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Chair

Mr. James Bezan

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● (0905)

[*English*]

The Chair (Mr. James Bezan (Selkirk—Interlake, CPC)): We'll call meeting 26 to order. We'll continue, under Standing Order 108(2), our study of the oil sands and Canada's water resources.

Joining us for the first hour is James Bruce, an environmental consultant on climate and water.

Mr. Bruce, if you could make your opening comments and keep them under 10 minutes, we'd appreciate that.

Mr. James Bruce (Environmental Consultant, Climate and Water, As an Individual): Thank you very much for the opportunity to talk to you a little about, and to hear your questions about, water and the oil sands projects.

There are two main aspects to which I have given some study. One is the question of groundwater. That was done through the Expert Panel on Groundwater management in Canada, put in place by the Council of Canadian Academies. I think you have been sent copies of at least sections of that report. If you haven't received them, we'd be happy to provide you with copies of the *Report in Focus*—the short version of the report—in both official languages.

The other thing I would like to discuss is some earlier work I did from 2006 to 2008 for WWF Canada on trends in the flow of the Athabasca River and what they mean for water availability for the oil sands.

So if you give me enough time, I will try to cover both of these issues.

I'm sure you've had several other presentations, so you will be aware that the in situ recovery of bitumen at levels below about 75 metres is undertaken by steam injection to soften the bitumen and then to pump it back up to the surface. That steam injection, of course, requires water, and it's usually groundwater that's used. As for the amounts, they originally hoped it would in the order of half a barrel of water per barrel of recovered oil, but it now looks as if it's going to be substantially more than those values. It's very hard to get a good estimate. The original hope was also that they'd be able to use saline groundwater, but there are apparently some real problems with what to do with the salt when they take the water out of the ground. So they are using substantial quantities of natural groundwater.

In reviewing 11 case studies—eight in Canada and three in the United States—to get an idea of how sustainable our management of groundwater is, the panel selected a number of places across the country. One of them was the oil sands.

We relied heavily on the work of the Alberta Research Council in coming to our conclusions about the oil sands. Those appear on page 148 of our report. The questions that the Alberta Research Council raised in 2007 have not, to date, been satisfactorily answered—although, as I understand it, there is some motion towards getting some answers.

Let me review briefly what the Alberta Research Council said. They said that there was a whole bunch of unanswered questions.

How do low-flow levels in the Athabasca River affect shallow groundwater, and how does aquifer dewatering in the mine areas affect surface water systems?

What are the effects of increased mining activities on changing land cover or the effects of the diversion of groundwater out of mined areas on groundwater recharge?

How will changes in water quality resulting from aquifer disturbance and tailings pond leakage affect the quality of groundwater and surface water resources?

What data are required to assess the claim that deep injection of steam and waste does not negatively impact the regional and local aquifer systems? And are those data available?

What are the regional threshold objectives to ensure sustainable groundwater management?

And last, do planned developments have adverse impacts on water in adjoining jurisdictions, that is, the Northwest Territories and Saskatchewan, and on downstream ecosystems?

● (0910)

The panel concluded that those projects had gone ahead with a completely inadequate understanding of the groundwater regime in the area, and they are having significant impacts on the groundwater regime.

We used it as an example to try to illustrate the fact that it's very important to get the basic information on groundwater before you move ahead with projects that can have a significant influence on the groundwater.

So we considered it a pretty unsustainable situation. We could talk about that later, if you wish.

Now to turn to the Athabasca River as a source water mainly for the surface mining operations...and this involves scraping off of the bitumen, along with the peat and the trees and the near-surface groundwater, down to about 75 metres, which is fairly deep. In this case, we do know that each barrel of bitumen consumes an average of three barrels of freshwater, mainly from the river. This strip mining operation also changes the shallow groundwater interchanges with the river, and has even obliterated some small tributary watersheds and one-half of the large 1,500-square kilometre Muskeg Creek watershed. It's projected that as projects move to heavier clay deposits, even more water will be needed to recover the bitumen.

Let's take water quantity first. Water quantity and quality are the two issues. In the water-taking permits that have been given, the amounts allocated for oil sands projects appear to have been based—I reviewed a couple of the environmental impact statements—on a percentage of the long-term mean annual flow of the river, ignoring the fact that the flow of the river has been declining for the last 35 years due to shrinkage of the Athabasca Glacier by 25% and due to increased evapotranspiration in the basin as the water runs from the east slopes in the long trek across Alberta towards the oil sands. They're sometimes cited by industry as 2.2% of long-term average flows, but that's a meaningless figure. The water scientists around the world now believe that stationarity is dead. By this they mean that the amounts of water we've seen in rivers and lakes in the past is no indication of what we're going to see in the future because of the changing climate.

So using an average flow over a long period of time has two serious flaws. One is that the winter flows are much less than the summer, ten times or more less than the summer and spring flows, and it's the winter flows that are critical in protecting ecosystems in the river. The trends have been quite remarkable, as in some other rivers in southern parts of Canada. Average summer flows have declined 33% since 1970 and the minimum flows in winter, which is more worrisome, have declined by 27% in the most recent decade compared to the decade of the seventies.

These trends are bound to continue and may accelerate because of the decline in the glacier that feeds the river and the headwaters, the Athabasca Glacier, and acceleration of greenhouse gas concentrations in the atmosphere. Greenhouse gases were going up about 1.6 parts per million per year up until 2000. Since 2000 they've been going up at 1.9 parts per million per year.

Now, it's possible that the current economic downturn will give a little blip, but I don't think it's going to last for long. I think we're on a path towards much more rapid increase of greenhouse gases in the atmosphere because of increased emissions.

● (0915)

The drought in the early 2000s that helped cause the decline in flow was quite modest compared to past droughts, according to tree ring analysis, and is likely to be a very modest drought compared to future droughts if the climate change projections are anywhere close to right.

The winter flows are the lowest of the year, and Alberta has begun to recognize the importance of trying to maintain those flows in the winter. Their allocations to date don't take that into account. They've now developed a scheme to reduce the amount of water the oil sands projects take in the winter months to try to protect ecosystems. But if you look at the data, this means that in a typical year in the last little while, the oil sands projects would have only half of the water they say they're going to need with full development of the oil sands. If it's a very acute situation, they would have only about one third of the water they've projected they will need in the future for full development.

You have to recognize that only about 10% of the water withdrawn is returned to the river, since it becomes too polluted in the processing to do so. It's dumped into these huge tailing ponds or lakes that now cover 50 square kilometres or more. These lakes have high concentrations of toxic naphthenic acids and other contaminants, as many migratory birds have discovered. They also mobilize arsenic from natural sources in the watershed through the processes being used.

While reliable data are difficult to obtain because there is a lack of independent monitoring in the system, a presentation in Houston in 2007 indicated that these contaminants are seeping into groundwater and occurring in the sediments of the river already.

You have to recognize that the Athabasca is the most southern tributary of the Mackenzie River basin, and flows northward into the Arctic. The impacts of oil sands takings or water takings, both groundwater and surface water, on the flows of the Athabasca River northward into the Mackenzie have not really been taken into account.

My personal recommendation to you is that the federal government try to help ensure that under the Mackenzie basin agreement, negotiations are completed on a binding water-sharing and water quality protection agreement between Alberta, the Northwest Territories, Saskatchewan, B.C., and the Yukon.

Secondly, the Government of Alberta should consider withholding approval of any additional oil sands projects and related water-taking licences until the most critical of these issues raised by the Alberta Research Council are really addressed, and substantial water conservation measures are implemented in the project. I've heard that Suncor has reduced its water demand by about 30%. Let's get them all doing that, for goodness' sake.

Assurances also need to be made that the in-stream flow needs can be met to protect ecosystems and public health in the lower Athabasca, in the face of the changing climate and the declining flow of the Athabasca River. The companies need to reduce their water demands through a number of processes, which they know a lot more about than I do.

● (0920)

Since the oil sands projects are likely to be most adversely affected by climate change, they should redouble their efforts or make strong efforts to reduce their greenhouse gas emissions so they aren't contributing to the problem that will affect them in the very near future, and that is affecting them now.

The other thing is that we're looking at the water, but emissions from the developments into the atmosphere have effects on water downwind in Saskatchewan and in the Northwest Territories through airborne transport of pollutants such as acid rain and other things.

Those are my suggestions for improved federal involvement in this project.

The Chair: Thank you very much, Mr. Bruce.

I believe there has been an agreement that we'll do the opening round at five minutes, to give everybody a chance to get up as quickly as possible.

So I do ask, Mr. Bruce, that when members ask questions, you keep your response as succinct as possible.

Mr. Scarpaleggia, please start us off.

Mr. Francis Scarpaleggia (Lac-Saint-Louis, Lib.): Thank you.

Thank you, Dr. Bruce. We've heard or read that industry admits that there is seepage from the tailings ponds into the groundwater. But then we read that there is a lot of clay beneath the tailings ponds so this seepage is not problematic. We've also heard that the groundwater in that area gets somewhat contaminated but it's still usable, and that some sort of levelling of the quality of groundwater takes place and the water is still usable despite the seepage.

How do you view those kinds of claims? These claims are made—and signed off on, really—in environmental assessment panel reviews. There's an admission that there's seepage, but then the conclusion drawn is that it's not a problem.

Mr. James Bruce: I would make a couple of comments. One is that most of the geologists who have studied the area say there is no such thing as an impermeable layer, and that in fact there is seepage. It will take place either more quickly or more slowly, depending on the permeability, but it will take place. The fact that there are already naphthenic acids, which are only produced through the oil sands mining bitumen processing operation, in the sediments in the river would suggest that the stuff isn't staying in the groundwater.

Also, if you read the Alberta Research Council's analysis, and look at what is done in several environmental assessments—I don't know whether that's all, as I only looked at two—the concern for groundwater has been a very local one in the environmental assessments. What the Alberta Research Council is saying is that we should be looking at the groundwater flow on a regional basis and what's happening regionally.

So I'm not convinced that the contamination in the groundwater isn't seeping into the river.

● (0925)

Mr. Francis Scarpaleggia: Also, when we were in Alberta speaking with industry representatives, the statistics kept cropping that 80% of oil sands development is through in situ, and when we look at in situ, 95% of the water used for in situ production is recycled. Therefore, the implication is that as we move more towards in situ, the issue of water consumption goes away or is diminished.

Perhaps you could give us your take on the impact of in situ on aquifers, and the knowledge gaps that exist in terms of that.

Mr. James Bruce: That's the problem. I think we don't have good knowledge at all of what the in situ SAGD extraction process has on groundwater. We don't know how much of that groundwater gets back down in. I don't know about the 95% figure, but if you look at what the Alberta Research Council says, they claim we really don't have a clue what the impact is on the regional groundwater and what the long-term effect will be of those projects.

But I would also say that we saw in the paper just the other day that another large project, the Imperial Oil Esso project, has been approved for the mining operation, so we're not finished with them yet.

Mr. Francis Scarpaleggia: Do you think there can be cross-boundary impacts going into the Northwest Territories and Saskatchewan? Just looking at the map, it's so vast that it's hard to understand intuitively how groundwater contamination around Fort McMurray could impact on groundwater and presumably surface water in the Northwest Territories and Saskatchewan.

Mr. James Bruce: There are two ways that can occur. One is if the groundwater seeps into the surface water—and there's evidence that's happening—and that surface water gets carried downstream a long way. The other thing is that atmospheric transport of contaminants could well be contaminating water in the downstream areas in other jurisdictions.

The Chair: Thank you, Dr. Bruce.

Monsieur Bigras.

[*Translation*]

Mr. Bernard Bigras (Rosemont—La Petite-Patrie, BQ): Thank you, Mr. Chair.

Dr. Bruce, thank you very much for being here with us this morning to help us understand the situation, particularly with regard to the quantity and quality of water.

[*English*]

Mr. James Bruce: I've understood you so far, but I'm not sure I'll understand your question.

My interpretation device is all tangled up at the moment. My apologies.

[*Translation*]

Mr. Bernard Bigras: Can you hear me?

● (0930)

[*English*]

Mr. James Bruce: Yes, thank you.

[*Translation*]

Mr. Bernard Bigras: First, I would like you to confirm the figures that I recently learned about. They deal with the flow of the Athabasca River and the water removals from it. According to documents I read, the river lost 20% of its flow between 1958 and 2003. I also read that, for all of the oil sands extraction projects, water removals from that river will need to be increased by 50%.

Could you confirm those figures? Are they accurate, to what percentage point?

[*English*]

Mr. James Bruce: From 1970 to 2005-06 there has been about a 33% decline in the summer flow and a 27% decline in the winter flow, which is more critical. I have no idea how much additional water will be needed in moving to the heavier clays in later extraction.

Was that the second part of your question?

[*Translation*]

Mr. Bernard Bigras: In 2006, I took part in the Conference of the Parties to the United Nations Framework Convention on Climate Change in Nairobi. I remember that the World Wildlife Fund and the Sage Foundation had published a report there. I was struck by some figures, and I took note of them. Apparently, Alberta was subject to 359 million cubic metres of water removals per year, just for the oil sand sector alone, and this was equal to twice the amount of water used by the city of Calgary. This isn't negligible; it's quite significant. At the end of the study, the report indicated that if the trend continued, Saskatchewan and the Northwest Territories would run out of water.

Is that forecast apocalyptic or realistic in your opinion?

[*English*]

Mr. James Bruce: The total quantity of water being used per year is approximately right. As you say, it is much more than the city of Calgary uses, to give some comparison.

The question of impacts downstream is rather tricky. There is no doubt that the withdrawal of water and the impact of the groundwater taken will likely have some impact on the flow of the rivers downstream in the Mackenzie system. That is ameliorated somewhat by the fact that they go through big lakes in the Peace-Athabasca delta before it gets into the Mackenzie River, and there are other big tributaries.

One of the things we found is that the Liard River, which flows into the west side of the Mackenzie from Yukon, has actually been going up in flow. That is a typical pattern with climate change. You see the northern rivers getting more snow, mainly off the more open sea. There's more flow there, and in the southern rivers you're getting much less flow. The Athabasca River is typical of the southern rivers.

The total flow of the Mackenzie River may not change a lot, but the inflow from the Athabaska River into the Peace-Athabaska delta and into the lakes that feed into the Mackenzie system is certainly going to have an effect.

[*Translation*]

Mr. Bernard Bigras: As far as I can understand, we do in fact need to be concerned about water quantity and quality in areas located in proximity to the development, but the development also has an impact on areas located further away.

I would like to know whether we know enough about the state of the aquifer in Alberta. Studies are currently being done in order to ensure the fairest possible situation, but there are significant delays in various provinces.

● (0935)

[*English*]

Mr. James Bruce: No, and that is what the Alberta Research Council says. We don't know what impact the in situ projects are going to have on groundwater, and we don't know what the surface mining projects impact is on groundwater because that hasn't been studied. It is very difficult to study.

The Chair: Thank you, Dr. Bruce.

I am going to continue on.

Ms. Duncan.

Ms. Linda Duncan (Edmonton—Strathcona, NDP): Thank you, Mr. Chair.

Thank you, Dr. Bruce, for appearing before us. It is fabulous to have before us someone of your calibre in both climate change and water. We appreciate your taking the time.

I've noted in your report that there were concerns raised as far back as 2007 by the Alberta Research Council that those very substantive issues about the groundwater and surface water regime were not even being studied or documented yet. Which of those would you suggest be the priority? Are they all priorities to be proceeding with, and what role would you see the federal government playing in addressing those critical information gaps?

Mr. James Bruce: Let me say that when the groundwater panel looked at these examples across the country, the ones that we thought looked as if they were managing the groundwater sustainably, or very close to it, were ones in which Geological Survey had played an active role in understanding the geological conditions in which the groundwater flows and takes place. So I would assume that there would be a great benefit in having Geological Survey help with an understanding of what's happening in this area. That's on the science side.

On the policy side, it seems to me that the federal government has several policies that should perhaps be pursued more vigorously. One is the environmental assessment program and the impacts on fisheries and ecosystems downstream of leakage from the holding ponds. There are also the potential health impacts. In addition, the federal government has a role in ensuring that one jurisdiction's activities will not adversely affect other jurisdictions, like the territories and Saskatchewan, downstream and downwind of the oil sands projects.

Ms. Linda Duncan: Thanks.

The Deputy Premier of the Northwest Territories, Mr. Miltenberger, also testified before us in Alberta several weeks ago. He similarly recommended that we need to be taking action on the Mackenzie River Basin Transboundary Waters Master Agreement. He's also called for an increased role for the federal government in the regulatory process.

The Deputy Premier stated his concern that there really has been no consultation with the Northwest Territories on existing or potential future impacts on the Slave and Mackenzie basin by these projects.

Can you provide to us a bit more, because you were involved, of course, in the development of this Mackenzie basin agreement? Can you tell us a bit about what the intent was, what it's supposed to offer, and which pieces are missing that the federal government could be helping to institute?

Mr. James Bruce: Well, in the dim past of history, I was, I think, probably the first chair of the Mackenzie basin umbrella agreement, which was intended and still is intended to be an oversight agreement on this, I guess, third-largest basin in the world to try to ensure that the jurisdictions that do have responsibilities there work together to maintain the quality and the quantity of waters in the system.

Within that umbrella agreement involving six different jurisdictions, counting the federal government, the idea was that there would be specific agreements between jurisdictions to deal with particular water issues. To my knowledge, the only one that is completed or close to completed is the one between British Columbia and Alberta on the Peace River system because of the building of the Bennett Dam in B.C. affecting the flows of the Peace River. None of the other specific agreements between jurisdictions have been completed.

I think it's important that the initiative, through the Mackenzie basin umbrella agreement, be followed up, particularly in the case of Alberta and the territories.

● (0940)

Ms. Linda Duncan: Successive federal governments, as well as the provincial governments, I'm sure, have dropped the ball on helping to pursue these bilateral agreements.

Mr. James Bruce: I don't know if they've dropped the ball. They've certainly not pushed hard under the Mackenzie basin agreement. But sometimes it's very hard to get provinces to do things under such an agreement.

The Chair: Your time has expired.

Mr. Warawa.

Mr. Mark Warawa (Langley, CPC): Thank you, Dr. Bruce, for being here. I have a number of questions, so I'll try to be as quick as possible.

The report that you're referencing today is current, right? It just came off the presses recently?

Mr. James Bruce: This is the one on sustainable management of groundwater? Yes, it was issued May 11.

Mr. Mark Warawa: So it's relevant and current.

I also read the October 2006 report. Is that pretty much relevant?

Mr. James Bruce: Yes, I think it is. I've checked the flow figures for the last few years to make sure that the trends that I cited in that report are continuing, and they are.

Mr. Mark Warawa: In the 2006 report, you referenced Pembina quite a few times. What's your relationship with them now?

Mr. James Bruce: I just admire the work they do.

Mr. Mark Warawa: Thank you very much.

When's the last time you personally visited the oil sands, by either air, land, or river?

Mr. James Bruce: I have not visited there since before the oil sands project started.

Mr. Mark Warawa: So in the last five years, you haven't been there?

Mr. James Bruce: No.

Mr. Mark Warawa: In the last ten years, you haven't been there?

Mr. James Bruce: I guess not. I've been to Fort McMurray before, but not since the oil sands project started.

Mr. Mark Warawa: Okay.

On page 4 of your 2006 report, you referred to “oil-soaked sands within 75 metres of the surface, bitumen is obtained by 'scraping away an ancient forest of spruce and poplars' and large areas of peat and muskeg”. You also mentioned that in today's testimony.

We took a trip. We flew over. We saw large areas where that was not happening. They were harvesting the wood. Then they were moving the overburden right from one area to a reclaimed area, a former tailings pond, so that it was a stockpile. The overburden has seeds in it, and what they shared with us was that if you harvest the wood, and then you remove the overburden and immediately place it on a reclaimed area, the regrowth happens fairly quickly.

Were you aware of that?

Mr. James Bruce: I have read of that kind of activity, but I've also read of extensive areas in which that hasn't taken place.

Mr. Mark Warawa: Thank you.

On page 6 of your 2006 report, it says that only 10% of the water used is returned to the river. This is referring to the open-pit mining process.

That's not the case. If they're actually removing water from ground sources and from the Athabasca, they're not returning contaminated water to the river. Is that something that has changed now, or were you mistaken in the 2006 report?

Mr. James Bruce: No. My understanding is that because it's contaminated in processing the bitumen, it can't be returned to the river. It is put into the holding ponds.

Mr. Mark Warawa: But you're saying that 10% is returning to the river. Is that not correct?

Mr. James Bruce: That's a figure that has been obtained from several reports.

● (0945)

Mr. Mark Warawa: Could you provide those reports and where you are finding that?

Mr. James Bruce: Sure.

Mr. James Bruce: Those were figures taken from the Alberta energy board. I am not sure that the current downturn in the economy will have an effect on that. I would say that the current downturn in the economy gives an opportunity to Alberta and the federal government to undertake the studies that weren't undertaken before.

The Chair: Mr. Warawa, your time has expired. It's only five minutes, and it goes fast.

Mr. Trudeau.

Mr. Justin Trudeau (Papineau, Lib.): Thank you.

Dr. Bruce, you were talking about in situ extraction. One of the things we heard repeatedly when we were visiting in the oil sands area was the emphasis on the use of saline groundwater sources. They did mention that it is difficult; you have to clean up the saline water a little bit before you can convert it into steam and do it.

You referred to substantial amounts of freshwater being used currently in situ. Can you talk a little bit more about that concern?

Mr. James Bruce: That, again, is information from the Pembina Institute and other sources that suggests that because of the difficulty of desalinating the saline groundwater, there is more freshwater being used than had originally been hoped. That's another issue the Alberta Research Council raised. It asked for better information on how much of the water being used in these operations is saline and how much is freshwater.

Mr. Justin Trudeau: You mentioned that there is difficulty figuring out what to do with the salt. I don't understand. If you're extracting salt, surely you can find a use for it. What is the concern around that?

Mr. James Bruce: It is extracted in such large quantities that you have to put it in big piles somewhere rather than in salt shakers.

Mr. Justin Trudeau: Doubtless it's not consumable salt, either.

The other concern you bring up that worries me is the general sense that before the oil sands projects were developed, there were inadequate studies of groundwater. Right now, because the economic climate is in pause mode for new developments, this may be an opportunity to take a look at studying groundwater before giving the thumbs-up to any more projects.

What kind of study, what kinds of resources, and what kind of timelines would be required to adequately study this before starting up new projects?

Mr. James Bruce: I would say probably several years. The main concern is the regional groundwater flow patterns, how groundwater flows from the areas in which the in situ projects and the mining projects take place, and the impacts in those areas to which the groundwater moves.

I looked at a couple of the environmental impact statements that worried only about whether an in situ well would affect anybody else's groundwater—any farmer, or anybody right nearby. So it was a very local assessment that was undertaken. What the Alberta Research Council is saying is that we need to understand what's happening to the groundwater and its relationship to the surface water in this whole region.

● (0950)

Mr. Justin Trudeau: Now, you mentioned comparing to other areas of the country where groundwater studies have been more extensive. It seems to me from the amount of development in and around northern Alberta that there has been a lot of studying and testing on local areas rather than regional. But is there not a possibility, then, to draw together all those studies and create a comprehensive picture, or would more studies be required?

The other question is whether there's something more difficult intrinsically about the land formations in northern Alberta that makes a groundwater study more challenging to do there than elsewhere around the country.

Mr. James Bruce: I suspect it is more challenging, but I don't think you can put together small local studies of impacts on local wells and extrapolate those to a much larger area, because you aren't looking at the flow patterns of groundwater and the interchanges with the river when you do that kind of analysis. It takes a new kind of analysis. Alberta Environment has a regional groundwater quality monitoring network that they have moved on in the last year or two, the first phase in the design of a monitoring program, which is cited in our report.

So there is some attention now being paid. But I think one should let those studies proceed before permitting more withdrawals of water either in the in situ projects or in the mining projects.

The Chair: Thank you. The time has expired.

Mr. Watson.

Mr. Jeff Watson (Essex, CPC): Thank you, Mr. Chairman.

I'm actually going to defer my time to Mr. Warawa, if I could.

Mr. Mark Warawa: Thank you.

I have a few more questions, Mr. Bruce. You talked about the difference between in situ and open pit.

On page 2 of the report that you referred to today, it says that typically, 2.0 to 4.5 cubic metres of water are required to produce 1 cubic metre of synthetic crude oil. Two paragraphs below, you're saying that it's 0.2—so two-tenths of a cubic metre to produce the bitumen using in situ. But then on page 5, you've used that same 0.2 cubic metres per metre of bitumen produced, and then you go on to say, "the demand for groundwater for in situ production could be as great as or greater than the demand for surface water for oil-sands mining".

It seems to be a contradiction. On one hand you're saying it's less for in situ, and now you're saying it could be more.

Mr. James Bruce: My understanding is that the initial estimate of the need for groundwater for the in situ project was indeed that 0.2:1 ratio, but that some of the most recent experience would suggest that it's more in the same range as it is for the mining operations. As you pointed out earlier, the in situ bitumen, or the bitumen at the deeper levels—below, say, 75 metres—is much more extensive than the bitumen that could be mined in surface mining.

So it's putting those two things together that leads one to think that maybe this is as big a problem or a bigger problem than in the mining.

Mr. Mark Warawa: No, I.... With respect, it appears there is a contradiction there.

You also then go on to say that "unless new extraction processes are adopted" for in situ production. What new technologies are you aware of for in situ?

Mr. James Bruce: I'm not aware of any new technologies.

Mr. Mark Warawa: I encourage you to study "toe to heel". There is no water used for toe to heel.

Mr. James Bruce: Is it applicable in other areas?

Mr. Mark Warawa: Yes, for processing 80% of that resource without use of water.

● (0955)

Mr. Francis Scarpaleggia: A point of order, Mr. Chair.

The Chair: Go ahead.

Mr. Francis Scarpaleggia: To my understanding, and maybe Mr. Warawa can clarify, toe to heel is experimental at this point, is it not?

Mr. Mark Warawa: Well, the point—

Mr. Francis Scarpaleggia: It's just for the record.

The Chair: I don't think we're into a point of order. It's a guesstimate on the facts.

Mr. Warawa, you can go on.

Mr. Mark Warawa: Thank you.

On page 6 of today's report, it says that, "when reclaimed, the surface-mined sites are expected to....ecosystems are vulnerable to leakage from tailings ponds near the Athabasca". When we took the tour, reclaimed tailing ponds were sand, and then the overburden was put on them.

How could a reclaimed site leak when there's no more water in the tailing ponds?

Mr. James Bruce: Well, where did the water go?

Mr. Mark Warawa: It was processed and used. You now have a dry site.

Mr. James Bruce: It's not the.... What percentage of the area that has been mined has now been reclaimed in that way?

Mr. Mark Warawa: We saw a number of areas that had been reclaimed.

On page 7, you said, referring to CEMA, that, "Environmental groups have withdrawn from this organization because some 'consensus' recommendations have not been accepted."

So environmental groups have withdrawn. Is it all environmental groups, or some?

Mr. James Bruce: I think it's some of the key environmental groups.

Mr. Mark Warawa: Are there more environmental groups that stayed or more environmental groups that left?

Mr. James Bruce: I don't know.

Mr. Mark Warawa: It was actually more that left. There were three that left. I think there are five still participating in CEMA.

In your 2006 report, you referred a lot to climate change. That was your primary focus, I believe. In this report from today, it's not focusing on climate change or the Bennett Dam. That's okay, but there was an absence of the other causals: the pulp industry, local development, a uranium mine that was there.

What does that play in the contamination of the waters?

Mr. James Bruce: It plays some role, but some of the contaminants, such as the naphthenic acid, are sort of typical of the oil sands development and are tracers that can be used to say whether those developments are indeed causing seepage into the groundwater or contamination of sediments in the river.

Mr. Mark Warawa: Chair, do we have a vote coming here? I hear the bell.

The Chair: No, that's just the House getting called back, opening up the session.

Mr. Mark Warawa: Am I out of time?

The Chair: You have probably less than 10 seconds.

Mr. Mark Warawa: Thank you.

I appreciate your testimony, Dr. Bruce, but there are a lot of interesting things that we have learned. I encourage you to pay a visit to the oil sands; it was very enlightening.

Mr. James Bruce: Thank you.

The Chair: Thank you very much.

We have a couple of minutes left.

Monsieur Bigras, do you want to just take a couple of minutes to bring us to the top of the hour?

Mr. Bernard Bigras: No.

The Chair: Okay.

With that, we'll switch witnesses.

Dr. Bruce, thank you very much for coming in and sharing your recommendations and thoughts. You were asked to produce a few reports that you used for reference. If you could do that homework and get it back to the clerk, I'd really appreciate it.

As Dr. Bruce leaves the table and we call up our next witnesses, I'll mention that one of the things I'd like to do before we adjourn for the summer recess is have either a lunch or a supper as a committee and have in Scott Vaughan. It would be in an informal setting, just a chance to build relationships and camaraderie around the table.

Essentially, we'd have an end-of-session meal in an informal setting, probably at the parliamentary restaurant. I'm thinking of either next Monday night, the 15th, or on the 17th for lunch.

I just wanted to run that by you to see what your availability is like and what your thoughts are on it.

Ms. Linda Duncan: I'll have to get back to you. I don't have my BlackBerry.

Mr. Justin Trudeau: Unfortunately, I can't do the 15th. I might be able to do the 17th—

Ms. Linda Duncan: The 15th or the 17th?

The Chair: The 15th for supper or the 17th for lunch.

Mr. Justin Trudeau: The 15th for supper is okay. I have a lunch on the 17th.

● (1000)

The Chair: We may just have to pick a day. I was thinking originally about Wednesday night, but that's the Speaker's supper, and I'm sure everybody would love to go out to Kingsmere and have the great feast that the Speaker always puts on.

We should have a motion on it. Could I ask somebody to move a motion that we have a meal together next week as a committee, in an informal setting?

It's so moved by Mr. Woodworth.

So if you'll leave it with me, we'll find a date that works, either the 15th or the 17th for lunch.

Some hon. members: Agreed.

The Chair: Okay. So ordered.

We'll continue on with our hearings this morning.

We have joining us now Mr. Mark Corey, assistant deputy minister for the earth sciences sector with the Department of Natural Resources. Joining him is David Boerner, director general of the Central and Northern Canada Branch of the Geological Survey of Canada. We also have Alfonso Rivera, manager of the groundwater mapping program, from the environment, safety, and geographic foundations programs. They are also both from the Department of Natural Resources.

Welcome to the committee.

I assume, Mr. Corey, you'll be reading your opening comments.

[*Translation*]

Mr. Mark Corey (Assistant Deputy Minister, Earth Sciences Sector, Department of Natural Resources): Thank you very much, Mr. Chair.

As you mentioned, my name is Mark Corey and I am assistant deputy minister, Earth Sciences Sector at the Department of Natural Resources. I am accompanied by Mr. David Boerner, director general of the Geological Survey of Canada, and Mr. Alfonso Rivera, who is an expert and program manager of our Ground Water Program.

[*English*]

I'm going to just give you a brief overview, and then David has a deck that he can take you through.

Our focus really is on water as it moves underground in Canada, and particularly larger-scale aquifers. We'd like to give you a brief overview of the NRCan groundwater geoscience program to talk about the context in which we work.

To start off, we believe groundwater is a critical resource. That's our starting point. We understand groundwater. When water moves underground, actually, it's really the geologists who understand it. So that's what we at the Geological Survey do. We study water as it moves underground.

In Canada we've identified 30 major national aquifers. There are a lot of other smaller ones, but those are the critical ones. We've done what we would call a reconnaissance preliminary assessment of all of those aquifers. Now we're doing a much more in-depth, detailed analysis of each one. We've completed the in-depth analysis on 12 of those 30, and we're accelerating the work on the rest.

Just to give you an idea, we were spending about $3 million a year. We've now accelerated that by an internal reallocation of resources and we're spending about $3.9 million a year.

Our goal is to have a comprehensive and consistent evidence base across Canada of how these aquifers work and behave under different conditions and scenarios. We work very closely with the provinces and territories and with all the other provincial actors and academia. It really is a shared responsibility. One of our principal roles is national overview and standards for this.

[*Translation*]

I would like to introduce you to Mr. David Boerner, who will be making the presentation. First, he will talk to you about groundwater in Canada and then he will give you an overview of our work, particularly in Alberta.

[*English*]

Dr. David Boerner (Director General, Central and Northern Canada Branch, Geological Survey of Canada, Department of Natural Resources): So you have a deck in front of you. Slide 2 actually shows what we are going to talk about quickly. It is an overview of what we know about aquifers in Canada, the key aquifers, the large ones. As Mark said, we have identified 30 that we're studying in great detail, but there are literally hundreds of aquifers in Canada. We'll focus on the regional picture.

We'll talk briefly about what we need to add to our understanding to achieve this goal of sustainable management and sustainable use of groundwater resources, and then give you a snapshot of what the groundwater studies are that we've been doing, which are pertinent to the Alberta situation. Several of the questions you've already raised. I hope we'll come back to that particular topic.

Slide 3 shows the graph of Canada. It shows the map of Canada with key hydrogeological regions in Canada. Precipitation patterns and geography control some of that. Marked on there are a bunch of circles that show the generalized location of the 30 aquifers we've identified as key.

All 30 of these aquifers have had a preliminary assessment where we've looked at whatever existing data there is about the aquifers and we've tried to assess what we can tell about those aquifer systems. This data, of course, is a bit spotty. It was collected by different people in different times and different eras, but it does give us a preliminary sense of where the aquifers are, how they work, and what the geology is.

We're systematically going through these trying to do a much more complete assessment. I'll show you a summary of a couple of pages of what is in that more complete assessment, but the ones we have completed on here are marked in green. The ones we have yet to do are still a white circle.

Twelve have been assessed in greater detail, and we're trying to understand the groundwater availability, the dynamics of the aquifer; as you've already heard, water is constantly in motion and the real challenge of some of these aquifers is understanding those dynamics —it's not so much just locating where they are—and the potential vulnerabilities of those aquifers to contamination or disturbance or overuse.

As Mark said, we are accelerating our efforts to do this. We had thought we would try to finish these by 2030 with the resources we had. We've now taken five years off that schedule by allocating more resources to this, so we're taking steps to try to move faster because we certainly recognize how important this is to Canadians. About 10 million Canadians depend on groundwater as the potable water supply.

Slide 4 shows what kind of information we can expect from existing aquifers in this preliminary assessment that we've already done of all 30. We know something about the basic geological setting. We know something about the depth and location. This is an interesting issue. A lot of people think aquifers are like underground lakes or underground rivers. They are not. They are probably more akin to something like sponges, where water is distributed everywhere inside them. It is sometimes a real challenge to ask where the boundaries of these things are and where the water is contained.

The other thing about aquifers that people don't appreciate is the time that water takes to move through them. It can range from tens of years to hundreds of years, even thousands of years. So if you cause a disturbance in one part of an aquifer, it may be a long time before you have any knowledge of it occurring someplace else in the aquifer. When you ask how long it takes to study one of these things, if the water movement is hundreds of years, it is a real challenge to figure out what the aquifer is doing in just a couple of years of study.

We also know something about withdrawal rates, because most of the information we have about existing aquifers comes from existing water wells. These were drilled by individuals, often, or corporations, or by different companies. They don't have consistent records or always complete records, but we do have some information about what is happening.

We know, in many cases, the basic water chemistry. Actually, I think we can say that Canada is quite fortunate that the water quality of groundwater is, for the most part, excellent in many places.

We know something about the probable recharge and discharge areas. So we know how water gets into the aquifers in a general sense and we know something about how it comes out.

But that's about it. That's an overview summary.

This is a preliminary assessment, so there's quite a bit known. If you look at slide 5, though, what we really want to do is try to understand how the aquifer functions. This is a whole different question. We need to be a lot more systematic about understanding the dimensions of the aquifer, where the water is, how it's moving, and what the particular draws on the water might be from different places where people are withdrawing it.

Here is a list—I'm not going to go through it—that shows, in comparison to previous lists, that much more comprehensive data is needed. One of the problems that we've certainly had in Canada is that the history of studying groundwater has been scattered among a whole bunch of jurisdictions. People do things differently in different places, and one of the activities we're certainly going to take is to try to consolidate and coordinate some of that so we have much more consistent and comprehensive information.

Slide 6 reiterates that point. This is definitely a collaborative effort. We often work very closely with the provinces and municipalities to try to get, between us, all the information we need. Often the federal government doesn't have much of the information. It's really the provinces that have the management responsibilities, and often the municipalities that have a lot of the detailed information.

● (1005)

So we work quite hard at a collaboration to make sure everybody is sharing information and we all know what it means. Collectively, in doing this, we're establishing common approaches.

One of the real strengths of this program is due to Dr. Rivera. His vision sort of came out in 2001 that we needed to have a very comprehensive way of doing this and that everybody should be doing it roughly the same way, because water does move. It's our only natural resource that crosses boundaries all the time. If you have different approaches on two different sides of a boundary, then you've got incompatible data and you can't even begin to make policy.

The other thing we're doing as part of this program, which I think is key, is trying to create a groundwater information network. This is a completely distributed database system. Nobody holds all the information, but it's all accessible by everybody else. We're not trying to amass everything into a huge database; we're just trying to say that if it's available, then everybody should be able to get the information they need whenever they need it. It's really a question of linking things together.

Slide 7, I understand, is one of your primary interests—some of the aquifer systems in Alberta. Because aquifers are more like sponges than they are like lakes, it's actually very hard to depict them on maps, so this is a very schematic map. It shows the general locations of some of the key aquifers in Alberta. Of course, there are many more than are shown on here, but these are some of the ones we've identified as part of our list. I'll take you through the list starting at the top.

The Paskapoo sandstones is one of the major aquifers in Alberta. It sort of runs between Calgary and Edmonton. This is a primary focus of the Alberta Geological Survey and the Alberta environment department, because this supplies an awful lot of water to population centres in Alberta. This is something we just completed an assessment of with the Alberta groups, so it's now fairly complete.

The second thing we're focusing on now is the buried valley aquifers, which is “BV” on this graphic. These are paleovalleys. They are actually valleys that existed at one time but were since infilled by sediment. Because there were sediments put into these things—sediments are more porous, and let water run through them—the valleys still take a lot of water through them, but they're buried underneath the rock.

These are actually best thought of as a bunch of channels that run across the region and they're quite large in area of extent. This is of particular interest around the oil sands because they occupy a lot of the same area, as you can see.

This is something we're currently working on with Alberta and Saskatchewan, because these buried paleovalleys actually extend to Saskatchewan, and I believe some of them extend into Manitoba. They're quite large areas, and we're in discussions right now with Alberta and Saskatchewan about how they're best studied. They are huge systems and we can't understand the whole thing, but we want to understand the critical parts of it. We should complete the assessment of that aquifer system by about 2012.

There are three other sets of aquifers marked on the map, which currently aren't on our schedule to do in the next three years. They'll be prioritized in a different way. We still feel they're important, but they're not as critical in terms of timeliness as the buried paleovalleys.

We'd be remiss if we didn't mention our Alberta colleagues. They have a fairly proactive and forward-looking groundwater strategy that they started in 2007. They have started a 10-year plan to understand groundwater across the province. Their aquifer mapping process and progress is completely compatible with what we're doing. As we complete this inventory of 30, what they'll be doing in their program will add to that inventory and potentially speed up our access to completing all 30. The first area they are really focusing on is more in the Edmonton-Calgary corridor, but they're doing an awful lot of work around the oil sands as well, as I'm sure you're quite aware.

In summary of where we are with our program, as Mark said, we believe groundwater is a critical resource, and we're trying to get the information into people's hands so they can make sustainable management decisions. Lack of information is the real problem. We're doing this collectively with everybody who has a stake in groundwater management in Canada, because we really think collective leadership is what's going to allow us to have comprehensive, consistent data across the country. Our ultimate goal is that people do assessments of aquifers in a way in which information can be shared and contained. One of our challenges is that they do connect with surface water. They do connect across boundaries, including boundaries with the United States. Having a comprehensive database allows much more sound policy decisions.

At this point, we'd be quite happy to try to answer your questions.

● (1010)

The Chair: Thank you very much.

We'll stick with the five-minute rounds.

Mr. Scarpaleggia.

Mr. Francis Scarpaleggia: Thank you for being here. That was a very interesting presentation.

In terms of creating an information network, I understand you're trying to encourage all the jurisdictions to use the same unit of measurement and measure things in the same way so that we can have a consistent distributed database, if you will. Is that going well? Are some jurisdictions possessive of their information? It sounds great in theory, and I'm sure it's working with some provinces, but is it working with all the provinces? Is it sort of a seamless effort, or are there frictions?

Dr. David Boerner: I'll take a quick shot at it, and then Alfonso can put some more details in.

I think it's working extremely well. I don't think anybody is being protective of data. I think some of the limitations are resources. A lot of this is trying to get existing data into the right formats in digital forms. That's a fairly person-intensive and therefore resource-intensive exercise.

Mr. Francis Scarpaleggia: Does that require hydrogeologists, if that's the term for the professional who does this kind of work?

Dr. David Boerner: Yes, I think it does.

Alfonso, do you want to add to that?

Dr. Alfonso Rivera (Manager, Groundwater Mapping Program, Environment, Safety and Geographic Foundations Programs, Department of Natural Resources): Sure.

Yes, it does, but it's a mixture of technicians, because as soon as we begin by using standards, we have to have a mélange of both hydrogeologists, who understand groundwater physics or groundwater chemistry, and technicians, who understand the standards from the point of view of information management systems. So it's a collaborative effort.

Mr. Francis Scarpaleggia: Thank you very much, Dr. Rivera.

At our hearings in Edmonton, Dr. Mary Griffiths provided the following statement, which you may be aware of:

> Although the Alberta Geological Survey has a long history of mapping hydrogeology in the Athabasca Oil Sands region, a great deal more needs to be done....Data are, for example, extremely sparse between Cold Lake and the Ft. McMurray area. Alberta Environment is in partnership with the Alberta Geological Survey to map groundwater resources in the province, but their work is currently focused on the Edmonton-Calgary corridor. The federal government could assist through the Natural Resources Canada Groundwater Mapping Program.

Do you agree with that statement?

● (1015)

Dr. Alfonso Rivera: Yes, I think we do, and actually we are already doing it. We are collaborating with them, and, as Dr. Boerner mentioned, the large system of Paskapoo was in fact quite an extensive study over more than three years. It was done by us in terms of standards that we are used to using, but also in terms of sharing the data with Alberta Environment and Alberta Geological Survey. So yes, we do.

Mr. Francis Scarpaleggia: She makes another statement. Again, this was delivered not even a month ago:

> The Natural Resources Canada Groundwater Mapping Program has identified about 30 key aquifers across Canada and undertaken mapping in some of them. One of the key hydrological regions includes the buried valley/blanket aquifers of Alberta. They are recognized as a source for domestic use, energy projects and industry, but the federal government has not focused on this region and indicates that the size, status and risks to the aquifers are unknown.

Dr. David Boerner: We're starting that process now, so we are taking that on, and I think the statement is accurate.

Mr. Francis Scarpaleggia: My previous statement was accurate too, that you are working on that Cold Lake-Fort McMurray corridor? Okay.

I looked at the 30 aquifers. How many are transboundary, between provinces? It's not clear, really, from the map. What percentage would be sort of trans-provincial aquifers?

Dr. Alfonso Rivera: Transboundary is a word that's used extensively, but we distinguish transboundary aquifers in two ways. One, there are aquifers crossing boundaries within Canada, and then there are aquifers crossing boundaries between Canada and the U.S. A. For the first case, we have only four, but for the second case, aquifers crossing the boundary with the United States, we have seven identified and actually already two of them mapped.

Mr. Francis Scarpaleggia: Now, just as a matter of law, we're talking about a federal role in aquifer mapping, but we hear all the time that groundwater is a provincial resource. So are you allowed to just about go anywhere and map what you wish, or do you need permission from landowners? In other words, are you restricted technically to just mapping crown lands?

For example, Dr. Rivera, you were on the radio a while ago talking about some mapping going on; it was in the Chelsea region. Do you need permissions, or do you have some sort of legal power to go in there and drill your...your “eyes”, as you called them in your interview?

Dr. David Boerner: I'm not sure we can answer the legal question precisely, but we always do this, exactly, with the provinces or territories. We would never go in on our own to try to do something.

Mr. Francis Scarpaleggia: So you have no problem; if you say, “We have to look at this”, they let you in?

Dr. David Boerner: We have no problem. We actually have an agreement between the federal government and each of the provinces called the Intergovernmental Geoscience Accord. It sort of separates the provincial roles from the federal roles, and collaboration is a key thing. We never do anything unilaterally. It's always done with the permission of the provinces. For individual landowners, of course, we absolutely have to have permission to work on their land.

The Chair: Thank you very much.

Monsieur Bigras.

[*Translation*]

Mr. Bernard Bigras: Thank you very much, Mr. Chair.

First I want to welcome our witnesses.

I was surprised to read that the most recent exhaustive study on Canada's groundwater resources had been published in 1967. Is that correct? I was not yet born then. That gives you an idea of how much we know about groundwater resources.

I would also like to reiterate that the provinces have proprietary rights over the natural resources and that, legally, groundwater regulations come under provincial jurisdiction. For its part, the federal government is responsible for developing knowledge and funding university research.

That said, I want to ask a very basic question. Since the Geological Survey of Canada plays an important role, I would like to know whether its budget has been increased.

Mr. Mark Corey: The budget for this program was approximately $3 million, but this year, we have increased it to $3.9 million. Our goal is to accelerate the work, because we know that it is quite important.

● (1020)

Mr. Bernard Bigras: In the report that Dr. Bruce presented to us this morning, he talks about an important model based on data bases, the geological framework and the hydrological regime. However, there are obstacles. First, this mandate hasn't been given to higher authorities. Second, funding is insufficient for program implementation and there is a shortage of staff or skills to develop and implement those programs. Finally, the available data are insufficient.

I understand that your budget has been increased and that you are doing your best, but will you admit that there are major obstacles in terms of resources, based on the report we have here?

Mr. Mark Corey: Mr. Chair, program resources are always insufficient. Employees are always trying to obtain more resources.

Mr. Bernard Bigras: I understand, but is this compromising access to information by the public? There are never enough resources, but there are urgent needs. We are currently looking at the impact of the oil sands on groundwater reserves. Some studies show that the Northwest Territories and Saskatchewan could face a water shortage. Is the lack of resources not compromising access to essential information by the public?

Mr. Mark Corey: I would say no. We have added resources this year. We are trying to accelerate the work and we are doing what we can with the available resources. Also, we have made groundwater a priority.

Mr. Bernard Bigras: On page 7 of your PowerPoint presentation, there is an overview of aquifers. Thirty regional aquifers are being evaluated, but the Paskapoo aquifer assessment seems to have been completed in 2009.

Did you assess the impact of oil sands development on water reserves? Could you give us a report to assure us that groundwater has not been contaminated as a result of the development of various oil sands projects? Is that report public?

Dr. Alfonso Rivera: The short answer is no. We are not able to provide facts. However, as Dr. Boerner indicated earlier, we have conducted some very preliminary characterizations before mapping the aquifers.

You asked us whether we were familiar with the Alberta aquifer. I'm going to take the time to give you an explanation, because this is extremely important. There is no aquifer either in Alberta or Canada. Aquifers are formations on different scales. It goes from an extremely localized scale—a few wells, to a more local scale, let's say a municipality that is approximately 100 km squared, to the scale of thousands of square kilometres, which the Geological Survey of Canada calls the regional scale.

Slide 7 presents a series of aquifers. It's quite schematic, and shouldn't be looked at as delimiting the aquifers. This system is presented on a regional scale, but it doesn't include all the aquifers in Alberta, far from it. This needs to be quite clear.

To answer your question, we don't know the details and we cannot give you a detailed report, but we do know the geology, as Mr. Boerner said. We know the geological system, meaning the reservoirs that, by the way, do not just include aquifers. There are three things: aquifers, aquitards and aquicludes. I apologize for using technical terms, but I have to. There is a distinction between the three. In the case of the Athabasca oil sands, the BV or buried paleovalleys are fairly shallow and relatively quaternary channels, but—

The Chair: Thank you.

[*English*]

Ms. Duncan.

Ms. Linda Duncan: Thank you, Mr. Chair.

I note in your report that you're planning, with Alberta and Saskatchewan, to complete the study in the Beaver Valley area by 2012. Has that fieldwork actually started?

● (1025)

Dr. Alfonso Rivera: The discussions have started, but the study itself is supposed to begin this summer.

Ms. Linda Duncan: Can you give us an estimate of what it will cost to complete this study in the complete Beaver Valley area?

Dr. Alfonso Rivera: We estimate it will cost approximately $3 million per aquifer over about three years. So that's approximately $1 million per year on average.

Ms. Linda Duncan: Do you have those resources?

Dr. Alfonso Rivera: We do.

Ms. Linda Duncan: You're aware of the big Canadian report on groundwater that was completed by Dr. Jim Bruce, who just testified here. He also documents in his study unanswered questions identified by the Alberta Research Council in 2007. There is a whole list of issues on unknowns about groundwater in that area in northern Alberta.

Dr. Rivera, I think you alluded to the fact that we know something about the geology in the area, but we don't specifically know about the aquifers. In order to make any determinations on whether or not either the in situ or the mining will have an impact, is it necessary to know about the specific aquifers and where they're located?

Dr. Alfonso Rivera: Absolutely.

Ms. Linda Duncan: So we can't definitively say right now whether or not there are impacts, or what the extent of them might be.

Dr. Alfonso Rivera: We have an idea based on the hydrogeology. The exact numbers are known only by Alberta Environment, because they commissioned extensive studies by private consulting companies. They are not public yet, but they have used those studies to establish a framework for groundwater management. However, we do know that given the geology and the hydrogeology of the region, those aquifers right above the McMurray formation are paleovalleys, buried channels, and have a very small capacity to keep groundwater in the reservoir as storage. We also know that their recharge is very small.

I'll just give you two numbers quickly. Imagine you have aquifers that contain approximately 15 million cubic metres of water. If the recharge in the area is in the order of one million to two million cubic metres of water per year, it will take approximately 10 years to refill them.

Ms. Linda Duncan: So the recharge area is very critical to replenishing the groundwater.

Dr. Alfonso Rivera: Yes.

Ms. Linda Duncan: One of the issues raised by the Alberta Research Council was that there needed to be a more intensive look at the mining disturbance and the impact. Do you agree that also needs to be looked at?

Dr. Alfonso Rivera: Absolutely.

Ms. Linda Duncan: Has NRCan played a big role in the environmental impact assessments of the tar sands projects? Have you been called in to review the environmental impact assessments and the cumulative impact assessment?

Dr. David Boerner: Yes. They typically collect expert advice from a variety of federal government departments, and we have groundwater experts inside NRCan. Whenever there's an environmental assessment report that needs to be reviewed from a groundwater perspective, our experts are asked for that information.

Ms. Linda Duncan: So until you have the information that Dr. Rivera is indicating, it's hard to make a definitive finding.

Dr. David Boerner: Yes. That's one of the perennial challenges. This is very much a research program in some ways. We understand some types of aquifers very well and can tell you what's going to happen with them from studies of other ones. This buried valley kind of aquifer is a little different, and we don't understand it quite as well. You always have to go on the principle that as much as you know, you try to give the best advice you can about the things you have to consider. But it is very much a research project, and we don't really know enough to be definitive.

Ms. Linda Duncan: Is there a reason why this study has extended over three years? If you had all the resources this summer, could you complete the entire review of the Beaver Valley area?

Dr. David Boerner: Well, yes and no. That's an excellent question, but it's also a bit tough to answer.

As Dr. Rivera said, it takes maybe 10 years to recharge this aquifer system. We're interested in the dynamics, but it's very hard to get a handle on the dynamics from a one-year study. We can certainly accelerate some parts of it and we can collect lots of different types of data, but there still are uncertainties that we just can't deal with. We have to take a longer time to know how these things—

● (1030)

Ms. Linda Duncan: So there is no baseline for this area now?

The Chair: The time has expired, so just make a very quick response, please.

Dr. David Boerner: Alfonso, do you want to respond?

Dr. Alfonso Rivera: Sure.

Yes, there is a baseline, but we don't have it. We haven't done it. It's Alberta Environment that has it.

Ms. Linda Duncan: But when does it start?

Dr. Alfonso Rivera: I do not know the exact dates.

The Chair: Thank you very much.

We're going to move on.

Mr. Calkins.

Mr. Blaine Calkins (Wetaskiwin, CPC): Why, thank you, Mr. Chair.

I certainly appreciate having an opportunity to ask some questions of our panel here. I certainly appreciate the testimony I've heard so far. It's been quite enlightening.

I worked for a number of years for Environment Canada. I also worked for Alberta Environment in a different capacity. Basically, I was one of the cogs in the wheel who was constantly doing surface water samples and so on. So we do have lots of those inventories. I was taking samples, whether it was potable water at a park or water from a lake that I happened to be working near, and so on.

You made reference to Alberta's "Water for Life" strategy, which is the one that started in 2007 and goes out for 10 years. I was on a municipal council in Alberta, and when you look at Alberta, there's a large move to go away from groundwater or aquifer use to regional water and waste water systems. The town I live in, for example, along with several other partnering communities, is now using or drawing water from the Red Deer River, which is a non-glacier-fed river. We found immediately that the aquifers we were drawing down—we would notice a steady decline—have now almost completely recharged within a year and a half, or much faster than we had anticipated or the engineers had suggested the aquifers would recharge. So I thought that was quite interesting.

When you take something like that, where make a best guess, and we apply it to what's happening in, let's say, the oil sands.... You guys know what the geology is. We know where the formations are. We know where the water is and, to a certain degree, how that water moves through there. So when we're going through that whole process, what are the unknowns that we need to know? We're going to go through this study—Ms. Duncan referred to it—and I think it's going to take time to tackle these things.

Now, I've heard stories. I've talked to people who have gone out into the Paskapoo area, where they've actually put dyes in the water. They monitored where the dyes ended up, so they could trace where these waters moved through the aquifers, and so on.

How much more do we need to know, in your opinion, before we can at least be comfortable knowing that when we issue permits or licences for development, we can be relatively sure we're doing the right thing? How far away are we from that?

Dr. Alfonso Rivera: I cannot speak on behalf of Alberta, but I can tell you from the point of view of hydrogeology and science and the experience we have with our program.

I think I can wrap up your question in three points.

This applies mostly everywhere, but particularly in the Athabasca oil sands, we need, and they need—we all need—to specify very clearly what is the sustainable safe yield off those aquifers. What I mean by that is what is the exact amount that can be sustainably extracted without affecting anything else around it?

It would be very technical to explain, but think about a reservoir where you have water running into it and you have water running out of it. You have to know the exact amount of the *lame d'eau* that you can extract without having adverse effects. That is not known. We call it the sustainable safe yield.

The second thing that is very important to learn is transport mechanisms. I also heard earlier this morning a question about the groundwater contaminated all the way to Yukon. That is a very tough question, but one about which I can say we do not know what other transport mechanism...because groundwater carries contaminants in very different ways: advection, dispersion, diffusion, and many different ways. The issues there are scales of time. You may have groundwater contamination that is stuck, that doesn't move, because of the different mechanical dispersion, etc.

The third thing, which we still do not know about very in-depth, are the surface water and groundwater connections. Given the geological nature of the buried valleys in the Athabasca area, sometimes they simply cross the river. They “outcrop”, let me say. This means that parts of the Athabasca and some other minor rivers also capture groundwater. In fact, if you measure sometimes the flow rate of the rivers, part of it is what we call the base flow. The base flow—even in the absence of rain, the river continues flowing—is in fact groundwater. Some of the amount of the buried valleys goes into the river. Not everything; they have mapped 27 buried channels in the Athabasca area.

So what I mean by surface water and groundwater interaction is that you need extensive monitoring to precisely evaluate what is the discharge—not the recharge, but the discharge—to the river.

If I go to the first point, sustainable yield, most people think that sustainable use of groundwater is to take the recharge and not pump more than the recharge. Sorry, but that's wrong. In fact, it's the discharge that counts, because the recharge is very slow. You may take 10 years or more before the aquifer is fully recharged again; don't forget, water is a cycle every year. However, in terms of the discharge, when you pump groundwater out, in fact what you are extracting is the discharge. In other words, if you extract more than what is discharging somewhere and you don't want to cause any effect, then you have to learn that.

So it's not the recharge. The recharge is important, of course, but you also have to understand; it's both the recharge and the—

● (1035)

Mr. Blaine Calkins: The recharge is out of our control. We can't control how much it rains. All we can control is how much we extract.

Dr. Alfonso Rivera: That's right. Exactly.

The Chair: Time has expired.

Mr. Trudeau.

Mr. Justin Trudeau: Thank you.

I thank Mr. Calkins for his line of questioning, because I'd like to follow up on that a little bit with Dr. Rivera.

Certain aquifers in North America were filled by the end of the last glacial era. That was the big recharge that created things. When we talk about drawing from aquifers, either for wells or for industrial usage, this is something new to the past 100 or 150 years to any significant amount. Before that, the past 10,000 years, there has been sort of a system built up.

Do we know, independently of recharge rates, there are consequences other than simply removing water? When we remove water from underground aquifers, we have new flows created. We have shifting patterns of behaviour down there that have never happened before. It's more than just, we have a pot, it's now empty, and it will be empty for a little while until it fills up again. There are actually new behaviours happening.

How much of the science is establishing what happened before? How much of the science is happening now? Is there a capacity to try to understand that difference?

Dr. Alfonso Rivera: Yes. Hydrogeology has evolved, as well, in the last 30 to 35 years. It went from being a qualitative type of geological branch to a more quantitative physical, or chemical, hydrogeology.

We have the tools. We understand the processes better. One thing is having the tools, knowing the processes and mechanisms. The other thing is collecting the data you need to assess a given aquifer.

All that is to say that I think the consequences, as you call them, could be enormous. So far, what we have learned from the aquifers we have mapped is that most of the aquifers in Canada are in pre-development conditions, meaning that they don't have a long-term transient effect yet. But that does not apply to every aquifer. Some do. An example is the buried channel type in Estevan between Saskatchewan and Montana. That behaviour we never suspected would happen, because it takes much longer to recover after pumping than we thought. That's one thing. Another thing is that we learn from other studies elsewhere in North America, such as from the United States.

Two consequences can also happen, depending on the type of rock. If you have a certain amount of groundwater, and the aquifer is located between clays with some compressibility, what you may have is land subsidence, *les tassements*. The ground collapses, so you have land subsidence, as we have seen already in California, Houston, and elsewhere.

A third consequence, which is also sometimes very important, is saltwater intrusion. You go into aquifers that are around the coastlines, and if you pump the freshwater in the aquifers, you may induce salt water from the sea into the aquifer, so you contaminate it. What we have observed that is interesting in Canada is that we may have saltwater intrusion not on the coastline but within the continent. That's very interesting.

● (1040)

Mr. Justin Trudeau: That was my question also about the saline reservoirs they institute. Extraction is making the use of saline an issue. Where does that saline water come from? Is it salt water, as you were saying it might be, from the ocean? Or is it just mineral content within the...?

Dr. Alfonso Rivera: It's not only salt.

Let me give you an example for comparison reasons. Salt water from the sea contains in the order of 31 grams per litre. The salt water in the area of the Athabasca has ten times more, 350 grams per litre, of TDS, or total dissolved salts.

That is brine. It is extremely salty. It comes from the Devonian types of rocks, which are lower than the basal magma formation, which is the one they extract in the sands—the bitumen. If you fly over the area—I have done it—you will see spots of salt springs. There are salt springs naturally flowing out there, which means, for us, hydrogeologists, that there are hydrologic connections between the three types of aquifers. Really salty water can come up to the surface naturally.

Mr. Justin Trudeau: This is the beginning of understanding. This is a fairly new science. Has this been integrated into the planning process for oil sands projects? Are you seeing responsible long-term management of this integrated into either the government side in permitting or in the proposals of companies and such?

Dr. David Boerner: There is a well-established understanding of this in some realms. In oil and gas exploration, for example, they are very careful to seal off their well holes so that they don't create a hydrologic connection between two layers. So that understanding, I think, is there.

There is actually a legal framework, and people follow it all the time. I guess the limitation would be whether you understand what you're going through when you drill these holes and whether you inadvertently create connections between places. But I think we do have an understanding of how they could connect so that we can prevent them from connecting. Lack of knowledge means that sometimes you do your best and you still make a mistake. That's the philosophy on this.

The Chair: Thank you.

Your time has expired.

Mr. Woodworth, the floor is yours.

Mr. Stephen Woodworth (Kitchener Centre, CPC): Thank you very much.

I very much appreciate the evidence you gentlemen have given us today and the approach you're taking.

One area that tweaks my interest stems from a comment one of you made to the effect that, as you know, Alberta is doing a lot of work in this area.

I regret to say that I do not know, and that Alberta has not been terrifically forthcoming, as I understand it, to our committee.

You may have detected some note of surprise around the table at the answer given that they have a baseline for this Athabasca River system.

My first question to you is whether or not you can assist us in directing us to any relatively easily digestible documents, that are publicly accessible from the Alberta government, on the Athabasca River area, and in particular on the buried paleovalleys you've identified as the relevant aquifer.

I don't expect you to tell me that right now.

I see you nodding your head, so may I assume that you might be able to send us something in that regard?

Dr. Alfonso Rivera: Yes.

Let me tell you that they have systematically studied the three areas: Cold Lake, the Athabasca oil sands, and the Peace River oil sands. In these three cases, they used a four-step approach. First they studied the groundwater quantity. Next they studied the groundwater quality. Then they built a numerical model to integrate that. At the end, they prepared a framework for groundwater management.

The Cold Lake area is the most extensively studied and known. The Alberta Geological Survey has published their results on their website at www.ags.gov.ab.ca.

For the Athabasca oil sands, they did not do all of the work themselves. They did part of it. Alberta Environment gave the work to consultants. This is not public yet because they want to finish the framework for groundwater management first and then build a numerical model base.

For the third one, the Peace River, they also have done the work on the first and second steps, but not the model. That is also available on the Alberta Geological Survey's website.

● (1045)

Mr. Stephen Woodworth: Thank you.

Gentlemen, do you and your department know enough about the work that underlies the existing Athabasca River management framework to express an opinion about whether in fact it has yielded sufficiently reliable information as to make the environmental assessment that's been done solid and reliable? Can you express an opinion?

Mr. Mark Corey: No. I would have to say that we haven't actually looked at that.

Mr. Stephen Woodworth: All right.

Regarding the 2012 timeline you've referred to for your work in the Athabasca River system, Ms. Duncan asked one of my questions, which was whether it could be accelerated.

I understand your answer about that, but I'd like to know if, when you're done, it will answer the three questions that you so articulately outlined to us a few moments ago, Dr. Rivera, about sustainable safe yield and transfer mechanisms and surface water collections. Will we have that information through your efforts by 2012 regarding the Athabasca area?

Dr. Alfonso Rivera: I believe so.

Mr. Stephen Woodworth: Excellent.

I understand there has been some preliminary assessment done in this area. Is that a public document? Again, could you reference it for us as to where we might get a copy or how lengthy it is? I don't know if it's readable for a layman.

Dr. Alfonso Rivera: For the Athabasca?

Mr. Stephen Woodworth: Yes.

Dr. Alfonso Rivera: Not from us directly, but we can provide you with a copy from other groups who did it.

Mr. Stephen Woodworth: That would be helpful.

Thank you very much. I think I have come to the end of my time.

The Chair: Moving on, we'll go to Monsieur Bigras.

You don't have questions?

Mr. Braid.

Mr. Peter Braid (Kitchener—Waterloo, CPC): Thank you, Mr. Chair.

Thank you to the panellists for being here this morning.

According to your presentation, 12 studies have been completed so far. At a high level, could you just describe some of the data that's been collected through these studies and the conclusions that have been drawn?

Dr. Alfonso Rivera: Yes. Most of them are regionally scaled. We have observed that they are in pre-development conditions, meaning that they are not over-exploited.

Second, we also observed that in most of the cases, for domestic, agricultural, and industrial use, people are using mostly the upper 200 metres—I would even say 150 metres—of depth.

Third, we also have observed that the recharge for most of them, the recharge in the cycle of every year, is in the order of 30% to 40% of precipitation. In some cases, we were a bit surprised. We have observed that the recharge can be as high as 60%, as it is in some cases of aquifers in British Columbia.

Another aspect we have observed is that the quality of groundwater is excellent. It is, we believe, as in cases in Quebec, still untouched, so to speak, by anthropogenic effects.

But again, I must emphasize that we are working on a regional scale. As you go to a scale that is perhaps a municipality, or rural in some cases, that is perhaps something different. At a higher scale, this is what we see.

Mr. Peter Braid: Thank you very much.

Just to clarify one of the points you've just made, in some cases you mention that the recharge percentage from precipitation can be lower. What factors contribute to a lower percentage of recharge?

Dr. Alfonso Rivera: Essentially it's the geology. Don't forget, as Mr. Trudeau already mentioned, in Canada we have preglacial, and after deglaciation, we have extensive areas of tills and clays that have accumulated and that prevent recharge because the permeability is very low. That's one of the reasons.

Mr. Peter Braid: With respect to the 12 completed studies, is there anything unique about the regions in which you have completed the studies that has allowed you to complete those now as opposed to the other regions for which the studies are not yet completed? Were there factors involved in expediting the completion of some studies?

● (1050)

Dr. Alfonso Rivera: When we began this series of assessments, we had a list of priority criteria to select aquifers that we were going to map. That is what we are using so far. They are related to economic factors, to people using the aquifers. Paskapoo, for instance, which you see on the map, is used extensively by municipalities and rural areas. That makes it a priority high-level aquifer.

Mr. Peter Braid: Earlier today when Dr. Bruce was here, he indicated in part of his testimony, or perhaps in a response to a question, that the impact of the oil sands on groundwater is “difficult” to study. Do you concur with that?

Dr. Alfonso Rivera: I do, certainly. As I said, there are so many mechanisms by which contaminated groundwater can be transferred.

The easiest example to understand is that if you put any contaminant in water, it moves with the water. That's an advective transport. Groundwater doesn't behave like that, because it goes through pores or fractures. So in addition to advective transport, you have to add molecular diffusion.... I don't know if I have time to explain this, but it's very complicated...from the ion exchange to rock.

Don't forget that groundwater may change the geology and vice versa. The rocks may affect groundwater. Sometimes you need to separate natural phenomena versus anthropogenic phenomena.

I concur with what he said. It's very difficult.

Dr. David Boerner: I would suspect he actually means the three things that Dr. Rivera outlined, of sustainable yield, transport mechanism, and interconnections between systems. Without an understanding of how that works, all three of those are a little problematic. We're at the beginning stages of understanding that aquifer, so it's hard to be concrete about any of those three. That's probably what he meant.

The Chair: You have only a very short time left.

Mr. Peter Braid: Specifically, could you help me understand what studies or research is being done to determine the impact of the oil sands developments on groundwater?

Dr. Alfonso Rivera: By us?

Mr. Peter Braid: Yes.

Dr. Alfonso Rivera: No, we haven't....

Mr. Peter Braid: Okay. So you're relying on perhaps studies that are being done provincially?

Dr. Alfonso Rivera: By Alberta, yes.

Mr. Peter Braid: Thank you.

The Chair: Thank you.

Mr. Watson, you have the floor.

Mr. Jeff Watson: I have no questions.

The Chair: Does anybody else have questions?

Mr. Scarpaleggia.

Mr. Francis Scarpaleggia: I have just one.

In your last statement, you said you aren't doing any work to study the impact of the oil sands on water, but you had done some work around Cold Lake. Did I understand correctly?

Dr. Alfonso Rivera: That was the Alberta Geological Survey, not us.

Mr. Francis Scarpaleggia: Okay.

I read a quote before from Mary Griffiths, which said that the Geological Survey of Canada could play a role in mapping between, I think, Fort McMurray and Cold Lake.

So you could step in and help the Alberta Geological Survey in the interests of Albertans and all Canadians.

Dr. Alfonso Rivera: Yes, we could.

Mr. Francis Scarpaleggia: I have just one more. This might be science fiction, but someone who studies water policy issues told me that in the United States they have a very sophisticated national database of groundwater that even includes consumption rates and perhaps recharge rates, which you could consult almost by postal code. Am I understanding correctly?

Dr. Alfonso Rivera: You are understanding correctly, but instead of using the words that you used, I would say “indicators”. They have indicators—very simple things to understand—between zero and one. If they are at six, for example, then you are overusing the water. Of course, the indicators contain a lot of the questions, but for the public, you can go there and find out the state of the water circling or going over.

Mr. Francis Scarpaleggia: Can we ever come to that in Canada?

Dr. Alfonso Rivera: Well, as a matter of fact, that's our goal, in the middle- to long-term. Once we complete the groundwater information network that Dr. Boerner mentioned earlier, we want to have that type of indicator available to the public.

Mr. Francis Scarpaleggia: But we would have to get statistics on water consumption.

Dr. Alfonso Rivera: Absolutely.

Mr. Francis Scarpaleggia: That is problematic, I guess.

Thank you.

Go ahead.

Mr. Justin Trudeau: I have just a short question, if I may.

One of the things we've been hearing in terms of the different data collections done specifically by industry around the oil sands development is that there are not just problems with different standards and measurement techniques, but problems in some cases of getting access to this data. So far with the goal of creating a groundwater information network to share all existing data, have you encountered resistance from industry in terms of offering their data in the sense that it may be accessible to all, including the general public and competitors?

● (1055)

Dr. Alfonso Rivera: Do you know what? This is a very good question. It's funny, because, no, it's exactly the contrary. They come and ask us to be part of it. They actually like to put money into it.

I don't know; it's very nice news. We're surprised by it. They're keen to participate in this information network.

Mr. Justin Trudeau: Thank you very much.

The Chair: Mr. Woodworth, I understand you have a quick question.

Mr. Stephen Woodworth: Thank you.

This is about tailing ponds. I don't know whether your department and your specific division is familiar with the issues around tailing ponds. I'm having a little difficulty understanding the reclamation process, but as I understand it, means are provided to settle out contaminants, and I have the impression that the water evaporates off the tailing ponds.

If I'm right about that, and you can tell me if I am, does that in some fashion contribute to recycling the water back into the aquifer, through evaporation, or is that totally unrelated to the aquifer?

Dr. David Boerner: Well, evaporation is the primary means by which the tailing ponds empty. The question, I guess, is whether they leak as well. That's the part that's open.

Yes, it's one cycle. If water evaporates into the atmosphere, it becomes part of the net holdings of the atmosphere, which get precipitated at some point. So there is a series of connected ways.

There is no water created on earth. It's the same water; it just gets put into different forms.

Mr. Stephen Woodworth: Thank you.

The Chair: Ms. Duncan.

Ms. Linda Duncan: Thank you, Mr. Chair.

I really want to thank you for your presentation. It has been really informative. It certainly seems to mirror what Dr. Griffiths testified to, only in greater detail, and I'm sure she has relied...in fact, she cites your reports thoroughly.

Based on the information, those three key information gaps, and the three key pieces of information needed to determine impact on groundwater, and given the fact that the federal and provincial governments can only impose mitigation measures on developments, presumably based on some science, would it be fair to say that thus far we don't have the information for the projects approved thus far, when we don't even know what the implications might be? It may be necessary to open up all those licences once we have more solid information down the road.

Would that be fair to suggest?

Mr. Mark Corey: I'd have to say we'd be kind of hesitant to comment on all projects in that sense.

Ms. Linda Duncan: You don't have to speak to a specific project, but I'm just speaking generally about impacts in the area.

Mr. Mark Corey: Again, I think we would be hesitant to get into that, just because our role really is to work with others to understand the groundwater and once it gets into the permitting phase and things like that—

Ms. Linda Duncan: But it is true that we don't know the answers to these questions yet.

Dr. David Boerner: The sustainable yield transport mechanisms in surface water...in several cases we don't have the answers to those.

Ms. Linda Duncan: And similar to the in-stream flow needs of the river, we need to know a similar kind of information for groundwater.

This has been incredibly informative. I thank you for your presentation.

The Chair: It's not too often I get to ask a question, but we have a couple of minutes left.

I was interested in the comments about using the saline water for the in situ process. What depth are they pumping that brine, as you described it, Dr. Rivera? What depth does that come from the ground?

Dr. Alfonso Rivera: The pumping of groundwater?

The Chair: Yes, that they're using in the in situ.

Dr. Alfonso Rivera: On the saline water, I'm not sure of the exact depth, but I do know it's in the order of 70 to 100 metres. But I would be hesitant to make a....

The Chair: So it's coming out below where the sands are themselves—

Dr. Alfonso Rivera: Below, yes.

The Chair: —and then they're using them in the in situ. So in the process of pumping the saline brine down into the oil sands, does any of that salt stay in the surface, or is it all recovered in the pumping process and recycled?

Dr. Alfonso Rivera: I'm not sure about that detail.

Dr. David Boerner: I'm not sure either. I understand, though, that they try to extract the salt before they use it. It's actually an industrial problem; salty water is corrosive, and they don't want pump it through the pumps. I believe they clean it before they inject it into the system.

● (1100)

The Chair: Yes, that's what I was figuring. I know that in some places where they have saline aquifers they've been using for irrigation, it's created quite a bit of problem on the surface. It makes a saline soil that then is infertile. So I'm just wondering what happens with the salt and how that's going to affect the overall long-term health of the areas. Does it go to reclamation of tailings ponds where the salt is probably going to end up?

Dr. David Boerner: Yes, it's a huge issue. Again, you have to go to the industry people to probably answer this question better. The oil industry deals with this problem all the time because they encounter briny waters. There are ways to manage it. They're very controlled in how they release it back to the environment. It's certainly recognized as having an environmental impact that needs to be managed.

The Chair: Yes.

I want to thank all of you for coming in and for your testimony today. It will help us form our final report as we move forward on the oil sands study.

The meeting is adjourned.

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