate. This not only puts it squarely on the view of the responsibility for protection of the environment on the licensees but demonstrates and states that the licensee must demonstrate this, meaning that it is not the

responsibility of the CNSC staff to ask for anything or to demonstrate anything or to be driving any parts of this. It is the responsibility of the licensee.

Any comments on that from SRBT?

MR. LEVESQUE: No, but as CNSC staff -- as part of the Groundwater Study, we only identified in March that there was standing water levels of those levels around the facility and that's when we undertook the sampling to be able to take further precautions and measures.

THE CHAIRPERSON: As part of this protection of the environment, one of the questions that -- I guess one of the questions, I guess, that strikes me as we go through this is that Dr. Thompson talked about the fact that the environment shouldn't be used for containment, and I think there is -- this strikes me, and perhaps I'm incorrect that there is a sense that the environment is containment for SRB, that there is, I think, comments coming back that strikes me as, "Well, it's not that bad. You know, it gets diluted. It goes here, it goes there; whatever." And one of the basic premises of the statement is that the environment is not to be used for containment.

Would SRBT like to comment on that?

MR. LEVESQUE: I don't think the statement

was made that it should be used for containment. I think what was said is that, “Is it safe?” and “Does it cause a risk to the environment?” I think I’m correct in saying that.

THE CHAIRPERSON: Do you have any comments with regards to should the environment be a containment for tritium?

MR. MORRIS: Neil Morris for the record.

It’s a good question because it begs the question: What is a level of tritium at which you have a concern?

By the very nature of every facility that deals with tritium or any other radionuclide in Canada or elsewhere there are radionuclides released to the environment. There are no zero emission facilities. It’s incumbent upon industry and the regulator to at least identify a level at which there is a concern initially in order for someone to understand if they are responsible for environmental protection, that they are approaching a level that is of environmental concern. That, to me, has not been done in this case.

That’s not to negate the fact that precautions should not be taken but, again, within the whole concept of ALARA and allocation of resources, do you pursue an unknown, unidentified, unconfirmed source that

has not been demonstrated in any way to exceed levels that are acceptable in the environment barring a zero emission scenario? Do you proceed those or do you allocate your efforts to another source?

THE CHAIRPERSON: I would just read again that it says: "The applicant for the CNSC licences must demonstrate through performance assessments monitoring or other evidence that their provisions to protect the environment are adequate" and I think that might ---

My next question is with regards to inspections since the Order has been placed. So the question is to both applicant but starting with the staff and then going back.

Has the CNSC staff been inspecting the facility since the Order has been served?

DR. THOMPSON: Patsy Thompson.

Staff went to SRBT last Thursday, August 24th, in the afternoon to verify that the Order was being complied with.

THE CHAIRPERSON: Does staff have an inspection program in place with regards to ensuring that the Order is complied with?

DR. THOMPSON: We have not established an inspection program going forward. We verified compliance with the inspection. Staff has put seals in the area

where the tritium that can be used for processing is stored and that is the mechanism by which we would ensure that the tritium is not being removed and potentially used for processing.

THE CHAIRPERSON: A question for SRBT: Are you complying with the Order?

MR. LEVESQUE: Yes.

THE CHAIRPERSON: Thank you.

I'm going to start with a second round, if there is any questions, starting with Dr. Barnes.

MEMBER BARNES: Just two quick ones. One is a question, really, and the other is another question.

I think Mr. Morris and other representing SRBT have drawn analogies to other sites that release tritium in Canada, particularly nuclear facilities and so on, but there is one difference as I see it here in terms of responsibility and the environment is a broad term in a sense. But most of the sites that you referred to have the applicant's -- the licensee's also have control on the area around the point source contamination for the most part because they are large acreages on their site.

But correct me if I'm wrong here, as I understand it, SRBT leases part of a strip mall. It doesn't necessarily lease the land. Is that granted? So if there were to be a plume in another situation like a

nuclear site they have, in a sense, full access to the site to remediate that plume as far as possible with groundwater curtain-type remediation programs and so on.

It's not clear to me exactly what the legal access it is for SRBT to the environment in which you are saying it's okay to place a certain amount of excess tritium. It's not your land, is it?

MR. LEVESQUE: It's not at the moment but we have asked that question of CNSC staff a few weeks ago, that we were considering purchasing the land from the landowner if it made any improvements or comfort factor from the regulatory point of view and those are discussions we have taken with the landlord and he is willing to entertain an agreement like that.

MEMBER BARNES: Okay. The second is we've talked a fair bit about the stack in the emissions, et cetera, et cetera, and it does look as though the atmospheric model applies fairly well to more distant areas, right, beyond whatever it was, two kilometres, the rate of deposition of tritium. What you pick up in the wells more or less fits the model and where it doesn't apply is within 500 metres of the site itself, and elsewhere in the document which is talking about the effects of buildings close to stacks and so forth, right, with the downdrafts from the stack, et cetera.

No one has addressed whether there is a particular problem with the design of the stack itself; the temperatures that it generated to essentially ensure an upwardly-directed plume or whether the height of the stack is appropriate to disperse the tritium contaminants, in a sense beyond it. When you address the problem well of MW06-01 you say, “Well, it’s all the contaminant on the roof that comes down the gutters that gets washed across the pavement”. Again, clearly, there is a problem of contamination if that’s the case on the roof or across the asphalt. The stack itself is not connected by the asphalt to that particular well. In fact, it’s on the other side of the building.

So it kind of seems to me that there is a problem, a potential problem in the height of the stack that it’s not doing its job, right? Now, in other places people put up higher stacks except you might need to replace the furnace or, you know, the whole process because you can only keep adding, as I understand it, so far depending on the design of it. You just can’t keep adding more and more stack height.

But could you comment whether you’ve considered the issue of the appropriate stack height here on the basis of what I have just said?

MR. MORRIS: Neil Morris for the record.

The issue of stack height could be relevant amongst many things and this again points to the need to make sure we understand the nature of this problem before proceeding with any mitigation measures.

Yes, I concur with your view that, you know what? The stack if it were higher would possibly carry tritium further away from contact with the roof and possibly result in a lower level of tritium being transported by runoff water to Well MW01 or 06-01. Whether that's the right thing to do or not it's an interesting question and, again, one that requires some time to answer.

MEMBER BARNES: It kind of worked in Sudbury, right?

MR. MORRIS: It worked very well in Sudbury unless you happen to live in Porcupine.

THE CHAIRPERSON: Perhaps we can ask the staff to comment, Dr. Barnes?

DR. THOMPSON: Patsy Thompson for the record.

We essentially had discussions with experts from the Ontario Ministry of the Environment on different aspects related to stack performance and some of the issues on the SRBT site and our sense is that there is uncertainty in terms of whether or not the stack is

appropriately located and is not through some mechanism creating condensation of H2O vapour, essentially, and to water droplets. But those would need to be investigated further and would need to be tested.

Essentially, this is -- I felt was outside of the scope of the Order. We felt it was important, or I felt it was important, that the Order focus on the issue of the contamination that needed to be prevented, recognizing that there would be broader issues that would be best dealt with outside of an Order that has a significant impact on the licensee. But it’s certainly something that will need to be investigated and looked into by the licensee.

THE CHAIRPERSON: As a supplementary to that, if work had to be done in terms of that containment at the stack or stack performance, would the facility have to be operating in order to do that?

First, to SRBT and then to staff.

MR. LEVESQUE: Would you repeat that question, please?

THE CHAIRPERSON: If work was being done to explore options with regards to stack performance, would the facility have to be operating in order to do that?

MR. LEVESQUE: Any changes that we would have to look at making at the facility to have the

financial resources to do that we would have to operate to plan a shutdown.

THE CHAIRPERSON: Staff, any comments with regards to that?

DR. THOMPSON: Patsy Thompson.

The information we have from other experts as well as our own specialist, Avijit Ray, is that the work that would need to be done to understand the stacks and the ventilation system could be done without processing tritium.

The facility ventilation system is currently being operated even if the processing of tritium is not happening. It was an essential requirement to maintain the conditions of the facility to protect the health and safety of people. And so a lot of the work investigating the behaviour of the system whether it's, you know, the exit, velocity, height and other parameters could be done without processing tritium.

THE CHAIRPERSON: You mentioned the Ministry of the Environment. Are there specific involvements of either the federal or provincial Ministry of the Environment in this data or these studies that the Commission should be aware of?

DR. THOMPSON: Patsy Thompson for the record.

Essentially, we've had technical discussions with representatives of the Ontario Ministry of the Environment. We had a meeting last November to discuss the issues with them. We have provided the Ontario Ministry of the Environment with copies of the reports that SRB has produced. They are in the process of doing the technical reviews of those documents and we have had initial technical discussions about a week and a half ago.

THE CHAIRPERSON: Dr. McDill, do you have a further question -- Dr. Barnes, were you finished?

MEMBER BARNES: Yes, thank you.

THE CHAIRPERSON: Dr. McDill.

MEMBER McDILL: Thank you.

I wonder if SRBT could let me know if there are other facilities in Europe or the United States or outside Canada who use an open stack that you're aware of -- an open stack?

MR. LEVESQUE: Do you mean facilities who process tritium like ours?

MEMBER McDILL: That's correct.

MR. LEVESQUE: Yes. There are some even in Canada.

MEMBER McDILL: I'm asking specifically outside Canada.

MR. LEVESQUE: Yes, there is.

MEMBER McDILL: Where is it located?

MR. LEVESQUE: Switzerland.

MEMBER McDILL: Thank you.

My next question is with respect to action levels and numbers. Dr. Thompson referred to 10,000 becquerels per litre and it's also referred to in EcoMetrix' letter of Tab 21.

Could I ask staff what actions are required of Western Waste Management when they hit 10,000 becquerels per litre?

DR. THOMPSON: Patsy Thompson for the record.

THE CHAIRPERSON: Yes, I'm just a little concerned about comments from one licensee to another.

MEMBER McDILL: I understand.

THE CHAIRPERSON: So ---

MEMBER McDILL: Maybe I can rephrase.

THE CHAIRPERSON: Yes, that might be ---

MEMBER McDILL: Could you confirm that 10,000 becquerels per litre is considered an action level for other facilities and how far away from the facility roughly?

DR. THOMPSON: Patsy Thompson.

The exact location of the monitoring well

where the action level is placed I would need to verify. I can't remember the exact number. 10 metres comes to mind but I am very uncertain so I would rather not speculate.

The action level is in place essentially because the expectation is that we would not be getting tritium and groundwater outside of the foundation drains, essentially. The storage buildings are constructed in a manner that tritium is supposed to be contained, but tritium gas does have a way of moving, and so the expectation was that outside of the foundation drains, tritium would not be found. So the action level was placed as a measure of verifying facility performance.

MEMBER McDILL: Thank you.

I wonder if I could have comment from SRBT because there was a statement that no existing action levels existed. I understand that you're proposing short-circuiting and runoff into that well, that you have a well at 25 metres from the facility at 58 becquerels per litre and you referred in your own letter to 10,000.

Perhaps you could comment?

MR. MORRIS: Yes, Neil Morris for the record.

The 10,000 must be recognized as a site-specific action level which when you do an actual risk

assessment of that groundwater on site, it is so infinitesimally small compared to the number it would have to be to have any reasonable expectation of adverse environmental impact that it disappears. So 10,000 in that context is -- it's not a benchmark per se. It's a site-specific action level. I'm not entirely familiar with the origins of it.

The important part of that document in which that's referenced is the fact that you could be as high as 12 million at that point of origin and not have adverse effects on the environment.

MEMBER McDILL: Thank you.

THE CHAIRPERSON: Further questions, Mr. Graham?

MEMBER GRAHAM: Yes. I just have two questions. I listened to SRB this afternoon and the comments Mr. Levesque made that they had been working on an action plan and you had been working with CNSC to identify the source and you had been working with CNSC to work with regard to remediate the site and find the nature of the problem.

Is everything at a standstill right now due to the issuance of this Order?

MR. LEVESQUE: No, I think some samples have -- if I can just confer -- some samples have been

taken. Yes, samples have continued throughout since we've been issued the Order.

MEMBER GRAHAM: But my question really is -- I guess maybe I didn't phrase it right -- is it business as usual? Are you working full steam ahead to try and resolve -- work on an action plan to resolve the various problems or have things slowed down? That's what my question is. Are you working to try and resolve this as quickly as possible or have things changed?

MR. LEVESQUE: No, our hope is that we're allowed to continue to operate because without the financial resources, it will come to a standstill. We won't be able to do anything.

MEMBER GRAHAM: That's not my question. My question is, at the present time, with the Order in place, because you're not operating this aspect of your company, are you working at the same diligent speed to resolve the outstanding issues that CNSC has identified?

MR. LEVESQUE: I would say we've been delayed by a two-week period for preparation for this today.

MEMBER GRAHAM: Would CNSC care to comment any further? Have they seen -- are you still getting the cooperation to try and get these things resolved as quickly as possible?

DR. THOMPSON: Patsy Thompson, for the record.

Essentially, what staff has done is not pursued issues and timelines with SRBT for the last week and a half to essentially give them the opportunity to focus on the Order.

I am uncertain, and I could verify, if the action plan and things that were scheduled to be provided to the CNSC at the end of August, what the status is. I can verify or I can have Mr. Rabski perhaps provide a bit more information on the status of the licensing actions.

MEMBER GRAHAM: Yes, if Mr. Rabski could, I would appreciate it.

MR. RABSKI: For the record, Henri Rabski, Processing and Research Facility Director.

Compliance and licensing staff over the summer months were in direct consultation with the licensee and working towards the action plan that SRBT has mentioned that would be filed August 31st, there were continuous discussions up until, as Dr. Thompson pointed out, in the last week and a half and we had all belief that SRBT, based on their record over the last several months, that they had all intents and intentions to supply us with that action plan August 31st and understood what our expectations were prior to the issuance of the Order.

MEMBER GRAHAM: My question then is to SRBT.

Will you have the action plan submitted by August 31st?

MR. LEVESQUE: I think considering the Order and the two weeks that we spent on doing it, we won't be able to be ready for that time, but it's not a matter of months. It's a matter of those two weeks again.

MEMBER GRAHAM: Thank you.

One other further question, Madam Chair, to CNSC staff.

The Order, the action plan and the various things that have been discussed today, the requirements that may be required today, would any of this trigger an EA?

DR. THOMPSON: Patsy Thompson for the record.

The issuance of an Order is not a trigger under the *Canadian Environmental Assessment Act*. So the answer is no.

MEMBER GRAHAM: And any of the other remedial work that was discussed about identification of the direction of the plume, the groundwater monitoring, the stack, work around the stack and so on, that would not also?

DR. THOMPSON: Patsy Thompson for the record.

No, it does not.

THE CHAIRPERSON: Dr. Dosman, do you have a further question?

MEMBER DOSMAN: Madam Chair, I would just like to ask SRBT, do you think that the levels of emissions that you have achieved currently would result in the same emissions from the stack as have been recently measured or would they change?

MR. LEVESQUE: In respect to the groundwater we expect that it will be proportional to our emissions. So as we continue to reduce our emissions, the number going into the groundwater will continue to go lower proportionally.

MEMBER DOSMAN: But, Madam Chair, my question was more specific.

Perhaps to clarify my question, if I might, are you satisfied that the measurements that have resulted in the Order were fairly your lowest emissions?

MR. LEVESQUE: I think it’s a difficult question to answer because if you look in the Order, I think it mentions the well at MW06-1. I think it would be from historical measurements.

I’ll ask Mr. Morris to confirm there.

MR. MORRIS: Neil Morris for the record.

If I understand the question correctly, my thought is that as emissions decrease and as they are being demonstrated to decrease over time, your loading to groundwater will decrease and in all locations you would expect to see, in time, given time -- remember this is something that takes perhaps years to really be measurable because of the slow time of groundwater travel -- those numbers would go down proportionally. I'm not sure if that answers your question or not.

MEMBER DOSMAN: No.

MR. LEVESQUE: Sorry, if you referred to the numbers in the Order, there's two sets of numbers. There's numbers that relate to the operation today. So water dripping off the stack, that's today's numbers, but when you look at numbers in actual MW06-1, that's historical numbers. If you look at the soil samples which are also listed in there, I think Mr. Nicholson stated that there's about a year lag between the soil samples and what we see in our emissions.

MEMBER DOSMAN: I'm sorry, I was referring to water dripping off the stacks, the actual current contaminants. I wonder whether CNSC staff have any comment on my question?

DR. THOMPSON: Patsy Thompson for the

record.

The measurements in soils taken by staff in May and the measurements of tritium and water dripping off the stacks that SRB has been taking over the last few weeks are the result of ongoing operations with emissions that are very much reduced in comparison to what they were in the past.

MEMBER DOSMAN: Thank you very much.

THE CHAIRPERSON: I notice one of the issues that is of concern to me is the community, concerns of the community.

As I mentioned, we are certainly well aware of the socioeconomic issues facing the company and the employees and are aware of those. However, we also are aware of the community's concerns, particularly about health of themselves and their children.

The Order specifically talks about issues to do with precautions to protect the environment, and I wonder if SRB and then staff could comment with regards to the current issues facing the citizens of Pembroke and perhaps to provide some reassurances in that regard.

MR. LEVESQUE: We held a public information session which was advertised on TV, radio and the paper for the citizens of Pembroke, where we had 14 members of the community who attended and we've answered their

questions regarding their health. I have also submitted several statements to the press regarding the health of the public wasn't at risk and continue to do so and trying to show our commitment to addressing the issues while hopefully being able to operate.

I don't know if you have anything to add, Mr. Morris?

MR. MORRIS: Neil Morris for the record.

In absolute terms of expectations of environmental or human health impacts, our position is that there are none, that drinking water levels in the community of Pembroke are well within acceptable levels. They are reflective of historical emissions to some extent, so we expect, without any reason to expect otherwise, that they will be going down as time continues now that SRB has greatly reduced their emissions. Given that they are already well within acceptable limits, that risk will only decrease in time.

THE CHAIRPERSON: Thank you.

Staff?

DR. THOMPSON: Patsy Thompson.

Essentially, staff concur that the consequences of tritium releases from SRBT on members of the public from exposure to tritium through sort of day-to-day activities like breathing and drinking water and

feeding infants and eating fruits and vegetables from gardens is not resulting in doses to members of the public that would pose a concern. They are all well below the public dose limit set by the CNSC.

The submission provided by SRBT contains, as Attachment 8, an assessment that staff had done in 2003 that was very conservative, and this assessment stands, essentially. The consequences are well below the public dose limit.

THE CHAIRPERSON: I think you can understand the need on behalf of the Commission to provide these reassurances to the community. The community itself has shown some concerns in this regard. So I think it's important for us to do that.

My question, Dr. Thompson, is this. Having heard the evidence put before you by SRB, the reply from SRB to the questions posed by CNSC staff, do you still believe that the Order which you issued is valid and should remain in place?

DR. THOMPSON: Patsy Thompson.

The basis on which the Order was issued and the issue of groundwater contamination from water dripping off the stacks remains. There is nothing that has been presented today that essentially removes that concern and that issue that needs to be dealt with.

My understanding is that there is currently no measures in place that can mitigate this direct discharge of contaminated water to the environment.

What I would like to add is in relation to a question that was posed by Commission Members a little while back about what about operating when it is not raining. I had raised issues of compliance verification.

I guess the other issue which I didn't mention and I should have is that the information that SRBT has collected around the stack has been for a limited period during the summer. We have no information during winter conditions as to what would happen in terms of input of contamination at the base of the stack.

THE CHAIRPERSON: My comment now, as I'm turning the floor to SRBT, are there any comments that you would like to make before the hearing is drawn to a close?

MR. LEVESQUE: Is this where we can ask questions of the staff? We have a few questions. One of the questions we would like to know is what -- because we have been working on this several months and supplying CNSC staff with data for several months, and we had committed before getting a response to having a plan in place to identify any different testing or changes to the facility by March 31st, '07, knowing that, what precipitated the sudden change in position from staff?

THE CHAIRPERSON: I think, Mr. Levesque, that's outlined in the Order in terms of the facts that the staff have put forward. If the staff wishes to add, but I think the Commission has actually asked that question specifically. So if the staff wish to answer anything further, but the Commission did ask that question.

DR. THOMPSON: Patsy Thompson.

I don't think any more could be added at this point. The information is in the Order and I think a lot of the information came forward today.

THE CHAIRPERSON: Mr. Levesque.

MR. LEVESQUE: My next thing is not so much a question but regarding what we want to do moving forward is we just want to have the opportunity to keep operating while addressing these issues. That's what we want. We've never shied away from that responsibility. I think that as part of the groundwater study, and I have the results in front of me, it was only on March 10th to 14th that we've identified that there's considerable amount of tritium in snow and surface water on the facility, and we've undertaken to do a lot of sampling. We were going to undertake to do more well drilling, and I hope that we've demonstrated today that the risk to the environment will not increase the concentration that are around the

facility and we propose to operate while it doesn’t rain while we can find ways to further mitigate this issue.

THE CHAIRPERSON: Thank you, and thank you very much for being here today.

With respect to the matter, I propose that the Commission confers with regard to the information we have today and then determine if further information is needed or if the Commission is ready to proceed with a decision, and we will advise accordingly.

Thank you all very much, including those people that have come in to observe this. Thank you very much for being here today.

Thank you.

--- Upon adjourning at 4:43 p.m.