October, 2012

Reply of the Expert Panel

to the Criticism by Dr. Kevin Timoney of the

Royal Society of Canada Expert Panel Report:

Environmental and Health Impacts of Canada's Oil Sands Industry

December 2010

Disclaimer

Throughout his various critiques of the above noted report, Dr. Timoney refers to the RSC report and, in a few cases, to decisions or actions of the Royal Society of Canada. The report in question was commissioned by the Royal Society of Canada, which selected and vetted the expert panel members for appropriate expertise, required full declaration of any potential conflicts of panel members, specified the rules for the conduct of the expert panel process, subjected the draft report to its quality control process and covered the costs of producing the report. However, the report and its contents are the sole responsibility of its authors. Accordingly, the following response to Dr. Timoney's various critiques was prepared by the following authors who take sole responsibility for this written reply, as they did for the report itself. The authors received no compensation for their time invested in writing the original report and in preparing this reply.

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INTRODUCTION TO RSC EXPERT PANEL WEB RESPONSE TO TIMONEY CRITIQUE

This document delivers the commitment we made to Canadians in our letter published in *Environmental Science & Technology* (*ES&T*) on April 3, 2012 (see Appendix) to respond fully following publication of a critique of our original expert panel report by Dr. Kevin Timoney in a viewpoint (Timoney 2012a) published in the same journal February 24, 2012 and posting of an 11,000+ word critique on his consulting company web site (Timoney 2012b). Following is a brief history of how this matter has developed.

On February 23, 2012, 14 months after we released our report: *Environmental and Health Impacts of Canada's Oil Sands Industry*, one of us (S.E.H.) received a telephone call and an email from an Ottawa reporter for Postmedia to advise that Alberta environmental consultant, Dr. Timoney, was publishing a critical assessment of our report in *ES&T* the next day. The reporter (Mike De Souza) said he was writing a story on this critique for release to Postmedia newspapers across Canada to run on February 24, 2012 and he invited a response from our panel. As De Souza promised, newspapers across Canada ran stories on February 24 and 25, 2012 with headlines such as: "***Royal Society oil sands report plagued with problems: expert***" and "***Royal Society oil sands report went easy on industry: analysis*****".** We invite readers to consider the substance of Dr. Timoney's criticisms, which follow along with our answers, to decide for themselves the accuracy of the message conveyed by this media coverage.

We undertook to review the February 24, 2012 *ES&T* (Timoney 2012a) published viewpoint and a much longer critique (Timoney 2012b) that Dr. Timoney posted on his consulting company website (and cited in his published viewpoint) and to provide a full response. The Editor of *ES&T* allowed us a 1000 word letter reply to the February 24, 2012 viewpoint by Timoney of the same length. Our response letter was published by *ES&T* on April 3, 2012 (the text of our letter response is provided in Appendix A to this document). In that response we noted that we would provide a list of our panel-members' publications because Dr. Timoney had alleged that we lacked expertise in a number of specific disciplinary areas (Section B13 in the following). Those publication lists are included as Appendix B to this document. On April 11, 2012, *ES&T* published a letter from Dr. Timoney responding to our letter in which he accused us of "*sleight of hand*", "*obfuscation*" and "*denial*".

What follows is our response to all three critiques from Dr. Timoney: the original *ES&T* viewpoint (February 24, 2012), his website critique (downloaded February 24, 2012) and his rebuttal *ES&T* letter (April 11, 2012) (Timoney 2012a,b,c). We all volunteered our time as a service to Canadians over the 14 months it took us to prepare the original expert panel report. We have also invested substantial time in preparing this document. **This response is our complete and final answer to Dr. Timoney on these matters.**

Dr. Timoney titles his website critique as *"Scientific Review of* 'The Royal Society of Canada Expert Panel: Environmental and Health Impacts of Canada's Oil Sands Industry'." The purpose was stated as: "*The objective of this document is to provide a critical scientific review of the water quantity and quality section of the RSC report.*" This 11,000+ word document was able to identify one error of any substance, three valid comments where we could have better explained our interpretation or discussion and eleven editorial corrections. We made no claims of perfection for our report and we committed to correcting any errors identified in its 440 pages. Overall, these critiques (Timoney 2012a,b,c) are not accurate and often selectively interpret the evidence to support Dr. Timoney's point of view. Despite the length and

minute detail of Dr. Timoney's critiques, we have found nothing of sufficient substance to cause us to reach different overall findings than we reported in December 2010

Unlike Dr. Timoney (http://www.youtube.com/watch?v=nReBw5IzaCM), we neither actively support nor oppose oil sands development; we do support effective protection of the environment and public health. We believe such protection can only be achieved by pursuing an accurate and honest assessment of the environmental and public health impacts of oil sands development.

A challenge we face in preparing this response to Dr. Timoney's critiques is to do so in a rational and coherent manner that will be of value to interested readers. This is challenging for several reasons, four of which will be elaborated below.

1. In numerous places in his critiques, Dr. Timoney attempts to show our report to be in error and on the basis of the alleged errors, questions the overall credibility of our report. In all but four cases (one actual error and three issues that we could have explained better) his allegations of substantial identified errors are not correct. Only the most dedicated reader is likely to have the time or the patience to read all of his critiques or our entire response to his critiques and thereby be satisfied that Dr. Timoney's questioning of the overall credibility of our report is unwarranted.

2. Dr. Timoney stated that he was conducting a review of one section of our report, Section 8, dealing with water quantity and quality issues, but across his three critiques, he raises other non-water issues. Most of these were not covered in our RSC Report Section 8, because they belonged in other sections (e.g. public health, air quality, land reclamation, history), yet he alleged that we failed to cover them in our report. In other cases, he criticizes issues from other sections of the report (e.g., public health) even though these were not within his self-defined focus on water quantity and quality.

3. Dr. Timoney's 11,000+ word critique that was posted on his consulting company website, was organized within headings of: Abstract, Background, Objectives, Detailed Evaluation, General Discussion, Conclusions, Appendix – Supplemental Information. The challenge for us in responding is that he has criticisms in almost all of these sections, with many repeated among main body sections and the Appendix. This format, combined with the critiques in his two *ES&T* published items creates considerable repetition and potential confusion which readers may mistakenly interpret to reflect overall problems with our report.

4. Although it might have been easiest to work sequentially through each of his critiques using his format and deal with each criticism individually as it arose, we believe that readers will find a format based strictly on his order of presentation very difficult to follow. Thus, we have attempted to organize all of Dr. Timoney's criticisms in a coherent manner, to respond to the issues he has raised.

To minimize repetition while seeking some coherence to our response, we will begin by responding to the final response (published April 11, 2012) of Dr. Timoney to our letter (published April 3, 2012) in which we were responding to his original viewpoint published February 24, 2012, all appearing in *Environmental Science & Technology*.

A. FINAL TIMONEY ES&T LETTER, APRIL 11, 2012 (Timoney 2012c)

Dr. Timoney's view that our report is deficient does not make that true. Dr. Timoney is entitled to believe whatever he chooses about our report. However, if he inaccurately represents or selectively interprets the evidence, we are obliged to explain why the evidence supports what we wrote. Open and frank scientific debate in a civil society is not consistent with how Dr. Timoney attacked our report initially, nor how he responded to our defense of it. His April 11, 2012 letter stated:

"*Hrudey et al. illustrate an inability to focus on the issues. Rather than recognize deficiencies in the Royal Society of Canada (RSC) report and address them, the authors responded with an ad hominem attack. I will not follow that facile path and attack the integrity or motives of Hrudey et al. but will focus on matters that relate to bitumen exploitation.*"

After stating that we suffer from "*an inability to focus on the issues*", Dr. Timoney opened his published reply to our response to his original published critique by stating that he will not "*attack"* our *"integrity or motives*". Dr. Timoney closes his letter by alleging that we "*divert attention from the report's deficiencies*" and engaged in "*obfuscation and denial*".

Suggesting that our word-limited response in *ES&T* did not address adequately his concerns fails to reflect what happened. Dr. Timoney knows from dealing with *ES&T* that word limits were enforced on the published exchange, with 1,000 words each for his viewpoint and our response letter and 500 words for his final rebuttal letter. We could not possibly address, in adequate detail, any of the issues he raised in his 1,000 word viewpoint and his 11,000+ word website critique, nor could we hope to address all of them, even superficially within the confines of our 1,000 word letter.

We explained in our word-limited letter responding to Timoney's original viewpoint: "*Because of length limitations on our response and Timoney's reliance on a detailed critique cited in his Viewpoint we cannot respond here to everything. However, in the spirit of our commitment, as a volunteer public service to Canadians under the sole sponsorship of Canada's national academy, we will be posting a detailed response on the RSC Website*." The response which we promised is what we have now provided in this document. We will leave it to readers of this document to judge whether we have been able to focus on the issues and effectively address the alleged deficiencies in our report.

The issues specifically discussed by Dr. Timoney in his April 11, 2012 response are addressed below.

A.1 World's largest energy project

Dr. Timoney stated in his original viewpoint and he further defends in his reply letter that: "*bitumen production and processing in Alberta, Canada <u>has become</u> the world's largest energy project*." [emphasis added]

Dr. Timoney alleges we used "*sleight of hand*" for pointing out that with current oil sands production being only about 1.8% of world oil production, a claim that the oil sands are the world's largest energy project is unfounded on quantitative grounds. He views the oil sands to be "*a project*" despite the fact that current oil sands activity in Alberta is comprised of 94 separate projects operated by 24 individual companies in 3 different bitumen deposits (AB Energy 2012). He alleges that it is "*sleight of hand*" to compare what he views as a "*project*" with total oil production because oil is an "*industry sector*." That

rationale does not resolve the inaccuracy of the claim. If the diverse collection of Alberta oil sands developments can be called a "*project*" producing a combined total of 1.6 million bbl/day in 2010, then surely Saudi Arabia's single national oil company, Saudi Aramco must also be considered a "*project*". Saudi Aramco produced some 7.9 million bbl/d in 2010, with 5 million bbl/d coming from a single oilfield, the Ghawar field, which is the world's largest oil field, not including its other energy products such as natural gas (Saudi Aramco 2010) [emphasis added]. The Saudi Aramco oil production was 4.9 times Alberta oil sands production in 2010.

A.2 Global environmental and public health relevance

We questioned the accuracy of the statement in Dr. Timoney's original published viewpoint that "*Issues of bitumen development have global environmental and public health relevance that deserve careful attention*." We have no quarrel with the fact that environmental and public health issues with oil sands "*deserve careful attention*"; our report provides over 400 pages devoted to demonstrating the need for such careful attention. We do, however question Dr. Timoney's assertion of global relevance, particularly for the water quantity and quality issues which were his self-defined focus for criticism.

The only environmental issue with global public health implications (in the long term), which we could identify, is emission of greenhouse gases. This would be true only to the extent that such emission substantially contributes to climate change. Accordingly, we noted that the accessible estimates for oil sands industry contributions are less than 0.1% of global greenhouse gas emissions, a figure we logically interpret to mean that completely shutting down the oil sands industry would have a minimal impact on the current global challenge to reduce greenhouse gas emissions.

Our search for a quantitative rationale for Dr. Timoney's "*global concerns*" was met in Dr. Timoney's April 11, 2012 response with: "*Issues of bitumen development have global relevance. With rising demand and declining availability of conventional oil, bitumen's share of global oil production is becoming increasingly significant. The allusion to greenhouse gases is an attempt at misdirection*." We find this statement, combined with earlier statements, to be inconsistent. If there is no concern about greenhouse gas emissions from bitumen production it is not evident why it should matter that bitumen's share of global oil production is increasing. The only environmental factor directly associated with the oil sands industry that is capable of impacting the health of anyone outside of Canada is growth of greenhouse gas emissions. However, the scale of oil sands production is not sufficient **to drive** global climate change.

Dr. Timoney lists 13 other issues which he alleges are globally relevant (e.g. national issues like a claim of failing to enforce the Fisheries Act or North American issues like a controversial pipeline). Of these, Dr. Timoney lists only two environmental issues that might arguably be matters that could justify some international interest. We acknowledge that the UNESCO World Heritage Site / Ramsar Wetland of International Significance (Wood Buffalo National Park and the Peace-Athabasca Delta) and issues related to the Migratory Birds Convention Act deserve careful attention and are of international interest. We are much less certain that these alone are sufficient to drive the international concern over oil sands development which has been generated in recent years. This acknowledged global importance should be considered in relation to the scale of mismanagement of wetlands, wildlife and migratory birds that is evident elsewhere on the planet (Millennium Ecosystem Assessment 2005).

A3. Not an academic literature review

Timoney states: "*Hrudey et al. provide the nolo contendere that they* 'were not conducting an academic literature review.' *Yet the RSC refers to its report as* 'the most comprehensive evidence-based assessment' *and* 'an independent review'. *If their effort was not an academic review, then what was it?*"

We stated in the Introduction of our report[1]: "*The debate of the merits and risks of oil sands development among critics, the industry, and the Government of Alberta has become increasingly strident. Canadians are left with a dilemma to determine what is accurate versus what is rhetoric in support of widely divergent positions on the issues. This report seeks to provide an independent review to assess available evidence bearing on the issues and identify knowledge gaps to provide Canadians with a scientific perspective that is not motivated by any of the advocates in the current debate*." [emphasis added]

Dr. Timoney apparently sees no difference in purpose and content between an "*academic literature review*" and an "*expert panel review*" designed to inform interested Canadians, but we certainly had no difficulty in recognizing a difference. An academic literature review is judged, in part, by assuring that everything that may be relevant to the topic under review is cited and discussed, partly to demonstrate that the academic author(s) possess(es) the literature research skills to locate all relevant publications on a topic. This is typically possible because the scope of an academic literature review is limited to a specific focus, as found in graduate student theses, or in discipline-specific academic journal articles. Such journals do not normally publish 440 page reports. If we had attempted to perform the kind of academic literature review Dr. Timoney has criticized us for not doing, our report would have been thousands of pages long, unmanageable to write and essentially inaccessible to the interested public to read. Interested Canadians were our stated audience, **not** other academics.

We believe that we largely, but certainly not perfectly, achieved what we set out to do. Any substantive errors that Dr. Timoney has drawn to our attention in his detailed website critique, are addressed below and will be corrected in our posted report. We did not find any errors requiring correction in either the original published February 24, 2012 viewpoint critique (Timoney 2012a) or his April 11, 2012 letter in reply (Timoney 2012c) to our response to the February 24, 2012 viewpoint.

A4. Posting of our publication lists

Dr. Timoney states: "*Although Hrudey et al. attempt to divert attention from their report's deficiencies and direct readers to their list of publications (which are largely irrelevant to the issues at hand), the facts speak louder.*" Despite having opened his letter by stating that he would not: "*attack the integrity or motives of Hrudey et al.*", describing our reasonable action of posting our publications lists as an "*attempt to divert attention*" from our report suggests otherwise.

Dr. Timoney challenged our collective expertise in his original published viewpoint (Timoney 2012a) by stating about us: "*Various subjects seemed to lie outside the expertise of the authors such as environmental chemistry, hydrology, sedimentology, surficial materials, statistics, and wildlife ecology.*" We do not understand how Dr. Timoney would have had us to respond to his challenge, other than by

[1] Dr. Timoney quotes from our introduction in his website critique.

providing a listing of our scientific publications, the usual measure of scientific expertise, for any interested party to judge.

B. TIMONEY *ES&T* VIEWPOINT, PUBLISHED FEBRUARY 24, 2012 (Timoney 2012a)

We now address the major issues Dr. Timoney raised in his original published *ES&T* viewpoint, addressing at the same time the additional detail on these matters we found on his website critique. Other issues raised on his website critique, but not related to any allegations in his published February 24, 2102 viewpoint will be addressed in a final section C.

B1. RSC report out of date and superficial

Dr. Timoney repeatedly alleges our report is out of date and suggests that readers should doubt the credibility of our report because of these allegations. For example, he states in his website critique: "*Treatment of much of the material was superficial*, *used out of date information*, *and contained errors and misinformation*."

Dr. Timoney was misleading in his allegation that our report was substantially out of date primarily because it appears to be based on his concerns that we did not cite some 2010 publications that he mentions in his various critiques. We initiated our RSC expert panel process in October 2009 and we made a written request to 58 stakeholders for submission of evidence by December 31, 2009, extended to January 31, 2010 to provide a basis for our review. Our 440 page report, citing over 650 references, was completed in draft form in August 2010 and ultimately released, after peer review, in December 2010, all of which Dr. Timoney knew before he submitted his February 24, 2012 viewpoint to *ES&T*. We did include some important late publications but we do not claim to have reviewed everything published in 2010 and certainly not publications appearing after August 2010 when we completed our draft report and prepared for peer review. Logically, there had to be some deadline for acquiring new evidence, particularly after we engaged the peer review of our draft.

We clearly stated the defined limitations of our coverage in the introductory section of our report where we outlined the scope of our review:
"This review was undertaken by the panel to assess the issues outlined in the scope and terms of reference at an appropriate high level. In a number of cases, more detail was pursued to illustrate some of the complexities and subtleties that are involved. In other cases, our review focused on what we deemed to be the most critical factors and evidence available to us. The panel acknowledges that the sheer mass of information that was available precluded a comprehensive review of everything potentially relevant. The panel had to exercise its judgement to review and rely upon those sources which offered the most relevant and credible evidence for our task. We also recognized the importance of completing this undertaking in a timely manner. Therefore, despite a continuing onslaught of new information, we have made our best effort to present what we judge to be an accurate assessment of the issues based on the most credible evidence available to us until early December 2010." [emphasis added]

If we had anticipated anyone characterizing our report as being "*not credible*" because it was "*out of date*", we would have stated that only the most compelling new information after August 2010 was included in our report. For example, we did include Kelly et al. (2010), which is discussed extensively, and the final verdict of the Syncrude trial concerning the deaths of over 1,600 ducks on its tailings pond.

B2. Simplistic and incomplete treatment of how industrial activities may impact the aquatic environment.

Dr. Timoney states: "*The report provided an incomplete list of how bitumen industrial activities may impact the aquatic environment. The RSC listed:* "withdrawal of surface water and groundwater, loss of fish and benthic invertebrate habitat through removal of streams or rivers, and reductions in water quality through leaching of contaminants from tailings ponds and in situ operations into ground water and rivers*". Impacts not included, or reviewed inadequately, were: (1) permitted (licensed) discharges to air and land; (2) evaporation from tailings ponds; (3) leaks from pipelines; (4) spills of bitumen, oil, wastewater, and other compounds; (5) stack emissions; windblown (6) coke dust, (7) dry tailings, and (8) bitumen sands dust; (9) outgassing from mine faces; (10) fugitive emissions from storage tanks, pipe joints, etc.; and (11) ancillary activities such as transportation; road, bridge, and other construction; dewatering, depressuring, stripping of vegetation and soils, rerouting of streams, and fluvial and wind erosion from disturbed terrain.*

The only licensed discharge of oil sands industrial wastewater to the Athabasca River is that for the Suncor bitumen upgrader which has been authorized in various forms since 1967. This discharge poses no more of a water pollution concern than several conventional petroleum refineries which are licensed to discharge refinery industrial wastewaters to surface waters across Canada. Otherwise, current licensed discharges relate to matters such as landscape dewatering, non-contact cooling water and domestic wastewater. These sources are not significant in relation to the process-related contaminant concerns being expressed for the Athabasca River. We discussed air emissions in Section 7 of our report, including evaporation from tailings ponds and other fugitive emissions and stack emissions. We discussed the history of environmental problems, spills and releases in Section 3 of our report.

B3. Superficial treatment of tailings pond issues, including downplaying the seepage issue

Dr. Timoney states in his website critique:
"*The report took a simplistic view with regard to release of toxins from bitumen operations. It assumed that surface mining might affect surface water quality in two ways—via leaks from tailings ponds or through disposal of wastes in* 'end pit lakes*' (the* 'wet landscape option*'). The report stated:* 'Oil sands operations do not release extraction wastes to the environment; rather they contain all OSPW [oil sand process waste water] and fine tailings on site, primarily in large tailings or settling ponds.*' The report noted:* 'the ability of process generated waterborne contaminants to reach the off-site aquatic environment must occur by means of groundwater flow...*' In practice, water quality can be affected by many other processes, some of which may have significant impacts. Background information and documented incidents are provided in Supplemental Information, Pollution Documentation.*

The degree to which tailings ponds leak contaminants into groundwater and thence to surface water was considered by the RSC. Although the report made an effort to identify knowns and unknowns, <u>it downplayed the significance of tailings pond seepage</u> and ignored important information (Supplemental Information, Pollution Documentation)." [emphasis added]

Our report did state: "*Oil sands operations <u>do not release extraction wastes</u> to the environment; rather they contain all OSPW [oil sand process waste water] and fine tailings on site, primarily in large tailings or settling ponds*"[emphasis added]. This statement <u>is correct because tailings (i.e. extraction wastes) are not discharged to the environment</u>, these extraction wastes <u>are discharged to tailings ponds</u>. Our accurate statement did not preclude any possibility for the escape of specified contaminants to the

environment as a result of tailings impoundment. If we had claimed zero possibility of such contaminant release, we would not have discussed the primary pathways for contaminant escape: groundwater contamination, surface water as a result of the end pit lake option and fugitive emissions (addressed in our report section 7).

Dr. Timoney makes the following allegation regarding tailings pond seepage:
"In the discussion of cumulative naphthenic acid loading to the Athabasca River, the report used an out of date mean annual discharge for the Athabasca River of 644 m^3/sec. That figure overestimates current flows. Over the most recent decade (2000-2009), the mean annual discharge of the Athabasca River below Fort McMurray has been 500 m^3/sec (Timoney 2012). River discharge data for the most recent decade were available online to the RSC. Elsewhere in the RSC report, declining discharge of the lower Athabasca River was recognized but not adequately addressed. Use of outdated discharge data undermined the RSC discussion of both water quantity and water quality issues. It is unclear why the RSC did not use current river discharge data to inform their discussion of impacts." [emphasis added]

Our report actually stated: "*To transform these loadings into concentrations, Total E&P Joslyn Ltd. (2010) used flow records for the Athabasca River between 1957 and 2004 to compute a 10-year, 7-day low flow value for March, which is equal to 108 m^3/s compared to the mean annual flow of 644 m^3/s for the same period*."

We did not use out-dated flow data, as Dr. Timoney alleges. We clearly cited the original source of these calculations as being Total E&P Joslyn Ltd. (2010). When citing the work of others it is necessary to accurately present what the original source stated, as we did. Regarding any attempt to understate impact as Dr. Timoney alleges, Total E&P Joslyn Ltd actually used 108 m^3/s (5-fold lower and 5-fold more cautious than the flow suggested by Dr. Timoney) for this assessment of dilution to estimate possible naphthenic acid concentrations in the Athabasca River. However, we also noted in our report that despite Total E&P Joslyn Ltd using a 10-year, 7-day low flow value for March, the Total E&P Joslyn Ltd. estimate was not entirely cautious because it assumed complete mixing at the point of discharge to the Athabasca River, something that will not happen for a considerable distance downstream because of slow transverse mixing and dilution across the river channel. To assert, as Dr. Timoney has done, that we used outdated data to downplay the impact of groundwater seepage on the Athabasca River is both inaccurate and misleading. Dr. Timoney asserts in his February 24,2012 viewpoint that: *"Use of outdated discharge data undermined the discussion of water quantity and water quality issues"* [emphasis added]. This allegation casts broad, but unwarranted aspersions on the overall credibility of our report.

Dr. Timoney goes on to state in his website critique:
*"The RSC report cast doubt on an estimate of 11 million L/day of escaped seepage from all tailings ponds (current to 2007) reported by Environmental Defence (2008). The RSC report stated: '*The actual seepage of tailings water into groundwater is not known, but should be less than values used by Environmental Defence (2008) assuming that the proposed mitigation measures are in place.*' Assuming that all proposed mitigation measures will be in place and will work as planned is a tenuous assumption given their history of partial effectiveness. Furthermore, the RSC report cited a Total E&P Joslyn Ltd. study (missing from the RSC references cited) as estimating a combined seepage rate of 12.6 million L/day in 2013, which essentially supported the Environmental Defence estimate for '*current*' conditions. The two estimates (Total and Environmental Defence) of seepage rates diverged when projected decades into the future because of differences in assumptions due to scientific and management uncertainties. Yet the RSC report stated: '*A review of seepage rates presented by Environmental Defence (2008) would be warranted.*' "* [emphasis added]

We cast no more doubt about the Environmental Defence (2008) numbers than that report did about itself. We wrote: "*Environmental Defence (2008) acknowledges that this average is a crude estimate because it does not account for physical processes responsible for seepage. They acknowledge overall quantitative limitations of the approach in their technical appendix, but justify using it because they could not get measured seepage rates that should be reported to AENV in annual environmental reports required by the respective EPEA approvals.*" We agreed with Environmental Defence when we wrote in our report: "*Notably, the issue of seepage of OSPW, and discrepancies in predictions from various sources, could be clarified considerably if results from annual environmental assessment reporting under EPEA approvals were made publicly available."* Our recommendation about making these data publicly accessible was criticized by Dr. Timoney (Section B.4)

Dr. Timoney criticizes our statement that : "*The actual seepage of tailings water into groundwater is not known, but should be less than values used by Environmental Defence (2008) assuming that the proposed mitigation measures are in place"* and he misrepresents our position in quoting the following statement by placing a period after "*warranted*". Our full statement was: "*A review of seepage rates presented by Environmental Defence (2008) would be warranted to ensure that mitigation measures are accounted for."* [emphasis added]. We stated the obvious: if Environmental Defence (2008) estimates did not allow for any mitigation measures to reduce seepage escaping to the environment, the actual seepage that escapes to the environment would be lower than their estimate if any mitigation measures were actually in place and even partially functional. Our logic is not predicated on requiring all mitigation measures to be in place and fully functional as suggested by Dr. Timoney in his criticism which states: "*Assuming that all proposed mitigation measures will be in place and will work as planned is a tenuous assumption given their history of partial effectiveness."*[emphasis added] It might be tenuous for us to assume that "*all*" mitigation measures were "*all*" fully functional. We did not. It is not necessary to assume that "*all*" mitigation measures are in place to expect that Environmental Defence (2008) estimates for seepage escape to the environment will be higher than actual seepage escape if any mitigation measures are working to any extent compared to assuming none are in place as Environmental Defence apparently may have done.

Dr. Timoney further states:
"Various datasets indicate that tailings pond are leaking in spite of mitigation measures. Hunter (2001) quantified the flow of process-affected water (tailings water) from Tar Island Pond One into the Athabasca River at 5.6 million L/day. Three other examples:
(1) Correspondence between Alberta Environment and Syncrude (Alberta Environment 2008) indicates that Alberta Environment suspects escaped seepage off the Syncrude site... 'Explain the increasing chloride concentration (76 mg/L) at sample location BRC in 2007...Wells ... continue to clearly show increasing chloride concentrations not reflective of background chemistry... This is all indicative of an advancing plume... Wells with elevated chloride (>100 mg/L) concentrations... indicate increasing chloride concentrations... Explain the increasing naphthenic acid concentration (60 mg/L) in monitor well OW98-09 located down-gradient of the pumping system and east of Hwy #63.' *Alberta Environment is aware that Syncrude's seepage mitigation wells are not working as planned (Timoney 2008).*
(2) The Alberta government has acknowledged escape of tailings from the Aurora North tailings pond. In correspondence, it advised Syncrude that it hoped construction of a soil bentonite wall would reduce or eliminate further seepage of process water (Alberta Environment 2007). The seepage occurs adjacent to Stanley Creek, a tributary of the Muskeg River.
(3) The pond known as 'Natural Wetland' *on the Suncor lease contains elevated levels of hydrocarbons, naphthenic acids, and salinity due to seepage of tailings water through the adjacent containment dyke (Wayland and Smits 2004).*"

These examples are site-specific issues that Dr. Timoney likely has drawn from his collection of documents (cited by him as letters from Alberta Environment to specific oil sands operators) that he has apparently obtained from Alberta Environment in a freedom of information request. We do not have these documents and we are not able to verify that the extracts provided above have been accurately extracted from these documents. Likewise we cannot judge the merits of the interpretations that Dr. Timoney has placed on the meaning of the extracts he quotes. We clearly acknowledged in our report that release of seepage from tailings ponds is an issue that needs to be better characterized and we still hold that view. We can do so without needing to accept Dr. Timoney's interpretation that these brief extracts from letters he has obtained from Alberta Environment through a freedom of information request demonstrate that mitigation measures for collection of seepage have failed on a wide scale.

As we noted in the introduction to this response, we undertook to review only publicly accessible documents which does not include us having to resort to freedom of information requests to obtain documents. As we noted earlier we put out a call for evidence to 58 stakeholder groups requesting submission of relevant evidence and inviting each to forward our request to any other stakeholder to whom anyone seeing our request chose to refer it. We note that by this mechanism, Dr. Timoney's colleague (and co-author), Peter Lee of Global Forest Watch Canada (GFWC) did submit some documents to us in response to this call for evidence, including their co-authored paper, Timoney and Lee (2009) which we included in our report.

Dr. Timoney writes: "*Various datasets indicate that tailings pond are leaking in spite of mitigation measures. Hunter (2001) quantified the flow of process-affected water (tailings water) from Tar Island Pond One into the Athabasca River at 5.6 million L/day*" [emphasis added]. We maintain that this statement is fundamentally inaccurate. We first need to clarify that Ferguson (whom we quoted as Ferguson et al. 2009) and Hunter are actually the same person. Hunter (2001) is the MSc thesis completed by G. Hunter (maiden name) at the University of Waterloo. Ferguson et al. (2009) presented the main results from that thesis. The flow value, cited by both Hunter (2001) and Ferguson et al. (2009) and equal to 5.6 million L/day, comes from a numerical simulation of groundwater flow through the Tar Island Dyke structure. The numerical model was calibrated to observed hydraulic heads but the flow rate into the river was not measured.

The 5.6 million L/day flow rate to the river cited by Ferguson et al. (2009) is, contrary to what is stated by Dr. Timoney, not the flow of process water leaking from a tailings pond directly into the Athabasca River but the simulated discharge of groundwater flow to the river through the underlying limestone bedrock, which Ferguson et al. (2009) included in their model. Since the simulated up-gradient inflow of groundwater into the limestone bedrock in the Ferguson et al. (2009) model was almost equal to the outflow to the river, and a fine tailings layer above the limestone greatly reduced downward migration of process water from the pond, Ferguson et al. (2009) concluded (page 1458) that: "*Flow into the foundation sediments was restricted by a clayey silt layer. Numerical modeling simulations determined that the flow of process water into the foundation material was much lower than the flow contributed by the up-gradient limestone formation. This flow was in turn much lower than the flow of the adjacent Athabasca River*." They also state in their discussion on page 1458 that "*the modeled low water fluxes from the system corroborated the findings of previous studies, and groundwater geochemical data that identified low to negligible concentrations of process water indicator parameters in the foundation and adjacent river water*" [emphasis added].

Ferguson et al. (2009) go on to state: "*Although the releases to the surrounding environment appear to be minimal at the oil sands tailings impoundment, the remaining tailings process water and fine tailings*

in the pond represent a major long-term legacy of environmental concern." This conclusion is entirely consistent with our analysis of tailings pond environmental issues but disagrees with Dr. Timoney's inaccurate representation of Hunter (2001, i.e. Ferguson et al 2009) that tailings ponds are leaking vast quantities of oil sands tailings process contaminants out to the surrounding environment. Notably, the numerical model used for the simulations presented in Hunter (2001) and Ferguson et al. (2009) is FRAC3DVS, a model which has been developed by RSC panel member, Dr. Therrien.

Given the evident misunderstanding that Dr. Timoney has demonstrated above concerning groundwater contamination, it likely worth drawing attention to an important observation in our report that is commonly misunderstood by those unfamiliar with groundwater, namely, the rate at which contaminants may move in groundwater. We stated in our report a reality that is relevant to considerations of release and capacity for detecting contamination by groundwater monitoring: "*In contrast to surface water, groundwater flows at much smaller velocities. For example, groundwater typically moves at a rate of one meter per year (m/y) in permeable aquifers compared to water velocities of metres per second (m/s) in the Athabasca River. Therefore, the time scale for groundwater pollution is much longer than it is for surface water and, depending on the hydrogeological context, it can take decades for groundwater pollutants to migrate from a source to a receptor*."

On other groundwater issues, Dr. Timoney writes: "*The RSC report considered potential in situ impacts to groundwater in its Appendix A5. The RSC referenced a report (Lemay et al. 2005) and stated that:* 'Preliminary results from the groundwater quality study indicate that the regional groundwater chemical quality is generally within Canadian drinking water quality guidelines, without detectable changes over time.' *Lemay et al. (2005) did not report a temporal trend analysis. It was therefore misleading for the RSC to state that no detectable changes were found over time."*

We reported the main conclusion of the Lemay et al. (2005) study which was that: "*Preliminary results from the groundwater quality study indicate that the regional groundwater chemical quality is generally within Canadian drinking water quality guidelines, <u>without detectable changes over time</u>*." [emphasis added] Dr. Timoney's critique is therefore more appropriately aimed at Lemay et al. (2005) than at our RSC report because we have accurately reported their findings

The allegation made by Dr. Timoney that "*Lemay et al. (2005) did not report a temporal trend analysis*" is <u>not</u> correct. Lemay et al. (2005) did evaluate concentration changes over time. Their section 5.3.9 (page 115) is entitled "*Changes in chloride concentrations over time"* and it presents a time series analysis of chloride concentrations. Accompanying Figures 5.36 and 5.37 include box plots of arsenic, chloride and phenol concentrations measured in the 1970s, 1980s, 1990s and 2000s (based on available data since analyses were not available for all species for these periods). The Lemay et al. (2005) conclusions on the lack of temporal increase in concentrations are based on their temporal analysis.

Regarding the data presented by Lemay et al. (2005), Timoney writes that : "*Inspection of the Lemay et al. (2005) data, however, indicates increasing concentrations of arsenic, chloride, and phenols in shallow aquifers and channel aquifers of the northeast Beaver River area and little or no evidence of trends elsewhere (Timoney 2011). The northeast Beaver River area has the highest densities of inactive oil and gas wells, industrial wells that have been or are currently being used for injection or disposal, point sources for environmental releases related to the oil and gas industry, and above ground and underground industrial storage tanks (Lemay et al. 2005).*"

For comparison with Dr. Timoney's interpretation of what Lemay et al. (2005) say, which implies that groundwater chemistry is being impacted primarily by oil and gas activities, Lemay et al. (2005) actually write in their conclusion on page 146:
"In discussions with Alberta Environment, certain parameters, elements and organic compounds were identified as being of particular concern. These included, TDS, chloride, arsenic and phenols. The distribution of these parameters, elements or compounds varied throughout the five flow systems within the Basin as well as by Formation. However, the median concentrations varied little through time, or across flow systems or aquifer groups. General trends of increased chloride and TDS concentrations were observed in the vicinity of discharge areas. However, not all higher concentrations of chloride and TDS may be related to natural processes. These samples are in proximity to various industrial, transportation or agricultural sites that have the potential to affect groundwater quality. Arsenic and phenol concentration information was localized primarily in the vicinity of industrial development in the area. Some of the concentrations exceed water quality guidelines. Without similar well control in other portions of the Basin, it is difficult to establish any direct link to industrial operations and arsenic or phenol concentrations, especially since evidence exists to support the natural occurrence of these constituents in the Basin. The natural versus anthropogenic nature of these constituents is an issue that should be resolved to the satisfaction of decision makers." [emphasis added]

B4. RSC in error over seepage data accessibility issue

Dr. Timoney alleges in his February 24 published viewpoint that (Timoney 2012a):
"*The RSC report was in error when it stated issues of seepage could be clarified if results from annual environmental assessment reporting were made publicly available. Annual environmental assessment reports have been publicly available for years, many of which are posted online*." [emphasis added]

This statement conveys an impression that does not accurately reflect the reality of public access to these data when we made our recommendation. We noted in our discussion (Section B.3) of the Environmental Defence (2008) report attempting estimates of tailings pond seepage that they were unable to access the operating approval monitoring data on this topic to validate their estimates and assumptions. Gillian McEachern of Environmental Defence has publicly complained about the difficulty of obtaining such information and others who have attempted to obtain such monitoring data have found similar frustration. Dr. Timoney criticizing our report for recommending better public access to this important source of relevant monitoring data is difficult to justify as being in the public interest.

Such data may only be obtained by formally requesting it from the industrial approval-holder and if that request is refused or not responded to, Alberta Environment, at its discretion will ultimately make those data available in a form and manner of its choosing. The data that Dr. Timoney alludes to in his comment above were made available to him by Alberta Environment by allowing him to send a representative to a specified Alberta Environment office to photocopy the documents. The statement Dr. Timoney makes: "*many of which are posted online*" must refer to the fact that he has posted the specified documents he obtained in the manner described on the Global Forest Watch Canada (GFWC) website. These data have not been, nor were they in February 2012, available online from either the government or the approval holder. Dr. Timoney's GFWC website posting of some data he was able to obtain from Alberta Environment is not the open public access that we were recommending for any such tailings pond seepage monitoring data.

B5. Declining river flow not adequately addressed

Dr. Timoney in his website critique addresses the river flow issue as follows:
"*The problem of non-stationarity of the time series of river flows was not addressed in the RSC report. Because many rivers in northern Alberta are experiencing decades-long trends of declining discharge, relevant, pre-industrial "baseline" discharges do not exist for many rivers, including the major water source for the region, the lower Athabasca River. Declining discharge of the Athabasca and other rivers has been documented (e.g., Schindler and Donahue 2006, Rood et al. 2008). Declining winter snowpacks, decreasing relative humidity, increasing temperatures, and declining annual and summer river discharge have ushered in a time of relative water scarcity in the Peace-Athabasca Delta downstream of the bitumen sands (Timoney 2012). Regional water scarcity may come to threaten ecosystems and society as well as development of bitumen resources. Waste assimilation capacities of rivers are limited at times of low discharge (Yulianti and Burn 1998).*

Although the RSC report acknowledged an 'observed continuous decline in flow rates of the Athabasca River'*, in the same section, the RSC reported a Regional Aquatics Monitoring Program (RAMP) study that* 'revealed no changes in water discharge for the Lower Athabasca River and Athabasca River Delta'. *However, RAMP "has repeatedly been found unable to measure and assess development-related environmental change... the RAMP Review Panel ... concluded that the Regional Aquatics Monitoring Program is unable to detect changes if they occur and cannot adequately identify potential sources of changes if they occur" (Timoney 2012)."*

One of the main "messages" in our report is that a Water Management Framework (WMF) was now in place to regulate the use of the Athabasca River water. The WMF requires that river flow rate be continuously monitored. The threshold values used for management action are based on these observations (for example the Q90 and Q95 values in our report Table 8.1) and they should therefore fluctuate according to the natural flow rate fluctuations and, for example, decrease if the flow rate decreases.

This WMF is intended to account for decreasing (or increasing) trends in river flow rates. Addressing the problem of non-stationarity of the time series of river flows, as mentioned by Dr. Timoney, would not have changed the statement we made: "*This variability in flow rates must be monitored and responded to in real time by being accounted for in the water management framework.*"

Dr. Timoney states that we should have cited Schindler and Donahue (2006) who investigated flow rates of rivers in the western prairie provinces and Rood et al. (2008) who studied the Rocky Mountain rivers. Both studies covered an area much larger than the oil sands region. Given that we cited studies that focused directly on the Athabasca River (Squires et al. 2010; Jacques Whitford 2008) and we reported declining trends in flow rates that those references reported, it is not clear to us how citing the former two studies would have added anything to our discussion of declining Athabasca River flow rates.

We cited the RAMP (2009)[2] conclusions that there were no significant decreases in water discharge for the rivers studied in the oil sands region except for the Tar River Watershed. We acknowledge that we should have clarified that these RAMP conclusions were for the 2004-2009 period and were not based on a comparison with historical records as done by Squires et al. (2010) and Jacques Whitford (2008), both of which we did cite. RAMP (2009) acknowledges declining flow rates of the Athabasca River as shown for example by the following excerpt from its Section 4.2.1:

[2] RAMP (2009), as cited in our report, was the 2009 Final Technical Report of RAMP which was published in April 2010.

"*The total annual runoff volume for the Athabasca River measured at WSC Station 07DA001, Athabasca River below McMurray, was 14,890 million m^3 in 2009 (Table 4.2-1). This is 24% less than the long-term average value of 19,653 million m^3 over the station's 52-year recording period (1958 to 2009), and is the eighth lowest-value to occur (Figure 4.2-1). Since 1991, all annual runoff values have been lower than this long-term average, with the exception of 1996, 1997 and 2005*."

In relation to the Athabasca River flow rate, we raised a major issue not mentioned by Dr. Timoney in his critique. Although there is a recorded recent trend of decreasing river flow rates as mentioned above, we cite in Section 3.3, the study by Sauchyn and Kulshreshtha (2008) that reports that the greatest precipitation increase predicted by the Canadian Coupled Global Climate Model 2 will be for an area that contains the oil sands region. Increased precipitation will be expected to cause increased flow rates in the Athabasca River. We further note in Section 10.4.3 that there is a lack of consideration of extreme weather associated with climate change in current Environmental Impact Assessments, including consideration of the "*vulnerability of any of the tailings dykes failing with resultant release of tailings to the environment*" that may occur as a result of extreme precipitation. Our treatment of the environmental impact associated with tailings ponds therefore goes well beyond the concern expressed by Dr. Timoney about low river flow rates and addresses the potential impact of increased precipitation and extreme weather on the vulnerability of tailings dykes.

B6. Consideration of in-stream flow needs was out of date and superficial. RSC was imprudent to draw conclusions about industrial water withdrawals

Dr. Timoney said in his published February 24, 2012 viewpoint (Timoney 2012a) about our coverage of the Water Management Framework (WMF):
"*The consideration of in-stream flow needs was out of date and superficial. The RSC did not consider the **current** water management framework and the potential biological implications of withdrawing water at times of low discharge, nor did it incorporate the federal scientific evaluation of the water management framework that concluded that the climate change analysis underestimated changes in minimum flows and that water withdrawals under certain low flow conditions would result in fish habitat losses and in loss of productive capacity of the lower Athabasca River. It was imprudent for the RSC to conclude that the viability of the Athabasca River ecosystem is not threatened by industrial water withdrawals*."
[emphasis added]

Dr. Timoney is incorrect and consequently he is misleading readers on an issue which is central to his critique of our report. The Phase 1 WMF that we cited in our report (AENV 2007) was the WMF that was in place when our report was published and it was still the WMF in place at the time (February 24, 2012) that Dr. Timoney published his critique of our report. Yet in his February 24, 2012 published viewpoint, Dr. Timoney clearly represents our report as "*out of date and superficial".* He does so by stating that we did not consider "*the current water management framework*". What he is representing as being the current WMF is Phase 2, which was a work in progress in 2010. The Phase 2 WMF has not been implemented as of February 2012.

Dr. Timoney cites in his February 24, 2012 viewpoint (Timoney 2012a, cited reference #3) a Department of Fisheries and Oceans (DFO) report, published in September 2010, DFO(2010). This report was only one scientific input to the development of the Phase 2 WMF. Dr. Timoney inaccurately portrays the publication of DFO (2010) as constituting proof that the Phase 2 WMF was implemented and that, therefore, our report was outdated for not citing the "*the current water management framework*".

Even if Dr. Timoney was not inaccurate on this key point, the conclusions of our report were clearly predicated upon the WMF being adopted and fully enforced, a requirement that we clearly did not limit in scope to any particular phase of WMF development. We stated in our report: ***"****Water use demands do not threaten the viability of the Athabasca River system if the Water Management Framework developed to protect in-stream flow needs is fully implemented and enforced…Concerns expressed about water withdrawals during low flow conditions in the Athabasca River (typically in winter) can be addressed effectively by implementing additional industrial off-stream storage to capture water during high flow in spring.****"*** [emphasis added] Our report was clear about the need to **fully implement and enforce** the WMF (with no limitation as to which phase, but Phase 1 remains the only Phase of WMF implemented as of February 2012).

In describing (Timoney 2012b) the contributions of the September 2010 DFO report, Dr. Timoney states about our report: "*It was therefore imprudent for the RSC to conclude (from the out of date and less rigorous Phase 1 Framework) that the viability of the Athabasca River ecosystem is not threatened by industrial water withdrawals*." [emphasis added] The Phase 1 WMF was not out of date in 2010 or in February 2012 when Dr. Timoney's comments were posted.

There was also nothing "*imprudent*" about our conclusions given the obvious option of implementing the long-standing, well-established water resources management approach of implementing off-stream storage to take advantage of high spring flow, when and if necessary. Given the enormous spring flows in the Athabasca River, there is no need for any threat to in-stream flow needs at annual low flow, regardless of any realistic predictions for what that future low flow may be, as long as the WMF is fully implemented and enforced, as we recommended.

B7. Inadequate and inaccurate coverage of in situ bitumen recovery

Dr. Timoney alleges a number of deficiencies in our coverage of in situ bitumen recovery and potential impacts on groundwater. He states in his website critique regarding our report Section 8.3:

"This section provided a survey of some of the knowns and unknowns regarding groundwater quality and quantity as they relate to in situ bitumen operations. It failed to note, however, that northeastern Alberta, from Fort McMurray north to the Northwest Territories, is mapped as either 'unsuitable; high permeability*' or with* 'insufficient data*' for shallow wastewater disposal (Andriashek and Waters 2005). This important fact is critical to understanding potential ecological impacts and operational constraints in the region.*

*The RSC authors were confused as to the nature of surficial materials. The report referred to glacial drift (till, morainal deposits) as sediments; they are not. For example: '*Their results show that naturally occurring hydrocarbons are regionally extensive within Quaternary sediments, particularly till.*' There are glacial sediments in the region in the form of glaciofluvial and glaciolacustrine deposits; tills are present, but they are not sediments.*

*Concerns about leaking from in situ well bores received little attention. The report concluded: "*The probability of casing failure is, however, considered to be very low based on extensive experience with oil wells in Alberta*." Scientific support for this statement was not provided. The risk of well bore leakage may be greater than the RSC report indicates*

Supplemental Information, In Situ Concerns.
In Situ Concerns

In a study of factors affecting or indicating potential leakage from well bores in Alberta, Bachu and Watson (undated) found that geographic area (location), well deviation (directional or whipstocked wells), well type, abandonment method, economic activity, regulatory changes, gas leak testing, and uncemented casings and hole annuli were the major factors that affected leakage of gases from wells. Cased and abandoned wells (14% of all wells and 98% of wells that leaked gas) were the most problematic; in contrast, the incidence of gas leakage in drilled and abandoned wells was 0.5%. Uncemented well casings and casing failures caused by use of bridge plugs were two major factors that increased the risk of gas leakage in abandoned wells. They concluded that 'good and properly-enforced regulations' *were critical to control and detect well leakage.*

It failed to note, however, that northeastern Alberta, from Fort McMurray north to the Northwest Territories, is mapped as either 'unsuitable; high permeability' *or with* 'insufficient data' *for shallow wastewater disposal (Andriashek and Waters 2005)".*

Dr. Timoney is incorrect about us ignoring the matter of geological suitability in this region because he has apparently not read our report completely. In our Section 6 on greenhouse gases where we addressed the issue of carbon capture and storage (CCS), we clearly noted that the oil sands region is regarded as geologically unsuitable for this geological disposal / storage option. We stated: "*Unfortunately for the specific case of GHG emissions from oil sands, the geology of northeastern Alberta, where most of the oil sands activity is concentrated, is generally not suitable for CCS because it is located at the shallow end of the Alberta sedimentary basin and only a qualified range of possible geological storage options may be feasible (Bachu and Grobe 2000). GHG emissions for bitumen upgraders located elsewhere in Alberta offer more promise for CCS*." [emphasis added]

Dr. Timoney wrote: "*The RSC authors were confused as to the nature of surficial materials. The report referred to glacial drift (till, morainal deposits) as sediments; they are not.*" Dr. Timoney alleged that the panel lacked expertise in surficial materials and sedimentology.

The RSC authors are absolutely not confused about the nature of surficial sediments and certainly not about labeling till as sediment. Students in quaternary geology will learn that till is indeed a glacial sediment and consultation of any competent dictionary of geology, such as that published by the American Institute of Geology, will confirm that till is a glacial sediment. We refer further to the work of Dr. Aleksei Dreimanis, formerly professor at the University of Western Ontario and an internationally-recognized expert in glacial geology who specialized in tills. Hicock and Menzies (2000), in their tribute to Dr. Dreimanis, even stated that he became known worldwide as "*Dr. Till*" (page 1668 of Hicock and Menzies, 2000). Consultation of any publication written by Dr. Dreimanis will clearly reveal that he labeled till as sediment. For example, the first sentence of the abstract of the Dreimanis and Schlüchter (1985) paper is "*Till is a highly variable sediment*".

Regarding risk of leakage from in situ wells, we recognize that the risk of leakage from in situ wells is greater than conventional oil wells, in part because of the thermal stress that in situ wells experience. However, risk to usable groundwater is minimized and remains manageably small, primarily because of ERCB requirements for surface casing to protect useable groundwater resources and secondarily by increased groundwater monitoring requirements for in situ operations.

B8. Effects of tailings ponds on wildlife received inadequate attention; no review of relevant scientific literature.

Dr. Timoney writes in his viewpoint:
"*Effects of tailings ponds on wildlife received inadequate attention. There was no review of relevant scientific literature. The presence of extensive tailings ponds along an internationally significant bird migration corridor has long been known to pose threats to migratory and resident birds*." [emphasis added]

Regarding Dr. Timoney's first allegation, we invite readers to consider the following extracts from our report to decide whether the attention we gave this topic was adequate. Dr. Timoney is wrong with his second allegation because we did review the scientific literature on this topic. We quote from Section 9 on Land Reclamation of our report at the end of this section.

Our report stated on this topic:
"*An ongoing concern is that the constituents in tailings ponds pose an immediate significant risk to fish and wildlife. The tailings ponds can become biological traps for passing or migrating birds that mistake these for natural bodies of water or perceive the oily edges of the ponds to be mud flats. Landing in these areas results in the birds becoming oiled which generally leads to a gruesome death, as occurred with over 1,600 ducks in April 2008 (see Sections 3.2.4 and 5.5.3) and more than 400 additional ducks again in October 2010. Through the preening process, birds will also ingest toxic chemicals and may suffer from longer-term health risks. The Syncrude incidents highlight the critical need for oil sands operators to undertake extensive, thorough and effective measures to keep waterfowl off their tailings ponds. However it is equally clear that additional measures need to be developed to minimize the quantity of floating bitumen present on tailings ponds or to at least isolate floating bitumen to areas where bitumen can be continuously skimmed off while maintaining safer fresh water areas where waterfowl can land safely if practical deterrents prove inadequately effective, as was apparently the case in the October 2010 incidents*." [emphasis added]

We also stated in our review of environmental compliance in Section 3.2.4:
"*Most recently, Syncrude has been prosecuted under the Alberta Environmental Protection and Enhancement Act (EPEA) and the federal Migratory Birds Convention Act (MBCA) for an incident in late April 2008 when an estimated 1,600 ducks died after landing on the Syncrude Aurora tailings pond and being oiled after contacting floating bitumen.*

The case was tried in the spring and summer of 2010, with the judge making a finding of guilty on both charges (EPEA and MBCA) and, based on a negotiated settlement between the prosecution and Syncrude, ordering the largest penalties for an environmental conviction in Canadian history, a total of $2,900,000. More discussion of this incident can be found in Sections 5.5.2 and 5.5.3 and the problem of waterfowl being endangered by tailings ponds is discussed in Section 8.2.2.1."

We also discussed this issue extensively in Sections 5.5.2 and 5.5.3 concerning regulatory aspects.

Given what our report did say about the threat to migratory birds and the importance we clearly attached to this issue, the criticism posed by Dr. Timoney is inaccurate and misleading. Dr. Timoney was concerned because we did not cite a paper (Timoney and Ronconi 2010) he had published in the September 2010 issue of *The Wilson Journal of Ornithology*. Although we did look at Timoney and Ronconi (2010) even though our report was already out for peer review, its content, an uncertain range of estimates, by various approaches, of annual bird mortality caused by tailings pond, would not have

caused us to conclude any differently than we did in the extracts above where we clearly recognized the importance of concerns about migratory bird mortality in tailings ponds and the compelling need to fix this problem.

Regarding Dr. Timoney's inaccurate allegation that we did no literature review on the impact of oil sands development on birds, the following is the literature review we provided in our Section 9 on Land Reclamation:

"*There is particular concern for birds in the oil sands region (Wells et al. 2008) as many species showing significant decline are highly dependent on the boreal forest of the oil sands region. Millions of birds are projected to be lost from mining and in situ operations in the oil sands; millions more are projected to lose their breeding habitat and thus offspring over a period of years. There is evidence that birds are affected by high noise levels associated with industrial activities (Bayne et al. 2008), suggesting oil sands operations will have a similar effect. Some species treat linear disturbances as territory boundaries which can result in reduced abundances of those species (Machtans 2006; Bayne et al. 2005).*

There were no differences among reclaimed wetland sites for tree swallow reproductive success, nestling growth rate, and immune response that could be attributed to tailings or tailings pond water additions (Smits et al. 2000). Increased ethoxyresorufin-o-deethylase (EROD) (a biomarker of chemical exposure activity) confirmed the presence of xenobiotics in the diets of nestlings from two sites, while the main reference site was relatively free of EROD inducing compounds. Dietary analyses showed that 84% of the food items of the tree swallow nestlings were of aquatic origin, likely from the local wetlands, and thus would be expected to provide a good reflection of biological effects of any mining related contaminants accumulating through the food chain.

One study found large scale and rapid development negatively affected boreal bird populations and community structure on oil sands sites, making reclaimed areas inappropriate habitat for birds (Dagenais 2009). In another study, tree swallows nesting on tailings sands were exposed to unrecovered bitumen, NA, and PAH (Gentes et al. 2007; Gentes 2006). Reproductive success was very low on oil sand process water material sites compared to the reference site in one year, but relatively unaffected the next year. Nestlings on oil sands had higher thyroid hormone levels and suffered parasitic burdens twice those of reference site nestlings. Nestling growth, hematocrit, blood biochemistry, organ weights, and EROD activity appeared unaffected by NA. No toxic changes were detected on histopathological evaluation of major organs, suggesting exposure to other chemicals such as PAHs is a greater concern than exposure to NA. Nests on wetlands containing water and sediments affected by chemicals related to the oil sands extraction process were more heavily infested than nests on a control site. Nestling growth was negatively affected by parasite load on industrial sites but not on the reference site. Harms et al. (2010) tested the same populations of tree swallows and showed that there were no negative effects on the reproductive performance of resident adults or on innate and acquired immune function in juveniles (nestlings) exposed to oil sands process affected materials. This study was conducted when weather conditions were near ideal which still leaves some question as to whether these responses would be sustainable under other conditions."

To summarize, the RSC report has provided significant coverage of the effects of tailings ponds on wildlife including a review of the relevant scientific literature. We find the criticisms made by Dr. Timoney of our RSC report on this subject are not accurate.

B9. Uncritical acceptance of RAMP findings

Dr. Timoney quotes several places where our report refers to RAMP and argues that we uncritically accepted its findings. This is inaccurate. Dr. Timoney seems to infer that quoting anything from RAMP constitutes a severe deficiency in our report. We find this assertion to be interesting given that Dr. Timoney's recent paper (Timoney and Lee, 2011) re-analyzing RAMP monitoring data on PAHs in Athabasca River Delta sediments is entirely reliant on the validity of RAMP data.

The act of quoting relevant findings in a review did not constitute acceptance by us. For example, we quoted various findings of Dr. Timoney which we certainly do not "*uncritically accept*" simply because we have quoted him. An accurate and balanced overview assessment of the evidence, such as we undertook to perform, seeks to provide relevant statements from relevant sources. Where there are evident discrepancies among different sources, these need to be noted.

Dr. Timoney states on his website critique: "*Uncritical acceptance of RAMP findings given the documented inability of RAMP to assess change (Ayles et al. 2004; Timoney 2007; Dowdeswell et al. 2010) undermined the credibility of the RSC report. The RSC glossed over RAMP's deficiencies and instead emphasized that improvements are needed to restore confidence in monitoring results, as if the issues are communications problems rather than environmental and scientific problems.*" [emphasis added]

Following is an example of what our report had to say about RAMP. We do not believe this is uncritical acceptance of RAMP or a focus only on communication issues:
"*There is concern that the results of the 2009 RAMP report and their previous reports do not provide an integrated long-term assessment of fish populations in the oil sands region. These concerns were raised in an external review of the RAMP (Ayles et al. 2004) and continue to be problematic in the 2009 report. These concerns pertain to the experimental design including selection of sampling sites, statistical approaches, and failure to provide a power analysis. The survey approach used in the RAMP program does not clearly provide the most robust assessment of fish populations. Many endpoints and lessons learned from extensive monitoring programs such as the Environmental Effects Monitoring program for the pulp and paper sector (Environment Canada 2005) have not been adopted by RAMP. For example, much of the information on the impacts of pulp mill effluents has been derived from assessing changes in investment in gonadal growth (measurement of gonadosomatic index) or changes in energy metabolism (measurement of condition factor and hepatosomatic index). The RAMP sampling regime only includes these measures in a small portion of the studies. Other biomarkers, such as induction of the P4501A1 that are commonly measured to assess exposure to hydrocarbons which would be agonists of the aryl hydrocarbon receptor are generally not incorporated as part of the RAMP. Focused endpoints such as these would assist in establishing whether there was significant elevated exposure to chemicals associated with OSPW in the waters downstream of oil sands development sufficient to pose a risk to the aquatic ecosystem*."

Further, when we attempted to compare the findings of RAMP with those of Kelly et al. (2010), we criticized both sources for failing to provide adequate information on how river samples were collected:
"*Judging the comparative merits of these differing findings is difficult because of the limited detail about sampling methods used. This detail is essential for comparing water quality along any river's length which is obviously necessary to draw conclusions about downstream impacts. Rivers are known to be relatively slow to mix transversely across the river cross-section while they mix comparatively rapidly in the vertical cross-section (i.e. top to bottom) because rivers have a large width to depth ratio (Putz and Smith 1998). If there are differences in water quality across a river's cross-section, as there inevitably will be based on contaminants entering from a bank source or tributary entering, performing comparisons of*

water quality numbers along the length of the river has little meaning without clear explanation of how the river cross-section has been sampled.

*RAMP (2010) states with regard to its river sampling: '*Field sampling involved collection of grab samples of water from smaller creeks or rivers, collection of cross-channel composite samples or bank-adjacent grab samples in large rivers*…' Presumably, the Athabasca River is considered a large river so it may involve cross-channel composite samples of an unspecified number, but this statement also allows for the possibility that some Athabasca River data are based on '*bank-adjacent grab sample*.' Further details on cross-river sampling strategy for the Athabasca River*[3] *were provided in RAMP (2009). No details could be found in Kelly et al. (2010) in either the main paper or the accompanying supplementary information about the river water sampling methods employed. Clearly any attempt to compare or contrast water quality results for the Athabasca River between RAMP and Kelly et al (2010) will require better information on the sampling methods used."*

In this example, RAMP provided better, although still inadequate, information than did Kelly et al. (2010) about river sampling methods.

Dr. Timoney states that: "*In assessing RAMP benthic invertebrate community data, RSC reported that for 9 out of 11 sites*, 'variations in benthic invertebrate community measurement endpoints were classified as negligible-low because measurement endpoints in fall 2009 were within the range of historical values for these reaches, and there were no trends over time...*' This was another example of uncritical reporting of* 'no effect*' from a discredited monitoring program. RSC failed to note that the temporal duration of the dataset was limited and that all data were post-development, both of which factors would minimize the probability of finding an effect."*

Dr. Timoney alleges that the quoted text from our report represents "*another example of uncritical reporting of* 'no effect*' from a discredited monitoring program*". Here he is again referring to the RAMP monitoring program. Our RSC report accurately described what was found in the RAMP report. Dr. Timoney alleges that our report failed to note that the temporal duration of the data set was limited. In fact, we wrote that "*Follow up studies are necessary at Poplar Creek and Isadore's Lake to see if the changes persist over time and to identify cause and effect* ". In the next section of our report we contrast the invertebrate data with that of the fish collections program done under the RAMP program.

B10. Downstream effects marred by mis-reporting and misunderstanding of various studies and a failure to review relevant information

Dr. Timoney states in his February 24, 2012 viewpoint: "*The consideration of downstream effects was marred by misreporting or misunderstanding of various studies and a failure to review relevant information."* He elaborates on this in his website critique by stating: "*The RSC reviewed an analysis of Timoney and Lee (2009) who examined trends in PAH concentrations in sediment of the Athabasca River Delta. The RSC stated: '*The Timoney and Lee conclusion about a long term trend in sediment PAH levels is unwarranted given the small overall range of PAH levels detected and the comparatively large

[3] *"At most stations on the Athabasca mainstem, samples are collected at the east and west banks of the river, given previous studies have shown that cross-channel mixing in the Athabasca River in this reach occurs slowly. A cross-channel composite sample is collected at ATR-FR (upstream of the Firebag River); cross channel composites have also been collected at ATR-DC (upstream of Donald Creek) and ATR-DD (downstream of development) in recent years, although sampling in 2008 at these locations was changed to west and east bank samples, consistent with other, upstream locations on the Athabasca River mainstem.*" RAMP 2009. Note: the comment about cross-channel mixing occurring slowly "*in this reach*" reflects a misunderstanding because cross-channel mixing occurs slowly in any large river.

variability of PAH values in a given sampling year. More recent data (including 2008 and 2009 results) confirm only the variability, but do not show any clear upward trend for alkylated PAHs in sediments for the Athabasca Delta (RAMP 2010).' *RSC was again in error. Firstly, Timoney and Lee (2009) did not state there was a long-term trend. Secondly, the linear regression line was statistically significant in spite of variability in concentrations. Thirdly, when more recent RAMP data were included from 2008 and 2009, as was done in a follow-up paper by Timoney and Lee (2011), the trend of increasing PAHs remained statistically-significant. Fourthly, it is noteworthy that RSC would base their conclusion on an uncritical reporting of RAMP results."* [emphasis added]

Dr. Timoney also criticized our report for stating: "*The Timoney and Lee conclusion about a long term trend in sediment PAH levels is unwarranted given the small overall range of PAH levels detected and the comparatively large variability of PAH values in a given sampling year. More recent data (including 2008 and 2009 results) confirm only the variability, but do not show any clear upward trend for alkylated PAHs in sediments for the Athabasca Delta (RAMP 2010).*"

The exact quote from Timoney and Lee (2009) that our report was commenting upon was: "*Over the period 1999-2007, concentrations of alkylated PAHs increased in Athabasca River Delta sediment (Fig. **3**). Alkylated PAH concentrations were correlated significantly with both year and Athabasca River annual discharge (Pearson r = 0.38, 0.52, p = 0.03, 0.005), indicating that both a temporal trend and a hydrologic relationship may be in effect*." We can apparently debate with Dr. Timoney about whether calling a "*temporal trend*" over 8 years a "*long term trend"* is accurate, but we do not accept this to be an "*error*".

Dr. Timoney's second point that a correlation coefficient of 0.38, for the number of data points involved is "*significant*" at the 5% level is not sufficient evidence for experienced environmental scientists who know how to distinguish statistical significance from practical or environmental significance. That is the reason we included Figure 3 from Timoney and Lee (2009), as our Figure 8.8 (shown below) to allow readers to judge the practical significance of these variable sediment results for themselves. Experienced environmental scientists will not rely on simple calculations of statistical significance without also providing the data scatter plot, which to their credit, Timoney and Lee (2009) did provide (and we reproduced in our report as Figure 8.8 as shown below). This figure clearly suggests that 2 high data points in 2005 are largely responsible for suggesting any upward trend in alkylated PAHs.

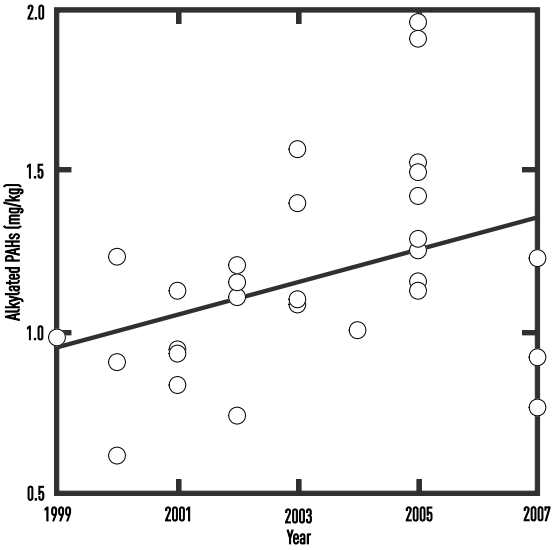

Figure 8.8 from RSC Report (after Timoney and Lee 2009)

Regarding Dr. Timoney's third point, inclusion of 2008 and 2009 RAMP data retaining statistical significance for the correlation coefficient (as demonstrated in Timoney and Lee 2011, not available to us in 2010) supports no more than the earlier finding (Timoney and Lee 2009) which itself is not convincing. Dr. Timoney's view regarding statistical inference that comparison with an arbitrary significance level of 5% is inherently meaningful is contrary to current best statistical inference practice that focuses on the data variability and presenting confidence intervals. The ecological sciences have begun to take note of this matter in recent years (Newman 2008). However, the misinterpretation of arbitrary statistical significance levels vs. interpretation of biological significance has long been noted for the ecological sciences (Yoccoz 1991) and health sciences (Oakes 1990).

Dr. Timoney goes on to state:
"The RSC then stated that when PAH data back to 2001 are normalized to 1% total organic carbon, 'there is definitely no upward trend in PAH at any of the four sites' *(again citing RAMP (2010) as the authority). This statement is true and was considered by Timoney and Lee (2011) who found that both PAHs and total organic carbon in sediment increased over the period of record. Rather than attempting to explain away the results, the RSC would have been advised to analyze the data themselves rather than rely on RAMP, and, once demonstrating an increasing trend in total organic carbon, attempt to account for it. Although normalizing to 1% carbon is sometimes done as a means of comparison, it does not change trends or patterns evident (or obscured) in whole sediments. The RSC's misinterpretation of normalizing to 1% carbon suggests a lack of familiarity with sediment monitoring."*

Dr. Timoney is not correct in alleging that we cited "RAMP (2010) *as the authority*" [emphasis added]. We cited RAMP (2010) as the source of the data that we referred to, just as Dr. Timoney needed to cite RAMP for his two papers discussing PAHs in sediments of the Athabasca Delta (Timoney and Lee 2009, 2011), both of which are entirely reliant on the validity of the monitoring data provided by RAMP. What we actually said in our RSC report was:
"Timoney and Lee (2009) performed their own analyses of RAMP showing that over the period 1999–2007, concentrations of alkylated PAHs increased in Athabasca River Delta sediment from about 1.0 mg/kg in 1999 to a range from about 0.75 to 1.25 mg/kg in 2007, with values in intervening years ranging from about 0.6 to about 2 mg/kg (Figure 8.8). The Timoney and Lee conclusion about a long

term trend in sediment PAH levels is unwarranted given the small overall range of PAH levels detected and the comparatively large variability of PAH values in a given sampling year. More recent data (including 2008 and 2009 results) confirm only the variability, but do not show any clear upward trend for alkylated PAHs in sediments for the Athabasca Delta (RAMP 2010). When data back to 2001 are compared on the basis of being normalized to 1% TOC, to account for variability in organic content of sediment samples, an adjustment that is scientifically sound based on the behaviour of PAHs in water in contact with sediment, there is definitely no upward trend in PAH at any of the four sites in the Athabasca Delta (RAMP 2010). Given the ongoing controversy about downstream contamination, this matter is worthy of continuing analysis and interpretation." [emphasis added]

We do not understand Dr. Timoney's criticism of our statement, beyond inferring that any use of RAMP by us is wrong. As noted in his statement above, the observation we made about correcting PAH in sediment values to 1% TOC is valid. We did not say that this organic carbon correction was the only way to look at sediment data, but given the large dependence that adsorption of highly hydrophobic PAHs to sediments has upon the carbon content of sediments because of the increased affinity of PAHs for sediments with higher organic content, it was imbalanced and incomplete for Timoney and Lee (2009) to present their findings without any reference to sediment organic carbon content. Timoney and Lee (2011) do consider sediment organic carbon content in their recent paper, which makes the point that the TOC content of sediments should be considered when attempting to interpret the meaning of PAH concentrations in sediments. Given his apparent acceptance of this practice, we find Dr. Timoney's statement that: "*The RSC's misinterpretation of normalizing to 1% carbon suggests a lack of familiarity with sediment monitoring"* to inconsistent and wholly unwarranted.

Dr. Timoney states further on the matter of PAH concentrations in sediments:
*"The RSC also criticized an analysis of PAH concentrations upstream and downstream of industry in the Muskeg River. It stated: "*Although this comparison was based on a single pair of samples, Timoney and Lee (2009) applied a statistical analysis (Mann-Whitney test) on 'all PAHs as a group' to demonstrate statistical significance for the evident upstream-downstream differences*." It is difficult to understand what was being implied by the RSC. Firstly, the nonparametric statistical test used is more conservative than is the comparable parametric test. Secondly, Timoney and Lee compared the concentrations of all PAH species at the upstream and downstream sites, not aggregate totals as seems to be implied. Thirdly, Timoney and Lee applied several tests for differences in PAH concentrations: for all PAHs, low molecular weight PAHs, alkylated PAHs, and non-alkylated PAHs."*

In this case, Dr. Timoney admits to difficulty in understanding what we are "*criticizing*" and his speculation about the appropriateness of the particular statistical test used does miss our intended point. We were simply pointing out that although Timoney and Lee (2009) refer to using sample number of n=28 for this test, these are not 28 independent observations, they are evidently 28 separate groups of PAH analytes obtained for a single pair of sediment samples (MUR-6 u/s and MUR-5 d/s). Although Dr. Timoney has concluded that we lack statistical expertise, we possess enough to recognize that doing statistical tests on any measures derived from a single pair of samples deserves some commentary to alert readers.

Dr. Timoney was selective in the quote from our report (above) to present a message that we were unfairly criticizing his work. What he did not include, immediately before what he describes as our criticism is the following passage from our report: "*the single comparison between a site upstream of oil sands developments and one downstream clearly showed substantially higher (4-fold higher for total detectable PAHs, including PASH, but excluding retene and 3.6-fold higher for the higher molecular*

weight PAHs) levels at the downstream site." In our view, the foregoing quote provides more useful insight for comparing the single pair of samples than any statistical test attempting to show statistical significance for differences observed in various measures obtained from a single pair of samples.

Dr. Timoney criticizes our mention of the analysis by Timoney and Lee (2009) on some data obtained by RAMP. He states: "*The RSC criticized the findings of Timoney and Lee (2009) who studied the relative concentrations of a suite of waterborne PAHs upstream and downstream of industry in the Muskeg River. The RSC noted that:* 'Problems were encountered in the pilot project with the day zero and travel blanks which were contaminated by lower molecular weight hydrocarbons, particularly alkylated naphthalenes and fluorenes and alkylated dibenzothiophenes*…' The relevance of the "contamination" to the findings may be limited. Uptake of airborne PAHs in the trip blank may have occurred in the field and this would be an interesting result that might suggest poor air quality or contamination introduced during sampling. More to the point, if Timoney and Lee had adjusted the PAH concentrations by subtracting those in the Day 0 blank from those observed at the two Muskeg River stations, the relative differences between the upstream and downstream sites would have been even greater than those reported by Timoney and Lee (2009). Therefore, the relative differences in PAH concentrations between the upstream and downstream sites were probably conservative. A major study of PAHs in water by Kelly et al. (2009) later corroborated the conclusion that industry is a significant source of PAHs. The RSC followed with further criticisms of Timoney and Lee (2009) that were misleading and belied a superficial understanding of sediments and statistical analyses."*

Dr. Timoney has provided a detailed defense of the sampling problems encountered by RAMP, the data source that he has consistently criticized us for considering, yet he has completely relied upon this source in his publications about PAHs. The sampling program and associated problems that we were, in Dr. Timoney's words "*criticizing*" (and which Dr. Timoney appears to be defending) were part of a pilot project conducted by RAMP to deploy semi-permeable membrane devices (SPMDs) seeking to obtain sufficient sensitivity for dissolved PAHs to allow inferences to be drawn about industrial impacts on water quality in tributaries to the Athabasca River. The only commentary we made on this matter that we regard as criticism was to note that RAMP failed to repeat this pilot project in subsequent years. Our discussion of sampling problems encountered by RAMP in collecting these data is merely sound scientific commentary about the RAMP methods and analysis used in this case.

Dr. Timoney disagreed with a caution we made about translating results from polyethylene membrane devices by stating: "*In commenting on the PAH assay methods of Kelly et al. (2009), the RSC stated that* 'the water concentrations between sites should be interpreted in relative site comparisons rather than in absolute concentration terms...' *despite published studies (e.g. Carls et al. 2004) showing that the methods used by Kelly et al. (2009) concur with direct measurements of PAH to within a factor of about two, and provide a much more efficient time-integrated indication of aqueous PAH concentrations. The Kelly et al. (2009) authors disagree with RSC and maintain that their estimates of equivalent aquatic concentrations are defensible (D. Schindler, pers. comm., January 2012)."*

Dr. Timoney presents our caution (which he describes as criticism) without providing the whole context of our statement, which was:
"*The PMD results are obtained as a mass of PAC extracted in the laboratory from the device which collected PACs from flowing waters over the sampling period of about 30 d. These results must be translated into water concentrations according to information on the equilibrium partitioning of each individual PAC between water and lipophilic stage. Thus, the water concentrations between sites should be interpreted in relative site comparisons rather than in absolute concentration terms and should not be directly compared with aquatic water quality criteria concentrations (Carls et al. 2004).*"

Our caution was justified by what the published reference on this method (Carls et al. 2004) said about the subject of comparing the membrane device results with water concentrations: "*Differences in rates of PAH accumulation and loss in PEMDs explain why the PAH composition in PEMDs was different than that in water. Our results indicate that PAH uptake increases exponentially with molecular mass (and with log Kow, because it is linearly related to molecular mass) (Table 1). Furthermore, higher-mass PAH are preferentially retained by PEMDs in clean water. This selective sampling causes PAH composition in PEMDs to differ from that in water, yet the source of oil remained identifiable in PEMDs, perhaps in part because smaller PAH preferentially accumulate in water."*

In describing our treatment of the Kelly et al. (2010) paper which was released with considerable publicity after we had completed our draft report in August 2010, Dr. Timoney selectively quotes two words ("*limited scope*") from more than 2.5 pages we devoted to this paper. Dr. Timoney states: "*Kelly et al. (2010) observed that the bitumen industry releases significant amounts of 13 US EPA priority pollutant elements (PPE) to the Athabasca River. Over a four-month winter period in 2008, 11,400 tonnes of airborne particulates, the majority of which were bitumen particles, were deposited within a 50 km radius of the main upgrading facilities. Air emissions were a significant source of the elevated pollutants observed in the Athabasca River and its tributaries. The pattern of increases in PPE in the Athabasca Delta and Lake Athabasca was similar to increases near development,* "indicative of a persistent anthropogenic signal with oil sands development as the most likely source.*" The RSC downplayed the significance of these findings, writing that the results were of "*limited scope*" and that it was unable to judge the comparative merit of the findings of Kelly et al. (2010) and RAMP because of insufficient information provided on methods."* [emphasis added]

Dr. Timoney's comment that the RSC report characterized the Kelly et al. 2010 paper as only being of "*limited scope*" can be contrasted with what we did say about this paper:
*"The most recent study addressing oil sands impacts on regional water quality was released in September of this year (Kelly et al. 2010) and it addresses 13 trace metals (described as toxic priority pollutants or PPE as designated by the U.S. Environmental Protection Agency[4]) measured in snow samples, tributaries and the Athabasca River (AR) in February and June 2008. This study concludes that '*the oil sands industry substantially increases loadings of toxic PPE to the AR and its tributaries via air and water pathways*'. This conclusion is set in contrast to conclusions from the annual RAMP reports which generally conclude that oil sands operations are having minimal impacts on downstream water quality.*

Judging the comparative merits of these differing findings is difficult because of the limited detail about sampling methods used. This detail is essential for comparing water quality along any river's length which is obviously necessary to draw conclusions about downstream impacts. Rivers are known to be relatively slow to mix transversely across the river cross-section while they mix comparatively rapidly in the vertical cross-section (i.e. top to bottom) because rivers have a large width to depth ratio (Putz and Smith 1998). If there are differences in water quality across a river's cross-section, as there inevitably will be based on contaminants entering from a bank source or tributary entering, performing comparisons of water quality numbers along the length of the river has little meaning without clear explanation of how the river cross-section has been sampled.

[4] *The U.S. Environmental Protection Agency has identified a list of 126 environmental contaminants that are described as priority pollutants - http://water.epa.gov/scitech/swguidance/methods/pollutants.cfm*

*RAMP (2010) states with regard to its river sampling: '*Field sampling involved collection of grab samples of water from smaller creeks or rivers, collection of cross-channel composite samples or bank-adjacent grab samples in large rivers…*' Presumably, the Athabasca River is considered a large river so it may involve cross-channel composite samples of an unspecified number, but this statement also allows for the possibility that some Athabasca River data are based on "*bank-adjacent grab sample*." Further details on cross-river sampling strategy for the Athabasca River*[5] *were provided in RAMP (2009). No details could be found in Kelly et al. (2010) in either the main paper or the accompanying supplementary information about the river water sampling methods employed. Clearly any attempt to compare or contrast water quality results for the Athabasca River between RAMP and Kelly et al (2010) will require better information on the sampling methods used.*

Kelly et al. (2010) raise important issues about the interpretations of water quality impacts of oil sands developments by RAMP. Summer sampling suggested three to fourfold increases from upstream to oil sands development sites for chromium, copper, lead, mercury and nickel and 60% (arsenic) to 2.5 fold (cadmium) increases for other metals. Except for a 1.7 fold increase in mercury, increases were not found for any of the metals found to increase in the summer sampling. The limited scope of results obtained[6] *does not allow firm conclusions to be drawn about the extent of the impact of oil sands operations on the Athabasca River. Clearly, there is a need to resolve the apparent discrepancy in findings because sound environmental management of oil sands operations cannot be achieved without valid water quality monitoring data.* [emphasis added, was not in our report; note explanation in footnote 6]

Kelly et al. (2010) allude to human health concerns in the context of their report about toxic priority pollutants being added to the Athabasca River. They acknowledge that none of the metals concentrations measured exceeded any of the applicable Guidelines for Canadian Drinking Water Quality (GCDWQ). Table 8.8 summarizes the findings of Kelly et al. (2010) with regard to observed Athabasca River concentrations and the GCDWQ (Health Canada 2008). This considers only the June 2008 results because the February 2008 results are lower. The GCDWQ are concentrations that are set to allow consumption of 1.5 L of water per day at the maximum acceptable concentration for a 70 year lifetime without causing any significant adverse health effect.

Kelly et al. (2010) report that relevant surface water quality criteria for the protection of aquatic life for some of these metals were exceeded in surface water samples in their study. At the oil sands developed site for June 2008, this was found for cadmium (0.070 ± 0.004 µg/L vs. criterion of 0.033 µg/L), copper (4.5 ± 0.24 µg/L vs. criterion of 2 µg/L), lead (2.3 ± 0.085 µg/L vs. criterion of 2 µg/L) and mercury (0.011± 0.00054 µg/L vs. 0.005 µg/L). For the February sample only silver exceeded the protection of aquatic life criterion (0.23 ± 0.18 µg/L vs. criterion of 0.1 µg/L) at the oil sands development site. Confirming the extent to which oil sands developments may be causing metals concentrations in regional

[5] 'At most stations on the Athabasca mainstem, samples are collected at the east and west banks of the river, given previous studies have shown that cross-channel mixing in the Athabasca River in this reach occurs slowly. A cross-channel composite sample is collected at ATR-FR (upstream of the Firebag River); cross channel composites have also been collected at ATR-DC (upstream of Donald Creek) and ATR-DD (downstream of development) in recent years, although sampling in 2008 at these locations was changed to west and east bank samples, consistent with other, upstream locations on the Athabasca River mainstem.' *RAMP 2009. Note: the comment about cross-channel mixing occurring slowly* "in this reach" reflects a misunderstanding because cross-channel mixing occurs slowing in any large river.

[6] *Kelly et al. (2010) reported on one winter and one summer sampling period with upstream characteristics based on 3 samples for each period, development site based on 7 samples, downstream unspecified distances along the Athabasca River based on 6 samples and downstream in Lake Athabasca was based on a single sample for each period in 2008. Drawing any conclusions regarding the meaning of a single sample is certainly unusual for a scientific study.*

rivers and lakes to exceed surface water criteria for the protection of aquatic life is clearly something that must be determined as soon as possible and must be maintained by RAMP on a continuing basis."

Our full page Table 8.8, alluded to in the extract above, reported for the highest concentrations of "*toxic*" metals (Kelly et al. 2010) from the Athabasca River downstream in the Athabasca River Delta that all these metals were substantially below relevant Guidelines for Canadian Drinking Water Quality (GCDWQ) for those metals which had this criterion, and for those which did not, they were either non-detectable or well below the applicable World Health Organization drinking water guideline.

Finally Dr. Timoney viewed our observation (footnote 6 in extract from Kelly et al. 2010 above) as inaccurate criticism. We view it as simply a statement of fact, contrary to the impression conveyed by Dr. Timoney in his website critique (Timoney 2012b):
"The RSC criticized Kelly et al. (2010) for drawing conclusions from a "single sample". In reality, Kelly et al. sampled more than 30 sites, in winter and summer, distributed across a network of locations that allowed differentiation of natural and anthropogenic influences; they provided ample details on methods in the two companion papers (Kelly et al. 2009, 2010) and in their accompanying supplemental information."

Despite Dr. Timoney referring to 30 sampling sites in his statement above, the reality is that Kelly et al. (2010), in their supporting information provide a link to an Excel table (Table S6) which confirms, despite no other mention in the text of the main paper or the supporting information, that there was only a single sample (n=1) for each of the June and February sampling periods at the Lake Athabasca site. We would have been remiss in conducting our scientific review of this work to not bring this relevant fact to the reader's attention.

Dr. Timoney states: "*In an important recent study not considered by RSC, Parsons et al. (2010) stated that due to a lack of regional monitoring programs, potential biological impacts have not been assessed. They conducted a bioassessment of water chemistry and benthic macroinvertebrates at 32 lakes, including five test lakes located in a modelled high deposition region about 40 to 50 km east of the Athabasca River and bitumen processing facilities. Benthic macroinvertebrate assemblages in test lakes were 'impaired' relative to those of reference lakes (Parsons et al. 2010)."*

Dr. Timoney's statement above conveys a substantially different impression than the conclusions of Parsons et al. (2010) which stated:
"*Significant differences in BMI between all 5 test lakes and their reference lakes were identified using One-Sample T-Tests and MANOVA. In contrast, the TSA analysis identified no lakes that were significantly impaired, 3 lakes (428, 470 and 471) were potentially impaired and 2 lakes (185 and 452) were in "reference condition". The BMI communities in test lakes are unquestionably different than BMI communities in their reference groups but this difference appeared to result from natural physico-chemical differences between the two groups of lakes more so than the effects of atmospheric emissions. Any assessments utilizing the RCA in the future must limit these differences to more clearly identify effects arising from industrial activities in the region. Given the lack of obvious impairment of the study lakes due to emissions from the AOSR we recommend a regional BMI monitoring program be established using the sampling approach utilized in this study to provide a more reliable assessment of impacts in the region and the baseline dataset established in this study may be considered an appropriate start in this regard.*" [emphasis added; AOSR is Athabasca Oil Sands Region, BMI is benthic macroinvertebrates, RCA is reference condition approach; TSA is test site analysis]

B.11 Literature review of surface water quality impacts on aquatic organisms and fisheries was superficial

Dr. Timoney states in his website critique:
"In summarizing the results of Conly et al. (2007), the RSC report concluded that elevated levels of arsenic in Athabasca River tributaries were due to natural background contributions rather than to anthropogenic sources. A companion study by Headley et al. (2005) was also summarized by the RSC to conclude that "high concentrations of metals were of natural origin."

Regarding Conly et al. (2007), our report stated: "*…Conly et al. (2007) assessed the concentration of metals in bottom and suspended sediments in three tributaries to the Athabasca River, the Ells River, MacKay River, and Steepbank River. They concluded that measured metal concentrations were within CCME guidelines, except for arsenic whose elevated concentrations were assumed to result from natural background levels rather than anthropogenic sources*."

Conly et al. (2007) state in their conclusions: "*In general, levels of metal concentrations were with*[sic] *the guidelines. The exceedence of CCREM interim guidelines for arsenic appears to be due to natural background levels as opposed to contributions from anthropogenic sources*."

Regarding Headley et al. (2005) our report states: "*Headley et al. (2005) report on the occurrence of inorganic chemicals in the water of those three tributaries: drinking water guidelines were exceeded at some locations for aluminum, iron, manganese, copper, zinc, silver, and lead, with iron being the most predominant trace metal. However, it was concluded that the high concentrations of metals were of natural origin*."

Headley et al (2005) state in their conclusions: *"Although high concentrations of metals are found in the three tributaries, it should be noted that these are of natural origin and may serve as base-line data for the assessment of future oil sands activities in the area and should also help in the establishing of guidelines for such mining activities in the region."*

Dr. Timoney continues to state in his website critique:
*"The RSC did not note, however, that both studies were not designed to differentiate the relative contributions of natural and anthropogenic sources, and during the time of data gathering (1998 to 2000), the river reaches sampled would not have been expected to show evidence of industrial contributions. The Headley et al. (2005) study made this clear: '*The Steepbank River, Mackay River, and Ells River were the three tributaries considered suitable for continued characterization based upon... lack of obvious anthropogenic impact*…' The Conly and Headley studies provide useful characterizations of baseline physical and chemical conditions. Headley et al. (2005) noted that their results can be used to provide baseline data for future assessments of the influence of industrial activities. The RSC mis-characterized these studies as failing to find industrial effects when the objectives and study designs of these studies were focused on characterizing pre-disturbance conditions."*

We fail to see how our report mischaracterized the findings of either Conly et al. (2007) or Headley et al. (2005) concerning the high natural levels of metals they reported in some tributaries to the Athabasca River.

Dr. Timoney continues to state in his website critique: "*The RSC mis-characterized the results of Conly et al. (2002), stating that the study suggested:* 'that less than 3% of the sediment-bound hydrocarbon contaminants detected downstream of the oil sands development were attributed to the oil sands mining

operations.*' In reality, Conly et al. (2002) concluded: 'the amount of naturally-derived oil-sand sediment passing the Embarras site is <3% annually. As such, the expectation of finding naturally derived PAHs in the lower reaches of the Athabasca River system would be limited.' The Conly et al. study focused on characterizing the sediment regime of the lower Athabasca River; it did not measure contaminants in the sediment and did not examine the relative contributions of natural vs. anthropogenic contaminants."*

Dr. Timoney was correct in pointing out that the study of Conly et al. (2002) did not comment on the sediment load derived from oil sands mining operations but only on sediment loads carried naturally by tributaries and the main stem of the Athabasca River. We will correct our report in this regard.

Dr. Timoney continues to state in his website critique:
"*In reporting the results of Tetreault et al. (2003), the RSC downplayed or misunderstood the significance of industry in increasing the exposure of fishes to PAHs (see Supplemental Information, Further Comments on Downstream Effects).*

Increased levels of hepatic EROD and cytochrome CYP1A are indicative of contaminant stress, such as exposure to some PAH compounds. In reporting the results of Tetreault et al. (2003), the RSC concluded simply that "altered biochemical and reproductive responses in native fish species residing in the Athabasca oil sands were found relative to fish from reference areas*." In reality, Tetreault et al. (2003) controlled for exposure source by comparing EROD responses of slimy sculpin at a natural bitumen-exposed site, an industrially-affected site, and a reference site outside of bitumen sources. They observed that slimy sculpin exposed to mining elevated levels of bitumen showed up to a ten-fold increase in hepatic EROD activity relative to the bitumen-free reference site; fishes exposed to natural levels of bitumen showed a two-fold elevation of hepatic EROD activity. The study points to industry's role in raising contaminant levels above background."*

Our report accurately reported that there are altered biochemical and reproductive responses in native fish species collected adjacent to oil sands mining activities relative to those from reference sites (Tetrault et al. 2003). While Dr. Timoney suggests that our report downplays the effects of exposure to oil sands mining wastes on EROD activity he did not consider this one response in relation to all endpoints examined. For example, when basal and stimulated steroid production by testicular and ovarian tissues were measured, significant differences in steroid output for fish from sites receiving natural inputs of oil sands materials and mining wastes were seen in only 4 of 16 comparisons (Tetrault et al 2003). Equally there were no differences in gonadosomatic index for fish from these sites when examined over a two year period. As such, the appropriate conclusion was, as we reported, that more work examining the long term consequences of exposure to naturally derived and mined oil sands constituents was needed, specifically we stated:
"*These findings illustrate that native fish species are exposed to naturally occurring oil sands related compounds, consistent with PAH exposure. Certainly more work on the long term consequences of exposure to chemicals derived from oil sands operations is warranted to determine the impact of oil sands development relative to the natural background oil sands exposure*."

B12. Dismissal of downstream (Fort Chipewyan) public health concerns not justified and review of potential pathways of human exposure was superficial.

In his website critique Dr. Timoney elaborates his interpretation of public health concerns by stating:

"The RSC report stated that the conclusions of Timoney and Lee (2009) and Kelly et al. (2009) were 'unfortunate' *and* 'likely to create fear' *because* 'recognized carcinogenic PAH comprise a negligible

proportion of the PAH that either paper reports'. *This seems to be more obfuscation than elucidation given that the carcinogenic activity of most PAHs has not been investigated. Although more than 100 PAHs have been identified to date, only 18 PAH species are commonly evaluated for human exposure and health risk (Baird et al. 2007). For alkylated PAHs, the dominant forms in bitumen, there is insufficient toxicity data to quantify risk (Baird et al. 2007). Thousands of PAH species remain unidentified and undescribed. The RSC's dismissal of cancer risk as negligible was not warranted.*

Dismissal of downstream public health concerns was not justified given the superficial treatment of the data and the considerable remaining unknowns such as the need to quantify total exposure to contaminants and to explain the increased rates of cancers and other diseases in Fort Chipewyan." [emphasis added]

Dismissal of public health concerns

As we noted in our word-limited April 3 response to Dr. Timoney's published February 24, 2012 viewpoint (Timoney 2012a), we did not dismiss public health concerns. We acknowledged that residents of Fort Chipewyan were naturally concerned for their health, particularly when being told by various parties, certainly through the media, that they are experiencing excess cancers as a result of the oil sands industry. Dr. Timoney appears to have overlooked that we stated in our Executive Summary findings that: "*Highly publicized media reports of downstream contamination from oil sands developments are likely amplifying the considerable concern among downstream residents about their health, particularly given the magnitude and visual impact of industrial development that is occurring. Current levels of concern in potentially affected communities make it important for previous environmental contaminant exposure studies, which have focused on air pollutant exposures, to be expanded. New exposure assessment studies need to address contaminant exposures in food and water*."

We concluded: "*There is currently no credible evidence of environmental contaminant exposures from oil sands developments reaching downstream communities at levels expected to cause elevated human cancer cases in the local population*." We will elaborate on the basis for this finding later in this section.

But public health concerns should not be limited to exposure to environmental contaminants, because several other very important health determinants are at play in this region. Our overall assessment of health in the oil sands region was quite explicit: *"there are major negative effects on community health."*

What we also did say is that *"Analysis revealed that for many indicators of community health, this region fares substantially worse than the provincial average. (…) The problems identified are classic indicators of the '*boom town*' effect which have been well documented elsewhere. Such health disparities are difficult to reconcile with the wealth the region generates."* Moreover, our concerns included occupational health and human health risk from technological disasters, not addressed so far, as well as cumulative impact assessment for human populations.

Several practical recommendations related to public health were also made, notably that governments implement *" a broader health impact assessment approach addressing the full set of health determinants, in line with national and international best practice"* , and not only potential contaminants exposure as has been the case so far in past EIAs. We also indicated that, at the minimum *"investigation to validate these health discrepancies is needed, with subsequent [public health] strategies developed."* Our final recommendation mentioned that: *"A coordinated public health effort needs to be organized to address the evident health disparities."*

Superficial consideration of human exposure pathways to environmental carcinogens

Regarding potential contaminant pathways to human exposure, humans anywhere can only take contaminants into their bodies by inhalation (e.g., air), ingestion (e.g., water, food or soil), dermal contact (e.g., physical transfer across the skin) or direct injection (e.g., use of needles). This does not need to be studied by literature review to understand what must be assessed. Because we were addressing the environmental and public health impacts of the oil sands industry, we focused on the environmental pathways that could provide the means by which humans can intake contaminants. Inhalation of contaminants requires them to be in the air (or water if aspirated into the air during bathing or showering, or soil that can be suspended as inhalable dust). Ingestion of contaminants requires them to be in the water, food or soil. Dermal uptake requires contaminants to be in water (mainly) or air or soil. Direct injection is not an environmental exposure route.

To propose that humans in a community, located downstream more than 150 km, are being exposed to contaminants from the oil sands developments, those contaminants must be able to travel from their source to where the humans reside or otherwise may find themselves (work, travel, recreation, etc.). Thus, for claims that oil sands environmental contaminants are present in sufficient quantity to explain observations of elevated cancer rates in a community (like Fort Chipewyan) of approximately 1,200 residents, there needs to be some viable, realistic theory of how those contaminants are able to reach those residents in sufficient quantity, with sufficient carcinogenic potency, to support an expectation that such environmental contaminants pose a measureable cancer risk to downstream residents.

We found no credible theory put forth by Dr. Timoney or any scientific source concerning exposure to carcinogens. There has only been some casual mention of carcinogens, and then only with reference to polycyclic aromatic hydrocarbons (PAH) and arsenic.

Regarding PAH, Kelly et al. (2009), actually studied polycyclic aromatic compounds (PAC), a group of compounds broader than PAH that includes sulphur-heterocycles such as alkyl substituted dibenzothiophenes. They found that: "*Approximately 75% of PAC homologues accumulated by PMDs deployed at the M-L sites consisted of three-ring PAC, dominated by alkyl-substituted dibenzothiophenes, phenanthrenes/ anthracenes and fluorenes, with the remainder mostly four-ring PAC including alkyl-substituted fluoranthenes/ pyrenes and benzanthracenes/chrysenes and negligible naphthalenes*." [emphasis added]

According to monitoring of snow for accumulation of PACs by Kelly et al. (2009), levels dropped exponentially with distance from the two operating bitumen upgraders and were essentially at background levels beyond 50 km. This evidence was used by Kelly et al. (2009) to support their case that these bitumen upgraders were the source for these elevated PACs.

With respect to dissolved PAC levels in the Athabasca River, Kelly et al. (2009) found:
"*Dissolved PAC did not persist as far as the Athabasca River Delta and Ft. Chipewyan, at least during the seasons sampled. However, PAC-contaminated sediments in the Athabasca Delta and Lake Athabasca (35, 36) are consistent with long-range atmospheric and fluvial transport of particulate PAC. Our sampling did not include the intervening spring snowmelt, which would release a pulse of PAC up to 50 km from oil sands upgrading facilities into nearby tributaries and the Athabasca. Although this should increase PAC concentrations in tributaries, it might not be detected in the main stem because of high-volume dilution by uncontaminated snowmelt from areas upstream of oil sands mining. PAC may also be removed from the water column by microbial degradation and adsorption to organic matter that settles*

out of the water column (37). These dilution and removal processes likely account for declining concentrations of dissolved PAC as the Athabasca flows to Lake Athabasca and Fort Chipewyan."

Dr. Timoney criticizes what he characterizes as our lack of concern about carcinogenic risks from PAHs, citing Baird et al. (2007), a paper which offers generic concerns about additional carcinogenic risk associated with alkylated PAHs beyond what is represented by those PAHs experimentally assessed for carcinogenicity. Baird et al. (2007) offer no quantitative estimate of the extent of their concern, so like many other examples, Dr. Timoney apparently translates a non-quantitative expression of concern into grounds for arguing that there is a serious cancer threat to residents of Fort Chipewyan. Baird et al. (2007) do note, as will any accurate reference on this subject, only PAHs with 4 or more rings have been found to be carcinogenic. Kelly et al (2009), which Dr. Timoney has presented as an accurate publication regarding environmental releases of PAH from oil sands operations, found less than 25% of the total PACs associated with bitumen production to be four ring compounds of which only a fraction are likely to be carcinogenic.

The subject of carcinogenicity of PAHs is extremely complex and is not readily amenable to simple claims about potency and cancer risk. Readers need to appreciate that the potency of individual carcinogens which has been modeled from rodent cancer bioassay experiments and expressed as cancer slope factors has yielded a range of carcinogenic potency that spans 100 million-fold (Hrudey and Krewski 1995). This reality makes it largely meaningless to speak of exposure to carcinogens without developing some sense of how the carcinogens to which humans are being exposed are rated along this enormous range of cancer potency and what level of exposure would be required to explain observed cases of human cancer. That concept is developed further below. However, after decades of research on the topic, there are quantitative bounds to our uncertainty and regulatory authorities have interpreted the extensive literature comparing carcinogenic potency of individual carcinogens like benzo[a]pyrene and complex mixtures like coal tar to develop limits for consumer products based on benzo[a]pyrene equivalents (EC 2005). Likewise, cancer risk assessment for exposure to complex mixtures of PAHs in media such as contaminated soil has been developed (Schneider et al. 2002).

The approach of Schneider et al. (2002) which accounts for additional tumours like lung tumours caused by mixtures rather than just the rodent fore-stomach tumours for which benzo[a]pyrene alone adequately explains the observed tumours, is a reasonable, experimentally-determined, cautious approach to explain the additional carcinogenic properties of complex PAH mixtures. Schneider et al. (2002) estimate the effective additional contribution of PAHs from the PAH mixture to be almost 60% greater than that from benzo[a]pyrene alone, when expressed in terms of the benzo[a]pyrene content of the PAH mixture. This provides the quantitative perspective that is lacking from the generic concerns of Baird et al. (2007) that were cited by Dr. Timoney to justify his cancer concerns regarding PAHs.

The Alberta Cancer Board report on cancers in Fort Chipewyan (Chen 2009) estimated that over a 12 year period, the observed number of cases of cancer (51) was greater than an "*expected*" number, estimated from an Alberta average (taking into account the population age, sex and First Nation status) by 12 cases, or 1 excess cancer case per year. This estimated excess of cancer cases, if it was very certain (but Chen 2009 reported a 95% confidence interval ranging from -1 to +28 cases on this understandably uncertain estimate), in an average population of 1,162, would amount to an annual incremental cancer risk of about 0.9 per 1,000, or an increased incremental lifetime (70 year) cancer risk of 6 in 100 (6 % with confidence interval: <0% to +14%). This is a cancer risk estimate much larger than would be realistic to attribute to environmental contaminant exposures unless such exposures were extraordinarily massive. Environmental contaminant exposures assessed for carcinogenic risk are typically judged for

environmental contaminant exposure levels ranging from 1 in 100,000 to 1 in 1,000,000 as an upper bound lifetime cancer risk.

The Chen (2009) level of cancer risk would require a massive exposure to a chemical carcinogen like benzo[a]pyrene and this simply cannot be rationalized even using the cautious (i.e. protective), experimentally-derived potency of complex PAH mixtures in relation to benzo[a]pyrene (Schneider et al. 2002). For example, scaling up the drinking water lifetime cancer risk estimate of the U.S. EPA for benzo[a]pyrene by almost 60% to reflect that additional caution proposed by Schneider et al. (2002) for complex PAH mixtures, predicts that drinking water would need to contain an average of almost 190 µg/L of benzo[a]pyrene in 2 L of drinking water consumed per day continuously over a lifetime of exposure. That is a concentration 19,000 times the Guideline for Canadian Drinking Water Quality for benzo[a]pyrene.

For another rational and relevant quantitative comparison, the latest RAMP data for Athabasca Delta sites (BPC, FLC, GIC for 2010 or 2011) show an average benzo[a]pyrene concentration of approximately 5 µg/kg in river sediments. The European Commission Regulation 208/2005 allows smoked fish for human consumption to contain 5 µg/kg of benzo[a]pyrene using an "*as low as reasonably achievable*" regulatory approach, so it is inconceivable that such sediment concentrations pose any discernable cancer risk to residents of Fort Chipewyan. For such sediment benzo[a]pyrene concentrations to be relevant to a 6 % increase in lifetime cancer risk would require all residents to ingest several kg of sediment with such concentrations of benzo[a]pyrene every day for a lifetime.

Concerning arsenic, the only other carcinogen for which there is any evidence as potentially being caused by oil sands contamination, our report dealt with this subject in our public health section 10.4.1.3. Arsenic was not specifically addressed in Dr. Timoney's critique of our public health findings. However, to provide some perspective, a cancer risk assessment by Cantox Environmental Inc. (AHW 2007) considered the pathways of exposure to background (not from oil sands development) arsenic by local residents and predicted an upper bound total estimate of 35 cases of cancer per 100,000 per 80 years of exposure and 2 incremental cases of cancer per 100,000 per 80 years of exposure for additional arsenic exposure that could be contributed by oil sands operations in the region. Applying these upper bound (i.e. cautious) estimates to the population of Fort Chipewyan would predict one extra case of cancer every 200 years for the background arsenic exposure risk estimate and one extra case of cancer every 3,000 years for incremental arsenic exposure that might be attributed to oil sands operations.

Dr. Timoney briefly mentioned concerns about synergistic interaction between arsenic and PAHs (Maier et al. 2002, Fischer et al. 2005), but these references do not alter the foregoing findings. Maier et al. (2002) studied the impact of interaction *in vitro* between formation of DNA adducts and the presence of benzo[a]pyrene with or without arsenic in mouse cells. Fischer et al. (2005) studied a similar interaction of these chemicals with a specific genetic marker in mouse skin. Neither of these observations is suitable for quantitatively estimating cancer risk in humans. More relevant to cancer risk estimation, Pershagen et al. (1984) studied the interaction of arsenic and benzo[a]pyrene with tumours of the respiratory tract in hamsters and found no synergistic effect for malignant tumours, but observed only possible evidence of some synergistic interaction for non-malignant tumours. The need to find extraordinary environmental contamination exposures in Fort Chipewyan to explain the estimated cancer excess is not altered by such research findings.

All of this quantitative assessment shows that there would need to be extraordinarily and unrealistically high values of environmental contamination by carcinogens such as benzo[a]pyrene and/or arsenic to

explain elevated cancer rates such as estimated by Chen (2009) for the 12 year period he analyzed. There is considerable uncertainty about whether these elevated cancer rates are real or are simply an artifact of the required calculations involving small numbers of cancer cases in a small and variable population with different characteristics than the comparison population (all of Alberta). Yet, Dr. Timoney criticized our report for justifiably re-assuring residents of Fort Chipewyan that such a comparatively large relative increase in cancer cases could not credibly be attributed to exposures to environmental contaminants from oil sands.

Dr. Timoney stated about our report:
"*Also in the RSC public health section, on the issue of cancer in Fort Chipewyan, the RSC concluded: "... there is no credible evidence to support the commonly repeated media accounts of excess cancer in Fort Chipweyan* [sic] *being caused by contaminants released by oil sands operations..." The RSC authors did not visit Fort Chipewyan or interview local people and presented no new data. The RSC report did not deny increased cancer rates, but, for all intents, dismissed environmental contaminants released by industry as a potential cause. Its discussion of disease rates focused on Northern Lights Health Region data. That region includes the large, transient, and non-traditional population of Fort McMurray. Elevated disease rates in small, traditional populations of long-term residents, such as in Fort Chipewyan would be unlikely to be detected in such an analysis (Timoney 2012).*

Elevated incidences of type II diabetes, lupus, renal failure, and hypertension have been documented in Fort Chipewyan by Alberta Health and Wellness (AHW 2006). The overall rate of cancer in Fort Chipewyan is 30.8% higher than expected by chance (Chen 2009). For individual types of cancer, elevated rates of biliary tract cancers, cancers of the blood and lymphatic system and leukemia, and soft tissue sarcomas have been documented (Chen 2009). Three possible explanations for the elevated and possibly increasing rates of cancer were put forward by Chen (2009): increased risk, increased detection, and chance. The elevated rates of cancer and other diseases in Fort Chipewyan may be statistical anomalies that occur occasionally in small populations. In other words, elevated rates of disease in small populations may be observed without increased risk or increased detection. The problem is that currently there are insufficient data to elucidate causality. Although the RSC dismissed Fort Chipewyan's health concerns in relation to industrial activity, the RSC report did call for a rigorous health risk assessment."[emphasis added]

Although this statement acknowledges that Chen (2009) presented three possible explanations for the report's findings, Dr. Timoney has apparently focused on the increased cancer risk possibility, notably when he confidently interpreted the Alberta Cancer Board (Chen 2009) report findings to members of the community in Fort Chipewyan (http://www.youtube.com/watch?v=Ep4BOdfP5Eg&feature=related).

Dr. Timoney demonstrates an apparent misunderstanding of what the Alberta Cancer Board report (Chen 2009) was capable of determining when he states, as he did above, that Chen found the overall cancer rate to be 30.8% higher than expected. Dr. Timoney did not mention that the Chen (2009) estimate had confidence intervals ranging from -2% to +72%. Someone who understood epidemiologic estimates for cases like this which deal with small numbers would appreciate that this wide confidence interval reflects the instability in the cancer risk estimate that is caused by the very small number of cases of cancer (51 cases over 12 years) in a population that fluctuated from 1165 (in 1995) to 1213 (in 2001) and 1114 (in 2006).

All of the epidemiologic analysis is fundamentally dependent on knowing the denominator (overall population) for the cancer rate calculations. Even more problematic in such calculations is the estimation of the "*expected*" population cancer rates which provide the reference to conclude that

there has been higher or lower than "*expected*" cancer cases. These all require adjusting the age and gender distribution of the population because cancer occurrence is so strongly influenced by gender and age and, in this case, the proportion of the population that is First Nations, which was 82.6% for Fort Chipewyan versus 4.6% for the Alberta population. The expected cancer rates used in the comparison for Fort Chipewyan was achieved by using the cancer rates in the Alberta population, adjusted for the proportion of First Nation individuals, because cancer rates, except for the rare cancer, cholangiosarcoma (with approximately 2.6 times higher occurrence among First Nations in Alberta), have otherwise been lower in First Nations populations compared with Albertans who are not First Nations for the period studied. Making this adjustment means that the "*expected*" cancer rates for Alberta to which Fort Chipewyan was compared in the analysis of Chen (2009) was reduced to account for the overall estimate of 16% lower cancer incidence for First Nations across Alberta for the period under study. The accuracy of this adjustment to determine a valid comparison population for Fort Chipewyan depends entirely on the province-wide rates for cancer occurrence among First Nations being the correct number for First Nations residents of Fort Chipewyan, a reasonable but inherently uncertain assumption. The foregoing concern was third among six limitations to the study that were specified by Chen (2009) but not mentioned by Dr. Timoney. These were stated (Chen 2009) as:

- "*The small population size of Fort Chipewyan limits the ability to interpret results. In larger populations, one additional case does not have the same impact.*
- *The increased rates observed were based on a small number of cases*
- *The First Nations in Fort Chipewyan may have unique characteristics that are different from other First Nations communities in Alberta; this cannot be accounted for in the current analysis.*
- *This study was not able to account for the effect of migration on cancer rate calculation*
- *The study was not designed to determine whether living in Fort Chipewyan elevated cancer risk*
- *The study was not designed to determine the cause of any of the cancers experienced in Fort Chipewyan*."

There are other noteworthy findings by Chen (2009) which Dr. Timoney did not report. For the 12 years from 1995 to 2006 that were studied, there were zero cases of childhood (0-19 years of age) cancer. Because cancer typically has a lag time for development into a condition which can be diagnosed ranging from 10 to 40+ years for many cancers, childhood cancers are regarded as possible early sentinels for evaluating environmental causes of cancer. Dr. Timoney, by stating as he does: "*The overall rate of cancer in Fort Chipewyan is 30.8% higher than expected by chance (Chen 2009)"* does not show any appreciation of the wide confidence interval (-2% to +72%) that applies to the Alberta Cancer Board cancer rate estimate.

Dr. Timoney states in his published February 24 viewpoint: "*Dismissal of downstream public health concerns was not justified given the superficial treatment of the data and the considerable remaining unknowns such as the need to quantify total exposure to contaminants and to explain the increased rates of cancers and other diseases in the downstream community of Fort Chipewyan.*" As we have explained above, we did not dismiss the health concerns, but because we are able to judge cancer risk issues on at least approximate quantitative grounds, even in cases where there is substantial uncertainty, we are able to confidently judge that the cancer fear mongering that has been evident in the media and which Dr. Timoney appears to support with his criticism of our report is without merit or scientific foundation.

B13. RSC Panel lacked expertise in environmental chemistry, hydrology, sedimentology, surficial materials, statistics and wildlife ecology

Dr. Timoney alleged that we "*lacked expertise in environmental chemistry, hydrology, sedimentology, surficial materials, statistics and wildlife ecology*". In response to this allegation, we have provided our publication lists in Appendix B to this report. In his April 11, 2012 final rebuttal, Dr. Timoney states: "*Although Hrudey et al. attempt to divert attention from their report's deficiencies and direct readers to their list of publications (which are largely irrelevant to the issues at hand), the facts speak louder.*"

We do not know what could be more relevant to answering Dr. Timoney's allegation about our lack of expertise than providing our publication lists so that unbiased readers can judge for themselves whether or not we have the disciplinary knowledge deficiencies that he alleges. We are not clear what are the "*facts"* that "*speak louder*" to which Dr. Timoney is referring.

B14. Anonymity of contributors

Dr. Timoney in his published February 24 viewpoint stated: "*Upon study of the RSC report, and discussions with other scientists, it became evident that a scientific review of the report was warranted. This viewpoint summarizes a critical review of the water quality and quantity section of the RSC report. The detailed scientific review is available.*" [emphasis added]

In his website critique he states under the heading Acknowledgments: *"Various scientists contributed review comments. This work was conducted in the public interest and without funding.*" [emphasis added]

Given the tone and content of Dr. Timoney's critiques we are not surprised that other scientists who may have been involved would not wish to be identified with these documents, but it says little about the credibility or integrity of other scientists who would engage in this type of critique while choosing to remain anonymous.

C. ADDITIONAL TOPICS ON WEBSITE CRITIQUE NOT RAISED IN VIEWPOINT

C.1 Inadequate attention to habitat loss

Dr. Timoney states in his website critique: "*And finally, although the RSC report as a whole touched on the issue of habitat loss as it affects the region's wildlife populations, the treatment was cursory. Little effort was made to quantify the effect of habitat loss on wildlife populations."*

We did address issues of wildlife habitat in our section on land reclamation (as cited below). Ideally, we might have liked to have gone into greater depth on this issue. That said, quantifying the effect of habitat loss on wildlife populations is not a trivial undertaking to have any validity and this is not a realistic expectation for a review of our scope. Within the overall scope we set for this review, we believe that we did draw attention to the matter of habitat loss as being an issue of importance.

We focused our discussion primarily on the capability of land reclamation to restore landscapes to functional habitat, stating in our report:
"*Faunal biodiversity loss with oil sands development is a critical issue garnering much attention. There is debate as to the impact that oil sands developments and operations have had and will have on faunal biodiversity and on the likelihood of any reduced faunal biodiversity being reinstated with reclamation. Although it is difficult to address the latter point until more reclaimed areas have been certified and*

more time has passed for reconstructed ecosystems to develop, some key issues can be addressed via the research to date.

Oil sands development creates several landscape components damaging to fauna, including open pit mines, tailings ponds, and operations infrastructure. These features are mainly associated with direct habitat loss and alteration and fragmentation of additional habitat. Although in situ operations are expected to disturb a smaller area than mining, there is still much concern surrounding habitat fragmentation from seismic lines, roads, pipelines, well pads, and power lines, which increase the overall area of impact. The loss and fragmentation of habitat and subsequent biodiversity is of concern from ecological and land use perspectives, including traditional land uses. Even though these areas will be reclaimed, there is a long time between habitat destruction and successful reclamation. Many oil sands companies are attempting to deal with these inevitable habitat losses with conservation offsets and complementary strategies including enhancing reclamation, enhancing mitigation efforts and conserving substitute forest areas so no net loss of critical habitat is maintained in perpetuity. Although environmental impact assessments associated with oil sands development state no net loss of wildlife habitat will occur because land will be reclaimed, numerous reports have cited habitat loss and fragmentation as the single greatest threat to wildlife in the oil sands region (Gould Environmental 2009; Gillanders et al. 2008).

According to some studies, there is insufficient functional habitat to maintain and increase current caribou distribution and population growth rates within the Athabasca landscape area; boreal caribou will not persist for more than two to four decades without immediate and aggressive management intervention (Athabasca Landscape Team 2009). All monitored caribou populations in the Athabasca oil sands area are currently in decline, and recent trends and simulation modeling results indicate that there is a high risk that the populations will not persist for more than forty years. Caribou movement is predicted to be affected by oil sands operations, particularly in situ; thus the above concerns are magnified by oil sands disturbances. Few studies exist on the actual impact of oil sands on caribou, although some studies can reasonably be used to predict impacts. Seismic lines were not barriers to caribou movements, but roads with moderate vehicle traffic acted as semi-permeable barriers to caribou movements, particularly during the winter (Dyer et al. 2002; Dyer et al. 2001), suggesting the large area of road development in oil sand mining areas will impact winter movement of caribou.
Above-ground pipelines for in situ oil sands development are potentially significant vectors of habitat fragmentation for other large mammals such as moose, although pipeline crossing structures facilitated movement across the pipeline and were used more than sections of elevated pipelines by all species (Dunne 2007; Dunne and Quinn 2008). Although concerns centre around impacts on other large mammals, there are no studies to document those impacts."

C.2 Other environmental issues

Dr.Timoney states in a general section of comments: "*Because it has been shown that air emissions can impact ecosystems (e.g., Kelly et al. 2009, 2010), the RSC was remiss not to review relevant findings that were published prior to the completion of its report. Some of those findings are summarized below".*[emphasis added]

This statement about Kelly et al. (2009, 2010) is not accurate because they made no measurements of ecological impact; both papers were studies to determine whether they could detect the presence of contaminants that might be attributable to industrial sources. Simply detecting substances does not constitute an ecological impact. That said, we acknowledge that we did not review the various 2010 references that he mentions (Byternowicz et al. 2010, Curtis et al. 2010, Whitfield et al. 2010, Wieder et

al. 2010). These were all contained in a special supplement of the *Journal of Limnology* that was published in 2010. In retrospect, it might have been useful for us to have reviewed these papers but having now reviewed these papers, we do not find anything that would have changed our overall findings. However, we find that Dr. Timoney's representation of what these publications have to say is not balanced or entirely accurate, as we have noted earlier for Curtis et al. 2010 in Section B10.

Dr. Timoney states: "*The bitumen sands region of northern Alberta is the largest industrial source of sulphur emissions in Canada (Whitfield et al. 2010). Current emissions of sulphur dioxide are about 300 metric tons/day; estimated emissions for 2015 range from 350 to 400 metric ton/day (Wieder et al. 2010).*"

The statement accurately quoted from Whitfield et al. (2010) by Dr. Timoney only came closer to being true in 2010, not so much because of increased oil sands emissions of sulphur dioxide, but more because Hudson's Bay Mining and Smelting (HBMS) in Flin Flon, Manitoba dramatically reduced its activity and corresponding sulphur dioxide emissions. Environment Canada's National Pollutant Release Inventory - NPRI (Environment Canada 2012) shows that in 2010, sulphur dioxide emissions from this single industrial operation (not an industry sector like the oil sands) dropped to 58,000 tonnes per year or 160 tonnes/day (to allow comparison with the Whitfield et al. (2010) figures for oil sands industry emissions of sulphur dioxide). But, according to NPRI the average daily emissions of sulphur dioxide from HBMS over the 8 years from 2002 to 2009 were over 510 tonnes per day, substantially greater than even the future emissions from oil sands projected by Wieder et al. (2010). NPRI reported for 2010 that the non-ferrous metal smelting industry in Ontario emitted over 139,000 tonnes of sulphur dioxide per year (over 380 tonnes per day). Therefore, according to Environment Canada's NPRI data, Ontario's non-ferrous metal smelting industry has become Canada's largest emission source for sulphur dioxide, given the production decline of the smelting industry in Manitoba.

Dr. Timoney also described the findings of Curtis et al. (2010):
"*Curtis et al. (2010) studied 12 basins for chemical, spatial, and paleolimnological parameters. All lake sediment cores showed evidence of industrial contamination based on spheroidal carbonaceous particles (unambiguous indicators of fossil fuel combustion). Most lakes showed changes in diatom assemblages and sediment carbon:nitrogen ratios consistent with nutrient enrichment, with potential drivers including climate change, forest fires, and anthropogenic nitrogen deposition.*

In a study of industrial SO_2 and NOx deposition into lakes in the region, Hazewinkel et al. (2008) noted that the rate of bitumen extraction was outpacing the growth of ecological understanding. The extent of potential disturbances caused by atmospheric deposition was essentially unknown. They observed that complex in-lake biogeochemical processes could buffer acidity while increasing the availability of phosphorus and nitrogen. They concluded that the lakes studied showed characteristic changes towards greater productivity and that the majority of the lakes were on trajectories of rapid ecological change that were not incompatible with industrial atmospheric inputs."

Dr. Timoney's summary of the findings of Curtis et al. (2010) did not mention: *"Overall, the isotope and C/N ratio profiles for the 12 lakes did not show any systematic changes in the biogeochemistry of the lakes that can be attributed to recent oil sands activities related to the extraction of oil."* [emphasis added]

Curtis et al. (2010) also concluded "*various palaeolimnological analyses indicated that acidification does not appear to be a widespread problem in northern Alberta and largely support the conclusions of Hazewinkel et al. (2008). However, we do present the first evidence for one site with a significant, recent*

acidification (lake NE7). This is one of the smallest and shallowest of the sites studied with a peaty catchment, and it is possible that lakes of a similar type are the most vulnerable to the potentially acidifying impacts of deposition arising from the Oil Sands extraction activities."

Dr. Timoney did not mention in this section what our report did say about acidification concerns in our Section 7 on air pollution:
"*Saskatchewan Environment has implemented an air monitoring program with the assistance of equipment provided by Alberta Environment and these agencies along with the ERCB have signed a MoU on management of acid deposition in the region (Maqsood et al. 2006). Monitoring at 10 locations ranging from 25 km east of the Alberta–Saskatchewan border to 235 km east showed that maximum and six-month average NO_2 values were highest at the 25 km site and were elevated up to 150 km east of the Alberta border. In contrast, for 14 locations up to 512 km east of Alberta (within 100 km of the Manitoba–Saskatchewan border), there was no evidence of SO_2 influence from Alberta, but there was clear influence of elevated SO_2 within 180 km of the Manitoba border, most likely reflecting impacts from the Hudson's Bay Mining and Smelting complex at Flin Flon which accounted for almost 12% of all SO_2 emissions in Canada for 2008 according to NPRI.*

Monitoring and modeling of 424 lakes in northwest Saskatchewan for 2002 found that calculated acidification loading exceeded critical loads for 33% of the lakes (Das 2009). Updating 2007 monitoring data for lakes of the Environment Canada national critical loading map revealed that northwest Saskatchewan is among the most acid-deposition sensitive regions in Canada. While the SO_2 monitoring is somewhat encouraging for the influence SO_2 emitted from the oil sands may be having on northwest Saskatchewan, the impact of NO_2 emissions from the oil sands is clearly a concern and the issue of lake acidification of northwest Saskatchewan is a critical example of a cumulative environmental impact from oil sands which must be managed. The findings about elevated NO_2 levels in Saskatchewan further justify AENV effectively implementing its BATEA policy for emissions control. " [emphasis added]

We do not accept Dr. Timoney's view that our observations were "*down-playing*" potential concerns for lake acidification.

C3. Editorial and other matters

Dr. Timoney commented: "*For a report that devoted much of its attention to environmental impacts, there was a paucity of ecologists in the author team. The authorship for each chapter was not provided. Although the report was authored by "The Royal Society of Canada Expert Panel", only one member of the panel is a member of the Royal Society of Canada, and that member is not an ecologist.*"

These criticisms are not well informed. Our report was directed at dealing with the environmental and health impacts of Canada's oil sands industry, a scope much broader than just the specific scientific discipline of ecology. Our panel's expertise in aquatic biology and landscape restoration ecology was appropriate to our scope.

Dr. Timoney contacted one of us (S.E.H.) before he published his viewpoint critique and he was advised by email (partially quoted in his website critique, Timoney 2012b) about the authorship of individual chapters as follows: "*we had one or two lead authors for each section, but every section of this report was reviewed by every member of the expert panel and all sections of the report were approved by all members of the expert panel*." This is common practice for expert panel reports, particularly when being written as a consensus document for an audience of interested citizens.

The comment about only one member of the panel being a member (the correct term is "*fellow*") of the Royal Society of Canada is correct, but is otherwise irrelevant. Panelists were selected for their specific expertise (see our publications lists in Appendix B) and willingness to commit to the massive volunteer undertaking that was involved. Anyone familiar with national academy reports (Royal Society [U.K.], Royal Society of Canada, Council of Canadian Academies, National Academy of Sciences [U.S.]) will know that being a fellow of those respective academies is not a requirement for serving on an academy expert panel and it is common for the majority of such panelists to not be fellows.

Dr. Timoney finally observes: "*In summary, the author(s) of Section 8 (chapter on water quantity and quality) is anonymous; the expertise of the reviewers in regard to water issues is unspecified; and the nature and extent of the review comments for Section 8 are unspecified. Given the stated* 'extensive and demanding*' review prepared by seven authors and eight peer reviewers, the myriad deficiencies in the RSC's treatment of water quantity and quality issues represent a remarkable deviation between observed and expected results.*" [emphasis added]

The authors of Section 8 are the entire panel, as was explained by the email from one of us (S.E.H.) to Dr. Timoney quoted above, so it is not accurate to allege that the authors are "*anonymous*". All panelists were described with bios in our report, so it is fairly obvious which of our panelists likely had the greatest input to drafting Section 8, but all panelists are authors of the entire report. As noted earlier, our individual publication lists are provided in Appendix B. These provide further evidence about individual panel member expertise relevant to water issues.

Dr. Timoney alleges we were not careful in our editing, stating:
Three examples of apparent plagiarism were found in Section 8.4 of the RSC report, as follows:
(1) Original (Timoney 2007): "There are presently no Canadian guidelines for total PAHs in sediment.*"*
RSC (2010): "There are presently no Canadian guidelines for total PAHs in sediment…*"*
(2) Original (Timoney 2007): "*…* the US National Oceanic and Atmospheric Administration (Johnson 2000) recommended a threshold of 1 mg/kg dry weight of total PAHs in marine sediment for protection of estuarine fish populations.*" RSC (2010):* "*…* the U.S. National Oceanic and Atmospheric Administration (Johnson 2000) recommended a threshold of 1 mg/kg dry weight of total PAHs in marine sediment for protection of estuarine fish populations.
(3) Original (Timoney and Lee 2009): "Levels of PAHs in sediment of the Athabasca River are about twice that observed to induce liver cancers in fishes.*" RSC (2010):* "*…* levels of PAHs in sediment of the Athabasca River are about twice those observed to induce liver cancers in fishes.*"*

The plagiarized text may illustrate one of the risks of preparing a document under time constraints." [emphasis added]

These "*three*" cases cited above are actually a single extract from our report. We are also not clear why Dr. Timoney presents the first two items as being from "Timoney 2007" because those extracts are both found in Timoney and Lee (2009), the source he has cited for the third item.

This offending passage of two sentences appeared in our report as:

"*There are presently no Canadian guidelines for total PAHs in sediment although the U.S. National Oceanic and Atmospheric Administration (Johnson 2000) recommended a threshold of 1 mg/kg dry weight of total PAHs in marine sediment for protection of estuarine fish populations. The levels of PAHs*

in sediment of the Athabasca River are about twice those observed to induce liver cancers in fishes (Myers et al. 2003)."

As Dr. Timoney has suggested, this passage in our report was not properly edited. Accordingly, we can agree with Dr. Timoney's observation about preparing a document under time constraints, but these time constraints were self-imposed by the reality of our volunteer status; no restrictive timelines were imposed on us by the Royal Society of Canada.

Dr. Timoney presents a number of editorial issues that he lists under a heading of Minor Issues. We address each of these, in turn, as follows.

Dr. Timoney states:
"Minor Issues
There were examples of inconsistent or incorrect spelling, mistakes in references, and poorly reproduced figures and tables. The mis-spelling of the town of Fort Chipewyan four times in the report was egregious in light of the RSC's dismissal of this downstream community's health concerns as they relate to the activities of the bitumen industry."

(1) Spelling both inconsistent and incorrect:
Examples: "Groundwater" vs. "ground water"

"Clemenete" vs. "Clemente" (latter is correct)

"Fort Chipweyan" vs. "Fort Chipewyan" (latter is correct)

"Ministes" vs. "Ministers" (latter is correct)

These few typographical errors will be corrected in our report.

Dr. Timoney states:
"(2) Mistakes in references:

"RAMP (2009)" cited when RAMP (2010) was the correct reference.

"Total E&P Joslyn Ltd. (2010, missing from the RSC references cited)"

We acknowledge that there is confusion regarding RAMP (2009) and RAMP (2010) because the 2009 Final Technical Report of RAMP which we referred to often was published in April 2010 and this 2009 RAMP program report should have been cited consistently as RAMP (2010). A report that was correctly cited as RAMP (2009) was published in December 2009 and was titled: "*Technical Design and Rationale*." Our report will be corrected to insure that the correct RAMP reports are cited in each case.

Dr. Timoney is correct that the Total E&P Joslyn Ltd. (2010) was missing from the references listed for Section 8 of our report, this will be corrected.

Dr. Timoney states: "*Figure 8.1 on "conceptual regional groundwater flow patterns" was carelessly reproduced from its source. The original figure contains arrows that depict radial and semi-radial groundwater flow patterns that converge upon the Athabasca and Clearwater Rivers. No such arrows*

exist in the RSC figure; no groundwater flow patterns were depicted in the figure and therefore the figure conveyed no information to the reader."

Dr. Timoney suggests our graphic artist "*carelessly*" reproduced an original figure (Figure 8.1). The arrows mentioned were indeed missed in the figure that was used in the report. This oversight had been noted on the final proofing of the dozens of figures that we had re-drawn for this report. Unfortunately, the corrected version was not placed into the final document. While we acknowledge this, we do not view this oversight in the preparation of a 440 page document containing 49 figures as evidence of being "*careless*" in any sense that should pose a concern for readers of our report. The corrected figure will be provided in the final document.

Dr. Timoney states: *"Table 8.4 and 8.5 in the RSC report presented summaries of selected inorganic and organic parameters for oil sands process water, the Athabasca River, and regional lakes. Unfortunately, the RSC did not report whether the single values reported were means, medians, or modes, whether the data were normally-distributed, and what the sample sizes were for each of the parameters and sites. Because of this missing statistical documentation, the tables were of little use."*

The captions for the tables in question missed reporting that single values were mean values and the ranges were mean values from multiple sites. This information was available in the source (Allen 2008a) cited for these tables. We expect any readers intending to perform statistical interpretation of these data would refer to the original paper for full details.

Dr. Timoney states: *"In a criticism of an analysis of PAH concentrations in the Muskeg River that used RAMP data (Timoney and Lee 2009), the RSC erroneously reported the RAMP results to be from Appendix D-1; they were not. The RAMP results were taken from Appendix D-4."*

Dr. Timoney is correct that Appendix D-4 in RAMP (2007), the 2006 RAMP Final Technical Report should have been cited, not Appendix D-1. This typographical error will be corrected in our report.

Dr. Timoney states: *"In a criticism of an analysis of sediment PAH concentrations in the Athabasca River Delta (Timoney 2007), the RSC referred to sediment PAH data from RAMP (2010, "Section 8.4"). Again, RSC was in error. Section 8.4 of RAMP (2010) pertains to fish populations, not to PAHs. The correct section of the RAMP (2010) report was section 8.3.2, in which RAMP (2010) referred to their Table 8.2-1; no statistical results of tests for differences were reported in the RAMP table."*

Dr. Timoney is correct that Section 8.4 is not the citation we had intended for this discussion, but his assumption that we were relying on Section 8.3.2 and Table 8.2-1 was not correct. Our observations in this case were actually based on Tables 5.1-10 to 5.1-13 which failed to show any consistent increasing patterns of sediment PAHs for the September 2009 sediment samples in relation to the minimum, median and maximum values for the previous 6 to 8 fall samples at the same sites dating back to 1997.

D. CLOSING COMMENTARY

The progress of knowledge through scientific discourse relies on continuous challenging of accepted interpretations and beliefs, so we have welcomed constructive discussion of differing views regarding our report on oil sands. We certainly had extensive discussion and debate on many issues within our

panel as we drafted this report. We did disagree among us in some cases. We engaged each other in constructive debate to reach a consensus that we could all accept having our names associated with.

Qualified scientists can honestly disagree over the interpretation of the same evidence. Scientists will normally debate each other directly in such matters, or they may, as Dr. Timoney chose to do, publish a critique without engaging those being criticized. It is less common for scientists to pursue the latter course of action and simultaneously engage national media in advance to publicize their critique. We presume that Dr. Timoney had reasons for pursuing this media-oriented approach.

Dr. Timoney characterizes our report as a rushed, superficial, biased and largely inadequate effort. We invite readers to read our report and judge for themselves whether our report is as Dr. Timoney has characterized it.

REFERENCES CITED

The following list of references includes only those which we have cited. References only cited in quotes from Timoney (2012a,b or c) can be found in those references.

AB Energy. 2012. *Oil Sands Publications, Videos and Map*s. Alberta Department of Energy http://www.energy.alberta.ca/OilSands/960.asp

AHW (Alberta Health and Wellness) 2007. *Assessment of the Potential Lifetime Cancer Risks Associated with Exposure to Inorganic Arsenic among Indigenous People living in the Wood Buffalo Region of Alber*ta. Prepared by Cantox Environmental Inc. Edmonton, Alberta: Alberta Health and Wellness.

AENV (Alberta Environment). 2007. *Water Management Framework: Instream Flow Needs and Water Management System for the Lower Athabasca River*. Edmonton Alberta: Alberta Environment. Fisheries and Oceans Canada. http://environment.alberta.ca/documents/Athabasca_RWMF_Technical.pdf

Athabasca Landscape Team. 2009. *Athabasca caribou landscape management options report*. http://www.albertacaribouccommittee.ca/PDF/Athabasca-Caribou.pdf.

Ayles G. B., M. Dubé, and D. Rosenberg. 2004. *Oil Sands Regional Aquatic Monitoring Program (RAMP) Scientific Peer Review of the Five Year Report* (1997–2001) (Fisheries and Oceans Canada, Winnipeg, Manitoba, Canada).

Bachu, S., and M. Grobe. 2000. *Suitability of the Alberta Subsurface for Carbon-Dioxide Sequestration in Geological Media. Earth Sciences* Report 00-11. Alberta Energy and Utilities Board. Alberta Geological Survey.

Baird S.J.S., E.A. Bailey EA and D.J. Vorhees. 2007. Evaluating human risk from exposure to alkylated PAHs in an aquatic system. *Human and Ecological Risk Assessment*. 13: 322–338.

Bayne, E. M., E. L. Habib, and S. Boutin. 2008. Impacts of chronic anthropogenic noise form energy sector activity on abundance of songbirds in the boreal forest. *Conservation Biology* 22: 1186–1193.

Bytnerowicz A, Fraczek W, Schilling S, Alexander D. 2010. Spatial and temporal distribution of ambient nitric acid and ammonia in the Athabasca Oil Sands Region, Alberta. *Journal of Limnology*. 69(Suppl. 1):11-21.

Carls, M. G., L. G. Holland, J. W. Short, R. A. Heintz, and S. D. Rice. 2004. Monitoring polynuclear aromatic hydrocarbons in aqueous environments with passive low-density polyethylene membrane devices. *Environmental Toxicology and Chemistry* 23: 1416–1424.

Chen Y. 2009. *Cancer Incidence in Fort Chipewyan, Alberta 1995–2006*. Alberta Cancer Board, Division of Population Health and Information Surveillance, Alberta Health Services.

Conly, F. M., R. W. Crosley, J. V. Headley, and E. K. Quagraine. 2007. Assessment of metals in bed and suspended sediments in tributaries of the Lower Athabasca River. *Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering* 42 (8): 1021–1028.

Conly, F. M., R. W. Crosley, and J. V. Headley. 2002. Characterizing sediment sources and natural hydrocarbon inputs in the lower Athabasca River, Canada. *Journal of Environmental Engineering and Science* 1 (3): 187–199.

Curtis CJ, Flower R, Rose N, Shilland J, Simpson GL, Turner S, Yang H, Pla S. 2010. Palaeolimnological assessment of lake acidification and environmental change in the Athabasca Oil Sands Region, Alberta. *Journal of Limnology*. 69(Suppl. 1):92-104.

Dagenais, L. Y. 2009. *Post-Mining Habitats and Breeding Birds in the Athabasca Oil Sands Region*. MSc thesis, Department of Renewable Resources, University of Alberta, Edmonton, Alberta.

Das, B. 2009. *Ecological baseline information in northwest Saskatchewan*. Regina, Saskatchewan: Technical Resources Branch, Saskatchewan Ministry of Environment.

DFO. 2010. *Science Evaluation of Instream Flow Needs (IFN) for the Lower Athabasca River*, Science Advisory Report 2010/055; Canadian Science Advisory Secretariat: Department of Fisheries and Oceans. Ottawa.

Dreimanis, A., and C. Schlüchter. 1985. Field criteria for the recognition of till or tillite. *Palaeogeography, Palaeoclimatology, Palaeoecology*., 51: 7-14.

Dunne, B. M., and M. S. Quinn. 2008. Effectiveness of above-ground pipeline crossing structures for moose (*Alces alces*) and other large mammals. *Biological Conservation* 142: 332–343

Dunne, B. 2007. *Effectiveness of Above Ground Pipeline Crossing Structures for the Movement of Moose and Other Large Mammals*. MSc thesis, University of Calgary, Calgary, Alberta.

Dyer, S. J., J. P. O'Neill, S. M. Wasel, and S. Boutin. 2002. Quantifying barrier effects of roads and seismic lines on movements of female woodland caribou in northeastern Alberta. *Canadian Journal of Zoology* 80: 839–845.

Dyer, S. J., J. P. O'Neill, S. M. Wasel, and S. Boutin. 2001. Avoidance of industrial development by woodland caribou. *Journal of Wildlife Management* 65: 531–542.

Environment Canada. 2012. National Pollutant Release Inventory, NPRI. Environment Canada, Ottawa. http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=B85A1846-1

Environmental Defence. 2008. *The tar sands' leaking legacy*, Toronto, Canada.

EC 2005. European Commission Regulation 208/2005 of 4 February 2005 amending Regulation (EC) No 466/2001 as regards polycyclic aromatic hydrocarbons. *Official Journal of the European Union*. L34/3-4.

Ferguson, G. P., D. L. Rudolph, and J. F. Barker. 2009. Hydrodynamics of a large oil sands tailings impoundment and related environmental implications. *Canadian Geotechnical Journal* 46: 1446–1460.

Fischer J.M., S.B. Robbins, M. Al-Zoughool, S.S. Kannamkumarath, S.L. Stringer, J.S. Larson, J.A. Caruso, G. Talaska, P.J. Stambrook and J.R. Stinger. 2005. Co-mutagenic activity of arsenic and benzo[a]pyrene in mouse skin. *Mutation Research*. 588: 35-46.

Gentes, M., A. McNabb, C. Waldner, and J. E. G. Smits. 2007. Increased thyroid hormone levels in tree swallows (*Tachycineta bicolor*) on reclaimed wetlands of the Athabasca Oil Sands. *Archives of Environment Contamination and Toxicology* 53: 287–292.

Gentes, M., C. Waldner, Z. Papp, and J.E.G. Smits. 2006. Effects of oil sands tailings compounds and harsh weather on mortality rates, growth and detoxification efforts in nestling tree swallows (*Tachycineta bicolor*). *Environmental Pollution* 142; 24–33.

Gillanders, S., N. C. Coops, M. A. Wulder, and N. R. Goodwin. 2008. Application of Landsat satellite imagery to monitor land cover changes at the Athabasca Oil Sands, Alberta, Canada. *Canadian Geographic* 52: 466–485.

Gould Environmental. 2009. Wildlife Issues Resulting From Oil Sands Operations. Report to Environment Canada.

Harms, N. J., G. D. Fairhurst, G. R. Bortolotti, and J. E. G. Smits. 2010. Variation in immune function, body condition, and feather corticosterone in nestling tree swallows (*Tachycineta bicolor*) on reclaimed wetlands in the Athabasca oil sands, Alberta, Canada. *Environmental Pollution* 158: 841–848.

Hazewinkel RRO, Wolfe AP, Pla S, Curtis C, Hadley K. 2008. Have atmospheric emissions from the Athabasca Oil Sands impacted lakes in northeastern Alberta, Canada? *Canadian Journal of Fisheries and Aquatic Science*. 65: 1554-1567.

Headley, J. V., B. Crosley, F. M. Conly, and E. K. Quagraine. 2005. The characterization and distribution of inorganic chemicals in tributary waters of the lower Athabasca River, oil sands region of Canada. *Journal of Environmental Science and Health, Part A* 40: 1–27.

Health Canada. 2008. *Guidelines for Canadian Drinking Water Quality*. Federal-Provincial-Territorial Committee on Drinking Water. www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/sum_guide-res_recom/summary-sommaire-eng.pdf

Hicock, S.R., and J. Menzies. 2000. Aleksis Dreimanis: a legacy in Quaternary science, *Quaternary Science Reviews* 19: 1665-1676.

Hrudey, S.E and D. Krewski. 1995. Is there a safe level of exposure to a carcinogen? *Environmental. Science & Technology.* 29(8), 370A-375A.

Hunter G. 2001. Investigation of groundwater flow within an oil sand tailings impoundment andenvironmental implications. M.Sc. Thesis, Waterloo, Ontario: University of Waterloo.

Jacques Whitford. 2008. *A Review of Water Quantity Issues Related to Environmental Assessments of Selected Major Natural Resource Projects: Oil Sands*, prepared for Sustainable Water Management Branch Environment Canada.

Kelly, E. N., D.W. Schindler, P.V. Hodson, J.W. Short, R. Radmanovich, and C.C. Nielsen. 2010. Oil sands development contributes elements toxic at low concentration to the Athabasca River and its tributaries. *Proceedings of the National Academy of Sciences of the USA* 107: 16178–16183.

Kelly, E. N., J.W. Short, D.W. Schindler, P.V. Hodson, M. Ma, A.K. Kwan, and B.L. Fortin. 2009. Oil sands development contributes polycyclic aromatic compounds to the Athabasca River and its tributaries. *Proceedings of the National Academy of Sciences of the USA* 106: 22346–22351.

Lemay, T. G., and K. Parks, L.D. Andriashek, K. Michael, G.M. Jean, S.A. Stewart, E. Kempin. 2005. *Regional Groundwater Quality Appraisal, Cold Lake-Beaver River Drainage Basin, Alberta*, Alberta Energy and Utilities Board, Alberta Geological Survey, Special Report 073.

Millennium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being: Wetlands and Water Synthesis*. World Resources Institute, Washington, DC.

Maier A., B.L. Schumann, X. Chang, G. Talaska and A. Puga. 2002. Arsenic co-exposure potentiates benzo(a)pyrene genotoxicity. *Mutation Research* 517: 101-111.

Machtans, C. S. 2006. Songbird response to seismic lines in the western boreal forest: a manipulative experiment. *Canadian Journal of Zoology* 84: 1421–1430.

Maqsood, I., C. Bosgoed, C. Gray, M. Hilderman, L. Langford. 2006. Air Quality in Northern Saskatchewan – a field study to understand transboundary acidic emissions. Air Quality 2006 – Piecing the Puzzle, Banff, Alberta, February 14–16, 2006.

Newman, M.C. 2008. What exactly are you inferring? A closer look at hypothesis testing. *Environmental Toxicology and Chemistry*. 5: 1013 – 1019.

Oakes, M. 1990. *Statistical Inference*. Epidemiology Resources Inc. Newton Lower Falls, Massachusetts. U.S.A.

Parsons B.G., S.A. Watmough, P.J. Dillon and K.M. Somers. 2010. A bioassessment of lakes in the Athabasca Oil Sands Region, Alberta, using benthic macroinvertebrates. *Journal of Limnology*. 69(Suppl. 1):105-117.

Pershagen, G., G. Nordberg and N.E. Bjorklund. 1984. Carcinomas of the respiratory tract in hamsters given arsenic trioxide and/or benzo[a]pyrene by the pulmonary route. *Environmental Research*. 34: 277-241.

Putz, G., and D.W. Smith. 1998. Verification of a transient input, two-dimensional, river mixing model. *Canadian Journal of Civil Engineering* 25: 51–66.

RAMP (Regional Aquatic Monitoring Program). 2007. *Final Technical Report, Regional Aquatic Monitoring Program, 2006*. Prepared for RAMP Steering Committee by the RAMP 2006 Implementation Team.

RAMP (Regional Aquatic Monitoring Program). 2009. *Technical Design and Rationale*. *Regional Aquatic Monitoring Program*. December 2009.

RAMP (Regional Aquatic Monitoring Program). 2010. *Final Technical Report*, *Regional Aquatic Monitoring Program 2009*. Prepared for the RAMP Steering Committee by the RAMP 2009 Implementation Team

Rood, S.B., J. Pan, K.M. Gill, C.G. Franks, G.M. Samuelson, A. Shepherd. 2008. Declining summer flows of Rocky Mountain rivers: Changing seasonal hydrology and probable impacts on floodplain forests. *Journal of Hydrology*. 349: 397-410.

Sauchyn, D. and S. Kulshreshtha. 2008. Prairies. In: *From Impacts to Adaptation – Canada in a Changing Climate – 2007*. (eds. Lemmen, D. S., F. J. Warren, J. Lacroix, and E. Bush.) Ottawa, Ontario: Government of Canada. pp. 275–328.

Saudi Aramco 2010. Annual Report.

Schindler DW, Donahue WF. 2006. An impending water crisis in Canada's western prairie provinces. *Proceedings of the National Academy of Sciences of the USA* 103(19):7210-7216.

Schneider, K., M. Roller, F. Kalberlah, U. Schumacher-Wolz. 2002. Cancer risk assessment for oral exposure to PAH mixtures. *Journal of Applied Toxicology*. 22: 73-83.

Smits, J. E., M. M. Wayland, M. J. Miller, K. Liber, and S. Trudeau. 2000. Reproductive, immune, and physiological endpoints in tree swallows on reclaimed oil sands mine sites. *Environmental Toxicology and Chemistry* 19: 2951–2960.

Squires, A. J., C. Westbrook, and M. G. Dube. 2010. An approach for assessing cumulative effects in a model river, the Athabasca River basin. *Integrated Environmental Assessment and Management* 6 (1): 119–134.

Tetreault, G.R., M. E. McMaster, D. G. Dixon, and J. L. Parrott. 2003. Using reproductive endpoints in small forage fish species to evaluate the effects of Athabasca oil sands activities. *Environmental Toxicology and Chemistry* 22: 2775–2782.

Timoney, K.P. 2012a. Environmental and health impacts of Canada's bitumen industry: In search of answers. *Environmental Science & Technology*. 46: 2496−2497.

Timoney, K.P. 2012b. The full critical review of the RSC report. http://www.treelineecological.ca

Timoney, K.P. 2012c. Response to Hrudey et al. letter in reference to Timoney critique of Royal Society of Canada Report. *Environmental Science & Technology*. 46: 4685.

Timoney, K. P, and P. Lee. 2011. Polycyclic aromatic hydrocarbons increase in the Athabasca River Delta sediment: temporal trends and environmental correlates. *Environmental Science & Technology*. 45: 4278-4284.

Timoney, K. P, and P. Lee. 2009. Does the Alberta Tar Sands Industry Pollute? The Scientific Evidence. *The Open Conservation Biology Journal* 3: 65–81.

Timoney K.P., Ronconi, RA. 2010. Annual bird mortality in the bitumen tailings ponds in northeastern Alberta, Canada. *The Wilson Journal of Ornithology* 122(3):569-576.

Total E&P Joslyn Ltd. (2010) *Joslyn North Mine Project. Joint Review Panel Integrated Application and Supplemental Information*: updated February 2010.

Wells, J., S. Casey-Lefkowitz, G. Chavarria, and S. Dyer. 2008. *Danger in the nursery. Impact on birds of tar sands oil development in Canada's boreal forest*. New York: Natural Resources Defense Council.

Whitfield CJ, Aherne J, Watmough SA, McDonald M. 2010. Estimating the sensitivity of forest soils to acid deposition in the Athabasca Oil Sands Region, Alberta. *Journal of Limnology.* 69 (Suppl. 1):201-208.

Wieder RK, Vitt DH, Burke-Scoll M, Scott KD, House M, Vile MA. 2010. Nitrogen and sulphur deposition and the growth of *Sphagnum fuscum* in bogs of the Athabasca Oil Sands Region, Alberta. *Journal of Limnology*. 69 (Suppl. 1):161-170.

Yoccoz, N.G. 1991. Use, overuse and misuse of significance tests in evolutionary biology and ecology. *Bulletin of the Ecological Society of America*. 72(2): 106-111.

APPENDIX A

RSC Panel Response to Timoney (2012a) published in *Environmental Science & Technology* 46: 4257-4258.

Dr. Timoney's critique[1] of our December 2010 Royal Society of Canada (RSC) expert panel report[2] reviewing the environmental impacts of Canada's oil sands industry is inaccurate and misleading. We made clear that this is a massive industrial development that causes some major local and a few regional environmental impacts. We criticized the industry and governments for various actions and inactions, as well as opponents of the industry for making unsubstantiated claims. We did so to provide Canadians with an accurate and balanced assessment of publicly available and relevant evidence concerning this industry. We were not conducting an academic literature review.

According to Timoney, we were not sufficiently critical of this industry. We respectfully disagree. Because of length limitations on our response and Timoney's reliance on a detailed critique cited in his Viewpoint[1], we cannot respond here to everything. However, in the spirit of our commitment, as a volunteer public service to Canadians under the sole sponsorship of Canada's national academy, we will be posting a detailed response on the RSC website[2].

The first rule of harshly criticizing other scientists should be not to make your own inaccurate statements. Timoney starts and finishes his Viewpoint[1] with misleading assertions. He claims, without any citation, that the extraction and processing of bitumen from Alberta's oil sands "*has become the world's largest energy project*" and he closes by stating that this development has "*global environmental and public health relevance*." Current oil sands production is about 1.8% of current world oil production[3,4] and contributes less than 0.1% of the world's total greenhouse gas emissions[5], thus neither of Timoney's claims of global relevance have any quantitative foundation. The environmental impacts of Canada's oil sands industry, particularly for water quantity and quality issues that he reviewed, are entirely local and regional issues.

The failure to deal accurately with quantitative assessment of environmental issues underlies some of the many misunderstandings that Timoney conveys. Specifically, the distinction we would expect all informed readers of *ES&T* to understand is that mere detection of target contaminants in environmental media does not constitute an adverse environmental impact. Furthermore, as noted in our report, any conclusion about an adverse impact occurring requires validation of pathways for the environmental contaminants under suspicion to reach the impacted organism.

Timoney cites a prominent 2010 paper[6] for his website critique of our assessment of water quality. This paper[6] made an important contribution to the public debate about Athabasca River water quality by demonstrating that a number of priority metals that may arise from oil sands were found at higher concentrations in the river downstream from industrial operations compared with upstream. However, this paper also reported that all 9 trace metals studied, which had a Guideline for Canadian Drinking Water Quality (GCDWQ), were substantially below the GCDWQ in the river downstream; ranging from 0.3% of highest value relative to the GCDWQ for zinc to 23% for lead, with a median of 3% for antimony. There are no GCDWQ for the remaining trace metals sampled (silver, beryllium, nickel or thallium). We find no basis in this evidence, or other congruent monitoring results, to predict human health impacts in communities located further downstream.

Timoney never mentions reviewing our chapter on public health, nor is he scientifically qualified to do so, yet he claimed that we were not justified to dismiss "*downstream public health concerns*" [emphasis added]. We made no such dismissal, but we recommended additional studies to focus specifically on human health exposures to downstream residents, while advising that the considerable monitoring data do not support the prominent media claims that oil sands contaminants are causing human cancers downstream. Moreover, we identified several public health *impacts* related to the pressures of a booming economy and recommended government responses.

Timoney was misleading to claim our report was out of date because we did not cite some 2010 publications. We made a written request to 58 stakeholders for submission of evidence by December 31, 2009, extended to January 31, 2010 to provide a basis for our review. Our 440 page report, citing over 650 references, was completed in draft form in August 2010 and ultimately released, after peer review, in December 2010, all of which Timoney knew. We did include some important late publications[6] but we do not claim to have reviewed everything published in 2010 and certainly not after August 2010 when we completed our draft. There had to be some deadline for acquiring new evidence.

Timoney describes our consideration of in-stream flow needs as "*out of date and superficial*", in part, for not including "*a federal scientific evaluation*"[7] published in September 2010. Timoney is wrong to claim that we "*did not consider the current water management framework*." We reviewed the phase 1 framework published in 2007. Timoney misleads readers by claiming that we should have reviewed the phase 2 framework that has not been implemented yet. Regardless, we are entirely justified in our conclusions: "*Water use demands do not threaten the viability of the Athabasca River system if the Water Management Framework developed to protect in-stream flow needs is fully implemented and enforced…Concerns expressed about water withdrawals during low flow conditions in the Athabasca River (typically in winter) can be addressed effectively by implementing additional industrial off-stream storage to capture water during high flow in spring*."

Lastly we address Timoney's claim that our panel lacked expertise in "*environmental chemistry, hydrology, sedimentology, surficial materials, statistics and wildlife ecology*." This is also wrong. Timoney has made an issue of our competence for performing this review. By so doing, he puts at issue his own research experience and expertise to make such negative judgments. We invite readers to review and judge for themselves our research publication records[2] and compare them for relevance to water quality and quantity with Dr. Timoney's publication record as posted on the website he cites.

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Carleton University, Ottawa

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1. Timoney, K. ES&T. dx.doi.org/10.1021/es300513u. 2012.

2. Environmental and Health Impacts of Canada's Oil Sands Industry; Royal Society of Canada: Ottawa, Ontario, Canada, 2010. http://www.rsc-src.ca/creports.php

3. International Energy Agency – Oil Market Report 12 May 2011. World oil production http://omrpublic.iea.org/omrarchive/12may11sup.pdf accessed 3 March 2012.

4. Canadian Association of Petroleum Producers. 2011 Canadian Crude Oil Forecast and Market Outlook**.** June 2, 2011. http://www.capp.ca/aboutUs/mediaCentre/NewsReleases/Pages/2011-Oil-Forecast.aspx accessed 3 March 2012.

5. Alberta Government. About Oil Sands Greenhouse Gases. http://oilsands.alberta.ca/ghg.html accessed 3 March, 2012.

6. Kelly, E. N., D. W. Schindler, P. V. Hodson, J. W. Short, R. Radmanovich, and C. C. Nielsen. Oil sands development contributes elements toxic at low concentration to the Athabasca River and its tributaries. *Proceedings of the National Academy of Sciences of the United States of America.* 107: 16178–16183. 2010.

7. Department of Fisheries and Oceans. Science Evaluation of Instream Flow Needs (IFN) for the Lower Athabasca River, Science Advisory Report 2010/055; Canadian Science Advisory Secretariat: Ottawa, Ontario, Canada, 2010.

APPENDIX B

Scientific qualification and publication lists are provided following for:

Dr. Pierre Gosselin
Dr. Steve E. Hrudey
Dr. M. Anne Naeth
Dr. André Plourde
Dr. Glen Van Der Kraak
Dr. René Therrien
Dr. Zhenghe Xu

CURRICULUM VITAE

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Education and Training

- Doctor of Medicine, Laval University (Québec), 1976.
- License to practise medicine, College of Physicians of Québec, License #77-354; LMCC 1976.
- Master of Public Health (MPH), University of California at Berkeley, 1982, Environmental Health Sciences;
- Post-doctoral l training fellowship, August through December 1990, with various European organizations involved in risk analysis and risk analysis project management (OECD, UNEP, World Bank, French National Research Centres, WHO Geneva and Copenhagen, etc.); WHO fellowship.
- Post-doctoral l training fellowship on environmental impact assessment (policies and programs) on a WHO Grant, June to August 1995, in the Netherlands (WHO Bilthoven bureau and RIVM).

Professional/Personal Associations and Awards

- Québec Public Health Association; member of board of directors (1987-1989); in charge of environmental health committee.
- Canadian Public Health Association, member since 1986.
- Joint recipient of 1985 Québec Public Health Association prize of excellence; for research and interventions connected with the forest (spruce budworm) and the environment.
- Founding member, Québec Environment Foundation, 1987-1990.
- Member, Society to Overcome Pollution, 1986-91.
- Member, Québec Association against Acid Rain, 1986-89
- Member, Québec Nature Conservation Union (UQCN), and member of board of directors from 1990 to 1993; President from November 1990 to June 1993.
- Member, European Environmental Impact Assessment Trainers Network (based at University of Manchester, UK).
- Member, Conseil de la santé et du bien-être du Québec (Québec Advisory Council on Health and Welfare), nomination by government, 1993-1996.
- Bronze Medal, Académie nationale de Médecine, Paris, 1993; for the book *Mieux Vivre avec son environnement*.
- Member, Health Professionals Task Force, 1995-2005, International Joint Commission.
- President, ÉcoSommet, 1994-96; this ENGO conducted a multistakeholder concertation process on sustainable development throughout the province in 1995-96, with 5000 participants, a major conference (800 attendees), with support from over 50 public agencies, industrial groups, unions, etc. Invited to Quebec's Socioeconomic Summits in March and October 1996. See http://ecoroute.uqcn.qc.ca/envir/ecosommet/index.html
- Physician, community health, Centre hospitalier universitaire de Québec (CHUQ), since 1987; member of the Public Health Research Unit at the CHUQ Research Center
- Clinical Professor, Department of Social and Preventive Medicine, Faculty of Medicine, Université Laval, since 1990.
- Personality of the Year in Environment, award received on March 21, 1996; presented by the Fondation québécoise en environnement.
- Member, Board of the Institut pour la prévention et la gestion des sinistres (IPGS), 1998-1999.
- Member of the Board, Canadian Association of Physicians for the Environment (CAPE), 1997-2000
- Vice-president, North America, International Society of Doctors for the Environment (ISDE), 1998-2000.

- Affiliated researcher, Institut Environnement, Développement et Société, Université Laval. 2007-current. See http://www.ihqeds.ulaval.ca/chercheurs.html
- Associate professor, Institut national de la recherche scientifique, Eau-Terre-Environnement (INRS-ETE) ; 2008-2012.

Professional Experience

1977-87

- General practice 1977-78 (Lasarre Hospital; Fort-Chimo (now Kuujjuak) Hospital, La Saline Community Service Centre, Mont-Joli Community Service Centre), including occupational health in 1978;
- Coordinator of Occupational Health Service, Community Health Department, Rimouski Regional Hospital Centre, 1979 to 1983; extensive field work, health studies, environmental impact assessments and development of health programs (prevention and supervision), chiefly in the forestry/lumber, metal industry, hospital and general services sectors;
- Member of boards of directors of Matane Community Service Centre (1980-81) and Lower St. Lawrence, Gaspé Peninsula and Magdalen Islands Regional Health and Social Services Council (1981);
- Member, Occupational Health Training Committee, Department of Social Affairs (1982-83);
- Member of Medical and Environmental Occupational Health Information System Committee, Department of Social Affairs (1983-84);
- Member of Environmental Health Experts Advisory Committee, Department of Social Affairs (1983-86);
- Environmental Health Consultant, Rimouski Community Health Department (1984-1987); management and performance of epidemiologic research; reports and public hearings on the environment; Québec Health Survey pilot project ; in charge of infectious diseases.
- Member of Environmental Health Committee, Community Health Division, Québec Hospitals Association (1987-1989);
- Good Samaritan volunteer (Santo Domingo, Dominican Republic), Canadian Organization for Solidarity and Development, June and July 1985; coordination of an integrated multipartite development project proposal, 1986, for the same project, which was accepted (sponsored by OXFAM-Québec) for $ 1.7 million, by CIDA; consultant for Good Samaritan and OXFAM (1987-92). Consultant for an evaluative research study applied to the project, in cooperation with Laval University, the Haiti State University, and the Universidad Autonoma de Santo Domingo.

1987-1997

- Environmental health consultant, Community Health Departments, Laval University Hospital Centre and Enfant-Jésus Hospital, Québec City, 1987-1994
- Environmental health consultant, Rochon Inquiry Commission on Health and Social Services, fall 1987; including health indicators applicable to the environment .
- Coordinator, Public and Environmental Health Service, Community Health Department, Enfant-Jésus Hospital, Québec City, and head of Community Medicine Service, March 1988 to February 1990.
- Member, Injuries Prevention Committee, Community Health Division, Québec Hospitals Association, 1988 -89.
- Chair, Environmental Health Committee, Community Health Division, Québec Hospitals Association, 1989-1998; in charge of subcommittees on indicators and environmental evaluation.
- Member, Interdepartmental Environmental Health Advisory Committee (Department of Health and Social Services and Department of the Environment of Québec), 1988-1998 .
- Member, Steering Commitee on Indicators for Sustainable Development, Environment Canada and Health and Welfare Canada, from May 1989 to June 1991.
- Member, team of consultants, Commission of Inquiry into Hazardous Wastes, Board of Public Hearings on the Environment, Sept. 89-July 90.
- Grants for 1987-89: $ 405 000
- Member of the Canadian delegation (Health and Welfare Canada), Third international Conference on health promotion (Action for Public Health), WHO/UNEP/Nordic Council, Sundsvall, Sweden, 9-15 June 1991.
- Member of the Canadian delegation (Environment Canada), International Forum on Environmental Information for the 21st century, Environment Canada, Montréal, 21-24 May 1991.
- Member of the Canadian delegation (Environment Canada), International Conference of Environmental NGOs, in preparation of the Rio Earth Summit, Paris, dec. 1991.
- Member, Quebec Roundtable on Environment and Economy (minister level), 1991-92.
- Vice-chairman, Environmental Choice Program, Environment Canada, 1992-94

- Consultant, Evaluation of St-Lawrence Action Plan and Fraser River Action Plan, for the Office of the Auditor General of Canada, 1993.
- Consultant, St-Lawrence Health Effects Program, Health Protection Branch, Health Canada, 1994.
- Member, NAFTA Effects Senior Advisory Group, Commission for Environmental Cooperation,1995-1999.
- Member, Joint Management Committee, Community Action Program, Health Canada and Environment Canada, 1995-96.

Since 1997

- President, Prix Phénix (Collecte sélective Québec), 1997.
- Head, World Health Organization Collaborating Center on Environmental and Occupational Health Impact Assessment and Surveillance since 1998 (renewed until 2015).
- Director (acting) for research and expertise in environmental health, CHUQ, july 1998-june 1999.
- Associate researcher, Center for Research in Geomatics, U.Laval, since 1999
- Chair, Environmental and Occupational Health Surveillance Working Group, Canadian Federal/provincial/territorial EOH Committee, 1999-2003. Ex officio member of the Health Surveillance Workgroup, the senior management group for surveillance in Canada.
- Member, Steering Committee, Environment and Sustainable Development Indicators (ESDI) Initiative, National Round Table on the Economy and the Environment, 2000-2003, see http://www.nrtee-trnee.ca/eng/programs/current_programs/sdindicators/ ,
- Scientific advisor, Quebec Institute of Public Health, in charge of environmental health surveillance and health impact assessment., 2000-2010.
- Scientific consultant, Office of the Commissioner of Environment and Sustainable Development of Canada; Member of the permanent Scientific Consultative Committee (2000-2003).
- Member, expert group for the Canadian Health Examination Survey, June 20, 2003, Statistics Canada, Ottawa
- Member, Steering Committee, North American report on children's health and the environment, CEC-PAHO-IJC-WHO-OECD, 2002-2005
- Member, Reference Group for WHO web site on Health Impact Assessment (see http://www.who.int/hia/network/ref_group/en/); on-going.
- Member, Expert Review Committee of the North American indicators of children's health and the environment report, Ottawa, 17-18 March 2004.
- Member, Consultative committee, GEOHEALTH initiative, UNEP Regional office for Latin America and the Caribbean, 2005.
- Member, Réseau géomatique et santé des populations, Réseau de recherché en santé des populations, FRSQ. 2005+
- Coordinator, Climate change and Health Program, Ouranos. 2005-2014)
- Scientific director, Quebec Government Climate Change Action Plan, health component ($30 M for 2007-2013); at the Institut national de santé publique du Québec.
- Member, Heat Alert and Response Systems Advisory Committee, Health Canada, 2008-2011.
- Member, Expert Advisory Committee on Adaptation and Climate Change, Public Health Agency of Canada. 2008-2011.
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Teaching Experience (including reviews)

- Lecturer, University of Québec, Rimouski Campus, bachelor's degree in nursing; winter 1979: infectious diseases (3 credits); winter 1980: occupational health (3 credits);
- Introduction and planning of occupational health curriculum at University of Québec, Rimouski Campus (1980-81) designed for occupational health workers in administrative regions 01, 09 and 03B;
- Substitute professor (full time), occupational health and safety, and epidemiology , University of Québec, Rimouski Campus, 1983-84;
- External reviewer, Québec Health Research Fund (FRSQ) and Quebec Society and Culture Research Fund (FQRSC), CIHR, SSHRC since 1987; also for NHRDP, EcoResearch, B.C. Health Fund, Royal Society of Canada; outside member of community health doctoral jury, University of Montréal, 1988; Master of Environment essay supervisor, University of Sherbrooke, 1987; Croucher Foundation Hong Kong 2003; US National Institute of Medicine 2003; International Journal of Health Promotion and Education 2004; Bulletin of the World Health Organization (2000-present).

- Tutor and co-tutor, specialty training in community health, since 1988 (12 residents for 4-6 months each), Laval University;
- Tutor, training required for Master of Environment, University of Québec, Montréal Campus: 1988; University of Sherbrooke: 1987).
- Associate clinical professor, Department of preventive and social medicine, Faculty of Medicine, Laval University, 1990...; associate researcher, Research and Intervention Center in Health Promotion (GRIPSUL), Laval University; presently directing two Master's thesis.
- Invited professor, Dpt of Family Practice, University of British Columbia, april-july 1992.
- Member of scientific committee and speaker, Formation médicale continue: Update on drinking water, Université Laval, 22 octobre 1993.
- Co-organizer, International Conference on Indigenous Peoples and Water Resource Development Projects, Consensus,UQCN, Makivik, Montréal, 14-16 April 1994.
- Co-organizer, Colloque *Les urgences environnementales*, CSE, sept. 1990.
- Co-organizer, Colloque *Le développement industriel et la protection de la santé publique*, CSE, june 1992.
- Co-organizer, Colloque *L'éthique en santé environnementale*, CSE, oct. 1992.
- Co-organizer, Colloque *Les déchets domestiques et la santé publique*, CSE, april 1993.
- Co-organizer, 1er colloque en santé environnementale, ACFAS, may 1990.
- Co-organizer, 2ième colloque en santé environnementale, ACFAS, may 1992.
- Member of the Steering Committee, Colloques en santé environnementale MSSS-MENVIQ, 1990, 1992, 1994.
- Organizer of an intensive training in environmental impact assessment and public health, Ministry of Health and Social Services, for the public health network; December 6-10, 1993, Laval University.
- participation to the Workshop on Canadian Climate System Data, Royal Society of Canada, Québec, 16-18 may 1994.
- Organizer, Conference *Le Saint-Laurent et la santé*: le temps d'agir, 24-25 April 1995, Québec.
- Invited professor (6 conferences on Quebec EHIA methods and procedures, 35 participants, post-graduate level) at the Intensive Workshop on EHIA, Florencia (Colombia), 05/1996, within the UNAMAZ (Universidades de Amazonia) and IDRC initiative on EHIA. Also in Lima, Peru, in January 1999, same format.
- Temporary adviser, WHO/CEHI Eastern Mediterannean Office and Islamic Development Bank, Workshop on EHIA, Hammamet, Tunisia, sept. 1998; also similar workshop in December 1999 in Amman, Jordan, same venue.
- Organizer, Colloque annuel de l'Association québécoise d'évaluations d'impacts (AQEI), 12-16 November 1996, Montréal, on the environmental and social impact assessment of policies and programs.
- Co- organizer, Conference on the broadening of environmental health impact assessment, organized by AQEI, OEIA and Health Canada, 23-24 January 1997, Ottawa.
- President, Doctoral bursaries jury FCAR-FRSQ, février1997.
- Member, scientific committee, Quebec Annual Public Health Conference, 1998, Montréal, 17-19 November 1998; same in 2001, 6-9 november. Responsible for a one-day workshop in EOH and infectious diseases surveillance on Nov.7.
- Member, scientific committee, 3rd Conference of local health authorities of the Americas, march 2000.
- President, board of directors, Institut international francophone en évaluation environnementale, run with the participation of U.of Montreal, U.of Quebec in Montreal (UQAM) and U.Laval. Since 1998, one annual international training event for French speaking countries (Québec City in 1999, 2000; Cotonou, Benin in 2001; slated for Belgium in June 2002). Responsible for overall organization and for health impact assessment courses.
- Organizer, Workshop on the Future of surveillance in health protection, Journées annuelles de santé publique du Québec, 7 november 2001, Montréal.
- Co-organizer, Conference on Noise at the Quebec Annual Public Health Conference, 2004, Montréal Dec. 1st
- External reviews: 2003 WHO Report on Children's Health and the Environment; 2003 WHO Methods of Assessing Human Health and public health adaptation to climate change; chapter on occupational health in the NIH Disease Control Priorities Project (DCPP) of the Bill and Melinda Gates Foundation, 2004.
- Co-organizer, Workshop on Noise and Public Health, Journées annuelles de santé publique du Québec, 1er décembre 2004, Montréal (in collaboration with WHO-Europe and HQ).
- Organizer, Symposium on Climate Change and Public Health, Journées annuelles de santé publique du Québec, 26-27 oct. 2006, Montréal (in collaboration with WHO-Europe and PAHO).
- Reviewer for international projects, International office of Laval University, 2003-2004.
- Reviewer for the Canada Research Chairs program 2004-2008.

- Member, scientific committee, Rencontre francophone internationale sur les inégalités sociales de santé. 17-18 novembre 2008. Journées annuelles de santé publique. Centre des congrès de Québec.
- Co-organizer and member, scientific committee, United Nations Workshop on Space Technology for Public Health Actions in the Context of Climate Change Adaptation, In the framework of the Canadian Public Health Association 2011 Conference. June 19-21, 2011, Montreal, Québec, Canada. Online at: http://www.medvet.umontreal.ca/grezosp/tele-epi2011-spon.htm
- Member, scientific committee, for *La santé climatique des municipalités : «partager» pour mieux «gérer» l'adaptation aux aléas* within the Journées annuelles de santé publique du Québec, 30 november 2011 (Montréal).

Publications

Books and monographs

- CHAPDELAINE, A., GOSSELIN, P., *La santé contagieuse (contagious health)*, Montréal, Boréal Express, 1986, 167 p.; also in Spanish, *La Salud Contagiosa,* Madrid, Diaz de Santos, 1992, 145 p.
- GOSSELIN, P. and coll., *Santé environnementale au Québec, bases théoriques et pratiques (environmental health in Québec: theory and practice)*, Québec, Les Publications du Québec, 1986, 359 p.
- GOSSELIN, P. , FORTIN, C., *Épidémies d'origine hydrique et alimentaire, techniques d'enquête*, an adaptation of "Procedures to Investigate Waterborne Illness" and "Procedures to Investigate Foodborne Illness", by Bryan, F.L., et al., IAMFES, Les Publications du Québec, 1989, 150 p.
- GOSSELIN, P., "Le défi urbain" (the urban challenge), in P. DANSEREAU, et al., *L'homme et son environnement (man and his environment)*, Canadian Broadcasting Corporation (CBC), Montréal, 1989, 104 p.
- GOSSELIN, P. , CHAPDELAINE, A., and JOHNSON, P.M., "L'intersectorialité, le rôle des institutions"
- ("intersectoriality": the role of institutions), in BEAULNE, G., et al., *Les traumatismes au Québec (injuries in Québec)*, Québec, Les Publications du Québec, 1991, 372 p.
- GOSSELIN, P., et al., *Mieux vivre avec son environnement (living in greater harmony with our environment),* Québec, DSC Enfant-Jésus, November 1990, 392 p.; french reedition in 1996 under a grant from Health Canada.
- O'Neill,M., GOSSELIN, P. et al., *La santé politique*, Monographie no.3 of the Centre québécois collaborateur de l'Organisation mondiale de la santé pour le développement de Villes et Villages en santé, 1997, 263 p.
- Environnement Canada, Impacts et adaptation à la variabilité et au changement du climat au Québec, Tome 5 de l'Étude pan-canadienne, oct.1997 (collaboration of P.GOSSELIN)
- Gérin M. GOSSELIN P. Cordier S. Viau C. Quesnel P. Dewailly E. (éditeurs scientifiques), Environnement et santé publique : fondements et pratiques, co-édition Edisem (Montréal) et Éditions Tec& Doc Lavoisier (Paris), Janvier 2003. 1060 pages.
- GOSSELIN, P. et al., Canadian Environmental Health Impact Assessment Manual, in collaboration with Health Canada, 4 volumes, (available in French and English in draft version as of 08/99), final version (after peer review and corrections) published in Nov. 2004. http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/index_e.html
- Guidotti T.L and P.GOSSELIN, eds, The Canadian Guide to Health and the Environment, University of Alberta Press, 1999, 322 p.
- Levallois P., GOSSELIN P., Barthe C, Payment P, Carignan G et S Gingras, Projet pilote de surveillance active des gastroentérites dans 4 municipalités québécoises, , pp.258-273 in Robertson WC,ed, Facing the Next Millenium : New challenges to the production of drinking water in Canada, Ottawa, Canada, 2000.
- P.GOSSELIN, C.Furgal and A.Ruiz, Environmental health indicators for the US-Mexico border, Concept Document. Pan American Health Organization, 34 p. , El Paso, July 2001. Available at : http://www.fep.paho.org/english/env/indicadores/IndSA.htm
- Furgal, C., Martin, D., GOSSELIN, P. 2002. Climate Change and Health in Nunavik and Labrador: Lessons from Inuit Knowledge, In Krupnik, I., and Jolly, D. (Eds.) The Earth is Faster Now: Indigenous Observations of Arctic Environmental Change. Arctic Research Consortium of the United States, Arctic Studies Centre, Smithsonian Institution, Washington, D.C. Pgs 266-300.
- Health Professionals Task Force (including P.GOSSELIN), Great Lakes Fish Consumption Advisories: The Public Health Benefits and Risks, January 2004, International Joint Commission, Ottawa and Washington, 28 p. see http://www.ijc.org/php/publications/pdf/ID1540.pdf
- Ouranos (incl. P.GOSSELIN), Adapting to Climate Change, Montreal, 2004. 91 p. http://www.ouranos.ca/cc/table_e.html

- P. GOSSELIN (2005). Environnement et santé publique (23 p.). In G. Carroll, Pratiques en santé communautaire. Montréal, Chenelière Éducation.
- MSSS (sous la direction de Alain Poirier, directeur national de santé publique ; collaboration de P.GOSSELIN). Rapport national sur l'état de santé de la population du Québec : produire la santé. Gouvernement du Québec. 2005. 120 p. ISBN 2-550-44040-4 Voir
- WHO-CEHA (technical contribution by P.GOSSELIN) Environmental Health Impact Assessment of Development Projects. A practical guide for the WHO Eastern Mediterannean Region. 2005. Amman, Jordan. 132 pages.
- Gosselin P. et al. Recommended indicators of Children's Environmental Health (CEH) in Canada. Report of the Steering committee to the Federal/Provincial/Territorial Committee on Health and the Environment. Ottawa. May 2, 2006. 119 p.
- MSSS (sous la direction de Alain Poirier, directeur national de santé publique ; collaboration de P.GOSSELIN). Rapport national sur l'état de santé de la population du Québec : produire la santé. Gouvernement du Québec. 2006. 120 p. ISBN 2-550-44040-4 Voir http://www.inspq.qc.ca/pdf/publications/portrait_de_sante.asp?E=p
- Institut national de santé publique du Québec [INSPQ]. (2006). (incluant P.GOSSELIN). Portrait de santé du Québec et de ses régions 2006. Les analyses (section 1.4). INSPQ. Québec. 131 pages. Accessible en ligne le 4 décembre 2006 à : http://www.inspq.qc.ca/pdf/publications/portrait_de_sante.asp?E=p
- Bélanger, D., Gosselin, P., Poitras, P. (2006c). Changements climatiques au Québec méridional : perceptions des gestionnaires municipaux et de la santé publique. Institut national de santé publique du Québec, Québec. Disponible en octobre 2006 au http://www.inspq.qc.ca/publications/default.asp?E=p&Theme=8
- Bélanger, D., Gosselin, P., Valois, P., Abdous, B. (2006a). Vagues de chaleur au Québec méridional : adaptations actuelles et suggestions d'adaptations futures. Institut national de santé publique du Québec, Québec. Disponible en octobre 2006 au http://www.inspq.qc.ca/publications/default.asp?E=p&Theme=8
- Bélanger, D., Gosselin, P., Valois, P., Abdous, B. (2006b). Vagues de froid au Québec méridional : adaptations actuelles et suggestions d'adaptations futures. Institut national de santé publique du Québec, Québec. Disponible en octobre 2006 au http://www.inspq.qc.ca/publications/default.asp?E=p&Theme=8
- Giguère, M. & Gosselin, P. (2006a). Vagues de chaleur, effet d'îlot thermique urbain et santé : examen des initiatives actuelles d'adaptation aux changements climatiques au Québec. Disponible en octobre 2006 au http://www.inspq.qc.ca/publications/default.asp?E=p&Theme=8
- Giguère, M. & Gosselin, P. (2006b). Événements climatiques extrêmes et santé : examen des initiatives actuelles d'adaptation aux changements climatiques au Québec. Disponible en octobre 2006 au http://www.inspq.qc.ca/publications/default.asp?E=p&Theme=8
- Giguère, M. & Gosselin, P. (2006c). Eau et santé: examen des initiatives actuelles d'adaptation aux changements climatiques au Québec. Disponible en octobre 2006 au http://www.inspq.qc.ca/publications/default.asp?E=p&Theme=8
- Giguère, M. & Gosselin, P. (2006d). Maladies zoonotiques et à transmission vectorielle : examen des initiatives actuelles d'adaptation aux changements climatiques au Québec. Disponible en octobre 2006 au http://www.inspq.qc.ca/publications/default.asp?E=p&Theme=8
- Doyon, B., Bélanger, D., Gosselin, P. (2006). Effets du climat sur la mortalité au Québec méridional de 1981 à 1999 et simulations pour des scénarios climatiques futurs. Institut national de santé publique du Québec, Québec. Disponible en janvier 2007 au http://www.inspq.qc.ca/publications/default.asp?E=p&Theme=8
- Hernoun N., Gosselin P., Canuel M., Lebel G. (2007). Proposition pour le volet de santé environnementale du plan ministériel de surveillance multithématique. INSPQ. Québec. Janvier 2007. environ 175 pages.
- Bélanger, D., Gosselin, P., (2007). Changements climatiques au Québec méridional : perceptions de la population générale et suggestions d'adaptations futures. Institut national de santé publique du Québec, Québec. Disponible au http://www.inspq.qc.ca/publications/default.asp?E=p&Theme=8
- Bourque, A., G. Simonet, P.Gosselin et al.. « Québec », dans Vivre avec les changements climatiques au Canada : édition 2007, D.S. Lemmen, F.J.Warren, J. Lacroix et E. Bush (éditeurs), Gouvernement du Canada, Ottawa (Ontario), avril 2008, pp. 171-226. Also in English at : http://adaptation.nrcan.gc.ca/assess/2007/pdf/ch5_e.pdf
- Gosselin P., Bélanger D. et Doyon B. Les impacts santé des changements climatiques au Québec. Chapitre 6 dans Séguin J (ed.), Santé humaine et changements climatiques : Évaluation des vulnérabilités et de la capacité d'adaptation au Canada, Santé Canada. Ottawa. Juillet 2008. 558 p. En ligne au: http://www.ouranos.ca/fr/pdf/ouranos_chapitre-6.pdf Also available in English (Health Impacts of Climate Change in Quebec) at : http://www.ouranos.ca/en/pdf/ouranos_chapter-6.pdf
- Furgal C., Gosselin P., Vézeau N. (2008). Climate, Health and the Changing Canadian North. Chapter 35 in Grovers V. (ed). Global Warming and Climate Change. Oxford & IBH Publishing. London. Pp. 761-799.

- Owens S., Gosselin P.,Furgal C., Martin D. Nunatsiavut's public health surveillance in response to a changing climate: a baseline study. Centre de recherche du CHUQ. Nov. 2008. 110p. ISBN 978-2-9810983-0-6 (PDF)
- Bélanger D. et P.Gosselin. (2008).La santé publique et les changements climatiques. Chapitre dans L'état du Québec 2009. Institut du Nouveau Monde et Éditions Fides. Montréal. Pages 229-236.
- Ouranos. Savoir s'adapter aux changements climatiques. Rédaction : C. DesJarlais, M. Allard, A. Blondlot, A. Bourque, D. Chaumont, D.Bélanger, P. Gosselin, D. Houle, C. Larrivée, N. Lease, R. Roy, J.-P. Savard, R. Turcotte et C. Villeneuve, Montréal, 2010, 128 p. ISBN : 978-2-923292-03-8.
- Tairou FO, Bélanger D, Gosselin P. |Proposition d'indicateurs aux fins de vigie et de surveillance des troubles de la santé liés à la chaleur. INSPQ. 2010. ISBN 978-2-550-58748-4. 44 pages. (http://www.inspq.qc.ca/pdf/publications/1079_IndicateursVigieSanteChaleur.pdf)
- Tairou FO, Bustinza R. Bélanger D, Gosselin P. |Proposition d'indicateurs aux fins de vigie et de surveillance des troubles de la santé liés aux précipitations hivernales et aux avalanches. INSPQ. 2010. ISBN 978-2-550-60099-2. 85 pages. (http://www.inspq.qc.ca/pdf/publications/1160_PropIndicPrecipitationsHivernales.pdf)
- Bélanger D, Bustinza R., Tairou FO, Gosselin P. Proposition d'indicateurs aux fins de vigie et de surveillance des troubles de la santé liés aux vents violents. INSPQ. 2010. ISBN PDF : 978-2-550-59845-9. 85 pages. (http://www.inspq.qc.ca/publications/notice.asp?E=p&NumPublication=1150).
- Blachère J-C, Perreault S, Bélanger D, Gosselin P, Côté R, Kergoat M-J, Lacroix J, Blais L, Joober R, White-Guay B, Lanthier L, Roy L, Lalonde L. Médicaments du système nerveux central et canicules : Rapport et recommandations. Université de Montréal et INSPQ. Québec, 2011. 157 pages. ISBN : 978-2-550-60837-0 (PDF). En ligne au : http://www.inspq.qc.ca/pdf/publications/1199_MedSystemeNerveuxCanicules.pdf
- Bustinza R, Tairou FO, Gosselin P, Bélanger D, Proposition d'indicateurs aux fins de vigie et de surveillance des troubles de la santé liés à la foudre et aux incendies de forêt. INSPQ. 2011. ISBN imprimé : 978-2-550-61293-3. 74 p. (http://www.inspq.qc.ca/publications/notice.asp?E=p&NumPublication=1223).
- Santé Canada (2011). Lignes directrices à l'intention des travailleurs de la santé pendant les périodes de chaleur accablante : Un guide technique. Bureau de l'eau, de l'air et des changements climatiques. Direction générale de la santé environnementale et de la sécurité des consommaeteurs, Santé Canada. Ottawa, Ontario. 165 p. (P.Gosselin co-auteur, chap. 4). H128-1/11-642F. ISBN 978-1-100-96909-1. Aussi disponible en anglais sous le titre *Extreme Heat Events Guidelines : Technical guide for Health Care Workers.*

Journals (with Peer Review)

- GOSSELIN, P., and coll.," Arroser ou ne pas arroser, ce n'est pas la question" (to spray or not to spray: that is not the question), *Union Médicale du Canada*, 1985; 3:252-255.
- TREMBLAY, O., AUGER, P. L., GOSSELIN, P., "Rapport d'étude épidémiologique descriptive portant sur le syndrome hémolytique et urémique au Québec (1979-82)" (descriptive epidemiologic study report on hemolytic-uremic syndrome in Québec, 1979-82). Report submitted to Department of Social Affairs, March 1984, 46 p. plus appendices; also in *Maladies chroniques au Canada (chronic disease in Canada)*, vol. 5, No. 2, September 1984, p. 34.
- GOSSELIN, P., GUAY, D., "Surveillance épidémiologique et environnement, une revue" (a review of epidemiologic and environmental monitoring), *Union médicale du Canada*, 1986, 115: 11, 741-745, 803-812 and 1987, 116:1, 44-47 .
- FORGET, G., et al.(P.GOSSELIN), Epidemiologic Assessment of Acute Poisoning Incidence in Developing Countries: Report of an IDRC/IPCS Scientific Group, IDRC, June 1988,42 p.
- GOSSELIN, P. et DONTIGNY,A., Santé et environnement, les préoccupations des femmes enceintes , *L'actualité médicale, cahier de formation continue,* 10 octobre 1990.
- CHAPDELAINE, A. et GOSSELIN, P., Le contrôle des armes à feu: une question de santé publique, *Maladies chroniques au Canada*, vol.11, no.6, novembre 1990 (also available in English, *Chronic Diseases in Canada,* same date)
- APRIL, N., BONIN, L.,LABBÉ, J., JULIEN, C., GAUVIN, M., GOSSELIN, P., La qualité de l'eau potable à l'Ile d'Orléans, *Sciences et techniques de l'eau*, février 1992.
- GOSSELIN,P. et al., Indicators for a Sustainable Society, *Canadian Public Health Journal*, vol. 84, no 3, may 1993, p.197-200.
- GOSSELIN, P., Des sociétés viables, *Policy Options politiques*, vol.14, no.7, sept. 1993, p. 15-19.
- GOSSELIN, P. et al., Institutions and the Role of Intersectoral Action: Applying Theory to Practice in Motor Vehicle Safety, *Maladies chroniques au Canada/Chronic Diseases in Canada*, vol.14, no. 3, 1993, p.120-124.
- Y.Bédard, P.GOSSELIN, M.Jerrett, S.Elliott, D.Mowat,J.Moore, M.Goddard, R.Catelan, A.Gingras and P.Poitras 2000. Recent Technological Trends vs Users' Needs in Health Surveillance, a Canadian Study. Peer-reviewed paper accepted for the International Health Information Conference Infocus2000 Proceedings, co-

organized by the Canadian Institute for Health Information and by Canada's Health Informatics Association, Vancouver, Canada, June 24-27.

- Kwiatkowski R. et P.GOSSELIN, Promoting Human Impact Assessment within the Environmental Impact Assessment Process: Canada's work in progress, International Journal of Health Promotion, january 2001.
- C.Furgal et P.GOSSELIN, eds, Consensus Conference on Environmental Health Indicators, Supplement to the Canadian Journal of Public Health, S-1, September/October 2002, 72 p.
- Proulx, M.-J., Y. Bédard, M. Nadeau, P. GOSSELIN & G. Lebel, 2002, Géomatique et santé environnementale: innovations résultant du projet ICEM/SE, Géomatique 2002, 30 oct.. See http://sirs.scg.ulaval.ca/Yvanbedard/article_nonprotege/309.pdf
- Bédard, Y., GOSSELIN, P., Rivest, S., Proulx, M.J., Nadeau M., Lebel G. & Gagnon M.F. 2002, Integrating GIS Components with Knowledge DiscoveryTechnology for Environmental Health Decision Support. International Journal of Medical Informatics. Elsevier Science. vol. 70 :1 pp 79 – 94
- Gosselin, Pierre. Environmental change, climate and health: issues and research methods. Bull World Health Organ, 2003, vol.81, no.3, p.226-227. ISSN 0042-9686
- P.GOSSELIN, G.Lebel, S.Rivest, M.Douville-Fradet, The Integrated System for Public Health Monitoring of West Nile Virus (ISPHM-WNV): a Real-time GIS for Surveillance and Decision-Making. International Journal of Health Geographics. 13 September 2005. http://www.ij-healthgeographics.com/content/4/1/21
- D. Martin, D. Bélanger1 , P. GOSSELIN, J.Brazeau , C. Furgal, S. Déry. Climate change, drinking water and human health in Nunavik : adaptation strategies. Arctic. 60 (2); 195-202. June 2007..
- G.Lebel, P.GOSSELIN, Surveillance de l'infection par le virus du Nil occidental au Québec, 2003-2006. Bulletin épidémiologique hebdomadaire. Institut de veille sanitaire. 24 octobre 2006. no. 40-41. p. 314-317. Online on 24 oct. 2006: http://www.invs.sante.fr/beh/2006/40_41/beh_40_41_2006.pdf
- Berube, A ; Gosselin, P. Indicators of Children's Environmental Health (CEH) in Canada. Epidemiology. 17(6) (Suppl):S399, November 2006.
- El Adlouni S, Beaulieu C, Ouarda T, Gosselin P, Saint-Hilaire A. Effects of climate on West Nile Virus transmission risk used for public health decision-making in Quebec. *International Journal of Health Geographics*, 2007 **6**:40 (20 September 2007).Online : http://www.ij-healthgeographics.com/content/6/1/40/abstract
- Belanger D, Gosselin P, Valois P, Abdous B. (2008). Use of residential wood heating in a context of climate change: a population survey in Quebec (Canada). BMC Public Health. BMC Public Health 2008, 8:184, on line http://www.biomedcentral.com/1471-2458/8/184/abstract .
- Doyon B., Bélanger D., Gosselin P. (2008). The potential impact of climate change on annual and seasonal mortality for three cities in Quebec, Canada. International Journal of Health Geographics, 2008, 7:23. on line : http://www.ij-healthgeographics.com/content/7/1/23 .
- Bouden M , Moulin B and Gosselin P. (2008) The geosimulation of West Nile virus propagation: a multi-agent and climate sensitive tool for risk management in public health. International Journal of Health Geographics 2008, 7:35. On line at: http://www.ij-healthgeographics.com/content/7/1/35
- Gosselin P, Poitras P. Use of an Internet "Viral" Marketing Software Platform in Health Promotion. J Med Internet Res 2008;10(4):e47. URL: http://www.jmir.org/2008/4/e47/ doi: 10.2196/jmir.1127. PMID: 19033151
- Bélanger D., Gosselin P., Valois P., Germain S., Abdous B. Use of a Remote Car Starter in Relation to Smog and Climate Change Perceptions: A Population Survey in Québec (Canada). International Journal of Environmental Research and Public Health. 2009; 6(2):694-709. URL: http://www.mdpi.com/1660-4601/6/2/694/ doi:10.3390/ijerph6020694
- Bernier E., Gosselin P, Badard T, Bédard Y.. Easier surveillance of climate-related health vulnerabilities through a Web-based spatial OLAP application. International Journal of Health Geographics 2009, 8:18. On line at: http://www.ij-healthgeographics.com/content/8/1/18
- Febriani Y, Levallois P, Gingras S, Gosselin P, Majowicz SE and Fleury MD. The association between farming activities, precipitation, and the risk of acute gastrointestinal illness in rural municipalities of Quebec, Canada: a cross-sectional study. BMC Public Health. January 2010, 10 :48. MS : 1521403053284815. http://www.biomedcentral.com/1471-2458/10/48
- Bayentin J., El Adlouni S. Ouarda TBMJ., Gosselin P., Doyon B. Chebana F. Spatial variability of climate effects on ischemic heart disease hospitalization rates for the period 1989-2006 in Quebec, Canada. International Journal of Health Geographics 2010, 9:5doi:10.1186/1476-072X-9-5
- Bouden M , Moulin B and Gosselin P. A Geosimulation Tool to Assess Intervention Scenarios in Relation to the Spread of Infectious Disease and Environmental Factors. International Environmental Modelling and Software Society (iEMSs). 2010 International Congress on Environmental Modelling and Software. Modelling

for Environment's Sake, Fifth Biennial Meeting, Ottawa, Canada. Article dans proceedings: http://www.iemss.org/iemss2010/index.php?n=Main.Proceedings

- Gosselin P. et D.Bélanger. Recherche, impacts et adaptations de santé publique au nouveau climat du Québec. Revue de santé publique. Société française de santé publique. Juin 2010. Pp. 1-12.
- Arsenault J , Ravel A , Michel P , Berke O and Gosselin P. Do patients with recurrent reported episodes of campylobacteriosis differ from those with a single disease event? BMC Public Health 2011, 11:32 doi:10.1186/1471-2458-11-32. Online : http://www.biomedcentral.com/1471-2458/11/32
- Toutant S, Gosselin P, Belanger D, Bustinza R, Rivest S. An open source Web application for the surveillance and prevention of the impacts on public health of extreme meteorological events: the SUPREME system. International Journal of Health Geographics 2011, 10:39 doi:10.1186/1476-072X-10-39. Online: http://www.ij-healthgeographics.com/content/10/1/39/abstract
- Gosselin P, Bélanger D, Lapaige V, Labbé Y. The burgeoning field of transdisciplinary adaptation research in Quebec (1998-): A climate change-related public health narrative. Journal of Multidisciplinary Healthcare. 2011:4 pages 337-348. September 2011. Online : http://www.dovepress.com/articles.php?article_id=8289
- Vanasse A, Orzanco MG, Dagenais P, Ouarda T, Courteau J, Asghari S, Chebana F, Martel B, Gosselin P. Secular trends of hip fractures in Québec, Canada. Osteoporosis International. DOI 10.1007/s00198-011-1749-0. Online 30-08-2011: http://www.springerlink.com/content/9j246p7jv3k54j34/
- Modarres R., Ouarda T, Orzanco MG, Vanasse A, Gosselin P. (2012). Modling seasonal variation of hip fracture in Montreal, Canada. Bone, online 15 January 2012. http://www.sciencedirect.com/science/article/pii/S8756328212000129

Other publications
About 50 other publications (general public, briefs, opinions for government

Conferences (invited and peer-reviewed)
About 200 conferences.

PUBLICATION LIST
STEVE E. HRUDEY

CURRENT APPOINTMENTS:

Title: Professor Emeritus (as of January 1, 2008)
Division of Analytical and Environmental Toxicology
Department of Laboratory Medicine and Pathology
Faculty of Medicine and Dentistry
University of Alberta, Edmonton, Alberta T6G 2G3 Canada

Titles: Visiting Professor of the University
Cranfield University
Cranfield, England
U.K.

Adjunct Professor
School of Public Health &
Preventive Medicine
Monash University, Melbourne, Australia

EDUCATIONAL QUALIFICATIONS:

D.Sc (Eng), Environmental Health Sciences and Technology,
University of London, 2002

Ph.D., Public Health Engineering,
University of London, 1979

M.Sc., Public Health Engineering
Imperial College, University of London, 1971

B.Sc., Mechanical Engineering (with electives in life sciences)
University of Alberta, 1970

AWARDS AND HONOURS

2012 A.P. Black Award, American Water Works Association, the top research award from the world's largest professional organization dedicated to safe drinking water. The 2nd Canadian so honoured in the award's 45 year history.

2012 Honorary DSc, University of Alberta, March 2012

2011 Annual Lorch Lecture, Prestige Lecture Series, Cranfield University, Cranfield, U.K.

2010 International Water Association Fellow

2007 Fellow of the Society for Risk Analysis

2006 Fellow of the Royal Society of Canada, Academy of Science

2006 Donald R. Stanley Best Environmental Paper Award, Canadian Society of Civil Engineering, for: "*Occurrence of N-nitrosamines in Alberta public drinking water*

distribution systems." J.W.A. Charrois, J.M. Boyd, K.L. Froese and S.E. Hrudey. 2007. *J. Environ. Eng. Sci.* 6: 103-114.

2006 National Water Research Institute (Canada) Distinguished Speaker for 2006

2006 TD Canada Trust Walter Bean Visiting Professor in Environment, University of Waterloo

2005 Inaugural Schultz Oration for the Donal Herbert Schultz Endowment to the Flinders Research Centre for Coastal Environments, Flinders University, Adelaide, Australia

2003-04 Killam Annual Professor, University of Alberta.

2002 D.Sc (Eng), Environmental Health Sciences and Technology, University of London, (higher doctorate degree award based on career research publications)

2002: Honorary Professor (all re-named as "Adjunct" in 2008), Department of Epidemiology and Preventive Medicine, Monash University Medical School. Melbourne, Australia.

1997: Association of Environmental Engineering Professors Distinguished Lecture: "*Health Risk Assessment and Risk Management for Algal Toxins in Drinking Water Supplies* "at the American Water Works Association Annual Conference in Atlanta, June.

1995: Emerald Award for Environmental Research Advances, Alberta Foundation for Environmental Excellence

1993-98 *Eco-Research* Chair in Environmental Risk Management – Tri-Council NSERC-SSHRC-MRC

1991: Albert E. Berry Medal for significant contributions to Environmental Engineering in Canada, Canadian Society for Civil Engineering

1990: The Owen Holmes Science Lecture, The University of Lethbridge.

1989: National Lecture Tour, Environmental Engineering Division, Canadian Society for Civil Engineering.

1987-88: McCalla Research Professorship, University of Alberta

SCIENTIFIC AND PROFESSIONAL JOURNAL EDITORIAL BOARDS

Associate Editor
Environmental Reviews
published by the National Research Council of Canada, Ottawa, 1993-present

Member of Editorial Committee
Environmental Health
published by the Australian Institute of Environmental Health, 2000 - 2008

Editorial Board Member
Environmental Technology ,
published in London, U.K., 1985-2002
(Regional Editor for Canada, 1979-1985)

Associate Editor,
Environmental Engineering Science, 1997 - 2000
formerly Editorial Board Member,
***Hazardous Wastes and Hazardous Materials*,**
published in New York, 1988-1997

Editor and Member of Editorial Review Board,
Water Environment Research, (formerly, *Res. J. Water Pollut. Control Fed.*)
published by the Water Environment Federation,Washington, D.C., 1989-1993

Associate Editor for Environmental Engineering,
***Canadian Journal of Civil Engineering*,**
published by the National Research Council of Canada, Ottawa, 1988-1992

SERVICE AS AN EXTERNAL EXAMINER AT OTHER UNIVERSITIES

External Examiner – invited: Doctoral Thesis tentatively entitled: "Benefits of and Icelandic Experience with Water Safety Plans." Department of Civil and Environmental Engineering, University of Iceland, **to be scheduled in 2012**.

External Examiner, Doctoral Thesis entitled: "Waterborne Cryptosporidiosis: Adopting a Mixed Methods Approach to Inform Public Health Decision-Making." Dept. of Population Medicine, Ontario Veterinary College, University of Guelph, December 2008.

External Examiner, Doctoral Thesis entitled: "The relationship between water and helicobacter pylori and the burden of related illness, Langley, B.C." Dept. of Healthcare and Epidemiology, UBC, May 2008.

External Examiner, Doctoral Thesis entitled: "Disinfection By-Products in Drinking Water and Genotoxic Changes in Urinary Bladder Epithelial Cells" Epidemiology and Population Health, Australian National University, Canberra, Australia, April 2001.

External Examiner, Doctoral Thesis entitled: "Investigation of the Removal of Cyanobacterial Hepatotoxins by Bank Filtration" Department of Environmental Health, Faculty of Health Sciences, Flinders University, Adelaide, Australia, June 2000.

External Examiner, Doctoral Thesis entitled: "Cyanobacteria and Water Quality of Lakes.". Institut fur Pflanzenbiologie, University of Zurich, Zurich, Switzerland, May 2000.

External Examiner, Doctoral Thesis entitled: "Environmental Inorganic Arsenic Exposure, Human Absorption and Cancer Incidence" Department of Epidemiology and Preventive Medicine, Monash University Medical School, Melbourne, Australia, June 1999.

External Examiner, Doctoral Thesis entitled: "Decision Methodology for Site Owners in the Remediation of Contaminated Sites" Department of Civil Engineering, University of Toronto, September, 1998

External Examiner, Doctoral Thesis entitled: "Factors Affecting Biodegradation of 2-Chlorophenol Under Various Redox Conditions" Faculty of Engineering, University of Manitoba, July, 1995

External Examiner, Doctoral Thesis entitled: "Treatment of Oily Water Using Peat" Faculty of Engineering, University of Regina, Sept., 1990.

External Examiner, Doctoral Thesis entitled: "Off Flavours in Drinking Water" Water/Environ. Studies, U. of Linkoping, Sweden, May 1989.

PUBLICATIONS:

Books:

Hrudey, S.E. & J.W.A. Charrois. **Eds**. 2012. *Disinfection By-Products and Human Health*. IWA Publishing, London. In preparation for publication, May 2012.

Hrudey, S.E. & E.J. Hrudey. 2004. *Safe Drinking Water – Lessons from Recent Outbreaks in Affluent Nations*. IWA Publishing, London. 514pp.

Hrudey, S.E. 2003. **Ed**. *Drinking Water Safety – A Total Quality Management Approach*. Proc. Inter. Conf. Water & Health, Ottawa, Sept 23-25, 2002, NERAM – IRR, University of Waterloo.476pp.

Thomas, S. P. & S. E. Hrudey. 1997. *Risk of Death in Canada- What We Know and How We Know It*. University of Alberta Press, Edmonton, 292 pp.

Hrudey, S.E., Chen, W. & C. Rousseaux. 1995. *Bioavailability in Environmental Risk Assessment*. Lewis Publishers, CRC Press, Boca Raton, Florida, 291 pp.

Vandermeulen, J.H. & Hrudey, S.E. 1987. **Ed**. *Oil and Freshwater: Chemistry, Biology and Countermeasure Technology*, Pergamon Press, 510 pp.

Barnes, D., Forster, C.F. & Hrudey, S.E. 1987. **Ed.** *Surveys in Industrial Wastewater Treatment: Manufacturing and Chemical Industries*, Vol.**3**, Longmans Ltd., London, 217 pp.

Barnes, D., Forster, C.F. & Hrudey, S.E. 1984. **Eds**. *Surveys in Industrial Wastewater Treatment: Petroleum and Organic Chemical Industries*, Vol.**2**, Pitmans Ltd., London, 233 pp.

Barnes, D., Forster, C.F. & Hrudey, S.E. 1984. **Ed**. *Surveys in Industrial Wastewater Treatment: Food and Allied Industries*, Vol.**1**, Pitmans Ltd., London, 326 pp.

Book Chapters and Specialty Proceedings Publications

Hrudey, S.E. & J.W.A. Charrois. 2012. Overview of Disinfection By-Products as a Public Health Issue. Chapter 1. In: *Disinfection By-Products and Human Health*. IWA Publishing, London. In preparation for publication, May 2012.

Hrudey, S.E. & J.W.A. Charrois. 2012. Research Overview, Regulatory History and Current Worldwide Status of Disinfection By-Products Regulations and Guidelines . Chapter 2. In: *Disinfection By-Products and Human Health*. IWA Publishing, London. In preparation for publication, May 2012.

Boyd, J., J.W.A. Charrois, R. Hoffman and S.E. Hrudey 2012. Health Risk Assessment and Management of Nitrosodimethylamine (NDMA) and Other Nitrosamines. Chapter 7. In: *Disinfection By-Products and Human Health*. IWA Publishing, London. In preparation for publication, May 2012.

Zhao, Y., W. Wang, S.E. Hrudey and X.F. Li. 2012. Halogenated Benzoquinones a Recent Novel Class of Disinfection By-Products. Chapter 8. In: *Disinfection By-Products and Human Health*. IWA Publishing, London. In preparation for publication, May 2012.

Hrudey, S.E. 2012. Epidemiological Inference and Evidence on Disinfection By-Products and Human Health. Chapter 11. In: *Disinfection By-Products and Human Health*. IWA Publishing, London. In preparation for publication, May 2012.

Hrudey, S.E. & J.W.A. Charrois. 2012. Concluding Thoughts on Disinfection By-Products, Water Quality and Public Health Risks. Chapter 12. In: *Disinfection By-Products and Human Health*. IWA Publishing, London. In preparation for publication, May 2012.

Hrudey, S.E. & E.J. Hrudey. 2009. Prevention is Painfully Easy in Hindsight: Fatal *E. coli* O157:H7 and Campylobacter outbreak in Walkerton, Canada, 2000. *Global Issues in Water, Sanitation and Health*. Institute of Medicine of the National Academies. National Academies Press. pp. 127-152.

Bradshaw, R.A., Pollard, S.J.T., Jalba, D.I., Charrois, J.W., S.E. Hrudey and N.J. Cromar. 2009. Evaluating cause-effect relationships and impact of incidents – a learning approach for operations and asset management. In: *Water Contamination Emergencies – Collective Responsibility*, Gray, J. and Thompson K.C. (eds.) Royal Society of Chemistry, Special Publication No. 317, pp. 82-116.

Hrudey, S.E. 2006. Fatal Disease Outbreak from Contaminated Drinking Water in Walkerton, Canada. In: *Case Studies in Environmental Engineering and Science*. Eds: A. Bhandari & M.A. Butkus, Association of Environmental Engineering and Science Professors, Champaign, Illinois. pp. 4-18.

Hrudey, S.E. 2006 Waterborne Outbreak of Cryptosporidiosis – North Battleford, Canada. In: *Case Studies in Environmental Engineering and Science*. Eds: A. Bhandari & M.A. Butkus, Association of Environmental Engineering and Science Professors, Champaign, Illinois. pp. 19-34.

Hrudey, S.E. and S. Rizak. 2006. Preventing drinking water emergencies – water quality monitoring lessons from recent outbreak experience In: *Water Contamination Emergencies: Enhancing our Response*. Eds. K.C. Thompson and J. Gray, Royal Society of Chemistry, Special Publication No. 302, pp.42-52.

Pollard, S.J.T., J.E. Strutt, B.H. MacGillivray, J.V. Sharp, S.E. Hrudey and P.D. Hamilton. 2006. Risk management capabilities – Towards 'Mindfulness' for the international water utility sector. In: *Water Contamination Emergencies: Enhancing our Response*. Eds. K.C. Thompson and J. Gray, Royal Society of Chemistry, Special Publication No. 302, pp. 70-80.

Leiss, W. and S.E. Hrudey. 2005 *On Proof and Probability, Introduction to Law and Risk*, Chap 1, 1-19, Law Commission of Canada. University of British Columbia Press and Les Presses de l'Universite Laval, 208pp.

Hrudey, S.E. and E.J. Hrudey. 2004.*Converting Hindsight into Foresight – Understanding the Causes of Waterborne Outbreaks,* Chap. 9 In: *Microbial Waterborne Pathogens*, **Ed**. Cloete, T.E., J. Rose, L.H. Nel and T. Ford. IWA Publishing, London. 205-217.

Hrudey, S.E. 2000. Limits to Science for Assessing and Managing Environmental Health Risks. *Science, Truth and Justice.* Canadian Institute for the Administration of Justice, Les Éditions Thémis. Faculté de Droit. Université de Montréal. ISBN 2-89400-151-7 pp. 127-150

Jardine, C.G. and S.E. Hrudey. (1999). "What is Risk?" Chap 17. *Environmental Health For All*. Kluwer Academic Publishers. 205-211.

Jardine, C.G. and S.E. Hrudey. (1999). "Promoting Active Public Particiipation?" Chap 13. *Environmental Health For All*. Kluwer Academic Publishers. 157-168.

Hrudey, S.E. 1998. "Quantitative Cancer Risk Assessment - Pitfalls and Progress." *Issues in Environmental Science and Technology.*Eds. R.E. Hester and R.M. Harrison **9**: 57-90, Roy. Soc. Chem. Pub., Cambridge

Leiss, W. and S. E. Hrudey. (1997). "Dioxins or Chemical Stigmata." Chapter 3. *Mad Cows and Mother's Milk: The Perils of Poor Risk Communication*, **Eds**: D. Powell and W. Leiss. McGill-Queens University Press, pp 41-76.

Hrudey, S.E., Whitfield, F.B. & McGuire, M.J. (1995). **Ed**. "Off-Flavours in Drinking Water and Aquatic Organisms" International Association on Water Quality, Pergamon Press, Oxford, England., 280 pp.

Hrudey, S.E. (1991). "Specific problems in risk analysis and environmental monitoring" In: *Hazardous Waste Incineration Calculations*. **Eds**. Reynolds, J.P., Dupont, R.R. and Theodore, L., Wiley Interscience, pp 31-37, 131-142.

Fedorak, P.M. & Hrudey, S.E. (1988). "Anaerobic Degradation of Phenolic Compounds with Applications to Treatment of Industrial Wastewaters" In: *Biotechnology Applied to Environmental Problems: A. Bioenvironmental Systems* **Ed**. Wise, D.L., CRC Press, pp 169-225.

Vernick, A.S., Langer, B.S., Lanik, P.D. & Hrudey, S.E. (1984). "Petroleum Refining Industry Wastewater Management." Chapter 1. *Surveys in Industrial Wastewater Treatment: Petroleum and Organic Chemical Industries,*, **Vol. 2**, **Eds**. Barnes, Forster & Hrudey, Pitmans Ltd., London, pp 1-64.

Hrudey, S.E. (1984). "Meat and Poultry Products Industry Wastewater Management." Chapter 3. *Surveys in Industrial Wastewater Treatment: Food Processing Industries,* Vol.**1**, **Eds**: Barnes, Forster & Hrudey, Pitmans Ltd., London, pp 128-208.

Smith D.W. and Hrudey, S.E.(1981), **Eds.** "Design of Water and Wastewater Services for Cold Climate Communities", In: *Water Science and Technology.* **13**(supp.) 184 pp., Pergamon Press Ltd., London.

Hrudey, S.E. (1977). General Sampling Techniques, Chapter 1. *Handbook of Air Pollution Analysis,* , **Eds**: R. Perry & R. Young. pp.1-83, Chapman and Hall Ltd., London, J. Wiley & Sons Inc., New York.

Expert Panel Reports

Singer, P. (Chair), J. Bluestein, P. Chen, M. Hotaling, S.E. Hrudey, K.L. Jones, A. Levine, A. Obelinsky, V. Snoeyink & S. Summers. 2011. Expert Panel to the Washington Aqueduct Future Treatment Alternatives Study. Report to the U.S. Army Corps of Engineers regarding the safety of the drinking water supply for Washington, D.C.

Hrudey, S.E. (Chair), P. Gosselin, A. Naeth, A. Plourde, R. Therrien, G. Van Der Kraak & Z. Xu. 2010. Environmental and Public Health Impacts of Canada's Oil Sands Industry. Expert Panel of the Royal Society of Canada. Ottawa. http://www.rsc.ca/creports.php

Heath, L., S.J.T. Pollard (Chair), S.E. Hrudey & G. Smith. 2010. Engaging the Community: a handbook for professionals managing contaminated land. Cooperative Research Centre for Contamination Assessment and Remediation of the Environment. CRC Care, Adelaide, Australia.

Bruce , J.P. (Chair), W. Cunningham, A. Freeze, R. Gillham, S. Gordon, S. Holysh, S.E. Hrudey, W. Logan, K. MacQuarrie, P. Muldoon, L. Nowlan, J. Pomeroy, S. Renzetti, B. Sherwood Lollar & R. Therrien. (Expert Panel on Groundwater) 2009. Sustainable Management of Groundwater in Canada. Council of Canadian Academies. Ottawa.

Hrudey, S.E. (Chair), M.J. Allen, R.W. Brecher, R. Copes & P. Payment. 2008. Turbidity and microbial risk in drinking water. Ministerial Technical Advisory Committee for the Minister of Health pursuant to Section 5 of the Drinking Water Act (S.B.C. 2001).

Swain, H. (Chair), Louttit, S. & S.E. Hrudey. 2006. Report of the Expert Panel on Safe Drinking Water for First Nations. Minister of Indian and Northern Affairs, Ottawa, November 2006 (Vol. 1 and 2) www.eps-sdw.gc.ca/rprt/index_e.asp

Brawner, C.O., L.H.M. Chan, L.J. Connell, S.E. Hrudey, J.-M. Konrad, R.R.J. Leech, M.A.J. Matich, C. Nowakowski & K.G. Raven. 2005. Progress Review Comments by the Independent Peer Review Panel (IRPP) of the Giant Mine Remediation Plan. Yellowknife, NT.

Fazil, A., Paoli, G., Lammerding, A.M., Davidson, V., Hrudey, S.E., Isaac-Renton, J. & M. Griffiths. 2005. Microbial Risk Assessment as a Foundation for Informed Decision-Making. Microbial Food Safety Assessment Unit, Public Health Agency of Canada, Guelph, ON.

Hrudey, S.E. (Chair), Bathija, A., Bull, R.J., Dodds, L., Jenkins, G., King, W., Murphy, P., Narotsky, M., Reif, J., Savitz, D. and B. Thomas. 2003. Executive Summary. International Expert Workshop for Health Canada to Identify Critical Endpoints for Assessment of Health Risks Related to Trihalomethanes (THMs) in Drinking Water. March 2003.

Langley, A. (Chair) et al. 2002. *Environmental Health Risk Assessment – Guidelines for Assessing Human Health Risks from Environmental Hazards*. En Health: Department of Health and Ageing. Canberra, Australia.

Callan, P. (Chair), Cunliffe, D., Howard, J., Hrudey, S.E., Rizak, S., Sinclair, M. & R. Vulcano. 2002. *Framework for Management of Drinking Water Quality – A Total Quality Management Approach from Catchment to Consumer*. (Incorporated into the Australian Drinking Water Guidelines) Working Party to the National Health and Medical Research Council. Canberra, Australia.

Sinclair, M. (Chair), Bull, R., Froese, K., Hrudey, S.E., Nieuwenhuijsen, M. & S. Rizak. 2002. Disinfection By-Products and Health Effects. Summary of an International Expert Workshop. CRC for Water Quality and Treatment. Occasional Paper No. 5. Salisbury, South Australia.

Hrudey, S.E. (Chair), V. Adamowicz, R. Dales, B.A. Hale, A. Krupnick, M. Lippmann, J. McConnell & P. Renzi. 2001. *Expert Panel to Review the Socio-Economic Models and Related Components Supporting the Development of Canada-Wide Standards for Particulate Matter and Ozone*. The Royal Society of Canada. Ottawa. 240pp.

WHO. 2001. *Effective Approaches to Regulating Microbial Drinking-Water Quality*. Meeting of the WHO Working Group on Microbial Risks with the Working Party of the National Health and Medical Research Council on a Framework for Management of Drinking Water Quality for the Australian Drinking Water Guidelines. Adelaide, Australia, 14-18 May 2001.

Hrudey, S.E., M. Burch, M. Drikas and R. Gregory. 1999. Remedial Measures. Chapter 9. In: *Toxic Cyanobacteria in Water – A Guide to Public Health Consequences and their Management in Water Resources and Supplies*. **Eds**: I. Chorus and J. Bartram, World Health Organization. E & F.N. Spon. London. 275-312. A WHO Expert addressing management of health risks from cyanobacterial toxins in drinking water supplies 1997-1999.

Mills, C.J. (Chair), R. Bull, K. Cantor, J. Reif, S.E. Hrudey, P. Huston & an Expert Working Group. 1998. Published as: "Health risks of drinking water chlorination byproducts: Report of an expert working group. *Chronic Diseases in Canada*. 19(3): 91-102.

Yoo, R.S. (Chair), Carmichael, W.W., Hoehn, R.C. & S.E. Hrudey. 1995. *Cyanobacterial (Blue-Green Algal) Toxins: A Resource Guide*. American Water Works Association Research Foundation. Denver.

Hrudey, S.E. (Chair), Coutts, R.T., Kratochvil, B., Bernhardt, H., Foley, P.D., Huck, P.M., Logsdon, G.S., Smith, D.W., Snoeyink, V.L., Trussell, A.R., Bull, R.J., Munro, I.C., Payment, P., Rogers, R.E., Tobin, R.S., & P. Toft. 1986. *A Critical Assessment of Drinking Water in Edmonton*. Report to the Edmonton Board of Health, City of Edmonton and Alberta Environment.

Hrudey, S.E. (Chair), Kratochvil, B.G., Markham, J.W., Orford, R.R. and R.K. Shaw. 1983. Scientific Methodology Assessment Committee Report to the Honourable Fred D. Bradley, Minister of the Environment, Government of Alberta. Edmonton. 42 pp.

Refereed Journal Articles:

Published or In Press

163. Muro, M., S.E. Hrudey, S. Jude, L. Heath & S. Pollard. 2011 Making it real: What risk managers should know about community engagement. *J. Environ. Assess. Policy Manage*. In Press.

162. Anichina, J., Y. Zhao, S.E. Hrudey, A. Schreiber & X.-F.Li. 2011. Electrospray ionization tandem mass spectrometry analysis of the reactivity of structurally related bromo-methyl-benzoquinones towards oligonucleotides. *Anal. Chem*. 83: 8145–8151.

161. Hrudey, S.E., B. Conant, I.P. Douglas, J. Fawell, T. Gillespie, D. Hill, W. Leiss, J.B. Rose & M. Sinclair. 2011. Managing uncertainty in the provision of safe drinking water. *Water Sci. Technol.: Water Supply*. 11(6): 675-681.

160. Bradshaw, R., A.M Gormley, J.W.A. Charrois, S.E. Hrudey, N.J. Cromar, D. Jalba & S.J.T. Pollard. 2011. Managing incidents in the water utility sector - towards high reliability. *Water Sci. Technol.: Water Supply*. In Press.

159. Boyd, J.M. S.E. Hrudey, S.D. Richardson & X.F. Li. 2011. Solid-phase extraction and high-performance liquid chromatography mass spectrometry analysis of nitrosamines in treated drinking water. *Trends Anal. Chem.* 30(9): 1410-1421.

158. Bull, R.J., D.A. Reckhow, Xingfang Li, A.R. Humpage, C. Joll, S.E. Hrudey. 2011. Potential carcinogenic hazards of non-regulated disinfection by-products: haloquinones, halo-cyclopentene and cyclohexene derivatives, N-halamines, halonitriles and heterocyclic amines. *Toxicology*. **286**: 1– 19.

157. Anichina, J.; Zhao, Y.; Hrudey, S.E.; Le, X.C.; Li, X.F. 2010. Electrospray ionization mass spectrometry characterization of interactions of newly identified water disinfection byproducts halobenzoquinones with oligodeoxynucleotides. *Environ. Sci. Technol.* **44**: 9557-9563.

156. Jalba, D.I., Cromar, N.J., Pollard, S.J.T., Charrois, J.W.A., Bradshaw, R. & S.E. Hrudey. 2010. Safe drinking water: critical components of effective interagency relationships. *Environ. Int.* 36: 51-59.

155. Hrudey, S.E. 2009. Chlorination disinfection by-products, public health risk tradeoffs and me. [Invited career perspective – peer reviewed] *Water Res.* 43: 2057-2092.

154. Zhou, W.J., J.M. Boyd, F. Qin, S.E. Hrudey & X.F. Li. 2009. Formation of N-nitrosdiphenylamine and two new N-containing disinfection byproducts from chloramination of water containing diphenylamine. *Environ. Sci. Technol.* 43: 8443–8448.

153. Hrudey, S. 2009. Public health wonder or unwitting vector of disease: the challenge of delivering safe water supplies. *Rev. Environ. Sci. Biotechnol*. 8: 235-237.

152. Zhang, W., Gabos, S. Schopflocher, D., Li, X.F., Gati, W.P. & S.E. Hrudey. 2009. Validation of Urinary Trichloroacetic Acid as a Biomarker of Exposure to Drinking Water Disinfection By-Products. *J. Water Health*. **7**(3): 359-371.

151. Zhang, W., Gabos, S. Schopflocher, D., Li, X.F., Gati, W.P. & S.E. Hrudey. 2009. Reliability in using urinary and blood trichloroacetic acid as a biomarker of exposure to chlorinated drinking water disinfection by-products. *Biomarkers*. **14**(6): 355-365.

150. Wu, S., Hrudey, S.E., French, S., Bedford, T., Soane, E. and Pollard, S. 2009. A role for human reliability analysis in preventing drinking water incidents and securing safe drinking water, *Water Res*. 43: 3227-3238.

149. Liu, Y., Wang, C., Tyrrell, G., Hrudey, S.E. and X.-F. Li. 2009. Induction of Escherichia coli O157:H7 into the viable but non-culturable state by chloraminated water and river water and subsequent resuscitation. *Environ. Microbiol. Rep.* 1(2): 155-161.

148. Rizak, S. & S.E. Hrudey. 2008. Drinking water safety – challenges for community-managed systems. *J. Water Health.* 6(S1): 33-41.

147. Zhao,Y.-Y., Boyd, J.M., Woodbeck, M., Andrews, R.C., Qin, F. Hrudey, S.E., and X.-F. Li. 2008. Formation of *N*-nitrosamines from eleven disinfection treatments of seven different surface waters. *Environ. Sci. Technol.* 42(13): 4857-4862.

146. Rizak, S & S.E. Hrudey. 2007. Achieving safe drinking water. Risk management based on experience and reality. *Environ. Rev.* 15: 169-174.

145. Rizak, S & S.E. Hrudey. 2007. Strategic water quality monitoring for drinking water safety. *Water – Journal of the Australian Water Association.* 34(4): 52-56

144. Liu, X.; Zhao, Y.; Chan, K.; Hrudey, S.E.; Li, X.-F.; Li, J. 2007. Analysis of nitrosamines by capillary electrospray- high-field asymmetric waveform ion mobility spectrometry-mass spectrometry with programmed CV. *Electrophoresis* 28: 1327-1334.

143. Rizak, S. & S.E. Hrudey. 2007. Evidence of water quality monitoring: limitations for outbreak detection. *Environmental Health – Journal of the Australian Institute of Environmental Health.* 7(1): 11- 21.

142. Hrudey, S.E. & E.J. Hrudey. 2007. A nose for trouble – The role of off-flavours in assuring safe drinking water. *Water Sci. Technol.* 55(5): 239-247.

141. Charrois, J.W.A & S.E. Hrudey. 2007**.** Breakpoint chlorination and free-chlorine contact time: Implications for drinking water N-nitrosodimethylamine concentrations*. Water Res*. 41: 674-682.

140. Charrois[*], J.W.A., Boyd, J.M., Froese, K.L. & S.E. Hrudey. 2007. Occurrence of N-nitrosamines in Alberta public drinking water distribution systems. *J. Environ. Eng. Sci.* 6: 103-114

139. Hrudey, S.E. & E.J. Hrudey. 2007. Waterborne disease outbreaks – Risk of the past or recurrent threat. *Water Environ. Res*. 79(3): 233-245.

138. Zhao, Y.Y., Boyd, J.M., S.E. Hrudey & X.F. Li. 2006. Characterization of new nitrosamines in drinking water using liquid chromatography tandem mass spectrometry. *Environ. Sci. Technol*. 40: 7636-7641.

137. Rizak, S. and S.E. Hrudey. 2006. Misinterpretation of Drinking Water Quality Monitoring Data with Implications for Risk Management. *Environ. Sci. Technol*. 40(17) pp 5244 – 5250. Comment by S. Qi *Environ. Sci. Technol*. 41(9) 3388. Response *Environ. Sci. Technol*. 41(9) 3389 – 3390.

136. Zhao, Y.; Hrudey, S.; Li, X.F. 2006. Determination of microcystins in water using integrated solid phase microextraction (SPME) with microbore high performance liquid chromatography -electrospray quadruple time-of-flight mass spectrometry. *J. Chromatogr. Sci.* 44: 359-365.

135. Reynolds, L.A. & S.E. Hrudey. 2006. Managing uncertainty in environmental decision-making: the risky business of establishing a relationship between science and law. *Int. J. Risk Assessment and Management,* 6(1-3): 1-249.

134. Hrudey, S.E., E.J. Hrudey & S.J.T. Pollard. 2006. Risk management for assuring safe drinking water. *Environment International*.32: 948-957.

133. McAuley C. and S.E. Hrudey. 2006. Towards meaningful stakeholder comprehension of sour gas facility risk assessments. *J. Environ. Eng. Sci.* 5: 1-11

[*] This paper was awarded the inaugural Donald R. Stanley Best Environmental Paper Award established in 2006 by the Canadian Society for Civil Engineering in honour of the late Dr. Don Stanley, a leader in the transfer of research and technology into the practice of Environmental Engineering.

132. Jalba, D., S. Rizak & S.E. Hrudey. 2005. Interpretation of drinking water monitoring data for environmental health professionals. *Environmental Health – Journal of the Australian Institute of Environmental Health*. 5(3): 40-49.

131. Wenger, I.I., C.A. Ouellette, J.J.R. Feddes, and S.E. Hrudey. 2005. The design and use of the personal environmental sampling backpack (PESBII) for activity-specific exposure monitoring of career pig barn workers. *J. Agric. Safety Health*. 11(3): 315-324.

130. Hrudey, S.E. and R. Walker. 2005. Walkerton – 5 years later. Tragedy could have been prevented. *Opflow*. 31(6): 1, 4-7.

129. Rizak, S. and S.E. Hrudey. 2005. Interdisciplinary comparison of expert risk beliefs. *J. Environ. Eng. Sci.* 4: 173-185.

128. Hrudey, S.E. and S. Rizak. 2004. Discussion of rapid analytical techniques for drinking water security investigations. *Journal of the American Water Works Association*. 96(9):110-113.

127. Pollard, S.J.T., J.E. Strutt, B.H. MacGillivray, P.D. Hamilton and S.E. Hrudey. 2004. Risk analysis and management in the water utility sector – a review of drivers, tools and techniques. *Trans. IChemE. Process Safety Environ. Protect.* 82(B6): 453-462.

126. Pollard, S.J.T., S.E. Hrudey, Marv Rawluk and Bryan J. Fuhr. 2004. Characterisation of weathered hydrocarbon wastes at contaminated sites by GC-simulated distillation and nitrous oxide chemical ionisation GC-MS, with implications for bioremediation. *Journal of Environmental Monitoring*, 6: 713-718.

125. Charrois, J.W., M.W. Arend, K.L. Froese and S.E. Hrudey. 2004. Detecting N-nitrosamines in drinking water at ng/L levels using ammonia positive chemical ionisation. *Environmental Science and Technology*. 38: 4835-4841.

124. Bader, E.L., S.E. Hrudey and K.L. Froese. 2004. Urinary excretion half life of trichloroacetic acid as a biomarker of exposure to chlorinated drinking water disinfection by-products. *Occupational and Environmental Medicine*.61: 715-716.

123. Hrudey, S.E. 2004. Drinking water risk management principles for a total quality management framework. *J. Toxicol. Environ. Health* Part A. 67: 1555-1566.

122. Charrois, J.W., D. Graham, S.E. Hrudey and K.L. Froese. 2004. Disinfection by-products in small Alberta community water supplies. *J. Toxicol. Environ. Health* Part A, 67: 1797-1803.

121. Hrudey, S.E. and W. Leiss. 2003. Risk management and precaution – insights on the cautious use of evidence. *Environmental Health Perspectives*. 111(13): 1577-1581.

120. Rizak, S. D. Cunliffe, M. Sinclair, R. Vulcano, J. Howard, S. Hrudey and P. Callan. 2003. Drinking water quality management: a holistic approach. *Water Sci. Technol.* 47(9): 31-36.

119. Hrudey, S.E., P.M. Huck, P. Payment, R.W. Gillham and E.J. Hrudey. 2003. A fatal waterborne disease outbreak in Walkerton, Ontario: comparison with other waterborne outbreaks in the developed world. *Water Sci. Technol.* 47(3): 7-14.

118. Jardine, C.G., S.E. Hrudey, .J.H. Shortreed , D. Krewski, C. Furgal, L. Craig, S. McColl. 2003. Risk management frameworks for environmental, human health and occupational health risk, *Journal of Toxicology and Environmental Health* Part B, 6(6): 569-718.

117. Arbuckle, T.E., S.E. Hrudey, S.W. Krasner, J.R. Nuckols, S.D. Richardson, P. Singer, P. Mendola, L. Dodds, C. Weisel, D.L. Ashley, K.L. Froese, R.A. Pegram, I.R. Schulz, J. Reif, A.M. Bachand, F.M. Benoit, M. Lynberg, C. Poole and K. Waller. 2002. Assessing exposure in epidemiologic studies to disinfection by-products in drinking water: Report from an International Workshop. *Environ. Health Persp.* 110 *Supp.1*:53-60

116. Hrudey, S.E. and E.J. Hrudey. 2002. Walkerton and North Battleford – Key Lessons for Public Health Professionals. *Can. J. Public Health.* 93(5): 332-333.

115. Froese, K.L., M. Sinclair and S.E. Hrudey. 2002. Trichloroacetic acid as a biomarker of exposure to disinfection by-products in drinking water: A human exposure trial in Adelaide, Australia. *Environ. Health Persp.* 110(7): 679-687.

114. Hrudey, S.E., P.M. Huck, P. Payment, R.W. Gillham and E.J. Hrudey. 2002. Walkerton: Lessons learned in comparison with waterborne outbreaks in the developed world. *J. Environ. Eng. Sci*.1(6): 397-407.

113. Hrudey, S.E. 2001. "Drinking Water Quality – A Risk Management Approach. *Water.* 26(1): 29-32.

112. Dosman, D.M. Adamowicz, W.L. and S.E. Hrudey. 2001. "Socio-economic determinants of health and food safety related risk perceptions." *Risk Analysis*. 21(2): 307-317.

111. Ells, B., K.L. Froese, S.E. Hrudey, R.W. Purves, R. Guevremont, D. Barnett. 2000. "Detection of microcystins using electrospray ionization – high field asymmetric waveform ion mobility spectrometry – mass spectrometry", *Rapid Communications in Mass Spectrometry*. 14: 1538 - 1542.

110. Kotak, B.G., Lam A.K.-Y., Prepas, E.E. and S.E. Hrudey. 2000. Role of chemical and physical variables in regulating microcystin-LR concentration in phytoplankton of eutrophic lakes. *Can. J. Fish. Aquat. Sci.* 57: 1584-1593.

109. Ells, B., Barnett, D., Froese, K., Purves, R.W., Hrudey, S.E. and R. Guervremont. 1999. "Detection of chlorinated and brominated by-products of drinking water disinfection using electro-spray ionization – high field asymmetric waveform ion mobililty spectrometry – mass spectrometry. *Anal. Chem.* 71: 4747-4752.

108. Hilderman, T.L., Hrudey, S.E. and D.J. Wilson. 1999. "A Model for Effective Toxic Load from Fluctuating Gas Concentrations". *J. Hazard. Mater. A.* 64: 115-134.

107. Froese, K., Wolanski, A. and S.E. Hrudey. 1999. Factors governing odorous aldehyde formation as disinfection by-products in drinking water. *Water Res*. 33: 1355 – 1364.

106. Jardine, C.G., Gibson, N. and S.E. Hrudey. 1999. "Detection of Odour and Health Risk Perception of Drinking Water. *Water Sci. Technol*. 40(6): 91-98.

105. Jardine, C.G. and S.E. Hrudey. 1999. "Characterizing Response Variability and Method Uncertainty in Odour Perception Research. *Water Sci. Technol*. 40(6): 99-105.

104. Gibson, V., Higgs, E. and S.E. Hrudey. 1998. "Sour Gas - Bitter Relations." *Alternatives Journal*. **24**(2), 26-31.

103. Mills, C.J., Bull, R.,Cantor, K., Reif, J., Hrudey, S.E., P. Huston and an Expert Working Group. 1998. "Health risks of drinking water chlorination byproducts: Report of an expert working group. *Chronic Diseases in Canada*. 19(3): 91-102.

102. Saunders, L.D., Chen, W. and S.E. Hrudey. 1997. Studies of hazardous waste sites and human health: evaluation of internal validity. *Environ. Rev*. **5**: 167-180.

101. Hrudey, S.E. 1997. "Current needs in environmental risk management." *Environ. Rev*. **5**: 121-129.

100. Jardine, C.G. and S.E. Hrudey. 1997. "Mixed messages in risk communication." *Risk Anal*. **17**: 489-498.

99. Seymour, D.T., Verbeek, A., Hrudey, S.E. and P.M. Fedorak. 1997. "Acute toxicity and aqueous solubility of some condenses thiophenes and their microbial metabolites." *Environ. Toxicol. Chem*. **16**: 659-665.

98. Zemanek, M.G., Pollard, S.J., Kenefick, S.L. and S.E. Hrudey. 1997 "Toxicity and mutagenicity of component classes isolated from soils at petroleum- and creostoe-contaminated site." *J. Air Waste Manage. Assoc*. **47**: 1250-1258.

97. Zemanek, M.G., Pollard, S.J., Kenefick, S.L. and S.E. Hrudey. 1997. “Multiphase partitioning and co-solvent effects for polynuclear aromatic hydrocarbons (PAHs) in petroleum- and creosote-contaminated soils.” *Environ. Pollut.* **98**(2): 239-252.

96. Prepas, E.E., Kotak, B.G., Campbell, L.M., Evans, J.C., Holmes, C.F.B. and S.E. Hrudey. 1997. “Accumulation and elimination of cyanobacterial hepatotoxins by the freshwater clam *(Anadonta grandis simpsoniana).” Can. J. Fish. Aquat. Sci*. **54**: 41-46.

95. Wanke, M.I., Saunders, L.D., Hrudey, S.E. and T.L. Guidotti. 1996 “Considerations for Regional Health Authorities in the Provision of Environmental Health Services.” *Healthcare Manage. Forum* **9**(2), 5-14.

94. Lambert, T.L., Holmes, C.F.B. and S.E. Hrudey. 1996 “Adsorption of microcystin-LR by activated carbon and removal in full scale water treatment” *Water Res.* **30**(6), 1411-1422.

93. Saunders, L.D., Wanke, M.I., Pelton, J.M., Hrudey, S.E. and T.L. Guidotti. 1996. “Redesigning local environmental health programs.” *J. Environ. Health* **58**(9), 6-12.

92. Kotak, B.G., S. Semalulu, Fritz, D.L., Prepas, E.E., and S.E. Hrudey. 1996 “Comparative pathology of intraperitoneally-administered microcystin-LR in mice (*Mus musculus*) and rainbow trout (*Oncorhynchus mykiss*).” *Toxicon* **34**(5), 517-525.

91. Saunders, L.D., Wanke, M.I., Guidotti, T.L. and S.E. Hrudey, 1996 “Measurable objectives for local environmental health programs.” *J. Environ. Health* **58**(6), 6-12.

90. Hrudey, S.E and D. Krewski. 1995. "Is there a safe level of exposure to a carcinogen?" *Environ. Sci. Technol.* **29**(8), 370A-375A.

89. Hrudey, S.E. 1995. “Major concerns with quantitative cancer risk assessment for environmental risk management: North American experience.” *Process Safety Environ. Protect. - Trans. I. Chem. E.* **73**, Part B, S24-S27.

88. Kotak, B.G., Lam, A.K.-Y., Prepas, E.E., Kenefick, S.L. and S.E. Hrudey. 1995. "Variability of the Hepatotoxin Microcystin-LR in Hypereutrophic Drinking Water Lakes.” *J. Phycol*. **31**, 248-263.

87. Kenefick, S.L., Brownlee, B.G., Perley, T.R. and S.E. Hrudey. 1995. "A Chemical and Sensory Study of Odour Compounds in the Athabasca River, Alberta, Canada." *Water Sci. Technol.* **31**(11), 15-21.

86. Huck, P.M., Kenefick, S.L., Hrudey, S.E. and S. Zhang. 1995. "Bench Scale Study of the Removal of Odour Compounds with Biological Treatment Process Trains" *Water Sci. Technol.* **31**(11), 203-209.

85. Hrudey, S.E., Huck, P.M., Mitton, M.J. and S.L. Kenefick. 1995. "Evaluation of Odour Removal by Pilot Scale Biological Treatment Process Trains During Spring Runoff in an Ice-Covered River." *Water Sci. Technol.* **31**(11), 195-201.

84. Kenefick, S.L., Low, N.J., Hrudey, S.E. and B.G. Brownlee. 1995. "A Review of Off-Flavour Tainting of Water and Fish Caused by Pulp Mill Effluents." *Water Sci. Technol.* **31**(11), 55-61.

83. Brownlee, B.G., Kenefick, S.L., MacInnis, G.A. and S.E. Hrudey. 1995. "Characterization of Odorous Compounds from Bleached Kraft Pulp Mil Effluent." *Water Sci. Technol.* **31**(11), 35-40.

82. Lam, A.K.-Y., Prepas, E.E., Spink, D. and Hrudey, S.E. 1995. "Chemical Control of Hepatotoxic Phytoplankton Blooms: Implications for Human Health." *Water Res.* **29**(8), 1845-1854.

81. Kindzierski, W.B., Fedorak, P.M., Gray, M.R. and Hrudey, S.E. 1995."Activated Carbon and Synthetic Resins as Support Material for Methanogenic Phenol Degrading Consortia - Comparison of Phenol-Degrading Activities". *Water Environ. Res*. **67**(1), 108-117.

80. Peterson, H.G., Hrudey, S.E., Cantin, I.A., Perley, T.R. and S.L. Kenefick. 1995. “Physiological Toxicity, Damage and Release of Dissolved Organic Carbon and Geosmin by *Aphanizomen flos-aquae* after Exposure to Water Treatment Chemicals.” *Water Res*. **29**(6), 1515-1523.

79. Lambert, T.W., Holmes, C.F.B., and Hrudey, S.E. 1994. “Microcystin Class of Toxins: Health Effects and Safety of Drinking Water Supplies.” *Environ. Rev.* **2**(2), 167-186.

78. Lambert, T.W., Boland, M.P., Holmes, C.F.B., and Hrudey, S.E. 1994. “Quantitation of the Microcystin Hepatotoxins in Water at Environmentally Relevant Concentrations with the Protein Phosphatase Bioassay.” *Environ. Sci. Technol.* **28**, 753-755.

77. Pollard, S.J.T., Hrudey, S.E. and Fedorak, P.M. 1994. “Bioremediation of Petroleum- and Creosote-Contaminated Soils: A Review of Constraints.” *Waste Manage. Res.* **12**, 173-194.

76. Jensen, S.E., Anders, C.L., Goatcher, L.J., Perley, T., Kenefick, S. and S.E. Hrudey. 1994. “Actinomycetes as a Factor in Odour Problems affecting Drinking Water from the North Saskatchewan River.” *Water Res.* **28**, 1393-1401.

75. Hrudey, S.E. and Pollard, S.J. 1993. “The Challenge of Contaminated Sites: Remediation Approaches in North America.” *Environ. Rev.* **1**, 55-72.

74. Pollard, S.J.T., Hoffmann, R.E. and Hrudey, S.E. 1993. “Screening of Risk Management Options for Abandoned Wood-Preserving Plant Sites in Alberta.” *Can J. Civil Eng.* **20**, 787-800.

73. Peterson, H., Milos, J., Spink, D., Hrudey, S.E. and Sketchell, J. 1993. “Trihalomethanes in Finished Drinking Water in Relation to Dissolved Organic Carbon and Treatment Process for Alberta Surface Waters”. *Environ. Technol.* **14**, 877-884.

72. Kenefick, S.L., Hrudey, S.E., Peterson, H.G. and Prepas, E.E. 1993. "Toxin Release from *Microcystis aeruginosa* after Chemical Treatment." *Water Sci. Technol.* **27**(3/4), 433-440.

71. Kotak, B.G., Kenefick, S.L., Fritz, D.L., Rousseaux, C.G., Prepas, E.E. and Hrudey, S.E. 1993. "Occurrence and Toxicological Evaluation of Cyanobacterial Toxins in Alberta Lakes and Farm Dugouts". *Water Res.* **27**, 495-506.

70. Pollard, S.L., Hrudey, S.E., Fuhr, B.J., Alex, R.F., Holloway, L.R. and Tosto, F. 1992. "Hydrocarbon Wastes at Petroleum and Creosote-Contaminated Sites: Rapid Characterization of Component Classes by Thin Layer Chromatography with Flame Ionization Detection." *Environ. Sci. Technol.* **26**, 2528-2534.

69. Craik, S.A., Fedorak, P.M., Hrudey, S.E. and Gray, M.R. 1992. "Kinetics of Methanogenic Degradation of Phenol by Activated Carbon Supported and Granular Biomass." *Biotechnol. Bioeng*. **40**, 777-786.

68. Hrudey, S.E., Hrudey, E.J. & N.J. Low. 1992. "Health Effects Associated with Waste Treatment, Disposal and Reuse."*Water Environ. Res.* **64**, 593-599.

67. Morales, A., Birkholz, D.A. and S.E. Hrudey. 1992. "Analysis of Pulp Mill Effluent Contaminants in Water, Sediment and Fish Muscle. Fatty and Resin Acids." *Water Environ. Res.* **64**(5), 660-668.

66. Morales, A., Birkholz, D.A. and S.E. Hrudey. 1992. "Analysis of Pulp Mill Effluent Contaminants in Water, Sediment and Fish Muscle. Chlorophenols and Related Compounds." *Water Environ. Res.* **64**(5), 669-681.

65. Kindzierski, W.B., Gray, M.R., Fedorak, P.M. and Hrudey, S.E. 1992. "Activated Carbon and Synthetic Resins as Support Material for Methanogenic Phenol Degrading Consortia - Comparison of Surface Characteristics and Initial Colonization". *Water Environ. Res.* **64**(6), 766-775.

64. Hrudey, S.E. 1992. "Hazardous Waste Management Approaches in Canada". *Water Sci. Technol.* **26**(1-2), 1-10.

63. Emde, K.M.E., Best, N. and S.E. Hrudey. 1992. "Production of the Potent Odour Agent, Isopropylmethoxypyrazine by *Lysobacter enzymogenes*. *Environ. Technol.* **13**, 201-206.

62. Hrudey, S.E., Rector, D. & N. Motkosky. 1992. Characterization of Drinking Water Odour Arising from Spring Thaw for an Ice-Covered Upland River Source. *Water Sci. Technol*. **25** (2), 65-72.

61. Kenefick, S.L., Hrudey, S.E., Prepas, E.E., Motkosky, N. and H.G. Peterson. 1992. "Odorous Substances and Cyanobacterial Toxins in Prairie Drinking Water Sources. *Water Sci. Technol*. **25** (2), 147-154.

60. Koning, C.W. and S.E. Hrudey. 1992. "Sensory and Chemical Characterization of Fish Tainted by Exposure to Oil Sand Wastewaters." *Water Sci. Technol*. **25** (2), 27-34.

59. Craik, S.A., Gray, M.R., Hrudey, S.E. & P.M. Fedorak. 1991. "Thermogravimetric Determination of Biomass on Activated Carbon." *Environ. Technol*. **12**, 489-496.

58. Hrudey, S.E., Hrudey, E.J. & N.J. Shaw. 1991. "Health Effects Associated with Waste Treatment, Disposal and Reuse." *J. Water Pollut. Control Fed.* **63**, 437-444.

57. Kindzierski, W.B., Fedorak, P.M. & S.E. Hrudey. 1991. "Anaerobic Treatability of a Phenolic Coal Conversion Wastewater after Diisopropylether Extraction." *Water Res.* **25**, 479-484.

56. Hrudey, S.E. , Soskolne, C.L., Berkel, J. & S. Fincham. 1990. "Drinking Water Fluoridation and Osteosarcoma." *Can. J. Pub. Health.* **81**, 415-416.

55. Fedorak, P.M., W.B. Kindzierski & S.E. Hrudey. 1990. " Effects of Anilines and Hydantoins on the Methanogenic Degradation of Selected Phenols." *Water Res.* **24**, 921-925.

54. Hrudey, S.E. & E.J. Hrudey. 1990. "Health Effects Associated with Waste Treatment, Disposal and Reuse." *J. Water Pollut. Control Fed.* **62**, 452-460.

53. Roberts, D.J., P.M. Fedorak & S.E. Hrudey. 1990. "CO_2 -Incorporation and 4-Hydroxy-2-Methylbenzoic Acid Formation during the Anaerobic Metabolism of m-Cresol by a Methanogenic Consortium." *Appl. Environ. Microbiol.* **56**, 472-478.

52. Birkholz, D.A., R.T. Coutts, S.E. Hrudey, R.W. Danell and W.L. Lockhart. 1990. Comparative Aquatic Toxicology of Alkyl-Quinolines" *Water Res.*, **24**, 67-73.

51. Birkholz, D.A., R.T. Coutts and S.E. Hrudey. (1989). "Uptake and Biotransformation of 6,7-Dimethylquinoline and 6,8-Dimethylquinoline by Rainbow Trout (*Salmo gairdneri*)." *Xenobiotica*, **19**, 695-710.

50. Hrudey, S.E. & E.J. Hrudey. 1989. "Health Effects Associated with Wastewater Treatment, Disposal and Reuse." *J. Water Pollut. Control Fed.* **61**, 849-854.

49. Fedorak, P.M. & S.E. Hrudey. 1988. "Cyanide Transformation in Anaerobic Phenol-Degrading Methanogenic Cultures." *Water Sci. Technol.* **21**, 67-76.

48. Daignault, S.A., A. Gac & S.E. Hrudey. 1988. "Analysis of Low Molecular Weight Aldehydes Causing Odor in Drinking Water." *Environ. Technol. Lett.* **9**, 583-588.

47. Birkholz, D.A., R.T. Coutts & S.E. Hrudey. 1988. "Determination of Polycyclic Aromatic Compounds in Fish Tissue." *J. Chromatog.* **449**, 251-260.

46. Hrudey, S.E. 1988. "Taste and Odor Problems in Drinking Water from a Parkland River Source." *Water Qual. Bull.* **13**, 52-55.

45. Hettiaratchi, J.P.A., Hrudey, S.E., Smith, D.W. & D.C.C. Sego. 1988. "Shrinkage Behaviour of Clay Liner Material Exposed to Municipal Solid Waste Landfill Leachate." *Can. J. Civil Eng.* **15**, 500-508.

44. Roberts, D.J., Fedorak, P.M. & S.E. Hrudey. 1988. "Culture Methods for Obtaining m-Cresol Degrading Methanogenic Consortia." *Current Microbiol.* **17**, 83-87.

43. Hrudey, S.E., Gac, A. & S.A. Daignault. 1988. "Potent Odour-Causing Chemicals Arising from Drinking Water Disinfection." *Water Sci. Technol.* **20**(8/9), 55-61.

42. Jardine, C.G. & S.E. Hrudey. 1988. "Threshold Detection Values of Potential Fish Tainting Substances from Oil Sands Wastewaters." *Water Sci. Technol.* **20**(8/9), 19-25.

41. Hettiaratchi, J.P.A., Hrudey, S.E., Smith, D.W. & D.C.C. Sego. 1988. "A Procedure for Evaluating Municipal Solid Waste Leachate Components Capable of Causing Volume Shrinkage in Compacted Clay Soils." *Environ. Technol. Lett.* **9,** 23-34.

40. Hrudey, S.E. & E.J. Hrudey. 1988. "Health Effects Associated with Wastewater Treatment, Disposal and Reuse." *J. Water Pollut. Control Fed.* **60**, 858-864.

39. Hettiaratchi, J.P.A. & S.E. Hrudey. 1987. "Influence of Contaminant Organic - Water Mixtures on Shrinkage of Impermeable Clay Soils with Regard to Hazardous Waste Landfill Liners." *Hazard. Wastes & Hazard. Mater.* **4**, 377-388.

38. Hrudey, S.E., Knettig, E., Fedorak, P.M. & S.A. Daignault. 1987. "Anaerobic Semi-Continuous Culture Biodegradation of Dichlorophenols Containing an Ortho Chlorine." *Can. J. Water Pollut. Res.* **22**, 427-436.

37. Roberts, D.J., Fedorak, P.M. & S.E. Hrudey. 1987. "Comparison of the Fates of the Methyl Carbons of m-Cresol and p-Cresol in the Methanogenic Consortia." *Can. J. Microbiol.* **33**, 335-338.

36. Hrudey, S.E., E. Knettig, S.A. Daignault and P.M. Fedorak 1987. "Anaerobic Biodegradation of Monochlorophenols" *Environ. Technol. Lett.* **8**, 65-76.

35. Fedorak, P.M. and Hrudey, S.E. 1987. "Inhibition of Anaerobic Degradation of Phenolics and Methanogenesis by Coal Coking Wastewater." *Water Sci. Tech.* **19**, 219-228.

34. Nielsen, J.S., Hrudey, S.E. & Cantwell, F.F. 1987. "Prediction of Soluble Nickel Removal by Activated Sludge using Free Metal Ion Concentrations." *Water Sci. Tech.* **19**, 439-448.

33. Fedorak, P.M., Roberts, D.J. & Hrudey, S.E. 1986. "The Effects of Cyanide on the Methanogenic Degradation of Phenolic Compounds." *Water Res.* **20**, 1315-1320.

32. Fedorak, P.M. & Hrudey, S.E. 1986. "Nutrient Requirements for the Methanogenic Degradation of Phenol and p-Cresol in Anaerobic Draw and Feed Cultures" *Water Res.* **20**, 929-933.

31. Knettig, E., Thomson, B. & Hrudey, S.E. 1986. "Competitive Activated Carbon Adsorption of Phenolic Compounds." *Environ. Pollut. Ser.B*, **12,** 281-289.

30. Fedorak, P.M. & Hrudey, S.E. 1986. "Anaerobic Treatment of Phenolic Coal Conversion Wastewater in Semicontinuous Cultures." *Water Res.* **20**, 113-122.

29. Kindzierski, W. & Hrudey, S.E. 1986. "Effects of Phosphorus Removal Chemicals upon Methane Production during Anaerobic Sludge Digestion." *Can. J. Civ. Eng.* **13**, 33-38.

28. Hrudey, S.E. & Finch, G. 1985. "Water Reclamation and Reuse - 1984." *J. Water Pollut. Control Fed.* **57**, 557-560.

27. Fedorak, P.M., Knettig, E. & Hrudey, S.E. 1985. "The Effects of Activated Carbon on the Methanogenic Degradation of Phenolics in H-Coal Wastewater" *Environ. Technol. Lett.* **6**, 181-187.

26. Hrudey, S.E. 1985. "Residues from Hazardous Waste Treatment" *Effl. Water Treat. J.* **25**(1), 7-12.

25. Nelson, L.R. & Hrudey, S.E. 1985. "Fish Ladders in Alberta." *Prairie Forum: J. Plains Res. Cen.* **10**(1), 205-213.

24. Nielsen, J.S., Hrudey, S.E. & Cantwell, F.F. 1984. "Role of the Free Metal Ion Species in Soluble Nickel Removal by Activated Sludge" *Environ. Sci. Technol*. **18**, 883-886.

23. Fedorak, P.M. & Hrudey, S.E. 1984. "Batch Anaerobic Methanogenesis of Phenolic Coal Conversion Wastewater" *Water Sci. Technol.* **17**, 143-154.

22. Hrudey, S.E. & Putz, G. 1984. "Water Reclamation and Reuse - 1983" *J. Water Pollut. Control Fed.* **56**, 616-620.

21. Fedorak, P.M. & Hrudey, S.E. 1984. "The Effects of Phenol and Some Alkyl Phenolics on Batch Anaerobic Methanogenesis." *Water Res.* **18**, 361-367.

20. Nielsen, J.S. & Hrudey, S.E. 1984. "A Rapid Method for the Digestion of Sewage and Sludge for Metal Analyses." *Environ. Sci. Technol.* **18**, 130-132.

19. Fedorak, P.M. & Hrudey, S.E. 1983. "A Simple Apparatus for Measuring Gas Production by Methanogenic Cultures in Serum Bottles." *Environ. Technol. Lett.* **4**, 425-432.

18. Hrudey, S.E. 1983. "Hazardous Waste Management in Canada."*Water Qual. Bull.* **8**, 226-230, 247, 248.

17. Nielsen, J.S. & Hrudey, S.E. 1983. "Metal Loadings and Removal at a Municipal Activated Sludge Plant" *Water Res.* **17**, 1041-1052.

16. Hrudey, S.E. & Smith, D.W. 1983. "Water Reclamation and Reuse - 1982." *J. Water Pollut. Control Fed.* **55**, 662-674.

15. Cantwell, F.F., Nielsen, J.S. & Hrudey, S.E. 1982. "Free Nickel Ion Speciation in Sewage by an Ion Exchange Column - Equilibration Method." *Anal. Chem.* **54**, 1498-1503.

14. Hrudey, S.E. 1982. "Factors Limiting Emulsified Lipid Treatment Capacity of Activated Sludge." *J. Water Pollut. Control Fed.* **54**, 1207-1214.

13. Hrudey, S.E. 1982. "Water Reclamation and Reuse - 1981." *J. Water Pollut. Control Fed.* **54**, 654-673.

12. Hrudey, S.E. 1981. "Evaluation of Procedures for Measuring Fats, Oils and Greases (FOG) in Wastewaters." *Environ. Technol. Lett*. **2**, 503-510.

11. Hrudey, S.E. 1982. "Advances in Water Reuse: Issues for Water Management in Alberta." *Prairie Forum: J. Plains Res. Cen.* **7**, 1-13.

10. Hrudey, S.E. & S. Raniga .1981. "Greywater Characteristics, Health Concerns and Treatment Technology.", *Water Sci. Technol.* **13** (supp), 137-154.

9. Hrudey, S.E. 1981. "Activated Sludge Response to Emulsified Lipid Loading." *Water Res.* **15**, 361-373.

8. Hrudey, S.E. 1981. "Water Reclamation and Reuse -1980", *J. Water Pollut. Control Fed.* **53**, 751-767.

7. Bouthillier, P.H. & S.E. Hrudey 1980. "Dissolved Oxygen Depletion Problems in Ice Covered Alberta Rivers.", *Prairie Forum: J. Can. Plains Res. Cen.* **4**, 221-236.

6. Penttinen, S.E., P.H. Bouthillier & S.E. Hrudey 1979."Investigation of the Contribution of Natural Organic Runoff to Dissolved Oxygen Depletion in the Red Deer River.", *Water Pollut. Res. J. Can.* **14**, 71-83.

5. Hrudey, S.E. 1979. "Sources and Characteristics of Liquid Process Wastes from Arctic Offshore Hydrocarbon Exploration." *Arctic* **32**,.3-21.

4. Hrudey, S.E., G. Sergy & T. Thackeray 1976. "Toxicity of Oil Sands Plant Wastewaters and Associated Organic Contaminants.", *Water Pollut. Res. J. Can.* **11**, 34-45.

3. Hrudey, S.E., R. Perry & D.D. Ratnayaka. 1975. "Waste Discharges Arising from Municipal Refuse Incinerators", *Environ. Pollut. Man.* **5**, 33-36.

2. Hrudey, S.E., R. Perry & R. Wellings. 1974. "The Composition of Residues from Municipal Refuse Incinerators.", *Environ. Res.* **7**, 294-302.

1. Hrudey, S.E. & R. Perry. 1973. "Assessment of Organic Content of Incinerator Residues.", *Environ. Sci. Technol.* **7**, 1140-1147.

Op-Eds, *Recent Media Features and Columns.

17. Hrudey, S. 2011. Op-Ed: Environment Canada's mandate more about keeping minister out of hot water than serving taxpayers. *The Hill Times*. August 22.

16. *Foster, P. 2011. Op-Ed: Tripping Point. The fix was in, most obviously from what the film left out. *Financial Post – National Post*. January 28.

15. *Thomson, G. 2010. Column: No one should be rapt with report that rapped everyone. Royal Society judgment on oilsands did the job the Alberta government has failed to do. *Edmonton Journal*. December 18.

14. *Braid, D. 2010. Column: Government comes off worse than oil sands in scientists' report. *Calgary Herald.* December 16.

13. *Editorial Board. 2010. Editorial: The oil industry gets a do-over. Environmental rhetoric about the oil sands falls short on multiple counts. *National Post.* December 16.

12. *Austen, I. 2010. News story: Canada faulted for lax oil sands oversight. *The New York Times*. December 15.

11. *Hoag, H. 2010. News story: Impacts of Canada's oil-sands operations 'exaggerated'. Report rebuts cancer claims and recommends changes to oversight and monitoring. *Nature News online from the journal Nature*. December 15.

10. *Wingrove, J. 2010. Front page news story: Oil-Sands report criticizes all stakeholders. *Globe and Mail*. December 15.

9. Hrudey, S. 2008. Op-Ed: Canada must pay the true cost of safe drinking water. *Globe and Mail*. April 25.

8. Hrudey, S. 2008. Op-Ed: Safe water? Depends on where you live. *Canadian Medical Association Journal* 178(8): 975.

7. *Editorial Board. 2004. Editorial: A plea bargain steeped in fiction. *National Post.* December 22, 2004.

6. Hrudey, S. 2004. Op-Ed: Contaminating the facts. The truth about Walkerton is distorted by the Koebel's plea bargain. *National Post.* December 21.

5. *Truman, R. 2004. Feature: Weak training, poor practices. Canadian communities too complacent about their drinking water, scientist says. *Hamilton Spectator* and *Canadian Press*, December.

4. *Brady, M. 2004. Feature: Guess who's coming to dinner. Salmonella, giardiasis and E. Coli, to name just a few. *Ottawa Citizen*. August 29.

3. Hrudey, S. 2001. Op-Ed: Costly to neglect drinking water – Success in past has bred complacency. *National Post.* June 9.

2. Hrudey, S. 2000. Op-Ed: Could Walkerton water contamination tragedy occur here? *Edmonton Journal.* June 9.

1. *Truman, R. 1998. Feature: The death lottery – An Edmonton scientist who has been studying death trends in Canada has some advice on what we should and shouldn't be worrying about. *Globe and Mail*. December 21.

Discussions, Editorials and Non-Refereed Professional Commentaries

15. Bull, R.J., J. Fawell, J. Cotruvo & S.E. Hrudey. 2011. Critique of Chowdhury et al. - Disinfection byproducts in Canadian provinces: Associated cancer risks and medical expenses. *J. Hazard Mat.* 187:574-584. *J. Hazard Mat.* In press.

14. Hrudey. S.E. 2011. Oil Sands Contaminants. Critique of R. Weinhold. 2011. Alberta's Oil Sands: Hard Evidence, Missing Data, New Promises. *Environ. Health Persp.* 119: A126-A131. @ *Environ. Health Persp.* A330.

13. Hrudey, S.E. 2008. Water Safety Plans – Essential to Safe Drinking Water. *Drinking Water Safety International*. 1(2): 3-4.

12. Rizak, S. and S. E. Hrudey. 2007. Distinction needed between "detection" and "accurate detection". Comment on "On-line water quality parameters as indicators of distribution system contamination." *J Am Water Works Assoc.* 99(7): 62, 63, 121.

11. Williams, T. and S. Hrudey. 2007. Public health protection demands effective communication. *Water 21*. February 2007: 50-51.

10. Jalba, D. I. and S.E. Hrudey. 2006. Drinking water safety and risk management for public health agencies. *Environ. Health Rev*. 50(2): 37-44.

9. Hrudey, S.E. and E.J. Hrudey 2004. Global lessons from disease outbreaks. [Cover story]. *Water 21*. August 2004: 16-17.

8. Hrudey, S.E. and E. J. Hrudey 2003. *Reliability Eng. System Safety*.82: 343-345. Response to: Woo, D.M. and K.J. Vicente, 2003. Sociotechnical systems, risk management, and public health: comparing the North Battleford and Walketon Outbreaks. *Reliability Eng. System Safety* 80: 253-269.

7. Hrudey, S.E. 2003. Walkerton inquiry article raises questions and concerns. *West. Can. Water* 55(3); 35-38, Response to: Eryou, D.W. and C.S. Laughton. 2003. High reliability organizations and legal liability. *West. Can. Water* 55(1); 12-17.

6. Hrudey, S.E. and Lambert, T.W. 1994. "Mythology Cannot Expose Myths in Risk Communication. *J. Environ. Health*. **52**(2), 19-20

5. Hrudey, S.E. 1992. "Environmental Risk: What Do We Mean?" *Water Environ. Res.* **64**, 755.

4. Hrudey, S.E. and Low, N. 1992. Discussion of: "The Effect of Disinfectants on a Geosmin-Producing Strain of *Streptomyces griseus*" by Whitmore, T.N. and Denny, S. 1992. *J. Appl. Bacteriol.* **72**, 160-165. *J. Appl. Bacteriol.* **73**, 445-446.

3. Hrudey, S.E. 1990. Principles and Misconceptions in Environmental Health." *J. Water Pollut. Control Fed.* **62**, 211.

2. Hrudey, S.E. 1983. Reply to discussion of: "Factors Limiting Emulsified Lipid Treatment Capacity of Activated Sludge." by Dick, R.I. & Christensen, G.L. *J. Water Pollut. Control Fed.* **55**, 1024-1025.

1. Hrudey, S.E. 1982. "Fear of Hazardous Wastes: A Self Fulfilling Prophecy?" *Environ. Sci. Technol.*, **16**, p537A. & Reprinted in: *Ecolibrium* (1983) **12**(2), 14.

Published Conference Proceedings - Refereed marked (R):

73. Charrois, J.W., M.W. Arend, K.L. Froese and S.E. Hrudey. 2003. Detection of n-nitrosamines in water using solid phase extraction with GC/MCD ammonia positive chemical ionisation. *Water Quality Technology Conference. AWWA*. Philadelphia.

72. **(R)** Rizak, S. and S.E. Hrudey. 2003. Abstract only. Understanding of environmental monitoring evidence for risk management decision-making. *15th Conf. Int. Soc. Environ. Epidemiol*., 23-26 September, Perth. Australia.

71. **(R)** Chen, W., Gabos, S., Froese, K. and S.E. Hrudey. 2003. Abstract only. Validating urinary trichloroacetic acid as a biomarker of exposure for disinfection by-products in drinking water – a third human trial. *15th Conf. Int. Soc. Environ. Epidemiol*., 23-26 September, Perth. Australia.

70. Hrudey, S.E. 2003. Quality management recommendations from the Walkerton Inquiry. *Proc.WHO Water Safety – Risk Management Strategies for Drinking Water.* Berlin.

69. **(R)** Bader, E. S.E. Hrudey and K.L. Froese. 2003. Validating Trichloroacetic Acid for Time Intregration of Exposure to Drinking Water Disinfection By-Products. *Ozwater 2003 Biannual Conference of the Australian Water Association. Perth, WA.* April 2003. published on CD.

68. **(R)** Hrudey, S.E. 2003. Key messages for drinking water providers from Walkerton, North Battleford and other major outbreaks. *Ozwater 2003 Biannual Conference of the Australian Water Association*. Perth, WA. April 2003. published on CD.

67. **(R)** Hrudey, S.E., P.M. Huck, P. Payment, R.W. Gillham and E.J. Hrudey. 2002. Walkerton: Lessons learned in comparison with waterborne outbreaks in the developed world. *Proc. 10th Nat.Conf. on Drinking Water*

66. Froese, K.L., W. Gabryelski,, B. Ells, F. Wu, S.E. Hrudey, D.A. Barnett, R.W. Purves and R. Guevremont. 2002. The use of ESI-FAIMS-MS for the analysis of haloacetic acids in drinking water. Water Quality Technology Conference. AWWA.

65. **(R)** Froese, K., M. Sinclair and S. Hrudey. 2001.Trichloroacetic acid as a biomarker of human exposure for non-volatile disinfection by-products. *Proc. 9th Nat.Conf. on Drinking Water.* 40-49.

64. **(R)** Bodo, K., S. Hrudey and K. Froese. 2001. "Experimental determination of the n-octanol-water partition coefficient for dichloroacetonitrile (DCAN) and chloral hydrate (CH). *Proc. 9th Nat. Conf. on Drinking Water.* 301-308.

.

63. **(R)** Rizak, S. S. Hrudey, K. Kjartanson, T. Satchwill and K. Froese. 2001. Distribution system monitoring data as a basis to estimate human exposure to halogenated disinfection by-products. *Proc. 9th Nat.Conf. on Drinking Water*. 205-223.

62. **(R)** Hrudey, S.E. 1999. Health Risk Assessment – What We Know and How We Know It. *Proc Australian Water and Wastewater Conference*. Adelaide, published on CD, no page #s.

61. **(R)** Hrudey, S.E. 1999. "Drinking Water and Health Risk: Balancing Risk and Reason" Keynote Address. *Proc. 7th National Conference on Drinking Water*. Canadian Water and Wastewater Association. 1-11.

60. **(R)** Rizak, S., S.E. Hrudey and C. G. Jardine, 1997. Expert Judgments of Environmental Risks. *Proc. CSCE - ASCE Environmental Engineering Conference*, 1, 3-14.

59. **(R)**. Thomas, S.P. and S.E. Hrudey. 1997. Uncertainty in Knowledge of Health Risks. *Proc. CSCE-ASCE Environmental Engineering Conference*, 1, 15-26.

58. Hrudey, S.E. and W.B. Kindzierski. 1997. Environmental Risk Assessment: Informing Decision-Making or Rolling the Dice? *Proc. Risk Based Priorities for Managing Environmental Issues for the Oil and Gas Industry.* Air and Waste Management Association, April, 1997.

57. Hilderman, T.L., D.J. Wilson and S.E. Hrudey. 1997. Uncertainty and Predicting Fatalities from Toxic Gas Releases. *Proc. Risk Based Priorities for Managing Environmental Issues for the Oil and Gas Industry.* Air and Waste Management Association, April, 1997.

56. Arulanandam, S.J., D.J. Wilson and S.E. Hrudey. 1997. Gas Pipeline Failure - Analyzing the Data. *Proc. Risk Based Priorities for Managing Environmental Issues for the Oil and Gas Industry.* Air and Waste Management Association, April, 1997.

55. Kindzierski, W.B. and S.E. Hrudey. 1997. Health Risks from Flaring of Gases in Alberta - When to Model and When to Sample in Assessing Exposures. *Proc. Risk Based Priorities for Managing Environmental Issues for the Oil and Gas Industry.* Air and Waste Management Association, April, 1997.

54. Hrudey, S.E. 1997. "Normas de calidad de aire para cancerigenos podemos definir niveles seguros?" In: Calidad de Aire de Interiores – Contaminantes y sus Effectos en las Salud Humana. Ed. L. Gil and M. Adonis, Serie HCT/AIEPI-7, Santiago, Chile, Organicion Panamerica de la Salud, Organizacion Mundial de la Salud.

53. Scott, H.M., Ellahoj, E., Wilson, D.J., Martin, S.W., Soskolne, C.L., Coppock, R.W., Guidotti, T.L., Hrudey, S.E., Lissemore, K.D. 1997. "Geographical information systems for integrating air pollution modelling with outcomes and confounders: Effects of sour gas processing plant emissions on the health and productivity of cattle." *Epidemiologie et Sante Animale, Proceedings VIII International Society for Veterinary Epidemiology and Economics (ISVEE), Paris*, no. 31-32, 12.14.1 to 12.14.3.

52. **(R)** Kindzierski, W.B., Rector, D.W. and S.E. Hrudey. 1996."Balancing risk and reason: Public consultation for drinking water resource planning in Edmonton." *Proc. 6th National Drinking Water Conference*, Victoria, B.C., 25-38.

51. **(R)** Hrudey, S.E. 1996. "Strengths and Limitations of Risk Assessment." In*: Regulatory Efficiency and the Role of Risk Assessment*, Proc. from the First Annual Policy Forum of the Eco-Research Program in Environmental Policy and the School of Policy Studies at Queen's University, October 26-27, 1995, Ottawa, 136-139.

50. Seymour, D.T., Hrudey, S.E. and Fedorak, P.M. 1995. "Solubilities and Toxicities of Condensed Thiophenes and Their Microbial Metabolites." In: Proc. Fifth Annual Symposium on Groundwater and Soil Remediation, Toronto, 279-292.

49. Hrudey, S.E., Lambert, T.W. and Kenefick, S.L. 1994. "Health Risk Assessment of Microcystins in Drinking Water Supplies." In: *Proc. Toxic Cyanobacteria - A Global Perspective.* Australian Centre for Water Quality Research. Adelaide, Australia, 7-16.

48. **(R)** Hrudey, S.E., Kenefick, S.L., Lambert, T.W., Kotak, B.G., Prepas, E.E. and Holmes, C.F.B. 1994. "Sources of Uncertainty in Assessing the Health Risk of Cyanobacterial Blooms in Drinking Water." In: *Detection Methods for Cyanobacterial Toxins.* Ed. G. Codd., Royal Soc. Chemistry, Cambridge, U.K., 122-126.

47. **(R)** Holmes, C.F.B., McCready, T.L., Craig, M., Lambert, T.W. and Hrudey, S.E. 1994. "A Sensitive Bioscreen for Detection of Cyclic Peptide Toxins of the Microcystin Class." In: *Detection Methods for Cyanobacterial Toxins.* Ed. G. Codd., Royal Soc. Chemistry, Cambridge, U.K., 85-89.

46. **(R)** Pollard, S.J.T., Kenefick, S.L., Hrudey, S.E., Fuhr, B.J., Holloway, L.R. and Rawluk, M. 1994. "A Tiered Analytical Protocol for the Characterization of Heavy Oil Residues at Petroleum-Contaminated Hazardous Waste Sites." In: *Analysis of Soil Contaminated with Petroleum Constituents, ASTM STP 1221.* T.A. O'Shay and K.B. Hoddinott (editors). American Society of Testing and Materials, Philadelphia, 38-52.

45. **(R)** Hrudey, S.E. , Kenefick, S.L., Best, N., Gillespie, T., Kotak, B.G., Prepas, E.E. and H.G. Peterson. 1993. "Liver Toxins and Odour Agents in Cyanobacterial Blooms in Alberta Surface Water Supplies." In: *Disinfection Dilemma: Microbiological Control Versus By-Products. Proc. 5th National Conference on Drinking Water*. Winnipeg. American Water Works Association, 383-390.

44. **(R)** Kotak, B.G., Hrudey, S.E., Kenefick, S.L. and Prepas, E.E. 1993. "Toxicity of Cyanobacterial Blooms in Alberta Lakes." In: *Proc. 19th Aquatic Toxicity Workshop*, Can. Tech. Rep. Fisheries and Aquatic Science 1942, 172-179.

43. Kindzierski, W.B. and Hrudey, S.E. 1993. "Estimating Action Levels for Surface Soil at an Urban Residential Development in British Columbia. *Proc. Specialty Conf. on Developing Cleanup Standards for Contaminated Soil, Sediment and Groundwater - How Clean is Clean?* Water Environment Federation / U.S. Environmental Protection Agency / Agency for Toxic Substances and Disease Registry.

42. Pollard, S.J., Hrudey, S.E., Fuhr, B.J., Alex, R.F. and L.R. Holloway. 1992. "The Characterization of Petroleum and Creosote-Contaminated Soils: Component Class Analysis by Thin Layer Chromatography with Flame Ionization Detection." *Proc. Second Bi-annual Environmental Specialty Conference. Can. Soc. Civil Eng.* Quebec, May, 207-216.

41. Kindzierski, W.B. and S.E. Hrudey. 1991. "Implications of the Upper Bound and Average Exposure Scenario on Risk Management Decisions for Contaminated Site Remediation." *Proc. 84th Air Waste Manage. Assoc. Conf.,* Vancouver, paper 91-170.7 (15pp)

40. Hoffmann, R.E. and S.E. Hrudey. 1990. "Enhanced Land Treatment of Soil Contaminated with Wood Preserving Chemicals." *Proc. First Biennial Environmental Specialty Conference. Can. Soc. Civil Eng.* Hamilton, May, I-837-I-853.

39. Mercer, S. M. and S.E. Hrudey. 1990. Demonstration of Quantitative Risk Assessment for a Municipal Water Treatment Plant Chlorination Process. *Proc. First Biennial Environmental Specialty Conference. Can. Soc. Civil Eng.* Hamilton, May, I-120-I-139.

38. Hrudey, S.E. 1990."Electotechnologies for Hazardous Waste Processing." *Electrotechnologies and Industry - Congress 90*, Calgary, April, 4.0-4.14.

37. Hrudey, S.E., P.M. Fedorak and W.B. Kindzierski. 1990. "Anaerobic Biological Treatment of Coal Conversion Wastewaters." *Proc. 1990 Fundamental Coal Science Workshop*, 51-66.

36. Hrudey, S.E. 1989. "Protection of Public Health as a Basis for Environmental Protection Criteria." In: *Hazardous Waste Management for the 90s. Proc. International Specialty Conference of the Air and Waste Management Association*, SP-70, 247-259.

35. Hrudey, S.E., S.A. Daignault, A.J. Gac, D. Poole, G. Walker and D.A. Birkholz. 1989. "Swampy or Swimming Pool Odours Caused by Chlorination and Chloramination" *AWWA Seminar Proc. Identification of Taste and Odor Compounds. 1989 Annual Conf. Am. Water Works Assoc.* Los Angeles, June 18-23, 143-156.

34. Hettiaratchi, J.P.A. and S.E. Hrudey. 1989. "An Alternative Method of Designing Clay Liners for Waste Storage and Disposal Facilities." *Proc. 2nd Inter. Symp. Environmental Geotechnology*.

33. Hrudey, S.E. & P.M. Fedorak. 1988. "Anaerobic Biological Treatment of Synfuels Wastewaters."*Proc. Symp. Opportunities in the Synfuels Industry.* Bismarck, North Dakota. August 27-31.

32. Hrudey, S.E., Gac, A. & S.A. Daignault. 1988. "Odorous Aldehydes Produced by Disinfectant Reactions with Common Amino Acids." *Proc. 1988 Annual Conf. Am. Water Works Assoc.* Orlando, June 19-23, 1803-1812.

31. Birkholz, D.A., D.G. Erickson & S.E. Hrudey. 1988. "What Every Environmental Engineer Should Know about Trace Organic Contaminant Analyses." *Proc. 1988 Can. Soc. Civ. Eng. Annual Conf.* Calgary, May 23-25, 598-612.

30. Kindzierski, W.B., Hrudey, S.E. & P.M. Fedorak. 1988. "Solvent Extraction and Anaerobic Biological Treatment of High Strength Phenolic Wastewater." *Proc. 1988 Joint CSCE-ASCE National Conference on Environmental Engineering.* Vancouver, July 13-15, -719.

29. Hettiaratchi, J.P.A. & S.E. Hrudey. 1987. "Considerations of Soil Shrinkage in Designing Clay Liners for Municipal Solid Waste Landfills." *Proc. 9th Southeast Asian Geotechnical Conf.*, Bangkok, December, 3-121 to 3-136.

28. Hettiaratchi, J.P.A., Hrudey, S.E., Sego, D.C.C. & D.W. Smith. 1987. "Consideration of Clay Soil and Leachate Interactions in Landfill Liner Design.", *Proc. 9th Can. Conf. Waste Man.*, Edmonton, October, 1987.

27. Hrudey, S.E. & W.B. Kindzierski 1987. "Emerging Physical/Chemical Treatment Technologies for Hazardous Wastes Treatment." *Proc. Hazardous Waste Management - Getting the Job Done.* Canadian Prairie and Northern Section, Air Pollution Control Association. Edmonton, May.

26. Koning, W. & S.E. Hrudey 1987. "Fish Tainting by Oil Sands Tailings Pond Wastewaters." *Proc. 2nd Applied Aquatic Studies Workshop.* U. of Alberta. February.

25. Birkholz, D.A., Hrudey, S.E. & D.G. Erickson 1987. "Degradation Products Formed in Alkanolamine Sour Gas Treaters" *Proc. 22nd Workshop for Pesticide and Trace Organic Residue Analysts (Western Canada)*. Calgary, May.

24. Hrudey, S.E. 1986. "The Edmonton Drinking Water Study." *Proc. 1986 Am. Water Works Assoc. Water Quality Technology Conf.*, 1091-1097.

23. **(R)** Hrudey, S.E. & Kok, S. 1987. "Environmentally Relevant Characteristics of Oil-in-Water Emulsions" In: *Oil and Freshwater: Chemistry, Biology and Countermeasure Technology.* Ed. Vandermeulen, J.H. and Hrudey, S.E., Pergamon Press, 58-71.

22. **(R)** Birkholz, D., Hrudey, S.E., Kimble, B., Gray, M. and Rawluk, M. 1987. "Characterization of Water Soluble Components of a Wastewater Oil Sample from an Oil Sands Bitumen Upgrading Plant" In: *Oil and Freshwater: Chemistry, Biology and Countermeasure Technology.* Ed. Vandermeulen, J.H. and Hrudey, S.E., Pergamon Press, 42-57.

21. Hrudey, S.E. 1986. "Public Perception of Technical Issues - Problems in Siting and Operating Hazardous Waste Management Facilities."*Proc. 3rd Int. Conf. Operating European Hazardous Waste Management Facilities.* Odense, Denmark. Sept. 1986.

20. Hrudey, S.E. & K.J. Simpson 1986. "Management of Residues from Centralized Hazardous Waste Treatment Facilities." *Toxic Contamination in Large Lakes - Vol. III Sources, Fate, and Controls of Toxic Contaminants.*Lewis Publishers, 177-190.

19. Hrudey, S.E. & Fedorak, P.M. 1986. "Potential for Anaerobic Biological Treatment of Petroleum Industry Wastes."*Proc. Conf. "Petroleum Waste Management: A Western Perspective"* Calgary, Jan. 1986.

18. Hrudey, S.E. 1985. "Siting Hazardous Waste Management Facilities" *Proc. Conf. "National Strategies for Managing Hazardous Wastes"* Melbourne, Australia, Nov. 1985.

17. Kindzierski, W. & Hrudey, S.E. 1985. "Effects of Phosphorus Removal Chemicals upon Methane Production during Anaerobic Sludge Digestion." *Proc. 1985 Annual Conf., Can. Soc. Civ. Eng.*, III, 227-242.

16. Fedorak P.M. & Hrudey, S.E. 1983. "Assessment of Anaerobic Treatability of Industrial Wastewaters" *Water & Pollut. Control*, 122, 1, 32-33.

15. Hrudey, S.E. 1983. "Current Practices in Hazardous Waste Management: Europe and North America" *Proc. 35th Western Canada Water & Sew. Conf.*, 73-77.

14. Hrudey, S.E. 1983. "Survey of Operating Hazardous Waste Facilities in Europe and North America" *Proc. 1983 Nat.Conf. Environ. Eng. A.S.C.E.*, 210-217.

13. Hrudey, S.E. 1983. "Management of Residuals from Hazardous Waste Facilities" *Proc. 38th Purdue Industrial Waste Conf.* Ann Arbor Sci. Publ., 233-241.

12. **(R)** Hrudey, S.E and Tookwinas, S. 1982. "Influence of Dilution Water pH upon Acute Lethality of Oleic Acid and Linoleic Acid to Rainbow Trout. *Proc. 9th Aquatic Toxicity Workshop; Can. Tech. Rep. Fish. Aquatic Sci.* **1163**, 89-96.

11. Nielsen, J.S., Hrudey, S.E. & Cantwell, F.F. 1982. "Mechanisms of Nickel Removal by Activated Sludge" *Proc. Annual Conf. Can. Soc. Civ. Eng.,* 1459-1474.

10. Hrudey, S.E. & J.D. Scott 1982. "Water Reuse Needs of the Oil Sands Industry in Alberta" *Water Reuse Symp. II., Conf. Proc.* Washington, 1979-2004.

9. Nielsen, J.S., S.E. Hrudey & F.F. Cantwell 1981. "Significance of Speciation to Nickel Removal by Activated Sludge" *Heavy Metals in the Environment. Conf. Proc.* Amsterdam, 114-117.

8. Hrudey, S.E. 1981. "Biochemistry of Activated Sludge: Role of Lipids", *Water Industry 81, Conf. Proc.*, Brighton, 191-196.

7. **(R)** Hrudey, S.E. & S. Raniga. 1981. "Greywater Management for Isolated Northern Communities", *Proc. Amer. Soc. Civ. Eng. Specialty Conf.: The Northern Community - Search for a Quality Environment,* Seattle, 471-481.

6. **(R)** Nagendran, J. & S.E. Hrudey. 1981. "Oil Recovery and Recycle Water Treatment for In-Situ Oil Sand Production", *Environmental and Economic Considerations in Energy Utilization, Proc. 7th. Nat. Conf. Energy & Environ.*, pp.66-74, Ann Arbor Sci. Pub., Ann Arbor, Mich.

5. **(R)** Hrudey, S.E. 1980. "Surface and Subsurface Water Quality Implications of Waste Drilling Fluid Sump Abandonment in Permafrost Regions", *Proc. Symp. Research on Environmental Fate and Effects of Drilling Fluids and Cuttings*, Lake Buena Vista, Florida, 191-222.

4. Hrudey, S.E. 1980. "Factors Limiting Emulsified Lipid Treatment Capacity of Activated Sludge", *Proc. Res. Symp., 53rd Water Pollut. Control Fed. Conf*., Las Vegas, 1-15.

3. Hrudey, S.E. 1978. "Pretreatment of Meat and Poultry Products Plant Wastewaters", *Proc. Technology Transfer Seminar on Meat and Poultry Products Plant Regulations and Guidelines*, Environment Canada, Ottawa.

2. Hrudey, S.E. 1977. "Municipal Sewage Sludge - Types and Quantities", *Proc. Technology Transfer Seminar on Sludge Management*, Alberta Environment and Environment Canada, Edmonton.

1. Bryant, W.J., J. Goldburn & S.E. Hrudey. 1974. "Water Pollution Aspects from Waste Drilling Mud Disposal in Canada's Arctic", *Proc. 1974 Offshore Technol. Conf.*,OTC 2044, Houston, pp.95-102.

PUBLICATION LIST

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CURRENT APPOINTMENTS

Professor 2000 - Present
Land Reclamation and Restoration Ecology
Department of Renewable Resources, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta, Edmonton Alberta

Director 2011 - Present
Land Reclamation International Graduate School (LRIGS)
University of Alberta, Edmonton Alberta

Vargo Distinguished Teaching Chair 2005 - Present
University of Alberta, Edmonton Alberta

ACADEMIC QUALIFICATIONS

Doctor of Philosophy
1986 - 1988, Plant Science
Department of Plant Science, University of Alberta, Edmonton Alberta

Master of Science
1982 - 1985, Land Reclamation
Department of Soil Science, Department of Plant Science, University of Alberta, Edmonton Alberta
Double MSc met requirements of both departments

Special Student
1981 (2 terms), Soil Science
Department of Soil Science, University of Alberta, Edmonton Alberta
To obtain equivalent undergraduate background to soil science major

Bachelor of Science
1972 - 1976, Biology major, psychology minor
Faculty of Science, University of Alberta, Edmonton Alberta
Faculty of Arts and Science, University of Saskatchewan, Saskatoon Saskatchewan

AWARDS AND HONOURS

2011: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2010: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2009: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2008: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2007: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2007: Fellow of the Canadian Society of Soil Science
2006: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2006: 10 years of service, Environmental Appeals Board, Government of Alberta
2006: Alberta Women in Science Mentor of the Millennium
2005: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2005: Most thought provoking paper at the CSA meetings

2005: Alumni Award of Excellence, University of Alberta
2004: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2003: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2003: Award of Recognition from the Canadian Land Reclamation Association
2002: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2001: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2001: Killam Annual Professorship, University of Alberta
2000: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
2000: Distinguished Agrologist Award. Alberta Institute of Agrologists
1999: Teacher of the Year, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta
1999: Rutherford Award of Excellence for Undergraduate Teaching, University of Alberta
1999: Environmental Sustainability Award (Knowledge Builder), Alberta Agriculture, Food and Rural Development, for contributions to the industry from research and teaching
1997: 3M National Teaching Fellowship (top 10 professors in Canada)
1997: Fellow of the Society for Teaching and Learning in Higher Education
1996: Canadian Land Reclamation Association Noranda Land Reclamation Award for outstanding contributions to the field of land reclamation in Canada; the most prestigious award for land reclamation in Canada, reflecting a career of nationally and internationally recognized contributions to the field
1995: Faculty of Agriculture, Forestry and Home Economics Teaching Award
1994: National Association of College Teachers in Agriculture (NACTA) Teaching Award

REFEREED PUBLICATIONS

Antill, TM, MA Naeth, EW Bork and AL Westhaver. 2012. Russian thistle (*Salsola tragus* L.) control on bighorn sheep winter ranges in Jasper National Park. Natural Areas Journal. In Press For Late Summer.

Drozdowski, BL, MA Naeth and SR Wilkinson. 2012. Evaluation of substrate and amendment materials for soil reclamation at a diamond mine in the Northwest Territories, Canada. Canadian Journal of Soil Science 92(1):77-88.

Gardner, WC, MA Naeth, K Broersma, DS Chanasyk and AM Jobson. 2012. Influence of biosolids and fertilizer amendments on element concentrations and revegetation of copper mine tailings. Canadian Journal of Soil Science 92(1):89-102.

Krummelbein, J, O Bens, T Raab and MA Naeth. 2012. A history of lignite coal mining and reclamation practices in Lusatia, eastern Germany. Canadian Journal of Soil Science 92(1):53-66.

Naeth, MA, HA Archibald, CL Nemirsky, LA Leskiw, JA Brierley, MD Bock, AJ VandenBygaart and DS Chanasyk. 2011. Proposed classification for human modified soils in Canada: anthroposolic order. Canadian Journal of Soil Science 92(1):7-18.

Naeth, MA, DS Chanasyk and TD Burgers. 2011. Vegetation and soil water interactions on a tailings sand storage facility in the Athabasca oil sands region of Alberta Canada. Physics and Chemistry of the Earth 36:19-30.

Jackson, ME, MA Naeth, DS Chanasyk and CK Nichol. 2011. Phosphogypsum capping depth affects revegetation and hydrology in Western Canada. Journal of Environmental Quality 40(4):1122-1129.

Desserud, PA and MA Naeth. 2011. Promising results restoring grassland disturbances with native hay (Alberta). Ecological Restoration 29(3):215-219.

Naeth, MA. 2011. Wetland rehabilitation. Chapter 8 in: Oil and gas industry impact on arctic wetlands, mitigation, recovery and restoration options. Pp. 121-146. Editors: P Kershaw, A Sirin and O Bragg. Report for Wetlands International, Ede. 179 pp.

Kershaw, P and MA Naeth. 2011. Glossary of terms. In: Oil and gas industry impact on arctic wetlands, mitigation, recovery and restoration options. Pp. 9-13. Editors: P Kershaw, A Sirin and O Bragg. Report for Wetlands International, Ede. 179 pp.

Gosselin, P, SE Hrudey, MA Naeth, A Plourde, R Therrien, G Van Der Kraak and Z Xu. 2010. The Royal Society of Canada expert panel: environmental and health impacts of Canada's oil sands industry report. 438 pp.

Gosselin, P, SE Hrudey, MA Naeth, A Plourde, R Therrien, G Van Der Kraak and Z Xu. 2010. The Royal Society of Canada expert panel: Environmental and health impacts of Canada's oil sands industry executive summary. 23 pp.

Desserud, PA and MA Naeth. 2010. Smooth brome: an unexpected response to straw amended soil (Alberta). Ecological Restoration 28(2):133-135.

Gardner, WC, K Broersma, MA Naeth, D Chanasyk and A Jobson. 2010. Influence of biosolids and fertilizer amendments on physical, chemical and microbiological properties of copper mine tailings. Canadian Journal of Soil Science 90:571-583.

Hallin, IL, MA Naeth, DS Chanasyk and CK Nichol. 2010. Assessment of a reclamation cover system for phosphogypsum stacks in central Alberta, Canada. Journal of Environmental Quality 39(6):2160-2169.

Mackenzie, DD and MA Naeth. 2009. The role of the forest soil propagule bank in assisted natural recovery after oil sands mining. Restoration Ecology 17(3):1061-2971.

Patterson, SJ, DS Chanasyk, MA Naeth and E Mapfumo. 2009. Effluent effects on a coarse textured soil and associated impacts on the nutrient concentrations and growth of reed canarygrass (*Phalaris arundinacea* L.) and hybrid poplar (*Populus deltoides x P. petrowskyana* L.). Canadian Journal of Soil Science 89(2):223-234.

Naeth, MA and SR Wilkinson. 2008. Lichens as bioindicators of point source air pollution, Northwest Territories, Canada. Journal of Environmental Quality 37:1-10.

Choi, YD, VM Temperton, EB Allen, AP Grootjans, M Halassy, RJ Hobbs, MA Naeth and K Torok. 2008. Ecological restoration for future sustainability in a changing environment. Ecoscience 15:53-64.

Patterson, SJ, DS Chanasyk, E Mapfumo and MA Naeth. 2008. Effect of municipal and pulp mill effluents on the chemical properties and nutrient status of a coarse textured brunisol in a growth chamber. Canadian Journal of Soil Science 88:429-441.

Patterson, SJ, DS Chanasyk, E Mapfumo and MA Naeth. 2008. Effects of diluted kraft pulp mill effluent on hybrid poplar and soil chemical properties. Irrigation Science 26:547-560.

Bradshaw, DL, DS Chanasyk, VS Baron and MA Naeth. 2007. Soil water regimes of annual and perennial forages during drought years in the aspen parkland ecoregion of Alberta. Canadian Journal of Soil Science 87:523-533.

Donkor, NT, RJ Hudson, DS Chanasyk and MA Naeth. 2006. Quantification and simulation of grazing impacts on soil water in boreal grasslands. Journal of Agronomy and Crop Science 192:192-200.

Reid, NB and MA Naeth. 2005. Establishment of a vegetation cover on kimberlite mine tailings: a field study. Restoration Ecology 13(4):593-600.

Reid, NB and MA Naeth. 2005. Establishment of a vegetation cover on kimberlite mine tailings: a greenhouse study. Restoration Ecology 13(4):601-607.

Henderson, DC and MA Naeth. 2005. Multi-scale impacts of crested wheatgrass invasion in mixed-grass prairie. Biological Invasions 7:639-650.

Wilkinson, SR, MA Naeth and FKA Schmeigelow. 2005. Tropical forest restoration in Galapagos National Park: application of a state-transition model. Ecology and Society 10(1):28 [online] URL: http://www.ecologyand society.org/vol10/iss1/art28/.

Henderson, DC, BH Ellert and MA Naeth. 2004. Utility of 13C for estimating ecosystem carbon turnover in grazed mixed-grass prairie. Geoderma 119:219-231.

Henderson, DC, BH Ellert and MA Naeth. 2004. Grazing and soil organic carbon along a gradient of Alberta grasslands. Journal of Range Management 57:402-410.

Chanasyk, DS, E Mapfumo, WD Willms and MA Naeth. 2004. Quantification and simulation of soil water on grazed fescue watersheds. Journal of Range Management 57:169-177.

Hammermeister, AM, MA Naeth, JJ Schoenau and VO Biederbeck. 2003. Soil and plant response to wellsite rehabilitation on native prairie in southeastern Alberta, Canada. Canadian Journal of Soil Science 83:507-519.

Donkor, NT, JV Gedir, RJ Hudson, EW Bork, DS Chanasyk and MA Naeth. 2002. Impacts of grazing on soil compaction and pasture production in Alberta. Canadian Journal of Soil Science 82:1-8.

Mathison, MN, DS Chanasyk and MA Naeth. 2002. Longevity of deep ripping effects on solonetzic and associated soils. Canadian Journal of Soil Science 82:259-264.

Baron, VS, E Mapfumo, AC Dick, MA Naeth, EK Okine and DS Chanasyk. 2002. Grazing intensity impacts on pasture carbon and nitrogen flow. Journal of Range Management 55(6):535-541.

Mapfumo, E, MA Naeth, VS Baron, AC Dick and DS Chanasyk. 2002. Grazing impacts on litter and roots: annual versus perennial forages. Journal of Range Management 55(1):16-22.
Baron, VS, AC Dick, E Mapfumo, SS Mahli, MA Naeth and DS Chanasyk. 2001. Grazing impacts on soil nitrogen and phosporus under Parkland pastures. Journal of Range Management 54:705-710.
Moskal, TD, L Leskiw, MA Naeth and DS Chanasyk. 2001. Effect of organic carbon (peat) on moisture retention of peat:mineral mixes. Canadian Journal of Soil Science 81:205-211.
Schaefer, JW, MA Naeth and DS Chanasyk. 2001. Live staking with willows fails to protect eroded lakeshore slope (Alberta). Ecological Restoration 18(4):267-268.
Harker, KN, VS Baron, DS Chanasyk, MA Naeth and FC Stevenson. 2000. Grazing intensity effects on weed populations in annual and perennial pasture systems. Weed Science 48:231-238.
Mapfumo, E, VS Baron, MA Naeth and DS Chanasyk. 2000. Grazing impacts on selected soil parameters under short term forage sequences. Journal of Range Management 53:466-470.
Twerdoff, DA, DS Chanasyk, MA Naeth, VS Baron and E Mapfumo. 2000. Soil water regimes of rotationally grazed perennial and annual forages. Canadian Journal of Soil Science 79:627-637.
Mapfumo, E, DS Chanasyk, MA Naeth and VS Baron. 1999. Forage growth and yield components as influenced by subsurface compaction. Agronomy Journal 90:805-812.
Mapfumo, E, DS Chanasyk, MA Naeth and VS Baron. 1999. Soil compaction under grazing of annual and perennial forages. Canadian Journal of Soil Science 79(1):191-199.
Twerdoff, DA, DS Chanasyk, E Mapfumo, MA Naeth and VS Baron. 1999. Impacts of forage grazing and cultivation on near-surface relative compaction. Canadian Journal of Soil Science 79:465-471.
Gill, SI, MA Naeth, DS Chanasyk and VS Baron. 1998. Runoff and sediment from snowmelt and rainfall as influenced by forage and grazing. Canadian Journal of Soil Science 78:699-706.
Hammermeister, AM, DS Chanasyk and MA Naeth. 1998. Fly ash influences on near-surface temperature of a clay loam soil. Canadian Journal of Soil Science 78:345-350.
Hammermeister, AM, MA Naeth and DS Chanasyk. 1998. Implications of fly ash application to soil for plant growth and feed quality. Environmental Technology 19:143-152.
Sansom, JJ, MA Naeth, DS Chanasyk and JC Bateman. 1998. In situ amelioration of sodic minespoil with chemical amendments and crop management. II. Soil physical properties, soil water and plant growth. Canadian Journal of Soil Science 78:667-674.
Sansom, JJ, MA Naeth, DS Chanasyk and JC Bateman. 1998. In situ amelioration of sodic minespoil with chemical amendments and crop management. I. Soil chemical properties. Canadian Journal of Soil Science 78:359-365.
Salé, LY, DS Chanasyk and MA Naeth. 1997. Temporal influence of fly ash on select soil physical properties. Canadian Journal of Soil Science 77(4):677-683.
Naeth, MA and DS Chanasyk. 1996. Runoff and sediment yield under grazing in foothills fescue grasslands of Alberta. Water Resources Bulletin 32(1):89-95.
Chanasyk, DS and MA Naeth. 1996. Field measurement of soil moisture using neutron probes. Canadian Journal of Soil Science 76:317-323.
Salé, LY, MA Naeth and DS Chanasyk. 1996. Growth response of barley on unweathered fly ash amended soil. Journal of Environmental Quality 25:684-691.
Chanasyk, DS and MA Naeth. 1995. Grazing impacts on bulk density and soil strength in the foothills fescue grasslands of Alberta, Canada. Canadian Journal of Soil Science 75:551-557.
Dormaar, JF, MA Naeth, WD Willms and DS Chanasyk. 1995. Effect of native prairie, crested wheatgrass (*Agropyron cristatum* (L) Gaertn.) and russian wildrye (*Elymus junceus* Fisch.) on soil chemical properties. Journal of Range Management 48(3):258-263.
Irving, BD, RL Rutledge, AW Bailey, MA Naeth and DS Chanasyk. 1995. Grass utilization and grazing distribution within intensively managed fields in Central Alberta. Journal of Range Management 48(4):358-361.
Naeth, MA and DS Chanasyk. 1995. Grazing effects on soil water in Alberta foothills fescue grasslands. Journal of Range Management 48(6):523-529.
Naeth, MA, DS Chanasyk, WB McGill and AW Bailey. 1993. Soil temperature regime in mixed prairie rangeland after pipeline construction and operation. Canadian Agricultural Engineering 35:89-95.
Naeth, MA, DS Chanasyk and AW Bailey 1991. Applicability of the Kostiakov equation to infiltration in mixed prairie and fescue grasslands of Alberta. Journal of Range Management 44:18-21.

Naeth, MA, AW Bailey, DS Chanasyk and DJ Pluth. 1991. Water holding capacity of litter and soil organic matter in mixed prairie and fescue grasslands of Alberta. Journal of Range Management 44:13-17.

Naeth, MA, DS Chanasyk, RL Rothwell and AW Bailey. 1991. Grazing impacts on soil water in mixed prairie and fescue grassland ecosystems. Canadian Journal of Soil Science 71:313-325.

Naeth, MA, AW Bailey, DJ Pluth, DS Chanasyk and RT Hardin. 1991. Grazing impacts on litter and soil organic matter in mixed prairie and fescue grassland ecosystems of Alberta. Journal of Range Management 44:7-12.

Naeth, MA, DS Chanasyk, RL Rothwell and AW Bailey. 1990. Grazing impacts on infiltration in mixed prairie and fescue grassland ecosystems of Alberta. Canadian Journal of Soil Science 70:593-605.

Naeth, MA, DJ Pluth, DS Chanasyk, AW Bailey and AW Fedkenheuer. 1990. Soil compacting impacts of grazing in mixed prairie and fescue grassland of Alberta. Canadian Journal of Soil Science 70:157-167.

Chanasyk, DS and MA Naeth 1988. Measurement of near-surface soil moisture with a hydrogenously shielded neutron probe. Canadian Journal of Soil Science 68:171-176.

Naeth, MA, DS Chanasyk, WB McGill, AW Bailey and RT Hardin. 1988. Changes in soil water regime after pipeline construction in solonetzic native rangeland. Canadian Journal of Soil Science 68:603-610.

Naeth, MA, WB McGill and AW Bailey. 1987. Persistence of changes in selected soil chemical and physical properties after pipeline installation in solonetzic native rangeland. Canadian Journal of Soil Science 67:747-763.

REFEREED PUBLICATIONS IN REVIEW

Naeth, MA and SR Wilkinson. Effect of fire fuel break reclamation and management on establishment of native plant communities, Jasper and Elk Island National Parks, Alberta, Canada. Natural Areas Journal.

Raab, T, J Krümmelbein, A Schneider, W Gerwin, T Maurer and MA Naeth. Initial ecosystem processes as key factors of landscape development – a review. Physical Geography.

Desserud, PA and MA Naeth. Natural recovery of rough fescue (*Festuca hallii* (Vasey) Piper) grassland after disturbance by pipeline construction in central Alberta, Canada. Natural Areas Journal.

Desserud, PA and MA Naeth. Promising results with rough fescue (*Festuca hallii*) seeding following disturbance in central Alberta. Native Plants Journal.

BOOK CHAPTERS AND MANUALS

Mackenzie, DD and MA Naeth. 2006. Assisted natural recovery using a forest soil propagule bank in the Athabasca Oil Sands Region. In: Seeds: Biology, Development and Ecology. Editors S Navie, S Adkins and S Ashmore. CAB International Publishing. Pp 374-382.

Naeth, MA. 2003. Teaching resource manual. University of Alberta. Edmonton AB. 92 pp.

Naeth, MA. 1993. Teaching resource manual. University of Alberta. Edmonton AB. 66 pp.

Naeth, MA, DJ White, DS Chanasyk, TM Macyk, CB Powter and DJ Thacker. 1991. Soil physical properties in reclamation. Alberta Land Conservation and Reclamation Council Report Number RRTAC 91-4. Alberta Environment. Edmonton AB. 213 pp.

Naeth, MA. 1991. Teaching resource manual for graduate teaching assistants. University of Alberta. Edmonton AB. 55 pp.

SCIENTIFIC CONFERENCE PROCEEDINGS

Refereed

Mackenzie, DD and MA Naeth. 2005. Assisted natural recovery using a forest soil propagule bank in the Athabasca oil sands. 8th International Workshop on Seeds: Germinating New Ideas. Brisbane, Australia. CABI Publishing, United Kingdom.

Naeth, MA. 2000. Reclamation in western Canada: an overview of issues, approaches and research results. Proceedings of the Experiencias Internacionales en la Rehabilitacion de Espacino Degradados. Santiago, Chile. M Rodrigues (ed).

Chanasyk, DS and MA Naeth. 1992. Soil moisture monitoring with neutron probes: A field experience. National Hydrology Research Institute No 9 Soil Moisture Modelling and Monitoring for Regional Planning. FJ Eley, R Granger and L Martin (eds). Saskatoon SK.

Naeth, MA. 1990. The impacts of grazing regime on revegetation after pipeline construction in Canadian mixed prairie ecosystems. Proceedings of the Billings Symposium on Disturbed Land Rehabilitation, Vol II. FF Munshower and SE Fisher Jr (eds). Publication 9003. Billings MO.

Non Refereed

Naeth, MA. 2011. A German-Canadian liaison to tackle mine reclamation challenges. 6th International Conference on Mine Closure. Lake Louise. Alberta.

Wu, S, D Sego and MA Naeth. 2010. Evapotranspiration dewatering effect on CT deposits by grasses. Canadian Geotechnical Conference and Canadian Permafrost Conference. Calgary AB.

Naeth, MA. 2005. Plant community development in disturbed ecosystems: factors affecting community direction. Society for Ecological Restoration International Annual Meeting. Zaragoza, SP.

Naeth, MA. 2005. New directions in western Canadian soil science. Pacific Regional Society of Soil Science and the British Columbia Chapter of the Soil and Water Conservation Society Annual Meeting. Vancouver BC.

Graham, S and MA Naeth. 2004. Simulated in situ bioremediation of hydrocarbon contaminated soils. Alberta Soil Science Workshop. Lethbridge AB.

Patterson, S, DS Chanasyk, E Mapfumo, MA Naeth, VS Baron, AM Jobson, SX Chang, DD Johnson, C Kaiser, S McNamara, E Dzus and A Bertschi. 2004. Agroforestry and effluent irrigation: an alternative for wastewater treatment in Alberta. PACWEST conference. Jasper AB.

Henderson, DC, E Parker and MA Naeth. 2004. Landscape factors and alien grass invasions in Canadian grasslands. Prairie Conservation and Endangered Species Conference. Calgary AB.

Naeth, MA and SR Wilkinson. 2003. The effect of season of seeding and seeding depth on performance of twenty-one native grasses: implications for reclamation. Canadian Land Reclamation Association. Sudbury ON.

Gardner, WA, K Broersma, MA Naeth and AM Jobson. 2003. Influence of biosolids and fertilizer amendments on selected soil physical, chemical and microbial parameters in tailings revegetation. Annual BC Mine Reclamation Symposium. The BC Technical and Research Committee on Reclamation. Kamloops BC.

Naeth, MA. 2002. Educational standards in a regulatory environment. Alberta Soil Science Workshop. Nisku AB.

Silva, MJ, MA Naeth, DS Chanasyk, KW Biggar and DC Sego. 2002. Response of plants to oil sands tailings. Tailings and Mine Wastes 2002. Fort Collins CO.

Naeth, MA and SR Wilkinson. 2002. Plant species suitability for reclamation of oil sands consolidated tailings. Canadian Land Reclamation Association. Dawson Creek BC.

Reid, NB and MA Naeth. 2002. Ekati Diamond Mine processed kimberlite reclamation. Canadian Land Reclamation Association. Dawson Creek BC.

Naeth, MA. 2001. Restoration of degraded ecosystems. International Symposium on Plant Biology, Status, Conservation and Restoration. Seoul SK.

Reid, N and MA Naeth. 2001. Ekati Diamond Mine processed kimberlite tailings reclamation. Canadian Land Reclamation Association. Halifax NS.

McIntyre, NA and MA Naeth. 2001. Diesel fuel contaminated soil reclamation in northern Alberta: natural attenuation vs nutrient stimulation. Canadian Land Reclamation Association. Halifax NS.

Pitchford, CL and MA Naeth. 2000. Season of seeding and mowing for native plant community development in the aspen parkland. Canadian Land Reclamation Associatiion. Edmonton AB.

Erichsen-Arychuk, C and MA Naeth. 2000. Effect of season of seeding and mowing for annual weed control on survival of native forbs in aspen parkland. Canadian Land Reclamation Association. Edmonton AB.

Wilkinson, S, MA Naeth and FKA Schmiegelow. 2000. Control of invasive plant species and revegetation of native habitat in the Galapagos Islands, Ecuador. Canadian Land Reclamation Association. Edmonton AB.

Soulodre, E and MA Naeth. 2000. Soil erosion risks associated with alternative revegetation techniques in

dry mixed grass prairie: a preliminary analysis. Canadian Land Reclamation Association. Edmonton AB.
Howat, DR and MA Naeth. 2000. Soil salinity and the distribution of plant species. Canadian Land Reclamation Association. Edmonton AB.
Ostermann, DK and MA Naeth. 1999. Vegetation change over a twelve year period on a pipeline right-of-way in southern Alberta. Canadian Land Reclamation Association. Saskatoon SK.
Schaefer, JW, MA Naeth and DS Chanasyk. 1999. Bioengineering and reclamation to stabilize a lakeshore slope. Canadian Land Reclamation Association. Saskatoon SK.
Silva, MJ, KW Biggar, DC Sego, DS Chanasyk and MA Naeth. 1999. Plant dewatering and strengthening of tailings: laboratory and computer simulation. International Conference on Tailings and Mine Waste. Fort Collins CO.
Soulodre, E, AM Hammermeister and MA Naeth. 1999. Native prairie revegetation on wellsites in southeastern Alberta. Canadian Land Reclamation Association. Saskatoon SK.
Baron, VS, MA Naeth, DS Chanasyk, E Mapfumo, SS Malhi and KN Harker. 1998. Aspects of sustainability for intensive rotational pastures in central Alberta. Agriculture in Harmony with the Environment. Saskatchewan Institute of Agrologists Conference. Saskatoon SK.
Hammermeister, AM and MA Naeth. 1998. An ecological approach to seed mix design and native plant revegetation. Prairie Conservation and Endangered Species Conference. Saskatoon SK.
Mapfumo, E, DS Chanasyk, MA Naeth and VS Baron. 1998. Soil compaction under grazing with special reference to field vs laboratory penetration resistance. Alberta Soil Science Workshop. Edmonton AB.
Silva, MJ, KW Biggar, DC Sego, DS Chanasyk and MA Naeth. 1998. Plant dewatering of tailings: a theoretical model. Canadian Geotechnical Conference. Edmonton AB.
Silva, MJ, KW Biggar, DC Sego, DS Chanasyk and MA Naeth. 1998. Plant dewatering of tailings: model validation. Canadian Geotechnical Conference. Edmonton AB.
Silva, MJ, MA Naeth, KW Biggar, DS Chanasyk and DC Sego. 1998. Plant selection for dewatering and reclamation of tailings. Annual Meeting of the American Society for Surface Mining and Reclamation. St Louis MI.
Naeth, MA. 1997. The trainer: the role of academia in reclamation. Alberta Soil Science Workshop. Calgary AB.
Salé, LY, DS Chanasyk and MA Naeth. 1996. Temporal influence of fly ash on soil bulk density and aggregate size distribution. British Columbia Mine Reclamation Symposium. Kamloops BC.
Brown, DJ and MA Naeth. 1996. Effects of grazing, mowing, glyphosate and burning on smooth brome. Canadian Land Reclamation Association. Calgary AB.
Bush, CD and MA Naeth. 1996. Biodiversity and reclamation: how many species do we need in a seed mix? Canadian Land Reclamation Association. Calgary AB.
Chanasyk, DS and MA Naeth. 1996. Grazing impacts on bulk density and soil strength in foothills fescue grasslands. Canadian Land Reclamation Association. Calgary AB.
Gill, SI, MA Naeth, DS Chanasyk and VS Baron. 1996. Vegetation characteristics, grazing and soil erosion. Canadian Land Reclamation Association. Calgary AB.
Naeth, MA and DS Chanasyk. 1996. Runoff and sediment yield under grazing in foothills fescue grasslands of Alberta. Canadian Land Reclamation Association. Calgary AB.
Pelech, WE and MA Naeth. 1996. Emergence and survival of selected native and introduced grasses and legumes. Canadian Land Reclamation Association. Calgary AB.
Sansom, JJ, DS Chanasyk and MA Naeth. 1996. In situ amelioration of sodic minespoil using sulfur, gypsum and management. Canadian Land Reclamation Association. Calgary AB.
Twerdoff, DA, DS Chanasyk, MA Naeth and VS Baron. 1996. Near-surface compaction under grazing of annual and perennial forages. Canadian Land Reclamation Association. Calgary AB.
Baron, VS, MA Naeth, DS Chanasyk, DA Twerdoff and DG Young. 1995. Sustainable pastures in central Alberta. Forage Coordination Conference. Camrose AB.
Hammermeister, AM, MA Naeth and DS Chanasyk. 1995. Fly ash: waste by-product or wonder dust? Alberta Soil Science Workshop. Grande Prairie AB.
Naeth, MA. 1992. Grazing impacts on fescue grasslands. First Alberta Rough Fescue Grassland Workshop. Banff AB.
Naeth, MA. 1992. Use of forages in reclamation. International Symposium on Agricultural Techniques in Cold Regions. Edmonton AB.

Naeth, MA. 1992. Range management for soil conservation: grazing effects on soils and hydrology. Soil Conservation Workshop. Alberta Conservation Tillage Society Annual Meeting. Edmonton AB.

Lagroix-McLean, RL and MA Naeth. 1992. Factors affecting forage yield in the Lake Wabamun area. International Symposium on Agricultural Techniques in Cold Regions. Edmonton AB.

Chanasyk, DS, MA Naeth and CP Maule. 1990. Effects of agricultural management practices on infiltration and erosion. Farming for the Future Conference. Lethbridge AB.

Naeth, MA. 1986. Impacts of pipelines on native rangeland. Alberta Soil Science Workshop. Calgary AB.

Naeth, MA and AW Bailey. 1984. Effects of time and grazing regime on revegetation of native range after pipeline installation. Canadian Land Reclamation Association. Calgary AB.

TECHNICAL RESEARCH REPORTS

Naeth, MA, DS Chanasyk and EL Turner. 2012. Reclamation of phosphogypsum stacks at Fort Saskatchewan, Alberta. Annual Report for Agrium Inc. 5 pp.

Yao, M and MA Naeth. 2012. Potassium silicate drilling fluid as a land reclamation amendment. Annual Report for Marquis Alliance Energy Group Inc. 9 pp.

Naeth, MA and SR Wilkinson. 2011. Diamond mine reclamation in the NWT: substrates, sol amendments and native plant community development. Final Report Phase II for Diavik Diamond Mines Inc. 45 pp.

Naeth, MA and SR Wilkinson. 2011. Reclamation of disturbed sites at the Star-Orion Diamond Project in Saskatchewan: preliminary greenhouse research. Final Report for Shore Gold Inc. 42 pp.

Naeth, MA and SR Wilkinson. 2011. Evaluating success of dry mixed prairie well sites 14 years after reclamation. Final Report for Cenovus Energy. 29 pp.

Naeth, MA and SR Wilkinson. 2011. Potential of Denver cell sludge and lime kiln dust biosolids as amendments for limestone quarry reclamation: greenhouse research. Final report for Graymont Inc. 11 pp.

Naeth, MA, SR Wilkinson and H Stover. 2011. Investigation of non native plant management techniques for restoration of foothills fescue prairie in Waterton Lakes National Park, Alberta. Annual Report for Parks Canada. 13 pp.

Brown, RL and MA Naeth. 2011. Use of woody debris in oil sands reclamation. Annual Report for the Oil Sands Environmental and Reclamation Research Group. 3 pp.

Nemirsky, CL and MA Naeth. 2011. The impact of distance to pipeline disturbance on Cryptantha minima and Halimolobos virgata populations and habitat in southern Alberta. Annual Report for TransCanada Pipelines Ltd. 6 pp.

Cohen-Fernández, AC and MA Naeth. 2011. Reclamation of a limestone quarry to a natural plant community, Exshaw quarry reclamation research. Annual Report for Graymont Canada Inc. 10 pp.

Naeth, MA and Sherritt, DD. 2011. The impact of mycorrhizae and seed mix diversity on rough fescue establishment. Annual Report for Compton Petroleum Corporation. 2 pp.

Naeth, MA and AC Cohen-Fernández. 2011. Potential of lime kiln dust biosolids for limestone quarry reclamation greenhouse research. Final report for Graymont Inc. 19 pp.

Mackenzie, DD and MA Naeth. 2011. Reclamation using forest soil propagule banks in the Athabasca oil sands. Annual Report for the Oil Sands Environmental and Reclamation Research Group. 4 pp.

Naeth, MA, DS Chanasyk and EL Turner. 2011. Reclamation of phosphogypsum stacks at Fort Saskatchewan, Alberta. Annual Report for Agrium Inc. 5 pp.

Yao, M and MA Naeth. 2011. Potassium silicate drilling fluid as a land reclamation amendment. Research Progress Report for Marquis Alliance Energy Group Inc. 7 pp.

Desserud, PA and MA Naeth. 2011. How much rough fescue seed is needed in restoration seed mixes? The Hard Grass Advocate. 6 pp.

Naeth, MA and SR Wilkinson. 2010. Restoration methods for foothills grasslands of Waterton Lakes National Park. The Hard Grass Advocate. Fall 2010. 1 pp.

Desserud, PA and MA Naeth. 2010. Restoring rough fescue in central Alberta. The Prairie Conservation Forum Newsletter. Issue 5 Page 2.

Naeth, MA and SR Wilkinson. 2010. Diamond mine reclamation in the NWT: substrates, sol amendments and native plant community development. Final Report Phase I for Diavik Mines Inc. 38 pp.

Naeth, MA and SR Wilkinson. 2010. Diamond mine reclamation in the NWT: substatres, sol amendments and native plant community development. Annual Report for Diavik Diamond Mines Inc. 9 pp.
Naeth, MA and SR Wilkinson. 2010. Diamond mine reclamation in the NWT: substrates, sol amendments and native plant community development. Projected Research for Diavik Diamond Mines Inc. 8 pp.
Naeth, MA and SR Wilkinson. 2010. Reclamation of disturbed sites at the Star-Orion diamond mine in central Saskatchewan. Progress Report for Shore Gold Inc. 7 pp.
Naeth, MA, DS Chanasyk and I Hallin. 2010. Reclamation of phosphogypsum stacks at Fort Saskatchewan, Alberta. Annual Report for Agrium. 5 pp.
Naeth, MA and Sherritt, DD. 2010. The impact of mycorrhizae and seed mix diversity on rough fescue establishment. Annual Report for Compton Petroleum Corporation. 7 pp.
Naeth, MA and TM Antill. 2010. Biology and control of Russian thistle (Salsola tragus L) in bighorn sheep (Ovis canadensis Shaw) winter ranges in montane grasslands in Jasper National Park, Alberta, Canada. Annual Report for the Alberta Conservation Association. 8 pp.
Naeth, MA, SR Wilkinson and BE Shaughnessy. 2010. Natural recovery of upland boreal forest vegetation on a hummocky peat-mineral mix substrate in the Athabasca oil sands region, Alberta. Annual Report for Suncor Energy Inc. 6 pp.
Brown, RL and MA Naeth. 2010. Use of woody debris in oil sands reclamation. Annual Report for the Oil Sands Environmental and Reclamation Research Group. 4 pp.
Cartier, S and MA Naeth. 2010. Reclamation of calcareous soils along the TMX anchor loop pipeline right of way in Jasper National Park. Annual Report to Kinder Morgan Canada. 4 pp.
Cohen Fernandez, A and MA Naeth. 2010. Reclamation of a limestone quarry to a natural plant community, Exshaw quarry reclamation research. Annual Report for Graymont. 9 pp.
Desserud, PA and MA Naeth. 2010. Restoration of fescue grasslands. Update for funding partners. 6 pp.
Mackenzie, DD and MA Naeth. 2010. Reclamation using forest soil propagule banks in the Athabasca oil sands. Annual Report for the Oil Sands Environmental and Reclamation Research Group. 6 pp.
Nemirsky, C and MA Naeth. 2010. The impact of distance to pipeline disturbance on Cryptantha minima and Halimolobos virgate populations and habitat in southern Alberta. Annual Report for TransCanada Pipelines Ltd. 9 pp.
Naeth, MA and SR Wilkinson. 2009. Diamond mine reclamation in the NWT: substrates, sol amendments and native plant community development. 2008 Annual Report for Diavik Diamond Mines Inc. 26 pp.
Naeth, MA and SR Wilkinson. 2009. Effect of fire fuel break management on rehabilitation of montane and aspen parkland plant communities at Elk Island and Jasper National Parks. Final Report for Jasper and Elk Island National Parks. 23 pp.
Naeth, MA and SR Wilkinson. 2009. Diavik diamond mine permanent vegetation plots for habitat analysis. 2008 Assessment Report for Diavik Diamond Mines Inc. 11 pp.
Naeth, MA and SR Wilkinson. 2009. Drywall composts as soil amendments to reclaim disturbed sites. Final Report to the Edmonton Waste Management Centre of Excellence. 21 pp.
Naeth, MA and DD Sherritt. 2009. The impact of mycorrhizae and seed mix diversity on rough fescue establishment. 2008 Annual Report ofr Compton Petroleum Corporation. 8 pp.
Naeth, MA, DS Chanasyk, I Hallin and M Jackson. 2009. Reclamation of phosphogypsum stacks to a natural area at Fort Saskatchewan, Alberta. 2008 Annual Report for Agrium. 18 pp.
Cohen Fernandez, A and MA Naeth. 2009. Reclamation with EarthRenew organic amendment at the Exshaw Graymont quarry and plant. Annnual Report for EarthRenew Organics Ltd. 9 pp.
Cohen Fernandez, A and MA Naeth. 2009. OM Plus with tailings sand greenhouse reclamation research Final Report for EarthRenew Organics Ltd. 26 pp.
Cohen Gernandez, A and MA Naeth. 2009. Reclamation of a limestone quarry to a natural plant community. Summary Report for Graymont. 5 pp.
Cohen Fernandez, A and MA Naeth. 2009. Reclamation of limestone quarries to natural plant communities, Exshaw Quarry reclamation research. 2008 Annual Report for Graymont. 11 pp.
Desserud, PA and MA Naeth. 2009. Restoration of fescue grasslands. 2009 Update for funding partners. 2 pp.
Naeth, MA and SR Wilkinson. 2008. Restoration of the trade waste centre in Waterton Lakes National Park. Annual Report And Non Native Plant Management Plan for Waterton Lakes National Park. 22 pp.
Naeth, MA, DS Chanasyk, I Hallin and M Jackson. 2008. Reclamation of phosphogypsum stacks to a

natural area at Fort Saskatchewan, Alberta. Annual Report for Agrium. 12 pp.
Naeth, MA and SR Wilkinson. 2008. Disturbed area restoration in Jasper National Park, the woodlot landfill project. Annual Report for Jasper National Park. 13 pp.
Naeth, MA and SR Wilkinson. 2008. Diamond mine reclamation in the NWT: substrates, soil amendments and native plant community development. Annual Report for Diavik Diamond Mines Inc. 30 pp.
Cohen Fernandez, A and MA Naeth. 2008. EarthRenew organic amendment greenhouse reclamation research. Final Report for EarthRenew Organics. 35 pp.
Cohen Fernandez, A and MA Naeth. 2008. Reclamation of limestone quarries to natural plant communities, Exshaw Quarry reclamation research. Annual Report for Graymont. 14 pp.
Chanasyk, DS, MA Naeth and SX Chang. 2008. Effluent irrigation by agroforestry for industries and communities. CRD Final report submitted to NSERC. 16 pp.
Naeth, MA and AM Jobson. 2007. An assessment of potential contamination at the Trade Waste Centre in Waterton Lakes National Park. Final Report for Waterton Lakes National Park. 46 pp.
Naeth, MA and AM Jobson. 2007. An assessment of potential contamination at the Prince of Wales site in Waterton Lakes National Park. Final Report for Waterton Lakes National Park. 7 pp.
Naeth, MA, DS Chanasyk and I Hallin. 2007. Reclamation of phosphogypsum stacks to a natural area at Fort Saskatchewan, Alberta. Annual Report for Agrium. 8 pp.
Naeth, MA and SR Wilkinson. 2007. Suncor mature fine tailings greenhouse research. Final Report for Suncor Energy Inc. 21 pp.
Naeth, MA and SR Wilkinson. 2007. Diamond mine reclamation in the NWT: substrates, soil amendments and native plant community development. Annual Report for Diavik Diamond Mines Inc. 27 pp.
Naeth, MA and SR Wilkinson. 2007. Disturbed area restoration in Jasper National Park, the woodlot landfill project. Annual Report for Jasper National Park. 12 pp.
Naeth, MA and SR Wilkinson. 2007. Soil and plant community development on fire guards in Jasper and Elk Island National Parks. Progress Report for Jasper and Elk Island National Parks. 5 pp.
Naeth, MA and SR Wilkinson. 2007. Soil and plant community development on fire guards in Jasper and Elk Island National Parks. Annual Report for Jasper and Elk Island National Parks. 15 pp.
Macyk, T, MA Naeth, B Purdy, S Quideau, C Welham, L Leskiw and C Qualizza. 2007. Phase 3: biology, soil capping technology transfer. Report to oil sands industry and government. 63 pp.
Barbour, L, DS Chanasyk, J Hendry, T Macyk, C Mendoza, C Nichol, MA Naeth, L Leskiw, M O'Kane, B Purdy, C Qualizza, S Quideau, C Welham. 2007. Phase 4: technology transfer integration document. Report to oil sands industry and government. 54 pp.
Barbour, L, DS Chanasyk, J Hendry, T Macyk, C Mendoza, C Nichol, MA Naeth, L Leskiw, M O'Kane, B Purdy, C Qualizza, S Quideau and C Welham. 2006. Soil capping research in the Athabasca oil sands region. Volume 1 Technology synthesis (175 pp) and Volume 2 Factsheets (147 pp).
Naeth, MA and SR Wilkinson. 2006. Lichens as bioindicators of dust distribution and monitoring at Diavik Diamond Mine, Northwest Territories. Final Report for Diavik Diamond Mine Inc. 35 pp.
Naeth, MA and SR Wilkinson. 2006. Disturbed area restoration in Jasper National Park, the woodlot landfill project. Annual Report for Jasper National Park. 13 pp.
Naeth, MA and SR Wilkinson. 2006. Soil and plant community development on fire guards in Jasper and Elk Island National Parks. Progress Report for Jasper and Elk Island National Parks. 5 pp.
Naeth, MA and SR Wilkinson. 2006. Suncor greenhouse mature fine tailings research. Progress Report for Suncor Energy Inc. 1 pp.
Naeth, MA and SR Wilkinson. 2006. Suncor greenhouse mature fine tailings research. Annual Report for Suncor Energy Inc. 5 pp.
Naeth, MA and SR Wilkinson. 2006. Diavik Diamond Mine permanent vegetation plots for habitat analysis. Annual Report for Diavik Diamond Mines Inc. 11 pp.
Naeth, MA and SR Wilkinson. 2006. Soil and plant community development on fire guards in Jasper and Elk Island National Parks. Annual Report for Jasper and Elk Island National Parks. 16 pp.
Naeth, MA, SR Wilkinson and BL Kwiatkowski. 2006. Diamond mine reclamation, substrates, soil amendments and native plant development. Annual Report for Diavik Diamond Mines Inc. 34 pp.
Naeth, MA and SR Wilkinson. 2006. Update to the oilsands revegetation database. Website address is http://oilsands.rr.ualberta.ca/ on my personal website.
Naeth, MA and SR Wilkinson. 2005. Soil and plant community development on fire guards in Jasper and

Elk Island National Parks. Annual Report for Jasper and Elk Island National Parks. 11 pp.
Naeth, MA and SR Wilkinson. 2005. Lichens as bioindicators of dust distribution and monitoring at Diavik Diamond Mine. Annual Report for Diavik Diamond Mines Inc. 7 pp.
Naeth, MA, SR Wilkinson and BL Kwiatkowski. 2005. Mine reclamation at Diavik Diamond Mine NWT, substrates, soil amendments and native plant community development. Annual Report for Diavik Diamond Mines Inc. 13 pp.
Naeth, MA and SR Wilkinson. 2005. Disturbed area restoration in Jasper National Park: the woodlot landfill project. Annual Report for Jasper National Park. 12 pp.
Naeth, MA and SR Wilkinson. 2005. Soil and plant community development on fire guards in Jasper and Elk Island National Parks. Progress Report for Jasper and Elk Island National Parks. 5 pp.
Naeth, MA and AM Jobson. 2005. Assessment of potential contamination at Trade Waste and Prince of Wales Sites in Waterton Lakes National Park. Annual Report for Waterton Lakes National Park. 10 pp.
Naeth, MA. 2005. A restoration plan for disturbed sites in Waterton Lakes National Park. Annual Report for Waterton Lakes National Park. 6 pp.
Chanasyk, DS and MA Naeth. 2005. Effluent irrigation by agroforestry for industries and communities. Progress Report for NSERC. 12 pp.
Naeth, MA and SR Wilkinson. 2004. Revegetation research in the Athabasca oil sands: a literature review. Annual Report for Suncor Energy Inc. 71 pp and 534 pp annotated, searchable database.
Naeth, MA, DS Chanasyk and D. Harmon. 2004. Soil moisture use by forages. Literature review with annotated bibliography (17 pp), synthesis of results (8 pp), bibliography table of details (14 pp) and additional reference lists (4 pp). Final Report for Agricultural Field Services Corporation of Alberta.
Graham, S and MA Naeth. 2004. Bioremediation of hydrocarbon contaminated soils: an in situ experimental approach. Annual Report for City of Edmonton. 13 pp.
Henderson, DC and MA Naeth. 2004. Ecology and management of crested wheatgrass invasion. PTAC Annual Report. 18 pp.
Naeth, MA and SR Wilkinson. 2004. Revegetation of disturbed sites at Diavik Diamond Mine, NWT. Annual Report for Diavik Diamond Mines Inc. 12 pp.
Naeth, MA and SR Wilkinson. 2004. Diavik Diamond Mine permanent vegetation plots for habitat analysis. Annual Report for Diavik Diamond Mines Inc. 5 pp.
Naeth, MA and SR Wilkinson. 2003. Plant establishment and growth in slurries with potential for hydraulic reclamation of oil sands tailings. Final report for Syncrude Canada Ltd. 25 pp.
Chanasyk, DS, MA Naeth, T Burgers and CLA Chaikowsky. 2003. Hydrologic processes, erosion and salinization on a sand storage facility. Annual Report for NSERC. 13 pp.
Naeth, MA, SR Wilkinson, S Graham and A Heidman. 2003. Use of compost in land reclamation and remediation: a literature review. Annual Report for City of Edmonton. 90 pp.
Naeth, MA. 2002. Native species establishment for resource conservation. Final Report for Alberta Agricultural Research Institute. Project 98M233. 40 pp.
Naeth, MA and SR Wilkinson. 2002. Greenhouse emergence and establishment of selected plant species in consolidated tailings. Final Report for Suncor Energy Inc. 20 pp.
Chanasyk, DS and MA Naeth. 2002. Hydrologic processes, erosion and salinization of a sand storage facility. Final Report for Collaborative Research and Development NSERC. 8 pp.
Naeth, MA, A Westhaver and SR Wilkinson. 2002. Disturbed area restoration in Jasper National Park; Fifth Bridge Gravel Pits Project. Annual Report for Jasper National Park. 27 pp.
Soulodre, E and MA Naeth. 2001. The native prairie revegetation research project: dry mixed grass prairie sub-project. Phase II Project Report for PanCanadian Ltd and the Canadian Association of Petroleum Producers. 10 pp.
Baron, VS and MA Naeth. 2001. Improving efficiency of rotational pastures through studies on tissue turnover. Final Report for Alberta Agricultural Research Institute. Project 96M910. 32 pp.
Naeth, MA. 2001. Native species establishment for resource conservation. Final Report for Alberta Agricultural Research Institute. Report 95M832. 42 pp.
Reid, NB and MA Naeth. 2001. Ekati Diamond Mine processed kimberlite tailings reclamation. Annual Report for BHP Diamonds Inc. 34 pp.
Thurston, J, DS Chanasyk, RJ Hudson, J Olaf, MA Naeth and B Parkinson. 2001. The Elk Island visualization project. http://www/giscafe.com/GISVision/Feature/Communities.

Soulodre, E and MA Naeth. 2000. The native prairie revegetation research project: dry mixed grass prairie subproject. Phase II Project Report for PanCanadian Ltd. and Canadian Association of Petroleum Producers. 10 pp.

Hammermeister, AM and MA Naeth. 1999. The native prairie revegetation research project. Phase 1: Report for the dry mixed grass prairie. Report for Canadian Association of Petroleum Producers and PanCanadian. 50 pp.

Naeth, MA. 1998. Carbon sequestration assessment of pipeline and powerline rights-of-way in Alberta. Final Report for NOVA Corporation and TransAlta Utilities Corporation. 51 pp.

Baron, VS, E Mapfumo, MA Naeth and DS Chanasyk. 1998. Sustainable grazing systems for perennial and annual forages on sloped lands in central Alberta. Final Report for Canada Alberta Environmentally Sustainable Agriculture Agreement. Res-024-93. 161 pp.

Ellert, BH, MA Naeth, DC Henderson and BJ Johnson. 1998. Carbon storage in rangelands: Fall 1998 update. Agriculture and Agri-Food Canada. 15 pp.

Naeth, MA and RL Rothwell. 1998. Reclamation evaluation of the Roger's Pass reclamation project. Report for Environment Canada and Canadian Pacific Railway. 44 pp.

Brown, DJ and MA Naeth. 1998. Smooth brome research at the Cross Conservation Area. The Western Wheel. 1 pp.

Brown, DJ and MA Naeth. 1998. Managing smooth brome in native grassland. The Western Wheel. 1 pp

Brown, DJ and MA Naeth. 1998. Is reducing smooth brome possible? Conservation Area Newsletter. 1 pp.

Baron, VS, DS Chanasyk and MA Naeth. 1997. Water use shows grazing is balancing act. Grainews. June 1997. Pp 26.

Baron, VS, MA Naeth and DS Chanasyk. 1997. Pasture sustainability at Lacombe: soil water. Agricultural Service Board. Spring 1997. Tricounty Newsletter. Pp 1.

Lagroix-McLean, RL and MA Naeth. 1997. Forages in the aspen parkland a literature and data review. Final Report for Ducks Unlimited Canada, North American Waterfowl Management Plant and Conservation and Development Branch. 108 pp.

Naeth, MA. 1997. The long-term impact of pipeline construction on solonetzic mixed prairie. Environmental Research Monograph 1997-1. Published by NOVA Gas Transmission Ltd. 55 pp.

Naeth, MA, AT Lees, J Bietz, BD Irving and AW Fedkenheuer. 1997. Rangeland revegetation monitoring on two pipeline rights-of-way in southern Alberta mixed prairie. Environmental Research Monograph 1997-2. Published by NOVA Gas Transmission Ltd. 58 pp.

Naeth, MA. 1997. An overview of the Alberta Environmental Appeals Board. BIOS Newsletter. Edmonton AB. 1 pp.

Hammermeister, AM and MA Naeth. 1996. The native prairie revegetation research project: description of reclamation practices and research sites in dry mixed grass. Report for Canadian Association of Petroleum Producers. 74 pp.

Naeth, MA, TE Harms and SI Gill. 1996. Review of soil organic studies. Report for TransAlta Utilities Corporation. 23 pp.

Chanasyk, DS, MA Naeth and AM Hammermeister. 1995. Reclamation suitability of sandstone material. Field and greenhouse investigations. Report for TransAlta Utilities Corporation and Alberta Environment. 131 pp.

Lagroix-McLean, RL, MA Naeth and PT Genoway. 1995. Plant species composition on sodseeded plots. Report for the County of Lamont. 31 pp.

Naeth, MA, DS Chanasyk and MW Dell. 1995. The impact of forages on soil physical properties. Final Report for Alberta Agricultural Research Institute. Report No. 92-0033. 60 pp.

Stumpl-Allen, RCG, MA Naeth and JJ Leonard. 1995. Literature review on the use and value of MSW sewage sludge compost. Report for TransAlta Utilities Corporation. 21 pp.

Naeth, MA. 1994. Canmore Pilot Project. Analysis of the greenhouse plant growth tirals. Report for TransAlta Utilities Corportation. 25 pp.

Naeth, MA and C Qualizza. 1994. Prairie soil carbon sequestration initiative zero tillage vs conventional tillage literature review and interpretation. Report for TransAlta Utilities Corporation. 38 pp.

Naeth, MA, AT Lees, J Beitz, BD Irving and AW Fedkenheuer. 1994. Rangeland revegetation monitoring on two pipeline rights-of-way in southern Alberta. Report for NOVA Corporation. 60 pp.

Naeth, MA. 1993. The long-term impacts of pipeline construction on solonetzic mixed prairie. Report for

NOVA Corporation. 60 pp.
Naeth, MA. 1993. Keephills productivity study. Annual Report for TransAlta Utilities Corporation. 147 pp.
Naeth, MA and DS Chanasyk. 1993. Impacts of grazing on hydrology in foothills fescue. Final Report for Farming for the Future. Project 88-0408. 59 pp.
Naeth, MA and DS Chanasyk. 1993. Reclamation suitability of sandstone overburden. Annual Report for RRTAC and TransAlta Utilities Corporation. 48 pp.
Naeth, MA and RL Lagroix-McLean. 1993. Whitewood productivity study. Report for TransAlta Utilities Corporation. 54 pp.
Naeth, MA and RL Lagroix-McLean. 1993. Highvale productivity study. Annual Report for TransAlta Utilities Corporation. 93 pp.
Naeth, MA and RL Lagroix-McLean. 1993. Whitewood productivity study. Annual Report for TransAlta Utilities Corporation. 56 pp.
Naeth, MA. 1992. The long-term impacts of pipeline construction on solonetzic mixed prairie. Report Final Report NOVA Corporation. 51 pp.
Naeth, MA. 1992. Keephills productivity study. Annual Report for TransAlta Utilities Corporation. 146 pp.
Naeth, MA. 1992. Whitewood productivity study. Annual Report for TransAlta Utilities Corporation. 40 pp.
Naeth, MA. 1992. Highvale productivity study. Annual Report for TransAlta Utilities Corporation. 55 pp.
Naeth, MA. 1992. Keephills productivity study. Annual Report for TransAlta Utilities Corporation. 102 pp.
Chanasyk, DS and MA Naeth. 1992. Reclamation suitability of sandstone overburden. Annual Report for TransAlta Utilities Corporation. 49 pp.
Chanasyk, DS and MA Naeth. 1992. Highvale soil tilth project. Annual Report for TransAlta Utilities Corporation. 41 pp.
Naeth, MA and RL Lagroix-McLean. 1992. Highvale productivity study. Annual Report for TransAlta Utilities Corporation. 88 pp.
Naeth, MA. 1991. Keephills productivity study. Annual Report for TransAlta Utilities Corporation. 83 pp.
Chanasyk, DS and MA Naeth. 1991. Reclamation suitability of sandstone overburden. Annual Report for TransAlta Utilities Corporation. 36 pp.
Chanasyk, DS and MA Naeth. 1991. Highvale soil tilth project. Annual Report for TransAlta Utilities Corporation. 52 pp.
Salé, LY and MA Naeth. 1991. Rooting characteristics on coal mined land reclaimed with and without topsoil. Report for TransAlta Utilities Corporation. 14 pp.
Naeth, MA. 1990. Photosynthetic carbon fixation and its relationship to increased atmospheric carbon dioxide. Literature review for TransAlta Utilities Corporation. 38 pp.
Naeth, MA. 1991. Impacts of grazing on rangeland soils and hydrology. The effects of grazing on the soil dynamics of the shortgrass and fescue grasslands. Alberta Institute of Agrologists, Society for Range Management and Ducks Unlimited. 22 pp.
Naeth, MA. 1991. Proceedings of the Keephills Forage Fertility and Pasture Management Workshop. Sponsored by TransAlta Utilities Corporation, Alberta Agriculture and the Committee on Keephills Environment. 41 pp.
Naeth, MA. 1990. The impacts of grazing on range soils and hydrology. Executives of the Eastern Irrigation District Meeting. 20 pp.
Chanasyk, DS and MA Naeth. 1990. Highvale soil tilth project. Annual Report for TransAlta Utilities Corporation. 72 pp.
Naeth, MA. 1989. The impact of grazing on litter and hydrology in mixed prairie and fescue grassland ecosystems of Alberta. Report for NOVA Corporation. 48 pp.
Chanasyk, DS, MA Naeth and HE Martens. 1989. Highvale soil tilth project third annual report 1988. Report for TransAlta Utilities Corporation. 32 pp.
Naeth, MA. 1986. The impact of litter on rangeland hydrology. Summary of the Summer Meeting and Tour, International Mountain Section of the Society for Range Management. Agriculture Canada Research Substation, Stavely AB. July 24-26, 1986.
Naeth, MA. 1980. Creating a natural garden spot. News From The Centre. Alberta Environmental Centre. Vegreville AB. 1 pp.

ABSTRACTS

Refereed

Harms, TE, DS Chanasyk, MA Naeth and WJ Hastie. 1994. Runoff from reclaimed lands after coal mining. American Water Resources Association Annual Meeting. RA Martson and VR Hasfurther (eds). Jackson Hole WY.

Naeth, MA and DS Chanasyk. 1994. Impacts of grazing on runoff and soil water of foothills fescue grasslands. American Water Resources Association Annual Meeting. RA Martson and VR Hasfurther (eds). Jackson Hole WY.

Chanasyk, DS and MA Naeth. 1991. Hydrologic impacts of post-mining deep ripping. Canadian Society of Soil Science Annual Meeting. Fredericton NB. Canadian Journal of Soil Science 71:263.

Naeth, MA and DS Chanasyk. 1991. Hydrologic impacts of grazing in Alberta foothills fescue grasslands. Canadian Society of Soil Science Annual Meeting. Fredericton NB. Canadian Journal of Soil Science 71:275.

Naeth, MA, DS Chanasyk and AW Bailey. 1987. Effect of grazing regime on infiltration rates of Alberta rangelands. International Conference on Infiltration Development and Application. YS Fok (ed). Honolulu HA.

Non Refereed

Forsch, KBC and MA Naeth. 2112. Woody debris impacts on succession after oil sands reclamation. CONRAD ERRG Annual Symposium. Edmonton, Alberta.

Turner, EL, DS Chanasyk, MA Naeth and C Nichol. 2012. Influence of cap depth and vegetation on phosphogypsum stack reclamation in Fort Saskatchewan, Alberta. Alberta Soil Science Workshop. Edmonton, Alberta.

Luna Wolter, G and MA Naeth. 2012. Mature fine tailings and petroleum coke as a reclamation substrate. Alberta Soil Science Workshop. Edmonton, Alberta.

Jamro, GM. SX Chang and MA Naeth. 2012. Soil enzyme activities and nitrogen availability in oil sands reclaimed soils: influence of amendment type, soil depth and seasonal pattern. Alberta Soil Science Workshop. Edmonton, Alberta.

Mackenzie, DD and MA Naeth. 2011. Surface soil handling on mines in the boreal forest – from textbook to operations. 6th International Conference on Mine Closure. Lake Louise. Alberta.

Nemirsky, CL, MA Naeth and L Leskiw. 2011. Proposal classification for human modified soils in Canada: anthroposolic order. Canadian Society of Soil Science and Soil Science Society of America Annual Meeting. San Antonio, Texas.

Wu, S, D Sego, MA Naeth and B Wang. 2011. Response of wheat grass species to composite / consolidated oil sands tailings. Tailings and Mine Waste Conference. Vancouver, British Columbia.

Luna Wolter, G and MA Naeth. 2011. Early growth responses of three plant species to oil sands tailings reclamation substrate. Society for Ecological Restoration Annual Meeting. Merida, Mexico.

Turner, EL, MA Naeth and DS Chanasyk. 2011. Influence of soil cap depth and vegetation on phosphogypsum stack reclamation in Alberta, Canada. Society for Ecological Restoration Annual Meeting. Merida, Mexico.

Archibald, HA and MA Naeth. 2011. Early ecosystem genesis using LFH and peat amendments in Athabasca oil sands reclamation. Helmholtz-Alberta Initiative Annual Meeting. Potsdam, Germany.

Forsch, KBC and MA Naeth. 2011. Woody debris impacts on succession after oil sands reclamation. Helmholtz-Alberta Initiative Annual Meeting. Potsdam, Germany.

Archibald, HA and MA Naeth. 2011. Early ecosystem genesis using LFH and peat amendments in Athabasca oil sands reclamation. Helmholtz-Alberta Initiative Science Forum. Edmonton, Alberta.

Forsch, KBC and MA Naeth. 2011. Woody debris impacts on succession after oil sands reclamation. Helmholtz-Alberta Initiative Science Forum. Edmonton, Alberta.

Jamro, GM, SX Chang, MA Naeth, DS Chanasyk and T Siddique. 2011. Contrasting soil enzyme activities and nitrogen availability in soil cover materials used in oil sands reclamation. First Helmholtz-Alberta Initiative Science Forum. Edmonton, Alberta.

Luna Wolter, G and MA Naeth. 2011. Early growth responses of selected boreal plant species for initial reclamation using mature fine tailings and coke from the oil sands. Poster presentation by Luna Wolter

at the Forest Industry Lecture Series. Edmonton, Alberta.
Turner, EL, MA Naeth and D Chanasyk. 2011. The influence of soil capping depth and vegetation on the reclamation of Agrium phosphogypsum stacks in Fort Saskatchewan, Alberta, Canada. Poster presentation at the Forest Industry Lecture Series. Edmonton, Alberta.
Turner, EL, MA Naeth, DS Chanasyk and C Nichol. 2011. The influence of soil capping depth and vegetation on phosphogypsum stack reclamation in Fort Saskatchewan. Canadian Society of Soil Science, Soil Science Society of America Annual Meeting. San Antonio, Texas.
Chanasyk, DS and MA Naeth. 2010. Soil water regimes of reclaimed soils in the Alberta oil sands. First International Conference on Structures and Processes of the Initial Ecosystem. Cottbus, Germany.
Mackenzie, DD and MA Naeth. 2010. Relcamation using forest surface soil in the Athabasca oil sands. Canadian Oil Sands Network for Research and Development (CONRAD) Annual Symposium. Edmonton, AB.
Mackenzie, DD and MA Naeth. 2010. Reclamation using forest soil propagule banks in the Athabasca oil sands. Reclamation and restoration of boreal peatland and forest ecosystems: toward a sustainable future conrefence. Edmonton, AB.
Elsinger, MA and MA Naeth. 2010. Can a plains rough fescue grassland be restored after well site and pipeline construction? Prairie Conservation and Endangered Species Conference. Winnipeg, MB.
Sherritt, DD, MA Naeth and EW Bork. 2010. Impact of mycorrhizae and seed mix diversity on re-establishment of Festuca hallii and Festuca campestris (rough fescue) grasslands. Society for Range Management and the Weed Science Society of America Conference. Denver, CO.
Naeth, MA. 2010. Revegetation considerations for northen reclamation. Northern Reclamatoin and Remediation Conference. Yellowknife, NT.
Brown, R and MA Naeth. 2009. Use of woody debris in oil sands reclamation. Canadian Oil Sand Network for Research and Development Environmental Research Symposium. Edmonton, AB.
Leskiw, LA, MA Naeth and DS Chanasyk. 2009. Proposed classification system for anthropogenic soils in Alberta: anthroposol order. Alberta Soil Science Workshop. Edmonton, AB.
Mackenzie, DD and MA Naeth. 2009. Reclamation using forest soil propagule banks (LFH) in the Athabasca Oil Sands. Canadian Land Reclamation Association Alberta Chapter Annual Meeting. Red Deer, AB.
Naeth, MA and DS Chanasyk. 2009. Changes in soil properties in the early years of reclamation. European Goesciences Union General Assembly. Vienna, Austria.
Chanasyk, DS and MA Naeth. 2009. Evolution of hydrologic regimes in the early years or reclamation. European Geosciences Union General Assembly. Vienna, Austria.
Brown, R and MA Naeth. 2009. Use of woody debris in oil sands reclamation. CONRAD summer field tour. Fort McMurray, AB.
Mackenzie, DD and MA Naeth. 2009. Use of LFH in oil sands reclamation. CONRAD summer field tour. Fort McMurray, AB.
Shaughessy, B and MA Naeth. 2009. Natural recovery in the oil sands. CONRAD summer field tour. Fort McMurray, AB.
Brown, R and MA Naeth. 2009. Use of woody debris in oil sands reclamation. Society for the Ecological Restoration. Perth, Australia.
Desserud, PA and MA Naeth. 2009. Smooth brome reaction to ammonium and potassium. Alberta Soil Science Workshop. Edmonton, AB.
Jackson, ME, MA Naeth, DS Chanasyk and CK Nichol. 2009. Relationship between topsoil capping depth and subsurface water quality for reclamation of a phosphogypsum stack in central Alberta. Alberta Soil Science Workshop. Edmonton, AB
Hallin, I, MA Naeth and Ds Chanasyk. 2009. Alberta Soil Science Workshop. Edmonton, AB.
Naeth, MA. 2008. Land reclamation: a retrospective. Canadian Society of Soil Science Annual Meeting. Prince George BC.
Hallin, I, MA Naeth, DS Chanasyk and CK Nichol. 2008. Reclaiming phosphogypsum stacks in central Alberta. Canadian Society of Soil Science Annual Meeting. Prince George BC.
Jackson, M, MA Naeth, DS Chanasyk and CK Nichol. 2008. Development of a reclamation cap for phosphogypsum stacks in Alberta, Canada. Canadian Society of Soil Science Annual Meeting. Prince George BC.

Brown, RL and MA Naeth. 2008. Effect of woody debris on soil and microbial characteristics during oil sands reclamation. Canadian Society of Soil Science Annual Meeting. Prince George BC.

Elsinger, ME and MA Naeth. 2008. Assessment of reclamation success of well sites and pipelines on native grasslands in Rumsey Block, a protected area in Central Alberta. Canadian Society of Soil Science Annual Meeting. Prince George BC.

Leskiw, L, MA Naeth, DS Chanasyk, H Archibald, S Cartier, A Christensen, A Cohen-Fernandez, S Dunnett, I Hallin, T Hemsley, M Jackson, J Vandergust, N Medinski, C Nemisrsky, D Theberge, B Walchuk. 2008. Proposed classification system for anthropogenic soils in Alberta: anthroposol order. Canadian Society of Soil Science Annual Meeting. Prince George BC.

Brown, R and MA Naeth. 2008. Use of woody debris in oil sands reclamation. Canadian Oil Sands Network for Research and Development Environmental Research Symposium. Edmonton AB.

Mackenzie, DD and MA Naeth. 2008. Reclamation using forest soil propagule banks (LFH) in the Athabasca oil sands. Canadian Oil Sands Network for Research and Development Environmental Research Symposium. Edmonton AB.

Shaughnessy, B and MA Naeth. 2008. Natural revegetation in the oil sands. Canadian Oil Sands Network for Research and Development Environmental Research Symposium. Edmonton AB.

Desserud, PA and MA Naeth. 2008. Rough fescue restoration and ecology in central Alberta. Alberta Soil Science Workshop. Lethbridge AB.

Cohen-Fernandez, AC and MA Naeth. 2008. Developing a suitable substrate for limestone quarry reclamation in Alberta. Canadian Land Reclamation Association, Alberta Chapter Annual Meeting. Calgary AB.

Hallin, I, MA Naeth, DS Chanasyk and CK Nichol. Evaluating the relationship between depth of cover material and moisture profiles within phosphogypsum stacks in Central Alberta. Canadian Land Reclamation Association, Alberta Chapter Annual Meeting. Calgary AB.

Stanton-Kennedy, T, MA Naeth and K Landman. 2008. Soil properties and dominant vegetation cover on a reclaimed coal mine end cut in the aspen parkland region of north-central Alberta. US-IALE 23rd Annual Landscape Ecology Symposium. Landscape Patterns and Ecosystem Processes. Madison WI.

Desserud, PA and MA Naeth. 2008. Fragments of rough fescue grassland. How can it be restored? Alberta Native Plant Council Annual Workshop and General Meeting. Lethbridge AB.

Desserud, PA and MA Naeth. 2008. Rough fescue restoration in central Alberta rangelands. Society for Range Management. Louisville KY.

Elsinger, ME and MA Naeth. 2008. Restoration status of 50 oil and gas disturbances at Rumsey Block in central Alberta. Society for Range Management. Louisville KY.

Stanton-Kennedy, TS, K Landman and MA Naeth. 2008. Soil and vegetation changes over 15 years at a reclaimed coal mine in the aspen parkland region of Alberta. Canadian Society of Soil Science Annual Meeting. Prince George BC.

Lapp, J, C Smith and MA Naeth. 2007. International cooperation in the art and science of ecological restoration. Parks, Peace and Partnership Conference. Waterton Lakes National Park AB.

Mackenzie, DD and MA Naeth. 2007. Upland Reclamation using a jack pine forest soil propagule bank in the Athabasca oil sands. Canadian Land Reclamation Association Annual Meeting. Red Deer AB.

Mackenzie, DD and MA Naeth. 2007. Upland forest LFH to enhance native species establishment. Canadian Oil Sand Network for Research and Development Environmental Research Symposium. Edmonton AB

Naeth, MA. 2006. Reclamation in the coal fired energy industry. Canadian Society of Bioengineering Annual Meeting. Edmonton AB.

Mackenzie, DD and MA Naeth. 2006. Assisted natural recovery using a forest soil propagule bank in the Athabasca oil sands. Canadian Oil Sands Network for Research and Development Annual Instrumented Watershed Research Symposium. Edmonton AB.

Mackenzie, DD and MA Naeth. 2006. Assisted natural recovery using a forest soil propagule bank in the Athabasca oil sands. Alberta Soil Science Workshop. Edmonton AB.

Mackenzie, DD and MA Naeth. 2006. Assisted natural recovery using a forest soil propagule bank in the Athabasca oil sands. Canadian Society of Soil Science Annual Meeting. Banff AB.

Kwiatkowski, BL and MA Naeth. 2006. Diamond mine reclamation in the NWT, substrates, soil amendments and plant community development. Canadian Society of Soil Science Annual Meeting.

Banff AB.

Patterson, SJ, DS Chanasyk, MA Naeth, VS Baron, AM Jobson, SX Chang, DD Johnson, C Kaiser, S McNamara and A Bertschi. 2006. Irrigation with kraft pulp mill effluent for hybrid poplar and forage production. Alberta Soil Science Workshop. Edmonton AB.

Patterson, SJ, DS Chanasyk, MA Naeth, VS Baron, AM Jobson, SX Chang, DD Johnson, C Kaiser, S McNamara and A Bertschi. 2006. Agroforestry: an alternative for industrial and municipal wastewater treatment. Canadian Society of Soil Science Annual Meeting. Banff AB.

Mackenzie, DD and MA Naeth. 2005. Assisted natural recovery using a forest soil propagule bank in the Athabasca oil sands region. Alberta Chapter of the Canadian Land Reclamation Association Annual Meeting. Calgary AB.

Heidman, AP and MA Naeth. 2005. Bioremediation of hydrocarbon contaminated soil amended with compost: microbial population dynamics in the field. Canadian Society of Soil Science Annual Meeting. Halifax NS.

Heidman, AP and MA Naeth. 2005. Bioremediation of hydrocarbon contaminated soil amended with compost: microbial population dynamics at 14 months. Alberta Soil Science Workshop. Calgary AB.

Patterson, SJ, DS Chanasyk, MA Naeth, VS Baron, AM Jobson, SX Chang, DD Johnson, C Kaiser, S McNamara and A Bertschi. 2005. Use of kraft pulp mill effluent as source of irrigation water for hybrid poplar and forage production. Alberta Soil Science Workshop. Calgary AB.

Baron, VS, RL Lemke, DS Chanasyk, MA Naeth and K Greer. 2005. Influence of forage management and species on soil mineral nitrogen supply rates and seasonal dynamics. Plant Canada Meeting. Pp. 140.

Naeth, MA and SR Wilkinson. 2005. Restoration of tundra communities following diamond mining in the NWT: challenges and opportunities for research. International Arctic Workshop. Edmonton AB.

Graham, S and MA Naeth. 2004. Simulated in situ bioremediation of hydrocarbon contaminated soils. Alberta Soil Science Workshop. Lethbridge AB.

Burgers, T, MA Naeth and DS Chanasyk. 2004. Salinity, moisture and plant community associations at the southwest sands storage facility. Alberta Soil Science Workshop. Lethbridge AB.

Henderson, DC and MA Naeth. 2004. Battling both sides: prairie restoration through alien grass control an reinvasion prevention. Society for Ecological Restoration Annual Meeting. Victoria BC.

Henderson, DC and MA Naeth. 2004. The paradox of crested wheatgrass in the northwest: saviour or invader? Ecological Society of America Annual Meeting.

Erichsen-Arychuk, C and MA Naeth. 2001. Effect of location, planting season and mowing on native forbs transplanted onto aspen parkland reclamation sites. Society for Range Management Annual Meeting. Kona HA.

Henderson, DC and MA Naeth. 2001. Crested wheatgrass invasion, ecology and management. Prairie Conservation and Endangered Species Conference. Winnipeg MN.

Wruck, GW and MA Naeth. 2001. Pipeline revegetation in Alberta's aspen parkland native prairie on sandy soils. Canadian Land Reclamation Association. Halifax NS.

Wilkinson, SR, MA Naeth and FKA Schmiegelow. 2001. Control of elephant grass in Scalesia Forest, Galapagos National Park: methods and management. Society for Ecological Restoration. Niagara Falls ON.

Soulodre, E and MA Naeth. 2001. The native prairie revegetation research project: dry mixed grass prairie sub-project. Phase II Project Report. Canadian Association of Petroleum Producers Annual Meeting. Calgary AB.

Silva, M, DC Sego, KW Biggar, MA Naeth and DS Chanasyk. 2001. Plant response to oil sands tailings. Tailings and Mine Waste Conference.

Thurston, J, DS Chanasyk, RJ Hudson, J Olaf, MA Naeth and B Parkinson. 2001. The Elk Island visualization project. GIS 2001 Conference. Vancouver BC.

Naeth, MA. 2000. Reclaiming industrial disturbances: effects of landscape processes. Ecological Society of America. Symposium on Landscape Restoration. Snowbird UT.

Baron, VS, SS Mahli, MA Naeth, DS Chanasyk and E Mapfumo. 1998. Grazing intensity affects soil nitrate pool. American Society of Agronomy Annual Meeting. Baltimore MD.

Naeth, MA. 1997. Revegetation/restoration concepts and strategies: past, present and future. Northern Great Plains Native Plant Committee Summit. Saskatoon SK.

Gill, SI, MA Naeth, DS Chanasyk and VS Baron. 1996. Effect of grazing on runoff and erosion in annual

and perennial pastures in the parkland ecoregion. Alberta Soil Science Workshop. Edmonton AB.
Chanasyk, DS and MA Naeth. 1995. Measurement of soil moisture using neutron probes. Canadian Society of Agrometeorology. Agricultural Institute of Canada Annual Meeting. Ottawa ON.
Naeth, MA, DS Chanasyk, JF Dormaar and WD Willms. 1990. Runoff and erosion on foothills fescue grasslands in Alberta. Society for Range Management Annual Meeting. Reno NV.
Chanasyk, DS and MA Naeth. 1988. Measurement of near-surface soil moisture with a hydrogenously shielded neutron probe. Agricultural Engineering Abstracts 13:12.
Naeth, MA, AW Bailey and DS Chanasyk. 1988. The effect of grazing regime on soil moisture in Alberta rangelands. Society for Range Management Annual Meeting. Corpus Christi TX.
Naeth, MA, AW Bailey and DS Chanasyk. 1988. The effect of grazing regime on infiltration rates of Alberta rangelands. Society for Range Management Annual Meeting. Corpus Christi TX.
Naeth, MA, DS Chanasyk, J Thurston, WD Willms and AW Bailey. 1988. Soil water-climate interactions in mixed prairie and fescue grassland ecosystems of Alberta. Canadian Society of Agricultural Meteorology Newsletter. Edmonton AB.
Naeth, MA, DS Chanasyk and AW Bailey. 1987. The effect of grazing regime on infiltration rates of mixed prairie and foothills fescue grasslands of Alberta. Canadian Society of Soil Science Annual Meeting. Ottawa ON.
Naeth, MA, DS Chanasyk and AW Bailey. 1987. The effect of grazing regime on infiltration rates of Alberta rangelands. Graduate Studies Research Symposium. Edmonton AB.
Naeth, MA, WB McGill, DS Chanasyk and AW Bailey. 1987. The effect of pipeline installation and operation on soil temperature regime. Canadian Society of Soil Science Annual Meeting. Ottawa ON.
Naeth, MA and AW Bailey. 1986. The effect of grazing regime on revegetation of rangeland after pipeline construction in southern Alberta. Society for Range Management Annual Meeting. Orlando FL.
Naeth, MA, DS Chanasyk, WB McGill and AW Bailey. 1984. Persistence of changes in soil properties and moisture regime after pipeline installation in native range. Canadian Society of Soil Science Annual Meeting. Banff AB.

December 2011

CURRICULUM VITAE – *André PLOURDE*

EDUCATION

Ph.D. (Economics), University of British Columbia, 1985
title of thesis: "Modelling the Economic Implications of Offshore Oil: The Case of Hibernia"
supervisor: Professor John F. Helliwell;
M.A. (Economics), University of New Brunswick, 1979;
B.A. (Economics and Statistics), University of New Brunswick, 1978.

CURRENT POSITION

Professor, Department of Economics
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EMPLOYMENT HISTORY

2004-11	Full Professor, Department of Economics, University of Alberta;
2003-04	Associate Assistant Deputy Minister, Energy Sector (EX-4 level; Acting Assistant Deputy Minister, Energy Sector – October 2003-February 2004), Natural Resources Canada, Government of Canada;
2003-04	Full Professor, School of Business, University of Alberta (as of July 2003) [on leave without pay 2003-04];
2000-03	Associate Professor and EPCOR Professor of Energy Policy, School of Business, University of Alberta;
1998-2000	Associate Professor, Department of Economics and Faculty of Business, University of Alberta;
1998-	Fellow, Institute for Public Economics, University of Alberta;
1997-98	Director (EX-3 level), Economic Studies and Policy Analysis, Department of Finance, Government of Canada;
1990-98	Associate Professor, Department of Economics, University of Ottawa [on leave without pay 1997-98];
1990-98	Member, Institute for Research on the Environment and the Economy, University of Ottawa;
1988-98	Member, School of Graduate Studies and Research, University of Ottawa;
1987-90	Assistant Professor, Department of Economics, University of Ottawa (tenure granted as of July 1, 1989);
1983-2000	Research Associate, Institute for Policy Analysis, University of Toronto;
1983-87	Assistant Professor, Department of Economics, University of Toronto.

HONOURS

Teacher of the Year Award (jointly with Professor D. Jobson), First-Year MBA Students, Faculty of Business, University of Alberta, 1999-2000;

Teacher of the Year Award, First-Year MBA Students, Faculty of Business, University of Alberta, 1998-99;

APUS-SAC Award for Excellence in Undergraduate Teaching (Social Sciences), University of Toronto, 1985-86.

PRINCIPAL ADMINISTRATIVE DUTIES – UNIVERSITY OF ALBERTA

2011	Elected member, Executive Committee of General Faculties Council;
2010-11	Associate Dean (Research), Faculty of Arts;
2010-11	Member, Joint Committee on University Planning and Budgets (AASUA representative);
2010-11	Member, Board of Directors, Canadian Studies Institute, Campus Saint-Jean;
2008	Member, Unit Review Team, Campus Saint-Jean;
2007-09	Board of Directors, Alberta Gaming Research Institute;
2007-08	Chair, Chairs' Council Executive;
2006-08	Elected Member, Chairs' Council Executive and President's Advisory Committee of Chairs;
2005-09	Chair, Hiring Committee, Department of Economics (2005; 2005-06; 2006-07; 2007-08; 2008-09);
2005-06	Elected member, Advisory Search Committee for Vice President (External Relations);
2005-06	External member, Hiring Committee, Department of Marketing, Business Economics and Law (School of Business);
2004-09	Member, Board of Directors, Institute of Health Economics;
2004-09	Chair, Department of Economics;
2003	Member, Canada Graduate Scholarships – Master's Competition Committee, Faculty of Graduate Studies and Research (FGSR);
2003	Coach, The University of Alberta School of Business team, 2003 John Molson MBA International Case Competition, Concordia University, Montréal (January);
2002-03	Associate Director, Canadian Building Energy End-use Data and Analysis Centre, Department of Economics / School of Business;
2001-08	Invited Participant, University of Alberta Expert Forum (annual event);
2000-03	Member, Scholarship Committee, FGSR;
2000-02	Associate Dean, MBA Programs, School of Business;
2000-02	Member, Selection Committee, Canadian Business Leader Award.

PRINCIPAL ADMINISTRATIVE DUTIES – UNIVERSITY OF OTTAWA

1997	Member, Selection Committee, Young Researcher Award;

1996-97	Chair, Support Committee for "Career Vision", an initiative of the HSSFC, financed by Human Resources Development Canada;
1996	Co-Chair, United Way Campaign, Faculty of Social Sciences (also in 1994);
1994-95	Supervisor of Ph.D. Studies, Department of Economics;
1994-97	Secretary, Membership Committee, School of Graduate Studies and Research (1994-96; 1996-97);
1992-97	Chair, Department of Economics (1992-95; 1995-97);
1992-94	Member, University Research Committee;
1991-93	Member, Committee on Employment and Educational Equity;
1990-97	Director, Discussion Paper Series, Faculty of Social Sciences.
1989-91	Chair, Recruitment Committee, Dept. of Economics (1989-90; 1990-91).

SCHOLARLY AND PROFESSIONAL ACTIVITIES

2011	Chair, Committee of Observers, Standard Research Grant Competition, Social Sciences and Humanities Research Council of Canada (SSHRC), February-March 2011;
2010-11	Representative of the University of Alberta, Canadian Federation of Humanities and Social Sciences (CFHSS; from December 2010);
2010	Chair, Expert Panel – Evaluation of the Standard Research Grant and Research Development Initiative Programs, Social Sciences and Humanities Research Council of Canada (SSHRC; February to May);
2010	Member, Program Committee, World Congress of Environmental and Resource Economists, Montréal, June-July 2010;
2009	Visiting scholar, Division of Economics and Business, Colorado School of Mines, Golden CO (November);
2009	Invited testimony, House of Commons Standing Committee on Environment and Sustainable Development, Parliament of Canada, Ottawa, November 26;
2009	External evaluator, Tenure and Promotion (to Associate Professor), College of Humanities and Social Sciences, Nanyang Technological University, Singapore;
2009-10	Member, Expert Panel on the Environmental and Health Impacts of Canada's Oil Sands Industry, Royal Society of Canada (September 2009 to December 2010);
2009	External evaluator, Promotion (to Full Professor), Department of Economics, Hobart and William Smith Colleges, Geneva, NY;
2009	Chair, Nominations Committee, International Association for Energy Economics (IAEE);
2009	Consultant, Atlantic Canada Opportunities Agency (also in 2008);
2009	Consultant, Government of the Northwest Territories;
2009	External evaluator, Promotion (to Full professor), Rotman School of Management, University of Toronto;

2009 External assessor, Undergraduate programs in Economics, Université Laval;
2009 Invited testimony, House of Commons Standing Committee on Foreign Affairs and International Relations, Parliament of Canada, Ottawa, February 25;
2008 Member, Nominations Committee; Chair, Awards Committee, IAEE;
2008 Treasurer, Economics Society of Northern Alberta;
2008 Member, Multidisciplinary assessment committee, Exceptional Opportunities Fund, Canada Foundation for Innovation (CFI);
2007 Member, Royalty Review Panel, appointed by the Minister of Finance to assess the royalty and tax system applicable to Alberta's oil and gas production sector, Government of Alberta;
2007 President, IAEE (President-elect, September-December 2006; Immediate Past President, 2008; Past President, 2009);
2007-09 Academic Director, Centre for Regulatory Affairs, Van Horne Institute, Calgary;
2007 External assessor, Tenure and promotion decision, Department of Economics, University of North Carolina – Charlotte;
2006 Member, Program Committee, 27th Annual International Conference of the IAEE, Berlin;
2006 Consultant, Environment Canada;
2006 Chair, Multidisciplinary Assessment Committee #1, New Initiatives Fund, CFI;
2006 Member, Awards Committees for both IAEE and United States Association for Energy Economics (USAEE);
2006-09 Member, Advisory Committee for the Evaluation Framework of the Initiative on the New Economy, SSHRC;
2005-07 Member, Executive Board, Economics Society of Northern Alberta (2005-06; 2006-07);
2005-08 Appointed member, Energy Sector Sustainability Table, an Environment Canada initiative;
2005 Consultant, Expert Panel of Equalization and Territorial Formula Financing, Department of Finance, Government of Canada;
2005-07 Chair, Adjudication Committee, Major Collaborative Research Initiatives (MCRI) program, SSHRC (April and November 2005; April and November 2006; April and November 2007);
2005 External referee, Tenure and Promotion, School of Public Administration, University of Victoria;
2005 Consultant, Natural Resources Canada (also in 2007);
2005 Member, Program Committee, 25th Annual North American conference of the USAEE/IAEE, Denver, September;
2005 Member, Program Committee, 26th Annual International Conference of the IAEE, Taipei (Taiwan), June;
2004-06 Appointed member, Energy Aggregation Advisory Committee, Alberta Urban Municipalities Association (AUMA) (2004-05; re-appointed 2005-06);

2004	External assessor, Promotion to Professor, Center for Energy Studies (Office of the Vice Chancellor), Louisiana State University;
2004	Member, Program Committee, 24th Annual North American Conference of the USAEE/IAEE, Washington, July;
2004	Member, Nominations Committee, USAEE (also in 2005);
2004	Appointed Member, President's Advisory Board, USAEE;
2004-06	Member, Editorial Board, *Energy Studies Review*;
2003	General Conference Co-chair (with A. Sieminski & J.G. Santalo), 23rd North American Conference of the USAEE/IAEE, Mexico City, October;
2003-04	Vice President and Treasurer, IAEE (re-elected 2005-2006);
2003	Member, Program Committee, 25th Annual International Conference of the IAEE, Prague (June 2003);
2002-03	Consultant, Munk Centre for International Studies (University of Toronto) – joint work with researchers at Instituto Nacional de Investigaciones Economicas, Havana (Cuba);
2002-03	Consultant, Natural Resources Canada;
2002	Member, Program Committee, 22nd Annual North American Conference of the USAEE/IAEE, Vancouver, October;
2002-03	Chair, Peer Evaluation Committee, Initiative on the New Economy, Development and Outreach Grants, SSHRC (January 2002, May 2002, and February 2003);
2001-03	Appointed Member, Environmental Protection Advisory Committee, Minister of the Environment, Government of Alberta;
2001	Chair/Rapporteur, International Meeting on Clean Energy, Calgary (organized by Natural Resources Canada as part of the follow-up work on the Kyoto Protocol agreed to at CoP 6bis in Bonn);
2001-03	Instructor, Senior & Executive Managers' Development Program, Centre for Executive and Management Development, School of Business, University of Alberta;
2001-02	Member, Experts Advisory Group, Analysis and Modelling Group, Canada's Implementation Strategy for the Kyoto Protocol;
2001	Appointed Member, President's Advisory Board, USAEE;
2001	Member, Program Committee, 24th Annual International Conference of the IAEE, Houston, April;
2000	Consultant, Munk Centre for International Studies (University of Toronto) – materials prepared and course on energy and the environment delivered in Havana (Cuba);
2000	Member, Program Committee, 21st Annual North American Conference of the USAEE/IAEE, Philadelphia, September;
2000	External Referee, Tenure and Promotion, School of Management, University of Alaska – Fairbanks;
2000	Chair, Multidisciplinary Assessment Committee #2, CFI;
2000	Vice-President (Conferences), USAEE;

2000	External Referee, Tenure Decision, Faculty of Social Sciences, University of Calgary;
2000	Member, Joint Infrastructure Fund Assessment Panel, Economic and Social Research Council (United Kingdom);
2000	Referee, CFI – New Opportunities Mechanism (also 1999; 2005);
1999-2000	Consultant, Office of the Auditor General of Canada (also in 1989; 1992);
1999-2000	Consultant, Competition Bureau of Canada;
1999	Invited Participant, Colloquium on Government Support for Energy Investments, Office of the Auditor-General of Canada;
1999	Consultant, Analysis and Modelling Group, Canada's Implementation Strategy for the Kyoto Protocol;
1999	Member, Program Committee, 20th Annual North American Conference of the USAEE/IAEE, Orlando, August-September;
1999	Member, Multi-Disciplinary Assessment Committee, CFI;
1998	Member, Committee for Institutional Innovation Fund and Regional/National Facilities of less than $350,000, CFI;
1998-2003	Member, National Advisory Council on Energy Efficiency, Office of Energy Efficiency, Natural Resources Canada;
1998	External Evaluator, Institut d'économie appliquée, École des Hautes Études Commerciales, Université de Montréal;
1998	Member, Sous-comité d'évaluation projet pilote sur l'édition électronique des revues de recherche, Fonds pour la formation des chercheurs et l'aide à la recherche (FCAR), Québec;
1997	Consultant, Department of External Affairs, Government of Canada – materials prepared and course on promoting investment in Canada delivered in Parma (Italy);
1996-98	Program Committee Chair and Member of Organizing Committee, 21st International Conference of the IAEE, Québec, May 1998;
1996-97	Member, Comité de programme "Revues de recherche et de transfert des connaissances", Fonds FCAR; also served in 1993-94;
1996	Facilitator, Round-table discussion on "National Response to Climate Challenges", an initiative of the federal Ministers of Natural Resources and of the Environment, Ottawa, November;
1996-97	Member, Canadian Council for UNESCO (representative of the CFHSS);
1996-2006	President, Canadian Chapter, IAEE;
1996	Organization of conference: "L'Ontario français, valeur ajoutée?", for the Centre de recherche en civilisation canadienne-française, University of Ottawa (jointly with Professor Anne Gilbert, Department of Geography);
1995	Invited Testimony, Standing Committee of the House of Commons on Environment and Sustainable Development (November 29);
1995	Organization of Conference: "Economies in Transition: The Asia-Pacific Region", for the Faculties of Arts and of Social Sciences, University of Ottawa;

1995	Member, Selection Committee, Canadian Association for Graduate Studies Distinguished Dissertation Award;
1995-96	President, Ottawa chapter of the IAEE;
1994-97	Member, Doctoral Fellowships Committee, SSHR (also member, Doctoral Fellowships Review Committee, 1994-95); Chair, Committee 5, Doctoral Fellowships Committee (Chair, Doctoral Fellowships Review Committee), 1995-96 and 1996-97;
1994	Invited Testimony, Standing Committee of the House of Commons on Finance (December 1);
1994	Invited Presentation, New Brunswick Roundtable on the Environment;
1994	Editor, *Energy Studies Review*;
1994	Chair, Task Force on Economic Instruments and Disincentives to Sound Environmental Practices, an initiative of the federal Ministers of Finance and of the Environment;
1994	Consultant, Hydro-Québec;
1993-94	Moderator, Canadian Emissions Modelling Forum, a federal-provincial initiative managed by Natural Resources Canada;
1993-96	Representative of the University of Ottawa, Social Science Federation of Canada (SSFC);
1993	Visiting Scholar, Department of Economics, University of Alberta (June to August);
1993	Consultant, Industry, Science and Technology Canada;
1993	External Referee, Tenure and Promotion, Institut d'économie appliquée, École des Hautes Études Commerciales, Université de Montréal;
1993	Moderator, "Export Impact Assessment (EIA) Workshop", National Energy Board, Calgary, April;
1993	Moderator, "Incentive Regulation Workshop" (sessions on "Degree of Competition and Market Power" and "Effectiveness of Cost of Service Regulation"), National Energy Board, Calgary, January;
1992-96	Representative of the Canadian Economics Association, SSFC;
1992	Visiting Scholar, Dept. of Economics, Un. of Alberta (May to August);
1992	External Referee, Tenure and Promotion, Département de science politique, Université de Montréal;
1992	Chairman, Evaluation Panel, Ontario Graduate Scholarship Program;
1991-92	Member, Nominations Committee, IAEE;
1991-94	Board of Directors, Société canadienne de science économique;
1991-	Board of Editors, *The Energy Journal*;
1991	Invited Testimony, Standing Committee of the Senate on Energy, the Environment and Natural Resources, Senate of Canada (January 28);
1991	Member, Ad Hoc Committee on Distribution, IAEE;
1991	Member, Evaluation Panel, Ontario Graduate Scholarship Program;
1991	Consultant, Energy, Mines and Resources Canada;
1991	External Referee / Site Visitor, research project in the "Actions structurantes" program, Fonds FCAR;

1990	Program Committee Chairman, 12th annual North American conference of the USAEE/IAEE, Ottawa;
1990	Consultant, Royal Commission on National Passenger Transportation;
1990-	Referee, Fonds FCAR (1990, 1992, 1993, 1994, 1995, 1996; 1998);
1990-94	Associate Editor, *Energy Studies Review*;
1989-90	Editorial Board, *Energy Studies Review*;
1988	Organization of Conference: "Energy and the Environment: Linking Concepts to Applications" for the Ottawa chapter of the IAEE;
1988-95	Member, Executive Committee of the Ottawa chapter of the IAEE;
1987-88	Member, Socio-Economic Group and Consultant, *Energy and Canadians into the 21st Century - A Report on the Energy Options Process*, Energy, Mines and Resources Canada;
1986	Academic visitor, Department of Economics, University of Dar-es-Salaam, Tanzania (December);
1986	Organization of conference: "Natural Gas Deregulation in Canada: Issues, Problems, and Perspectives" for the Institute for Policy Analysis, University of Toronto and the Ontario Energy Board;
1986-	Referee, SSHRCC (1986, 1987, 1989, 1990, 1992, 1993, 1994, 1995, 1996, 1997, 1999, 2000, 2007, 2009);
1985-	Referee, *L'Actualité économique*, *Alternatives*, *Arctic,* Canadian Donner Foundation, *Canadian Journal of Development Studies*, *Canadian Journal of Economics*, *Canadian Public Policy - Analyse de Politiques*, *Canadian Tax Journal*, C.D. Howe Institute, Council of Canadian Academies, *Eastern Economic Journal*, *Empirical Economics, Energy Economics, The Energy Journal*, *Energy Policy*, *Energy Studies Review*, *Futures, International Review of Economics and Finance*, *Journal of Comparative Policy Analysis, Journal of Economics and Business*, *Journal of Environmental Economics and Management*.

SUPERVISION OF GRADUATE STUDENTS

Career numbers: 18 MAs, 46 MBAs, 2 PhDs

External examiner:

M.Sc. major paper (F. Mainville), Département de science politique, Université de Montréal, 1991;
Ph.D. thesis (N. Rivers), Faculty of Environment, Simon Fraser University, 2011;
Ph.D. thesis (A.K. Moghadam), Department of Economics, University of Guelph, 2008;
Ph.D. thesis (L. Shiell), Department of Economics, University of Toronto, 1997;
Ph.D. thesis (S. Gordon), Department of Economics, University of Toronto, 1990.

RESEARCH FUNDING

2008	Centre for Applied Business Research on Energy and the Environment (CABREE), School of Business, University of Alberta, $12 500, research;
2003-04	Office of Energy Efficiency (Natural Resources Canada), with D. Ryan (Un. of Alberta), $150 000, research contribution (Canadian Building Energy End-use Data and Analysis Centre - CBEEDAC) – grant attributed prior to my joining Natural Resources Canada;
2002-03	Office of Energy Efficiency (Natural Resources Canada), with D. Ryan (Un. of Alberta), $150 000, research contribution (CBEEDAC);
2002	Office of Energy Efficiency (Natural Resources Canada), with D. Ryan (Un. of Alberta), $50 000, research contribution (set-up funding for CBEEDAC);
2000	CIBS/WCER, Faculty of Business, University of Alberta, with D. Ryan (Un. of Alberta), $3 500, research;
1995	University of Ottawa, $6 150, research;
1992	University of Ottawa, $750, travel;
1991-95	SSHRCC, with D. Ryan and D. Young (Un. of Alberta), $13 000 (annually), research;
1991	University of Ottawa, with C. LaCasse, J. Silva-Echenique, N.V. Quyen, $5 380, research;
1991	University of Ottawa, $1 250, travel;
1990	University of Ottawa, $2 690, research;
1989-90	Ontario Ministry of Energy, $8 500, research;
1989-91	SSHRCC, with D. Ryan (Un. of Alberta), $11 800 (annually), research;
1988-89	Ontario Ministry of Energy, $12 000, research;
1987	University of Ottawa, $2 500, equipment purchase;
1986-87	Canadian Tax Foundation, with J.F. Helliwell (Un. of British Columbia), M.E. MacGregor (Un. of Toronto), R.N. McRae (Un. of Calgary), $33 000, research & publication;
1986-87	Ontario Ministry of Energy, jointly with D.P. Dungan and M.E. MacGregor (Un. of Toronto), $75 000, research.

PUBLICATIONS

1) Summary according to the following categories:

Books authored	*2*
Conference proceedings edited	*6*
Special issues of journals edited	*2*
Chapters in books	*10*
Papers in refereed journals	*28*
Papers in conference proceedings	*13*
Other refereed publications	*2*

2) Details for publications (excluding technical reports and papers read):

A - Books authored:

2. John F. Helliwell, Mary E. MacGregor, Robert N. McRae, André Plourde, *Oil and Gas in Canada - The Effects of Domestic Policies and World Events*. Toronto: Canadian Tax Foundation, 1989, pp. xviii + 340.
1. Paul Halpern, André Plourde, Leonard Waverman, *Petro-Canada: Its Role, Control and Operations*. Ottawa: Economic Council of Canada, 1988, pp. xiii + 140 (une version française a paru sous le titre, *Pétro-Canada : Rôle, contrôle et exploitation*, pp. xi + 136).

B - Conference proceedings edited:

6. Jan Myslivec, Ivan Benes, Anthony Owen, André Plourde (editors), *New Challenges for Energy Decision Makers*. Proceedings of the 26th International Conference of the International Association for Energy Economics. Cleveland: IAEE, 2003; on CD-ROM.

5. Michelle Michot Foss, Gurcan Gulen, Omuwumi Iledare, André Plourde (editors), *2001: An Energy Odyssey?* Proceedings of the 24th International Conference of the International Association for Energy Economics. Cleveland: IAEE, 2001; on CD-ROM.

4. André Plourde (editor), *Experimenting with Freer Energy Markets: Lessons from the Last 20 Years and Prospects for the Future*, 2 volumes. Proceedings of the 21st International Conference of the International Association for Energy Economics. Cleveland: IAEE, 1998, volume 1: pp. xii + 486; volume 2: pp. xii + 550 ("Editor's Preface" by A. Plourde, p. xi of both volumes).

3. André Plourde (editor), *Economies in Transition: The Asia-Pacific Region.* Proceedings of a symposium. Ottawa: Faculty of Arts and Faculty of Social Sciences, University of Ottawa, 1997, pp. xi + 172 ("Introduction" by A. Plourde, pp. vi-ix).

2. Anne Gilbert, André Plourde, *L'Ontario français, valeur ajoutée?* Actes du colloque. Ottawa: Centre de recherche en civilisation canadienne-française de l'Université d'Ottawa, 1996, pp. 128 ("Introduction" by A. Plourde, pp. 7-8; "De l'avis des participants" by A. Gilbert and A. Plourde, pp. 115-121).

1. André Plourde (editor), *Energy Supply/Demand Balances: Options and Costs*. Proceedings of the 12th North American Conference of the International Association for Energy Economics. Washington: IAEE, 1990, pp. xii + 449. ("Editor's Preface", pp. x-xi).

C - Special issues of journals edited:

2. Patrick Criqui, Mel Kliman, André Plourde (editors), *ESR / IEPE Co-Edition 1994: The First Oil Shock - 20 Years Later*. Vol. 6, No. 1 of *Energy Studies Review*. Hamilton: McMaster Institute for Energy Studies, 1994. ("Introduction" by the editors, pp. ii-iv.)

1. Dominique Finon, Mel Kliman, André Plourde (editors), *ESR / IEPE Co-Edition 1991-1992: Petroleum Markets After the Gulf Crisis*. Vol. 3, no. 3 of *Energy Studies Review*. Hamilton: McMaster Institute for Energy Studies, 1991. ("Introduction" by the editors, pp. iii-v).

D - Chapters in books

10. David L. Ryan, André Plourde, "Empirical Modelling of Energy Demand", in *International Handbook on the Economics of Energy*, J. Evans and L. Hunt, eds. Edward Elgar: Cheltenham UK, 2009, pp. 112-143.

9. David L. Ryan, André Plourde, "A Systems Approach to Modelling Asymmetric Demand Responses to Energy Price Changes", in *Functional Structure Inference,* W.A Barnett and A. Serletis, eds. Elsevier: London, 2007, pp. 183-224.

8. Terry Daniel, Joseph Doucet, André Plourde, "Electricity Industry Restructuring: The Alberta Experience", in *Electric Choices: Deregulation and the Future of Electric Power*, A.N. Kleit, ed., Lanham MD: Rowman & Littlefield, 2007, pp. 91-112.

7. André Plourde, "Offshore Energy Revenues and Equalization: Having Your Cake and Eating It Too?", in *How Ottawa Spends, 2006-07*, G.B. Doern, ed., Montreal: McGill-Queen's University Press, 2006, pp. 50-72.

6. André Plourde, "The Changing Nature of National and Continental Energy Markets", in *Canadian Energy Policy and the Struggle for Sustainable Development Era*, G.B. Doern, ed., Toronto: University of Toronto Press, 2005, pp. 51-82.

5. André Plourde, Bradford Reid, "Natural Resource Revenues and the Alberta Budget", in *Alberta's Volatile Government Revenues: Policies for the Long Run*, L.S. Wilson, ed., Edmonton: Institute for Public Economics, University of Alberta , 2002, pp. 3-24.

4. André Plourde, "Comment on the Acheson and Ferris Paper", in *Welfare, Property Rights and Economic Policy - Essays and Tributes in Honour of H. Scott Gordon*, T.K. Rymes, ed., Ottawa: Carleton University Press, 1991, pp. 65-69.

3. André Plourde, Leonard Waverman, "Canadian Energy Trade: The Past and the Future", in *Petro Markets: Probing the Economics of Continental Energy*, G.C. Watkins, ed., Vancouver: The Fraser Institute, 1989, pp. 141-180.

2. André Plourde, "Oil Import Charges and the Canada-U.S. Free-Trade Agreement", in *Trade-offs on Free Trade: The Canada-U.S. Free-Trade Agreement*, M. Gold and D. Leyton-Brown, eds., Toronto: Carswell, 1988, pp. 233-240.

1. John F. Helliwell, Robert N. McRae, Paul Boothe, Ardo Hansson, Michael Margolick, Tim Padmore, André Plourde, Reg Plummer, "Energy and the National Economy: An Overview of the MACE Model", in *Progress in Natural Resource Economics*, A.D. Scott, ed., Oxford: Clarendon Press, 1985, pp. 17-85.

***E - Papers in refereed journals**:*

28. André Plourde, "On Properties of Royalty and Tax Regimes in Alberta's Oil Sands", *Energy Policy*, Vol. 38, no. 8, 2010, pp. 4562-4662.

27. Valentina Galvani, André Plourde, "Portfolio Diversification in Energy Markets", *Energy Economics*, Vol. 32, no. 2, 2010, pp. 257-268.

26. André Plourde, "Oil Sands Royalties and Taxes in Alberta: An Assessment of Key Developments since the mid-1990s", *The Energy Journal*, Vol. 30, no. 1, 2009, 111-139 (Presidential article).

25. David L. Ryan, André Plourde, "Smaller and Smaller? The Price Responsiveness of Non-Transport Oil Demand", *Quarterly Review of Economics and Finance*, Vol. 42, no. 2, 2002, pp. 285-317.

24. Terry E. Daniel, Richard Hyndman, Michael Loenen, André Plourde, "Un beau risque? La libéralisation des marchés de l'électricité en Alberta", *Gestion, Revue internationale de gestion*, Vol. 25, no. 1, 2000, pp. 60-65.

23. André Plourde, G.C. Watkins, "Crude Oil Prices between 1985 and 1994: How Volatile in Comparison to Other Commodities?", *Resource and Energy Economics*, Vol. 20, no. 3, 1998, pp. 245-262.

22. André Plourde, David L. Ryan, "Government Policy and Access to Natural Gas Service in Canada", *Canadian Public Policy - Analyse de Politiques*, Vol. 21, no. 3, 1995, pp. 304-316.

21. Chantale LaCasse, André Plourde, "On the Renewal of Concern for the Security of Oil Supply", *The Energy Journal*, Vol. 16, no. 2, 1995, pp. 1-23.

20. André Plourde, G.C. Watkins, "How Volatile Are Crude Oil Prices?", *OPEC Review*, Vol. 18, no. 4, 1994, pp. 431-444.

19. André Plourde, "Natural Gas Trade in North America: Building Up to the NAFTA", *The Energy Journal*, Vol. 14, no. 3, 1993, pp. 51-73.

18. André Plourde, “Directions for Canadian Energy Policy in the Medium Term”, *Energy Studies Review*, Vol. 3, no. 1, 1991, pp. 61-75.

17. André Plourde, “The NEP [National Energy Program] Meets the FTA [Free-Trade Agreement]”, *Canadian Public Policy - Analyse de Politiques*, Vol. 17, no. 1, 1991, pp. 14-24.

16. André Plourde, “Canada's International Obligations in Energy and the Free-Trade Agreement with the United States”, *Journal of World Trade*, Vol. 24, no. 5, 1990, pp. 35-56.

15. André Plourde, “Les enjeux de la politique énergétique canadienne des années quatre-vingt”, *L’Actualité économique*, Vol. 66, no. 4, 1990, pp. 383-402.

14. André Plourde, “Canadian Fiscal Systems for Oil and Gas: An Overview of the Last Two Decades”, *Energy Studies Review*, Vol. 1, no. 1, 1989, pp. 1-15.

13. André Plourde, “On Aspects of Oil and Gas Trade [under the Free-trade Agreement]”, *The Energy Journal*, Vol. 9, no. 4, 1988, pp. 107-110.

12. Nguyuru Lipumba, Benno Ndulu, Sue Horton, André Plourde, “A Supply Constrained Macroeconometric Model of Tanzania”, *Economic Modelling*, Vol. 5, no. 4, 1988, pp. 354-376.

11. John F. Helliwell, Mary E. MacGregor, Robert N. McRae, André Plourde, “Canadian Oil and Gas Taxation”, *Osgoode Hall Law Journal*, Vol. 26, no. 3, 1988, pp. 453-494.

10. James E. Pesando, André Plourde, “The October 1979 Change in U.S. Monetary Policy: Its Impact on the Forecastability of Canadian Interest Rates”, *Journal of Finance*, Vol. 43, no. 1, 1988, pp. 217-239.

9. John F. Helliwell, Mary E. MacGregor, Robert N. McRae, André Plourde, Alan Chung, “Supply-oriented Macroeconomics: The MACE Model of Canada”, *Economic Modelling*, Vol. 4, no. 3, 1987, pp. 318-340.

8. André Plourde, “The Impact of $(US) 15 Oil on the Canadian Economy: Evidence from the MACE Model”, *Canadian Public Policy - Analyse de Politiques*, Vol. 13, no. 1, 1987, pp. 19-25.

7. André Plourde, “On the Role and Status of Canadian Natural Gas Carriers under Deregulation”, *Journal of Energy and Development*, Vol. 13, no. 1, 1987, pp. 1-25.

6. John F. Helliwell, Mary E. MacGregor, Robert N. McRae, André Plourde, “The Western Accord and Lower World Oil Prices”, *Canadian Public Policy - Analyse de Politiques*, Vol. 12, no. 2, 1986, pp. 341-355.

5. André Plourde, David L. Ryan, "On the Use of Double-Log Forms in Energy Demand Analysis", *The Energy Journal*, Vol. 6, no. 4, 1985, pp. 105-113.

4. John F. Helliwell, Mary E. MacGregor, Robert N. McRae, André Plourde, "Energy Deregulation and Uncertain World Oil Prices - What Are the Connections?", *Canadian Public Policy - Analyse de Politiques*, Vol. 11 (Supplement), 1985, pp. 479-491.

3. John F. Helliwell, Mary E. MacGregor, André Plourde, "Changes in Canadian Energy Demand, Supply and Policies", *Natural Resources Journal*, Vol. 24, no. 2, 1984, pp. 297-324.

2. John F. Helliwell, Mary E. MacGregor, André Plourde, "Energy Policy and Industry Activity: A Reply", *Canadian Public Policy - Analyse de Politiques*, Vol. 10, no. 4, 1984, pp. 476-480.

1. John F. Helliwell, Mary E. MacGregor, André Plourde, "The National Energy Program Meets Falling World Oil Prices", *Canadian Public Policy - Analyse de Politiques*, Vol. 9, no. 3, 1983, pp. 284-296.

F - Papers in conference proceedings*:*

13. André Plourde, "Developing Alberta's Oil Sands: Who Bears the Risk?", Proceedings of the 28th USAEE/IAEE North American conference, New Orleans, 2008, available online, 18 pp.

12. David L. Ryan and André Plourde, "Modelling Sluggish Price Responses in Energy Demand Models: A Critical Evaluation of Alternative Specifications", Proceedings of the 6th IAEE European Conference, Zurich, 2004,CD-ROM, 22 pages.

11. David L. Ryan, Denise Young, André Plourde, "Changing Panes / Changing Pains: The Determinants of Commercial Retrofit Decisions in Canada", Proceedings of the 25th North American Conference of the USAEE. Cleveland: USAEE, 2004, CD-ROM, 10 pages.

10. David L. Ryan, André Plourde, "The Heat Is On: The Changing Role of Weather on Residential Energy Demand", in *New Challenges for Energy Decision Makers,* J. Myslivec, *et al.* (eds.), Proceedings of the 26th International Conference of the IAEE, Cleveland: IAEE, 2003, CD-ROM, 10 pages.

9. David L. Ryan, André Plourde, "Thanks for the Memories: Oil Price Decompositions and Energy Demand Asymmetries", in *Innovation and Maturity in Energy Markets: Experience and Prospects,* A.G. Kemp (ed.), Proceedings of the 25th International Conference of the IAEE, Aberdeen: IAEE, 2002, CD-ROM, 10 pages.

8. David L. Ryan, André Plourde, "Energy Demand Asymmetries and Greenhouse Gas Abatement", in *Energy Markets & The New Millenium: economics, environment, security of supply,* R. Bartels and D. Fiebig, eds., Proceedings of the 23rd International Conference of the IAEE, Sydney: IAEE, 2000, CD-ROM, 33 pages.

7. André Plourde, G.C. Watkins, "Changing Relationships between Crude Oil and Natural Gas Prices?", in volume 2 of *New Equilibria in the Energy Markets: The Role of New Regions and Areas*, Vittorio D'Ermo, ed., Proceedings of the 22nd International Conference of the IAEE, Cleveland: IAEE, 1999, pp. 153-162.

6. David L. Ryan, Yu Wang, André Plourde, "Asymmetric Price Responses of Residential Energy Demand", *Canadian Journal of Economics* Vol. 29 (Special Issue Part 1), 1996, pp. S317-S323.

5. André Plourde, "The Petroleum Industry under NAFTA", in *The Impact of NAFTA: Economies in Transition*, M. Hodges, ed., Proceedings of a Symposium held at the London School of Economics and Political Science, London, U.K.: Centre for Research on the USA, LSE, 1995, pp. 121-145.

4. André Plourde, David L. Ryan, Yu Wang, "Oil Price Asymmetries: Fact or Artifact? Residential Oil Demand in Ontario, 1963-1992", in *The World Oil and Gas Industries in the 21st Century*, Anthony J. Finizza, ed. Proceedings of the 16th North American Conference of the USAEE, Cleveland: USAEE, 1994, pp. 413-422.

3. Chantale LaCasse, André Plourde, "Towards an Operational Definition of Security of Oil Supply", in volume 1 of *Coping with the Energy Future: Markets and Regulations*, Denis Babusiaux, ed. Proceedings of the 15th IAEE, Tours (France), 1992, pp. F39-F46.

2. André Plourde, "Energy Demand: How Much of a Legacy from the Oil Shocks?", in volume 4 of *Proceedings of the 13th World Petroleum Congress*, Chichester, U.K.: John Wiley and Sons, 1992, pp. 13-20.

1. André Plourde, David L. Ryan, "Expenditures on Fuels and Fuel-Specific Heating Equipment: The Residential Sector in Manitoba", in *Energy Disruptions: Lessons, Opportunities, Prospects*, Richard H. Hilt, ed. Proceedings of the 13th North American Conference of the USAEE, Washington: USAEE, 1991, pp. 184-195.

G - Other refereed publications:

2. Pierre Gosselin, Steve E. Hrudey, M. Anne Naeth, André Plourde, René Therrien, Glen Van Der Kraak, Zhenghe Xu, *Report – The Royal Society of Canada Expert Panel: Environmental and Health Impacts of Canada's Oil Sands Industry*. Ottawa: The Royal Society of Canada, 2010, pp. xxiv + 414.

1. André Plourde, "Energy and the NAFTA", *C.D. Howe Institute Commentary*, No. 46. Toronto: C.D. Howe Institute, May 1993, 16 pp.

H - Selected non-refereed publications:

11. André Plourde, "Shale gas, shale oil: Peaking upward", *Diplomat and International Canada,* Vol. 11, no. 4, 2011, pp.42-44.

10. André Plourde, "On Canada's Importance as an Energy Supplier to the United States", 5 pages, Center for Hemispheric Policy, University of Miami (available at: https://www6.miami.edu/hemispheric-policy/Energy_in_the_Americas_Forum_Papers/Plourde_Canada_US_Energy_4-22-10.pdf);

9. André Plourde, Ed Whittingham, "A Complicated Tale – Developing Energy is not a Simple Matter in Canada", 7 pages, text prepared in support of the Energy Framework Initiative (available at: http://www.energyframework.ca/papers/pillar-4-social-license/);

8. André Plourde, "Canada-US Energy Relations: Issues for New Administrations", pp. 132-141 in *Background Papers: From Correct to Inspired – A Blueprint for Canada-US Engagement*, Canada-US Project, Norman Paterson School of International Affairs and the Centre for Trade Policy and Law, Carleton University, January 2009, Ottawa;

7. André Plourde, "An Economic Stimulus Package for Canada: A Few Thoughts", in *Taking Action on the Economy: Advice from Western Canada*, R. Gibbins, J. Marcil, R. Reach, eds. Canada West Foundation: Calgary, December 2008, pp. 41-42.

6. André Plourde, "President's Message", in all four issues of the *IAEE Newsletter* in 2007.

5. André Plourde, "G. Campbell Watkins, 1939-2005 – An Appreciation", *The Energy Journal*, Vol. 27, no. 1, 2006, pp. iii-vi.

4. André Plourde, "Natural Resource Revenues and Equalization: A Partial Overview of Selected Issues", prepared for the Expert Panel on Equalization and Territorial Formula Financing, Department of Finance, Government of Canada, 2005, 40 pp.

3. Donna White, David L. Ryan, André Plourde, "The *Canadian Building Energy End-use Data and Analysis Centre* at the University of Alberta", *Energy Studies Review*, Vol. 11, no. 2, 2003, pp. 230-232.

2. André Plourde, "Kyoto – An Unlevel Playing Field?", *Policy Options*, December 2002 – January 2003, p. 57.

1. André Plourde, "The Canada-U.S. Energy Relationship: Issues and Challenges – A Canadian Perspective", *IAEE Newsletter* Vol. 12, First Quarter 2003, pp.12-14, 17.

SELECTED PRESENTATIONS *(since 2005)*

- Invited Speaker, "Energy and the Environment: The Missing Element in Canadian Energy Policy?", Economics Society of Northern Alberta, Edmonton, January 2005;
- Invited Speaker, "Energy and Sustainability", Saskatchewan Council of Senior Federal Officials – Policy Forum, Regina, January 2005;
- Invited Speaker, "Natural Gas in North America", 2005 Annual Washington Policy Conference, National Association for Business Economics, Washington DC, March 2005;
- Invited Speaker, "Energy and the Economy", Political Science Forum, Red Deer College, Red Deer AB, March 2005;
- Invited Speaker, "Facilities Siting & NIMBY – Insights from the Academic Literature", 2005 CAMPUT (Canadian Association of Members of Public Utilities Tribunals) conference, Quebec City, May 2005;
- Invited Keynote Speaker, "Canadian Energy Policy in the Sustainable Development Era", 45th annual conference of the *Société canadienne de science économique*, La Malbaie QC, May 2005;
- Invited Speaker, "Economists Are *SO* Cheap…A Primer on Emissions Trading", 17th annual Lawyers in Government Conference, Edmonton, September 2005;
- Organizer, speaker, concurrent session entitled: "The Path to Getting Published", 25th North American conference, USAEE/IAEE, Denver, September 2005;
- Invited Speaker, "LNG in the North American Energy Mix – A (Slightly?) Discordant View", Energizing Supply: Oil and Gas Investment in Uncertain Times, conference sponsored by Foreign Affairs / International Trade Canada, Ottawa, October 2005;
- Invited Speaker, "High Prices and Canadian Energy Policy", Distinguished Speakers series, Industry Canada, Ottawa, April 2006;
- Invited Speaker, "Global and Continental Energy Situation and Outlook", Economic and Finance Councillors' Conference, Foreign Affairs Canada, Ottawa, April 2006;
- Invited Speaker, "Canada's Oil Sands: Potential and Challenges", Detroit Association for Business Economics, Detroit MI, May 2006;
- Invited Speaker, "Reflections on Oil and Gas in Alberta", ATB Financial, Headquarters Economic Discussion Group, Edmonton, June 2006;
- Invited Speaker, "Does Alberta Need a New Royalty Regime?", Institute for Public Economics – *Edmonton Journal* Forum, University of Alberta, September 2006;
- Invited Speaker, "Alberta in Canada: Focus on GHG Emissions", Institute for Public Economics – *Edmonton Journal* Forum, University of Alberta, October 2006;
- Invited Speaker, "Directions for Alberta Energy Policy in the Short(?) Term", Alberta Department of Energy, Edmonton, November 2006;

- Invited speaker, "The Report of the Alberta Royalty Review Panel", Augustana Campus symposium – *Alberta: Living the Boom and Bust*, University of Alberta, October 2007;
- Invited speaker, "Energy and the Environment: An Economics Perspective", Trudeau Foundation conference on public policy 2007– *A Climate of Reconciliation Economy, Social Justice and the Environment*, November 2007;
- Guest lecturer (2.5 hours), INT D 561 – Focus on the Oil Sands, "Oil Sands Royalties: A Partial Overview", School of Business, University of Alberta, November 2007;
- Speaker, "*Our Fair Share, The New Royalty Framework* and All That", CBEEDAC/CABREE Applied Energy Workshop series, Department of Economics, University of Alberta, November 2007;
- Invited speaker, "The Alberta Royalty Review Report, Industry Reaction and the Government Compromise: An Insider's View," Public lecture sponsored by the Department of Anthropology, Political Science and Economics, Grant MacEwan College, February 2008;
- Invited speaker, "Alberta's Royalty Review and the Environment", *Hot Topics* series, Alberta Department of Environment, February 2008;
- Invited speaker, "Energy & Energy Policy Challenges in North America", conference sponsored by Institute of Public Administration of Canada (conference title: "Canada's Energy Security: Superpower…or a Player?"), Edmonton, February 2008;
- Invited speaker, "Royalties, Taxes, and Alberta's Oil Sands: From 1997…to 1997", Ottawa Economic Association / Canadian Association for Business Economics Spring Policy Conference, Ottawa, March 2008;
- Keynote speaker, "Royalties, Taxes, and Alberta's Oil Sands: *Plus ça change*...", Statistics Canada Socio-Economic Conference 2008, Ottawa, May 2008;
- Keynote speaker, "Global and North American Challenges to the Canadian Oil and Gas Industry (with a focus on Atlantic Canada)", The Rothesay Energy Dialogue IV, Rothesay (New Brunswick), July 2008;
- Speaker, "Developing Alberta's Oil Sands: Who Bears the Risks?"
    - CBEEDAC/CABREE Applied Energy Workshop Series, Department of Economics, University of Alberta, October 2008;
    - 28th USAEE/IAEE North American conference, New Orleans, December 2008;
    - Department of Finance, Government of Canada, Ottawa, December 2008;
    - 2nd International Workshop on Empirical Methods in Energy Economics, Jasper AB, August 2009;
    - Division of Economics and Business, Colorado School of Mines, Golden CO, November 2009;
- Keynote speaker, "Energy Trends: Global, Canadian, and Atlantic (2009 and beyond)", The Rothesay Energy Dialogue V, Rothesay (New Brunswick), July 2009;
- Invited speaker, "A Complicated Tale – Energy Development is not a Simple Matter in Canada", Energy Framework Initiative Policy Forum, Ottawa, September 2009;
- Invited speaker, Conférence Louis Desrochers, "La Situation économique en 2008-09 : crise ou récession comme les autres ?", Campus Saint-Jean, University of Alberta, October 2009;

- Speaker, "Oil and Gas in the Canadian Federation", session entitled: Raising and Sharing Revenues", "Oil and Gas in Federal Systems" Conference (sponsored by the Forum of Federations, the World Bank, and the Norwegian Agency for Development Cooperation), Washington, March 2010;
- Invited panelist, "Post-Copenhagen: The Path Forward", Sustainable Energy Research Centre, Carleton University, Ottawa, March 2010;
- Invited speaker, "On Canada's Importance as an Energy Supplier to the United States", "Energy in the Americas" conference sponsored by the Center for Hemispheric Policy, University of Miami, March 2010;
- Invited speaker, "Reversing the Royalty Framework: Some Long-term Implications for Alberta", event sponsored by the Economics Society of Calgary, April 2010;
- Keynote address, "Some Implications of the Pipeline Business Model," International Pipeline Conference 2010, Calgary, September 2010;
- Invited speaker, "Energy Economics and Policy: Overview," at the Canada-Germany Forum on "Shaping Future Energy Supplies, Technologies and Policies", University of Alberta, October 2010;
- Invited speaker, "The Evolution of Royalty Systems in Alberta's Oil Sands: An Overview", Expert Workshop on Estimating Support to Fossil Fuels, OECD, Paris, November 2010;
- Keynote address, "Continental Energy Trade and Climate Change", Pacific Northwest Regional Economic Conference, Victoria, May 2011;
- Invited speaker, "World Markets for Oil and Gas? Some Emerging Issues and Trends", The Rothesay Energy Dialogue VI, Rothesay (New Brunswick), October 2011;
- Invited speaker, "Environmental Monitoring and Regulation in Canada's Oil Sands: Reflections One Year after the RSC Panel Report", annual conference of the Royal Society of Canada, Ottawa, November 2011.

RENÉ THERRIEN, ing. Ph.D.

A. PERSONNAL

Current Occupation

Professor and Chair, Department of Geology and Geological Engineering, Université Laval, Québec, Canada.

Studies

Feb 1992-April 1993	NSERC Postdoctoral Fellow, Department of Civil Engineering, Kassel University, Kassel, Germany. Under the supervision of Dr. Wolfgang Kinzelbach. Research Topic: *Simulating the transport of biodegradable organic contaminants in the subsurface.*
Sep. 1988-Jan. 1992	Ph.D. Earth Sciences, 1992, University of Waterloo, Ontario, Canada. Thesis: *Three-Dimensional Analysis of Variably Saturated Flow and Solute Transport in Discretely-Fractured Porous Media.*
Sep 1986-Aug. 1988	M.Sc. Hydrogeology, 1989, Université Laval, Québec, Canada. Thesis: *Modélisation tridimensionnelle de l'écoulement de l'eau et du transport de masse pour l'aquifère de Trois-Rivières-Ouest.*
Aug. 1982-May 1986	B.A.Sc. Geological Engineering, 1986, Université Laval, Québec, Canada.

Positions

Sept. 2008-present	Chair, Department of Geology and Geological Engineering, Université Laval, Québec, Canada
July 2008-Aug. 2008	Visiting Professor, Flinders University, Adelaide, Australia.
Sept. 2007-Jun. 2008	Visiting Professor, Université de Liège, Belgium
Jan. 2005-Dec 2013	Adjunct Professor, Department of Earth and Environmental Sciences, University of Waterloo, Ontario, Canada
Jun. 2003-present	Full Professor, Department of Geology and Geological Engineering, Université Laval, Québec, Canada.
Sep. 1999-Jun. 2000	Visiting Professor, School of Earth Sciences, Flinders University of South Australia, Adelaide, Australia.
Jun. 1999-Jun. 2003	Associate Professor, Department of Geology and Geological Engineering, Université Laval, Québec, Canada.
Sept. 1998-Sept. 2004	Graduate officer, M.Sc. and Ph.D. programs in Earth Sciences, Université Laval, Québec, Canada.
Nov.1994-Jun. 1999	Assistant Professor, Department of Geology and Geological Engineering, Université Laval, Québec, Canada.
May 1993-Nov. 1994	Assistant Professor, Department of Earth and Planetary Sciences,

Honours and Scholarships received

- Cross Canada Lecture Tour 2004 – Canadian Geotechnical Society
- Award for excellence in teaching, Faculty of Science and Engineering, Laval, 2003, 2004, 2006, 2007, 2010.
- Governor General's Gold Medal for the highest academic achievement in all graduate programs at the University of Waterloo, 1992.
- NSERC Postdoctoral Fellow, 1992-1993.
- FCAR Graduate Scholarship, 1990-1991, NSERC Graduate Scholarship, 1986-1991.
- Joint NSERC-FCAR award, 1990.
- University of Waterloo Graduate Award, 1986.

B. RESEARCH

Publications

In refereed journals

Calderhead, A., R. Martel, J. Garfias, A. Rivera R. Therrien, 2012. Sustainable management for minimizing land subsidence of an over-pumped volcanic aquifer system: tools for policy design, accepted in Water Resources Management. http://dx.doi.org/10.1007/s11269-012-9990-7

Bonton A, C Bouchard, A Rouleau, MJ Rodriguez, R Therrien, 2012. Calibration and validation of an integrated nitrate transport model within a well capture zone, Journal of Contaminant Hydrology, Volume 128, Issues 1–4, 1–18. http://dx.doi.org/10.1016/j.jconhyd.2011.10.007

Blessent, D., R. Therrien, J.-M. Lemieux, 2011. Inverse modeling of hydraulic tests in fractured crystalline rock based on a transition probability geostatistical approach, Water Resour. Res., 47, W12530, http://dx.doi.org/10.1029/2011WR011037

Calderhead, A., R. Martel, A. Rivera, J. Garfias, R. Therrien, Pumping dry: An increasing groundwater budget deficit induced by urbanization, industrialization, and climate change in an over-exploited volcanic aquifer, Environmental Earth Sciences, http://dx.doi.org/10.1007/s12665-011-1398-9.

Blessent, D., R. Therrien, C.W. Gable, 2011. Large-scale numerical simulation of groundwater flow and solute transport in discretely-fractured crystalline bedrock, Advances in Water Resources, vol 34, Issue 12, 1539-1552, http://dx.doi.org/10.1016/j.advwatres.2011.09.008

Raymond, J., R. Therrien, L. Gosselin, R. Lefebvre, 2011. Numerical simulation of geothermal energy transfer beneath exothermic waste rock piles, HVAC&R Research, vol 17, no 6, Special Issue, http://dx.doi.org/10.1080/10789669.2011.589747

Partington D., P. Brunner. C.T. Simmons, R. Therrien, A.D. Werner, G.C. Dandy, H.R. Maier, 2011. A hydraulic mixing-cell method to quantify groundwater discharge within spatially distributed fully integrated surface water - groundwater flow models, Environmental Modelling & Software, vol 26, Issue 7, 886-898 http://dx.doi.org/10.1016/j.envsoft.2011.02.007

Raymond, J., R. Therrien, L. Gosselin, R. Lefebvre, 2011. A review of thermal response test analysis using pumping test concepts, Review Paper, Ground Water, vol 49, Issue 6, 932-945. http://dx.doi.org/10.1111/j.1745-6584.2010.00791.x.

Raymond, J., R. Therrien, L. Gosselin, 2011. Borehole temperature evolution during thermal response tests, Geothermics, vol 4, Issue 1, 69-78, http://dx.doi.org/10.1016/j.geothermics.2010.12.002.

Calderhead, A., R. Therrien, A. Rivera, R. Martel, J. Garfias, 2010. Simulating pumping-induced regional land subsidence with the use of InSAR and field data in the Toluca Valley, Mexico, accepted in Advances in Water Resources, vol 34, Issue 1, 83-97, http://dx.doi.org/10.1016/j.advwatres.2010.09.017

Raymond J, R Therrien, L Gosselin, R Lefebvre. 2011. Numerical analysis of thermal response test using groundwater flow and heat transport modeling, Renewable Energy, Vol 36, Issue 1, 315-324, http://dx.doi.org/10.1016/j.renene.2010.06.044

Burns, E.R., L.R. Bentley, R. Therrien, C.V. Deutsch, 2010. Upscaling Facies Models to Preserve Connectivity of Designated Facies, Hydrogeology Journal, Vol 18, No 6, 1357-1373, http://dx.doi.org/10.1007/s10040-010-0607-z

Brunner, P., C.T. Simmons, P.G. Cook, R. Therrien, 2010. Modeling Surface Water Groundwater Interaction Using MODFLOW: Some Important Considerations, Ground Water, vol 48, no 2, 174-180, http://dx.doi.org/10.1111/j.1745-6584.2009.00644.x

Cloutier V., R. Lefebvre, M.M. Savard, R. Therrien, 2010. Desalination of a sedimentary rock aquifer system invaded by Pleistocene Champlain Sea water and processes controlling groundwater geochemistry, Envir. Earth Sciences, vol 59, no 5, 977-994, http://dx.doi.org/10.1007/s12665-009-0091-8.

Goderniaux, P., S. Brouyère, H.J. Fowler, S. Blenkinsop, R. Therrien, P. Orban, A. Dassargues, 2009. Large scale surface-subsurface hydrological model to assess climate change impacts on groundwater reserves, Journal of Hydrology, vol 373, no 1-2, 122-138, http://dx.doi.org/10.1016/j.jhydrol.2009.04.017.

Lemieux, J.-M., D. Kirkwood, R. Therrien. 2009. Fracture network analysis of the St-Eustache Quarry, Québec, Canada, for groundwater resources management. Can. Geotech. J., 46(7): 828–841, http://dx.doi.org/10.1139/t09-022

Blessent, D, R. Therrien, K. MacQuarrie, 2009. Coupling geological and numerical models to simulate groundwater flow and mass transport in fractured media, Computers & Geosciences, vol 35, no 9, 1897-1906, http://dx.doi.org/10.1016/j.cageo.2008.12.008

Graf, T., R. Therrien, 2009. Stable-unstable flow of geothermal fluids in fractured rock, Geofluids, vol 9, no 2, 138-152, http://dx.doi.org/10.1111/j.1468-8123.2008.00233.x.

Bernardez, L., R. Therrien, R. Lefebvre, R. Martel, 2009. Simulating the injection of micellar solutions to recover diesel in a sand column, Journal of Contaminant Hydrology, vol 103, no 3-4, 99-108, http://dx.doi.org/10.1016/j.jconhyd.2008.09.009

Rosenbom, A., R. Therrien, J.C. Refsgaard, K.H. Jensen, V. Ernstsena, K.E.S. Klinta, 2009. Numerical Analysis of Water and Solute Transport in Variably-Saturated Fractured Clayey Till, Journal of Contaminant Hydrology, vol 104, no 1-4, 137-152, http://dx.doi.org/10.1016/j.jconhyd.2008.09.001.

Graf, T., R. Therrien, 2008. A test case for the simulation of three-dimensional variable-density flow and solute transport in discretely-fractured porous media, Advances in Water Resources, vol 31, no 10, 1352-1363. http://dx.doi.org/10.1016/j.advwatres.2008.07.003.

Cloutier V., R. Lefebvre, R. Therrien, M.M. Savard, 2008. Multivariate statistical analysis of geochemical data as indicative of the hydrogeochemical evolution of groundwater in a sedimentary rock aquifer system, Journal of Hydrology, vol 353, no 3-4, 294-313, http://dx.doi.org/10.1016/j.jhydrol.2008.02.015.

Weatherill, D., T. Graf, C. T. Simmons, P.G. Cook, R. Therrien, D. Reynolds, 2008. Discretising the fracture-matrix interface to simulate solute transport, Ground Water, vol 46, no 4, 606-615, http://dx.doi.org/10.1111/j.1745-6584.2007.00430.x.

Raymond, J, R. Therrien, 2008. Low-temperature geothermal potential of the flooded Gaspé Mines, Québec, Canada, Geothermics, vol 37, no 2, 189-210, http://dx.doi.org/10.1016/j.geothermics.2007.10.001.

Graf, T., R. Therrien, 2008. A method to discretize non-planar fractures for 3D subsurface flow and transport simulations, International Journal for Numerical Methods in Fluids, vol 56, no 11, 2069-2090, http://dx.doi.org/10.1002/fld.1607.

Savard, C., G. Beaudoin, R. Therrien, 2007. Numerical modeling of 3D fluid flow and oxygen isotope exchange in fractured media: spatial distribution of isotope patterns, Geofluids, vol 7, no 4, 387-400, http://dx.doi.org/10.1111/j.1468-8123.2007.00193.x.

Paradis, D., R. Martel, G. Karanta, R. Lefebvre, Y. Michaud, R. Therrien, M. Nastev, 2007. Comparative study of methods for WHPA delineation, Ground Water vol. 45, No. 2: 158-167, http://dx.doi.org/10.1111/j.1745-6584.2006.00271.x.

Graf, T., R. Therrien, 2007. Coupled thermohaline groundwater flow and single-species reactive solute transport in fractured porous media, Advances in Water Resources, vol 30, no 4, 742-771, http:dx.doi.org/10.1016/j.advwatres.2006.07.001

Graf, T., R. Therrien, 2007. Variable-density groundwater flow and solute transport in irregular 2D fracture networks, Advances in Water Resources, vol 30, no 3, 455-468, http://dx.doi.org/10.1016/j.advwatres.2006.05.003.

Cey, E., D. Rudolph, R. Therrien, 2006. Simulation of groundwater recharge dynamics in partially saturated fractured soils incorporating spatially variable fracture apertures, Water Resources Research, vol. 42, W09413, http://dx.doi.org/10.1029/2005WR004589.

Beaudoin, G., R. Therrien, C. Savard, 2006. 3D numerical modelling of fluid flow in the Val-d'Or orogenic gold district: major crustal shear zones drain fluids from overpressured vein fields, Mineralium Deposita, vol 41, no 1, 82–98, http://dx.doi.org/10.1007/s00126-005-0043-5.

Cloutier, V., R. Lefebvre, M.M. Savard, E. Bourque, R. Therrien, 2006. Hydrogeochemistry and groundwater origin of the Basses-Laurentides sedimentary rock aquifer system, St. Lawrence Lowlands, Québec, Canada, Hydrogeo. Jour., vol 14, no 4, 573-590, http://dx.doi.org/10.1007/s10040-005-0002-3

Lemieux, J.-M., R. Therrien, D. Kirkwood, 2006. Small scale study of groundwater flow in a fractured carbonate-rock aquifer at the St-Eustache quarry, Québec, Canada, Hydrogeology Journal, vol 14, no 4, 603-612, http://dx.doi.org/10.1007/s10040-005-0457-2.

Descamps, G., P. Therrien, R. Therrien, 2006. An interactive and open approach for the analysis and diffusion of geoscientific data, Computer & Geoscience, vol 32, no 5, 643-655, http://dx.doi.org/10.1016/j.cageo.2005.09.008.

Graf, T., R. Therrien, 2005. Variable-density groundwater flow and solute transport in porous media containing nonuniform discrete fractures, Advances in Water Resources, vol 28, no

12, 1351-1367, http://dx.doi.org/10.1016/j.advwatres.2005.04.011.
Martel, R., S. Foy, L. Saumure, A. Roy, R. Lefebvre, R. Therrien, U. Gabriel, P. Gélinas, 2005. Polychlorinated biphenyl (PCB) recovery under a building with an in situ technology using micellar solutions, Canadian Geotechnical Journal, vol 42, no 3, 932-948, http://dx.doi.org/doi:10.1139/t05-027.
Nastev, M., R. Lefebvre, R. Therrien, P. Gelinas, 2003. Numerical Modeling of Lateral Landfill Gas Migration. Journal of Solid Waste Technology and Management, Vol.29, No.4, pp. 265-276.
Dueri, S., R. Therrien, J. Locat, 2003. Numerical simulation of the migration of dissolved heavy metals through a subaqueous capping layer, Journal of Environmental Engineering and Science, 2: 213–226.
Dueri, S., R. Therrien, 2003. Factors Controlling Contaminant Transport through the Flood Sediments of the Saguenay Fjord: Numerical Sensitivity Analysis, Contaminated Sediments: Characterization, Evaluation, Mitigation/Restoration, and Management Strategy Performance, ASTM STP 1442, J. Locat, R. Galvez-Cloutier, R.C. Chaney and K. Demars, Eds., ASTM International, West Conshohocken, PA, pp. 167-182.
Badertscher, N, G. Beaudoin, R. Therrien, M. Burkhard, 2002. Glarus overthrust: a major pathway for the escape of fluids out of the Alpine orogen, Geology, 30(10), 875-878.
Nastev, M., R. Therrien, R. Lefebvre, P. Gélinas, 2001. Landfill gas production and migration in landfills and geological materials, Journal of Contaminant Hydrology, 52 (1-4), p. 187-211.
Therrien, R., E.A. Sudicky, 2001. Well bore boundary conditions for variably-saturated flow modeling, Advances in Water Resources, 24, 195-201, doi:10.1016/S0309-1708(00)00028-2 .
Beaudoin, G., R. Therrien, 1999. Sources and drains: majors controls of hydrothermal fluid flow in the Kokanee range, BC, Canada, Geology, 27(10), 883 - 886.
Lepage, N., P. Hamel, R. Lefebvre, R. Therrien, C. Blais, 1999. Decision analysis for leachate control at a fractured rock landfill, Ground Water Monitoring and Remediation, vol 19, no 3, 157-170.
Therrien, R., E.A. Sudicky, 1996. Three-dimensional analysis of variably-saturated flow and solute transport in discretely-fractured porous media, Journal of Contaminant Hydrology, 23, 1-44.
Schäfer, W., R. Therrien, 1995. Simulating transport and removal of xylene during remediation of a sandy aquifer, Journal of Contaminant Hydrology, 19, 205-236.
Panday, S., P.S. Huyakorn, R. Therrien, R.L. Nichols, 1993. Improved three-dimensional finite element techniques for field simulation of variably-saturated flow and transport. Journal of Contaminant Hydrology, 12, 3-33.

Books

Rausch, R., W. Schäfer, R. Therrien, C. Wagner, 2005. Solute transport modelling – An introduction to models and their solutions, Borntraeger Editors, 180 pp.

Lightly refereed journals

Raymond, J., R. Therrien, L. Gosselin, 2010. Low-temperature geothermal energy in mining environments. Canadian Institute of Mining Journal, 1(2): 140-149.

Raymond, J., M. Frenette, A. Léger, E. Magni, R. Therrien, 2010. Modélisation numérique d'échangeurs de chaleur au sol équipés de tuyaux Geoperformx. La maîtrise de l'énergie, vol. 25, no. 2: 8-10.

Therrien, R., G. Beaudoin, 2009. Le stockage du CO2 dans les formations géologiques : quels sont les risques? La maîtrise de l'énergie, vol. 24, no. 3, Septembre 2009.

Raymond, J., R. Therrien, A. Lemieux, 2009. La géothermie, un outil de développement économique pour Murdochville, La maîtrise de l'énergie, vol. 24, no. 3, Septembre 2009.

Raymond, J., R. Therrien, A. Lemieux, 2009. Québec : La géothermie, un outil de développement économique pour Murdochville, La géothermie en France, No 5, Mai 2009, pp 10-11.

Raymond, J., R. Therrien, L. Gosselin, 2008. La recherche en géothermie: un tour d'horizon, La maîtrise de l'énergie, vol. 23, no. 1, Mars 2008.

Full papers presented at conferences

Fortier, R., A.-M. Leblanc, G. Falorni, R. Therrien, PSInSAR Monitoring of Ground Movement at Salluit, Quebec (Canada), Due to Freeze-Thaw Cycles, Active Layer Thickening and Permafrost Warming, Tenth International Conference on Permafrost, June 2012, Salekhard, Russia.

Robert, T., R. Therrien, J.-M. Lemieux, F. Nguyen, Improving groundwater flow model conceptualisation and calibration with electrical resistivity tomography and self-potential methods, ModelCARE 2011, Leipzig.

Blessent, D., R. Therrien, 2011. Coupling a geomodel and a hydrogeological model for groundwater flow simulation in discretely-fractured rock: the Olkiluoto case study, GeoHydro 2011, Joint IAH-CANQUA conference, Québec.

Lemieux, J.-M., S. Brouyère, J. Beaujean, R. Therrien, T. Graf, A. Dassargues, 2011. Physically-based groundwater vulnerability assessment using sensitivity analysis methods, GeoHydro 2011, Joint IAH-CANQUA conference, Québec.

Palmer, S., S. Campeau, V. Cloutier, R. Daigneault, M. Larocque, R. Lefebvre, J.-M. Lemieux, J. Molson, C. Rivard, A. Rouleau, R. Therrien, 2011. Collaborative approaches to groundwater knowledge acquisition in Québec: Inter-regional characterization. GeoHydro 2011, Joint IAH-CANQUA conference, Québec.

Raymond, J., M. Frenette, A. Léger, E. Magni, R. Therrien, 2011. Numerical Modeling of Thermally Enhanced Pipe Performances in Vertical Ground Heat Exchangers. ASHRAE Transactions.

Raymond, J., G. Robert, R. Therrien, L. Gosselin, 2010. A novel thermal response test using heating cables. Proceedings of the World Geothermal Congress, Bali, pp. 1-8.

Calderhead, A, R. Martel, A. Rivera, R. Therrien, J. Garfias, 2009. Pumping-induced regional land subsidence: calibrating a flow and compaction model with remote sensors and field data, 62st Canadian Geotechnical Conference & 10th Joint CGS/IAH-CNC Groundwater Conference, Halifax, pp. 1585-1592.

Raymond, J., R. Therrien, L. Gosselin, R. Lefebvre, 2009. Thermal response test with variable heat injection rate, 62st Canadian Geotechnical Conference & 10th Joint CGS/IAH-CNC Groundwater Conference, Halifax.

Blessent, D., R. Therrien, 2009. Tetrahedral meshes to model discretely-fractured media: application to the Olkiluoto site (Finland), 62st Canadian Geotechnical Conference & 10th Joint CGS/IAH-CNC Groundwater Conference, Halifax.

Goderniaux, P., S. Brouyère, H.J. Fowler, S. Blenkinsop, R. Therrien, P. Orban, A. Dassargues, 2009. How can large scale integrated surface - subsurface hydrological model be used to evaluate long term climate change impact on groundwater reserves, Proceeding of the 7th international conference on calibration and reliability in groundwater modeling (ModelCARE), China university of geosciences press, pp 137-140.

ben Abdelghani, F., R. Simon, M. Aubertin, R. Therrien, J. Molson, 2008. Modelling water flow and transport of contaminants from mine wastes stored in open pits within fractured rock, 61th Annual CGS Conference, Edmonton.

Raymond, J., R. Therrien, F. Hassani, 2008. Overview of geothermal energy resources in Canadian mining environments, 10th International Mine Water Association Congress, Karlovy Very, June 2008.

Blessent, D., R. Therrien, 2008. A new approach for hydrogeological modeling in discretely-fractured media: from 3D geological representation to numerical simulations, Abstract, Computational Method in Water Resources XVII International Conference, San Francisco, July 2008.

Blessent, D., L. Hashemi Beni, R. Therrien, 2008. 3D Modelling for hydrogeological simulations in fractured geological media, Paper, The 19th IASTED International Conference on Modelling and Simulation, Québec City, May 2008.

Hashemi Beni, L, D. Blessent, M.A. Mostafavi, R. Therrien, 2008. A 3D Free-Lagrangian method to simulate three-dimensional groundwater flow and mass transport, Paper, The 19th IASTED International Conference on Modelling and Simulation, Québec City, May 2008.

Raymond, J., R. Therrien, L. Gosselin, 2007. Geothermal Technology and Resources for Active Mines, CIM Conference and Exhibition, Montréal, QC.

Bonton, A., A. Rouleau, C. Bouchard, M. Rodriguez, R. Therrien, 2007. Modelling nitrate transport for groundwater source protection in an agricultural area, XXXV Congress IAH, Lisbon.

ben Abdelghani, F., R. Simon, M. Aubertin, R. Therrien, J. Molson, 2007. Numerical analysis of water flow and contaminant transport through mining wastes disposed in fractured rock, 60th Annual CGS Conference, Ottawa, 2007.

Raymond, J., R. Therrien, 2006. Investigating the low-temperature geothermal energy potential of the Gaspé Mines, Murdochville, Canada, Geothermal Resources Council, 2006 Annual Meeting, San Diego

Blais, V., R. Lefebvre, T. Ouellon, M. Parent, R. Therrien, B. Michaud, Groundwater flow and TCE transport in relationship with the Jacques-Cartier River in Shannon, Québec, Canada, 7th Joint CGS/IAH Groundwater Specialty Conference, Vancouver, 2006.

Graf, T., R. Therrien, Modelling thermohaline variable-density flow and solute transport in fractured porous media, in press, ModelCARE 2005: From Uncertainty to Decision Making, IAHS Redbook.

Sudicky, E.A., T.A. Di Iorio, J.P. Jones, R.G. McLaren, R. Therrien, 2004. Holistic Simulation of Flow and Contaminant Transport in Integrated Surface-subsurface Flow Systems at the Catchment Scale, 5th Joint CGS/IAH Groundwater Specialty Conference, October 24-27, 2004, Québec, Canada, 8 p.

Cloutier, V., R. Lefebvre, M.M. Savard, R. Therrien, Groundwater origin and geochemical processes in the Basses-Laurentides sedimentary rock aquifer system, St. Lawrence Lowlands, Québec, Canada, 5th Joint CGS/IAH Groundwater Specialty Conference,

October 24-27, 2004, Québec, Canada, 8 p.
Graf, T., R. Therrien, 2004. Modeling variable-density groundwater flow and solute transport in complex fracture networks, 5th Joint CGS/IAH Groundwater Specialty Conference, October 24-27, 2004, Québec, Canada, 8 p.
Ledoux, C., R. Therrien, K. Novakowski, D. Kirkwood, 2004. Investigation of the impact of fracture intersection on solute transport in fractured carbonate, 5th Joint CGS/IAH Groundwater Specialty Conference, October 24-27, 2004, Québec, Canada, 8 p.
Kenny, G., R. Therrien, A., Fortin, C. Tibirna, 2004. Large-scale mass transport modelling in discretely-fractured porous media, 5th Joint CGS/IAH Groundwater Specialty Conference, October 24-27, 2004, Québec, Canada, 8 p.
Pontlevoy, O., R. Lefebvre, R. Therrien, R. Martel, M. Ouellet, C. Lamontagne, 2004. Numerical modeling of groundwater flow and mass transport in interconnected granular and rock aquifers at the Ville Mercier DNAPL-contaminated site, Québec, Canada, 5th Joint CGS/IAH Groundwater Specialty Conference, October 24-27, 2004, Québec, Canada, 8 p.
Boutin, A., R. Lefebvre, V. Blais, R. Martel, R. Therrien, M. Parent, 2004. Modelimg groundwater flow and TCE transport in the Valcartier area aquifer system, Québec, Canada, 5th Joint CGS/IAH Groundwater Specialty Conference, October 24-27, 2004, Québec, Canada, 8 p.
Lefebvre, R., A. Boutin, V. Blais, M. Parent, T. Ouellon, R. Martel, R. Therrien, N. Roy, M. Lapointe, 2004. Hydrogeological context and dissolved TCE plume characterization in the Valcartier area, Québec, Canada, 5th Joint CGS/IAH Groundwater Specialty Conference, October 24-27, 2004, Québec, Canada, 8 p.
Murat, V., R. Martel, M.M. Savard, M. Nastev, D. Paradis, Y. Michaud, R. Lefebvre, R. Therrien, 2004. Comparing Vulnerability mapping methods in two Canadian hydrogeological settings, 5th Joint CGS/IAH Groundwater Specialty Conference, October 24-27, 2004, Québec, Canada, 8 p.
Beaudoin, G., R. Therrien, 2004. Fluid flow in overpressured vein fields : what is the role of major crustal shear zones?, invited extended abstract (4 p.), Society of Economic Geologists 2004 Conference, Perth, Australia, Sept. 27 – Oct 01, 2004.
Sudicky, E.A., T.A. Di Iorio, J.P. Jones, J.-M. Lemieux, Y.-J. Park, R.G. McLaren, R. Therrien, S. Panday, 2004. Flow and Contaminant Transport in Integrated Surface-subsurface Flow Systems at the Catchment Scale: Numerical Solution Strategy and Application, Finite-Element Models, MODFLOW,, More 2004, Carlsbad, Czech Republic, 13-16 September 2004.
Ledoux, C, R. Therrien, K. Novakowski, D. Kirkwood, 2004. Investigation of the Impact of Fracture Intersection on Solute Transport in Fractured Carbonate, 2004 U.S. EPA/NGWA Fractured Rock Conference, Portland, Maine, p 836-847.
Kenny, G., R. Therrien, A. Fortin, 2004. Large-scale Solute Transport Modeling in Discretely-Fractured Porous Media, 2004 U.S. EPA/NGWA Fractured Rock Conference, Portland, Maine, p. 848-860.
Cey, E., D. Rudolph, R. Therrien, 2004. Dynamics of groundwater recharge through structured soils and the influence on water quality, Groundwater Quality 2004, 4th International Conference, July 19th - 22nd, 2004, University of Waterloo, Ontario, Canada.
Graf, T., R. Therrien, 2004. Modeling variable-density groundwater flow and solute transport in

discretely-fractured media: numerical solution for a single inclined fracture, Groundwater Quality 2004, 4th International Conference, July 19th - 22nd, 2004, University of Waterloo, Ontario, Canada.

Thériault, V., M. Aubertin, R. Simon, R. Therrien, J. Molson, 2004. Modelling disposal of mining wastes in open pit with a pervious envelope, Groundwater Quality 2004, 4th International Conference, July 19th - 22nd, 2004, University of Waterloo, Ontario, Canada.

Boyaud, C., R. Therrien, 2004. Numerical modeling of mine water rebound in Saizerais, northeastern France, Proceedings of the 15th International Conference on Computational Methods in Water Resources (CMWR XV), June 13–17 2004, Chapel Hill, North Carolina, Computational Methods in Water Resources, Volume 2, Developments in Water Science 55, Edited by: C.T. Miller, M.W. Farthing, W.G. Gray, and G.F. Pinder, Elsevier Science, Amsterdam, The Netherlands, pp. 977–989.

Morin, R., T. Thériault, R. Therrien, Y. Michaud, 2002. Generalized hydrogeologic properties of the Maritimes Carboniferous Basin from downhole measurements in selected wells, 3rd Joint IAH-CNC and CGS Groundwater Specialty Conference, Niagara Falls, October 20-23 2002.

Boutin, A., R. Lefebvre, R. Martel, D. Paradis, R. Therrien, 2002. Numerical modelling of groundwater flow and dissolved TCE transport in the Valcartier area granular aquifer, Quebec, Canada, 3rd Joint IAH-CNC and CGS Groundwater Specialty Conference, Niagara Falls, October 20-23 2002.

Pontlevoy, O., R. Lefebvre, R. Therrien, R. Martel,, M. Ouellet, C. Lamontagne, 2002. Regional groundwater modelling to support aquifer system management in the Ville Mercier area, Québec, 3rd Joint IAH-CNC, CGS Groundwater Specialty Conference, Niagara Falls, October 20-23 2002.

Ibaraki, M., R. Therrien, 2001. Preface to the special edition of the Journal of Contaminant Hydrology : Practical Applications of Coupled Process Models in Subsurface Environments, Journal of Contaminant Hydrology, 52 (1-4), p. 1-2.

Mailloux, M., R. Martel, R. Therrien, R. Lefebvre, S. Thiboutot, G. Ampleman, 2001. Numerical modelling of three-dimensional variably-saturated flow and transport of dissolved energetic materials at an anti-tank range, 2nd Joint IAH-CNC and CGS Groundwater Specialty Conference, Calgary, September 16-19 2001, p 832-839.

Hamel, A,. R. Therrien, P. Gélinas, 2001. Groundwater recharge of fractured rock aquifers in southwestern Quebec, 2nd Joint IAH-CNC and CGS Groundwater Specialty Conference, Calgary, September 16-19 2001, p. 1078-1085.

Cloutier, V., E. Bourque, R. Lefebvre, M. Savard, M. Nastev, R. Martel, R. Therrien, 2001. Regional groundwater hydrogeochemistry of fractured rock aquifers in southwestern Quebec, 2nd Joint IAH-CNC and CGS Groundwater Specialty Conference, Calgary, September 16-19 2001, p 1068-1077.

Karanta, G., R. Martel, M. Nastev, R. Therrien, D. Paradis, R. Lefebvre, 2001. Comparative study of methods for wellhead protection area delineation in fractured rock, 2nd Joint IAH-CNC and CGS Groundwater Specialty Conference, Calgary, September 16-19 2001, p 1350-1357.

Hamel, A., R. Therrien, P. Gélinas, 2001. Groundwater recharge for fractured rock aquifers in southwestern Quebec, Fractured Rock 2001, Toronto, Extended Abstract (4 pages).

Lemieux, J.-M., D. Kirkwood, R. Therrien, 2001. Detailed hydrogeological study of a fractured dolostone, Fractured Rock 2001, Toronto, Extended Abstract (4 pages).

Savard, M.M., M. Nastev, R. Lefebvre, R. Martel, N. Fagnan, E. Bourque, V. Cloutier, P. Gélinas, D. Kirkwood, P. Lapcevic, G. Karanta, A. Hamel, A. Bolduc, M. Ross, M. Parent, J.-M. Lemieux, E. Boisvert, O. Salad Hersi, D. Lavoie, F. Girard, K. Novakowski, R. Therrien, M. Etienne, R. Fortier, Regional hydrogeology of the fractured-rock aquifers of southwestern Quebec (St-Lawrence Lowlands), Québec, Canada, 1st Joint IAH-CNC and CGS Groundwater Specialty Conference, Montréal, October 15-18 2000.

Murat, V., R. Martel, Y. Michaud, R. Therrien, N. Fagnan, Étude comparative des méthodes d'évaluation de la vulnérabilité des aquifères à la pollution: Application aux aquifères granulaires du piémont laurentien, Québec, Canada, 1st Joint IAH-CNC and CGS Groundwater Specialty Conference, Montréal, October 15-18 2000.

Larose-Charette, D., R. Lefebvre, N. Fagnan, Y. Michaud, R. Therrien, 2000. Groundwater flow dynamics in unconfined deltaic aquifers of the Portneuf area, Quebec, Canada, 1st Joint IAH-CNC and CGS Groundwater Specialty Conference, Montréal, October 15-18 2000.

Bernardez, L, R. Therrien, R. Lefebvre, R. Martel. Numerical simulation of soil column experiments of diesel recovery using micellar solutions, 1st Joint IAH-CNC and CGS Groundwater Specialty Conference, Montréal, October 15-18 2000.

Michaud, Y., É. Boisvert, R. Lefebvre, N. Fagnan, M. Parent, R. Martel, É. Bourque, A. M. Bolduc, D. Paradis, V. Murat, F. Girard, D. Larose-Charette, R. Fortier, R. Therrien, M. M. Savard, 2000. La cartographie hydrogéologique régionale: Un exemple d'application des systèmes d'information géographique (SIG) pour la gestion des ressources en eau souterraine, 1st Joint IAH-CNC and CGS Groundwater Specialty Conference, Montréal, October 15-18 2000.

Martel, R., S. Foy, L. Saumure, A. Roy, R. Lefebvre, P. Gélinas, R. Therrien, 2000. PCB recovery under a building with an in situ technology using micellar solutions, 1st Joint IAH-CNC and CGS Groundwater Specialty Conference, Montréal, October 15-18 2000.

Hamdi, Y., J.-L. Robert, R. Therrien, 2000. Numerical modelling of natural groundwater recharge, Computational Methods in Water Resources XIII, Bentley et al. (eds), Calgary, 25-29 June 2000, 1101-1106.

Ghogomu, N.F., R. Therrien, 2000. Reactive mass transport modelling in discretely-fractured porous media, Computational Methods in Water Resources XIII, Bentley et al. (eds), Calgary, 25-29 June 2000, 285-292.

Brouyère, S., A. Dassargues, R. Therrien, E.A. Sudicky, 1999. Modelling of dual porosity media: comparisons of different techniques and evaluation of the impact on plume transport simulations, ModelCARE'99, International Conference on Calibration and reliability in groundwater modelling, Coping with uncertainty, Zürich, 20-23 September 1999.

Hamdi, Y, J.-L. Robert, R. Therrien, 1998. Numerical modelling of natural groundwater recharge, The 1998 Annual Conference of the International Association for Mathematical Geology, Ischia Island, Italy, 5-9 October 1998.

Nastev, M., R. Lefebvre, R. Therrien, P.J. Gélinas, 1998. Numerical modelling of landfill gas production and migration with a N_2-H_2O-CO_2-CH_4 system and a production function, TOUGH workshop ´98, Lawrence Berkeley National Laboratory, Berkeley, California, 4-6 May 1998.

Lepage, N., P. Hamel, R. Lefebvre, R. Therrien, C. Blais, 1997. Evaluation of leachate hydraulic

control options at a large landfill site in fractured rock using groundwater flow modelling and decision analysis, Conférence Americana 97, Mars 1997, Montréal, Québec.

Hadjigeorgiou, J., R. Therrien, 1996. An integrated strategy for field data collection, three-dimensional joint representation and modelling of fluid flow in fractured rock masses, in Eurock 96, Prediction and performance in rock mechanics and rock engineering, G. Barla (ed.), A. A. Balkema, Rotterdam, p. 1231-1236.

Young, S.C., R. Therrien, 1996. Application of numerical modelling for interpreting drawdown responses in an unconfined fluvial aquifer intersected by fully-penetrating wells, ModelCARE'96: International Conference in Calibration and Reliability in Groundwater Modelling.

Schäfer, W., R. Therrien, A. Voss, 1994. Simulation of a xylene spill in a sandy aquifer with a 3D transport and biogeochemistry model, in: Th. Dracos, F. Stauffer (eds.), Transport and reactive processes in aquifers, A. A. Balkema, Rotterdam 1994, 463-469.

Conference presentation (Abstracts)

Therrien, R., J.-M. Lemieux, 2011. Large-scale Thermo-Hydro-Mechanical Simulations in Complex Geological Environments, Invited Talk, AGU Fall Meeting, San Francisco.

Therrien, R., P. Brunner, 2011. Recent advances in the integrated simulation of surface and subsurface flow and mass transport, Invited Talk, GSA Annual Meeting, Minneapolis.

Matanga, G., A. Brookfield, E.A. Sudicky, R. Therrien, D. DeMarco, 2011. Challenges of Evaluation of Water-Supply, Water-Quality and Ecosystem-Health Issues in a Fully-Integrated Surface/Subsurface Framework, ASCE Annual Conference, Las Vegas.

Blessent, D., R. Therrien, J.-M. Lemieux, 2010. Inverse modelling of hydraulic tests within fractured crystalline rock based on a Markov-chain transition-probability geostatistical approach, GSA Annual Meeting 2010, Denver.

Goderniaux, P., S. Brouyère, H.J. Fowler, S. Blenkinsop, R. Therrien, P. Orban, A. Dassargues, 2009. Large scale integrated surface – subsurface hydrological model to assess climate change impacts on groundwater resources, 2009 Ground Water Summit - The Science and Engineering Conference: Adapting to Increasing Demands in a Changing Climate, 19-24 April 2009, NGWA, Tucson, AZ.

Rosenbom, A.E., J. Refsgaard, K.H. Jensen, H. Fluehler, V. Ernstsen, K.S. Klint, R. Therrien, 2008. Detailed Mechanistic Investigation of Preferential Flow and Transport in Variably-Saturated Fractured Clayey Till, Eos Trans. AGU, 89(53), Fall Meet. Suppl., Abstract H41C-0885.

Calderhead, A., R. Martel, A. Rivera, J. Garfias, R. Therrien, 2008. Land Subsidence and Groundwater Resources Investigations with the Use of D-InSAR, Numerical Modeling, and Field Data in the Toluca Valley, Mexico, Eos Trans. AGU, 89(53), Fall Meet. Suppl., Abstract H41B-0879.

Therrien, R., 2008. Recent developments in modeling coupled fluid flow and transport processes in fractured porous media, Eos Trans. AGU, 89(23), West. Pac. Geophys. Meet. Suppl., Abstract H31A-01.

Graf, T., R. Therrien, 2008. Two- and three-dimensional simulation of thermohaline flow in fractured rock: an overview, IAHR International Groundwater Symposium, Istanbul, Turkey.

Blessent, D., R. Therrien, 2008. Integration of 3D geological and numerical models to investigate

fractured geological media, Abstract, European Geosciences Union General Assembly, Vienna.

Blessent, D., R. Therrien, K. MacQuarrie, 2007. Integration of 3D geometrical and numerical models applied to contaminant transport in fractured porous media, Poster, GEOIDE 9th Annual Scientific Conference, Halifax, June 2007.

Graf, T., R. Therrien, 2007. Benchmarking three-dimensional variable-density flow in fractured porous media, GSA Annual meeting 2007, Denver.

Graf, T., T. Geyer, I. Ghergut, R. Therrien, M. Sauter, 2007. Modeling residence time distribution of a karst aquifer using a physically-based approach, GSA Annual meeting 2007, Denver.

Therrien, R., E.A. Sudicky, Y-J Park, R.G. McLaren, 2007. Flow and Contaminant Transport in Integrated Surface-subsurface Flow Systems: Model Development and Challenges, invited presentation, ModelCARE 2007, Copenhagen.

Sudicky, E.A., J.-M. Lemieux, A.J.A. Unger, R. Therrien, W.R. Peltier and L. Tarasov, 2007. Flow and Contaminant Transport in Integrated Surface-subsurface Flow Systems: Model Applications Over Multiple Spatial and Temporal Scales, ModelCARE 2007, Copenhagen.

Calderhead, A.I., R. Martel, A. Rivera , J. Garfias, R. Therrien, 2007. Groundwater Resources and Land Subsidence investigations in the Toluca Valley, Mexico, AGU Spring Meeting 2007, Acapulco, Mexico.

Sudicky, E.A, Y.-J.Park, A.J.A. Unger, J.P. Jones, A.E. Brookfield, D. Colautti, R. Therrien, T. Graf, 2006. Simulating complex flow and contaminant transport dynamics in an integrated surface-subsurface modeling framework, GSA Annual meeting 2006, Philadelphia.

Graf, T., R. Therrien, 2006. Discretizing non-planar discrete fractures for 3D numerical flow and transport simulations, GSA Annual meeting 2006, Philadelphia.

Therrien, R., T. Graf, Y-J Park, E.A. Sudicky, 2006. Modeling coupled fluid flow and transport processes in fractured porous media, GSA Annual meeting 2006, Philadelphia.

Diouf, C.W., R. Therrien, R. Lefebvre, 2006. Simulation numérique intégrée de l'écoulement de surface et souterrain du transport de soluté dans Portneuf, Montréal 2006, Congrès conjoint AGC-AMC.

Matanga, G., L. Gessford, K. Nelson, D. Demarco, E.A. Sudicky, R. Therrien, S. Panday, R. McLaren, 2006. Fully-integrated surface and subsurface model for conjunctive analysis of water supply reliability, water quality and ecosystem health, Joint 8th Federal Interagency Sedimentation and 3rd Hydrologic Modeling Conferences , April 2-6, 2006, Reno Nevada.

Sudicky, E.A., T.A. Di Iorio, J.P. Jones, J.-M. Lemieux, Y.-J. Park, R.G. McLaren, R. Therrien, C.W. Diouf, S. Panday, 2006. Flow and Contaminant Transport in Integrated Surface-subsurface Flow Systems : Model Application at Various Catchment Scales, Joint 8th Federal Interagency Sedimentation and 3rd Hydrologic Modeling Conferences , April 2-6, 2006, Reno Nevada.

Beaudoin, G., R. Therrien, 2005. Formation of orogenic gold deposits by short-lived pulses of metamorphic fluids drained by major crustal shear zones, GSA Annual Meeting 2005, Salt Lake City.

Sudicky, E.A, R. Therrien, Y.-J.Park, R.G. McLaren, J.P. Jones, J-M Lemieux, A.E. Brookfield, D. Colautti, S. Panday, V. Guvanesen, 2005. On the challenge of integrated surface-

subsurface flow and transport modeling at multiple catchment scales, GSA Annual Meeting 2005, Salt Lake City.

Graf, T., R. Therrien, 2005. Modelling coupled variable-density flow and reactive transport in discretely-fractured porous media, GSA Annual Meeting 2005, Salt Lake City.

Sudicky, E.A., R. Therrien, S. Panday, R. G. McLaren, 2004. Modeling flow and contaminant transport in integrated surface-subsurface flow systems: numerical solution strategy and application, GSA Annual meeting 2004, Denver.

Graf, T., R. Therrien, 2004. On the use of the Elder (1967) convection experiment as a benchmark for variable-density transport problems, GSA Annual meeting 2004, Denver.

Cey, E., D. Rudolph, R. Therrien, 2004. Role of fracture-matrix interaction in controlling recharge through variably saturated aquitards, GSA Annual meeting 2004, Denver.

Thériault, V., M. Aubertin, R. Simon, R. Therrien, J. Molson, 2004. Modelling fracture flow surrounding a pit using a discrete approach, Eos Trans. AGU, 85(7), Joint assembly Supplementary Abstract H12C-04.

Graf, T., R. Therrien, 2003. Variable-density groundwater flow and solute transport in discretely-fractured media: the impact of complex fracture geometry, GSA Annual meeting, Seattle.

Beaudoin, G., R. Therrien, 2003. The role of major crustal faults in vein fields under high fluid pressure, GAC-MAC Annual meeting, Vancouver, Program with abstracts, vol. 28.

Boutin, A., R. Lefebvre, R. Martel, R. Therrien, M. Parent, D. Paradis, 2002. Hydrogeological mapping and numerical modeling of a TCE plume in granular aquifer, Valcartier, Quebec, Canada, GSA Annual meeting, Denver.

Dueri, S., R. Therrien, J. Locat, 2002. Controlling factors for contaminant transport through a sediment cap: the case of the flood sediments of the Saguenay Fjord, submitted to the 36th Congress of the Canadian Meteorological and Oceanographic Society, Rimouski, Québec, 22-25 May 2002.

Dueri, S., R. Therrien, J. Locat, R. Galvez-Coutier, S. Leroueil, 2001. Modeling the transport of heavy metals through a capping-layer: the case study of the flood sediments deposited in the Saguenay Fjord, Quebec, GSA Annual meeting, Boston, Program with abstracts, vol. 32, no. 6.

Lemieux, J.-M., R. Therrien, D. Kirkwood, 2001. Small-scale delineation and modeling of groundwater flow in a fractured dolostone, GSA Annual meeting, Boston, Program with abstracts, vol. 32, no. 6.

Ghogomu, N.F., R. Therrien, R. Lefebvre, 2000. Simulating multicomponent reactive transport in a discretely-fractured carbonate aquifer, GSA Annual meeting, Reno, Program with abstracts, vol. 32.

Beaudoin G., R. Therrien, 1999c. Sources and drains: major controls of hydrothermal fluid flow under lithostatic pressure, GSA Annual meeting, Denver, Program with abstracts, vol. 31.

Beaudoin G., R. Therrien, 1999b. 3D modelling of crustal-scale hydrothermal fluid flow in the Val-d'Or auriferous vein field. GAC-MAC Annual meeting, Sudbury, Program with abstracts, vol. 24.

Beaudoin G., R. Therrien, 1999a. Sources and drains: major controls of hydrothermal fluid flow. Workshop on "Fluids and Fractures in the Lithosphere", Nancy, March 26-27, 1999.

Ghogomu, N.F., R. Therrien, 1999. Three-dimensional simulation of mass transport of multiple chemicals in a discretely -fractured media. GAC-MAC Annual meeting, Sudbury, Program with abstracts, vol. 24.

Michaud, Y., R. Lefebvre, N. Fagnan, M. Parent, R. Martel, E. Bourque, E. Boisvert, A. Bolduc, D. Paradis, V. Murat, F. Girard, D. Larose-Charette, R. Fortier, R. Therrien, F. Vitali, M.M. Savard, 1999, La cartographie hydrogéologique régionale: description de la méthode préconisée dans le projet Piémont Laurentien. Sommaire exécutif de la 3ème conférence biennale, Américana 1999, 24-26 mars 1999, Montréal, p. 363-364.

Lefebvre, R., D. Larose-Charette, N. Fagnan, Y. Michaud, R. Therrien, 1999. Dynamique de l'écoulement régional dans les aquifères libres de la MRC de Portneuf. Sommaire exécutif de la 3ème conférence biennale, Américana 1999, 24-26 mars 1999, Montréal, p. 367-368.

Martel, R., D. Paradis, V. Murat, Y. Michaud, R. Therrien, R. Lefebvre, N. Fagnan, E. Boisvert, 1999. Protection des aquifères : vulnérabilité et périmètres de protection autour des puits. Sommaire exécutif de la 3ème conférence biennale, Américana 1999, 24-26 mars 1999, Montréal, p. 375-376.

Nastev, M., R. Lefebvre, R. Therrien, P.J. Gélinas, 1998. TOUGH2-LGM: A Numerical Simulator for Landfill Gas Production and Migration. EOS, Transactions, American Geophysical Union 1998 Spring Meeting, vol. 79, no. 17, p. S118.

Kirkwood, D., R. Therrien, C. Dezayes, G. Beaudoin, 1998. Three-Dimensional Fracture Network Characterization at the CANMET Experimental Mine, Val d'Or, Québec. American Geophysical Union 1998 Spring Meeting, vol. 79, no. 17, p. S134.

Beaudoin, G., R. Therrien, 1998. The Kokanee range Ag-Pb-Zn hydrothermal system: 3D Modelling of crustal-scale fracture-controlled hydrothermal fluid-flow, Abstracts, Québec 1998, Joint Meeting AGC-AMC-APGGQ-AIH-UGC, vol 23, p. A-12.

Locat, J., G. Desrosiers, A. De Vernal, J.-P. Gagné, R. Galvez-Cloutier, Y. Gratton, P. Hill, C., Hillaire-Marcel, B. Long, A. Mucci, E. Pelletier, P. Simpkin, R. Therrien, 1998. Performance environnementale de la couche de sédiments du déluge de 1996 recouvrant les sédiments contaminés du fjord du Saguenay: Une occasion de développement technologique, Abstracts, Québec 1998, Joint Meeting AGC-AMC-APGGQ-AIH-UGC, vol 23, p. A-111.

Maurice, F., J. Locat, S. Leroueil, R. Galvez-Cloutier, R. Therrien, 1998. Consolidation de la couche 1996 recouvrant les sédiments contaminés du secteur de la baie des Ha !Ha! (Fjord du Saguenay), Québec: données préliminaires, Abstracts, Québec 1998, Joint Meeting AGC-AMC-APGGQ-AIH-UGC, vol 23, p. A-120.

Nastev, M., R. Lefebvre, R. Therrien, P.J. Gélinas, 1998. Numerical modelling of landfill gas production and migration, Abstracts, Québec 1998, Joint Meeting AGC-AMC-APGGQ-AIH-UGC, vol 23, p. A-134.

Murat, V., R. Martel, N. Fagnan, Y. Michaud, R. Therrien, R. Lefebvre, 1998. Étude des méthodes d'évaluation de la vulnérabilité des eaux souterraines à la pollution: Application aux aquifères du Piedmont Laurentien, Abstracts, Québec 1998, Joint Meeting AGC-AMC-APGGQ-AIH-UGC, vol 23 p. A-131.

Lepage, N., R. Lefebvre, R. Therrien, 1998. Numerical modelling of regional groundwater flow on the Island of Montreal, Abstracts, Québec 1998, Joint Meeting AGC-AMC-APGGQ-AIH-UGC, vol 23, p. A-108.

Roy, A., R. Lefebvre, R. Martel, R. Therrien, 1998. Conception par modélisation numérique et réalisation d'un essai de restauration in situ d'un site contaminé par des BPC avec des solutions tensioactives, Abstracts, Québec 1998, Joint Meeting AGC-AMC-APGGQ-AIH-UGC, vol 23, p. A-159.

Nastev, M., R. Lefebvre, R. Therrien, P.J. Gélinas, 1998. Modélisation numérique de la production et migration des biogaz dans les sites d'enfouissement sanitaire. Salon des technologies environnementales du Québec 1998, AQTE/AESEQ, 1-2-3 avril 1998, Québec (Québec).

Lepage, N., R. Lefebvre, R. Therrien, 1998. Modélisation hydrogéologique régionale de l'écoulement de l'eau souterraine sur l'île de Montréal. Salon des technologies environnementales du Québec 1998, AQTE/AESEQ, 1-2-3 avril 1998, Québec (Québec).

Therrien, R., W. Schäfer, 1993. Application of a 3D mass transport and biogeochemistry model to simulate a xylene spill in a sand aquifer, EOS, Transactions, American Geophysical Union 1993 Fall Meeting, vol. 74, no. 43, p. 307.

Therrien, R., E.A. Sudicky, 1993. Numerical simulation of variably-saturated flow and solute transport in discretely-fractured porous media, Abstracts with programs, 24, A-259, GSA Annual Meeting 1993.

Sudicky, E.A., J.E. Vanderwaak, R. Therrien, 1993. Numerical simulation of contaminant plume formation and remediation in discretely-fractured porous media, International Conference on Groundwater Quality Management.

Therrien, R., E.A. Sudicky, 1991. Three-dimensional analysis of variably-saturated flow and solute transport in discretely-fractured porous media, EOS, Transactions, American Geophysical Union 1991 Fall Meeting, vol. 72, p. 191.

Therrien, R., E.A. Sudicky, M.L. Brusseau, 1990. Three-dimensional analysis of solute transport in heterogeneous aquifers under multiprocess nonequilibrium, International Conference and Workshop, Transport and Mass Exchange Processes in Sand and Gravel Aquifers: Field and Modelling Studies, Ottawa, p. 62.

Huyakorn, P.S., S. Panday, R. Therrien, R.L. Nichols, 1989. Improved 3D finite element techniques for large-scale simulation of variably-saturated flow and transport. EOS, Transactions, American Geophysical Union 1989 Fall Meeting, vol. 70, p. 1077.

Software user manuals

Therrien, R., R.G. McLaren, E.A. Sudicky, S. Panday, 2008. HydroGeoSphere: A Three-dimensional Numerical Model Describing Fully-integrated Subsurface and Surface Flow and Solute Transport, User's Guide, Groundwater Simulations Group.

Therrien, R., E.A. Sudicky, R.G. McLaren, 2003. User's Guide for FRAC3DVS: An Efficient Simulator for Three-dimensional, Saturated-Unsaturated Groundwater Flow and Density-dependent, Chain-Decay Solute Transport in Porous, Discretely-Fractured Porous or Dual-porosity Formations, Université Laval and University of Waterloo, 150 pages.

Schäfer, D., W. Schäfer, R. Therrien, 1998. User's guide for TBC - Version 2.0. An Efficient Simulator for Three-Dimensional Saturated Groundwater Flow, Multispecies Transport, Reactions in Porous Formations, University of Heidelberg, Germany.

Mendoza, C.A., R. Therrien, E.A. Sudicky, 1991. ORTHOFEM user's guide, Research report, University of Waterloo.

Peer-reviewed Reports

Royal Society of Canada (RSC), 2010. Environmental and Health Impacts of Canada's Oil Sands Industry, 414 pp. (Expert Panel in alphabetical order : P. Gosselin, S.E. Hrudey, M.A.

Naeth, A. Plourde, R. Therrien, G. van der Kraak, Z. Xu)

Council of Canadian Academies (CAC), 2009. The sustainable management of groundwater in Canada, Expert Panel on Groundwater, 254 pp. (Expert Panel in alphabetical order : J.P. Bruce, W. Cunningham, R.A Freeze, R.W. Gillham, S. Gordon, S. Holysh, S.E. Hrudey, W. Logan, K.T. MacQuarrie, P. Muldoon, L. Nowlan, J. Pomeroy, S. Renzetti, B. Sherwood-Lollar, R. Therrien)

Reports

Fortier, R., M. Allard, J.-M. Lemieux, R. Therrien, J. Molson, D. Fortier, 2011. Rapport de synthèse de la phase I - Stratégie de déploiement du réseau Immatsiak: Cartographie des dépôts quaternaires et des formes périglaciaires, et compilation des informations disponibles des villages nordiques de Whapmagoostui-Kuujjuarapik, Umiujaq, Salluit et Kuujjuaq, présenté au Ministère du développement durable, de l'environnement et des parcs, 126 p., 4 cartes.

Grasby, S.E., Allen, D.M., Bell, S., Chen, Z., Ferguson, G., Jessop, A., Kelman, M., Ko, M., Majorowicz, J., Moore, M., Raymond, J, Therrien, R., 2011. Geothermal Energy Resource Potential of Canada, Geological Survey of Canada Open File 6914, 301P.

Therrien, R., 2008. Äspö Modelling Task Force – Modelling the KR24 Pumping Test at Onkalo, Task 7A, prepared for the Nuclear Waste Management Organization

Therrien, R., T. Graf, 2007. Äspö modelling task force – modelling the KR24 pumping test at ONKALO : A method to discretize non-planar fractures for 3D subsurface flow and transport simulations, Report NWMO TR-2007-xx, prepared for the Nuclear Waste Management Organization, 25 pp.

Lemaire, D., R. Therrien, 2006. Détermination des courbes caractéristiques de rétention d'eau et de conductivité hydraulique non saturée d'échantillons d'argile. Prepared for Quebec Ministry of Transportation.

Lemaire, D., R. Therrien, 2006. Difficulté de l'utilisation de l'étude à rebours pour déterminer les caractéristiques des glissements superficiels. Prepared for Quebec Ministry of Transportation.

Lemaire, D., R. Therrien, 2006. Instrumentation et suivi d'une planche d'essai sur l'infiltration des eaux dans une croûte argileuse : revue bibliographique des connaissances sur les glissements superficiels. Prepared for Quebec Ministry of Transportation.

Lavoie, M., D. Lemaire, R. Therrien, 2005. Caractérisation des propriétés physiques d'une croûte argileuse superficielle et préparation d'un plan d'instrumentation pour une planche d'essais. Prepared for Quebec Ministry of Transportation.

Chin, D. A., J. A. Dracup, N. L. Jones, V. M. Ponce, R. W. Schaffranek, R. Therrien. 2005. Peer Review of the Regional Simulation Model (RSM), prepared for the South Florida Water Management District, West Palm Beach, Florida, Final Report (050723).

Raymond, J., et Therrien, R., 2005a. Estimation du potentiel de production d'énergie géothermique des Mines Gaspé à Murdochville; caractérisation du site à l'étude. Rapport interne. Comité de relance de la ville de Murdochville, Murdochville, Canada, 22 pp + annexes.

Raymond, J., and Therrien, R., 2005b. Estimation du potentiel de production d'énergie géothermique des Mines Gaspé à Murdochville; essai de pompage. Rapport interne. Comité de relance de la ville de Murdochville, Murdochville, Canada, 25 pp + annexes.

Hamel, A., R. Therrien, 2004. Moderately-fractured rock experiment: predictive fluid flow and transport modeling using the EPM approach, Ontario Power Generation, Nuclear Waste Management Report 06819-REP-01300-xxxxx-R00, Toronto, Ontario, 142 pages.

Paradis, D, G. Karanta, M. Nastev, J.-M. Lemieux, E. Bourque, M.M. Savard, V. Cloutier, R. Therrien, R. Martel, R. Lefebvre, D. Kirkwood, C. Savard, 2004. Études locales de secteurs choisis du système aquifère fracturé du sud-ouest du Québec; editors : Savard, M M; Lefebvre, R; Nastev, M; Paradis, D. Commission géologique du Canada, Dossier public 4600, 2004; 163 pages.

Hamel, A., R. Therrien, 2003. Moderately-fractured rock experiment: analysis of pumping tests 1 to 4, Ontario Power Generation, Nuclear Waste Management Report 06819-REP-01300-xxxxx-R00, Toronto, Ontario, 269 pages.

Lefebvre, R., A. Boutin, R. Martel, R. Therrien, M. Parent, V. Blais, 2003. Caractérisation et modélisation numérique de l'écoulement et de la migration de la contamination en TCE de l'eau souterraine du secteur Valcartier, Québec, Canada, INRS-Eau, Terre et Environnement, Rapport de recherche R-631.

Pontlevoy, O., C. Racine, R. Lefebvre, R. Therrien, L. Trépanier, 2003. Étude initiale des alternatives de contrôle du panache d'eau souterraine contaminée émis par les anciennes lagunes de Mercier, INRS-Eau, Terre et Environnement, Rapport de recherche.

Savard, M.M., M. Nastev, D. Paradis, V. Cloutier, K. Lauzière, E. Bourque, A. Hamel, V. Murat, R. Lefebvre, R. Martel, M. Ross, N. Fagnan, R. Therrien, E. Boisvert, P.J. Gélinas, 2002. Caractérisation hydrogéologique régionale du système aquifère fracturé du sud-ouest du Québec, Partie I, Hydrogéologie régionale du système aquifère fracturé du sud-ouest du Québec, Edité par Martine M. Savard, Miroslav Nastev, René Lefebvre, D.Paradis, et Richard Martel, Rapport final revisé, remis au Conseil Régional de développement des Laurentides, et aux Municipalités régionales de comté d'Argenteuil, Deux-Montagnes, Mirabel et Thérèse de Blainville

Therrien, R., J.-M. Lemieux, 2002. Numerical simulation of fluid flow and solute transport in the Moderately Fractured Rock (MFR) domain at the Underground Research Laboratory: a preliminary application of the FRAC3DVS model, Ontario Power Generation, Nuclear Waste Management Report 06819-REP-01300-10046-R00, Toronto, Ontario.

Cook P.G., M. Stauffacher, R. Therrien, T. Halihan, P. Richardson, R.M. Williams, A. Bradford, 2001. Groundwater recharge and discharge in a saline, urban catchment; Wagga Wagga, New South Wales. CSIRO Land and Water, Tech. Rep. 39/01.

Murat, V, R. Martel, Y. Michaud, N. Fagnan, F. Beaudoin, R. Therrien, 2000. Cartographie hydrogéologique régionale du piémont laurentien dans la MRC de Portneuf : comparaison des méthodes d'évaluation de la vulnérabilité intrinsèque; Commission géologique du Canada, Dossier public 3664d, 1 feuille.

Savard, M.M., M. Nastev, R. Martel, R. Lefebvre, E. Bourque, N. Fagnan, V. Cloutier, F. Girard, A. Hamel, K. Lauzière, J.-M. Lemieux, M. Ross, P. Lapcevic, P.J. Gélinas, D. Kirkwood, G. Karanta, M. Étienne, M. Parent, R. Therrien, K. Novakowski, R. Fortier, 2000. Cartographie hydrogéologique régionale des aquifères fracturés en roches sédimentaires du sud-ouest du Québec (Basses-Terres du St-Laurent). Projet AFSOQ, Rapport d'étape 1999-2000.

Michaud, Y., R. Lefebvre, N. Fagnan, M. Parent, R. Martel, E. Bourque, E. Boisvert, A. Bolduc, D. Paradis, V. Murat, F. Girard, D. Larose-Charette, R. Fortier, R. Therrien, F. Vitali ,

M.M. Savard, 1998, Intégration des données géoscientifiques pour la caractérisation des aquifères du piémont laurentien. Séminaire d'information sur la recherche géologique, MRNQ, 25-267 novembre, 1998, Québec. (Poster)

Barbeau, C., J.-E. Côté, P.J. Gélinas, R. Therrien, 1999. Caractérisation et modélisation de contaminants radioactifs autour de l'aire de stockage des déchets radioactifs de la centrale Gentilly-2, report submitted by a panel of experts to Hydro-Québec.

Barbeau, C., J.-E. Côté, P.J. Gélinas, R. Therrien, 1998. Mise à jour des analyses de risques et modélisation de la dispersion du tritium autour de l'aire de stockage des déchets radioactifs de la centrale Gentilly-2, report submitted by a panel of experts to Hydro-Québec.

Martel, R., P.J. Gélinas, R. Lefebvre, R. Therrien, S. Foy, A.Roy, L. Saumure, 1996. Demonstration of an in situ soil washing technique for PCB recovery at the Longford Mills plant, Département de géologie et génie géologique and INRS-Géoressources, report, Domtar Research Centre, Senneville, Québec, 24pp.

Nastev, M., R. Therrien, P.J. Gélinas, 1995. Site d'enfouissement sanitaire de Saint-Étienne-Des-Grès: Modélisation numérique de l'écoulement de l'eau souterraine et du transport de contaminants, Groupe de Recherche en Environement en Géo-Ingénierie, Université Laval, Groupe Serrener.

Sudicky, E.A., R.G. McLaren, R. Therrien, J.B. Kool, A. Sinha, 1991. Combined analytical-numerical model for simulating three-dimensional flow and chain decay contaminant transport in the saturated zone, Hydrogeologic Inc., U.S. Environmental Protection Agency.

C. PROFESSIONAL AND ADMINISTRATIVE ACTIVITIES

Societies

- Ordre des Ingénieurs du Québec (OIQ)
- American Geophysical Union (AGU)
- National Ground Water Association (NGWA)
- International Association of Hydrogeologists (IAH)
- Geological Association of America (GSA)

Expert Panels

- Expert committee on Geothermal energy, Hydro-Québec, 2006
- Expert modelling committee, Montreal Center for Site Remediation, (CEMRS), 2006-2009
- Member of the Expert Panel on Groundwater, Council of Canadian Academies, 2007-2009
- Member of the Royal Society of Canada/Société Royale du Canada Expert Panel on the Environmental and Health Impacts of Canada's Oil Sands Industry, 2009-2010
- Member of the commission du Bureau d'audiences publiques sur l'environnement (BAPE) sur le Développement durable de l'industrie des gaz de schiste au Québec, 2010-

2011.

Editorial duties and reviewing

- Associate Editor, Hydrogeology Journal, 2006-2010
- Jury member, Annual Colloquium, Canadian Geotechnical Association, 2006-2007
- Jury member for the prize in research in environment in Québec (Phénix de l'environnement), 2006-2007
- Guest editor of a special issue of the Journal of Contaminant Hydrology on the "Practical application of coupled process models in subsurface environments", November 2001.
- Regular reviewer for Hydrogeology Journal, Water Resources Research, Canadian Geotechnical Journal, Revue des sciences de l'eau, Advances in Water Resources
- Regular reviewer of grant application from NSERC, FCAR
- Sponsor of a technical session at the GSA Annual meeting in Seattle, 2003.

Participation outside Université Laval

- FRAC-WECO follow-up committee, BELSPO project, Belgium (2007-2011)
- Minister's National Advisory Board for the Earth Sciences, Minister of Natural Resources Canada (2004-2009)
- Peer Review Panel for the Regional Simulation Model (RSM) of the South Florida Water Management District (2005)
- Canadian Geotechnical Research Board (2005 - present)
- Äspö Modelling Task Force, Sweden (2005 - present)
- Peer Review of the MODHMS model for HydroGeologic Inc (2006)
- HyMeX International Scientific Steering Committee (2008 - present)
- Chair, Evaluation Committee for the Strategic Grant Program, Healthy Ecosystems and Environment for the Natural Sciences and Engineering Research Council of Canada, NSERC, (2009-2011)
- Grant Selection Committee for the International Research Initiative on Adaptation to Climate Change of the International Development Research Centre of Canada (IDRC), 2010.
- Site visit for review of a proposal for an International Research Training Group submitted to the German Research Agency (DFG), Stuttgart (2010).
- Chair of a site visit committee for a Collaborative Research and Development grant application submitted to the Natural Sciences and Engineering Research Council of Canada (2010)
- Scientific Committee, Groundwater in Fractured Rock 2012, Prague.

BRIEF CURRICULUM VITAE
GLEN VAN DER KRAAK

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Education:

B.Sc. Hons. (1st Class Hons)	University of Manitoba	1976
M.Sc.	University of Manitoba	1979
Ph.D.	University of British Columbia	1984

Positions:

Associate Dean, Research	Nov 2003- reappointed Nov 2008 for a second 5 year term	
Chair	July 2000 - Dec 2003	Department of Zoology
Professor	July 1997 - present	Zoology (now Integrative Biology)
Associate Professor	July 1993 - June 1997	Zoology
Assistant Professor	July 1987-June 1993	Zoology
Adjunct Professor	July 1994-present	Department of Biology University of Waterloo
Adjunct Professor	July 2008 -present	Department of Biology McMaster University
Director	July 1996- August 2000	Axelrod Institute of Ichthyology University of Guelph
Postdoctoral Fellow	Feb 1984- June 1987	Department of Zoology University of Alberta

Professional activities: (partial list)
Editorial Boards: Journal of Experimental Zoology1998-present; Environmental Toxicology: 1999-present; General and Comparative Endocrinology 2001-present; Comparative Biochemistry and Physiology: 2002-present; Environmental Toxicology and Chemistry -2006-2009.

Professional Society Committees: Fish Reproduction Symposium
Fish Physiology Symposium
North American Society for Comparative Endocrinology

Member Organizing Committee: Pollutant Responses in Marine Organisms, Los Angeles May 2011

Member Organizing Committee: Aquatic Toxicity Workshop, Toronto October 2010

Panel Member Research Evaluation for the Development of research (RED10); Biology, University of Gothenburg 2010-2011.

Royal Society of Canada Expert Panel on Environmental and Health Impacts of Canada's Oil Sands Industry 2009-2011. .

Member Peer Review Panel NSERC Discovery Grant Accelerator Program 2007 and 2009

Canada Foundation for Innovation: College of Reviewers for the New Opportunities Innovation Fund: Jan 2004-present.

Member Science Advisor Panel, US Environmental Protection Agency Ecological Processes and Effects. May 2008-November 2008.

Member International Program Committee Symposium on Reproductive Physiology of Fish: 7th Symposium. Mie, Japan, 2003; 8th Symposium, Rennes France 2007; 9th Symposium India 2011.

Member International Program Committee: International Symposium on Fish Endocrinology. 5th Symposium, Castellon, Spain 2004; 6th Symposium Calgary, 2008; 7th Symposium, Buenos Aires, 2012.

Member Peer Review Panel: Board of Scientific Counselors: Endocrine Disruptors Program US Environmental Protection Agency Mid Cycle Review September 18, 2007.

Member International Steering Committee: World Health Organization IPCS/OECD/US EPA Panel on Approaches to Integrated Risk Assessment. 1998-2006.

Member United States Environmental Protection Agency Endocrine Disruptors Methods Validation Advisory Committee: April 2005- December 2006.

Member Peer Review Panel: Environmental and Human Health Effects of Manufactured Nanomaterials US Environmental Protection Agency, May 15-17, 2006.

Member International Steering Committee: World Health Organization IPCS/OECD/US EPA Panel on Endocrine Disruptors. 1997-2005.

Program Coordinator, Reproductive Endocrine Toxicology Program, Canadian Network of Toxicology Centres. 1994-2005.

Member Peer Review Panel: Exposure measurement tools for endocrine disrupting chemicals in mixtures. US Environmental Protection Agency, July 14-15, 2005.

Member NSERC Integrative Animal Biology Grant Selection Committee: 2001-2004 (Co-chair 2002-2003), Chair (2003-2004).

Member: Peer review panel: Computational toxicology and endocrine disruptors: US Environmental Protection Agency, May 10-11, 2004.

Member Peer review panel: Board of Scientific Counselors: Endocrine Disruptors Program US Environmental Protection Agency, December 13-15, 2004.

Member United States Environmental Protection Agency Endocrine Disruptors Methods Validation Sub-committee. 2001- 2003.

Papers published in journals

216. Irwin, D.A. and G. Van Der Kraak. Regulation and actions of insulin-like growth factors in the ovary of zebrafish (Danio rerio).General and Compartive Endocrinology. Accepted March 2012; 28 typed pages; 8 Figs).

215. Kavanagh, R.J., R. A. Frank, B. K. Burnison, R. F. Young, P. M. Fedorak, K. R. Solomon, and G. Van Der Kraak. Fathead minnow (*Pimephales promelas*) reproduction is impaired when exposed to a naphthenic acid extract. Aquatic Toxicology Accepted February 2012, 30 typed p, 3 Fig).

214. O'Connor, C.M., B. L. Barthel, K.M. Gilmour, D. P. Philipp, G. Van Der Kraak, S. J. Cooke. Reproductive history and nest environment are correlated with circulating androgen and glucocorticoid concentrations in a parental care-providing teleost fish. Physiological and Biochemical Zoology; 31 typed p; 2 Fig

213. Stacey, N.E. G.J. Van Der Kraak and K. H.Olsen, Male primer endocrine responses to preovulatory females: field studies in Swedish cyprinids. Journal of Fish Biol. 80:147-165.

212. van den Heuvel, M., N. Hogan, S. Roloson and G. Van Der Kraak. Reproductive development of yellow perch (Perca flavescens) exposed to oil sands-affected waters. Environmental Toxicology and Chemistry Accepted Nov 2011; 25 typed p; 4 Figs.

211. Desjardins, J.K., J.L. Fitzpatrick, K.A. Stiver, G. Van Van Der Kraak and S. Balshine. 2011. Lunar and diurnal cycles in reproductive physiology and behaviour in a natural population of cooperatively breeding fish. Journal of Zoology 285: 66-73.

210. Fuzzen, M, N.J. Bernier and G.Van Der Kraak 2011. Differential effects of 17β-estradiol and 11-ketotestosterone on the endocrine stress response in zebrafish (Danio rerio). General and Comparative Endocrinology 70: 365-373.

209. Kavanagh, R.J., R.A. Frank, K. D. Oakes, M. R, Servos, R. F. Young, P. M. Fedorak, M. MacKinnon, K. R. Solomon, D. G. Dixon and G. Van Der Kraak. 2011. Fathead minnow (*Pimephales promelas*) reproduction is impaired in aged oil sands process-affected waters. Aquatic Toxicology 101:214-220.

208. Kovacs, T., P.Martel, B. O'Connor, J. Parrott, M. McMaster, G. Van Der Kraak, D. MacLatchy, M.van den Heuvel and M. Hewitt. 2011. Kraft mill effluent survey: Leads toward best management practices for eliminating effects on fish reproduction. Environmental Toxicology and Chemistry. 30:1421-1429.

207. Lister, A.L., G. Van Der Kraak, R.Rutherford, D.MacLatchy.2011. Fundulus heteroclitus: Ovarian reproductive physiology and the impact of environmental contaminants. Comp Biochem Physio. C. 154: 278-287.

206. Martel, P.H., T. G. Kovacs, B. I. O'Connor, S. Semeniuk, L. M Hewitt, D. MacLatchy, M. E. McMaster, J. L. Parrott, M. R. van den Heuvel and Glen J. Van Der Kraak. 2011. Effluent monitoring at a

bleached kraft mill: Directions for best management practices for eliminating effects on fish reproduction. Journal of Toxicology and Environmental Health Part A. 46:833-843.

205. O'Connor, C.M., K.M. Gilmour, G. Van Der Kraak, S.J. Cooke. 2011. Circulating androgens are influenced by parental nest defense in a wild teleost fish. Journal of Comparative Physiology - A. 197: 711-715.

204. O'Connor, C.M., C. Y. Yick, K.M. Gilmour, G. Van Der Kraak, S.J. Cooke. 2011. The glucocorticoid stress response is attenuated but unrelated to reproductive investment during parental care in a teleost fish. General and Comparative Endocrinology 170: 215-221.

203. Van Der Kraak, G., and A. L Lister. 2011. The inhibitory control of oocyte maturation in the zebrafish: the role of the G-protein coupled estrogen receptor and epidermal growth factor. Biology of Reproduction 85: 6-8.

202. Cooperman, M.S., S. G. Hinch, G. T. Crossin, S. J.Cooke, D.A. Patterson, I. Olssen, A. Otto, A.G. Lotto, D. Welch, J. M. Shrimpton, G. Van Der Kraak, and A.P Farrell. 2010. Effects of experimental manipulations of salinity and maturational status on the physiological condition and mortality of homing adult sockeye salmon held in a laboratory. Physiological Zoology 83: 459-472.

201. Crossin G.T., S.G.Hinch SG, S.J. Cooke, D.A. Patterson, A.G. Lotto, G. Van Der Kraak, Y. Zohar,, U. Klenke and A.P. Farrell. Testing the synergistic effects of GnRH and testosterone on the reproductive physiology of pre-adult pink salmon *Oncorhynchus gorbuscha*.J.Fish Biol. 76:112-128

200. Dey, C.J., C. M. O'Connor, K. M. Gilmour, G. Van Der Kraak, S. J. Cooke. 2010. Behavioral and physiological responses of a wild teleost fish to cortisol and androgen manipulation during parental care. Hormones and Behavior 58: 599-605.

199. Donaldson, M.R., S.G. Hinch,, D.A. Patterson, A.P. Farrell, J.M. Shrimpton, K.M., Miller-Saunders, D., Robichaud, J. Hills, K.A. Hruska, K.C. Hanson, K.K. English, G. Van Der Kraak and SJ. Cooke. 2010. Physiological condition differentially affects the behaviour and survival of two populations of sockeye salmon during their freshwater spawning migration. Physiological and Biochemical Zoology 83: 446-458.

198. Eykelbosh, A.J. and G. Van Der Kraak. 2010. A role for the lysosomal protease cathepsin B in zebrafish follicular apoptosis. Comparative Biochemistry and Physiology A. 156: 218–223.

197. Fuzzen, M, G.Van Der Kraak and N.J. Bernier. 2010. Stirring up new ideas about the regulation of the hypothalamic-pituitary-interrenal axis in zebrafish (Danio rerio). Zebrafish 7:349-358.

196. Nelson, S.N.and G,Van Der Kraak. 2010. Characterization and regulation of the insulin-like growth factor (IGF) system in the zebrafish (Danio rerio) ovary. General and Comparative Endocrinology 168: 111–120

195. Nelson, S.N.and G,Van Der Kraak. 2010. The role of the insulin-like growth factor (IGF) system in zebrafish (Danio rerio) ovarian development. General and Comparative Endocrinology 168: 103-110.

194. Matsumoto, J, A.J. Hosmer, and G. Van Der Kraak, 2010. Survival, growth and iono-regulatory performance in Atlantic salmon smolts was not affected by atrazine exposure. Comparative Biochemistry and Physiology: Part C Pharmacology and Toxicology. 152: 379-384.

193. Oakes, K., A.Coors, B. I. Escher, K. Fenner, J. Garric, M. Gust, T. Knacker, A. Küster, C. Kussatz, C. D. Metcalfe, S. Monteiro, T.W. Moon, J. A. Mennigen, J. Parrott, A.R.R. Péry, M. Ramil, I. Roennefahrt J.V Tarazona, P.Sánchez-Argüello, T.A Ternes, V. L Trudeau, T. Boucard, G.J. Van Der Kraak and M.R Servos. 2010. An Environmental Risk Assessment for the Serotonin Re-uptake Inhibitor

Fluoxetine - A Case Study Utilizing the European Risk Assessment Framework. Integrated Environmental Assessment and Management. 6, Supplement 1: 524–539.

192. Orrego, R., M. McMaster, G. Van Der Kraak and D. Holdway. 2010. Effects of pulp and paper mill effluent extractives on aromatase CYP19a gene expression and sex steroid levels in juvenile triploid rainbow trout. Aquatic Toxicology 97:353-360.

191. Parrott, J.L., L M Hewitt, T. G. Kovacs, D.L. MacLatchy, P.H. Martel, M. R. van den Heuvel, G. J. Van Der Kraak, and M. E. McMaster. 2010. Responses in a fathead minnow (*Pimephales promelas*) lifecycle test and in wild white sucker (*Catostomus commersoni*) exposed to a Canadian bleached kraft mill effluent Water Quality Research J Canada 2010: 45: 187-200.

190. van den Heuvel, M. P. H Martel, T. G. G Kovacs, D.L, MacLatchy, G.J. Van Der Kraak, J.L. Parrott, M.E. McMaster, B. O'Connor, S.D. Melvin and L. M. Hewitt. 2010. Evaluation of short-term fish reproductive bioassays for predicting effects of a Canadian bleached kraft mill effluent. Water Quality Research J Canada 45: 175-186.

189. Du Preez, L.H., N. Kunene, R. Hanner, J. P. Giesy, K.R. Solomon, A. Hosmer and G.J. Van Der Kraak. 2009. Population-specific incidence of testicular ovarian follicles in Xenopus laevis from South Africa: A potential issue in endocrine testing. Aquatic Toxicology 95:10-16.

188. Frank, R., K. Fischer, R. Kavanagh, K. Burnison, G. Arsenault, J. Headley, K. Peru, G. Van Der Kraak and K. Solomon. 2009. Effect of carboxylic acid content on the acute toxicity of oil sands naphthenic acids. Environmental Science and Technology 43:266-271.

187. Hanson, K., C.M. O'Connor, G. Van Der Kraak and S.J. Cooke. 2009. Paternal aggression towards a brood predator during parental care in wild smallmouth bass is not correlated with biochemical or endocrine status. Hormones and Behavior 55:495-499.

186. Kavanagh, B. K.Burnison, R. A. Frank, K.R. Solomon and G. Van Der Kraak.2009. Detecting oil sands process-affected waters in the Alberta oil sands region using synchronous fluorescence spectroscopy. Chemosphere 76: 120-126.

185. Lister, A., C. Regan, J. Van Zwol and G. Van Der Kraak. 2009. Inhibition of egg production in zebrafish by fluoxetine and municipal effluents: a mechanistic evaluation. Aquatic Toxicology 95: 320-329.

184. Lister, A. and G. Van Der Kraak. 2009. Regulation of prostaglandin synthesis in the ovaries of sexually-mature zebrafish. Molecular Reproduction and Development 76: 1064-1075.

183. O'Conner, C., K.M. Gimour, R. Aringhaus, G. Van Der Kraak and S.J. Cooke. 2009. Stress and parental care in a wild teleost: Insights from exogenous supraphysiological cortyisol implants. Physiological and Biochemical Zoology 82: 709-19.

182. Alsop, D.H., J.Matsumoto, S.B. Brown and G. Van Der Kraak. 2008. Retinoid requirement in the reproduction of zebrafish. General and Comparative Endocrinology 156: 51-62.

181. Cooke, S.J., G.T. Crossin, D.A. Patterson, S.G. Hinch, K.K. English, M.C. Healey, S. Macdonald, M. Shrimpton, A. Lister, G. Van Der Kraak, and A.P. Farrell. 2008. Physiological correlates of coastal arrival and river entry timing in late summer Fraser River Sockeye salmon (Oncorhynchus nerka). Behavioural Ecology 19: 747-758.

180. Cooke, S.J., S.G. Hinch, A.P. Farrell, D.A. Patterson, K. Miller-Saunders, D.W. Welch, M.R. Donaldson, K.C. Hanson, G.T. Crossin, M.S. Cooperman, M.T. Mathes, A.G. Lotto, K.A. Hruska, I. Olsson, G.N. Wagner, R. Thomson, R. Hourston, K.K. English, S. Larsson, J.M. Shrimpton, and G. Van Der Kraak. 2008. Developing a mechanistic understanding of fish migrations by linking telemetry with

physiology, behaviour, genomics and experimental biology: an interdisciplinary case study on adult Fraser River sockeye salmon. Fisheries 33:321-338.

179. Crossin, G.T., S.G. Hinch, S.J. Cooke, D.W. Welch, D.A. Patterson, S.R.M. Jones, A.G. Lotto, R.A. Leggatt, M.T. Mathes, J.M. Shrimpton, G. Van Der Kraak, and A.P. Farrell. 2008. Exposure to high temperature influences the behaviour, physiology, and survival of sockeye salmon during spawning migration. Canadian Journal of Zoology 86: 127-140.

178. Desjardins, J.K., J.L. Fitzpatrick, K.A. Stiver, N. Milligan, G.J. Van Der Kraak and S. Balshine 2008. Costs and benefits of polygyny in the cichlid, Neolamprologus pulcher. Animal Behaviour 75: 1771-1779.

177. Desjardins, J.K., K.A. Stiver, J.L. Fitzpatrick, N. Milligan, G.J. Van Der Kraak and S. Balshine. 2008. Behavioral and hormonal correlates of sex and status in a cooperatively breeding fish (Neolamrologus pulcher). Behavioural Ecology and Sociobiology 62:785–794

176. du Preez, L.H., N. Kunene, G.J. Everson, J.A. Carr, J.P. Giesy, T.S. Gross, A.J. Hosmer, R.J.Kendall, E.E. Smith, K.R. Solomon and G.J. Van Der Kraak, 2008. Reproduction, larval growth, and reproductive development in African Clawed frogs (Xenopus laevis) exposed to atrazine. Chemosphere 71: 546-552.

175. Frank, R., R. Kavanagh, B. K. Burnison, G. Arsenault, J. V. Headley, K. M. Peru, G. Van Der Kraak and K. R. Solomon. 2008. Toxicity assessment of collected fractions from an extracted naphthenic acid mixture. Chemopshere 72: 1309-1314.

174. Hanson, K.C., S.J. Cooke, S.G. Hinch, G.T. Crossin, D.A. Patterson, K.K. English, M.R. Donaldson, J.M. Shrimpton, G. Van Der Kraak, and A.P. Farrell. 2008. Individual variation in migration speed of upriver migrating sockeye salmon in the Fraser River in relation to their physiological and energetic status at marine approach. Physiological and Biochemical Zoology 81: 255-268.

173. Hewitt, M., T. Kovacs, M. Dube, D. MacLatchy, P. Martel, M. McMaster, M. Paice, J. Parrott, M. van den Heuvel and G. Van Der Kraak. 2008. Altered reproduction in fish exposed to pulp and paper mill effluents: Role of individual compounds and mill operating conditions. Environmental Toxicology and Chemistry 27: 682-697.

172. Lister, A., V. Nero, A. Farwell, D.G. Dixon and G. Van Der Kraak. 2008. Reproductive and stress hormone levels in goldfish (Carassius auratus) exposed to oilsands process-affected water. Aquatic Toxicology 87: 170-177.

171. Lister, A.L. and G. Van Der Kraak. 2008. An investigation into the role of prostaglandins in zebrafish oocyte maturation and ovulation. General and Comparative Endocrinology 59: 46-57.

170. Solomon, K., J.A.Carr, L.H. du Preez, J.P.Giesy, R.J. Kendall, E.E. Smith and G. Van Der Kraak. 2008. Effects of atrazine on fish, amphibians and aquatic reptiles: a critical review. Critical Reviews in Toxicology 38: 721-772.

169. Alsop, D.H., S.B. Brown and G. Van Der Kraak. 2007. The effects of copper and benzo[a]pyrene on retinoids and reproduction in zebrafish. Aquatic Toxicology 82:281-295.

168. Crossin, G.T., S.G. Hinch, S. J. Cooke, D.W. Welch, S.D. Batten, D.A. Patterson, J.M. Shrimpton and A.P. Farrell. 2007. Behaviour and physiology of sockeye salmon homing through coastal waters to a natal river. Marine Biology 152:905–918.

167. Leanos-Castaneda and G. Van Der Kraak. 2007. Functional characterization of estrogen receptor subtypes, ERα and ERβ, mediating vitellogenin production in the liver of rainbow trout. Toxicology and Applied Pharmacology 224: 116-125.

166. Leanos-Castaneda, G. Van Der Kraak, R. Rodriquez-Canul and G. Gold. 2007.Endocrine disruption mechanism of o,p'-DDT in mature male Tilapia (*Oreochromis niloticus*). Toxicology and Applied Pharmacology 221:158-167.

165. Vermeire, T., W. R. Munns, Jr., J. Sekizawa, G. Sutter and G. Van Der Kraak. 2007. An assessment of integrated risk assessment. Journal of Human and Ecological Risk Assessment 13: 339-354.

164. Cooke, S.J., S.G. Hinch, G.T. Crossin, D.A. Patterson, K.K. English, J.M. Shrimpton, G. Van Der Kraak, and A.P. Farrell. 2006. Physiology of individual late-run Fraser River sockeye salmon (*Oncorhynchus nerka*) sampled in the ocean correlates with fate during spawning migration. Canadian Journal of Fisheries and Aquatic Sciences. 63:1469-1480.

163. Cooke, S.J., S.G. Hinch, G.T. Crossin, D.A. Patterson, K.K. English, M.C. Healey, J.M. Shrimpton, G. Van Der Kraak and A.P. Farrell. 2006. Mechanistic basis of individual mortality in Pacific salmon during spawning
migrations. Ecology 87: 1575-1586.

162. Desjardins, J.K., J. R. Hazelden, M.R., G.J. Van Der Kraak and S. Balshine, S. 2006. Males and females provide support for the 'Challenge Hypothesis': Steroid hormones and territoriality in a cooperatively breeding cichlid fish. Behavioral Ecology 17: 149-154.

161. Frank, R., R. Kavanagh, B. K. Burnison, J. V. Headley, K. M. Peru, G. Van Der Kraak, and K. R. Solomon. 2006. Diethylaminoethyl cellulose clean-up of a large volume naphthenic acid extract. Chemosphere 64: 1346-1352.

160. Hecker, M., M.B. Murphy, K. K. Coady, D. L. Villeneuve, P.D. Jones, J.A. Carr, K.R. Solomon, E.E. Smith, G.J. Van Der Kraak, T. Gross, L.H. du Preez, R.J. Kendall and J.P. Giesy. 2006. Terminology of gonadal anomalies in fish and amphibians resulting from chemical exposures. Reviews of Environmental Contamination and Toxicology 187: 103-131.

159. Ings, J.S and G, Van Der Kraak. 2006. Characterization of the expression of StAR and steroidogenic enzymes in zebrafish ovarian follicles. Molecular Reproduction and Development 73: 943-954.

158. Marlatt, V.L., L.M. Hewitt and G. Van Der Kraak. 2006. Utility of in vitro test methods to assess the activity of xenoestrogens in fish. Environmental Toxicology and Chemistry. 25: 3204-3212.

157. Murphy M. B, M. Hecker K.K. Coady, A.R. Tompsett, E.B. Higley, P.D. Jones, L.H. du Preez, K.R. Solomon, J.A. Carr, E.E. Smith, R.J. Kendall, G. Van Der Kraak and J.P. Giesy JP. 2006. Plasma sex steroid concentrations, aromatase activities and GSI in ranid frogs collected from agricultural and non-agricultural sites in Michigan (USA). Aquatic Toxicology 77: 153-166.

156. Murphy M. B., M. Hecker, K.K. Coady. A.R. Tompsett, P.D. Jones, L.H. du Preez, G.J. Everson, K.R. Solomon, J.A. Carr, E.E. Smith, R.J. Kendall, G. Van Der Kraak, and J.P.Giesy. 2006. Atrazine concentrations, gonadal gross morphology and histology in ranid frogs collected in Michigan agriculture areas. Aquatic Toxicology 76: 230-245.

155. Murphy M. B, M. Hecker, K.K. Coady, A.R. Tompsett, P.D. Jones, J.L. Newsted, H.L. Wong, L.H. du Preez, K.R. Solomon, J.A. Carr, E.E. Smith, R.J. Kendall, G. Van Der Kraak and Giesy JP. 2006. Sediment TCDD-EQs and EROD and MROD Activities in Ranid Frogs from Agricultural and Nonagricultural Sites in Michigan (USA). Archives of Environmental Contamination and Toxicology 51: 467-477.

154. Nero, V., A. Farwell, A. Lister, G. Van Der Kraak, L.E.J. Lee, T. Van Meer, M.D. MacKinnon and D. G. Dixon. 2006. Gill and liver histopathological changes in yellow perch (*Perca flavescens*) and

goldfish (*Carassius auratus*) exposed to oil sands process-affected water. Ecotoxicology and Environmental Safety 63: 365-377.

153. Park J.-W., M. Hecker, M.B. Murphy, P.D. Jones, K.R. Solomon, G. Van Der Kraak, J.A. Carr , E.E. Smith, L.H. du Preez, R.J. Kendall and J.P. Giesy. 2006. Development and optimization of a Q-RT PCR method to quantify CYP19 mRNA expression in testis of male adult Xenopus laevis: Comparison with aromatase enzyme activity. Comparative Biochemistry and Physiology 144B: 18-28.

152. Young, J.L., S.G. Hinch, S.J. Cooke, G.T. Crossin, D.A. Patterson, A.P Farrell, G. Van Der Kraak, A. Lotto, A. Lister, M.C. Healey and K. English. 2006. Physiological and energetic correlates of en route mortality for abnormally early migrating adult sockeye salmon (Oncorhynchus nerka) in the Thompson River, British Columbia. Canadian Journal of Fisheries and Aquatic Sciences 63: 1067-1077.

151. Boudreau, M., S.C. Courtenay, D.L. MacLatchy, C.H. Bérubé, L.M. Hewitt, and G.J. Van Der Kraak. 2005. Morphological abnormalities during early life development of the estuarine mummichog (*Fundulus heteroclitus)*, as an indicator of androgenic and anti-androgenic endocrine disruption. Aquatic Toxicology 71: 357-369.

150. Bubenik, G.A., K.V. Miller, A.L. Lister, D.A. Osborn. L. Bartos, and G.J. Van Der Kraak. 2005. Testosterone and estradiol concentrations in serum, velvet, skin and growing antler bone of male white-tailed deer. Journal of Experimental Zoology 303A: 186-192.

149. Coady K.K., M.B. Murphy, D.L Villeneuve, M. Hecker, J.A. Carr, K.R. Solomon, G. Van Der Kraak, E.E. Smith, R.J. Kendall, and J.P. Giesy. 2005. Effects of atrazine on metamorphosis, growth, laryngeal and gonadal development, aromatase activity, and sex steroid concentrations in *Xenopus laevis*. Ecotoxicology and Environmental Safety. 62: 160-173.

148. Cooke, S.J., G.T. Crossin , D. Patterson, K.K. English, S.G. Hinch, J.L. Young, JR.F. Alexander, M.C. Healey, G. Van Der Kraak and A.P. Farrell. 2005. Coupling non-invasive physiological assessments with telemetry to understand inter-individual variation in behaviour and survivorship of fish: development and validation of a technique. Journal of Fish Biology 67: 1342-1358.

147. Du Preez LH, P.J. Jansen van Rensburg, A.M. Jooste, J.A. Carr, J.P. Giesy, T.S. Gross, R.J. Kendall, E.E. Smith, G. Van Der Kraak, and K.R. Solomon. 2005. Seasonal exposures to triazine and other pesticides in surface waters in the western Highveld corn-production region in South Africa. Environmental Pollution 135: 131-141.

146. Du Preez LH, K.R. Solomon, J.A. Carr , J.P. Giesy, T.S. Gross, R.J. Kendall, E.E. Smith, G. Van Der Kraak and C. Weldon. 2005. Population structure characterization of the clawed frog (*Xenopus laevis*) in maize-growing versus non-maize-growing areas in South Africa. African Journal of Herpetology 54: 61-68.

145. Hecker M., W.J. Kim, J.W. Park, M.B. Murphy, D.L. Villeneuve, K.K. Coady, P.D. Jones, K.R. Solomon, G. Van Der Kraak, J.A. Carr, E.E. Smith, L. du Preez, R.J. Kendall and J.P. Giesy. 2005. Plasma concentrations of estradiol and testosterone, gonadal aromatase activity and ultrastructure of the testis in *Xenopus laevis* exposed to estradiol or atrazine. Aquatic Toxicology 72: 383-396.

144. Hecker, M., J.-W. Park, M.B. Murphy, P.D. Jones, K.R. Solomon, G. Van Der Kraak, J.A. Carr, E.E. Smith, L. du Preez, R.J. Kendall and J.P. Giesy JP. 2005. Effects of atrazine on CYP19 gene expression and aromatase activity in testes and on sex steroid concentrations in plasma of male African clawed frogs (*Xenopus laevis*). Toxicological Sciences 86: 273-280.

143. Hewitt, M., R. Schryer, A. Pryce, A. Belknap, B. Firth and G. Van Der Kraak. 2005. Hormonally-active substances are accumulated by wild white sucker (*Catostomus commersoni*) exposed to effluents discharged to the Wabigoon River. Water Quality Research Journal of Canada 40: 315-327.

142. Jooste, A.M., L.H. Du Preez, J.A. Carr, J.P. Giesy , T.S. Gross, R.J. Kendall, E.E. Smith, G.J. Van Der Kraak and Solomon KR. 2005. Gonadal development of larval male *Xenopus laevis* exposed to atrazine in outdoor microcosms. Environmental Science and Technology 39: 5255-5261.

141. Lariviere, K., M. Samia, A. Lister. G. Van Der Kraak, and V.L. Trudeau. 2005. Sex steroid regulation of brain glutamic acid decarboxylase (GAD) mRNA is season-dependent and sexually dimorphic in the goldfish, Carassius auratus. Molecular Brain Research 141: 1-9.

140. McMaster, M.E., L.M. Hewitt, G.R. Tetreault, T. Janoscik, C. Boyko, L. Peters, J.L. Parrott, G.J. Van Der Kraak, C.B. Portt, K. J. Kroll, and N.D. Denslow. 2005. Detailed endocrine Assessments of wild fish in the Northern River Basins, Alberta in comparison to EEM monitored endpoints. Water Quality Research Journal of Canada 40: 299-314.

139. Oakes, K.D., L.M. Hewitt, M.E. McMaster, C.Wood, K.R. Munkittrick and G. J, Van Der Kraak. 2005. Oxidative stress and sex steroid levels in fish following short term exposure to pulp mill effluents. Journal of Toxicology and Environmental Health Part A, 68:267-285.

138. Oakes, K.D., P.K. Sibley, J.W. Martin, D.D. MacLean, K.R. Solomon, S.A. Mabury and G.Van Der Kraak. 2005. Short-term exposures of fish to perfluoroctane sulfonate (PFOS): effects on fatty acyl-CoA oxidase, oxidative stress and circulating sex steroids. Environmental Toxicology and Chemistry 24: 1172-1181.

137. Oakes, K.D., L.A. Tremblay and G.J. Van Der Kraak. 2005. Short-term lab exposures of immature rainbow trout (*Oncorhynchus mykiss*) to sulphite and kraft pulp mill effluents: effects on oxidative stress and circulating sex steroids. Environmental Toxicology and Chemistry 24: 1451-1461.

136. Smith E. E,, L.H. du Preez, A. Gentles, K.R. Solomon, B. Tandler, J.A. Carr, G.J. Van Der Kraak, R.J.Kendall , J.P. Giesy and T.S. Gross. 2005. Assessment of laryngeal muscle and testicular cell types in *Xenopus laevis* (Anura Pipidae) inhabiting maize and non-maize growing areas of South Africa. African Journal of Herpetology 54: 69-76.

135. Wagner, G.N., S.G. Hinch, L.J. Kuchel, A. Lotto, S.R.M. Jones, D.A. Patterson, J.S. Macdonald, G. Van Der Kraak, M. Shrimpton, K.K. English, S. Larsson, S. J. Cooke, M.C. Healey and A.P. Farrell, 2005. Metabolic rates and swimming performance of adult Fraser River sockeye salmon (*Oncorhynchus nerka*) after a controlled infection with *Parvicapsula minibicornis*. Canadian Journal of Fisheries and Aquatic Sciences 62: 2124-2133.

134. Alsop, D.A., Brown, S. and G. Van Der Kraak. 2004. Dietary retinoic acid induces hindlimb and eye deformities in *Xenopus laevis*. Environmental Science and Technology 38: 6290-6299.

133. Boudreau, M., S.C. Courtenay, D.L. MacLatchy, C.H. Berube, J.L. Parrott and G. Van Der Kraak. 2004. Utility of morphological abnormalities during early life development of the estuarine mummichog, *Fundulus heteroclitus*, as an indicator of estrogenic and anti-estrogenic endocrine disruption. Environmental Toxicology and Chemistry 23: 415-425.

132. Coady KK, Murphy MB, Villeneuve DL, Hecker M, Carr JA, Solomon KR, Van Der Kraak G, Smith EE, Kendall RJ, and Giesy JP. 2004. Effects of atrazine on metamorphosis, growth, and gonadal development in the green frog (*Rana clamitans*). Journal of Toxicology and Environmental Health Part A. 67: 941-957.

131. Cooke, S.J., S.G. Hinch, A.P. Farrell, M.F. LaPointe, S.R.M. Jones, J.S. MacDonald, D. Patterson, M. C. Healey and G. Van Der Kraak, 2004. Abnormal migration timing and high enroute mortality of sockeye salmon in the Fraser River, British Columbia. Fisheries 29: 22-33.

130. Hecker M, Giesy JP, Jones PD, Jooste AM, Carr JA, Solomon KR, Smith EE, Van Der Kraak GJ, Kendall RJ, Du Preez LH. 2004. Plasma sex steroid concentrations and gonadal aromatase activities in African clawed frogs (Xenopus laevis) from the corn-growing region of South Africa. Environmental Toxicology and Chemistry 23: 1996-2007.

129. Leanos-Castaneda, O., G. Gold-Bouchot, G. Van Der Kraak, A. Lister, V. Ceja-Moreno and R. Sina-Alvarez. 2004. An aromatase inhibitor and tamoxifen decrease plasma levels of o,p'-DDT and its metabolites in Nile Tilapia (*Oreochromis niloticus*) . Marine Environmental Research 58: 337-342.

128. Oakes, K.D., M.E. McMaster and G. Van Der Kraak. 2004. Oxidative stress responses in longnose sucker (*Catostomas catostomas*) exposed to pulp and paper mill and municipal sewage effluents. Aquatic Toxicology 67: 255-271.

127. Oakes, K.D., P.K. Sibley, K.R. Solomon, S.A. Mabury and G.J. Van Der Kraak. 2004. Impact of perfluorooctanoic acid (PFOA) on fathead minnow (*Pimpephales promelas*) fatty acyl-CoA oxidase activity, circulating steroids and reproduction in outdoor mesocosms. Environmental Toxicology and Chemistry. 23: 1912-1919.

126. Sharpe, R.L., D. L. MacLatchy, S.C. Courtnay, and G. Van Der Kraak. 2004. Effects of a model androgen (methyl testosterone) and a model anti-androgen (cyproterone acetate) on reproductive endocrine endpoints in a short-term adult mummichog (Fundulus heteroclitus) bioassay. Aquatic Toxicology 67: 203-215.

125. Wood, A.W., J. Matsumoto, and G. Van Der Kraak. 2004. Thyroglobulin type-1 domain protease inhibitors exhibit specific expression in the cortical ooplasm of vitellogenic rainbow trout oocytes. Molecular Reproduction and Development 69: 205-214.

124. Alsop, D., M. Hewitt, M. Kohli, S. Brown, G. Van Der Kraak. 2003. Constituents within pulp mill effluent deplete retinoid stores in white sucker and bind to rainbow trout retinoic acid receptors and retinoid X receptors. Environmental Toxicology and Chemistry 22: 2969-2976.

123. Burnison, B.K., A. Hartmann, A. Lister, M.R. Servos, T. Ternes, G. Van Der Kraak. 2003. A toxicity identification evaluation (TIE) approach to study estrogenic substances in hog manure and agricultural runoff. Environmental Toxicology and Chemistry 22:2243-2250

122. Calp, M.K., J.A. Matsumoto and G. Van Der Kraak. 2003. Activin and transforming growth factor-β as local regulators of ovarian function in the goldfish. General and Comparative Endocrinology 132: 142-150.

121. Carr, J.A., A. Gentles, E.E. Smith, W.L. Golman, L.J. Urquidi, K. Thuett, R.J. Kendall, J.P. Giesy, T.S. Gross, K.R. Solomon and G. Van Der Kraak. 2003. Response of larval xenopus laevis to atrazine: Assessment of gonadal and laryngeal morphology. Environmental Toxicology and Chemistry 22: 396-405.

120. Hewitt, L.M., A.C. Pryce, J.L. Parrott, V. Marlatt, C. Wood, K. Oakes and G. Van Der Kraak. 2003. Accumulation of ligands for aryl hydrocarbon and sex steroid receptors in fish exposed to treated effluent from a bleached sulphite/groundwood pulp and paper mill. Environmental Toxicology and Chemistry 22: 2890-2897.

119. Levesque, H.M., J. Dorval, A. Honteal, G. Van Der Kraak, and P.G.C. Campbell. 2003. Hormonal, morphological and physiological responses of yellow perch (Perca flavescens) to chronic

environmental metal exposures. Journal of Toxicology and Environmental Health, Part A 66: 657-676.

118. MacLatchy, D.L., S.C. Courtenay, C.D. Rice and G. Van Der Kraak. 2003 Development of a short-term reproductive endocrine bioassay using steroid hormone and vitellogenin end points in the estuarine mummichog, (*Fundulus heteroclitus*). Environmental Toxicology and Chemistry 22: 996-1008.

117. Oakes, K.D., M.E. McMaster, A.C. Pryce, K.R. Munkittrick, C.B. Portt, L.M. Hewitt, G.J. Van Der Kraak. 2003. Oxidative stress and bioindicators of reproductive function in pulp and paper mill effluent exposed white sucker. Toxicological Sciences 74: 51-65.

116. Oakes, K.D. and G. Van Der Kraak. 2003. Utility of the TBARS assay in detecting oxidative stress in feral white sucker (Catostomus commersoni) populations exposed to pulp and paper mill effluent. Aquatic Toxicology 63:447-463.

115. Pryce-Hobby, A.C., M.E. McMaster, L.M. Hewitt and G. Van Der Kraak. 2003. The effects of pulp mill effluent on the sex steroid binding protein in white sucker (Catostomus commersoni) and longnose sucker (C. catostomus). Comparative Biochemistry and Physiology 134C: 241-250.

114. Wood, A.W., and G. Van Der Kraak. 2003. Yolk proteolysis in rainbow trout oocytes after serum-free culture: evidence for a novel biochemical mechanism of atresia in oviparous vertebrates. Molecular Reproduction and Development 65:219-227.

113. Cottrill, R.A., R.S. McKinley and G. Van Der Kraak. 2002. An examination of utilizing external measures to identify sexually maturing female American eels (Anguilla rostrata L.) in the St. Lawrence River. Environmental Biology of Fishes 65: 271-287.

112. Leanos-Castaneda, O., G. Van Der Kraak, A. Lister, R. Sima-Alvarez and G. Gold-Bouchot. 2002. o,p'-DDT induction of vitellogenesis and its inhibition by tamoxifen in Nile tilapia (Oreochromis niloticus). Marine Environmental Research 54:703-707.

111. Lister, A. and G. Van Der Kraak. 2002. Modulation of goldfish testicular testosterone production in vitro by tumor necrosis factor □, interleukin-1□, and macrophage conditioned media. Journal of Experimental Zoology 292:477-486.

110. Schoenfuss, H.L., J.T. Levitt, G. Van Der Kraak and P.W. Sorensen. 2002. Ten-week exposure to treated sewage discharge has relatively minor, variable effects on reproductive behavior and sperm production in goldfish. Environmental Toxicology and Chemistry. 21:2185-2190.

109.Wood, A. and G. Van Der Kraak. 2002. Inhibition of apoptosis in vitellogenic ovarian follicles of rainbow trout (Oncorhynchus mykiss) by salmon gonadotropin, epidermal growth factor and 17 β□-estradiol. Molecular Reproduction and Development 61:511-518.

108. Alsop, D., S. Brown and G. Van Der Kraak. 2001. Development of a retinoic acid receptor binding assay with rainbow trout tissue: characterization of retinoic acid binding, receptor tissue distribution and developmental changes. General and Comparative Endocrinology123: 254-267.

107. Cottrill, R.A., R.S. McKinley, G. Van Der Kraak, J.-D. Dutil, K.B. Reid and K.J. McGrath. 2001. Plasma non-esterified fatty acid profiles and 17 β□-estradiol levels of juvenile immature and maturing adult American eels in the St. Lawrence River. Journal of Fish Biology 59:364-379.

106. Evanson, M. and G. Van Der Kraak. 2001. Stimulatory effects of selected PAHs on testosterone production in goldfish and rainbow trout and possible mechanisms of action. Comparative Biochemistry and Physiology 130:249-258.

105. Janz, D.M., M.E. McMaster, L.P. Weber, K.R. Munkittrick and G. Van Der Kraak. 2001. Recovery of ovary size, follicle cell apoptosis and HSP70 expression in fish exposed to bleached kraft pulp mill effluent. Canadian Journal of Fisheries and Aquatic Sciences.58: 620-625.

104. Lister, A. and G.J. Van Der Kraak. 2001. Endocrine disruption: why is it so complicated? Water Quality Research Journal of Canada. 36: 175-188.

103. McMaster, M.E., J.J. Jardine, G. Ankley, W.H. Benson, M. Greely, T. Gross, L. Guillette, D. MacLatchy, E. Orlando, G. Van Der Kraak and K.R. Munkittrick. 2001. An interlaboratory study on the use of steroid hormone in examining endocrine disruption. Environmental Toxicology and Chemistry 20:2081-2087.

102. Mercure, F., A.C. Holloway, D.R. Tocher, M.A. Sheridan, G. Van Der Kraak and J.F. Leatherland. 2001. Influence of plasma lipid changes in response to 17β-oestradiol stimulation on plasma growth hormone, somatostatin and thyroid hormone levels in immature rainbow trout. Journal of Fish Biology 59: 605-615.

101. Stacey, N., E.J. Fraser, P. Sorensen and G. Van Der Kraak. 2001. Milt production in goldfish: regulation by multiple social stimuli. Comparative Biochemistry and Physiology Part C130: 467-476..

100. Van Der Kraak, G., M. Hewitt, A. Lister, M.E. McMaster and K.R. Munkittrick. 2001. Endocrine toxicants and reproductive success in fish. Human and Ecological Risk Assessment. 7: 1017-1025.

99. Wood, A. and G. Van Der Kraak. 2001. Apoptosis and ovarian function: novel perspectives from the teleosts. Biology of Reproduction. 64: 264-271.

98. Hewitt, L.M., J.L. Parrott, K.L. Wells, M.K. Calp, S. Biddiscombe, M.E. McMaster, K.R. Munkittrick and G. Van Der Kraak. 2000. Characteristics of ligands for the Ah receptor and sex steroid receptors in hepatic tissues of fish exposed to bleached kraft mill effluent. Environmental Science and Technology 34: 4327-4334.

97. Makynen, E.A., M.D. Kahl, K.M. Jensen, J.E. Tietge, K.L. Wells, G. Van Der Kraak and G.T. Ankley. 2000. Effects of the mammalian antiandrogen vinclozolin on development and reproduction of the fathead minnow (Pimephales promelas). Aquatic Toxicology 48: 461-475.

96. Pankhurst, N.W. and G. Van Der Kraak. 2000. Evidence that acute stress inhibits ovarian steroidogenesis in rainbow trout in vivo, through the actions of cortisol. General and Comparative Endocrinology 117: 225-237.

95. Safe, S. H., W. G. Foster, J. C. Lamb, R.R. Newbold, G. Van Der Kraak, 2000. Estrogenicity and endocrine disruption. Council for Agricultural Science and Technology. 16. 16pp.

94. Wells, K. L. and G. Van Der Kraak. 2000. Differential binding of endogenous steroids and environmental chemicals to androgen receptors in rainbow trout and goldfish. Environmental Toxicology and Chemistry 19: 2059-2065.

93. Holloway, A.C., M.A. Sheridan, G. Van Der Kraak, and J.F. Leatherland. 1999. Correlations of plasma growth hormone with somatostatin, gonadal steroid hormones and thyroid hormones in rainbow trout during sexual recrudescence. Comparative Biochemistry and Physiology Part B. 123: 251-260.

92. Tremblay, L.T and G. Van Der Kraak. 1999. Comparison between the effects of the phytosterol □-sitosterol and pulp and paper mill effluents on sexually immature rainbow trout. Environmental Toxicology and Chemistry 18: 329-336.

91. Van Der Kraak, G. and S. Biddiscombe. 1999. Polyunsaturated fatty acids modulate the properties of the sex steroid binding protein in the goldfish. Fish Physiology and Biochemistry 20:115-123.

90. Ankley, G., E. Mihaich, R. Stahl, D. Tillitt, T. Colborn, S. McMaster, R. Miller, J. Bantle, P. Campbell, N. Denslow, R. Dickerson, L. Folmar, M. Fry, J. Giesy, L.E. Gray, P. Guiney, T. Hutchinson, S. Kennedy, V. Kramer, G. Le Blanc, M. Mayes, A. Nimrod, R. Patino, R. Peterson, R. Purdy, R. Ringer, L. Touart, G. Van Der Kraak and T. Zacharewski 1998. Overview of a workshop on screening methods for detecting potential (anti) estrogenic/androgenic chemicals in wildlife. Environmental Toxicology and Chemistry 17: 68-87.

89. Bishop, C.A., G. Van Der Kraak, P. Ng, J.E.G. Smits and A. Hontela. 1998. Health of tree swallows (Tachycineta bicolor) nesting in pesticide-sprayed apple orchards in Ontario, Canada II. Sex and thyroid hormone concentrations and testes development. Journal of Toxicology and Environmental Health Part A:561-581.

98. de Solla, S.R., C.A. Bishop, G.Van Der Kraak and R.J. Brooks. 1998. Impact of organochlorine contamination on levels of sex hormones and sexually dimorphic morphology of common snapping turtles (Chelydra serpentina serpentina) in Ontario, Canada. Environmental Health Perspectives 106: 253-260.

87. Harris, M.L., C.A. Bishop, J. Struger, M.R. van den Heuvel, G.J. Van Der Kraak, D.G., Dixon, B. Ripley, and J.P. Bogart. 1998. The functional integrity of northern leopard frog (Rana pipiens) and green frog (Rana clamitans) populations in orchard wetlands. I. Genetics, Physiology and biochemistry of breeding adults and young-of-the-year. Environmental Toxicology and Chemistry 17: 1338-1350.

86. Hewitt, L.M. , K.R. Munkittrick, G.J. Van Der Kraak, I.M. Scott, L.P Schleen and M.R. Servos. 1998. Hepatic MFO activity and vitellogenin induction in fish following a treatment of the lampricide 3-trifluormethyl-4-nitrophenol (TFM). Canadian Journal of Fisheries and Aquatic Sciences 55: 2078-2086.

85. Hewitt, L.M., L. Tremblay, G.J. Van Der Kraak, K.R. Solomon and M.R. Servos. 1998. Identification of the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) as an agonist for the rainbow trout estrogen receptor. Environmental Toxicology and Chemistry 17:425-432.

84. MacDougall, T., M. and G. Van Der Kraak. 1998. Peptide growth factors modulate prostaglandin E and F production by goldfish ovarian follicles. General and Comparative Endocrinology 110:46-57.

83. McKinley, S., G. Van Der Kraak and G. Power. 1998. Seasonal migrations and reproductive development in the lake sturgeon (Acipenser fulvescens) in the vicinity of hydroelectric stations in northern Ontario. Environmental Biology of Fishes 51:245-256.

82. Munkittrick, K.R., M.E. McMaster, L.H. McCarthy, M.R,. Servos and G. Van Der Kraak. 1998. An overview of recent studies on the potential of pulp mill effluents to impact reproductive function in fish. Journal of Toxicology and Environmental Health Part B. 1: 347-371.

81. Tremblay, L. and G. Van Der Kraak. 1998. Use of a series of in vitro and in vivo bioassays developed in rainbow trout to evaluate the actions of □-sitosterol. Aquatic Toxicology 43: 149-162.

80. Hazineh, A., S. H. Shin, C. Reifel, S.C. Pang and G. Van Der Kraak. 1997. Dopamine causes ultrastructural changes in prolactin cells of Tilapia (Orechromis niloticus). Cellular and Molecular Life Sciences 53: 452-458.

79. Janz, D.M. and G. Van Der Kraak. 1997. Suppression of apoptosis by gonadotropin, 17 β□-estradiol and epidermal growth factor in trout preovulatory ovarian follicles. General and Comparative Endocrinology 105: 186-193.

78. Janz, D.M., M.E. McMaster, K.R. Munkittrick and G. Van Der Kraak. 1997. Elevated ovarian follicular apoptosis and heat shock protein-70 expression in white sucker exposed to bleached kraft pulp mill effluent. Toxicology and Applied Pharmacology 147: 391-398.

77. MacLatchy, D., L. Peters, J. Nickle and G. Van Der Kraak. 1997. Exposure to □-sitosterol the endocrine status of goldfish differently than 17 β□-estradiol. Environmental Toxicology and Chemistry 16: 1895-1904.

76. Ballantyne, J.S. F. Mercure, M.F. Gerrits, G. Van Der Kraak, S. McKinley, D.W. Martens, S.G. Hinch and R.E. Diewert. 1996. Plasma nonesterified fatty acid profiles in male and female sockeye salmon, Oncorhynchus nerka, during their spawning migration. Canadian Journal of Fisheries and Aquatic Science 53: 1418-1426.

75. Cardwell, J.R., P.W. Sorensen, G.J. Van Der Kraak and N.R. Liley. 1996. Effect of dominance status on sex hormone levels in laboratory and wild-spawning male trout. General and Comparative Endocrinology 101: 333-341.

74. Flett, P.A., K.R. Munkittrick, G. Van Der Kraak, and J.F. Leatherland. 1996. Over-ripening as the cause of low survival to hatch in Lake Erie coho salmon (Oncorhynchus kisutch) embryos. Canadian Journal of Zoology 74: 851-857.

73. Jardine, J.J., G.J. Van Der Kraak, and K.R. Munkittrick. 1996. Capture and confinement stress in white sucker exposed to bleached kraft pulp mill effluent. Ecotoxicology and Environmental Safety 33: 287-298.

72. McMaster, M.E., G.J. Van Der Kraak and K.R. Munkittrick. 1996. An evaluation of the biochemical basis for steroid hormone depressions in fish exposed to industrial wastes. Journal of Great Lakes Research 22: 153-171.

71. Mercure, F. and G. Van Der Kraak. 1996. Mechanisms of action of free arachidonic acid on ovarian steroid production in the goldfish. General and Comparative Endocrinology 102: 130-140.

70. Pankhurst, N.W., G.J. Purser, G. Van Der Kraak, P.M. Thomas and G.N.R. Forteath. 1996. Effect of holding temperature on ovulation, egg fertility, plasma levels of reproductive hormones and in vitro ovarian steroidogenesis in the rainbow trout Oncorhynchus mykiss. Aquaculture 146: 277-290.

69. MacLatchy D.L. and G.J. Van Der Kraak. 1995. The phytoestrogen □-sitosterol alters the reproductive endocrine status of goldfish. Toxicology and Applied Pharmacology 134: 305-312.

68. McMaster, M.E., G.J. Van Der Kraak, and K.R. Munkittrick. 1995. Exposure to bleached kraft pulp mill effluent reduces the steroid biosynthetic capacity of white sucker ovarian follicles. Comparative Biochemistry and Physiology 112C: 169-178.

67. Mercure, F. and G. Van Der Kraak. 1995. Inhibition of gonadotropin-stimulated steroid production by polyunsaturated fatty acids in teleost fish. Lipids 30: 547-554.

66. Pankhurst, N.W., G. Van Der Kraak, and R. Peter. 1995. Evidence that the inhibitory effects of stress on reproduction are not mediated by the action of cortisol on ovarian steroidogenesis. General and Comparative Endocrinology 99: 249-257.

65. Scott, A.P., Nagahama, Y., G. Van Der Kraak and J.J. Nagler. 1995. Sulphation and uptake of the maturation-inducing steroid, 17□,20□-dihydroxy-4-pregnen-3-one by rainbow trout ovarian follicles. Fish Physiology and Biochemistry 14: 301-311.

64. Srivastava, R.K. and G. Van Der Kraak. 1995. Multifactorial regulation of DNA synthesis in goldfish ovarian follicles. General and Comparative Endocrinology 100: 327-333.

63. van den Heuvel, M.R., K.R. Munkittrick, G.J. Van Der Kraak, M.R. Servos and D.G. Dixon. 1995. Hepatic 7-ethoxyresorufin -O-deethylase activity, plasma steroid hormone concentrations and liver bioassay-derived 2,3,7,8-TCDD toxic equivalent concentrations in wild white sucker (Catostomus commersoni) caged in bleached kraft pulp mill effluent. Canadian Journal of Fisheries and Aquatic Sciences 52: 1339-1350.

62. Flett, P.A., G. Van Der Kraak, and J.F. Leatherland. 1994. Effects of excitatory amino acids on in vivo and in vitro gonadotropin and growth hormone secretion in testosterone primed immature rainbow trout (Oncorhynchus mykiss). Journal of Experimental Zoology 268: 390-399.

61. Gagnon, M.M., J.J. Dodson, P.V. Hodson, G. Van Der Kraak and J.H. Carey. 1994. Seasonal effects of bleached kraft mill effluent on reproductive parameters of white sucker (Catostomus commersoni) populations of the St. Maurice River, Quebec, Canada. Canadian Journal of Fisheries and Aquatic Sciences 51: 337-347.

60. McMaster, M.E., K.R. Munkittrick, P.L. Luxon and G.J. Van Der Kraak. 1994. Impact of low level sampling stress on interpretation of physiological responses of white sucker exposed to effluent from a bleached kraft pulp mill. Ecotoxicology and Environmental Safety 27: 251-264.

59. Munkittrick, K.R., M.R. Servos, J.L. Parrott, V. Martin, J.H. Carey, P.A. Flett and G.J. Van Der Kraak. 1994. Identification of lampricide formulations as a potent inducer of MFO activity in fish. Journal of Great Lakes Research 20: 355-365.

58. Munkittrick, K.R., G.J. Van Der Kraak, M.E. McMaster, C.B. Portt, M.R. van den Heuvel and M.R. Servos. 1994. Survey of receiving water environmental impacts associated with discharges from pulp mills. 2. Gonad size, liver size, hepatic MFO activity and plasma sex steroid levels in white sucker. Environmental Toxicology and Chemistry 13: 1089-1101.

57. Munkittrick, K.R. and G.J. Van Der Kraak. 1994. Receiving water environmental effects associated with discharges from Ontario pulp mills. Pulp and Paper Canada 95: 199-201.

56. Servos, M.R., S.Y. Huestis, D.M. Whittle, G. Van Der Kraak and K.R. Munkittrick. 1994. Survey of receiving water environmental impacts associated with discharges from pulp mills. 3. Polychlorinated dioxins and furans in muscle and liver of white sucker (Catostomus commersoni). Environmental Toxicology and Chemistry 13: 1103-1115.

55. Srivastava, R.K. and G. Van Der Kraak. 1994. Insulin as an amplifier of gonadotropin action on steroid production: mechanisms and sites of action in goldfish prematurational full, grown ovarian follicles. General and Comparative Endocrinology 95: 60-70.

54. Srivastava, R.K. and G. Van Der Kraak. 1994. Effects of activators of different intracellular signaling pathways on steroid production by goldfish vitellogenic ovarian follicles General and Comparative Endocrinology 93: 181-191.

53. Srivastava, R.K. and G. Van Der Kraak. 1994. Regulation of DNA synthesis in goldfish ovarian follicles by hormones and growth factors. Journal of Experimental Zoology 270: 263-272.

52. van den Heuvel, M.R., K.R. Munkittrick, G.J. Van Der Kraak, M.E. McMaster, C.B. Portt, M.R. Servos and D.G. Dixon. 1994. Survey of receiving-water environmental impacts associated with discharges from pulp mills. 4. Bioassay derived 2,3,7,8-tetrachlorodibenzo-p-dioxin toxic equivalent concentrations in white sucker (Catostomus commersoni) in relation to biochemical indicators of impact. Environmental Toxicology and Chemistry 13: 1117-1126.

51. Wade, M.G., P.M. Jacobson, and G. Van Der Kraak. 1994. Polyunsaturated fatty acids do not activate protein kinase C in the testis of the goldfish (Carassius auratus). Fish Physiology and Biochemistry 13: 49-57.

50. Wade, M.G., G. Van Der Kraak, M.F. Gerrits, and J.S. Ballantyne. 1994. The release and steroidogenic actions of polyunsaturated fatty acids in the goldfish testis. Biology of Reproduction 51: 131-139.

49. Wong, A.O.L., G. Van Der Kraak and J.P. Chang. 1994. Cyclic 3'5'-Adenosine monophosphate (cAMP) mediates dopamine D1-stimulated growth hormone release from goldfish pituitary cells. Neuroendocrinology 60:410-417.

48. Liley, N.R., K.H. Olsen, C.J. Foote, and G. Van Der Kraak. 1993. Endocrine changes associated with spawning behaviour in male kokanee salmon (Oncorhynchus nerka) and the effects of anosmia. Hormones and Behaviour 27: 470-487.

47. Tao, Y.X., H.R. Lin, G. Van Der Kraak and R.E. Peter. 1993. Hormonal induction of precocious sex reversal in ricefield eel, Monopterus albus. Aquaculture 118: 131-140.

46. Trudeau, V.L., M.G. Wade, G. Van Der Kraak and R.E. Peter. 1993. Effects of 17β□-estradiol on pituitary and testicular function in male goldfish. Canadian Journal of Zoology 71:1131-1135.

45. Wade, M.G. and G. Van Der Kraak. 1993. Arachidonic acid and prostaglandin E2 stimulate testosterone production by goldfish testes in vitro. General and Comparative Endocrinology 90: 109-118.

44. Wade, M.G. and G. Van Der Kraak. 1993. Regulation of prostaglandin E and F production in the goldfish testis. Journal of Experimental Zoology 266: 108-115.

43. Chang, J.P., A.O.L. Wong, G. Van Der Kraak and F. Van Goor. 1992. Gonadotropin responses to two native gonadotropin-releasing hormones in the goldfish are not mediated by cyclic AMP. General and Comparative Endocrinology 86: 359-377.

42. Hodson, P.V., M. McWhirter, K. Ralph, B. Gray, D. Thivierge, J. Carey, G. Van Der Kraak, D. McWhittle and M. Levesque. 1992. Effects of bleached kraft mill effluent on fish in the St. Maurice River, Quebec. Environmental Toxicology and Chemistry 11: 1635-1651.

41. Kellner, R.G. and G. Van Der Kraak. 1992. Multifactorial regulation of prostaglandin synthesis in preovulatory goldfish ovarian follicles. Biology of Reproduction 46: 630-635.

40. Munkittrick, K.R., M.E. McMaster, C.B. Portt, G. Van Der Kraak, I.R. Smith and D.G. Dixon. 1992. Changes in maturity, plasma sex steroid levels, hepatic MFO activity and the presence of external lesions in lake whitefish exposed to bleached kraft mill effluent (BKME). Canadian Journal of Fisheries and Aquatic Sciences 49: 1560-1569.

39. Munkittrick, K.R., G. Van Der Kraak, M.E. McMaster and C.B. Portt. 1992. Response of hepatic MFO activity and plasma sex steroids to secondary treatment of bleached kraft pulp mill effluent and mill shutdown. Environment Toxicology and Chemistry 11: 1427-1439.

38. Pearson, M., G. Van Der Kraak and E.D. Stevens. 1992. In vivo pharmacology of spleen contraction in rainbow trout. Canadian Journal of Zoology 70: 625-627.

37. Van Der Kraak, G. 1992. Mechanisms by which calcium ionophore and phorbol ester modulate steroid production by goldfish preovulatory ovarian follicles. Journal of Experimental Zoology 262: 271-278.

36. Van Der Kraak, G., K.R. Munkittrick, M.E. McMaster, C.B. Portt and J.P. Chang. 1992. Exposure to bleached kraft pulp mill effluent disrupts the pituitary-gonadal axis of white sucker at multiple sites. Toxicology and Applied Pharmacology 115: 224-233.

35. Van Der Kraak, G., K. Suzuki, R.E. Peter, H. Itoh and H. Kawauchi. 1992. Properties of common carp gonadotropin I and gonadotropin II. General and Comparative Endocrinology 85: 217-229.

34. Lin, H.R., M.L. Zhang, S.M. Zhang, G. Van Der Kraak and R.E. Peter. 1991. Stimulation of pituitary gonadotropin and ovarian development by chronic administration of testosterone in female Japanese Silver Eel, Anguilla japonica. Aquaculture 96: 87-95.

33. Lin, H.R., X.J. Zhou, G. Van Der Kraak and R.E. Peter. 1991. Effects of gonadotropin releasing hormone agonists and dopamine antagonists on gonadotropin secretion and ovulation in Chinese loach, Paramisgurnus dabryanus. Aquaculture 95: 139-147.

32. McMaster, M.E., G. Van Der Kraak, C.B. Portt, K.R. Munkittrick, P.K. Sibley, I.R. Smith and D.G. Dixon. 1991. Changes in hepatic mixed-function oxygenase (MFO) activity, plasma steroid levels and age at maturity of a white sucker (Catostomus commersoni) population exposed to bleached kraft pulp mill effluent. Aquatic Toxicology 21: 199-218.

31. Munkittrick, K.R., C. Portt, G.J. Van Der Kraak, I. Smith and D. Rokosh. 1991. Impact of bleached kraft mill effluent on population characteristics, liver MFO activity, and serum steroid levels of a Lake Superior white sucker population. Canadian Journal of Fisheries and Aquatic Sciences 48: 1371-1380.

30. Van Der Kraak, G. 1991. Role of calcium in the control of steroidogenesis in preovulatory ovarian follicles of the goldfish. General and Comparative Endocrinology 81: 268-275.

29. Wade, M.G. and G. Van Der Kraak. 1991. The control of testicular steroidogenesis in the goldfish: effects of activators of different intracellular signalling pathways. General and Comparative Endocrinology 83: 337-344.

28. Danzmann, R.G., G. Van Der Kraak, T.T. Chen and D.A. Powers. 1990. Growth hormone accelerates sexual maturation in rainbow trout at high rearing temperatures but does not influence growth. Canadian Journal of Fisheries and Aquatic Sciences 47: 1292-1301.

27. Van Der Kraak, G. 1990. The influence of calcium ionophore and activators of protein kinase C on steroid production by preovulatory ovarian follicles of the goldfish. Biology of Reproduction 42: 231-238.

26. Van Der Kraak, G. and J.P. Chang. 1990. Arachidonic acid stimulates steroidogenesis in goldfish preovulatory ovarian follicles. General and Comparative Endocrinology 77: 221-228.

25. Van Der Kraak, G., P. Rosenblum, and R.E. Peter. 1990. Growth hormone dependent potentiation of gonadotropin stimulated steroid production by ovarian follicles of the goldfish. General and Comparative Endocrinology 79: 233-239.

24. Habibi, H.R., G. Van Der Kraak, R. Fraser and R.E. Peter. 1989. Effect of a teleost GnRH analog on steroidogenesis by follicles enclosed goldfish oocytes, in vitro. General and Comparative Endocrinology 76: 95-105.

23. Lin, H.R., C. Peng, G. Van Der Kraak and R.E. Peter. 1989. Dopamine inhibits gonadotropin secretion in the Chinese loach (Paramisgurnus dabryanus). Fish Physiology and Biochemistry 6: 285-288.

22. Stacey, N.W., P.W. Sorensen, G.J. Van Der Kraak and J.G. Dulka. 1989. Direct evidence that 17□,20□-dihydroxy-4-pregnen-3-one functions as a goldfish primer pheromone: Preovulatory

release is closely associated with male endocrine responses. General and Comparative Endocrinology 75: 62-70.

21. Van Der Kraak, G., N.W. Pankhurst, R.E. Peter and H.R. Lin. 1989. Lack of antigenicity of human chorionic gonadotropin in silver carp (Hypothalmichthys molitrix) and goldfish (Carassius auratus). Aquaculture 78: 81-86.

20. Van Der Kraak, G., P.W. Sorensen, N.E. Stacey and J.G. Dulka. 1989. Periovulatory female goldfish release three potential pheromones: 17□,20□-dihydroxyprogesterone, 17□,20□-dihydroxyprogesterone glucuronide and 17□-hydroxyprogesterone. General and Comparative Endocrinology 73: 452-457.

19. Habibi, H.R., G. Van Der Kraak, E. Bulanski and R.E. Peter. 1988. Effect of teleost GnRH on reinitiation of oocyte meiosis in goldfish, In vitro. American Journal of Physiology 255 (Regul. Integ. Comp. Physiol. 24): R268-R273.

18. Lin, H.R., G. Van Der Kraak, X.J. Zhou, J.Y. Liang, R.E. Peter, J.E. Rivier and W.W. Vale. 1988. Effects of [D-Arg6, Trp7, Leu8, Pro9 NEt]-LHRH (sGnRH-A) and [D-Ala6, Pro9 NEt]-LHRH (LHRH-A), in combination with pimozide or domperidone on gonadotropin release and ovulation in Chinese loach and common carp. General and Comparative Endocrinology 69: 31-40.

17. Peter, R.E., H.R. Lin and G. Van Der Kraak. 1988. Induced ovulation and spawning of cultured freshwater fish in China: Advances in application of GnRH analogues and dopamine antagonists. (Invited plenary lecture IDRC Workshop Fish Culture, Singapore, 6-10 April, 1987). Aquaculture 74: 1-10.

16. Dulka, J.G., N.W. Stacey, P.W. Sorensen, and G. Van Der Kraak. 1987. A sex-steroid pheromone synchronizes male-female spawning readiness in goldfish. Nature 325: 251-253.

15. Van Der Kraak, G., E.M. Donaldson, H.M. Dye, G.A. Hunter, J.E. Rivier and W.W. Vale. 1987. Effects of mammalian and salmon gonadotropin-releasing hormones and analogues on plasma gonadotropin levels and ovulation in coho salmon (Oncorhynchus kisutch). Canadian Journal of Fisheries and Aquatic Sciences 44: 1930-1935.

14. Eales, J.G., G. Van Der Kraak, J.P. Chang and R.J. Omeljaniuk. 1986. Effects of temperature on triiodothyronine plasma levels, kinetics and hepatocyte nuclear binding in rainbow trout, Salmo gairdneri. Canadian Journal of Zoology 64: 2658-2664.

13. Fitzpatrick, M.S., G. Van Der Kraak and C.B. Schreck. 1986. Profiles of sex steroids and gonadotropin in coho salmon, Oncorhynchus kisutch, during final maturation. General and Comparative Endocrinology 62: 437-451.

12. Lin, H.R., C. Peng, G. Van Der Kraak, R.E. Peter and B. Breton. 1986. Effects of [D-Ala6, Pro9 NEt]-LHRH and catecholaminergic drugs on gonadotropin secretion and ovulation in the Chinese loach (Paramisgurnus dabyranus). General and Comparative Endocrinology 64: 389-395.

11. Pankhurst, N.W., N.E. Stacey and G. Van Der Kraak. 1986. Reproductive development and plasma levels of reproductive hormones of goldeye Hiodon alosoides (Rafinesque) taken from the North Saskatchewan River during the open water season. Canadian Journal of Zoology 64: 2843-2849.

10. Pankhurst, N.W., G. Van Der Kraak and R.E. Peter. 1986. Effects of human chorionic gonadotropin, des Gly10 [D-Ala6]LHRH-ethylamide and pimozide on oocyte final maturation, ovulation and levels of plasma sex steroids in the walleye (Stizostedion vitreum). Fish Physiology and Biochemistry 1: 45-54.

9. Pankhurst, N.W., G. Van Der Kraak, R.E. Peter and B. Breton. 1986. Effects of D-Ala6, Pro9-N ethylamide)-LHRH on plasma levels of gonadotropin, 17□, 20□ dihydroxy-4-pregnen-3-one and testosterone in male goldeye (Hiodon alosoides (Rafinesque). Fish Physiology and Biochemistry 1: 163-170.

8. Van Der Kraak, G. and E.M. Donaldson. 1986. Steroidogenic capacity of coho salmon ovarian follicles throughout the periovulatory period. Fish Physiology and Biochemistry 1: 179-186.

7. Van Der Kraak, G., E.M. Donaldson and J.P. Chang. 1986. Dopamine involvement in the regulation of gonadotropin secretion in coho salmon. Canadian Journal of Zoology 64: 1245-1248.

6. Lin, H.R., C. Peng, L.Z. Lu, X.J. Zhou, G. Van Der Kraak and R.E. Peter. 1985. Induction of ovulation in the loach (Paramisgurnus dabyranus) using pimozide and [D-Ala6, Pro9-N-ethylamide]-LHRH. Aquaculture 46: 333-340.

5. Van Der Kraak, G., H.M. Dye, E.M. Donaldson and G.A. Hunter. 1985. Plasma gonadotropin, 17β□-estradiol, and 17□, 20□-dihydroxy-4- pregnen-3-one levels during luteinizing hormone releasing hormone and gonadotropin induced ovulation in coho salmon (Oncorhynchus kisutch). Canadian Journal of Zoology 63: 824-833.

4. Van Der Kraak, G., H.M. Dye and E.M. Donaldson. 1984. Effects of LH- RH and des Gly10 [D-Ala6]LH-RH-ethylamide on plasma sex steroid profiles in adult female coho salmon (Oncorhynchus kisutch). General and Comparative Endocrinology 55: 36-45.

3. Van Der Kraak, G., H.R. Lin, E.M. Donaldson, H.M. Dye and G.A. Hunter. 1983. Effects of LH-RH and des Gly10 [D-Ala6]LH-RH ethylamide on plasma gonadotropin levels and oocyte maturation in adult female coho salmon (Oncorhynchus kisutch). General and Comparative Endocrinology 49: 470-476.

2. Eales, J.G., J.P. Chang, G. Van Der Kraak, R.J. Omeljaniuk and L. Uin. 1982. Effects of temperature on plasma thyroxine and iodide kinetics in rainbow trout (Salmo gairdneri Richardson). General and Comparative Endocrinology 47: 295-307.

1. Van Der Kraak, G.J, and J.G. Eales. 1980. Saturable 3, 5, 3'-triiodo- L-thyronine-binding sites in liver nuclei of rainbow trout (*Salmo gairdneri* Richardson). General and Comparative Endocrinology 47: 295-307.

Submitted Manuscripts

Books and Chapters in books

C.23. Gosselin P, S.E. Hrudey, A.M. Naeth, A Plourde, R. Therrien, G. Van Der Kraak and Z. Xu, 2010. Environmental and Health Impacts of Canada's Oil Sands Industry. Ottawa, Ontario: Royal Society of Canada (Dec 2010). 436pp. http://www.rsc.ca/documents/expert/RSC%20report%20complete%20secured%209Mb.pdf

C.22. Fuzzen, M. N.J. Bernier and G. Van Der Kraak. 2011. Chapter 6: Stress and Reproduction. In: Hormones and Reproduction in Vertebrates. Volume 1: Fishes In: D.O Norris and K. H. Lopez, Eds. Academic Press. pp.103-117.

C.21 Van Der Kraak, G. 2009. The GnRH system and the neuroendocrine regulation of reproduction. In: N. Bernier, G. Van Der Kraak, A.P. Farrell and C. Brauner, Eds. Fish Physiology Volume 28 Fish Neuroendocrinology pp 115-149. [NSERC DG]

C.20. Perkins, E., N. Denslow, J. K. Chipman, P.D. Guiney, J.R. Oris, H. Poynton, P.Y. Robidoux, R. Scroggins and G. Van Der Kraak. 2007. Application of genomics to assessment of the ecological risk of complex mixtures. In: Genomics in regulatory ecotoxicology : Applications and Challenges. G.T. Ankley, A.L. Miracle, E.J. Perkins and G.P. Daston, eds. pp. 87-121.

C.19. Alsop, D., G.J. Van Der Kraak, S. B. Brown and J. G. Eales. 2005. The biology and toxicology of retinoids in fish. Biochemistry and Molecular Biology of Fishes, 6; Environmental Toxicology, T.P. Mommsen and T. Moon, eds. pp. 413-428.

C.18. MacLatchy, D.M., K. L. Gormley, R.E.M. Ibey, R.L. Sharpe, K. S. Shaughnessey, S.C. Courtenay, M.G. Dube and G. Van Der Kraak. 2005. A short term Mummichog (Fundulus heteroclitus) bioassay to assess endocrine responses to hormone-active compounds and mixtures. In Techniques in Aquatic Toxicology Vol. 2. (G. Ostrander, Ed.). pp. 55-91.

C. 17. Wood, A.W., D.M. Janz and G. Van Der Kraak. 2005. Cell death; investigation and application in fish toxicology. Biochemistry and Molecular Biology of Fishes, 6; Environmental Toxicology, T.P. Mommsen and T. Moon, eds. pp. 303-328.

C.16. WHO/IPCS. 2002. Global Assessment of the State-of-the-Science of Endocrine Disruptors. Eds T. Damstra, S. Barlow, A. Bergman, R. Kavlock. G.Van Der Kraak WHO/PCS/EDC/02.2 World Health Organization, Geneva, Switzerland. 180pp http://ehp.niehs.nih.gov/who/

C.15. Servos, M.R. and G. Van Der Kraak (Editors). 2001. Endocrine disrupting substances in the Canadian Environment. Water Quality Research Journal of Canada. 36.pp. 171-346.

C.14. Munkittrick, K.R., M. McMaster, G. Van Der Kraak, C. Portt, W. Gibbons, A. Farwell and M. Gray. 2000 Development of Methods for Effects-Based Cumulative Effects Assessment Using Fish Populations: Moose River Project. SETAC Press, Pensacola, FL. 236 pp. + xviii.

C.13. Munkittrick, K.R., M.E. McMaster, C.Portt, W. N. Gibbons, A. Farwell, L. Reumper, M.R. Servos, J. Nickle and G.J. Van Der Kraak. 2000. The development of cumulative effects assessment tools using fish populations. In: Integrated Assessment of Ecosystem Health, (K. Scow, G.E. Fogg and M.L. Johnson Eds). Lewis Publishers, Boca Raton, FL. pp. 149-174.

C.12. Fairbrother, A., G.T. Ankley, L.S. Birnbaum, S.P. Bradbury, B. Francis, L.E. Gray, D. Hinton, L.L. Johnson, R. E. Peterson, and G. Van Der Kraak. 1999. Reproductive and developmental toxicology of contaminants in oviparous animals. In: Reproductive and developmental effects of contaminants in oviparous vertebrates. (R. DiGiulio and D.E. Tillitt, Eds). SETAC Press, Pensacola Fl. pp. 283-361.

C.11. Munkittrick, K.R., M.R. Servos, K. Gorman, B. Blunt, M.E. McMaster and G.J. Van Der Kraak. 1999. Characteristics of EROD induction associated with exposure to pulp mill effluent. In: Impact assessment of hazardous aquatic contaminants. (S.S. Rao, Ed.) CRC Press, Boca Raton , Fl. pp. 79-88.

C.10. Leatherland, J.F., J.S. Ballantyne and G. Van Der Kraak.1998. Diagnostic assessment of non-infectious disorders of captive and wild fish populations and the use of fish as sentinel organisms for environmental studies. In: Fish Diseases and Disorders II: Non-infectious disorders (J.F. Leatherland and P.T.K. Woo, Eds.) CABI Publishing Oxon, UK. pp. 335-366.

C.9. Van Der Kraak, G. 1998. Observations for endocrine effects in wildlife with evidence of their causation. In: Natural and Anthropogenic environmental estrogens: the scientific basis for risk assessment (A. N. Wright, Ed). Journal of Pure and Applied Chemistry 70: 1785-1794.

C.8. Van Der Kraak, G., Zacharewski, T., D. Janz, B. Sanders and J. Gooch. 1998. Comparative Endocrinology and mechanisms of endocrine modulation in fish and wildlife. In: Principles and

processes for evaluating endocrine disruption in wildlife (R.J. Kendall, R.L. Dickerson, W.A. Suk and J.P. Giesy, Eds.).SETAC Press Pensacola, FL. pp. 97-119.

C.7. Van Der Kraak, G.J., J.P. Chang, and D.M. Janz. 1998. Reproduction. In: The Physiology of Fishes, Second Edition (D.H. Evans, ed.) CRC Press, Boca Raton pp. 465-488.

C.6. Van Der Kraak, G. K.R. Munkittrick, M.E. McMaster and D.M. MacLatchy. 1998. A comparison of bleached kraft pulp mill effluent, 17β□-estradiol and □-sitosterol effects on reproductive function in fish. In: Principles and processes for evaluating endocrine disruption in wildlife (R.J. Kendall, R.L. Dickerson, W.A. Suk and J.P. Giesy, Eds SETAC Press Pensacola, FL. pp. 249-265.

C.5. Pankhurst, N.W. and G. Van Der Kraak. 1997. Effects of stress on reproduction and growth of fish. In: Fish Stress and Health in Aquaculture. (G.K. Iwama, J. Sumpter, A.D. Pickering and C.B. Schreck, Eds). Society for Experimental Biology Seminar Series, 62; Cambridge University Press, Cambridge UK. pp. 73-95.

C.4. Van Der Kraak, G. and N.W. Pankhurst 1997. Temperature effects on the reproductive performance of fish. In: Global warming: implications for freshwater and marine fish. (D.G. McDonald and C.M. Wood, Eds.) Society for Experimental Biology Seminar Series, 61; Cambridge University Press, Cambridge UK. pp. 159-176.

C.3. Servos, M.R., K.R. Munkittrick, J.H. Carey and G. Van Der Kraak (Editors). 1996. Environmental Fate and Effects of Pulp and Paper Mill Effluents. St. Lucie Press, Delray Beach Florida. 703p.

C.2. Crim, L.W., R.E. Peter and G. Van Der Kraak. 1987. The use of LHRH analogs in aquaculture. In: LHRH and its Analogs: Contraceptive and Therapeutic Applications, Part 2 (B.H. Vickery and J.J. Nestor, eds.). MTP Press Ltd., Lancaster. pp. 489-498.

C.1. Van Der Kraak, G. 1983. An introduction to gonadotropin receptor studies in fish. In: Fish Physiology, Vol. 9A, Endocrine Tissues and Hormones (W.S. Hoar, D.J. Randall and E.M. Donaldson, eds.). Academic Press, New York. pp. 405-441.

3. Refereed Conference Proceedings

P.54. Kovacs, T., M. Hewitt, D. MacLatchy, P. Martel, M.E. McMaster, J. Parrott, G. Van Der Kraak and M. van den Heuvel, 2007. First findings of a national project investigating the cause of effects of pulp mill effluents on fish reproduction. Proceedings Pulp and Paper Technical Association of Canada - PACWEST Conference 2007, Harrison Hot Springs Resort, BC, May 9-12, 2007.

P. 53. Solomon K. R. J.A. Carr, L.H. du Preez, J.P. Giesy, T.S. Gross, R.J. Kendall, E.E. Smith and G.J. Van Der Kraak 2005. Ecotoxicological risk assessment of atrazine in amphibians. In: Clark J.M and H. Ohkawa, editors. Environmental Fate and Safety Management of Agrochemical ACS Symposium Series No 899. Washington, DC, USA: American Chemical Society. P. 124-137.

P.52. Solomon KR, Carr JA, du Preez LH, Giesy JP, Gross TS, Kendall RJ, Smith EE, Van Der Kraak GJ. 2004. Ecotoxicological risk assessment of atrazine in amphibians. In: Clark JM, editor. Proceeding of the 3rd Pan Pacific Pesticide Conference. Washington, DC, USA: American Chemical Society. In press.

P.51. Boudreau, M., S. Courtenay, D. Robertson, M. Freborne, L.Van Guelpen, D. MacLatchy, C. Berube and G. Van Der Kraak. 2004. Are developmental abnormanilities a useful endpoint for the wild fish survey element of the Canadian EEM Program for pulp and paper mills. In: Pulp and Paper Mill Effluents Environmental Fate and Effects , D. L. Borton, T. Hall, R. Fisher and J. Thomas (Eds) DEStech Publications, Lancaster, PA. pp. 491-505.

P.50. Hewitt, L.M., J.Parrott, M.McMaster , A. Pryce, G. Van Der Kraak, R. Schryer, B. Firth, and A. Belknap, 2004. Development of an accumulation model to investigate active substances bioavaialable to fish exposed to treated pulp mill effluents. In: Pulp and Paper Mill Effluents Environmental Fate and Effects , D. L. Borton, T. Hall, R. Fisher and J. Thomas (Eds) DEStech Publications, Lancaster, PA. pp. 420-428.

P. 49 MacLatchy, R.L. Sharpe, D.L., M.G. Dubé, L.M. Hewitt, S.C. Courtenay, and G.Van Der Kraak, G.J. 2004. Development of a fish bioassay to test for hormonally-active contaminants in pulp mill effluents. In: Pulp and Paper Mill Effluents Environmental Fate and Effects , D. L. Borton, T. Hall, R. Fisher and J. Thomas (Eds) DEStech Publications, Lancaster, PA. pp. 41-419.

P.48. McCarthy, L.H., K.R. Munkittrick, B.R. Blunt, G.J. Van Der Kraak, C.S. Wood and J. Parrott. 2003. Steroid levels in goldfish exposed to pulp mill effluent. In: Environmental impacts of pulp and paper waste streams. T. Stuthridge, M.R. van den Heuvel, N.A. Marvin, A.H. Slade, and J. Gifford Eds. Proceed. 3rd Internat. Conf. Environmental Fate and Effects of Pulp and Paper Mill Effluents, Rotorua, NZ, November 9-13,1997. SETAC Press, Florida Chapter 3.14 pp. 342-351.

P.47. Munkittrick, K.R., M.E. McMaster, M.R. Servos and G.J. Van Der Kraak. 2003. Changes in the reproductive performance of fish at Jackfish Bay over the period of mill modernization (1988-1996). In: Environmental impacts of pulp and paper waste streams. T. Stuthridge, M.R. van den Heuvel, N.A. Marvin, A.H. Slade, and J. Gifford Eds. Proceed. 3rd Internat. Conf. Environmental Fate and Effects of Pulp and Paper Mill Effluents, Rotorua, NZ, November 9-13,1997. SETAC Press Chapter 3.13 pp. 332-341.

P.46. Munkittrick, K.R., O. Sandstrom, A. Larsson, G.J. Van Der Kraak, L. Forlin, E. Lindesjoo, M.E. McMaster and M. Servos. 2003. Evolution of tools for ecological assessment of pulp mill effluent impacts 1982 through 1997: A reassessment of the original reviews of Norrsundet and Jackfish Bay field studies (a backward look at risk assessments). In: Environmental impacts of pulp and paper waste streams. T. Stuthridge, M.R. van den Heuvel, N.A. Marvin, A.H. Slade, and J. Gifford Eds. Proceed. 3rd Internat. Conf. Environmental Fate and Effects of Pulp and Paper Mill Effluents, Rotorua, NZ, November 9-13,1997. SETAC Press Chapter 4.12: pp. 459-477.

P.45. Nickle, J.C., M.E. McMaster, K.R. Munkittrick, C.R. Rumsey, C.B. Portt and G.J. Van Der Kraak. 2003. Reproductive effects of primary treated bleached kraft and magnefite-thermomechanical pulp mill effluent on whitesucker (Catostomus commersoni) in the Moose River basin. In: Environmental impacts of pulp and paper waste streams. T. Stuthridge, M.R. van den Heuvel, N.A. Marvin, A.H. Slade, and J. Gifford Eds. Proceed. 3rd Internat. Conf. Environmental Fate and Effects of Pulp and Paper Mill Effluents, Rotorua, NZ, November 9-13,1997. SETAC Press Chapter 4.2 pp. 363-370.

P.44. Van Der Kraak, G. and A.L. Lister. 2002 Status of studies of endocrine disruption in wildlife. In Chemicals in the 21st Century: Chemicals for Sustainable Development. Proceedings of the Fourth Princess Chulabhorn International Science Congress. Chulabhorn Research Institute Bangkok, Thailand pp. 327-334.

P.43. Servos, M., P. Chambers, R. Macdonald and G. Van Der Kraak. 2001. Municipal Wastewater effluents. In: Threats to sources of drinking water and aquatic ecosystem health in Canada. National Water Research Institute, Burlington, ON. NWRI Scientific Assessment Report Series #1 pp 37-40.

P.42. Hewitt, M., Parrott, J.,Wells, K., Elliott, K, Biddiscombe, S., McMaster, M., and Van Der Kraak, G. 2000. Accumulation of ligands for the Ah receptor, androgen receptor, estrogen receptor and sex steroid binding protein by white sucker exposed to bleached kraft mill effluent. In 4th International conference on environmental impacts of the pulp and paper industry: Proceedings from the conference. Eds. M. Rouppa, J. Paasivirta, K.J. Lehtinen and S. Ruonala. Finnish Environmental Institute # 417: 159-164.

P.41. McMaster, M., Hewitt, M., Parrott, J., Sherry, J., Koli, M., Van Der Kraak, G., Oakes, K., Janz. D., Portt, C., Denslow, N. and Munkittrick, K. 2000. Detailed endocrine assessments in wild fish downstream of pulp and paper mills: Application to the Northern Rivers Ecosystem Initiative endocrine program in Northern Alberta, Canada. In 4th International conference on environmental impacts of the pulp and paper industry: Proceedings from the conference. Eds. M. Rouppa, J. Paasivirta, K.J. Lehtinen and S. Ruonala. Finnish Environmental Institute # 417: 232-237.

P.40. Munkittrick, K.R., McMaster, M.E, , Portt, C. and Van Der Kraak, G.J. 2000. The ecological relevance of changes in the reproductive performance of fish at Canadian pulp mill sites over the period of mill modernization (1989-1999). In: Proceedings of the 4th International conference on environmental impacts of the pulp and paper industry, Helsinki, Finland, June12-15, 2000. M.Ruoppa, J. Paasivirta, K.J. Lehtinen and S. Ruonala Eds). Finish Environmental Institute Report. 417.pp. 178-184.

P.39. Munkittrick, K. R., M. E. McMaster, M. R. Servos and G. J. Van Der Kraak. 2000. Changes in secondary sex characteristics and gonadal size in fish exposed to pulp mill effluents over the period of mill moderization. p. 383 In B. Norberg, O. S. Jesbu, G. L. Taranger, E. Andersson and S. O. Steffanson (Eds.). Proc. 6th International Symp. Fish Reprod. Physiol., Bergan, Norway, July 5-9 1999.

P.38. Ritter, L., B. Hale, K. Krishnan, G. Van Der Kraak and D. Warner. 2000. Canadian Network of Toxicology Centres (CNTC) Executive summary-annual research symposium, 29-30 March 1999. Journal of Toxicology and Environmental Health Part A59: 527-538.

P.37. Wood, A.W. and G. Van Der Kraak.2000. Apoptotic cell death in rainbow trout (Oncorhynchus mykiss) and goldfish (Carassius auratus) ovarian follicles in vivo and in vitro. Proceeding of the 6th International Symposium on Reporoductive Physiology of Fish pp. 295-297.

P.36. Munkittrick, K.R. and G. Van Der Kraak. 1999. Appropriate uses of physiological techniques for endocrine studies. In: Standardization of Biomarkers for Endocrine Disruption and Environmental Assessment: Eighth Volume, Environmental Toxicology and Risk Asssessment ASTM 1364 (D. S. Henshel, M.C. Black and M.C. Harras, Eds.) American Society for Testing and Materials, West Conshohocken. PA . pp. 95-118.

P.35. Solbé, J.F., R. Bias, E. Mihaich, G. Randall, C. Romijn, L. Tatersfield, G. Van Der Kraak and M. Holt. 1998. White paper on ecosystem dynamics research. In. Long-range health and environmental research initiative: State of the science white papers. Chemical Manufacturers Association and Chemical Industry Institute of Toxicology. Research Triangle Park. pp. 64-79.

P.34. Benson, W.H., G. Van Der Kraak, C. Tyler, K. Brugger, G. Datson, M. Fry, S. Gimeno, F. Hunger, M. Kolossa, R. Lange and P. Matthiessen. 1997. Strategies and approaches to in vivo screening and testing in identifying the hazards of endocrine modulating chemicals to wildlife. In: SETAC-Europe/OECD/EC Expert Workshop on Endocrine Modulators and Wildlife: Assessment and Testing. Veldhoven, The Netherlands, 10-13 April. 1997. (L. Tattersfield, P. Matthiessen, P. Campbell, N. Grandy and R. Lange, Eds.) Chapter 4 pp. 59-78.

P.33. Munkittrick, K.R., M.R. Servos, J.H. Carey and G.J. Van Der Kraak. 1997. Environmental impacts of pulp and paper wastewater: evidence for a reduction in environmental effects at north American pulp mills since 1992. (Presented at 5th International Association on Water Quality on Forest Industrial Waste Water. Vancouver June 10-13, 1996) Water Science and Technology 35: 329-338.

P.32. Hewitt, L.M., I.M. Scott, K.R. Munkittrick, G.J. Van Der Kraak, K.R. Solomon and M.R. Servos. 1996. Development of TIEs for complex mixtures using physiological responses in fish. In: Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment-Fifth Volume, ASTM STP

1306 (David A. Bengston and Diane S. Henshel Eds.) American Society for Testing and Materials, pp. 37-52.

P.31. McMaster, M.E., K.R. Munkittrick, G.J. Van Der Kraak, P.A. Flett and M.R. Servos. 1996. Detection of steroid hormone disruptions associated with pulp mill effluent using artificial exposures of goldfish. In: Environmental Effects of Pulp Mill Effluents (M.R. Servos, K.R. Munkittrick, G. Van Der Kraak J. Carey, Eds.) St. Lucie Press, Boca Raton FL. pp. 425-437.

P.30. MacDougall, T. and G. Van Der Kraak. 1995. Epidermal growth factor enhances ovarian prostaglandin synthesis in the goldfish. In: Proceedings of the 5th International Symposium on Reproductive Physiology of Fish (F.W. Goetz and P. Thomas, Eds). Austin, Texas July 2-8, 1995. pp. 318.

P.29. MacLatchy, D.L., X.Yao, L. Tremblay, and G. Van Der Kraak. 1995. The hormone mimic □-sitosterol alters the reproductive status in goldfish. In: Proceedings of the 5th International Symposium on Reproductive Physiology of Fish (F.W. Goetz and P. Thomas, Eds). Austin, Texas July 2-8, 1995. pp. 189.

P.28. McMaster, M.E., G. Van Der Kraak, and K.R. Munkittrick. 1995. Differential modes of hormonal disruption in fish exposed to various organic contaminants. In: Proceedings of the 5th International Symposium on Reproductive Physiology of Fish (F.W. Goetz and P. Thomas, Eds). Austin, Texas July 2-8, 1995. pp. 191.

P.27. Mercure, F.M. and G. Van Der Kraak. 1995. Peroxisome involvement in ovarian steroidogenesis in teleosts. In: Proceedings of the 5th International Symposium on Reproductive Physiology of Fish (F.W. Goetz and P. Thomas, Eds). Austin, Texas July 2-8, 1995. pp. 321.

P.26. Pankhurst, N.W., G. Van Der Kraak and R.E. Peter. 1995. Evidence that inhibition of reproduction by stress is not mediated by the action of cortisol on ovarian steroidogenesis. In: Proceedings of the 5th International Symposium on Reproductive Physiology of Fish (F.W. Goetz and P. Thomas, Eds). Austin, Texas July 2-8, 1995. pp. 195.

P.25. Tremblay, L. and G. Van Der Kraak. 1995. Interactions of the environmental estrogens nonylphenol and □-sitosterol with liver estrogen receptors in fish. In: Proceedings of the 5th International Symposium on Reproductive Physiology of Fish, (F.W. Goetz and P. Thomas, Eds). Austin, Texas July 2-8, 1995. pp. 202.

P.24. Van Der Kraak,G., M.McMaster, and K.R. Munkittrick. 1995. Application of reproductive physiological testing to understand the mechanisms of environmental endocrine disruptors. In: Proceedings of the Fifth International Symposium on Reproductive Physiology of Fish (F.W. Goetz and P. Thomas, Eds). Austin, Texas July 2-8, 1995. pp. 173-175.

P.23. Flett, P.A., J.F. Leatherland and G. Van Der Kraak. 1994. Endocrine correlates of seasonal reproduction in fish: thyroid hormones and gonadal growth, steroidogenesis and energy partitioning in Great lakes salmon. (Invited paper at the 12th International Congress of Comparative Endocrinology, Toronto May 16-21, 1993). Perspectives in Comparative Endocrinology (K.G. Davey, R.E. Peter and S.S. Tobe Eds.) National Research Council of Canada, Ottawa. pp 602-610.

P.22. Van Der Kraak, G. and M.G. Wade. 1994. A comparison of signal transduction pathways mediating gonadotropin actions in vertebrates. (Invited paper at the 12th International Congress of Comparative Endocrinology, Toronto May 16-21, 1993). Perspectives in Comparative Endocrinology (K.G. Davey, R.E. Peter and S.S. Tobe Eds.) National Research Council of Canada, Ottawa. pp 59-63.

P.21. Peter, R.E., H.R. Lin, G. Van Der Kraak and M. Little. 1993. Use of GnRH analogs and dopamine antagonists for induction of ovulation and spawning of cultured freshwater fish. Presented at the

symposium On Application of Comparative Endocrinology to Fish Culture (22-23 May 1989, Almunecar, Spain), Recent Advances in Aquaculture IV (Edited by N. Bromage, E.M. Donaldson, S. Zanuy, M. Carillo and J. Planas) pp. 25-30.

P.20. Munkittrick, K.R., G.J. Van Der Kraak, M.E. McMaster and C.B. Portt. 1992. Reproductive dysfunction and MFO activity in three species of fish exposed to bleached kraft mill effluent at Jackfish Bay Lake Superior. (Presented at 26th Canadian Symposium Water Pollution Research, Burlington, Ontario, February 13-14, 1991). Water Pollution Research Journal of Canada 27: 439-446.

P.19. Servos, M., J. Carey, M. Ferguson, G. Van Der Kraak, H. Ferguson, J. Parrott, K. Gorman and R. Cowling. 1992. Impact of a modern bleached kraft mill on white sucker populations in the Spanish River, Ontario. (Presented at 26th Canadian Symposium Water Pollution Research, Burlington, Ontario, February 13-14, 1991). Water Pollution Research Journal of Canada 27: 423-437.

P.18. Flett, P.A., K.R. Munkittrick, G. Van Der Kraak and J.F. Leatherland. 1991. Reproductive problems in Lake Erie coho salmon. In: Proceedings of the Fourth International Symposium on Reproductive Physiology of Fish (7-12 July 1991, Norwich, U.K.) (A.P. Scott, J.P. Sumpter, D.E. Kime and M. Rolfe, Eds.). University of East Anglia Press, Norwich, U.K. pp. 151-153.

P.17. Lin, H.R., M.L. Zhang, S. Zhang, H.R. Shi, M. Lu, G. Van Der Kraak and R.E. Peter. 1991. Induction of gonadal development and maturation by chronic administration of testosterone and androstenedione in female Japanese silver eel, Anguilla japonica. In: Proceedings of the Fourth International Symposium on Reproductive Physiology of Fish (7-12 July, 1991, Norwich, U.K.) (A.P. Scott, J.P. Sumpter, D.E. Kime and M. Rolfe, Eds.). University of East Anglia Press, Norwich, U.K. pp. 281.

P.16. Munkittrick, K.R., G.J. Van Der Kraak, M.E. McMaster and C.B. Portt. 1991. Bleached kraft pulp mill effluent (BKME) alters steroid production, regulation and metabolism in white sucker (Catostomus commersoni). In: Proceedings of the Fourth International Symposium on Reproductive Physiology of Fish (7-12 July 1991, Norwich, U.K.) (A.P. Scott, J.P. Sumpter, D.E. Kime and M. Rolfe, Eds.). University of East Anglia Press, Norwich, U.K. pp. 284.

P.15. Van Der Kraak, G. and P.M. Jacobson. 1991. Regulation of steroid production by goldfish ovarian follicles. Interaction of GtH I and GtH II with calcium ionophore and phorbol ester. In: Proceedings of the Fourth International Symposium on Reproductive Physiology of Fish (7-12 July 1991, Norwich, U.K.) (A.P. Scott, J.P. Sumpter, D.E. Kime and M. Rolfe, Eds.). University of East Anglia Press, Norwich, U.K., pp. 215-217.

P.14. Wade, M.G. and G. Van Der Kraak. 1991. Multihormonal control of testicular steroidogenesis in the goldfish: the role of arginine vasotocin (AVT). In: Proceedings of the Fourth International Symposium on Reproductive Physiology of Fish (7-12 July 1991, Norwich, U.K.) (A.P. Scott, J.P. Sumpter, D.E. Kime and M. Rolfe, Eds.). University of East Anglia Press, Norwich, U.K., pp. 237.

P.13. Lin, H.R., M. Zhang, S. Zhang, G. Van Der Kraak and R.E. Peter. 1990. Effects of sex steroids [D-Ala6, Pro9-N-ethylamide]-LHRH (LHRH-A) and domperidone (DOM) on gonadotropin secretion in female silver eel, Anguilla japonica, Teminck and Schegeg. (Invited paper at the Second Asian Fisheries Forum, Tokyo, Japan, 17-22 April 1989), In: The Second Asian Fisheries Forum (R. Hirano and I. Hanyu, Eds.). Asian Fisheries Society, Manila, Philippines., pp. 591-594.

P.12. Dulka, J.G., N.E. Stacey, P.W. Sorensen and G.J. Van Der Kraak. 1987. A sex pheromone system in goldfish: Is the terminal nerve involved? (Invited symposium paper, New York Academy of Sciences, New York, 2-4 February 1987). In: The Terminal Nerve (Nervus terminalis): Structure, Function and Evolution (L.S. Demski and M. Schwanzell-Fukuda, Eds.). Annals of the New York Academy of Science 519: 411-420.

P.11. Habibi, H.R., G. Van Der Kraak, E. Bulanski, R. Fraser and R.E. Peter. 1987. Effects of a gonadotropin-releasing hormone (GnRH) analog on goldfish oocyte meiosis and steroidogenesis in vitro. (Invited poster at Third International Symposium on Reproductive Physiology of Fish, St. John's, Newfoundland 2-7 August, 1987). In: "Proceedings of the Third International Symposium on Reproductive Physiology of Fish" (D.R. Idler, L.W. Crim and J.M. Walsh, Eds.). Memorial University Press, St. John's, pp. 255.

P.10. Lin, H.R., J.Y. Liang, G. Van Der Kraak and R.E. Peter. 1987. Stimulation of gonadotropin secretion and ovulation in common carp by an analogue of salmon GnRH and domperidone. (Invited poster at First Congress of the Asia and Oceania Society for Comparative Endocrinology, Nagoya, Japan Nov. 2-5, 1987). In: Proceedings of the First Congress of the Asia and Oceania Society for Comparative Endocrinology. (E. Ohniski, Y. Nagahama and H. Ishizaki; Eds.). Nagoya University Press, Nagoya, Japan, pp. 155-156.

P.9. Lin, H.R., X.J. Zhou, G. Van Der Kraak and R.E. Peter. 1987. Comparison of [D-Arg6, Trp7, Leu8, Pro9 NEt]-luteinizing hormone- releasing hormone (t-GnRH-A) and [D-Ala6, Pro9 NEt]-luteinizing hormone-releasing hormone (LHRH-A), in combination with pimozide or domperidone in stimulating gonadotropin release and ovulation in the Chinese loach (Paramisgurnus dabryanus). (Invited poster at the Third International Symposium on Reproductive Physiology of Fish, St. John's, Newfoundland 2-7 August, 1987). In: "Proceedings of the Third International Symposium on Reproductive Physiology of Fish" (D.R. Idler, L.W. Crim and J.M. Walsh, Eds.). Memorial University Press, St. John's, pp. 33.

P.8. Peter, R.E., H.R. Lin and G. Van Der Kraak. 1987. Drug/Hormone induced breeding of Chinese teleosts. (Invited symposium paper at the Third International Symposium on Reproductive Physiology of Fish, St. John's, Newfoundland 2-7 August, 1987). In: "Proceedings of the Third International Symposium on Reproductive Physiology of Fish" (D.R. Idler, L.W. Crim and J.M. Walsh, Eds.). Memorial University Press, St. John's, pp. 120-123.

P.7. Stacey, N.E., P.W. Sorensen, J.G. Dulka and G. Van Der Kraak. 1987. Fish reproductive pheromones. (Invited Symposium paper at the Third International Symposium on Reproductive Physiology of Fish, St. John's, Newfoundland 2-7 August, 1987). In: "Proceedings of the Third International Symposium on Reproductive Physiology of Fish" (D.R. Idler, L.W. Crim and J.M. Walsh, Eds.). Memorial University Press, St. John's, pp. 150-153.

P.6. Van Der Kraak, G. and R.E. Peter. 1987. Concanavalin A separates two forms of maturational gonadotropin in goldfish. (Invited poster at the Third International Symposium on Reproductive Physiology of Fish, St. John's, Newfoundland 2-7 August, 1987). In: "Proceedings of the Third International Symposium on Reproductive Physiology of Fish" (D.R. Idler, L.W. Crim and J.M. Walsh, Eds.). Memorial University Press, St. John's, pp. 78.

P.5. Van Der Kraak, G., R.E. Peter, K. Suzuki and H. Kawauchi. 1987. Immunological characteristics of two glycoprotein gonadotropins from the carp pituitary. (Invited poster at the Third International Symposium on Reproductive Physiology of Fish, St. John's, Newfoundland 2-7 August, 1987). In: "Proceedings of the Third International Symposium on Reproductive Physiology of Fish" (D.R. Idler, L.W. Crim and J.M. Walsh, Eds.). Memorial University Press, St. John's, pp. 79.

P.4. Lin, H.R., G. Van Der Kraak, J.Y. Liang, C. Peng, G.Y. Li, L.Z. Lu, X.J. Zhou and R.E. Peter. 1986. The effects of LHRH analogue and drugs which block the effects of dopamine on gonadotropin secretion and ovulation in fish cultured in China. (Invited symposium paper, at the International Symposium on the Aquaculture of Carp and Related Species, Evry, France 2-5 September, 1985). In: "Aquaculture of Cyprinids" (R. Billard and J. Marcel, Eds.). INRA Service des Publications, Paris, pp. 139-150.

P.3. Donaldson, E.M., G.A. Hunter, H.M. Dye and G. Van Der Kraak. 1985. Induced ovulation in Pacific Salmon using LHRH analogs and salmon gonadotropin. (Invited paper at the IXth International

Symposium on Comparative Endocrinology, Hong Kong, 7-11 December, 1981). In: "Current Trends in Comparative Endocrinology" (B. Lofts and W.N. Holmes, Eds.). Hong Kong University Press, Hong Kong, pp. 375-377.

P.2. Donaldson, E.M., G.A. Hunter, G. Van Der Kraak, and H.M. Dye. 1982. Application of LH-RH and LH-RH analogues to the induced final maturation and ovulation of coho salmon Oncorhynchus kisutch. (Invited paper at the International Symposium on Reproductive Physiology of Fish, Wageningen, Netherlands, 2-6 August, 1982). In: "Proceedings of the International Symposium on the Reproductive Physiology of Fish" (C.J.J. Richter and H.J.Th. Goos, Eds.). Pudoc, Wageningen, The Netherlands, pp. 177-180.

P.1. Van Der Kraak, G. and E.M. Donaldson. 1982. Saturable gonadotropin binding sites in the testis and ovary of immature chum salmon. (Invited poster at the International Symposium on Reproductive Physiology of Fish, Wageningen, Netherlands, 2-6 August, 1982). In: "Proceedings of the International Symposium on the Reproductive Physiology of Fish" (C.J.J. Richter and H.J.Th. Goos, Eds.). Pudoc, Wageningen, The Netherlands, pp. 205.

Published Non-refereed Reports and Conference Proceedings

U.12. Solomon, K.R., J.A. Carr, L.H. Du Preez, J.P. Geisy, T.S. Gross, R.J. Kendall, E.E. Smith and G. Van Der Kraak. 2002. Endocrine system responses in fish, amphibians and reptiles to atrazine: assessment of an expert panel. Syngenta Crop Protection Inc. Greensboro, NC 100 pp.

U.11. McMaster, M.E., K.R. Munkittrick and G.J. Van Der Kraak. 1997. Recovery of reproductive function in fish in response to advances in pulping technology. International Emerging Technologies Conference Proceedings, Orlando Fl. March 9-13, 1997. 7 pp.

U.10. Munkittrick, K.R., M.R. Servos, M.E. McMaster and G.J. Van Der Kraak. 1997. Evidence for a reduction in environmental effects at North American pulp mills since 1992. International Emerging Technologies Conference Proceedings, Orlando Fl. March 9-13, 1997. 8 pp.

U.9. Kidd, K., G. Van Der Kraak and K.R. Munkittrick. 1993. The effects of PCB 126 on hepatic mixed function oxygenase activity and steroidogenic capacity of the goldfish (Carassius auratus). Proceedings 19th Aquatic Toxicology Workshop, Edmonton, Alberta, October 4-7, 1992. E.G. Baddaloo, S. Ramamoorthy and J.W. Moore (Eds.). Canadian Technical Report Fisheries and Aquatic Sciences 1942: 470-475.

U.8. Munkittrick, K.R. and G. Van Der Kraak. 1993. Receiving water environmental effects associated with discharges from Ontario pulp mills. 79th Annual Meeting of the Canadian Pulp and Paper Association, Technical Section. A341-A345.

U.7. Servos, M., S. Huestis, K. Munkittrick, M. Whittle and G. Van Der Kraak. 1993. Biological responses of white sucker to polychlorinated dioxins and furans at pulp and paper mills in Ontario. Proceedings 19th Aquatic Toxicology Workshop, Edmonton, Alberta, October 4-7, 1992. E.G. Baddaloo, S. Ramamoorthy and J.W. Moore (Eds.). Canadian Technical Report Fisheries and Aquatic Sciences 1942: 88-94.

U.6. Van Der Kraak, G.J., M.E. McMaster, K.R. Munkittrick, M.R. Servos, C. Portt, M.R. van den Heuvel and D.G. Dixon. 1993. Environmental survey of effects associated with discharges from Ontario pulp mills. Proceedings 19th Aquatic Toxicology Workshop, Edmonton, Alberta, October 4-7, 1992. Canadian Technical Report Fisheries and Aquatic Sciences 1942: 81-86.

U.5. McMaster, M.E., D.G. Dixon, K.R. Munkittrick, C. Portt, G.J. Van Der Kraak and I.R. Smith. 1991. Comparison of fish population impacts of bleached kraft mill effluent (BKME) before and after installation of secondary treatment. Proceedings Environmental Research: 1991 Technology

Transfer Conference. Toronto, November 25-26, 1991. Session B (Water Quality Research) 1: 262-266.

U.4. Munkittrick, K.R., M.E. McMaster, G.J. Van Der Kraak, C.B. Portt, and I.R. Smith. 1991. Comparison of wild fish populations before and after secondary treatment of bleached kraft mill effluent. Proceedings 18th Aquatic Toxicology Workshop. Sept. 30-Oct. 3, 1991. Ottawa, Ontario. Canadian Technical Report Fisheries and Aquatic Sciences 1863: 190-197.

U.3. McMaster, M.E., D.G. Dixon, K.R. Munkittrick, C. Portt, G. Van Der Kraak, I.R. Smith and D. Rokosh. 1990. Impact of bleached kraft mill effluent (BKME) on fish populations near Terrace Bay, Ontario. Proceedings Environmental Research: 1990 Technology Transfer Conference. Toronto, November 19-20, 1990. Session B (Water Quality Research) 1: 295-301.

U.2. Munkittrick, K.R., M.E. McMaster, C. Portt, G.J. Van Der Kraak, D.G. Dixon, I.R. Smith and D. Rokosh. 1990. Characteristics of fish populations in a lake superior bay receiving bleached kraft mill effluent. Proceedings at 17th Annual Aquatic Toxicology Workshop. Vancouver, November 5-7, 1990. Canadian Technical Report Fisheries and Aquatic Sciences, No. 1774 Vol. 2: 716-717.

U.1. Peter, R.E., H.R. Lin and G. Van Der Kraak. 1988. Induced spawning in Chinese carps. Proceedings of the Aquaculture International Congress, Vancouver, B.C., 1988, pp. 543-547.

5. Technical Reports

T.3. WHO (World Health Organization. 2001. Report on integrated Risk Assessment. WHO/IPCS/IRA/01/12. World Health Organization. Geneva. Switzerland.

T.2. McMaster, M.E., K.R. Munkittrick, J.J. Jardine, R.D. Robinson and G.J. Van Der Kraak. 1995. Protocol for measuring in vitro steroid production by fish gonadal tissue. Canadian Technical Report of Fisheries and Aquatic Sciences 1961. 78 pp.

T.1. McMaster, M.E., K.R. Munkittrick and G. Van Der Kraak. 1992. Protocol for measuring circulating levels of gonadal sex steroids in fish. Canadian Technical Report of Fisheries and Aquatic Sciences 1836. 29 pp.

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Publications

Publication	Books & Chapters	Patents (Issued or Pending)	Refereed Journal Articles	Conference Papers
Total number	11	8	252	56

Books and Book Chapters

B11 Masliyah, J., Czarnecki, J. and Z. Xu, 2011, *Handbook on Theory and Practice of Bitumen Recovery from Athabasca Oil Sands. Vol. 1: Theoretical Basis*. Kingsley, Calgary.

B10 Wang, L., Englert, A., Masliyah, J. and Z. Xu, 2011, Role of colloidal chemistry in oil sands processing, in *Encyclopedia of Surface and Colloid Science*, P. Somasundaran (ed.), Taylor & Francis Group, London, in press.

B9 Long, J., Xu, Z. and J. Masliyah, 2009 Bitumen recovery from oil sands, in *Encyclopedia of Surface and Colloid Science*, P. Somasundaran (ed.), Taylor & Francis Group, London, 1: 1, 1-18.

B8 Xu, Z. and J. Dong, 2008, Synthesis, characterization and application of magnetic nanocomposites for removal of heavy metals from industrial effluents, in *Emerging Environmental Technologies V*, Shah (ed.), Springer Publications, 105-148.

B7 Xu, Z. and Q. Liu (eds.), 2006, *Interfacial Phenomena in Fine Particle Technology*, MetSoc, Montreal.

B6 Lopetinsky, R., Masliyah, J. and Z. Xu, 2006, Solids-stabilized emulsions: A review, in *Colloidal Particles at Liquid Interfaces*, B.P. Binks and T.S. Horozov (eds.), Cambridge University Press, 186-224.

B5 Xu, Z. and J.H. Masliyah, 2003, Contact angle measurements for oxide and related surfaces, in *Encyclopedia of Surface and Colloid Science*, A. Hubbard (ed.), Marcel Dekker, New York, 1228-1241.

B4 Xu, Z., 2000, Flotation Historical Development, in *Encyclopedia of Separation Science*, I. D. Wilson, T. R. Adlard, C. F. Poole and M. Cook (eds.), Academic Press, 1527-1537.

B3 Xu, M, Zhou, Z. and Z. Xu, 2000, Feed aeration, in *Encyclopedia of Separation Science*, I. D. Wilson, T. R. Adlard, C. F. Poole and M. Cook (eds.), Academic Press, 1556-1562.

B2 Xu, Z., Liu Q. and J.A. Finch, 1999, Engineering of Nano-size Superparamagnetic particles for the use in magnetic carrier technology, in *Surfaces of Nanoparticles and Porous Materials*, J. Schwarz and C. Contescu (eds.), Marcel Dekker, New York, pp. 31-50.

B1 Xu, Z., Zhang, Q. and J.A. Finch, 1999, Surface ionization and complexation, in *Surfaces of Nanoparticles and Porous Materials*, J. Schwarz and C. Contescu (eds.), Marcel Dekker, New York, pp. 593-612.

Refereed Journal Publications

J252 Bisson, T., Xu, Z., Gupta, R., Maham, Y., Lium Y., Yang, H., Clark, I. and M. Patel, 2012, Chemical-mechanical bromination of biomass ash for mercury removal from flue gases, *Fuel*, in press.

J251 Lin, F., Nolan, L., Xu, Z. and K. Cadien, 2012, Study on colloidal stability and its role in CMP of mixed abrasive slurries composed of silica and ceria nanoparticles, *J. Electrochemical Soc.*, in press.

J250 Peng, J., Liu, Q., Xu, Z. and J. Masliyah, 2012, A novel demulsifier for water removal from diluted bitumen emulsion, *Energy Fuels*, in press.

J249 Ge, L., Vernon, M., Simon, S., Maham, Y., Sjoblom, J. and Z. Xu, 2012, Interactions of divalent cations with tetrameric acid aggregates in aqueous solutions, *Colloids Surf. A: Physicochem. Eng. Aspects*, 396: 238-245.

J248 Hou, J., Feng, X., Masliyah, J. and Z. Xu, 2012, Understanding interfacial behavior of ethylcellulose at water/diluted bitumen interface, *Energy Fuels*, in press.

J247 Peng, J., Liu, Q., Xu, Z. and J. Masliyah, 2011, Synthesis of interfacial active and magnetically responsive nanoparticles for multiphase separation applications, *Adv. Func. Materials*, in press.

J246 Wang, J., Tuuk Opedal, N., Lu, Q., Xu, Z., Zeng, H., J. Sjoblom, 2011, Probing molecular interactions of an asphaltene model compound in organic solvents using a surface force apparatus (SFA), *Energy Fuels*, in press.

J245 Bobicki, E., Liu, Q., Xu, Z. and H. Zeng, 2012, Carbon capture and storage using alkaline industrial wastes, *Progress Energy Combustion Sci.*, 38: 302-320.

J244 Zhang, J., Li, Q., Chen, M. Li, H. and Z. Xu, 2011, Electrochemically monitoring the removal of bisphenol A based on its anodic deposition at an ITO electrode, *Sensors Actuator B-Chemical*, 160: 784-790.

J243 Yan, L., Englert, H., Masliyah, J. and Z. Xu, 2011, Determination of anisotropic surface characteristics of different phyllosilicates by direct force measurements, *Langmuir*, 27:

12996-13007.

J242 Ge, L., Simon, S., Grimes, B., Nordgard, E., Xu, Z. and J. Sjoblom, 2011, Formation of vesicles and micelles in aqueous systems of tetrameric acids as determined by means of dynamic light scattering, *J. Disp. Sci. Tech.*, 32: 1582-1591.

J241 Jose, J., Mmbaga, J., Hayes, R. and Z. Xu, 2011, Modeling of cavitation in a high-intensity agitation cell, *Can. J. Chem. Eng.*, 89: 1154-1164.

J240 Natarajan, A., Xie, J., Wang, S., Liu, Q., Masliyah, J., Zeng, H. and Z. Xu, 2011, Understanding molecular interactions of asphaltenes in organic solvents using a surface force apparatus, *J. Phy. Chem. C*, 115: 16043-16051.

J239 Liu, Y., Zhu, Z., Liu, G., Xu, Z., Kuznicki, S. and H. Zhang, 2011, A novel method to improve crystallinity of supported nanoparticles using low melting point metals, *J. Phy. Chem. C*, 115: 14591-14597.

J238 Li, Q., Li, H., Zhang, J. and Z. Xu, 2011, A novel pH potentiometric sensor based on electrochemically synthesized polybisphenol A films at an ITO electrode, *Sensors Actuators B-Chemical*, 115: 730-736.

J237 Alagha, L., Wang, S., Xu, Z. and J. Masliyah, 2011, Adsorption kinetics of a novel organic-inorganic hybrid polymer on silica and alumina studied by quartz crystal microbalance, *J. Phys. Chem. C*, 115: 15390-15402.

J236 Ji, Y., Li, H., Xu, Z. and Z. Tan, 2011, The diffusion coefficient of H_2S in liquid sulfur, *Fluid Phase Equilibria*, 307: 135-141.

J235 Feng, X., Wang, S., Hou, J., Wang, L., Cepuch, C., Masliyah, J. and Z. Xu, 2011, Effect of hydroxyl content and molecular weight of biodegradable ethylcellulose on demulsification of water-in-diluted bitumen emulsions, *Ind. Eng. Chem. Res.*, 50: 6347-6354.

J234 Guo, Q., Chen, M., Li, Q., Xu, J., Li, H. Z. Xu, 2011, DNA intercalating studies of $[Ru(bpy)_2dmt]^{2+}$ with two vacant nitrogen atoms by introducing copper (II) ions, DNA *Cell Biology*, 30: 329-336.

J233 Wang, S., Segin, N., Wang, K., Masliyah, J. and Z. Xu, 2011, Wettability control mechanism of highly contaminated hydrophilic silica/alumina surfaces by ethyl cellulose, *J. Phys. Chem. C*, 115: 10576-10587.

J232 Zhu, R., Liu, Q., Xu, Z., Masliyah, J. and A. Khan, 2011, Role of dissolving carbon dioxide in densification of oil sands tailings, *Energy Fuels*, 25: 2049-2057.

J231 Chen, M., Li, H., Shao, Y. and Z. Xu, 2011, Preparation of a $[Ru(bpy)_2(dppz)]^{2+}$-intercalated DNA cast film using a self-standing method and its luminescence tuning by Cu^{2+} ions and EDTA, *Inorg. Chem.*, 50: 2043-2045.

J230 Natarajan, A., Mahavadi, S., Natarajan, T., Masliyah, J. and Z. Xu, 2011, Preparation of solid and hollow asphaltene fibers by single step electrospinning, *J. Engineered Fibers Fabrics*, 6 (2):1-6.

J229 Luo, G., Yao, H., Xu, M., Gupta, R. and Z. Xu, 2011, Identifying modes of occurrence of mercury in coal by temperature programmed pyrolysis, *Proceedings the Combustion Institute*, 33: 2763-2769.

J228 Liu, G., Zhong, H., Xia, L., Wang, S., Z. Xu, 2011, Improving copper flotation recovery from a refractory copper porphyry ore by using ethoxycarbonyl thiourea as a collector, *Minerals Engineering*, 24: 817-824.

J227 Long, J., Li, H., Xu, Z. and J. Masliyah, 2011, Improving oil sands processability using a temperature-sensitive polymer, *Energy Fuels*, 25: 701-707.

J226 Guo, Q., Shao, J., Sun, T., Li, H., Lan, S. and Z. Xu, 2011, Electrochemical fabrication and

potential-enhanced luminescence of $[Ru(bpy)_2tatp]^{2+}$ incorporating DNA-stabilized single-wall carbon nanotubes on an indium tin oxide electrode, *Electrochemica Acta*, 56: 1432-1438.

J225 Adegoroye, A., Wang, L., Omotoso, O., Xu, Z. and J. Masliyah, 2010, Characterization of organic-coated solids isolated from different oil sands, *Can. J. Chem. Eng.*, 88: 462-470.

J224 Zhou, Z., Chow, R., Cleyle, P., Xu. Z. and J. Masliyah, 2010, Effect of dynamic bubble nucleation on bitumen flotation, *Can. Met. Quarterly*, 49: 363-372.

J223 Yu, X., Xu, Z. and S. Han, 2010, Gemini surfactant controlled preparation of well-ordered lamellar mesoporous molybdenum oxide, *J. Porous Mater.*, 17: 99-105.

J222 Wang, L., Dang-Vu, T., Xu, Z. and J. Masliyah, 2010, Use of short chain amine in processing of weathered/oxidized oil sands ores, *Energy Fuels*, 24: 3581-3588.

J221 Al-Hallak, K., Azarmi, S., Xu, Z., Maham, Y. and R. Lobenberg, 2010, Isothermal microcalorimetry as a quality by design tool to determine optimal blending sequences, *American Association Pharmaceutical Science J.*, 12: 417-423.

J220 Gao, S., Moran, K., Xu, Z. and J. Masliyah, 2010, Role of naphthenic acids in stabilizing water-in-diluted bitumen emulsions, *J. Phys. Chem. B*, 114: 7710-7718.

J219 Liu, Y., Bisson, T., Yang, H. and Z. Xu, 2010, Recent Developments in novel sorbents for flue gas clean up, *Fuel Processing Technology*, 91: 1175-1197.

J218 Wang, X., Feng, X., Xu, Z. and J. Masliyah, 2010, Polymer aids for settling and filtration of oil sands tailings, *Can. J. Chem. Eng.*, 88: 403-410.

J217 Yu, X., Xu, Z., Han, S., Che, H., Yan, X. and X. Zhao, 2010, Synthesis of mesoporous tungsten trioxide with crystalline pore wall at low hydrothermal temperature, *J. Disp. Sci. Technol.*, 31: 709-714.

J216 Er, V., Babadagli, T. and Z. Xu, 2010, Pore-scale investigation of thematrix-fracture interaction during CO_2 injection in naturally fractured oil reservoirs, *Energy Fuels*, 24: 1421-1430.

J215 Vejahati, F., Xu, Z. and R. Gupta, 2010, Trace elements in coal: associations with coal and minerals and their behavior during coal utilization – a review, *Fuel*, 89: 904-911.

J214 Luo, G., Yao, H., Xu, M., Cui, X., Chen, W., Gupta, R. and Z. Xu, 2010, Carbon nanotube-silver composite for mercury capture and analysis, *Energy Fuels*, 24: 419-426.

J213 Liu, Y., Xu, Z. and S. Kuznicki, 2010, Development of a novel mercury cartridge for mercury analysis, *Energy Fuels*, 24: 10-17.

J212 Feng, X., Mussone, P., Gao, S., Wang, S., Wu, S., Masliyah, J. and Z. Xu, 2010, Mechanistic study on demulsification of water-in-diluted bitumen emulsions by ethylcellulose, *Langmuir*, 26: 3050-3057.

J211 Wang, S., Liu, J., Zhang, L., Masliyah, J. and Z. Xu, 2010, Interaction forces between asphaltene films in organic solvents, *Langmuir*, 26: 183-190.

J210 Yu, X., Xu, Z., Han, S., Che, H., Yan, X. and A. Liu, 2009, Synthesis of well-ordered lamellar mesoporous molybdenum oxide, *Colloids Surfaces A: Physicochem. Eng. Aspects*, 333: 194–198.

J209 Hong, W., Li, H., Yao, S., Sun, F. and Z. Xu, 2009, Mediated oxidation of guanine by $[Ru(bpy)_2dpp]^{2+}$ and their electrochemical assembly on the ITO electrode, *Electrochimica Acta*, 54: 3250-3254.

J208 Siddiqui, S., Unwin, P., Xu, Z. and S. Kresta, 2009, The effect of stabilizer addition and sonication on nanoparticle agglomeration in a confined impinging jet reactor, *Colloids Surfaces A: Physicochem. Eng. Aspects*, 350: 38-50.

J207 Ren, S., Zhao, H., Dang-Vu, T., Xu, Z. and J. Masliyah, 2009, Effect of weathering on oil sands processability, *Can. J. Chem. Eng.*, 87: 879-886.

J206 Ren, S., Zhao, H., Long, J., Xu, Z. and J. Masliyah, 2009, Understanding weathering of oil sands ores by atomic force microscope, *AIChEJ*, 55: 3277-3285.

J205 Adegoroye, A., Uhlik, P., Omotoso, O., Xu, Z. and J. Masliyah, 2009, A comprehensive analysis of organic matter removal from clay–sized minerals extracted from oil sands using low temperature ashing and hydrogen peroxide, *Energy Fuels*, 23: 3716-3720.

J204 Zhao, H., Dang-Vu, T., Long, J., Xu, Z. and J. Masliyah, 2009, Role of bicarbonate ions in oil sands extraction systems with a poor processing ore, *J. Dispersion Sci. Technol.*, 30: 809-822.

J203 Dong, J., Xu, Z. and S. Kuznicki, 2009, Mercury Removal from flue gases by novel regenerable magnetic nanocomposite sorbents, *Environ. Sci. Technol.*, 43: 3266-3271.

J202 Wang, S., Liu, J., Zhang, L., Xu, Z. and J. Masliyah, 2009, Colloidal interactions between asphaltene surfaces in toluene, *Energy Fuels*, 23: 862-869.

J201 Adeyinka, O., Samiei, S., Xu, Z. and J. Masliyah, 2009, Effect of particle size on the rheology of Athabasca clay suspensions, *Can. J. Chem. Eng.*, 87: 422-434.

J200 Dang-Vu, T., Jha, R., Wu, S., Tannant, D., J. Masliyah and Z. Xu, 2009, Effect of solid wettability on processability of oil sands ores, *Energy Fuels*, 23: 2628-2636.

J199 Gao, S., Moran, K., Xu, Z. and J. Masliyah, 2009, Role of bitumen components in stabilizing water-in-diluted oil emulsions, *Energy Fuels*, 23: 2606-2612.

J198 Dong, J., Xu, Z. and S. Kuznicki, 2009, Novel magnetic multi-functional nano composites for environmental applications, *Advanced Functional Materials*, 19: 1268-1275.

J197 Zhou, Z., Xu, Z., Finch, J., Masliyah, J. and R. Chow, 2009, On the role of cavitation in particle collection in flotation-a critical review II, *Minerals Engineering*, 22: 419-433.

J196 Dang-Vu, T., Jha, R., Wu, S., Tannant, D., Masliyah, J. and Z. Xu, 2009, Wettability determination of solids isolated from oil sands, *Colloids Surfaces A: Physicochemical Engineering Aspects*, 337: 80-90.

J195 Ren, S., Dang-Vu, T., Zhao, H., Long, J., Xu, Z. and J. Masliyah, 2009, Effect of weathering on surface characteristics of solids and bitumen from oil sands, *Energy Fuels*, 23: 334-341.

J194 Gray, M., Xu, Z. and J. Masliyah, 2009, Physics in the oil sands of Alberta (Feature Article), Physics Today, 62: 31-35.

J193 Feng, X., Xu, Z. and J. Masliyah, 2009, Biodegradable polymer for demulsification of water-in-bitumen emulsions, *Energy Fuels*, 23: 451-456.

J192 Zhang, C., Chen, G., Gupta, R. and Z. Xu, 2009, Emission control of mercury and sulfur by mild thermal upgrading of coal, *Energy Fuels*, 23: 766-773.

J191 Yan, X., Li, H., Xu, Z. and W. Li, 2009, Electrocatalytic activity of $[Ru(bpy)_3]^{2+}$ for hypoxanthine oxidation studied by rotating electrode methods, *Bioelectrochemistry*, 74: 310-314.

J190 Drelich, J., Long, J., Masliyah, J. and Z. Xu, 2009, Contribution of colloidal forces in non-contact area to the adhesion between a micro-probe and a substrate surface-theoretical analysis, *J. Adhesion Sci. Technol.*, 23: 125-138.

J189 Najafi, A., Xu, Z. and J. Masliyah, 2008, Measurement of sliding velocity and induction time of a single micro-bubble under an inclined collector surface, *Can. J. Chem. Eng.*, 86: 1001-1010.

J188 Sun, W., Long, J., Xu, Z. and J. Masliyah, 2008, Study of $Al(OH)_3$-polyacrylamide induced pelleting flocculation by single molecular force spectroscopy, *Langmuir*, 24: 14015-12910.

J187 Zhao, H., Bhattacharjee, S., Chow, R., Wallace, D., Masliyah, J. and Z. Xu, 2008, Probing surface charge potentials of clay basal planes and edges by direct force measurements, *Langmuir*, 24: 12899-12910.

J186 Wang, G., Siggers, K., Zhang, S., Jiang, H., Xu, Z., Zernicke, R.F., Matyas, J. and H. Uludag, 2008, Preparation of BMP-2 containing bovine serum albumin (BSA) nanoparticles stabilized by polymer coating, *Pharmaceutical Research*, 25: 2896-2909.

J185 Liu, Y., Chen, F., Kuznicki, S., Wasylishen, R. and Z. Xu, 2009, A novel method to control the size of silver nanoparticles formed on chabazite, *J. Nanosicence Nanotechnology*, 9: 2768-2771.

J184 Drelich, J., Long, J., Masliyah, J. and Z. Xu, 2009, Contribution of colloidal forces in non-contact area to the adhesion between a micro-probe and a substrate surface: theoretical analysis, *J. Adhesion Sci. Technol.*, 23: 125-138.

J183 Liu, Y., Kelly, D., Yang, H., Lin, C., Kuznicki, S. and Z. Xu, 2008, Novel regenerable sorbent for mercury capture from flue gases of coal fired-power plant, *Environ. Sci. Technol.*, 42: 6205-6210.

J182 Dong, J., Mielczarski, J., Mielczarski, E. and Z. Xu, 2008, In situ characterization of the adsorbed Concanavalin A on germanium surface at various pH, *Biotechnol. Prog.*, 24: 972-980.

J181 Sharp, D., Zhang, M., Xu, Z., Ryan, J., Wanke, S. and A. Afacan, 2008, Mixing hot and cold water streams at a T-junction, *Chem. Eng. Education*, 42: 154-164.

J180 Huang, G., Diakur, J., Xu, Z. and L.I. Wiebe, 2008, Asialoglycoprotein receptor-targeted superparamagnetic iron oxide nanoparticles, *Int. J. Pharmaceutics*, 360: 197-203.

J179 Zheng, D., Li, H., Lu, B., Xu, Z. and H. Chen, 2008, Electrochemical properties of ferrocene adsorbed on multi-walled carbon nanotubes electrode, *Thin Solid Films*, 516: 2151-2157.

J178 Mak, C., Choung, J., Beauchamp, R., Kelly, D. and Z. Xu, 2008, Potential of air dense medium fluidized bed separation of mineral matter for mercury rejection from Alberta subbituminous coal, *Int. J. Coal Preparation Utilization*, 28: 115-132.

J177 Yao, S., Li, H., Guo, Q., Xu, Z. and L. Ji, 2008, DNA-promoted electrochemical assembly of $[Ru(bpy)_2dpp]^{3+/2+}$ on the ITO electrode by introducing copper (II) ion, *Electrochimica Acta*, 53: 5169-5173.

J176 Lu, B., Li, H., Deng, H., Xu, Z., Li, W. and H. Chen, 2008, Voltammetric determination of 6-mercaptopurine using $[Co(phen)_3]^{3+}$/MWCNT modified graphite electrode, *J. Electroanalytical Chem.*, 621: 97-102.

J175 Chandra, M., Xu, Z. and J. Masliyah, 2008, Interfacial films adsorbed from bitumen in toluene solution at a toluene-water interface: A Langmuir and Langmuir-Blodgett film approach, *Energy Fuels*, 22: 1784-1791.

J174 Li, H., Long, J., Xu, Z. and J. Masliyah, 2008, Effect of molecular weight and charge density on the performance of polyacrylamide in low-grade oil sand ore processing, *Can. J. Chem. Eng.*, 86: 177-185.

J173 Li, H., Long, J., Xu, Z. and J. Masliyah, 2008, Novel polymer aids for low-grade oil sand ore processing, *Can. J. Chem. Eng.*, 86: 168-176.

J172 Najafi, A., Xu, Z. and J. Masliyah, 2008, Single micro-bubble generation by pressure pulse technique, *Chem. Eng. Sci.*, 63: 1779-1787.

J171 Drelich, J., White, C. and Z. Xu, 2008, Laboratory tests on mercury emission monitoring with resonating gold-coated silicon cantilevers, *Environ. Sci. Technol.*, 42: 2072-2078.

J170 Dong, J., Xu, Z. and F. Wang, 2008, Engineering and characterization of mesoporous silica-coated magnetic particles for mercury removal from industrial effluents, *Applied Surface Sci.*, 254: 3522-3530.

J169 Yang, H., Xu, Z., Fan, M., Gupta, R., Slimane, R., Bland, A. And I. Wright, 2008, Progress in

carbon dioxide separation and capture: A review, *J. Environ. Sci.*, 20: 14-27.

J168 Li, H., Liu, Y., Xu, J., Xu, Z., Ji, L., Li, W. and H. Chen, 2007, DNA-enhanced assembly of $[Ru(bpy)_2ITATP]^{3+/2+}$ on an ITO electrode, *Electrochimica Acta*, 52: 4956-4961.

J167 Al-Hallak, K., Xu, Z., Ghaffari, F. and R. Lobenberg, 2007, The effect of compression forces on the stability of dibasic calcium phosphate dihydrate tablets in the presence of glutamic acid hydrochloride monitored by isothermal calorimetry, *Thermochimica Acta*, 467: 86-90.

J166 Li, H., Mei, W., Xu, Z., Pang, D., Ji, L. and Z. Lin, 2007, Electrochemistry of a novel monoruthenated porphyrin and its interaction with DNA, *J. Electroanalytical Chem.*, 600: 243-250.

J165 Zhang, Z., Li, H., Xu, J., Yao, S. and Z. Xu, 2007, DNA intercalating studies of $[Ru(bpy)_2HPIP]^{2+}$ with intramolecular hydrogen bond ligand based on introduction of copper ion, *Transition Metal Chem.*, 32: 776-780.

J164 Gu, G., Zhang, L., Xu, Z. and J. Masliyah, 2007, Novel bitumen froth cleaning device and rag layer characterization, *Energy Fuels*, 21: 3462-3468.

J163 Minami, W., Xu, Z. and H. Kim, 2007, Mercury removal characteristics during thermal upgrading of fractionated Alberta subbituminous coal, *Energy Fuels*, 21: 3607-3611.

J162 Long, J., Drelich, J., Xu, Z. and J. Masliyah, 2007, Effect of operating temperature on water-based oil sands processing, *Can. J. Chem. Eng.*, 85: 726-738.

J161 Long, J., Xu, Z. and J. Masliyah, 2007, Single molecule force spectroscopy of asphaltene aggregates, *Langmuir*, 23: 6182-6190.

J160 Farrell, L., Pepin, J., Kucharski, C. Lin, X., Xu, Z. and H. Uludag, 2007, A comparison of the effectiveness of cationic polymers poly-L-lysine (PLL) and polyethylenimine (PEI) for non-viral delivery of plasmid DNA to bone marrow stromal cells (BMSC), *European J. Pharmaceutics Biopharmaceutics*, 65: 388-397.

J159 Liu, J. and Z. Xu, 2007, Role of flotation reagents in tuning colloidal forces for sphalerite-silica separation, *Canadian Metallurgical Quarterly*, 46: 329-340.

J158 Yang, H., Xu, Z., Fan, M., Bland, A. and R. Judkins, 2007, Adsorbents for capturing mercury in coal-fired boiler flue gas, *J. Hazardous Materials*, 146: 1-11.

J157 Najafi, A., Drelich, J., Yeung, A., Xu, Z. and J. Masliyah, 2007, A novel method of measuring electrophoretic mobility of gas bubbles, *J. Colloid Interface Sci.*, 308: 344-350.

J156 Kuznicki, S., Kelly, D., Bian, Junjie, Lin, C., Liu, Y., Chen, J., Mitlin, D. and Z. Xu, 2007, Metal nanodots formed and supported on chabazite and chabazite-like surfaces, *Microporous Mesoporous Materials*, 103: 309-315.

J155 Li, H., Long, J., Xu, Z. and J. Masliyah, 2007, Flocculation of kaolinite clay suspensions using a temperature-sensitive polymer, *AIChE J.*, 53: 479-488.

J154 Zhang, C., Chen, G., Yang, T., Lu, G., Mak, C., Kelly, D. and Z. Xu, 2007, An investigation on mercury association in an Alberta subbituminous coal, *Energy Fuels*, 21: 485-490.

J153 Liu, J., Vandenberghe, J., Masliyah, J., Xu, Z. and J. Yordan, 2007, Fundamental study on talc-ink adhesion for talc-assisted flotation deinking of wastepaper, *Minerals Engineering*, 20: 566-573.

J152 Zhang, L., Breen, P., Xu, Z. and J. Masliyah, 2007, Asphaltene films at a toluene/water interface, *Energy Fuels*, 21: 274-285.

J151 Peng, H., Chen, H., Li, W., Hu, S., Li, H., Nan, J. and Z. Xu, 2007, A study on the reversibility of Pb(II)/PbO_2 conversion for the application of flow liquid battery, *J. Power Sources*, 168: 105-109.

J150 Ding, X., Repka, C., Xu, Z. and J. Masliyah, 2006, Effect of illite clay and divalent cations on

bitumen recovery, *Can. J. Chem. Eng.*, 84: 643-650.

J149 Long, J., Zhang, L., Xu, Z. and J. Masliyah, 2006, Colloidal interactions between Langmuir-Blodgett bitumen films and fine solid particles, *Langmuir*, 22: 8831-8839.

J148 Zhao, H., Long, J., Masliyah, J. and Z. Xu, 2006, Effect of divalent cations and surfactants on silica-bitumen interactions, *Ind. Eng. Chem. Res.*, 45: 7482-7490.

J147 Drelich, J., Long, J., Xu, Z., Masliyah, J. and C.L. White, 2006, Probing colloidal forces between a Si_3N_4 AFM tip and single nanoparticles of silica and alumina, *J. Colloid Interface Sci.*, 303:627-638.

J146 Goual, L., Horvath-Szabo, G., Masliyah, J. and Z. Xu, 2006, Characterization of the charge carriers in bitumen, *Energy Fuels*, 20: 2099-2108.

J145 Drelich, J., Xu, Z. and J. Masliyah, 2006, Structural effects recorded for AFM tips interacting with individual nanoparticles and their clusters deposited on substrates, *Langmuir*, 22: 8850-8859.

J144 Solovyev, A., Zhang, L., Xu, Z. and J. Masliyah, 2006, Langmuir films of bitumen at oil/water interfaces, *Energy Fuels*, 20: 1572-1578.

J143 Drelich, J., Long, J., Xu, Z., Masliyah, J., Nalaskowski, J., Beauchamp, R. and Y. Liu, 2006, AFM colloidal forces measured between microscopic probes and flat substrates in nanoparticle suspensions, *J. Colloid Interface Sci.*, 301: 511-522.

J142 Choung, J., Mak, C. and Z. Xu, 2006, Fine coal beneficiation using an air dense medium fluidized bed, *Coal Preparation*, 26:1-15.

J141 Wang, Y., Lim, S., Luo, J.L. and Z. Xu, 2006, Tribological and corrosion behaviors of Al_2O_3/polymer nanocomposite coatings, *Wear*, 206: 976-983.

J140 Gu, G., Zhang, L., Wu, A., Xu, Z. and J. Masliyah, 2006, Isolation and characterization of interfacial materials in bitumen emulsions, *Energy Fuels*, 20: 673-681.

J139 Wang, Y. and Z. Xu, 2006, Nanostructured Ni-WC-Co composite coatings fabricated by electrophoretic deposition, *Surface Coatings Tech.*, 200: 3896-3902.

J138 Long, J., Xu, Z. and J. Masliyah, 2006, Role of illite-illite interactions in oil sands processing, *Colloids Surfaces A: Physicochemical Engineering Aspects*, 281: 202-214.

J137 Su, L., Xu, Z. and J. Masliyah, 2006, Role of oily bubbles in enhancing bitumen flotation, *Minerals Engineering*, 19: 641-650.

J136 Liu, J., Zhang, L., Xu, Z. and J. Masliyah, 2006, Colloidal interactions between asphaltene surfaces in aqueous solutions, *Langmuir*, 22: 1485-1492.

J135 Long, J., Xu, Z. and J. Masliyah, 2006, Adhesion of single polyelectrolyte molecules on silica, mica, and bitumen surfaces, *Langmuir*, 22: 1652-1659.

J134 Long, J., Li, H., Xu, Z. and J. Masliyah, 2006, Role of colloidal interactions in oil sand tailings treatment, *AIChE J.*, 52: 371-383.

J133 Li, H., Xu, Z., Pang, D., Wu, J. Ji, L. and Z. Lin, 2006, DNA-promoted electrochemical assembly of $[Ru(bpy)_2IP]^{3+/2+}$ at an ITO electrode, *Electrochimica Acta*, 51: 1996-2002.

J132 Liu, J., Xu, Z. and J. Masliyah, 2005, Processability of oil sands ores in Alberta, *Energy Fuels*, 19: 2056-2063.

J131 Goual, L., Horvath-Szabo, G., Masliyah, J. and Z. Xu, 2005, Adsorption of bituminous components at oil/water interfaces investigated by quartz crystal microbalance: Implications to the stability of water-in-oil emulsions, *Langmuir*, 21: 8278-8289.

J130 Liu, J., Xu, Z. and J. Masliyah, 2005, Interaction forces in bitumen extraction from oil sands, *J. Colloid Interface Sci.*, 287: 507-520.

J129 Zhang, L., Lopetinsky, R., Xu, Z. and J. Masliyah, 2005, Asphaltene monolayers at a

toluene/water interface, *Energy Fuels*, 19: 1330-1336.

J128 Takafuji, M., Mimaki, T., Xu, Z. and H. Ihara, 2005, Surface charge controlled magnetic nanoparticles with grafting of poly(4-vinylpyridine), *J. Nanoscience Nanotechnology*, 5: 390-393.

J127 Wu, P. and Z. Xu, 2005, Silanation of nanostructured mesoporous magnetic particles for heavy metal recovery, *Ind. End. Chem. Res.*, 44: 816-824.

J126 Christendat, D., Abraham, T., Xu, Z. and J. Masliyah, 2005, Adhesion forces between functionalized probes and hydrophilic silica surfaces, *J. Adhesion Sci. Technol.*, 19: 149-163.

J125 Li, H., Zhou, Z.A., Xu, Z. and J. Masliyah, 2005, The role of acidified sodium silicate in low temperature bitumen extraction from poor processing oil sands, *Ind. Eng. Chem. Res.*, 19: 936-943.

J124 Long, J., Xu, Z. and J. Masliyah, 2005, On the role of temperature in oil sands processing, *Energy Fuels*, 19: 1440-1446.

J123 Li, H., Long, J., Xu, Z. and J. Masliyah, 2005, Synergetic role of polymer flocculant in low-temperature bitumen extraction and tailings treatment, *Energy Fuels*, 19: 936-943.

J122 Vandenberghe, J., Choung, J., Xu, Z. and J. Masliyah, 2005, Flux modeling for a two-phase system in a flotation column, *Can. J. Chem. Eng.*, 83: 169-176.

J121 Liu, J., Xu, Z. and J. Masliyah, 2005, Colloidal forces between bitumen surfaces measured with atomic force microscopy in aqueous solutions, *Colloids Surfaces A: Physicochem. Eng. Aspects*, 260: 217-228.

J120 Naghash, A.R., Xu, Z. and T.H. Etsell, 2005, Coprecipitation of nickel-copper-aluminum takovite as catalyst precursors for simultaneous production of carbon nanofibers and hydrogen, *Chem. Mater.*, 17: 815-821.

J119 Zhang, L., Xu, Z. and J. Masliyah, 2005, Characterization of adsorbed Athabasca asphaltene films at solvent-water interfaces using a Langmuir interfacial trough, *Ind. Eng. Chem. Res.*, 44: 1160-1174.

J118 Lu, B.T., Chen, Z.K., Luo, J.L., Patchettr, B.M. and Z. Xu, 2005, Pitting and stress corrosion cracking behavior in welded austenitic stainless steel, *Electrochimica*, 50: 1391-1403.

J117 Li, H., Xu, Z., Ji, L. and W. Li, 2005, Interactions of polypyridyl cobalt complexes with DNA studied by rotating electrode methods, *J. Applied Electrochemistry*, 35: 235-241.

J116 Wang, W., Zhou, Z., Nandakumar, K., Masliyah, J. and Z. Xu, 2005, An induction time model for the attachment of an air bubble to a hydrophobic sphere in aqueous solutions, *Int. J. Miner. Process.*, 75: 69-82.

J115 Xu, Z., Lu, G. and O. Chan, 2004, Fundamental study on mercury release characteristics during thermal upgrading of an Alberta subbituminous coal, *Energy Fuels*, 18: 1855-1861.

J114 Masliyah, J., Zhou, Z., Xu, Z, Czarnecki, J. and H. Hamza, 2004, Understanding water-based bitumen extraction from Athabasca oil sands. A review article. *Can. J. Chem. Eng.*, 82: 628-654.

J113 Liu, J., Xu, Z. and J. Masliyah, 2004, Interaction between bitumen and fines in oil sands extraction system: implication to bitumen recovery, *Can. J. Chem. Eng.*, 82: 655-666.

J112 Wallwork, V., Xu, Z. and J. Masliyah, 2004, Processibility of Athabasca oil sand using a laboratory hydrotransport extraction system (LHES), *Can. J. Chem. Eng.*, 82: 687-695.

J111 Zhou, Z., Kasongo, T., Xu, Z. and J. Masliyah, 2004, Assessment of bitumen recovery from the Athabasca oil sands using a laboratory Denver flotation cell, *Can. J. Chem. Eng.*, 82: 696-703.

J110 Choung J., Walker, J., Xu, Z. and J. Masliyah, 2004, Effect of temperature on the stability of froth formed in a recycle process water of oil sand extraction, *Can. J. Chem. Eng.*, 82: 801-

806.

J109 Lawrence, S., Zhang, L-Y, Xu, Z. and J. Masliyah, 2004, Langmuir and Langmuir-Blodgett asphaltene films at heptane-water interface, *Can. J. Chem. Eng.*, 82: 821-828.

J108 Gu, G., Sanders, S., Nandakumar, K. Xu, Z. and J. Masliyah, 2004, Hydrogen and oxygen bubble attachment to a bitumen drop, *Can. J. Chem. Eng.*, 82: 846-849.

J107 Abraham, T., Christendat, D., Gohy, J.F., Jérôme, R., Xu, Z. and J. Masliyah, 2004, Role of polyelectrolyte charge density in tuning colloidal forces, *AIChE J.*, 50: 2613-2626.

J106 Gu, G., Sanders, R., Nandakumar, K., Xu, Z. and J. Masliyah, 2004, A novel experimental technique to study single bubble-bitumen attachment in flotation, *Int. J. Miner. Process.*, 74: 15-29.

J105 Liu, J., Xu, Z. and J. Masliyah, 2004, Role of fine clays in bitumen extraction from oil sands, *AIChE J.*, 50: 1917-1927.

J104 Wu, P., Zhu, J. and Z. Xu, 2004, Template-assisted synthesis of mesoporous magnetic nanocomposite particles, *Advanced Functional Materials*, 14: 345-351.

J103 Takafuji, M., Ide, S., Ihara, H. and Z. Xu, 2004, Preparation of poly(1-vinylimidazole)-grafted magnetic nanoparticles and their application for removal of metal ions, *Chem. Mater.*, 16: 1977-1983.

J102 Xu, Z., Plitt, V. and Q. Liu, 2004, Recent advances in reverse flotation of diasporic ores - A Chinese experience (review), *Minerals Engineering*, 17: 1007-1015.

J101 Wang, W., Zhou, Z., Nandakumar, K., Xu, Z. and J. Masliyah, 2004, Effect of charged colloidal particles on adsorption of surfactants at oil-water interface, *J. Colloid Interface Sci.*, 271: 625-630.

J100 Hu, Y., Sun, W., Li, H. and Z. Xu, 2004, Role of macromolecules in kaolinite flotation, *Minerals Engineering*, 17: 1017-1022.

J99 Fang, J., Tang, B., Li, M. and Z. Xu, 2004, Recovery of cadmium from a zinc hydrometallurgical leachate using reactive emulsion liquid membrane technology, *J. Chem. Tech. Biotechnol.*, 79: 313-320. DOI: **10.1002/jctb.946**

J98 Zhang, L., Xu, Z. and J. Masliyah, 2003, Langmuir and Langmuir-Blodgett films of mixed asphaltene and a demulsifier, *Langmuir*, 19: 9730-9741.

J97 Wallwork, V., Xu, Z. and J. Masliyah, 2003, Bitumen recovery with oily bubbles, *Can. J. Chem. Eng.*, 81: 993-997.

J96 Chi, R., Hu, Y., Zhu, G., Xu, S., Zhou, Z. and Z. Xu, 2003, Solution chemistry analysis of ammonium bicarbonate consumption in rare earth elements precipitation, *Metallurgical Materials Trans.*, 34: 611-617.

J95 Hu, Y. and Z. Xu, 2003, Interactions of amphoteric amino phosphoric acids with calcium-containing minerals and selective flotation, *Int. J. Miner. Process.*, 72: 87-94.

J94 Liu, X., Hu, Y. and Z. Xu, 2003, Effect of chemical composition on electrokinetics of diaspore, *J. Colloid Interface Sci.*, 267: 211-216.

J93 Gray, M.R., Zhang, Z., McCaffrey, W.C., Huq, I., Boddez, L., Xu Z. and A.W. Elliott, 2003, Measurement of adhesive forces during coking of Athabasca vacuum residue, *Ind. End. Chem. Res.*, 42: 3549-3554.

J92 Fang, J., Li, M. and Z. Xu, 2003, Separation of cobalt from a nickel-hydrometallurgical effluent using an emulsion liquid membrane, *Sep. Sci. Technol.*, 38: 3553-3574.

J91 Zhu, G., Chi, R., Shi, W. and Z. Xu, 2003, Chlorination kinetics of fluorine- fixed rare earth concentrate, *Minerals Engineering*, 16: 671-674.

J90 Zhang, L.Y., Lawrence, S., Xu, Z. and J.M. Masliyah, 2003, Studies of Athabasca asphaltene

Langmuir films at air-water interface, *J. Colloid Interface Sci.*, 264: 128-140.

J89 Liu, J., Xu, Z. and J. Masliyah, 2003, Studies on bitumen-silica interaction in aqueous solutions by AFM, *Langmuir*, 19: 3911-3920.

J88 Lu, B.T., Chen, Z.K., Lou, J.L., Patchett, B.M. and Z. Xu, 2003, Stress corrosion crack initiation and propagation in longitudinally welded 304 austenitic stainless steel, *Corrosion Eng. Sci. Tech.*, 38: 69-75.

J87 Gu, G., Zhou, Z., Xu, Z., Nandakumar, K., and J. Masliyah, 2003, Role of fine kaolinite clay in toluene-diluted bitumen/water emulsion, *Colloids Surfaces A*, 215: 141-153.

J86 Hu, Y., Chi, R. and Z. Xu, 2003, Solution chemistry study of salt-type mineral flotation systems: role of inorganic dispersants, *Ind. Eng. Chem. Res.*, 42: 1641-1647.

J85 Wang, W., Zhou, Z., Nandakumar, N., Xu, Z. and J. Masliyah, 2003, Effect of surface mobility on the particle sliding along a bubble or a solid sphere, *J. Colloid Interface Sci.*, 259: 81-88.

J84 Hu, Y., Liu, X. and Z. Xu, 2003, Role of crystal structure in flotation separation of diaspore from kaolinite, pyrophyllite and illite, *Minerals Engineering*, 16: 219-227.

J83 Gu, G., Xu, Z., Nandakumar, K. and J. Masliyah, 2003, Effects of physical environment on induction time of air-bitumen attachment. *Int. J. Miner. Process.*, 69: 235-250.

J82 Wang, W., Zhou, Z., Nandakumar, K., Xu, Z. and J. Masliyah, 2003, Attachment of individual particles to a stationary air bubble in model systems, *Int. J. Miner. Process.*, 68: 47-69.

J81 Xu, Z., Liu, J., Choung, J. and Z. Zhou, 2003, Electrokinetic study of clay interactions with coal in flotation, *Int. J. Miner. Process.*, 68: 183-196.

J80 Gu, G., Xu, Z., Nandakumar, K. and J. Masliyah, 2002, Influence of water-soluble and water-insoluble natural surface active components on the stability of water-in-toluene-diluted bitumen emulsion, *Fuel*, 81: 1859-1869.

J79 Liu, J., Mak, T., Zhou, Z. and Z. Xu, 2002, Fundamental study of reactive oily-bubble flotation, *Minerals Engineering*, 15: 667-676.

J78 Chen, F., Finch, J., Gomez, C. and Z. Xu, 2002, Wettability effect on bubble formation at a rigid porous sparger, Canadian Metallurgical Quarterly, 41: 273-280.

J77 Liu, J., Zhou, Z., Xu, Z. and J. Masliyah, 2002, Bitumen-clay interactions in aqueous media studied by zeta potential distribution measurement, *J. Colloid Interface Sci.*, 252: 409-418.

J76 Li, J. and Z. Xu, 2002, Physical characterization of a chitosan based hydrogel delivery system, *J. Pharmaceutical Sci.*, 91: 1669-1677.

J75 Abraham, T., Christendat, D., Karan, K., Xu, Z. and J. Masliyah, 2002, Asphaltene-silica interactions in aqueous solutions: Direct force measurements combined with electrokinetic studies, *Ind. Eng. Chem. Res.*, 41: 2170-2177.

J74 Chi, R., Zhu, G., Xu, S., Tian, J., Liu, J. and Z. Xu, 2002, Kinetics of manganese reduction leaching with sodium sulfite from weathered rare earth mud, *Metallurgical Materials Trans.*, 33B: 41-46.

J73 Liu, J., Zhou, Z. and Z. Xu, 2002, Electrokinetic study of hexane droplets in surfactant solutions and process water of bitumen extraction systems, *Ind. Eng. Chem. Res.*, 41:52-57.

J72 Abraham, T., Kumpulainen, A., Xu, Z., Rutland, M., Claesson, P.M. and J. Masliyah, 2001, Polyelectrolyte mediated interaction between similarly charged surfaces: Role of divalent counterions in tuning surface forces, *Langmuir*, 17: 8321-8327.

J71 DiFeo, A., Finch, J.A. and Z. Xu, 2001, Sphalerite-silica interactions: effect of pH and calcium ions, *Int. J. Miner. Process.*, 61: 57-71.

J70 Chi, R., Xu, Z., DiFeo, T., Finch, J.A. and J.L. Yordan, 2001, Measurement of interaction forces between talc and toner particles, *J. Pulp Paper Science*, 27:152-157.

J69 Xu, Z., Chi, R., DiFeo, T. and J.A. Finch, 2000, Surface forces between sphalerite and silica particles in aqueous solutions, *J. Adhesion Sci. Technol.*, 14: 1813-1827.

J68 Zhou, Z., Xu, Z. and J. Masliyah, 2000, Effect of natural surfactants released from Athabasca oil sands on air holdup in a water column, *Can. J. Chem. Eng.*, 78: 617-624.

J67 Kasongo, T., Zhou, Z., Xu, Z. and J. Masliyah, 2000, Effect of clays and calcium ions on bitumen extraction from Athabasca oil sands using flotation, *Can. J. Chem. Eng.*, 78: 674-681.

J66 Liu, J., Chi, R., Zeng, Z. Liang, J. and Z. Xu, 2000, Selective arsenic fixing roast of refractory gold concentrate, *Metallurgical Materials Trans.*, 31B: 1163-1168.

J65 McKinnon, W., Choung, J.W., Xu, Z. and J.A. Finch, 2000, Magnetic seed in ambient temperature ferrite process applied to acid mine drainage treatment, *Environ. Sci. Technol.*, 34: 2576-2581.

J64 Choung, J.W., Xu, Z. and J. Szymanski, 2000, An integrated approach for coal tailings management, *Can. J. Chem. Eng.*, 78: 780-784.

J63 Chi, R., Zhu, G., Zhou, Z. and Z. Xu, 2000, A novel process for recovering rare earth from weathered black earth, *Metallurgical Materials Trans. 31B*: 191-196.

J62 Duong, C., Choung, J., Xu, Z. and J. Szymanski, 2000, A novel process for recovering clean coal and water from coal tailings, *Minerals Engineering*, 13: 128-135.

J61 Choung, J.W., Xu, Z. and J.A. Finch, 2000, Advances in ambient temperature ferrite process applied to acid mine drainage treatment, *Environ. Technol.*, 21: 201-207.

J60 Choung, J.W., Xu, Z. and J.A. Finch, 1999, Role of complex agents in ferrite formation under ambient conditions from industrial effluent, *Ind. Eng. Chem. Res.*, 38: 4689-4693.

J59 Bozkurt, V., Xu, Z., and J.A. Finch, 1999, Effect of depressants on xanthate adsorption on pentlandite and pyrrhotite: single vs mixed minerals, *Canadian Metallurgical Quarterly*, 38: 105-112.

J58 Chen. F, Finch, J.A., Xu, Z. and J. Czarnecki, 1999, Wettability of fine solids extracted from bitumen froth, *J. Adhesion Sci. Technol.*, 13: 1209-1224.

J57 Zhou, Z.A., Xu, Z. and J.A. Finch, 1999, Generation of small bubbles by hydrodynamic cavitation, *Trans. IMM*, 108: C55-C58.

J56 Bozkurt, V., Xu, Z., Brienne, S.H.R., Butler, I. and J.A. Finch, 1999, In situ orientation study of xanthate on copper under potential control, *J. Electroanalytical Chemistry*, 475: 124-129.

J55 Chi, R. and Z. Xu, 1999, A solution chemistry approach to study of rare earth element precipitation by oxalic acid, *Metallurgical Materials Trans.*, 30B: 189-195.

J54 Broomberg, J., Gelinas, S., Finch, J.A. and Z. Xu, 1999, Review of magnetic carrier technologies for metal ion removal, *Magnetic Electrostatic Separation*, 9: 169-188.

J53 Zhou, Z., Xu, Z., Masliyah, J. and J. Czarneki, 1999, Coagulation of bitumen with fine silica in model systems, *Colloids Surfaces A*:, 148: 199-211.

J52 Liu, Q., Xu, Z., Finch, J.A. and R. Egerton, 1998, A novel two-step silica coating process for engineering magnetic nanocomposites, Chem. Mater., 10: 3936-3940.

J51 Vergouw, J.M., DiFeo, A., Xu, Z. and J.A. Finch, 1998, An agglomeration study of sulphide minerals using zeta-potential and settling rate. Part II: Sphalerite/pyrite and sohalerite/galena, *Minerals Engineering*, 11: 605-614.

J50 Sui, C., Finch, J.A. and Z. Xu, 1998, Effect of diethylenetriamine on xanthate interaction with Pb-contaminated pyrite, *Minerals Engineering*, 11: 639-649.

J49 Sui, C., Rashchi, F., Xu, Z., Kim, J., Nesset, J.E. and J.A. Finch, 1998, Interactions in the sphalerite-Ca-SO4-CO3 systems, *Colloids Surfaces A*:, 137: 69-77.

J48 Gass, H., Butler, I., Rao, R., Xu, Z. and J.A. Finch, 1998, A useful spectroscopic method for the

determination of the concentration of diethylenetriamine (DETA) in aqueous mineral flotation solutions, *Talanta*, 46: 145-148.

J47 Zhou, Z., Hussein, H., Xu, Z., Masliyah, J. and J. Czarneki, 1998, Interaction of ionic species and fine solids with a low energy hydrophobic surface from contact angle measurement, *J. Colloid Interface Sci.*, 204: 342-349.

J46 Rashchi, F., Xu, Z. and J.A. Finch, 1998, Adsorption on silica in Pb- and Ca-SO4-CO3 systems, *Colloids Surfaces A*:, 132: 159-171.

J45 Vergouw, J.M., DiFeo, A., Xu, Z. and J.A. Finch, 1998, An agglomeration study of sulphide minerals using zeta-potential and settling rate. Part I: Pyrite and galena, *Minerals Engineering*, 11: 159-169.

J44 Gangli, P., Kozinski, J.A., Xu, Z. and S.H.R. Brienne, 1998, Bio-oxidation as a viable method for SOx emmision control, CIM Bulletin, 91: 86-89.

J43 Zhou, Z., Xu, Z. and J.A. Finch, 1998, Effect of surface properties of fine particles on dynamic bubble formation in gas-supersaturated systems, *Ind. Eng. Chem. Res.*, 37: 1998-2004.

J42 Hu, H., Zhou, Z., Xu, Z. and J.A. Finch, 1998, Numerical and experimental study of a hydrodynamic cavitation tube, *Metallurgical Materials Transactions*, 29B 911-917.

J41 Bozkurt, V., Xu, Z., and J.A. Finch, 1998, Pentlandite/pyrrhotite interaction and xanthate adsorption, *Int. J. Miner. Process.*, 52: 203-214.

J40 Xu, Z., Hu, Y. and Y. Li, 1998, Electrokinetics and wettability of huebnerite and ferberite, *J. Colloid Interface Sci.*, 198: 209-215.

J39 Rao, S.R., J.A. Finch, Zhou, Z. and Z. Xu, 1998, Relative flotation response of zinc sulphide: Mineral and precipitates, *Sep. Sci. Technol.*, 33: 819-833.

J38 Vergouw, J.M., Anson, J., Dalhke, R., Xu, Z., Gomez, C. and J.A. Finch, 1997, An automated data acquisition technique for settling tests, *Minerals Engineering*, 10: 1095-1105.

J37 Zhang, Q., Xu, Z. Bozkurt, V. and J.A. Finch, 1997, Pyrite flotation in the presence of metal ions and sphalerite, *Int. J. Miner. Process.*, 52: 187-201.

J36 Xu, Z., Liu, Q. and J.A. Finch, 1997, Silanation and stability of 3-aminopropyl triethoxy silane on nanosized superparamagnetic particles: I. Direct silanation, *Applied Surface Science*, 120: 269-278.

J35 Zhou, Z., Xu, Z., Finch, J.A., Hu, H. and S.R. Rao, 1997, Role of hydrodynamic cavitation in fine particle flotation, *Int. J. Miner. Process.*, 51: 139-149.

J34 Xu, Z., Rao, S.R., Finch, J.A., Kelebek, S. and P. Wells, 1997, Role of diethylene triamine (DETA) in pentlandite-pyrrhotite separation: I. Complexation of metals with DETA, *Trans. IMM*, 106: C15-C20.

J33 Hu, Y., Wang, D. and Z. Xu, 1997, A study of octyl hydroxamate adsorption on the flotation of wolframite, *Minerals Engineering*, 10: 623-633.

J32 Sui, C.C., Brienne, S.H.R., Xu, Z. and J.A. Finch, 1997, Xanthate adsorption on Pb contaminated pyrite, *Int. J. Miner. Process.*, 49: 207-221.

J31 Xu, Z. and J.A. Finch, 1996, A direct method for studying collector adsorption on minerals in a mixed mineral system, *Trans. IMM*, 105: C197-C199.

J30 Brienne, S., Bozkurt, V., Rao, R., Xu, Z., Butler, I. and J.A. Finch, 1996, Infrared spectroscopic investigations of the stability of xanthate-mineral interaction products, *Applied Spectroscopy*, 50: 521-527.

J29 Wang, W., Xu, Z. and J.A. Finch, 1996, Fundamental study of an ambient temperature ferrite process in the treatment of acid mine drainage, *Environ. Sci. Technol.*, 30: 2604-2608.

J28 Xu, Z., Ducker, W.A. and J.N. Israelachvili, 1996, Forces between crystalline alumina

(sapphire) surfaces in aqueous sodium dodecylsulphate surfactant solutions, *Langmuir*, 12: 2263-2270.

J27 Mielczarski, J.A., Xu, Z. and J.M. Cases, 1996, Qualitative and quantitative evaluation of heterogeneous adsorbed monolayers on semiconductor electrode by infrared reflection spectroscopy, *J. Phys. Chem.*, 100: 7181-7184.

J26 Zhou, Z., Xu, Z., Finch, J.A. and Q. Liu, 1996, Effect of gas nuclei on the filtration of fine particles with different surface properties, *Colloids Surfaces A*:, 113: 67-77.

J25 Liu, Q. and Z. Xu, 1996, Functionalization and application of nano-sized g-Fe2O3 particles, *J. Applied Physics*, 79: 4702-4705.

J24 Zhou, Z., Xu, Z. and J.A. Finch, 1996, Effect of gas nuclei on hydrophobic coagulation, *J. Colloid Interface Sci.*, 179: 311-314.

J23 Bozkurt, V., Brienne, S.H.R., Xu, Z., Rao, S.R., Butler, I.S. and J.A. Finch, 1996, Development of in situ external reflection spectroscopy technique for adsorbed films, *Minerals Engineering*, 9: 351-355.

J22 Xu, Z., Liu, Q., Ling, J. and A. Summers, 1996, Wettability of mercury surface by halide electrolyte solutions, *Langmuir*, 12: 547-554.

J21 Sui, C.C., Brienne, S.R.H., Rao, R.R., Xu, Z. and J.A. Finch, 1995, Metal ion production and transfer between sulphide minerals, *Minerals Engineering*, 8: 1523-1539.

J20 Zhang, Q., Xu, Z. and J.A. Finch, 1995, Surface ionization and complexation at the sphalerite/water interface: II. Computation of electrical double layer properties of sphalerite in the presence of iron ions in a simple electrolyte, *J. Colloid Interface Sci.*, 175: 61-67.

J19 Liu, Q. and Z. Xu, 1995, Self-assembled monolayer coatings on nano-sized magnetic particles using 16-mercaptohexadecanoic acid, *Langmuir*, 11: 4617-4622.

J18 Chiruvolu, S., Israelachvili, J.N., Naranjo, E., Xu, Z., Zasadzinski, J.A., Kaler, E.W. and K.L. Herrington, 1995, Measurement of forces between spontaneous vesicle-forming bilayers, *Langmuir*, 11: 4256-4266.

J17 Zhang, Q., Xu, Z. and J.A. Finch, 1995, Prediction of species distribution at sphalerite/water interface, *Minerals Engineering*, 8: 999-1007.

J16 Zhang, Q., Xu, Z. and J.A. Finch, 1995, Surface ionization and complexation at the sphalerite/water interface: I. Computation of electrical double layer properties of sphalerite in simple electrolyte, *J. Colloid Interface Sci.*, 169: 414-421.

J15 Zhou, Z., Xu, Z. and J.A. Finch, 1995, Minimum recovery zone height in flotation columns from bubble-particle collision analysis, *Trans. IMM*, 104: C102-C106.

J14 Xu, Z., Liu, Q. and J. Ling, 1995, An evaluation of van Oss-Chaudhury-Good's and Neumann's approach with mercury substrate, *Langmuir*, 11: 1044-1046.

J13 Ducker, W.A., Xu, Z. and J.N. Israelachvili, 1994, Measurement of hydrophobic and DLVO forces in bubble-surface interactions in aqueous solutions, *Langmuir*, 10: 3279-3289.

J12 Brienne, S., Zhang, Q., Xu, Z., Butler, I. and J.A. Finch, 1994, X-ray photoelectron and infrared spectroscopic investigation of sphalerite (ZnS) activation with iron, *Langmuir*, 10: 3582-3586.

J11 Zhou, Z., Xu, Z. and J.A. Finch, 1994, On the role of cavitation in particle collection during flotation-A critical review, *Minerals Engineering*, 7: 1073-1084.

J10 Ducker, W.A., Xu, Z., Israelachvili, J.N. and D.R. Clarke, 1994, Forces between alumina surfaces in salt solutions: non-DLVO forces and the implications for colloidal processing, *J. Amer. Ceramic Soc.*, 77: 437-443.

J9 Vigil, G., Xu, Z., Steinberg, S. and J.N. Israelachvili, 1994, Interactions of silica surfaces, *J. Colloid Interface Sci.*, 165: 367-385.

J8 Chen, Y.L., Xu, Z. and J. Israelachvili, 1992, Structure and interactions of surfactant-covered surfaces in non-aqueous (oil-surfactant-water) media, Langmuir, 8: 2966-2975.

J7 Xu, Z. and R.H. Yoon, 1990, A study of hydrophobic coagulation, *J. Colloid Interface Sci.*, 134: 427-434.

J6 Xu, Z. and R.H. Yoon, 1989, The role of hydrophobic interactions in coagulation, *J. Colloid Interface Sci.*, 132: 532-541.

J5 Chen, J., Chen, W. and Z. Xu, 1986, Adsorption and flocculation behaviours of ilmenite and feldspar in the presence of sulphonated polyacrylamide-Experimental, *J. Central-South Institute Mining Metallurgy*, No. 6: 84-94 (in Chinese).

J4 Chen, J. and Z. Xu, 1985, Advances in selective flocculation theory, *Nonferrous Metals*, No. 1: 14-22 (in Chinese).

J3 Ling, W., Shi, P., Xu, Z. and W. Chen, 1985, The determination of the trace quantities (ppm) of PAMS with GPC, *J. Central-South Institute Mining Metallurgy*, No. 1: 103-108 (in Chinese).

J2 Chen, W., Chen, J. and Z. Xu, 1985, Application of molecular orbit theory to the study of adsorption mechanisms of sulphonated polyacrylamide, *J. Central-South Institute Mining Metallurgy*, No. 4: 76-83

J1 Chen, W., Xu, Z. and X. Yu, 1982, A study of the choice of collectors in collector-polymer selective flocculation system for ilmenite-feldspar, *J. Central-South Institute Mining Metallurgy*, No. 3: 83-87 (in Chinese).

Patents

P8 Gupta, R., Xu, Z., Clark, I. and H. Yang, Bromination process, 2010, US Patent, US 2010/0126345 A1.

P7 Kuznicki, S., Kelly, D., Mitlin, D. and Z. Xu, Mercury adsorption using zeolite supported metallic nanodots, PCT WO2008/070988 A1, 2007; US patent Application 2010/0050868.

P6 Xu, Z., Liu, J. and Z. Zhou, 2005, Reactive oily bubble carriers in flotation processes and methods of generation and uses thereof, US Patent 6,959,815.

P5 Beetge, J.H., Kasongo, T., Komishke, B., Li, H., Long, J., Masliyah, J., Venter, J., Wang, S. and Z. Xu, Processing aids for enhanced hydrocarbon recovery from oil sands, oil shale and other petroleum residues, PCT WO 2005/028592 A1, 2005.

P4 Masliyah, J., Xu, Z., Li, H. and J. Long, Use of polymers for improved bitumen recovery and tailing settlings, US Provisional Patent, application filed on August 28, 2004.

P3 Choung, J., Szymanski, J. and Z. Xu, 2004, Process for treating fine coal particles, US Patent 6,767,465 (licensed to Energy Pacific, USA).

P2 Xu, Z. and Y. Gu, Magnetic nano particles for bioseparation applications, PCT 03/005029 A2, 2003.

P1 Masliyah, J., Wallwork, V. and Z. Xu, Oil assisted (oily bubble) bitumen flotation process in oil sands extraction, Canadian Patent, application filed on March 11, 2003.

Papers in Technical Conference Proceedings

C56 Deng, M., Liu, Q. and Z. Xu, 2012, Impact of total dissolved solids in process water on the surface properties of silica and sphalerite minerals, in *Proceedings The First International*

Symposium: Water in Mineral Processing (ed. J. Drelich), SME, Littleton, CO, 225-236.

C55 Wang, L., Sharp, D., Xu, Z. and J. Masliyah, 2012, A novel induction timer to study interactions between an air bubble and bitumen surface, in *Separation Technologies for Minerals, Coal and Earth Resources (Yoon Symposium)* (eds. C.A. Young and G.H. Luttrell), SME, Littleton, CO, 47-55.

C54 Thomas, T., Afacan, A., Masliyah, J., Xu, Z., Wang, Y. and J. Liu, 2010, Recovery of hydrocarbons from mature fine tailings of oil sands extraction, in *Proceedings 2nd International Conference on Oil Sands Tailings*, University of Alberta, Edmonton, pp. 141-148.

C53 Guo, L., Maham, Y., Masliyah, J. and Z. Xu, 2010, Understanding Al-PAM assisted oil sands tailings treatment, in *Proceedings 2nd International Conference on Oil Sands Tailings*, University of Alberta, Edmonton, pp.123-131.

C52 Alamgir, A., Masliyah, J. and Z. Xu, 2010, Al-PAM assisted filtration of mature fine tailings produced from oil sands development, in *Proceedings 2nd International Conference on Oil Sands Tailings*, University of Alberta, Edmonton, pp. 97-105.

C51 Wu, C., Nesset, K., Xu, Z. and J. Masliyah, 2010, Generation and attachment of submicron size bubbles to colloidal solids, in *Proceedings XXV International Mineral Processing Congress*, AusIMM (Publication Series No 7/2010), Carlton, Victoria, Australia, 2561-2568.

C50 Dave, P., Xu, Z., Szymanski, J., Gupta, R. and J. Boddez, 2010, Dry cleaning of coal by a laboratory continuous air dense medium fluidized bed separator, in *Proceedings XVI International Coal Preparation Congress 2010* (ed. R. Honaker), SME, Littleton, CO, 608-616.

C49 Wang, X., Xu, Z. and J. Masliyah, 2009, Polymer aids for flocculation of oil sands tailings, in *Paste 2009* (eds. R. Jewell, A. Fourie, S. Barrera and J. Wiertz, Vina del Mar), Chile, 93-100.

C48 Xu, Z. and J. Masliyah, 2008, Understanding flotation by visualization, in *Proceedings XXIV International Mineral Processing Congress* (eds. D. Wang, C. Sun, F. Wang, L. Zhang and L. Han), Beijing, China, 73-80.

C47 Liu, J., Zhang, L., Breen, O., Xu, Z. and J. Masliyah, 2008, Application of site binding modeling to oil droplets in aqueous solutions, in *Proceedings XXIV International Mineral Processing Congress* (eds. D. Wang, C. Sun, F. Wang, L. Zhang and L. Han), Beijing, China, 924-932.

C46 Zhou, Z., Chow, R., Xu, Z. And J. Masliyah, 2008, Spontaneous bubble nucleation on bitumen, in *Proceedings XXIV International Mineral Processing Congress* (eds. D. Wang, C. Sun, F. Wang, L. Zhang and L. Han), Beijing, China, 4318-4327.

C45 Choung, J., Lu, N. and Z. Xu, 2006, Upgrading of Canadian fine sub-bituminous coals by flotation, in *Proceedings XV International Coal Preparation Congress and Exhibition*, China University Mining Technology Press, Xuzhou, China, 398-405.

C44 Drelich, J., Xu, Z. and J. Masliyah, 2006, Measurements of colloidal forces between an AFM probe and nanoparticles deposited on a substrate, in *Interfacial Phenomena in Fine Particle Technology, Proceedings 6th UBC-McGill-UA International Symposium on Fundamentals of Mineral Processing* (eds. Z. Xu and Q. Liu), MetSoc, Montreal, Canada, 61-72.

C43 Beauchamp, R., Choung, J. and Z. Xu, 2006, Mineral particle interactions in gypsum-supersaturated process water, in *Interfacial Phenomena in Fine Particle Technology, Proceedings 6th UBC-McGill-UA International Symposium on Fundamentals of Mineral Processing* (eds. Z. Xu and Q. Liu), MetSoc, Montreal, Canada, 101-116.

C42 Xu, Z., Choung, J., Sun, W. and Z. Cui, 2006, Role of hydrodynamic cavitation by high intensity agitation in fine particle aggregation and flotation, in *Proceedings XXIII International Mineral Processing Congress* (eds. G. Onal, N. Acarkan, M.S. Celik, F. Arslan, G. Atesok, A. Guney, A.A. Sirkei, A.E. Yuce and K.T. Perek), Promedadvertising Agency, Istanbul, Turkey, pp. 395-400.

C41 Drelich, J., Nalaskowski, J., Long, J., Xu, Z. and J. Masliyah, 2006, Measurement of colloidal forces between microscopic probes and substrates in suspensions of nanoparticles, in *Proceedings Functional Fillers and Nanoscale Minerals* (ed. J.J. Kellar), SME, Inc., Littleton, CO, pp. 217-232.

C40 Dong, J. and Z. Xu, 2006, Synthesis of mesoporous silica coatings on magnetic particles for mercury removal applications, in *Proceedings Functional Fillers and Nanoscale Minerals* (ed. by J.J. Kellar), SME, Inc., Littleton, CO, pp. 241-252.

C39 Xu, Z., Choung, J., Sun, W. and Z. Cui, 2006, Visualization of fine bubbles and their role in fine particle flotation, in *Proceedings 2006: 38th Canadian Mineral Processors Conference*, CMP, Ottawa, 607-619.

C38 Gu, G., Lindmark, R., Xu, Z., Zhou, Z. and J. Masliyah, 2005, Induction time measurement in bitumen extraction systems, in *Innovations in Natural Resource Processing-Proceedings*, Jan. D. Miller Symposium (ed. by C.A. Young, J.J. Kellar, M.L. Free, J. Drelich and R.P. King), SME, Inc., Littleton, CO, pp. 337-349.

C37 Xu, Z., Zhou, Z., Choung, J.W. and T. Fu, 2004, Role of particle aggregation in fine sphalerite flotation studied by on-line visualization, in *Proceedings 5th UBS-McGill International Symposium on Fundamentals of Mineral Processing-Particle Size Enlargement in Mineral Processing* (ed. by J.S. Laskowski), MetSoc, Montreal, pp. 57-72.

C36 Xu, Z. and G. Lu, 2003, Up-grading and mercury removal from an Alberta subbituminous coal by pyrolysis, in *Symposium Combustion Canada '03* (ed. B. Clements), Natural Resources Canada, Ottawa, paper No. 7A-3.

C35 Wang, Y., Lim, S., Xu Z. and J.L. Luo, 2003, Micro Scratch and Corrosion Behaviors of Nanostructured WC Particles-Enhanced Polymer Composite Coatings, in *Proceedings 42nd Conference Metallurgists: Second International Symposium on Environmental Degradation of Materials and Corrosion Control in Metals* (eds. J. Luo, M. Elboujdaïni, D. Shoesmith and P.C. Patnaik), MET SOC, Montreal, Quebec, pp. 503-515.

C34 Liu, J., Zinterer, J., Masliyah, J.H., Yordan, J. and Z. Xu, 2003, Adhesion of talc and ink particles in paper de-inking flotation, in *Functional Fillers and Nanoscale Minerals* (eds. J.J. Kellar, M.A. Herpfer and B.M. Moudgil), SME, Littleton, Colorado, pp. 207-216.

C33 Xu, Z., Liu, J. and C. Kenney, 2003, Fundamental study of reactive oily bubbles in sulphide flotation, in *Proceedings 35th Conference of Canadian Mineral Processors*, CMP, Ottawa, 607-619.

C32 Chen, Z.K., Lu, B.T., Luo, J.L., Patchett B. M. and Z. Xu, 2002, Investigation of stress corrosion cracking in longitudinal welded specimens of austenitic stainless steel, in *Proceedings 41th Conference of Metallurgists, Symposium on Aerospace Materials: Development, Durability, Testing and Life Cycle Issues* (eds. P.C. Patnaik and M. Elboujdaïni), MET SOC, Montreal, pp. 181-189.

C31 Choung, J. and Z. Xu, 2001, A novel process for recovering clean coal and water from coal tailings, in *Pollution Control and Reutilization of Solid Wastes* (eds. L. Chai, C. Zhang and S. Lan), Central South University Press, 247-253.

C30 Liu, J., Zhou, Z. and Z. Xu, 2001, Electrokinetic study of hexane droplets in surfactant aqueous solutions, in *Proceedings Interactions in Mineral Processing* (eds. J.A. Finch, S.R. Rao and L. Huang), CIM, Montreal, 375-384.

C29 Choung, J.W., Xu, Z. and J.A. Finch, 2000, Ambient temperature ferrite process for acid rock drainage treatment, in *Proceedings: ICARD 2000*, SME inc., Littleton, CO, 1101-1111.

C28 Xu, Z., Choung, J.W. and J. Szymanski, 2000, An integrated process for recovering fine coals

and recycling water from coal tailings, in *Proceedings Coal Prep 2000*, 243-253.

C27 Zhou, Z., Xu, Z., Masliyah, J., Kasongo, T., Kizor, T. and D. Cox, 2000, Application of on-line visualization to flotation systems, in *Proceedings 32nd Annual Meeting of the Canadian Mineral Processors*, CMP, Ottawa, 120-137.

C26 Wang, W., Hu, C. and Z. Xu, 1999, Pelletizing characteristic of the magnetite concentrate from Daye Iron-Mine, in *ICARISM '99, Proceedings the International Conference on Alternative Routes of Iron and Steelmaking, Australasian Institute of Mining and Metallurgy Publication Series*, Perth, 99: 237-240.

C25 Choung, J.W., J. Liu, Z. Xu and J. Szymanski, 1999, Flocculant in integrated coal tailing's processing by hydrophobic extraction, in *The Use of Polymers in Mineral Processing* (ed. J. Laskowski), CIM, Montreal, 439-453.

C24 Bozkurt, V., Xu, Z. and J.A. Finch, 1998, Xanthate adsorption on pentlandite and pyrrhotite: Effect of mineral interactions, in *Innovations in Minerals and Coal Processing* (eds. S. Atak, G. Onal and M. Celik), A.A. Balkema Publishers, Netherlands, 93-98.

C23 Choung, J.W., Xu, Z. and J.A. Finch, 1998, Solutions to calcium problem in ambient temperature ferrite process applied to acid mine drainage treatment, in *Waste Processing and Recycling in Mineral and Metallurgical Industries III* (eds. S.R. Rao, L.M. Amaratunga, G.G Richards and P.D. Kondos), CIM, Montreal, 323-334.

C22 Xu, Z., Liu, Q. and J.A. Finch, 1998, Engineering of Magnetic Nanocomposites for Biological and Environmental Applications (Keynote presentation), in *Composites at Lake Louise '97* (ed. P. Nicholson), Eagle Press, Burlington, Ontario, 20-32.

C21 Wang, W., Xu, Z., Zhang, Y., Zhang, D. and L. Yang, 1997, Development of a stochastic mathematical model for spiral concentrator, in *Proceedings XX International mineral Processing Congress*, (eds. H. Hoberg and von H. Blottniz), GDMB, Clausthal-Zellerfeld, Germany, 2 521-530.

C20 Rao, S.R., Xu, Z. and J.A. Finch, 1997, Separation of calcium sulphate produced in effluent treatment by precipitate flotation, in *Processing of Complex Ores-Mineral Processing and Environment* (eds. J.A. Finch, S.R. Rao and I. Holubec), CIM, Montreal, 305-315.

C19 DiFeo, A., Xu, Z. and J.A. Finch, 1997, Electrokinetic study of sulphide minerals in mixed mineral systems, in *Processing of Complex Ores-Mineral Processing and Environment* (eds. J.A. Finch, S.R. Rao and I. Holubec), CIM, Montreal, 257-271.

C18 Bozkurt, V., Xu, Z. and J.A. Finch, 1997, Pentlandite/pyrrhotite interaction-xanthate adsorption in presence of Ni ions, in *Processing of Complex Ores-Mineral Processing and Environment* (eds. J.A. Finch, S.R. Rao and Holubec, I.), CIM, Montreal, 101-111.

C17 Zhou, Z., Langlois, R., Xu, Z., Finch, J.A. and R. Agnew, 1997, In-plant testing of a hydrodynamic cavitation reactor in flotation, in *Processing of Complex Ores-Mineral Processing and Environment* (eds. J.A. Finch, S.R. Rao and I. Holubec), CIM, Montreal, 185-193.

C16 Wang, W., Xu, Z., Choung, J.W. and J.A. Finch, 1997, Challenges for ambient temperature ferrite process in acid mine drainage treatment, in *Processing of Complex Ores-Mineral Processing and Environment* (eds. J.A. Finch, S.R. Rao and I. Holubec), CIM, Montreal, 293-304.

C15 Bozkurt, V., Xu, Z., Brienne, S.H.R., Butler, I.S. and J.A. Finch, 1996, A novel approach for in situ spectroelectrochemical characterization of collector-mineral reactions, in *Proceedings Fourth Int. Symp. On Electtrochemistry in Mineral and Metal Processing* (eds. R. Woods, F.M. Doyle and P. Richardson), Electrochemical Soc. Inc., Pennington, NJ, 108-118.

C14 Finch, J.A., Xu, Z. and S.R. Rao, 1996, Control of iron sulphides in mineral processing, in *Proceedings the Second International Symposium on Iron Control in Hydrometallurgy*, (eds. J.E. Dutrizac and G.B. Harris), CIM, Montreal, 3-15.

C13 Xu, Z., 1995, External reflection infrared spectroscopy of collector monolayers on mineral surfaces: A computer simulation approach, in *Proceedings CAMI'95* (ed. H.S. Mitri), CIM, Montreal, 773-780.

C12 Zhang, Q., Xu, Z. and J.A. Finch, 1995, Surface complexation modelling, in *Proceedings CAMI'95* (ed. H.S. Mitri), CIM, Montreal, 781-785.

C11 Zhou, Z., Xu, Z. and J.A. Finch, 1995, Fundamental study of cavitation in flotation, in *Proceedings XIX International mineral Processing Congress*, SME, Inc., Littleton, Co, 3: 93-97.

C10 Wang, W. and Z. Xu, 1995, New concepts on the separation of shaking table, in *Proceedings XIX International Mineral Processing Congress*, SME, Inc., Littleton, Co, 2: 159-162.

C9 Xu, Z., Zhou, Z., Liu, Q. and J.L. Yordan, 1995, Role of interfacial phenomena in fine coal dewatering, in *Proceedings Processing of Hydrophobic Minerals and Fine Coals* (ed. J.S. Laskowski), CIM, Montreal, 513-525.

C8 Rao, R., Xu, Z. and J.A. Finch, 1995, Selective solublization of Zn(II), Cu(II), and Ni(II) from Fe(III) in metal hydroxide sludges by diethylene triamine, in *Proceedings Waste Processing and Recycling in Mineral and Metallurgical Industries* (eds. S.R. Rao, L.M. Amaratonga, G.G. Richards and P.D. Kondos), CIM, Montreal, 69-77.

C7 Gangli, P., Kozinski, J.A. and Z. Xu, 1995, Microbiologically boosted removal of Sox and Nox from outgases, in *Proceedings Waste Processing and Recycling in Mineral and Metallurgical Industries* (eds. S.R. Rao, L.M. Amaratonga, G.G. Richards and P.D. Kondos), CIM, Montreal, 507-520.

C6 Bozkurt, V., Brienne, S.H.R., Rao, S.R., Xu, Z., Butler, I.S. and J.A. Finch, 1995, Xanthate interaction with chalcocite and heazlewoodite, in *Proceedings Copper '95, Int. Con.: Vol II, Mineral Processing and Environment*, Santiago, Chile, 169-182.

C5 Zhang, Q., Xu, Z., Brienne, S., Butler, I. and J.A. Finch, 1995, The effect of iron ions on the flotation of sphalerite and pyrite, in *Proceedings Zinc & Lead 95*, Sendai, Japan, 167-176.

C4 Zhou, Z., Xu, Z. and J.A. Finch, 1994, Gas nucleation in flotation, in *Innovations in Mineral Processing* (ed. Turgut Yalcin), Sudbury, Canada, 53-66.

C3 Laskowski, J.S., Xu, Z., and R.H. Yoon, 1991, Energy barrier in particle-to-bubble attachment and its effect on flotation kinetics, in *Proceedings XVII International Mineral Processing Congress*, Dresden, Germany, September, 237-249.

C2 Chen, J., Chen, W. and Z. Xu, 1988, Adsorption and flocculation behaviour of ilmenite, titanomagnetite and feldspar in the presence of sulphonated polyacrylamide, in *Proceedings XVI International Mineral Processing Congress* (ed. E. Forssberg), Elsevier Science Publishers, Amsterdam, 1347-1356.

C1 Yoon, R.H., Xu, Z., Chen, J. and W. Chen, 1987, Selective flocculation of titanomagnetite, ilmenite and feldspar using sulphonated polyacrylamide, in *Focculation in Biotechnology and Separation Systems*, (ed. by Y.A. Attia), Elsevier Science Publishers, Amsterdam, 707-716.