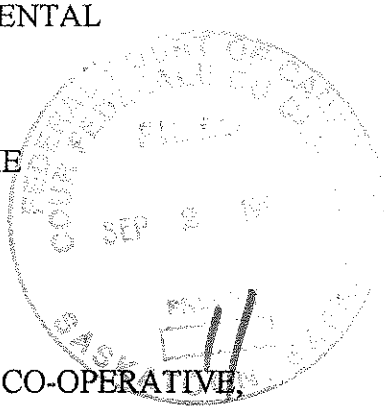
Federal Court No.: T-1313-99

FEDERAL COURT - TRIAL DIVISION

IN THE MATTER OF THE CANADIAN ENVIRONMENTAL ASSESSMENT ACT & REGULATIONS

AND IN THE MATTER OF THE RULES OF THE FEDERAL COURT OF CANADA



BETWEEN:

INTER-CHURCH URANIUM COMMITTEE EDUCATIONAL CO-OPERATIVE, of the City of Saskatoon, in the Province of Saskatchewan

APPLICANT

- and -

ATOMIC ENERGY CONTROL BOARD

RESPONDENT

AFFIDAVIT OF LINDA KATHRYN MURPHY

FORTUGNO LAW OFFICE
Barrister & Solicitor
#508 - 245 3rd Avenue South
SASKATOON, Saskatchewan, S7K 1M4

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RESPONDENT

AFFIDAVIT OF LINDA KATHRYN MURPHY

I, LINDA KATHRYN MURPHY, homemaker and teacher, of the City of Saskatoon, in the Province of Saskatchewan, SWEAR THAT:

1. I am the President of the Board of Directors of the Applicant Inter-Church Uranium Committee Educational Co-operative and as such have a personal knowledge of the facts and matters hereinafter deposed to except where otherwise stated.

2. The Applicant Inter-Church Uranium Committee Educational Co-operative (hereinafter "ICUCEC") is incorporated under the Saskatchewan *Co-operatives Act*, S.S. 1989, c. C-37.2.

3. The Inter-Church Uranium Committee (hereinafter "ICUC"), as it was then known, was formed in August of 1980 after a Federal Environmental Assessment Review

Office panel reviewed Eldorado Nuclear Ltd.'s proposal to construct a uranium refinery at Warman, Saskatchewan, and recommended that the refinery not be built.

4. Membership of the Committee has been drawn from the Roman Catholic, Anglican, Lutheran, United and Mennonite churches, the Religious Society of Friends, and First Nations and Métis communities. ICUCEC's approach to the issue of uranium mining and the questions the Committee has raised and addressed have been based on our various spiritual traditions and ethical thought.

5. Throughout ICUCEC's history the Committee's main interests with respect to uranium mining in Saskatchewan have been: Saskatchewan uranium and its connection to nuclear weapons production; environmental concerns; health and safety issues; the political participation of aboriginal peoples; economic issues with a particular emphasis on Northern Saskatchewan; the displacement of aboriginal peoples; and, energy alternatives.

6. ICUCEC has addressed the issues referred to in paragraph 5 above as follows: researching and producing publications; maintaining and operating an up to date resource centre including print and audio-visual material; organizing conferences, public meetings and workshops; working with Saskatchewan church leadership; speaking in churches and schools; working with northern aboriginal communities; and participating in a variety of public hearings and consultations such as environmental assessment and review processes, Senate Committee hearings, and citizen inquiries.

7. ICUCEC is also a founding member of the Canadian Uranium Alliance (hereinafter the "Alliance"), and has had its concerns presented through the Alliance to the Atomic Energy Control Board (the "AECB") in Ottawa. Individual members of ICUCEC, including Dr. William R. Adamson, Mrs. Maisie Shiell, Mrs. Marion Penna, Dr. James Penna, and Phillip Penna, have also made presentations to the AECB.

8. ICUC's first action was to organize an international conference called "Atoms for War and Peace: The Saskatchewan Connection". The conference was held in February 1981 in Saskatoon, Saskatchewan. The conference produced a document entitled *Atoms for War/Atoms for Peace: The Saskatchewan Connection.* A copy of this document is attached and marked as Exhibit "A" to my Affidavit.

9. Our Committee has worked with northern Saskatchewan Métis and First Nations communities in addressing the impacts of uranium mining. In the early 1980's ICUC members worked with the Village of Pinehouse. In 1984-85 we worked with the Hatchet Lake Band, assisting them with their concerns regarding the Rabbit Lake uranium mine. We have also worked with the Village of Green Lake through the Mayor's office and have spoken at a number of gatherings the office sponsored.

10. In 1982 ICUC produced a series of tabloids entitled as follows:

- *The Nuclear Debate, Questions and Answers*;
- *The Economics of Uranium in Saskatchewan*;
- *Canada the Innocent Profiteer?*;
- *Exporting Armageddon*;
- *The Smoke Screen of Nuclear Safe-Guards*; and
- *Uranium=Jobs=Blackmail.*

A copy of each document in this series is attached and the series is marked as Exhibit "B" to my Affidavit.

11. In 1983 ICUC produced the Saskatchewan Church Leaders' statement on uranium mining entitled *Christian Leaders Call for a Halt to Uranium Mining for the Sake of Peace.* This statement still stands and ICUCEC continues to receive support of our

church leadership. The Christian leadership that endorsed this statement in 1983 included:

- The Most Rev. Noel Delaquis, Roman Catholic Bishop of Gravelbourg;
- Mr. Edgar W. Epp, Executive Director, Mennonite Central Committee (Sask.);
- Most Rev. Charles Halpin, Roman Catholic Archbishop of Regina;
- Dr. John W. Kleiner, Professor of Christian Ethics & Church History, Lutheran Theological Seminary;
- Bishop G.W. (Lee) Leutkehoelter, Central Canada Synod, Lutheran Church In America;
- Most Rev. James P. Mahoney, Roman Catholic Bishop of Saskatoon;
- Most Rev. Blaise Morand, Roman Catholic Bishop of Prince Albert;
- Dr. Paul W. Newman, Past President, Saskatchewan Conference United Church of Canada;
- The Most Rev. Michael G. Peers, Anglican Archbishop of Qu'Appelle;
- The Rt. Rev. H.V.R. Short, Anglican Bishop of Saskatchewan;
- Rev. Wendell Stevens, President, Saskatchewan Conference United Church of Canada;
- Most Rev. Jerome Weber, Roman Catholic Abbot Ordinary of Muenster;
- The Rt. Rev. Roland A. Wood, Anglican Bishop of Saskatoon.

A copy of this statement is attached and marked as Exhibit "C" to my Affidavit.

12. In November of 1984 ICUC co-sponsored a conference on Economic Options for Northern Saskatchewan with the Northern Native Rights Committee. The conference was held in Saskatoon. A copy of the report published from this conference is attached and marked as Exhibit "D" to my Affidavit.

13. In 1985 ICUC came to national prominence when it exposed the Saskatchewan nuclear weapons connection. The information provided by ICUCEC was the basis for a CTV W-5 production.

14. In 1987 ICUC co-sponsored along with Project Ploughshares the Nuclear Weapons Free Zone Campaign in Saskatoon. The campaign resulted in a 1988 City bylaw declaring Saskatoon a nuclear weapons free zone. A copy of a flyer produced as part of this campaign is attached and marked as Exhibit "E" to my Affidavit.

15. In February 1991 ICUCEC incorporated under the *Co-operatives Act* to establish, maintain and operate on a non-profit basis a co-operative to phase-out uranium mining in Saskatchewan. This objective would be achieved through education, and the development of school curricula, conferences, research projects, and a resource centre to support economic development alternatives in and for Northern Saskatchewan.

16. In January 1993 ICUCEC publicly revealed evidence suggesting that Saskatchewan uranium mined by Cameco Corporation was involved in the production of "conventional weapons". A copy of ICUCEC's news release, a January 22, 1993 Star-Phoenix newspaper article, and a copy of Aerojet Ordnance Tennessee's letter and application to export uranium tetra-hexa-fluoride to Eldorado Resources Limited's (i.e. Cameco's), Port Hope, Ontario refinery, to be manufactured into depleted uranium penetrators (bullets) on U.S. Department of Defense contracts, are attached to my Affidavit and marked as Exhibits "F", "G", and "H" respectively.

17. Between 1993 and 1996 ICUCEC published and distributed the *Christian Leaders Call for Critical Reflection on Uranium Mining and the Nuclear Industry in Saskatchewan.* The document was endorsed in November of 1993 by the following:

- Mr. Eugene Anderson, President of the Saskatoon Council of Churches;

- Most Reverend Basil Filevich, Bishop of the Ukranian Catholic Eparchy of Saskatoon;
- the Reverend Allan Grundahl, Bishop Saskatchewan Synod, Evangelical Lutheran Church in Canada;
- the Most Reverend James P. Mahoney, Bishop Roman Catholic Diocese of Saskatoon;
- the Reverend Bernard de Margerie, Director Saskatoon Centre for Ecumenism;
- he Reverend Jim McKay, Chairperson Saskatoon Inner City Council of Churches;
- the Right Reverend Thomas Morgan, Bishop Anglican Diocese of Saskatoon;
- the Reverend Orest Olekshy, Holy Resurrection Orthodox Church, Saskatoon;
- Pastor Vern Ratzlaff, Nutana Park Mennonite Church, Saskatoon;
- the Reverend David Sonmor, Chairperson Saskatoon General Ministerial Association;
- Mrs. Linda Westcott, Saskatoon Presbytery, United Church of Canada.

18. The Christian Leaders document was further endorsed by the Western Half Yearly Meeting of the Religious Society of Friends in October of 1995 and the Prairie Monthly Meeting of the Religious Society of Friends in January of 1996. A copy of this document is attached and marked as Exhibit "I" to my Affidavit.

19. To provide background information for the Christian Leaders' document referred to in paragraphs 17 and 18 above, ICUCEC developed the document entitled *Background Information and Analysis: Christian Leaders Call for Critical Reflection on Uranium Mining and the Nuclear Industry in Saskatchewan.* This document is attached and marked as Exhibit "J" to my Affidavit.

20. In January 1997 ICUCEC sponsored a people's conference on the global problems of nuclear waste disposal. The people's conference was attended by members of aboriginal groups from Saskatchewan and Canada, and also included the participation of a delegate from Fiji who spoke about the links between Saskatchewan uranium mining and the oppression of South Pacific peoples.

21. In conjunction with the people's conference, in January 1997 ICUCEC participated in panel hearings reviewing Atomic Energy of Canada Ltd.'s high level nuclear waste deep burial disposal concept.

22. ICUCEC has been involved in most public hearings in Saskatchewan regarding uranium mining and nuclear power since 1980. Between 1991 and 1993, ICUCEC participated in the Federal Environmental Assessment Review Office panel review of the Eagle Point, A-zone and D-zone ore bodies at the Rabbit Lake uranium mining project. Between 1991 and 1996, ICUCEC also participated in the joint federal-provincial environmental assessments of the McArthur River Underground Exploration Program, the Dominique-Janine Extension, McClean Lake Project, Midwest Joint Venture, and the Midwest and Cigar Lake projects, both on its own and as a member of the Saskatchewan Uranium Coalition.

23. Between 1991 and 1993, ICUCEC worked with a variety of aboriginal organizations, individuals and solidarity groups such as the World Uranium Hearings in Austria.

24. As a result of the work conducted during this 1991 to 1993 period, the following people attended and made presentations to the Joint Federal-Provincial Panel on Uranium Mining Developments in Northern Saskatchewan (hereinafter "Joint Panel"):

- Ed Burt of Algoma Manitoulin Nuclear Awareness;

- Gordon Edwards of the Canadian Coalition for Nuclear Awareness;
- Jim Garrett of the Lakota First Nation from South Dakota, U.S.A.;
- journalist and writer Paul McKay;
- lawyer Lloyd Greenspoon from the group Northwatch in northern Ontario;
- Dieter Rogalla a member of the European Parliament;
- Remuna Tufariua from the Tavini-Huiraatira-Polynesian Liberation Front;
- Marvin Resnikoff Radioactive Waste Management Associates;
- and Guenter Wippel from the World Uranium Hearings based in Salzburg, Austria.

25. As a result of the work conducted during this 1991 to 1993 period, written submissions were made to the Joint Panel on behalf of and including the following groups:

- BIG MOUNTAIN aktionsgruppe, Team Frankfurt;
- Concerned Citizens of Manitoba;
- ICUCEC
- Fort Qu'Appelle Peace and Justice Committee;
- NO-Candu Coalition;
- and the Peoples' Organization Against Nuclear Power and Nuclear Weapon, Gavle, Sweden.

26. In October 1993, the Joint Panel issued a report on the Dominique-Janine Extension, the McClean Lake Project and the Midwest Joint Venture. A copy of the joint news release entitled *Uranium Mining Developments in Northern Saskatchewan: Recommendations on Three Projects Made Public*, issued by the federal Minister of the Environment and received by ICUCEC is attached and marked as Exhibit "K" to my Affidavit.

27. In its October 1993 report, the Joint Panel recommended that the McClean Lake Project be delayed for at least five years, stating that: "This would allow time to obtain more experience with pervious surround tailings management facilities." The panel stated that the project's approval at that later time should be contingent on fulfillment of the "...evaluation by regulatory agencies of the pervious surround tailings pit at Rabbit Lake after several more years of operation." A copy of this report, received by ICUCEC, is attached and marked as Exhibit "L" to my Affidavit.

28. In December 1993, the Federal Minister of Natural Resources issued a response to the Joint Panel's October 1993 conclusions and recommendations. It did not accept the principal recommendation for the McClean Lake project as the government determined that subsequent steps in the regulatory process, involving Atomic Energy Control Board approval, would mean that the project would not be implemented for several years and that these steps could address the Joint Panel's concerns.

29. On August 15, 1996 Doctor Annalee Yassi, a member of the Joint Panel, and a member of the faculty of Medicine, Department of Community Health Sciences, University of Manitoba, resigned from the Joint Panel. In a letter dated September 30, 1996 from Dr. Yassi to Vice-Chief John Dantouze of the Prince Albert Grand Council, another Joint Panel member, Dr. Yassi states that her resignation was due in part to her resistance to the "...political and industrial agenda we must follow", and that the Panel's changing of dates of public hearings, in disregard for her previous commitments, resulted in her being "...effectively pushed off the Panel." A copy of excerpts from this letter, received by ICUCEC, is attached and marked as Exhibit "M" to my Affidavit.

30. On August 23, 1996 the Joint Panel officially announced Dr. Annalee Yassi's resignation, stating that Dr. Yassi cited the difficulty of accommodating the panel's schedule and external time commitments as the reasons for her resignation. A copy of the news release received by ICUCEC is attached and marked as Exhibit "N" to my Affidavit.

31. On October 1, 1996, Vice-Chief John Dantouze, another member of the Joint Panel, resigned from the Joint Panel. The resignation was announced by a press release. In John Dantouze's press release Mr. Dantouze states that "...the fundamental problem in the Panel process is not any conflict between my political obligations to the Athabasca First Nations and my mandate on the Panel, but the pressures from the federal and provincial governments and the mining industry to proceed prematurely with decisions in their favour. My 'interest' is the same in both my roles; to ensure that uranium mining only proceeds where it is clearly of primary benefit to northern people." A copy of this press release, received by ICUCEC, is attached and marked as Exhibit "O" to my Affidavit.

32. As a result of the federal and provincial governments' decisions regarding the McClean Lake Project and the resignation of these Joint Panel members, ICUCEC withdrew in protest from the Joint Panel's assessment of Cigar Lake and Midwest Joint Venture projects.

33. Prior to its withdrawal from the formal environmental assessment process, ICUCEC was a member of the Saskatchewan Uranium Coalition. Other members of the coalition consisted of Big River Citizens for Energy Alternatives, the Northern Village of Green Lake, the Saskatoon Community Clinic, the International Uranium Congress, Pokebuster's Citizen's Coalition, and the Archdiocese of Keewatin-LePas.

34. The Saskatchewan Uranium Coalition, under the direction of Phillip Penna, a staff member for ICUCEC, received $20,100.00 through the Participant Funding Program to review the Midwest Environmental Impact Statement focusing on issues relevant to waste management and to prepare a brief that was presented to the Joint Federal-Provincial Panel during public hearings in 1996-97. The Saskatchewan Uranium Coalition received $11,500.00 through the Participant Funding Program to review the Cigar Lake environmental impact statement focusing on issues relevant to waste

management and to prepare a brief that was presented to the Joint Federal-Provincial Panel during the public hearings in 1996-97.

35. The Saskatchewan Uranium Coalition hired the firm Radioactive Waste Management Associates (RWMA) to assist it in the reviews of these environmental impact statements. RWMA produced several reports for the Joint Panel commissioned by the Saskatchewan Uranium Coalition. RWMA summarized its findings in a presentation to the Joint Panel entitled, *Before the Joint Federal-Provincial Panel on U Mining on Cigar Lake and McArthur River, Statement by Marvin Resnikoff, Ph.D., on behalf of the Saskatchewan Uranium Coalition, La Ronge, Saskatchewan August 12, 1997.* A copy of this presentation is attached and marked as Exhibit "P" to my Affidavit.

36. Summaries of the Saskatchewan Uranium Coalition reviews of the above environmental impact statements are contained in the document entitled *Uranium Mining in Northern Saskatchewan: Is It Worth the Risk?* A copy of this document is attached and marked as Exhibit "Q" to my Affidavit.

37. As noted in paragraph seven above, ICUCEC is a member of the Canadian Uranium Alliance ("the Alliance").

38. In the aftermath of the government decisions to proceed with the reviewed uranium mining projects, the Alliance has brought ICUCEC's concerns regarding the JEB pit to AECB licensing meetings in Ottawa. ICUCEC's membership in the Canadian Uranium Alliance has allowed it to overcome the distances involved in traveling to Ottawa to AECB meetings. ICUCEC has been able to continue its participation in and to monitor Atomic Energy Control Board licensing decisions.

39. As noted in paragraph seven above, ICUCEC members have also presented and submitted briefs to the Atomic Energy Control Board at its hearings to license uranium mine facilities. Submissions have included written and/or oral presentations.

40. I make this Affidavit in support of an Application by the Inter-Church Uranium Committee Educational Co-operative for an order quashing the AECB decision to issue licence amendment AECB-MFOL-170-0.5 to Cogema Resources Inc., and for an Order requiring the AECB to refer the projects presently under the licence to a Comprehensive Study under the *Canadian Environmental Assessment Act*, or any other appropriate relief.

SWORN BEFORE ME at the City of Saskatoon, in the Province of Saskatchewan, this 2nd day of September, A.D. 1999.

Linda Kathryn Murphy
LINDA KATHRYN MURPHY

Stefania Fortugno
A COMMISSIONER FOR OATHS
in and for the Province of Saskatchewan
Being a solicitor.

This Affidavit was delivered by:

FORTUGNO LAW OFFICE
Barrister & Solicitor
#508 - 245 3rd Avenue South
SASKATOON, Saskatchewan, S7K 1M4

Whose address for service is: same as above

Lawyer in charge of file: Stefania A. Fortugno

Telephone: (306) 653-0898
Facsimile: (306) 653-0879

ATOMS FOR WAR/ATOMS FOR PEACE: THE SASKATCHEWAN CONNECTION

This is Exhibit A referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999
Stefania Fortugno
A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

"If the Gospel vision is to become a reality, if we are to break the poverty barrier for almost two-thirds of the earth's people, if we are to continue to inhabit the earth, there has to be a revolution in the relationship of human beings to the earth and of human beings to each other."

Rev. Peter Hamel to the Inter-Church Uranium Committee Conference, Saskatoon, Sask., February 15, 1981.

Nuclear Proliferation: A Christian Response

A recent United Nations report says there are now 40 thousand nuclear warheads in the world's arms cache, the equivalent of one thousand Hiroshimas.

Surely the threat — the prospect — of nuclear war is of concern to all people, certainly it is to us as Christians. Central to our heritage and our values are the sacredness of human life and all creation in this and future generations, stewardship of the earth, and peace, not violence.

As Rev. Hamel says above, something has gone wrong in our relationship to the earth and our relationship to each other.

Undoubtedly, it is their knowledge of Christian values and heritage which has led many church leaders in Saskatchewan and many people in congregations and parishes to question the rapid development of our uranium reserves.

Several of the major churches and many organizations and individuals within the churches have called for a moratorium on future uranium development in the province; others are studying and analyzing the issue.

The churches are concerned for good reasons: health risks from radiation to miners and the public at large are likely to be greater than predicted; there are no known, acceptably safe methods of disposal for radioactive waste; the results of uranium development may be more harmful than beneficial to northern residents; and land entitlements have not yet been settled with Indian and native people in the areas where mining and exploration are occurring.

But a most important reason for the concern of church people is the possibility, the likelihood, that Saskatchewan uranium is contributing to the alarming problem of nuclear weapons' proliferation and the threat of nuclear war.

In the spring of 1980, a group of people drawn from various Christian churches in Saskatchewan created the Inter-Church Uranium Committee. The committee was organized because people realized that while numerous churches and church people had made statements about uranium development, very little had been done to support those statements, or to educate congregations and parishes about the issue. The ICUC pledged itself to a program of at least two years, concentrating first upon the problem of nuclear weapons proliferation. Its objective is to do educational work at every level of each of the churches represented on the committee, to assemble the information necessary to undertake that education campaign, and begin to develop strategies which would allow churches and church people to make their voices heard on the issue of uranium development.

The first major activity of ICUC was a conference — Atoms For War & Peace, The Saskatchewan Connection — in Saskatoon in February, 1981. People were invited on a representational basis from each of the churches involved in the committee (Anglican, Lutheran, Mennonite, Roman Catholic and United). Representatives of several citizens' public interest groups were invited as well. About 160 participants came out to hear an impressive assembly of resource people and to work through many questions in workshops. Each church group met as well in separate "caucus" sessions to discuss the best and most realistic response it could make to the question of uranium development and proliferation.

Information which emerged at the conference confirmed in a systematic way what many people had already known or suspected: there is a frightening increase in both the number of nuclear weapons and in the number of countries which have them; the technology used for civil nuclear reactors is so closely allied to that of weapons production that it is virtually impossible to separate "peaceful" and "warlike" uses of uranium; Saskatchewan and Canada have in the past, and still are contributing to the nuclear arms race.

One of the resource people, Dr. Tom Cochran, a nuclear physicist from Washington, D.C., concluded that: "The only way to stop nuclear weapons' proliferation and ease the threat of war is to phase out nuclear technology as an article of commerce."

At a resolutions session near the end of the conference, 160 people, most of them Christians, called upon the provincial government to declare a moratorium on the expansion of the nuclear industry in Saskatchewan, and many pledged to work in support of that position within their churches.

Atoms For War/ Atoms For Peace

"You cannot make bombs without uranium."
Dr. Tom Cochran

The nuclear industry and governments say Saskatchewan uranium will be used for only peaceful purposes. Still we know that there are 40 thousand nuclear weapons in existence, 26 thousand of them in the United States. We know that initially uranium was used to develop the bombs dropped on Japan. The so-called peaceful uses of uranium arrived only later, and continue to serve as a "cover" for the military use which we know is occurring.

Commercial nuclear reactors are fueled with uranium. American-made light water reactors use a low enriched uranium fuel, and Canadian CANDU reactors use natural uranium. But the use of uranium as fuel in any reactor produces plutonium as a by-product in the discharged spent fuel. Plutonium can be extracted from the other by-products by "re-processing" the spent fuel. Extracted plutonium can be made quickly into bombs, in weeks, days or even hours. It is relatively easy for a country to use a civil reactor program as a "cover" for the production of weapons-grade plutonium. While countries prefer to purchase re-processing equipment, there is also the possibility of the purchase or the theft (it has happened) of plutonium itself.

According to Dr. Cochran, an expert in questions of proliferation, "Any country that has a civil reactor program and a civil reactor fuel cycle and recovers plutonium in a re-processing plant is a nascent nuclear weapons state. The technology required to make the bomb is fairly simple, even one with a yield comparable to the one dropped on Hiroshima."

Non-Proliferation Treaty Inadequate

The nuclear industry and supportive governments say that proliferation can be prevented by diplomatic means through the Non-Proliferation Treaty.

The treaty doesn't even address "vertical" proliferation — the increasing stockpile of nuclear weapons by the major powers — but attempts to prevent "horizontal" proliferation — the spread of nuclear weapons to states other than the "big five".

The dramatic increase in the number of nuclear weapons and "nascent" weapons states from five to about 15 in the past 10 years is proof enough that the Non-Proliferation Treaty has not worked.

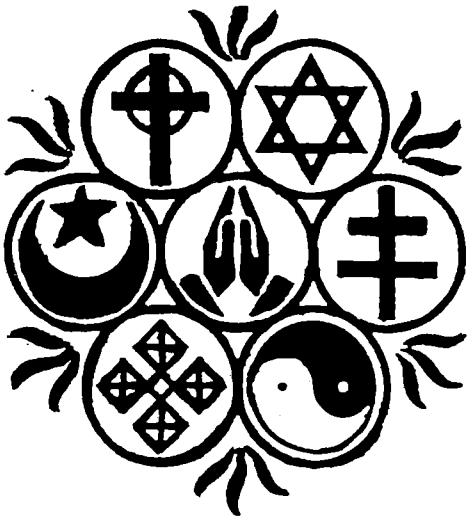
The prevention of proliferation relies upon "timely warning" to allow states, generally the major powers and supplier countries, to prevent uranium and nuclear technology from being used to military ends. But once a state decides to go the weapons route, the time involved is so short that sufficient international pressure cannot be mobilized in time to prevent it.

A nation which has a civil reactor program and access to enriching or re-processing technology can produce the bomb quickly if it is prepared to pay the price politically. And that price is often not very great because of the international competition to sell nuclear technology as an item of commerce.

It is also important to remember that almost one-half of the world's population is not party to the treaty, including two of the "big five" — France and China — and most of the suspected weapons states.

Nations have the freedom to renounce the treaty, and even among those party to it, inspection staff and procedures are clearly inadequate.

The only way to stop nuclear weapons proliferation is to phase out nuclear technology.



Resolution Adopted by the Conference Participants February 15, 1981

Whereas, there are corporations operating in Saskatchewan that collaborate with countries and companies involved in nuclear weapons proliferation, and
Whereas, the government of Saskatchewan is seeking markets for uranium sales among countries interested in nuclear weapons production, and
Whereas, the government of Saskatchewan is seeking markets for uranium sales in countries in which nuclear energy is neither appropriate nor necessary, and
Whereas, the government of Saskatchewan is collaborating through Saskatchewan Mining Development Corporation (SMDC) with these corporations and thus implicating Saskatchewan residents in this collaboration, and
Whereas, a significant amount of Canadian mined uranium has been used for nuclear weapons production in the United States, and
Whereas, the following church groups have called for a moratorium on the expansion of the uranium industry:
Saskatchewan Conference, United Church of Canada; 27th Annual Council, United Church of Canada; Anglican Diocese of Qu'Appelle; 19th Annual Convention of the Central Canada Synod of the Lutheran Church in America; Annual Meeting of the Quaker Energy Group (1979); National Council of the Churches of Christ; Joint meeting of scientists & theologians of the Massachusetts Institute of Technology (1979); World Council of Churches (1980); Mennonite Central Committee (Saskatchewan); the Roman Catholic Bishop & Priest's Senate of the Diocese of Saskatoon; Canadian Catholic Organization of Development and Peace; Provincial Council of the Catholic Women's League of Canada (1978); Saskatoon Roman Catholic Diocesan Pastoral Council; Saskatoon Roman Catholic Diocese - Sisters' Senate; Saskatoon Committee of Concerned Catholics; Abbacy of Muenster; Roman Catholic Archdiocese of Regina - Social Action Commission; Roman Catholic and Ukranian Catholic Bishops of Saskatchewan (1977); and Canadian Religious Conference West, and
Whereas, many groups among which are native, labour, farm, academic, student, public interest and citizens groups have called for a moratorium on the expansion of the uranium industry in Saskatchewan,

Be It Resolved that this Conference, Atoms for War & Peace - the Saskatchewan Connection, strongly urge the Saskatchewan Provincial Government to declare a moratorium on the expansion of the uranium industry in Saskatchewan, and

Be It Resolved that this Conference go on record as strongly protesting the narrow terms of reference of the Key Lake Inquiry which excluded from consideration, among others, the fundamental human issue of nuclear weapons proliferation.

The Nuclear Club

Big Five

Until about 10 years ago the following countries had the bomb: U.S., U.S.S.R., Great Britain, France, and China.

New Weapons and "Nascent" Weapons States

Israel: Almost certainly has had the bomb since the late 1960s. Likely received its first plutonium in mid-1960s from U.S. company with Israeli connections.

India: Exploded a bomb in 1974 using plutonium produced by CANDU reactor purchased from Canada.

South Africa: Despite denials it almost certainly has the bomb. U.S. and Soviet radar detected test blast.

Pakistan: Committed to developing the bomb, even if people have to "eat grass". Will likely use Canadian CANDU reactor near Karachi and uranium supplied by Canada.

Taiwan: Proceeding with nuclear weapons. Has CANDU reactor. Has withdrawn from Non-Proliferation Treaty.

South Korea: Has decided to produce nuclear weapons. Has a CANDU reactor and negotiating for another. Recipient of Canadian uranium. Saskatchewan government has promoted sale of more Canadian uranium to S. Korea.

Argentina: Has CANDU and likely reprocessing facilities provided by West Germany.

Brazil and Chile: Likely to follow if Argentina develops bomb.

Iraq: Was building reprocessing facility before recent war with Iran. Received technology from Italy and France.

Egypt and Philippines: Intend to develop the bomb.

Libya: Interested in developing the bomb.

Joint Ventures: The New Connection

Not long ago, international corporations looked upon governments as enemies at worst, and at best as obstacles to maximizing profit.

But in 1977, members of the Uranium Institute (the international cartel) held a symposium which discussed and blessed a trend which had already begun — that of the joint venture between transnationals and governments in uranium development.

There are great advantages for the transnationals. The strategy requires that governments put up much of the investment capital for exploration and development, making the corporate investment less expensive and more secure. The partnership guarantees that governments, in their role as equity partners, will provide an ideological rationale for development (employment, northern development, local control, national pride) and defend the nuclear industry in the face of public opposition. Government has more credibility than companies in this regard.

The government's role is also one of providing roads, air fields and power lines which would normally bite into the profits of companies. Government involvement is also likely to assure labour policies and environmental regulations as beneficial as possible to the companies, the ability to maintain secrecy about permits and contracts, and co-operation in providing a marketing system for uranium and nuclear technology.

A few of SMDC's partners in northern Saskatchewan include Rio Tinto Zinc, Anaconda Canada, Amax Minerals, Getty Minerals, Esso, Gulf, Mobil and Shell.

The Saskatchewan Connection

As the U.S. and U.S.S.R. engaged in the Cold War and the construction of nuclear arsenals during the post-war period, Canada and Saskatchewan became major suppliers of uranium to the Americans.

By the early 1950s there was a boom and the Crown corporation, Eldorado Nuclear, was producing at Uranium City. There was virtually no civilian nuclear power industry at the time. Most of the uranium mined was used to create the U.S. nuclear arsenal. Dr. Tom Cochran estimates that between 1942 and 1964, Canada supplied 30 per cent of the uranium used in the U.S. to make weapons. All of that uranium came from Ontario and Saskatchewan. Ironically, while Saskatchewan citizens of the day were marching for peace and calling for disarmament, our uranium was being used to build the American arsenal.

By 1964 the U.S. had such a stockpile of enriched uranium that it stopped making purchases from abroad. Saskatchewan's uranium industry promptly went bust, with production values falling from about $60 million to about $10 million annually.

In the early 1970s the existence of an international cartel and the prediction that nuclear power would finally become widely used caused a second uranium boom in Saskatchewan.

The Saskatchewan government decided to get in on the ground floor in the new bonanza. In 1975 it passed legislation requiring that the Saskatchewan Mining and Development Corporation be offered a 50 per cent equity in any new exploration and mining projects. Currently SMDC owns a percentage of six mines under construction and a 20 per cent interest in the producing Cluff Lake mine operated by AMOK.

One of the partners in the Cluff Lake mine is the Commissareate de L'Energie Atomique (CEA), an organ of the French government responsible for nuclear development in that country, including the development of weapons. France has not signed the Non-Proliferation Treaty although it will soon be receiving shipments of uranium from Cluff Lake under another, compromise agreement.

AMOK also has contracts to ship uranium to West Germany, which has assisted in the nuclear capability of South Africa and Brazil.

SMDC is also involved in three joint venture explorations with Wyoming Minerals, a wholly-owned subsidiary of the Westinghouse corporation. Westinghouse is involved in every facet of the nuclear industry, including major defence contracts for the U.S. Trident and Poseidon nuclear submarines and the Cruise missile. Westinghouse has also sold reactors to South Korea, Brazil and the Philippines.

SMDC is involved in five joint exploration ventures with Union Carbide, another major U.S. company involved in the nuclear arms business.

Regina researcher and author, Bill Harding pointed out that the demand for uranium to provide nuclear power in the western world is expected to be 60 thousand tonnes annually by the year 1990. Yet the predicted supply of uranium is 110 thousand tonnes, almost double the amount needed for so-called peaceful purposes. Either there will be a glut and depression in the market, or the use of uranium for weapons — something government and industry refuse to acknowledge — will take up the slack.

Saskatchewan alone is predicting a production of 13 thousand tonnes, almost one-quarter of the estimated demand for the entire western world. That is impossible given the competition from countries like the U.S., Australia, and South Africa, not to mention Ontario which still outranks Saskatchewan as a Canadian producer.

The only explanation for those kind of demand predictions is the supplying of a nuclear weapons industry.

The Cold War and the Third World

The roots of militarism and the nuclear balance of terror are not as simplistic as the Cold War, communist versus capitalist explanation we so often receive.

Ernie Regehr, a Project Ploughshares researcher and defence analyst, described both the U.S. and U.S.S.R. as expansionist countries determined to protect their "strategic interest" in any area of the globe.

The U.S. and many of its NATO allies (former colonial powers) have a history of dominating countries to secure natural resources to feed an ever increasing consumption, and to expand foreign markets for goods so the standard of living in the industrial country can be constantly improved.

The Soviet Union is also becoming more dependent upon resources from abroad as it develops into a consumer society and increases its military spending.

Regehr said that for powerful countries the use of military force to protect economic advantage "has been made respectable" by having the military protection of strategic interests cast in purely ideological terms. While the Americans talk about the containment of international communism, the Soviets talk about the containment of American imperialsim.

The maintenance of privilege is more subtle than it was in the era of colonial empires. The manipulation of capital investment and control of technology are used to keep poorer nations in line.

The possibility of direct intervention always exists as well (Afghanistan, Dominican Republic), but the superpowers prefer to supply arms to client states which act as their proxy in a region.

One consequence of this cynical trade in arms is a state of continuing warfare among client states, most of them poor Third World countries. Weapons purchases by military elites in those poor countries cause a shortage of foreign currency. To replenish the currency, more and more natural resources are shipped out in exchange for cash and direct foreign investment. Even food production is affected as land is shifted into the production of cash crops, such as tobacco or sugar, for export. The hardship which such policies cause among the people leads to demands for reform. Inevitably those demands are met by the military elite turning the imported arms upon the local populace.

The third way in which military force is used to pursue strategic interests is in the creation of vast nuclear arsenals.

Both "sides" have been arming since the end of the Second World War, but objectively, Regehr said, it's clear that the U.S. and its NATO partners have spent more and have a nuclear strike capacity which is more lethal than that of the U.S.S.R. and Warsaw Pact countries.

Regehr suggested that Canadian Christians should not accept the "we-they" proposition. There is "room to manoeuvre."

He suggested that Canadians must "stop looking at the question of strategy through American eyes, and end complicity with the nuclear weapons' system."

"The contemplation of mass destruction for whatever reasons is demonic."

He said that Canadians should demand an end to the Defence Production Sharing Agreement, a defence Auto Pact which has Canadians producing components for nuclear and other weapons' systems while our government purchases finished weapons in return.

He said we should declare Canada a "nuclear free zone", and we should insist that our professional army focus upon the "peace-keeping" role which Canada had begun to develop.

"The important thing for Christians is to seek alternatives to present conditions and policies."

Conference Papers Available:

One important purpose of the ICUC conference was to collect important information regarding nuclear proliferation. The major papers presented to the conference have been transcribed and collected. They are available in one large document from ICUC for $7.50.

For those who want one or several of the papers, they are available individually.

Tom Cochran — Atoms For Peace/Atoms For War
Walter Davis — The Yellowcake Road in Saskatchewan
Peter Hamel — Why Is The Church Involved? A Theological Analysis
Dennis Howlette — The Third World Connection: South Korea, A Case Study
Peter Prebble, Herman Boerma — Implications of Mining and Refining in Saskatchewan
Ernie Regehr — Canada And The Cold War: Are More Nuclear Weapons Needed To Stop The Soviet Union?

Church Strategies For Action

People at the ICUC conference — lay, clergy and bishops — did not attempt to speak for their entire churches. But everyone recognized the seriousness of the proliferation issue and pledged to encourage discussion within his or her own church.

Each church represented, and the non-church public interest groups in attendance, met in separate "caucus" sessions to discuss possible strategies for action:

Anglican: Committed themselves to a two-year program on energy and lifestyles.

Catholic: Each person present promised to write an MLA urging a moratorium position, and to discuss the issue with at least one group as a follow-up to the meeting. The group pledged to encourage Catholics and the church to support ICUC with funds.

Lutheran: Conference participants could not agree entirely upon a common strategy, but those speaking for the group pledged to put forward a moratorium position in their church and to encourage funding for ICUC.

Mennonites: Promised to report outcome of the meeting in the Mennonite press and to contact the Mennonite Central Committee, asking that information kits be made available to all churches.

United: Individuals pledged to take message from conference back to Presbyteries and to emphasize an educational program with church members at the base. They planned a campaign of letters to rural provincial MLA's and contemplated raising the uranium issue during the next provincial election campaign. They decided to ask the Saskatchewan Conference of the United Church to make uranium a priority issue.

Public Interest Groups: They pledged to work at co-ordinating the efforts of their various groups, to support an anti-nuclear day of protest (occurred April 25th), to support another Northern Survival Gathering and to circulate a disarmament petition.

God of love, hear our prayers, both those spoken and those in our hearts. We believe in you. You are shalom. Shalom is justice and equity. Shalom is peace and love. Shalom is reconciliation and wholeness. Shalom is community and deep relationships. You God, are found in these relationships wherever they may happen.
-from prayer service ICUC Conference

Inter-Church
Uranium Committee
Box 7724
Saskatoon, Saskatchewan

THE NUCLEAR DEBATE: Questions and Answers

1. Of course I'm against nuclear weapons, but what does that have to do with nuclear power?

2. Wouldn't people lose jobs if we stopped mining uranium and building nuclear power plants?

3. But we need nuclear power because the supply of oil and gas is running out, isn't it?

4. By opposing nuclear power aren't we opposing progress?

5. The Third World needs nuclear power, so who are we to stand in the way of Third World development?

6. Since the Third World already has access to nuclear technology, why not sell them our uranium? If we don't, someone else will.

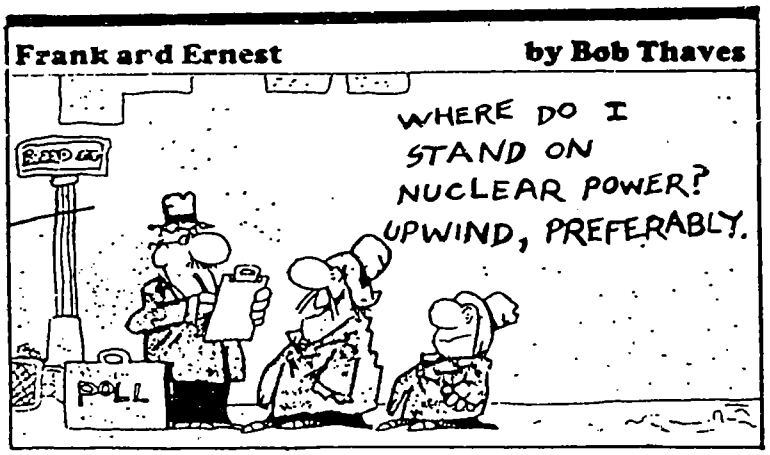
7. If we don't follow the "hard energy path" with nuclear, then what are the alternatives?

8. I'm concerned about this, but what can I do?

This is Exhibit B referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999

Stefania Fortugno

A Notary Public in and for the Province of Saskatchewan, Being a Solicitor



May 1982

This tabloid was produced by the Inter-Church Uranium Committee (ICUC), a group of Christians from Anglican, Lutheran, Mennonite, Roman Catholic and United Church congregations. ICUC supports a moratorium on uranium mining in Saskatchewan, in order that further research can be done on the unanswered questions of the issue such as Saskatchewan's role in the proliferation of nuclear weapons, the management of wastes and the effects of low level radiation. For further information contact:

Inter-Church Uranium Committee
Box 7724
Saskatoon, Saskatchewan
S7K 4R4

1. Nuclear power & nuclear weapons

* The key connection between power and weapons production is plutonium, a by-product of power plant operation, and the essential ingredient for nuclear weapons. The frightening significance of this connection is seen in the massive rate at which power plants produce it. A 1,000 megawatt nuclear power reactor produces 250 kilograms of plutonium each year. **This is enough for just over 20 nuclear weapons.**[1]

* The irradiation of uranium fuel in any reactor produces plutonium, which is a bomb material regardless of its composition or chemical form... Extracted plutonium can be made into bombs so quickly (in days or hours) that even instant detection cannot provide "timely warning", the cardinal principle of safeguards since the start of the nuclear age.[2]

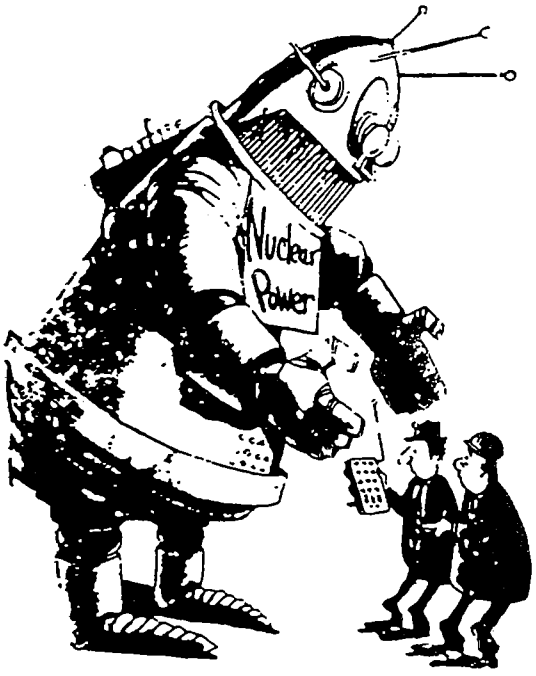
* Yes, nuclear energy and weapons are linked by the potential of either enriched uranium or plutonium to serve as fuel in weapons. But as has been demonstrated by Sweden and Canada, states possessing civilian nuclear power programs do not necessarily turn to weapons production. **Therefore the real link between the two is the political will, the political decision, to pursue a nuclear weapons program.** Whether the decision is made before or after the acquisition of nuclear materials and technology is unimportant. What is important is the fact that such an acquisition leaves the buyer with the option to go the nuclear weapons route. All he must do is circumvent safeguards — not a difficult task.[3]

* Once a reactor program and a civil reactor fuel cycle exists, and reprocessing is permitted in a country that is a non-nuclear weapons state (plutonium is recoverable from a civilian reprocessing plant) then that country is what I would call a nascent nuclear weapons state. **It is so close to having a bomb, it should really be considered a nuclear weapons state.** The technology for manufacturing a bomb is more or less low technology. It's easy to do... In order to make a weapon with a yield comparable to the Hiroshima or Nagasaki ones, one needs only a matter of weeks, as long as one has the fissile material. So, once again, if this type of recycling is allowed, that is, if plutonium is recovered at a reprocessing plant and stored in a non-weapons state — that state can have a weapons option in very short order. The time period, in fact, is so short that if it decided to take the nuclear weapons route, the time it would take would be too short for other countries to bring any diplomatic pressures to bear.[4]

* France is supplying Iraq with two reactors, the larger of which, Osirak, operates at 70 megawatts. It is not a power reactor...it is described as a "research" reactor... Iraq has no research scientists to speak of... The Iraqi reactor can be adapted to produce enough plutonium for several bombs per year.[5] Israel bombed the Iraqi reactor on June 7, 1981. The Baghdad raid has not only underscored the Israeli dilemma in general, but the Israeli dilemma with respect to nuclear weapons in hostile hands in particular... It seems most unlikley that Israel, or any other country for that matter, can prevent by force for more than a very few years the acquisition of nuclear weapons by any number of countries most of us would rather see without such weapons.[6]

* In 1956, Canada and India signed a bila-search reactor called CIRUS. **India exploded a bomb on May 18, 1974 using Canadian technology and U.S. ore**[7] In 1959 Canada signed a nuclear cooperation agreement with Pakistan covering the provision of 125 MWe CANDU-type power reactor.[8] **Some observers believe that Pakistan could explode a nuclear device within a few months.**[9]

* In 1974, Canada...signed a contract for the export of a 600 MWe power reactor to Argentina[10]...**A senior Argentinian official has confirmed long standing suspicions that the country's nuclear program has a military purpose.**[11]



"And he's absolutely harmless, as long as you push the right buttons."

2. The nuclear industry and jobs:

* Jobs in uranium mining are expensive. The Cluff Lake Mine in northern Saskatchewan has been built at a projected cost of $400 million over the life of the project (12-13 years). 55% of this would be spent in the province. The maximum number of jobs it will provide is 714. [1]

* Key Lake, which will be Saskatchewan's largest uranium mine, will have an estimated capital cost of $563 million[2] with an overall cost of over $1 billion (1979$). During operation, at its peak, about 500 persons will be employed. **Each job will have been created at a cost of over $1 million in capital investment.** [2]

* But how productive is the nuclear industry? When talking of employment generated, there are figures from a study by the Economic Council of Canada indicating that it takes more capital investment in electric utilities (including nuclear) utilities than in many other industries to create one job. Norm Ruben on Energy Probe in Toronto argues that any million dollars borrowed on the New York money markets could be better spent in the manufacturing sector than on construction of nuclear power plant. He argues that the energy industry is the least productive sector of the economy, having only a 3 to 3½% productivity on capital; whereas the industrial sector can claim 12% productivity before taxes. The Economic Council of Canada records a 10% industrial average on productivity.[3]

* To people watching over the graphs of such things, it seemed enough to note that as energy use rose over the years the economy grew and total employment increased. The assumption formed that to ensure economic growth and create more work it was necessary to expand our energy supply. About 1970, the graphs began to change. Growing unemployment and a succession of economic crises have been taking place while national energy use has been at an all-time high and increasing. The "more energy leads to more jobs" assumption is crumbling. If increased energy production has not been responsible for new jobs, what has? **Accompanying a growing population has been a very large increase in the use of goods and services per person. It is this that has been creating enough new jobs to offset those eliminated by the substitution of cheap energy for labour.**[4]

* Nuclear power is not labour-intensive; it is capital and energy-intensive. It demands a large number of relatively high-skilled labourers during the short period of construction who must be brought in from outside the areas and provided with housing and services during the "boom" of construction and who leave thereafter. Once the plant is running, it requires few staff, and those are highly-trained technologists. **It thus doesn't help solve local unemployment problems.**[5]

3. If no oil and gas, then nuclear?

* Canadians have learned to be very cautious about industry and government statistics which claim to divulge the state of petroleum and natural gas reserves. Reserve estimates, we have learned, usually serve the interests of the bodies that disgorge them. Consider, for example, the dramatic turnaround in the way that Imperial Oil's annual report was promoting continued exports of Canada's finite hydrocarbons:

In the current debate, the export of Canada's energy resources is being questioned; in effect we are being urged to bank our petroleum resources. Canada is not in any way deficient in energy resources. Our present energy reserves using present technology, are sufficient for our requirements for several hundred years.

One year later, in March of 1974, the "energy crisis" had begun and Imperial's annual report was promoting a different line:

Within the next 10 years, production rates from existing reserves in Western Canada will be inadequate to supply markets now being served, and new sources of supply must be ready to start delivering energy when this decline begins. The sources are available.

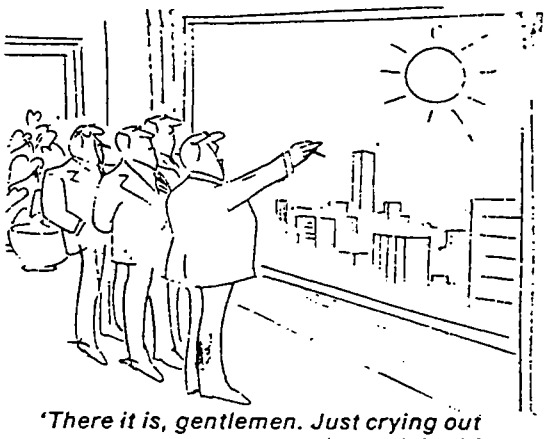
In spite of this kind of unblushing change of face, petroleum companies still ask that we accept their leadership on trust.[1]

* But, if we have learned to be sceptical about corporate estimates of oil supplies, we have even more reason to question what we are told about natural gas supplies. In the late sixties and early seventies, as we've seen, Canadians were being told their country had natural gas reserves that would last for hundreds of years. By 1977 the corporate sponsors of the proposed Mckenzie Valley Pipeline were citing studies that said things such as "Canada needs (Mackenzie) delta gas in the early 1980s."[2] Now the pendulum has swung back. Trans Canada Piplelines is taking out newspaper ads which proclaim: "Canada has lots of natural gas. There's more than enough to serve our domestic markets. From coast to coast. And to export too."[3]

* The Canadian government has embarked on a major nuclear program and foresees a gradual shift from the present energy supply based largely on fossil fuels to an electric society. The plans to increasingly rely on nuclear energy are usually defended by pointing to the supposed technical and economic advantages of the nuclear option, especially in a time when foreign supplies of oil are perceived as unreliable and domestic supplies, at least the more accessible ones, are starting to dry up. **There is increasing evidence that suggests that this course may be disastrous, and that major uncertainties and risks must be addressed and resolved now, rather than allowing a heavy reliance on nuclear power to occur.**[4]

* The Saskatchewan Power Corporation has about 2,000 megawatts of generating capacity. There is approximately an equal amount of undeveloped generating potential on the Saskatchewan river system. It's enough to meet all our foreseeable electricity needs for a long time into the future, if we use electricity wisely — that is only for the purposes for which electricity is really needed. Saskatchewan also has very substantial coal reserves, and although not really needed, some of the coal could be used (and in fact, some of it is now being used) to produce electricity.[5]

* All predictions that oil and gas supplies are about to run out in the next few years are based on the assumption of rapidly growing consumption. There is evidence now that not only is consumption of oil and gas in Canada not growing as rapidly as predicted **— it has also been shown that it is to the advantage of every Canadian to invest our energy dollars in conservation rather than in new large-scale energy supply developments.** A study of the Science Council of Canada shows that it costs four times as much to develop one unit of energy supply as it costs to reduce energy demand by one unit. Other studies who that investment in conservation (eg. home insulation) creates more jobs than investment in large capital-intensive energy supply developments.[6]



'There it is, gentlemen. Just crying out to be exploited.'

4. Nuclear power vs. progress:

* The argument of last resort for nuclear advocates is that progress cannot be achieved without taking risks. If our ancestors had not taken risks, they say, we would still be living in caves and dressing in animal skins. This is true up to a point — risk-taking is often necessary if we want to accomplish something of value. But it does not follow that all risky ventures lead to a desirable form of progress. The question is whether the benefits of nuclear power are **worth** the risk, and whether there are safer, better ways to achieve the same (or greater) benefits. **Finally, and perhaps most importantly, nuclear advocates seem to forget too easily that it is not their business to decide for us whether the risks of nuclear power are acceptable.** Since it is we who must live with these risks, we should be given candid information about the true dangers of nuclear power, and we should have the opportunity to decide for ourselves whether the risks are acceptable.[1]

* In our modern society, the last refuge of the promoter is to threaten people with the loss of jobs, loss of livelihood, lack of food, and a return to life in a cave. **The lights are not going to go out if we choose to do without nuclear power.** Conservation, understood not simply as "saving" or "doing without", but as raising energy's productivity to produce more with less energy, is quite feasible with today's technology.[2]

5. Nuclear & the Third World:

* Letter to Premier Allan Blakeney, Dec. 7/81: "You made much of the argument that the poor of the world depended on our uranium for future energy needs. Such a conclusion is based on the assumption that increased industrial development is the answer to poverty. Yet the evidence of our own workers overseas and of our partner churches in Third World countries is that such development, if that is what it should be called, benefits only a relatively small elite, and increases dependence on other industrialized countries to the continued detriment of the masses of the people. The recent Cancun Conference and the subsequent article in *MacLean's* magazine documented this very pointedly. This runs counter to what we believe ought to be the priority — development that leads to self-sufficiency and independence. We, and our sister churches and partners in World Council of Churches are committed to seeking a just, sustainable and participatory society. Capital intensive and high technology industries, of which the nuclear industry from mine to reactor (or bomb) is a prime example, are enterprises that point in just the opposite direction. We believe that there are other ways to meet the energy needs of the Third (and other) worlds through conservation and renewable energy paths. If the amount of money and human effort that has been spent on research and development in the nuclear industry had been applied to "soft energy paths" we would be much nearer real solutions. It is still not too late."[1]

* Other less obvious reasons for the appeal of nuclear power may be equally or more compelling. The fact that nuclear power is becoming less attractive in the industrialized countries means that the nuclear industry can survive only by aggressive marketing in the developing countries, which are often faced with "offers they can't refuse".[2]

* Many Third World countries interested in developing a nuclear power program are military regimes **where public debate does not exist and where the military may have eyes on nuclear weapons rather than nuclear power for the generation of electricity.**[3]

* Military issues may also be a critical factor, largely unspoken. Nigeria's recent interest in nuclear power, for example, has been cited as a response to South Africa's apparent proximity to a nuclear weapons capability. Pakistan's former President Zulfiqar Ali Bhutto purportedly admitted that his motivation in buying a French reprocessing facility had been to give Pakistan a nuclear weapons capability, presumably to match that of India. Other confrontations that may have led to the adoption of nuclear power include those of Egypt and Israel, Korea, and Japan, Taiwan and China, and Brazil and Argentina.[4]

6. If we don't, someone else will:

* Letter to Premier Allan Blakeney, Dec. 7/81: "You argued, I believe, that if we don't supply uranium, others will. Surely you know that this is the argument used by every prostitute, drug dealer, and bootlegger in the world. No, I do not wish to smear you by linking you with those people. I just want to point out that the argument is as invalid here as there. "Everybody is doing it" has never been an acceptable moral argument. Think of what a powerful witness it would be to the world if a major uranium source such as Saskatchewan were to announce a planned phasing out of uranium mining on moral grounds!"[1]

* **For the most part, the transition from nuclear and fossil fueled energy to safe renewable alternatives is a political problem rather than a technical one.** The physical tools to safely generate the power we need are available. The main problem we face as we enter the 1980s and the next century are — who will control energy and for what purpose?[5]

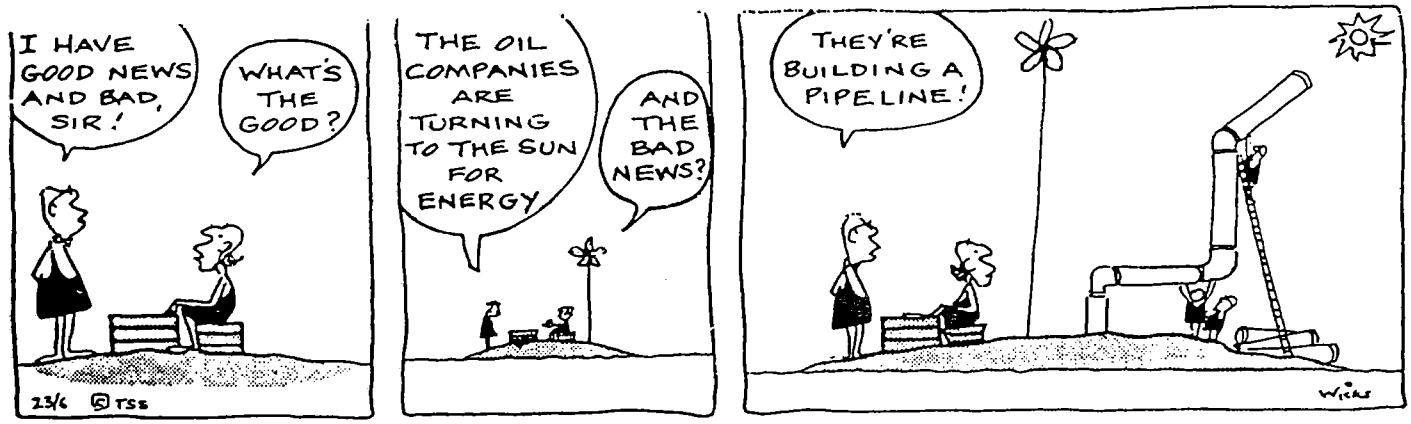
7. If not nuclear, then what?

* We are...confronted by two basic energy choices: the "hard path" versus the "soft path". The "hard path" represents the intense development of nuclear power, a heavy emphasis on coal extraction, an almost total lack of faith in renewable energy technologies, and the relegation of conservation policies and programs to a distinctly secondary role. The second path of "soft" technologies is intended to mean not vague, mushy, speculative, or ephemeral energy development but rather flexible, resilient, sustainable and environmentally benign energy sources based on renewables and conservation.[1]

* Probably the best known Canadian estimate, prepared for the Science Council of Canada by Amory Lovins in 1976, indicates that a renewable energy mix could supply all of Canada's energy needs in the year 2050 if reasonable energy efficiency measures were introduced. Lovins proposed a phased and orderly transition to the renewables. These include using direct solar energy, wind and biomass conversion — the use of crop, wood and other organic wastes and, where sustainable, perhaps an ecologically balanced growth of trees and shrubs for conversion to liquid and gaseous fuels. These diverse means could be deployed gradually to meet the needs of a society that at the same time is using existing systems (with the exception of nuclear) as a bridge to the future.[2]

* There is also a wide variety of alternative sources of energy available for use now and in the years to come. Such an alternative policy will yield more jobs and a more stable economy than does our present energy policy, and do so with less pollution, less disease and less social disruption. The issue of jobs has been distorted by pro-nuclear advocates to win support in the labour movement. Happily, not only will the soft energy path provide more jobs than the hard energy path, but also the new jobs created in renewable energy development will be longer lasting, better matched to available skills, and more likely to call on individual initiative and responsibility than jobs building and operating, say nuclear power stations.[3]

* Energy Probe reports that solar houses in Regina and Saskatoon are so snug and efficient that fuel bills to supplement the sun's power are less than $100 a year. Yet we cynically tend to dismiss solar and wind energy, along with questions of right and wrong, as hobby-horses for fuzzy-minded idealists. We mistakenly assume that if cheaper and safer energy sources really existed, "the powers that be" would adopt them. We forget that once industrial machinery and profits are channelled in a certain direction, momentum and greed will propel them on long past the borderline of rational thinking. And we're so awed by our sophisticated technology that we forsake common sense to adore cleverness.[4]



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   2 — *Not Man Apart*, "Nuclear Power and Nuclear Bombs", Amory B. Lovins, L. Hunter Lovins, Leonard Ross, The Newsmagazine of "Friends of the Earth", Vol. 10, No. 8, Aug. 1980, p. 4.
   3 — *Prairie Messenger*, "Atoms to bombs: the nuclear link" by Bradley Bird, Aug. 24, 1980.
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   6 — *Bulletin of Atomic Scientists*, "Baghdad" by Robert Gomer, Aug/Sept. 1981, p. 7.
   7 — Energy, Mines and Resources, *Nuclear Policy Review Background Papers*, 1980 "The International Non-Proliferation Regime: An Historical Overview" by Department of External Affairs, Nov. 1980, p. 340.
   8 — Ibid.
   9 — *The Guardian*, (New York: The Institute for Independent Social Journalism), Jan. 13, 1980.
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2. 1 — *Cluff Lake Board of Inquiry, Final Report*, May 31, 1978, p. 168.
   2 — *See Key Lake Board of Inquiry, Final Report*, February 1981
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   4 — *The Birch Bark Alliance*, "Energy and Jobs", by Jeff Hemming, Vol. 2, No. 1, Feb. 1979.
   5 — Ibid.
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   3 — *Globe and Mail*, Dec. 30, 1980, p. B3.
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   5 — "Should Uranium Stay in the Ground", tabloid produced by Saskatoon Environmental Society.
   6 — Ibid.
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   2 — *The Non-Nuclear Way*, op.cit., p. 86.
5. 1 — Letter to Premier Allan Blakeney from Rev. D. Petrie, Saskatchewan Conference, United Church of Canada, Regina, Dec. 7, 1981.
   2 — Energy for My Neighbour, *anticipation*, "Nuclear Power for the Third World?", by Joseph R. Egan and Shem Arungu-Olende, No. 28, Dec. 1980, p. 30 (available from World Council of Churches).
   3 — *Prairie Messenger*, "Third World Weighs Nuclear Options", Peter D. Jones, Aug. 24, 1980, p. 8.
   4 — Energy for My Neighbour, op.cit., p. 30.
6. 1 — Letter to Premier Allan Blakeney, op.cit.
7. 1 — *The Non-Nuclear Way*, op.cit., p. 61.
   2 — *The Non-Nuclear Way*, op.cit., p. 60.
   3 — *Jobs and Energy*, Richard Grossman and Gail Daneker, Environmentalists for Full Employment, Washington, 1977.
   4 — *MacLeans*, "Playing to bring the world down" by Carroll Allen, Feb 1982, p. 8.
   5 — *The Non-Nuclear Way*, op.cit., p. 88.

8. What can I do?

See — Judge — Act

* **See:** The growing questioning of Saskatchewan's role in the nuclear industry. The growing questioning of the nuclear industry all over the world.

* **Judge:** The continued expansion of the nuclear industry or a moratorium until all the questions have been answered and all the alternatives explored.

* **Act:** Share this tabloid with others — compare this information with the opposing views.

Presuming that we want a just, sustainable and participatory society, discuss the kinds of changes necessary in politics, in economics, in attitudes that would bring about a will to change our present system and make way for alternative energy options. Get involved:

join groups in your area or form your own group

make your voice heard, through your MLA, MP, church

help make this world a better place for everyone — ourselves, our children, our grandchildren.

THE ECONOMICS OF URANIUM IN SASKATCHEWAN

"PRESENT VALUE" ACCOUNTING HIDES LONG-TERM EFFECTS OF OUR ACTIONS

In *Creating Alternative Futures*, by A. Henderson; source: Office of the State Architect, Sacramento, California.

June 1982

Vested Interests

Saskatchewan Government investment in uranium is in two forms:

(1) The Saskatchewan Mining Development Corporation (SMDC) is a provincial crown corporation directly involved in every phase of uranium mining, usually in partnership with private investors such as Amok Ltee. at Cluff Lake and Uranerz Exploration and Mining Ltd. at Key Lake.[1]

This involvement is financed with **$250 million from the Heritage Fund and The Crown Investments Corporation.**[2] These advances are recallable by the Province but **bear no interest.** Another **$183.4 million in long term loans** taken out by SMDC have been **unconditionally guaranteed by the province.**[3] The provincial treasury is the financial base for SMDC.

(2) **Indirectly, the government assists the development of the entire uranium industry.** A number of departments are involved : Northern Saskatchewan, Highways, Environment, Health, Labour, Mineral Resources, and potentially, another crown corporation, the Saskatchewan Power Corporation. Joint road construction, training programs, research and monitoring, administration and clean-up all involve Government funds.[4] **These total more than $22 million in identifiable costs to date.**

Government Takes the Risks

In both forms of investment the government shoulders much of the economic risk involved, in order to attract large private investors. SMDC does more uranium exploration than any other company in Canada. This is expensive with a very low rate of return. The royalty structure is then designed to enable investors to recover their investment before any major royalties are taken. Assurances of a 20% rate of return[5] further indicate government commitment to make the uranium industry attractive to private investors. There are no assurances for revenues. Revenues vary with price and market conditions, which in this industry have a history of large fluctuations.[6]

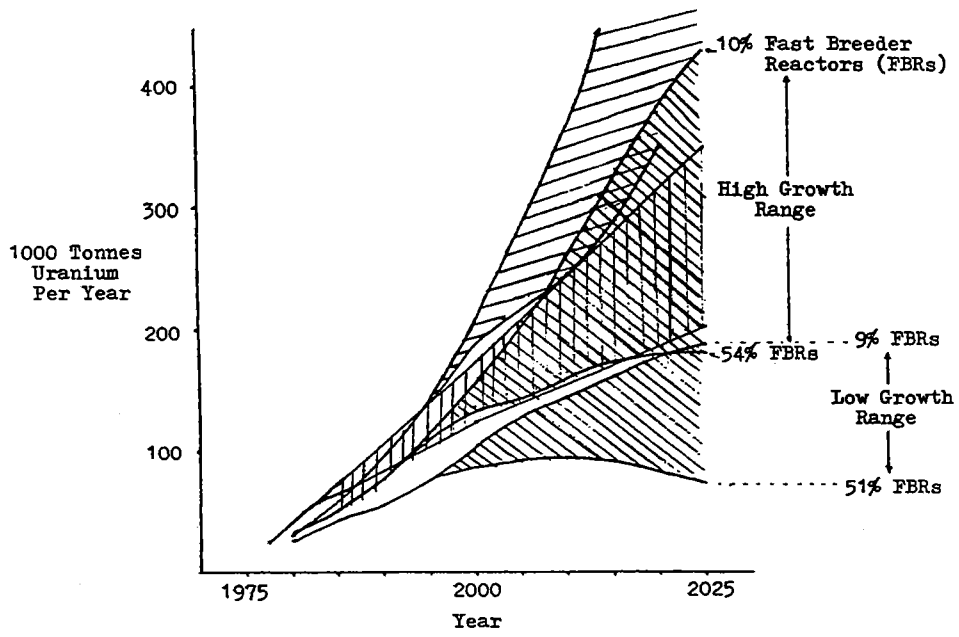
To Market

Over-supply of uranium has resulted in a major slump in the market and a price which is considerably lower than projected by the government and industry. Both are now speaking about the long-term demand. Projections do not show a recovery in price until the late 1990s but these are only projections not certainties. Figure 1 shows three recent industry projections for world uranium demand and **each new projection shows the previous ones to have been overly optimistic.** The trend is *down*.

Cancellation of reactors, most notably in the United States,[7] is indicative of this trend.[8] As an energy source, it is not economical for most countries. France is a major exception but its commitment to fast-breeder reactors means that its nuclear program will have little effect on the long-term uranium market.[9]

Figure 1:

COMPARISON OF LONG TERM PROJECTIONS
FOR ANNUAL WORLD URANIUM REQUIREMENTS



International Nuclear Fuel Cycle Evaluation (1980); High & Low Growth Ranges.

OECD Nuclear Energy Agency & the International Atomic Energy Agency (1977); "present trend" growth until 2000, "low" growth from 2000-2025.

Energy Mines and Resources Canada (1978); based on a World Energy Conference study.

SOURCE: World Uranium Requirements in Perspective, Energy Mines and Resources Canada, 1978; INFCE Group One Report, 1980; Uranium: Resources, Production and Demand, OECD-NEA and the IAEA, December 1977.

Returns Down

What can Saskatchewan expect in return? At the Public Inquiries into both the Cluff Lake Mine and the Key Lake Mine, projections of expected royalties and taxes were given. These were only projections and their attractiveness has dimmed as costs have risen and the market fallen.[10]

Key Lake which is still under construction is already expected to cost more than the "high" estimate.[11]

Cluff Lake, Phase II will have to lay off most of its workers if it is not allowed to pollute Claude Lake.[12]

The world 'spot market' price for uranium is currently below the lowest price estimate at both inquiries and well below the expected price.[13]

In 1981, revenues from uranium were 45% less than projected at the Cluff Lake Inquiry.[14]

The Midwest Lake Mine which was to open between 1985 and 1987 has been delayed indefinitely until the market improves.[15]

Optimistic projections aside, the indications are that the people of Saskatchewan are generally not going to appreciate significant benefits from the uranium industry; possibly no more than if the money were simply put in the bank and interest collected on it.

At the same time Government spending between 1976 and 1980 on health, education and social services has remained constant and even declined in real value when compared to Gross Domestic Expenditures (See Figure 2) and to an increased population.

Investment in uranium mining with all its risks has been made at the expense of the well-being of all of us in Saskatchewan. This is particularly so for the poor or disadvantaged which includes most of the residents of northern Saskatchewan.

Northern Losses

With the Cluff Lake Mine and even more so with the Key Lake Mine, the Government has tried to ensure that a significant percentage of the jobs and contracts go to northerners. In priniciple, this is a positive achievement, but a closer look is needed.

Uranium mining is capital intensive. That is, most of the costs occur in the development of the mine and for machinery. In the case of Key Lake, this is now estimated at $563 million.[16] **At the peak of its operation, the Key Lake Mine will employ about 500 people — a capital cost of over $1 million per job, none of which will last more than 15 years.**[17] More jobs are created in the construction phase of the mine, but these are even shorter term and are measured in *months*. Without other developments taking place the major effect of the mines will be to increase the number of skilled and semi-skilled *unemployed*. **At a million dollars per job, it is easy to see that uranium mining cannot support very many people for very long.**

Overall income in the north will rise but large wage disparities and the shock of sudden stimulus to the economy will result in severe social and economic instability and further destruction of the traditional renewable resource enonomy.[18] Justification for this has been that the revenues resulting from uranium exploitation would enable the Government to create new economic opportunities for northerners and eventually provide an economic base for life in the north. Declining expectations for revenues threaten this and the fact that to date **no comprehensive plan for the economic development of the north has been put forward by the government suggests that the people are a low priority.**

This is not a new experience for Canadians. It is the dominant pattern in our economic history. **Seldom have the promises been realized and we should not forget this.** Though it is guised in different terms by different political parties, the outcome is the same: **the people, including the governments, end up serving the economic interests of foreign investors.**

Government Policy of Subversion

This subversion of Canadian interests has some disturbing implications most notably in the area of nuclear weapons production. With competition being high there is considerable pressure to relax regulations and to compromise on our position of nuclear safeguards.[19] This pressure is made more precise when one realizes that some of our partners in uranium mining are also involved in weapons production.[20]

No overt breaking of these regulations and treaties could be approved. **Instead, one sees that the growing market for uranium is in weapons production as an extension of energy production. The technologies are inseparable and this allows for both "moral" and political-military uses.** Canada developed its bilateral agreements in order to ensure that this would not occur. Yet in 1981, the External Affairs Department released a paper stating that "Canada's approach to non-proliferation and safeguards is non-intrusive."[21] We will not interfere with political sovereignty. But can this be separated from military policy? The separation is blurred by economic pressures to sell. **We accept the risks of nuclear proliferation and war in order to make a profit!**

Saskatchewan has consistently delegated its responsibility in this area to the federal government. This in itself is a subversion of public interests and already reflects the Government's alliance with industry. The Saskatchewan Government has committed itself to uranium mining and has sought only to legitimate its commitment. Every job created is seen as an achievement without comparing its cost with alternative possibilities. Attention is focussed on inflated projections of revenues without reassessing them in light of change in price, market and costs. Every development has a cost factor. In this case, these are financial as well as social, environmental, health and moral. **The government would have us ignore the real costs in favour of possible profits without seriously weighing both sides before continuing its commitment.** The commitment has been made. Now it is trying to convince the people of its rightness.

SMDC has created a "Northern Opportunities Branch" which it announces "is especially proud of its development of a program of visits to northern schools as part of a broad educational initiative."[22] The cost of such programs advertising the uranium industry is subsidized by the Government.

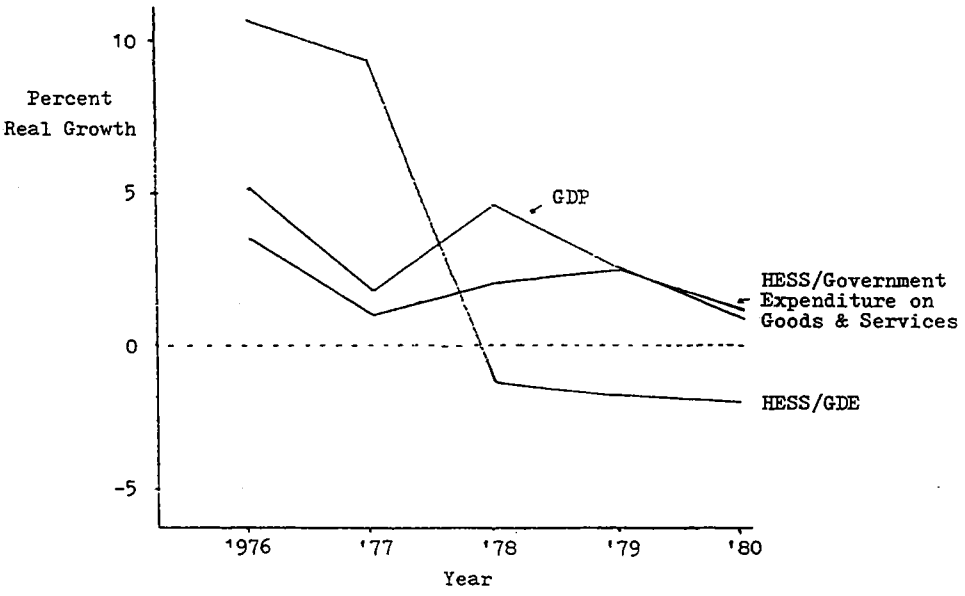
Through the *economic instrument* of a crown corporation, the Government is in fact promoting a *political policy* without fully taking into account the non-financial costs of this policy. These costs will be paid mostly by the poor or marginal peoples who do not exercise political power. **Finally though, we are all accountable.**

Figure 2:

PERCENT REAL GROWTH 1976 - 1980

Health, Education, & Social Services (HESS)

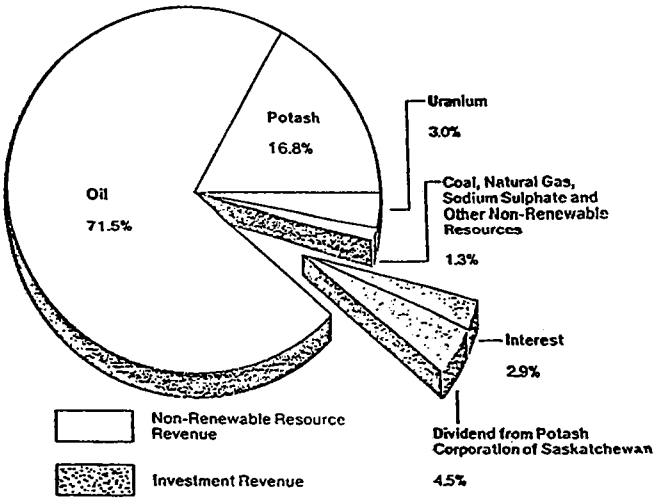
Gross Domestic Product (GDP)



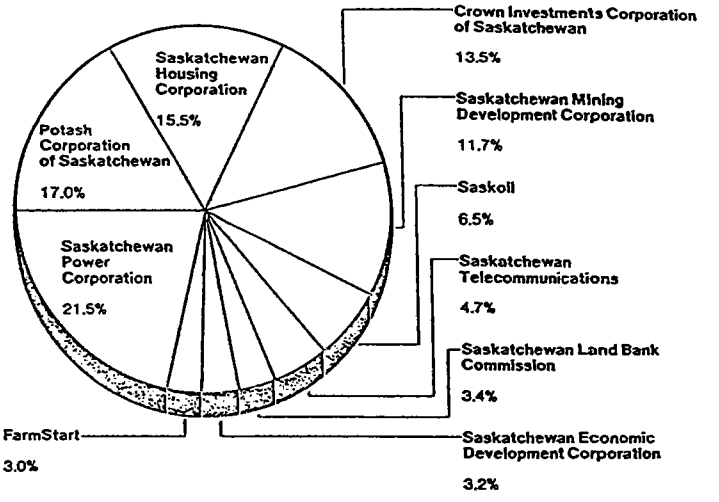
SOURCE: Public Accounts, Province of Saskatchewan, 1975-81;
Economic Review, Government of Saskatchewan, 1981.

HESS figures are for the fiscal year ending March 31 of the following year.

Province of Saskatchewan
Saskatchewan Heritage Fund
1982-83 Estimated Budgetary Revenues



Province of Saskatchewan
Crown Corporations
1982-83 Estimated Application of Funds Provided by the Government of Saskatchewan



NOTES:

1. Eldor Resources Limited, a wholly-owned subsidiary of the federal crown corporation, Eldorado Nuclear Limited, is also a partner in Key Lake Mining Corporation.
2. Saskatchewan Mining Development Corporation, *Annual Report 1981*, p. 31.
3. Saskatchewan Mining Development Corporation, *Annual Report 1982*, p. 36.
4. This information was made available to the researcher through correspondence with: Don Moroz, Deputy Minister, Saskatchewan Mineral Resources, Feb 18, 1982; Jerry Hammersmith, Minister of Northern Saskatchewan, Feb 3, 1982; Robert Long, Minister of Highways & Transportation, Feb 22, 1982; and, Douglas MacArthur, Chairman of the Board, Saskatchewan Power Corporation, Feb 18, 1982. Copies of these letters are available through the Inter-Church Uranium Committee.

Information on Social Services was taken from a paper by Jim Harding, Ph.D. and Graham Riches, M.A., "Social Welfare, Human Justice and Mineral Resources: A Saskatchewan Case Study" presented to the Conference of the Western Association of Sociology & Anthropology, Saskatoon, Feb 11, 1982. The paper is available from the authors through the School of Human Justice and the Faculty of Social Work, University of Regina, Regina, Saskatchewan, S4S 0A2.

5. Ray Lloyd, President of SMDC, has been quoted by the *Northern Miner*, Sept 18, 1980, saying that investors could expect a 20% rate of return. For an analysis, see David Griffin, "Saskatchewan's Uranium Industry: An Explanation and Assessment of the Economics", a paper prepared for the Inter-Church Uranium Committee, February 1982. Available from ICUC, $1.50 plus postage.
6. Ibid., pp. 7-11.
7. Recent plans by both Romania and Mexico to purchase nuclear reactors have been slowed down if not aborted altogether. The capital cost to build a nuclear reactor is tremendous and neither of these countries' economies can currently handle such an investment. Canada, with its CANDU reactor, was in competition for both of these programs.
8. See Laurence Welsh, "Uranium industry faces low sales, poor prices as power demand falls" in *Globe and Mail*, Toronto, March 29, 1982, Report to Business.
9. The breeder reactor creates more fissile nuclei than it uses. Its fuel supply is thus guaranteed.
10. See *Cluff Lake Board of Inquiry: Final Report* (CLBI), May 31, 1978 and *Key Lake Board of Inquiry: Final Report* (KLBI), Feb 1981.
11. See Griffin, op. cit., p. 11-14.
12. "Cluff threatens 200 layoffs unless pit mine accepted", *Star-Phoenix*, Saskatoon, March 16, 1982.
13. The current "spot price" is $26. In the *CLBI: Final Report* (op. cit.) revenue calculations are made on 2 price assumptions: a "low" of $25 (1976$)/lb. and a "high" of $35. (1976$/lb.) Variance between the projections of the Key Lake Mining Corporation and the Department of Mineral Resources resulted in the *KLBI: Final Report* (op. cit.) attempting to compromise these 2 predictions saying it would be between $35. and $40/lb.
14. The *CLBI: Final Report* predicted $54.5 million of revenue for the fiscal year ending March 31, 1982. In fact, revenues will be approximately $30 million — a shortfall of 45%. This is based on the SMDC *Annual Report, 1981* and the *Public Accounts*, Province of Saskatchewan, 1981.
15. "Mid-West Lake project delayed", *Star-Phoenix*, Saskatoon, Dec 5, 1981.
16. See *KLBI: Final Report* (op. cit.).
17. The total cost for Key Lake is projected at slightly more than $1 billion (1979$). Capital investment is at $563 (1980$). Of the billion dollars, $304 million will be for wages and services from Saskatchewan residents, $226 million for Saskatchewan manufactured goods. During operation, about 500 persons will be employed at its peak. This works out to $2 million per job, $1 million of which is capital investment. Figures from *KLBI*.
18. Overall wage income will increase but few permanent jobs will be created, especially for northerners and native peoples, resulting in a large income disparity. Most jobs available to northerners will be of a short-term nature and will not provide income or social stability.
19. In a *Globe & Mail* article of March 11, 1981, "Ottawa may ease safety rules on nuclear sales", Mark MacGuigan, Minister of External Affairs said, "Our national self-interest now calls for a reappraisal of the conditions in which we have to do business and for a new look at the relationship between businesses and government. The article goes on to say that competition with Australia requires developing nuclear safeguard standards which are international and "non-intrusive".
20. SMDC is involved in over 250 joint ventures with uranium companies including AMOK, Union Carbide, Wyoming Minerals, Rio Tinto Zinc, the Rothschilds, and Urangesellschaft, all known to be associated in weapons production. For further detail see "Atoms for War: The Saskatchewan Connection", a tabloid produced by the Inter-Church Uranium Committee, October 1981 and available upon request.
21. See *Globe & Mail*, Mar 11, 1981, op. cit.
22. See Saskatchewan Mining Development Corporation, *Annual Report 1981*, p. 23.

Postscript: Saskatchewan's Progressive Conservative Government

With the change in the Saskatchewan government to the Progressive Conservatives in May 1982, changes in political policy are likely. Priority will be given to the private sector and we can expect a possible restructuring of the royalty system in favour of private investors. If so, reduced royalty rates would mean a greater capital outflow from the province and even fewer potential benefits for the people of Saskatchewan. The possibility for reduced government spending on resource development would still have to be weighed against private industry's unwillingness to invest without government involvement. However, it could be possible for the government to reduce its investment in uranium and allow market forces to determine its development. This would allow the government to assess more objectively the real impacts of uranium development on the people of Saskatchewan and of the world, and to give greater weight to social, human and environmental factors before allowing it to proceed. These factors are an integral part of the complete economic analysis which is called for by the critics of past policies.

This tabloid was produced by the Inter-Church Uranium Committee (ICUC), a group of Christians from Anglican, Lutheran, Mennonite, Roman Catholic and United Church congregations. ICUC supports a moratorium on uranium mining in Saskatchewan, in order that further research can be done on the unanswered questions of the issue such as Saskatchewan's role in the proliferation of nuclear weapons, the management of wastes and the effects of low level radiation. For further information contact:

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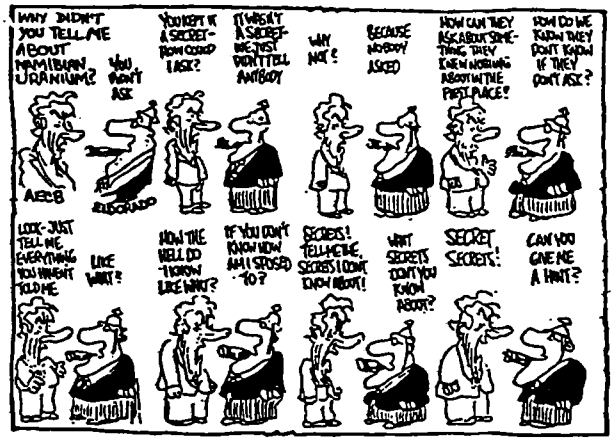
CANADA
THE INNOCENT PROFITEER?



On December 15, 1980 the CBC National News revealed that Eldorado Nuclear has illegally been importing uranium from Namibia, labeled as South Africa uranium. Eldorado defends its actions by saying the ore was not purchased, only imported for processing and return. The Atomic Energy Control Board denied any knowledge of the imports, agreed they were illegal but defended itself by saying it has few staff to investigate such matters. AECB is the regulatory branch of the government in the industry. Eldorado is a production and marketing branch of government in the industry. No action has been taken.
(Graphic and concept from Australian Campaign Against Nuclear Power newsletter.)

Namibia

Uranium Mining in Namibia

The world's largest open pit uranium mine is in Namibia. Mining is done by Rossing, Ltd. which is owned largely by Rio Tinto Zinc (RTZ) of the United Kingdom, but which is controlled by South African interests.[1] Namibia is being controlled illegally by South Africa: **the people of Namibia have no control over this mine.**

The uranium mined in Namibia is credited to and controlled by South Africa. South Africa does not hold to the Nuclear Non-Proliferation Treaty (NPT) and there is a strong concensus that **South Africa has developed nuclear weapons capability.**[2]

Because South Africa is exercising control over Namibia, black and "colored" people in Namibia are effectively treated in line with the principles of **apartheid.**[3] The Rossing ore deposit is extensive but is quite low grade — the only way extraction can be made profitable is to **pay the non-white workers very low wages.**[4]

The Rossing uranium mine is an extremely lucrative proposition — for South Africa. Namibian people obtain none of the profits of the Rossing mine, **but face all of the risks:**[5]

— White workers receive regular health checks; next to nothing is done to monitor black worker's health.
— White workers are able to join medical plans; black workers are allowed to apply only after one year of employment.
— The only adequate medical facility open to black Africans is 50 km. away.
— Housing for Namibian miners is near to and downwind of the radioactive tailings pile; white workers are housed 50 km. away.
— There is no evidence that steps are being taken to protect the Namibian environment.
— There is no evidence that steps are being taken to deal permanently with the mine tailings.

Case Studies

June 1982

The Philippines

As a Christian people we are called to declare ourselves for peace, for love and sacrifice for others, for justice, for sharing what we have with others. In order to consider some of the dilemmas of development, especially those where our Western technology is transplanted into another country, I would like to tell you a story about the Philippines. This story could also happen in almost any other Third World country...

The Bataan peninsula mountains and forest were tranquil today and flooded in warm sunshine. It was a fine morning. Corn planting season was here with all the excitement of a new start in the order of seasons. The Filipino farmer laid his hand to the drawn plough. His family was in the field planting food for the coming year. They were farming as had their ancestors for many generations before them. As the family bent to their work, a roaring of some large machine disturbed the stillness. They lifted their heads and in the distance they could see the form of a foreign built bulldozer. They watched, incredulous, as the machine moved methodically — pushing, piling, crushing. It couldn't be — but it was! — it was bulldozing down the houses of the village. The people gathered in a huddle, powerless, watching as the machine laid low their homes.

The farmer made his way to the land office in the city. The government official in his air-conditioned office soothingly answered the questions with an explanation. "But sir, we are developing your land. We have a blueprint, a wonderful theory. We are making an economic processing zone[16] at which you and your family can find employment." The farmer protested — he was a worker of the land, not a factory worker. The government agent assured him that he would do well, housing would be provided. What would his wages be? "Adequate, adequate." 85¢ a day.[17]

Namibia continued:

Canada's Role in Exploiting Namibia

The profitable situation for corporations involved in the Rossing uranium mine could too easily change if Namibia became independent. Obviously, companies and countries which make a profit from Namibian uranium will not be anxious to promote Namibian independence. **Canada is one such country** through Rio Algom's partnership in the Rossing mine.[6]

Rio Algom's part ownership of the Rossing uranium mine involves it in responsibility for the working conditions of the mine, **including the discriminatory system of wages, housing and medical services.**[7]

Rio Algom's part ownership of Rossing directly connects a Canadian company with South Africa's military domination of Namibia. South Africa's National Key Points Act, which has been extended to include Namibia, dictates that "strategic industries" must cooperate with the South African armed forces in maintaining commando-type paramilitary units. This includes supplying personnel. A document obtained from Rossing indicates that there is a 69 man unit stationed there armed with automatic weapons, "including 24 automatic rifles and 4 sub-machine guns, and ample rounds of ammunition."[8]

Extensive uranium prospecting by other mining firms is taking place. **Falconbridge of Canada operates a copper mine in Namibia** (25% owned by the South African Development Corporation), has claims in the Rossing area, and is also involved in prospecting in other areas of Namibia.[9]

The Canadian government allows Canadian corporations operating in Namibia to deduct taxes paid to the illegal South African administration as business expenses.[10]

Eldorado Nuclear Limited

In 1981 it was revealed that Eldorado Nuclear Limited, a Canadian Crown Corporation, was processing uranium destined for Japan which had been illegally mined in Namibia.[11] Decree One of the United Nations Council for Namibia[12] reads, in part:

(1) No person or entity...may search for, prospect for, explore for, take, extract, mine, process, refine, sell, export, or distribute any natural resource...without the consent and permission of the United Nations Council for Namibia...;

(2) Any permission...whensoever granted by any person or entity, including any body purporting to act under the authority of the Government of the Republic of South Africa or the "Administration of South West Africa" or their predecessors, is null, void, and of no f

(4) Any...natural resources...taken from

(3) Any...natural resource...taken from (Namibia) without the consent and written authority of the...Council for Namibia...may be seized...;

(6) Any person, entity, or corporation which contravenes the present decree in respect of Namibia may be held liable in damages by the future Government of an independent Namibia.

Thus, Eldorado's action would be illegal, except that Canada conveniently does not recognize Decree One.[13] Canada is supposed to be one of the five Western Contact countries working for the independence of Namibia. Our position is compromised. The allure of profits from uranium has caused us to forget our moral responsibility. **We profit at the expense of the black people of Namibia.**

Saskatchewan Implicated in Namibian Uranium Mining

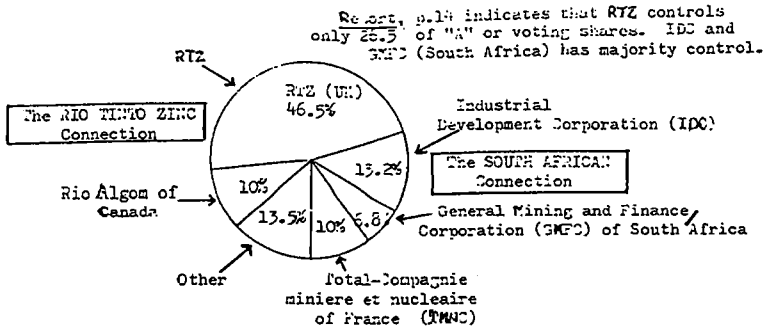
The Saskatchewan government has become connected with the illegal mining of uranium in Namibia. The 1980 *Annual Report* of the Saskatchewan Mining and Development Corporation (SMDC), a crown corporation, shows that joint exploration ventures are underway in partnership with Brinex Ltd. and Rio Tinto Finance and Exploration Ltd.[14] These two companies are subsidiaries of Rio Tinto Zince (RTZ), a British based company which **has come under severe attack by human rights and liberation groups for its complicity with South Africa's involvement in Namibian uranium mining.** This mining has been declared illegal by the United Nations Council for Namibia.

The partnership between SMDC and the subsidiaries or RTZ implies that the **Saskatchewan government tacitly supports what RTZ is doing in Namibia.** Any profits these companies might make in the future would only strengthen RTZ, **already strong at the expense of the people of Namibia.**[15]

"The participation of foreign governments and corporations in the extraction, processing and sale of Namibia's uranium contributes directly to the maintenance of South Africa's illegal presence in the territory and thereby to the continuing oppression... of the people of Namibia. Such participation also fortifies South Africa in its defiance of the decisions of the United Nations and of the purposes and principles of the charter."

Report of the United Nations Council for Namibia
Volune III, p. 45

The Rossing Uranium Mine in Namibia

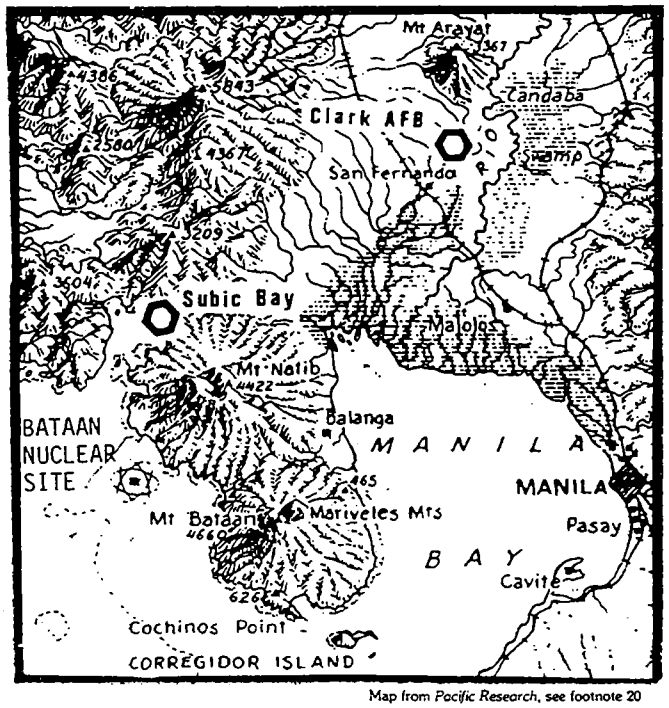


"Income contrasts are a shocking reminder of how far the global economy must still advance before there is adequate product for all, but they are pallid, impersonal expressions of the vast store of unmet needs in much of the world. How can statistics possibly define the crushing poverty in which millions of people live.

The numbers stand in long rows, like tombstones, silent monuments to lives lost:

...870,000,000 adults who cannot read and write
...500,000,000 people who have no jobs or are less than fully employed
...130,000,000 children who are unable to attend primary school
...450,000,000 people who suffer from hunger or malnutrition
...12,000,000 babies who die every year before their first birthday
...42,000,000 people who are blind or nearly so
...2,000,000,000 people who do not have safe water to drink
...250,000,000 people who live in urban slums or shantytowns

From: *World Military and Social Expenditures 1981*
by Ruth Leger Sivard



Map from *Pacific Research*, see footnote 20

The Philippines continued:

Out of the ruins the bulldozer had made rose large factories, textile plants, the toy factories, the Ford assembly plant.[18] These were modern looking buildings. But the factories were a prison to the farmer and his wife. The farmer's back ached, fatique numbed his arms as he put in 12 hour days. His wife grew thin and suffered from exhaustion.[19] The money was barely enough to afford the crudest rice. The home they returned to at night was a shack stacked among endless rows of thousands like it.

One evening, returning home weary from a hot day in the factory, the farmer was met by much weeping. His wife, ageing with anxiety and lack of food, was cradling a lifeless mass in her arms. O my God, it was his son, his eldest son. He had been tortured and killed by the military. Their son had protested the conditions of their work. He had demanded his government end the misery of the economic zone, increase the subsistence wages, and put in some safety and environmental controls. He had demanded to know the whereabouts of his friends who had been arrested without warrants or trials. The government of the dictator, President Ferdinand Marcos, did not like questions.[20]

The miserable years went by. One day the bulldozers arrived again to bulldoze down the shacks of the thousands of workers. The government official announced a great new development. They would build a nuclear reactor and generate cheap electricity.[21] Wasn't this wonderful? They could now use washing machines and toasters — they would have electric lights. "Where," said the weary farmer, "will we hang the lightbulbs — in the trees? You have destroyed my house again, such as it was." The wonder of government officials! What he needed was food, and a safe water supply for his family.[22] With what money would he buy those other gadgets? Though his wages were now $2.00/day, the 22% inflation rate of the country made his real wages half of what they had been 6 years before.[23] With a sigh he asked, "Where is this wonderful reactor to be built?" "Why, here on the Bataan peninsula, of course, you fortunate people. There will be extra jobs to be had." The farmer's senses reeled. He could not fathom the government official this time. He thought: "what devilish conspiracy is it that would place a nuclear dome on the slope of a volcano, beside an earthquake fault, on a coast prey to tidal waves and typhoons, among people ravaged by malaria and stunted by malnutrition. We are not against progress that brings life. We stand against profits that sow death."[24]

The farmer stumbled home late, alcohol was becoming his only salvation.[25] His daughters had been taken as prostitutes at the tender age of 12. They served the American soldiers in the nearby United States military bases. With such low wages, there was less and less money for food. A Mercedes Benz narrowly missed striking down the old man in the street. The visiting multinational dignitary was just telling his colleague: "These economic free trade zones are like Hilton Hotels. When you're inside one, you don't know what country you're in and the hassles of the country don't touch you. It's a business man's dream. The workers are polite and obedient and almost look alike. Sometimes you wonder if they're Mexicans, Filipinos, Malays or Arabs."[26]

As the dust stirred up by the luxurious car settled on the drunken man, the businessmen continued their dialogue enthusiastically. "This economic zone now has over 50 companies.[27] We pay no taxes and have custom-free shipping, plentiful cheap labour and no labour unions. The reactor core should be shipped some time in 1982."[28]

The farmer was old at 45, broken spiritually, physically, emotionally. His family was gone — his wife had died of an infection. Although there were several large drug companies in the economic zone, their medicine was only for export.[29] He could not afford any for his wife. Life for him was empty — a vacuum, barely an existence.

The agony of this Filipino farmer and his family cries out to us as Christian people. His country has been blest with all forms of intensive development but this has not benefitted the average citizen. What will the sale of our uranium do to an economy already bled dry — with a foreign debt 50 times greater than it was in 1961?[30]

It is up to you and me to be the conscience of the government and misguided development schemes. We need to speak up where there is injustice, discrimination, exploitation or callousness to human needs. We need to find ways to discuss basic problems and human needs, we need to learn to reform society without bloodshed. We as churches need to be called the Church of the Prince of Peace. We must recognize that Jesus has shown us a new and better way to live the life of love, to overcome evil with good, a way to give ourselves for the welfare of others. "To do any less is to rob the world of its message and its hope for peace."[31]

"Injustice reigns when some nations accumulate riches and live in abundance while other nations cannot offer the majority of people the basic necessities. Injustice reigns when within the same society some groups hold most of the wealth and power while large strata of the population cannot decently provide for the livelihood of their families."

— Pope John Paul II, 1981

Exporting Armageddon

Seeds of destruction

Canadian Complicity in Argentina's Nuclear Weapons Plan

Canada has been fully aware of the potential of a Candu reactor to be used for nuclear weapons purposes ever since India used a Canadian nuclear reactor in 1974 to attain a nuclear weapons potential.

In its dealing with Argentina over the past several years the Canadian government has given a series of clear signs that Argentina's intentions with respect to its Candu purchase are military in nature.

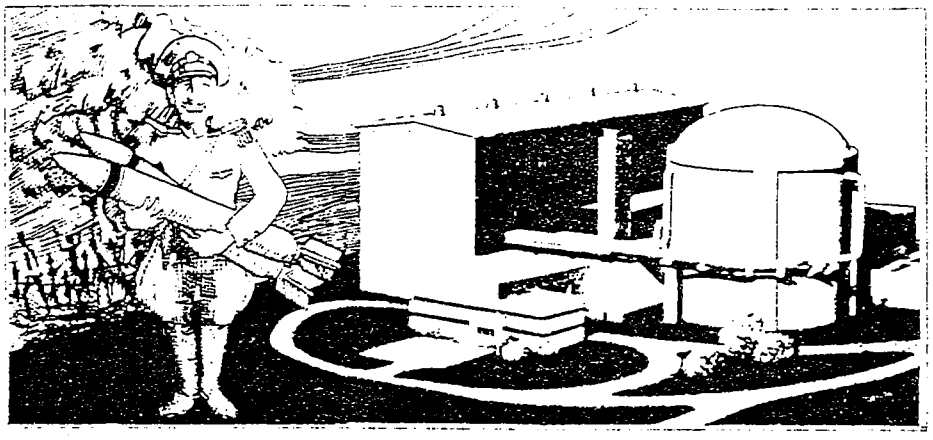
Argentina has consistently refused to meet Canadian requests to sign the Non-Proliferation Treaty (NPT). Canada has been making such requests of the Argentine government at least since 1976.

In 1978 the *Washington Post* learned that Argentina was building a facility to reprocess weapons-grade plutonium.[1] (It is now known that there are in fact two reprocessing plants in Argentina.[2]) At the time Hon. Tommy Douglas, federal N.D.P. energy critic, argued that Argentina's decision to build a reprocessing facility was sufficient grounds for discontinuing the construction of the reactor in Argentina, but Minister of External Affairs Don Jamieson rejected the plea.[3]

In 1979 retired naval officer and political figure Captain Francisco Manrique issued a communique in London, England which stated: "In 1980 our uranium reprocessing plant will be working, which will give us the ability, one supposes, to build an atomic bomb. Argentina could readily reprocess spent fuel from the Candu reactor (once in operation) to attain sizeable quantities of weapons grade material.[4]

In 1980 Argentina refused to bow to U.S. pressure to ratify the Tlatelolco Treaty for the Proscription of Nuclear Weapons in Latin America even though that treaty would have allowed Argentina to conduct so-called "peaceful nuclear explosions."[5]

In 1981 the United States cut off their supply of enriched uranium to Argentina (for use in experimental reactors) because of Argentina's refusal to sign the Non-Proliferation Treaty. Later in 1981 at the World Fair's International Energy Symposia in Knoxville, Tennessee (Nov. 3-6) Dr. Miquel Ussher, assistant to the President of Argentina, admitted that, while cheaper alternatives for the generation of electricity in Argentina were available, the nuclear option had been chosen because it gave Argentina the benefit of developing nuclear technology for military purposes.[6]



Argentina: An Internal Reign of Terror

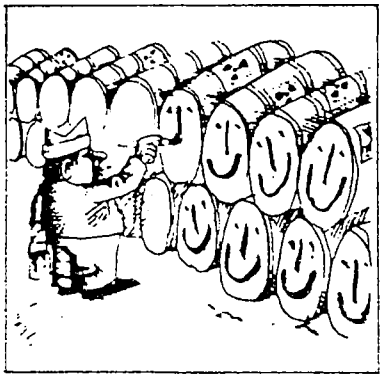
On March 24, 1976 the democratically elected government of President Isabel Peron was overthrown by the military. Following the coup every legal and constitutional guarantee in Argentina was suspended. National and provincial legislatures were dissolved and political and trade union rights were eliminated. The judiciary was placed in the hands of the military.[7]

The military government then implemented an unprecedented reign of terror. An estimated 7000 persons are known to have been killed by the military. Three thousand have been imprisoned and thousands more have "disappeared' (been kidnapped by the military and not seen again).[8]

In November 1980 the Organization of American States called on Argentina to take immediate action to halt the grave violation of fundamental human rights within the country.[9] In January 1981 the United Nations Working Group on Enforced or Involuntary Disappearances reported that it had received *specific information* on approximately 9000 cases of "disappearance" in Argentina and it listed 16 secret detention centres where the disappeared are believed to be held.[10] The total number of "disappeared" are estimated at between 15,000 and 20,000.[11]

The Argentine government's main response to international criticism in this area has been to simply pass a law declaring officially dead all persons who "disappeared" between November 4, 1974 and September 1979.[12]

One of the major targets of repression by the Argentine government has been the trade union movement in the country. Many trade union leaders have been kidnapped or killed. Upon coming to power the military also made any strike action punishable by up to 10 years imprisonment. In November 1979, a new labour law was passed by the government which abolished the national labour federation in Argentina, prohibited any sort of political activity by a trade union, expropriated all social services provided by trade unions and made all strikes illegal.[13]



The Candu Contract

In 1974 Canada agreed to construct a 600 megawatt nuclear reactor for Argentina at Embalse in the province of Cordoba (the first secret detention and torture camps were established by Argentina in Cordoba[14]).

While Canada was under no obligation to continue the agreement following the 1976 coup, the Canadian government chose to do so. Soon afterwards it became public that Atomic Energy of Canada Ltd. had obtained the Candu sale by paying a $2.5 million bribe, through an Italian middleman Jose Ber Belbard, to secure the contract. By 1978 the federal Liberal government had announced that due to escalating construction costs the taxpayers of Canada would actually lose $130 million on the Candu sale to Argentina.[15]

Ignoring their past economic losses, the repression in Argentina and the obvious signs that Argentina was committed to nuclear weapons production both the Liberal and then the 6 month Conservative[16] government in Ottawa tried unsuccessfully to sell Argentina a second Candu reactor in 1979.

The present Candu reactor has been under construction for several years and Canada has over 100 nuclear scientists and technical personnel working in Argentina on the project. The reactor is due to be completed in April 1983. As part of the contract Canada also undertook to provide sufficient uranium and fuel fabrication services for the first five years of reactor operation. The estimated requirement is approximately 500 tonnes of uranium.[17]

Canadian Government is Fully Aware

A briefing document on the construction of the Candu in Argentina was prepared for the federal cabinet in April and leaked to the *Ottawa Citizen* in that same month. It had been prepared because of concerns resulting from the Falklands crisis. The document states: "The Argentines have proven to be extremely difficult on the non-proliferation and safeguard matters related to the Embalse facility."[18]

It also notes that: "Argentina continues to show no inclination to accept Canadian policy requirements. In fact, the President of CNEA (Argentina Atomic Energy Commission) Rear Admiral Castro Madero, has in recent statements been unequivocal in rejecting the NPT and full scope safequards, while reaffirming his country's desire to retain a nuclear explosives option. Argentina is well on the way to developing an indigenous fuel cycle that is completely free of safeguards... Our immediate concern is that in their rush to close the cycle, the Argentines may be tempted to exploit their power reactor program which is now under safeguards."[19]

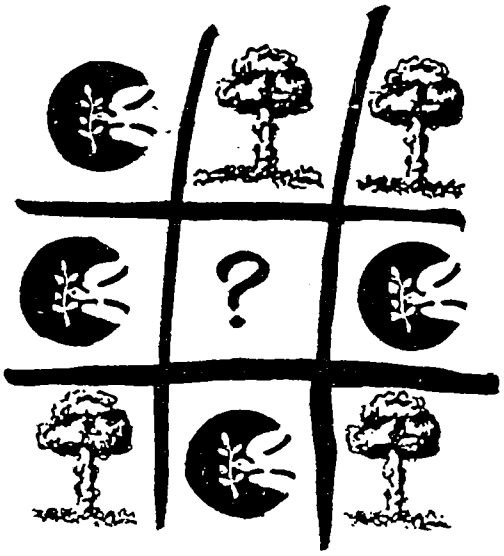
Safeguards Inadequate

The 600 megawatt nuclear power plant Canada is constructing for Argentina can produce enough plutonium to make 30 nuclear weapons per year.[20]

The major characteristic associated with the Candu reactor from the point of view of making it prone to use for military diversions is that high quality weapons grade plutonium can be produced by accelerating the reactor. At the same time the Candu can be continuously loaded with uranium fuel bundles instead of having to be shut down for several weeks for each reloading like other kinds of nuclear reactors must be.[21]

Canada was warned by the United Nations International Atomic Energy Agency (IAEA) that these characteristics make the proliferation safeguards on the Candu very difficult to implement. The warning came in a confidential report from the IAEA to Canada in the mid 1970s.[22]

Considering the characteristics of the Candu in the context of the Argentine sale, Dr. Gordon Edwards, Chairman of the Canadian Coalition for Nuclear Responsibility (CCNR) noted that the Candu will produce a "steady stream of spent fuel from which plutonium can be extracted" and will enable Argentina "to build an arsenal of atomic bombs" rather than just one or two.[23]



FOE/Australia, August 1977

The Saskatchewan Connection

By 1981 Atomic Energy of Canada Ltd. had provided the Argentine Atomic Energy Commision with reactor fuel containing approximately 124 tonnes of uranium. Responding to a letter of inquiry from Saskatchewan M.L.A. Peter Prebble, Energy Minister Marc Lalonde wrote on August 7, 1981: "This (124 tonnes) is sufficient fuel to fill the reactor and provide for the first few months of operation. The uranium used in this fuel was purchased by AECL from Eldorado Nuclear Limited and was refined at Eldorado's Port Hope facility."

Because uranium is often blended at the Eldorado Port Hope refinery, not all of the uranium is certain to have come from Eldorado's uranium mine in Uranium City, but it is certain that much of the uranium, if not all of it, is of Saskatchewan origin.

Repression Used by Military

Since the military came to power in 1976 academic research in Argentina has essentially ceased to function at the country's universities and technical institutes. Thousands of researchers and university professors have been fired. Leading scientific organizations such as the National Council for Scientific and Technical Research have been brought under the control of the military.[24]

At the same time the junta has boosted nuclear research. It has also eliminated leading atomic physicists who would be unlikely to accept its policies. For instance, two leading atomic physicists, Antonio Misetich and Federico Eduardo Alvarez Rojas are now among the "disappeared" and are suspected dead.[25]

The nature of Argentina's nuclear program from its early beginnings is perhaps best reflected by the little known fact that several of the key people who have assisted in the establishment of the nuclear program were prominent Nazis during Hitler's regime. For instance, the person most central to building up Argentina's nuclear infrastructure was Walter Schnurr, who as a chemist for I.G. Farben during World War II developed the gas Zyklon B used to exterminate millions in the Nazi death camps.[26]

New Brunswick Longshoremen Take a Stand

In May of 1982 longshoremen in St. John, New Brunswick refused to load 3000 uranium fuel bundles en route to Argentina by ship. Combustion Engineering had contracted with the Government of Argentina to assemble the fuel bundles for delivery by June 30th, 1982.[27] The fuel bundles are considered by the Government of Canada to fulfill about half of the total 500 tonnes originally committed.

The longshoremen, acting with the support of the New Brunswick Federation of Labour, cited the refusal of the Government of Argentina to sign the Non-Proliferation Treaty and the massive human rights violations in Argentina as their primary reasons for refusing to load the uranium and declaring it to be "hot cargo".[28]

This was the second occasion on which such courageous and principled action was taken by the New Brunswick longshoremen. On July 3, 1979, approximately one hundred longshoremen and railroad workers in Saint John risked charges and fines when they refused to load a cargo of 15 containers of heavy water bound for the Candu in Argentina. On that occasion the longshoremen demanded the release of 16 trade unionists kidnapped by the Argentine military. The effectiveness of their economic and political pressure was demonstrated by the fact that the Argentine embassy in Ottawa immediately prepared a full report on the whereabouts of the 16 Argentine trade unionists and freed 7 of them within four days, some of whom had been imprisoned for several years.[29]

Why Does Canada Continue?

For the past decade the Government of Canada has been pursuing a highly vigorous policy of reactor exports. This policy has been based on an attempt to keep the price of nuclear reactors and nuclear electricity down here in Canada. In other words, the price of nuclear electricity has been subsidized here at home at the expense of increasing nuclear proliferation in various parts of the world. Costs could be kept lower by increasing the number of units produced.

In an attempt to expand its overseas market, Canada sold each of its first five nuclear reactor exports at a loss. In each case the country was also a buyer known to be interested in nuclear weapons production. In addition to Argentina, the purchasers included India, Pakistan, South Korea and Taiwan.

By the late 1970s it became clear that demand for nuclear reactors in Canada was far lower than what the nuclear industry had been predicting. Thus, in the last two years the Canadian government has become absolutely desperate to find overseas buyers for the Candu in an attempt to keep the nuclear industry alive. The subsidies offered at the expense of the Canadian taxpayer have been huge. In 1982 the Government of Canada proposed to loan the Government of Mexico $6 billion at 7½% interest over 20 years to purchase four 600 megawatt Candu reactors. With 1982 interest rates in Canada running at 18% at the time, the value of the subsidy was in excess of $3.5 billion. The early months of 1982 also saw Marc Lalonde in the Middle East peddling reactor technology in one of the most unstable parts of the world and only months after Israel had bombed a reactor under construction in Iraq on the grounds that Iraq was constructing nuclear weapons.[30]

The Government of Canada is intent on selling nuclear reactors and uranium overseas regardless of the cost to Canadian taxpayers or the consequences for world peace. Only public opposition by Canadians will reverse this policy.

What You Can Do

1. Write letters of support to the longshoremen:
   Local 273
   International Longshoremen's Assoc.
   625 St. Jame's St.
   St. John, New Brunswick
   or
   New Brunswick Federation of Labour
   1, Hedley St.
   St. John New Brunswick
2. Write letters to Mark MacGuigan, Minister of External Affairs, asking him to halt all uranium export to Argentina and to halt construction of the Candu reactor in Argentina. Ask him to reevaluate Canada's commitment to nuclear exports given the ineffectiveness of current safeguards.
3. Distribute this tabloid in your organization. Arrange for a speaker from ICUC to address your church congregation, local organization or concerned citizens group.
4. Keep up to date and study the uranium issue. Keep the issue in the news. Write a letter to the editor of your local newspaper expressing your concern.

This tabloid was written by Peter Prebble and produced by the Inter-Church Uranium Committee (ICUC), a group of Christians from Anglican, Lutheran, Mennonite, Roman Catholic and United church congregations. ICUC supports a moratorium on uranium mining in Saskatchewan in order that further research can be done on the unanswered questions of the issue such as Saskatchewan's role in the proliferation of nuclear weapons, the management of wastes and the effects of low-level radiaton. For further information contact:
Inter-Church Uranium Committee
Box 7724
Saskatoon, Saskatchewan
S7K 4R4

Footnotes:

1. *Canada/Argentina Bulletin*, Vol. 1, No. 3, Jan-Feb 1979, p. 1 (published by: Group for the Defence of Civil Rights in Argentina, No Candu for Argentina Committee and the Emergency Committee for Argentine Political Prisoners and Refugees - 175 Carlton St., Toronto).
2. "Senior Argentinian Official Confirms Nuclear Military Program". A CCNR Background Paper based on the taping of a panel discussion at the 1982 World's Fair International Energy Symposia involving Dr. Miguel S. Ussher, an assistant to the President of Argentina and a conversation following the panel between Dr. Ussher and energy specialist and author Amory B. Lovins. The panel took place on Thurs. Nov. 3, 1981, in Knoxville, Tennessee. (Published in Montreal by the Canadian Coalition for Nuclear Responsibility).
3. Hansard of Canadian Parliament, Nov. 16, 1978.
4. *Guardian*, Feb. 25, 1979.
5. "Argentina leads Latin America's A-bomb Race", by Ziaddin Sarder, *New Scientist*, Dec. 3, 1982, p. 649.
6. "Senior Argentinian Official Confirms Nuclear Military Program", Ibid.
7. *Canada/Argentina Bulletin*, op.cit. Vol. 2, No. 1/2, Jan-Feb. 1980, p. 6.
8. Ibid., p. 6.
9. *Amnesty International Canadian Bulletin*, April 1981, p. 6.
10. Amnesty International Report 1981 (for the period May 1, 1980 to April 30, 1981), Amnesty International Publications (United Kingdom), p. 109.
11. *Canada/Argentina Bulletin*, op.cit., Vol. 2, No. 1/2, Jan-Feb. 1980, p. 6.
12. *Amnesty International Canadian Bulletin*, Dec. 1981, p. 6.
13. *Canada/Argentina Bulletin*, op.cit., Vol. 2, No. 1/2, Jan-Feb. 1980, p. 1.
14. *'Disappearances': A Workbook*, Amnesty International USA Publications (New York), 1981.
15. "The Deal That Never Was" by James Fleming, *MacLeans*, Oct. 15, 1979, p. 46.
16. News Release Issued on Sept. 29, 1979 by Dept. of Industry, Trade and Commerce, Government of Canada, entitled: "Minister Wilson's Visit to Argentina".
17. Letter dated August 7, 1981 from Hon. Marc Lalonde, Minister of Energy, Mines and Resources Canada to Peter Prebble, M.L.A., Saskatoon.
18. Copy of the Liberal Cabinet (Federal) Briefing Document Leaked to *Ottawa Citizen* in April 1982 after the Falklands crisis had developed between Britain and Argentina.
19. Ibid., p. 1 of the Liberal Cabinet Briefing Document.
20. "Argentine Candu Haunts Government" by Margaret Munro (Southam News), *Ottawa Citizen*, April 23, 1982, p. 1.
21. "Canada Warned in Mid-70s Its Nuclear Safeguards Inadequate", by Margaret Munro and Les Whittington, Southam News, Friday, May 7, 1982.
22. Ibid.
23. "Argentina May Get Big 'Gun' from Candu", by Stan Koma, *Prairie Messenger*, Vol. 59, No. 44, May 9, 1982 (Muenster, Sask.).
24. "Argentina Leads Latin America's A-bomb Race", op.cit., p. 649.
25. Ibid., p. 649.
26. "Nazi A-Bomb" by Ian Adams, *Today Magazine*, (The Weekend Sun), July 5, 1980 (Toronto), p. 5.
27. Information obtained by G. Dishaw (Special Asst. to Hon. Simon DeJong, M.P.) in conversation with Mr. H.A. Rose, Director, External Relations, A.E.C.L.
28. Telephone conversation with Larry Hanley, President, New Brunswick Federation of Labour, June 1, 1982.
29. *Canada/Argentina Bulletin*, Vol. 1, No. 5, July-August 1979, p. 1.
30. "Reactor Exports: An Incredible Give-Away", *The Birch Bark Alliance*, Winter 81-82, p.5.

August 1982

The Smoke Screen of Nuclear Safe-Guards

"There will be unquestionably a broader acceptance of nuclear facilities, including power generation, in a world confident that safeguards and protective routines are of undoubted adequacy."

Prime Minister Pierre E. Trudeau

"Over long years, much has been said on the subject of nuclear arms control but little has been done in reality... the world today stands on the brink of an abyss. Never before has mankind been in such grave peril."

Sigvard Eklund, former Director-General of IAEA to United Nations Assembly, November 10, 1981

"Safeguards are not safe. It is unreasonable...and dangerous to let people believe that nuclear safeguards have become adequate instruments to prevent the proliferation of nuclear weapons. The ways to cheat the international safeguards are as numerous as the ways of the Lord."

Enrico Jacchia
Former head, European nuclear guards
Star Phoenix, July 9. 1982

Abbreviations and Terms

AEC - Atomic Energy Commission (U.S.)
AECB - Atomic Energy Control Board (Canadian crown regulatory agency)
AECL - Atomic Energy of Canada Ltd. (Crown agency)
CANDU - Canadian-Deuterium-Uranium reactor, moderator is deuterium or heavy water, fuel is natural uranium
ENL - Eldorado Nuclear Ltd. (Crown corporation)
Enrichment - process of increasing the proportion of uranium
Fissionable material - uranium-233, uranium-235 and plutonium 239 are examples of significant fissile materials but only uranium-235 occurs naturally
IAEA - Internation Atomic Energy Agency, of the United Nations
NEB - National Energy Board, Canada
Natural uranium - uranium whose isotopic composition as it occurs in nature has not been altered
NPT - Non-Proliferation Treaty
NWS - Nuclear Weapons States (US, USSR, UK, France, China)
NNWS - Non-Nuclear Weapons States
Plutonium - a heavy radioactive metallic element whose prinicipal isotope is a major fissile material. It is produced artificially in reactors.
Proliferation

Horizontal - acquisition of nuclear weapons capacity through the vehicle of the civil nuclear reactor (ie - China) or in the form of direct military-technology transfer from one country to another (ie - India, with Canada's help)

Inadvertent (by a supplier) - acquisition of a nuclear explosive device through an act of malice (ie - highjacking)

Vertical - internal build-up in terms of numbers, size and delivery systems of national nuclear arsenals. Examples: US, USSR, UK, France and China

Recycling - the re-use of fissionable material in irradiated fuel. It is recovered by reprocessing.
Reprocessing - the extraction of fissionable material from spent fuel for later use by recycling

SOURCE: *Nuclear Energy: The Unforgiving Technology*, by Fred H. Knelman, Hurtig Publishers (Edmonton: 1976)

The Non-Proliferation Treaty (NPT)

The NPT was sponsored initially by the US, USSR and UK in the mid-60s and finally signed in 1968. It was essentially a bargain between Nuclear Weapons States (NWS) and Non-Nuclear Weapons States (NNWS).

Those with nuclear weapons promised not to transfer them and "not in any way to assist, encourage or induce any NNWS to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices... As payment for their promise to forswear nuclear weapons and to permit the so-called full-scope safeguards, the nations without nuclear weapons were guaranteed that nothing would stand in their way if they wanted to buy any 'civilian' nuclear technology." The irony in this is that now "as long as a country has signed the NPT, they are assumed to have only the most peaceful intentions and often in the face of the most blatant evidence to the contrary...And they do claim that the Treaty itself gives them every right to buy whatever they want."[1] Some 114 nations have signed and ratified the NPT.[2]

The Schizophrenic Policy of the Canadian Government

1. The Non-Proliferation Treaty and the inspections of the IAEA are the best safeguards against weapons proliferation. (Hon. A. MacEachen, 1975; Hon. M. MacGuigan, 1982)
2. Safeguards should not be allowed to hinder business. (Ernest Siddall, AECB, 1981; Nicholas Ediger, Eldorado Nuclear Ltd., 1979)

The Failure of the NPT

1. France, South Africa, Israel, China, India and Pakistan refuse to sign the NPT.[3]
2. The non-adherence to the NPT by countries includes half the world's population.
3. Nations who are members of the NPT may withdraw on 90 days notice.
4. A lack of commitment to the NPT by the US allows unlimited trade in nuclear technology and materials by its corporations... as long as they are not exporting bombs. The 1964 Atomic Energy Act allowed the AEC to licence private companies to handle their own trade in ore, and Westinghouse to reach its own reactor sales agreement with the Philippines, despite evident physical and environmental dangers. The US District Court of Appeals ruled that the National Regulatory Commission "is not obliged to examine the safety of a reactor exported from the U.S."[5] If such is the case for technology sales, how could controls of safeguards be meaningful?
5. Countries which have signed the NPT are then allowed to buy nuclear technology which can be used for weapons production. Examples: Iraq, Libya.
6. The first NPT Review Conference was held in 1975 and serious concerns were expressed that the nuclear arms race was continuing unabated.[6] The US and USSR rejected a ceiling on nuclear weapons and rejected calls for reductions in numbers of weapons.
7. **So serious have been the questions around "safeguards" that at the 1980 Second Review Conference on the NPT involving 113 countries, it was acknowledged that no concluding statement could be reached.**[7]

Nuclear Weapons States: US, USSR, Britain, France, China
Other nations known to have nuclear weapons: South Africa, Taiwan, Israel, India, Pakistan, South Korea, Brazil, Argentina
On the path: Egypt, Libya, Mexico, Cuba, Iraq, Philippines
Wanting the technology: Kuwait, Bangladesh, Nigeria

"Don't laugh. He used to be a nuclear physicist."

The International Atomic Energy Agency (IAEA) Tale of Another Split Personality

1. The IAEA was formed in 1956 and came into actual effect in 1957.
2. The IAEA is expected to play 2 conflicting roles: i) It is supposed to promote the worldwide growth of nuclear power and research programs, chiefly by encouraging the spread of "civilian" nuclear technology and providing technical assistance to nations in the Third World; ii) At the same time, it is supposed to prevent the spread of nuclear weapons.[8]
3. "In practice, the safeguards are a series of measures to keep track of 'sensitive' nuclear materials, the processes that produce them, the tanks that store them, and the facilities that handle them. Each nuclear installation under safeguards is expected to keep a record of all such materials and to account for any changes that are produced through nuclear reactors or other processes... The inspector also installs and monitors a wide range of technical devices to make sure that nuclear materials cannot be moved or altered without detection."[9]
4. "The goal of all this prying and poking is simple - to provide 'timely detection' of any diversion of a 'significant quantity' of bomb-prone materials... At best the aim is to detect the diversion, not to prevent it, and to make the detection in enough time to give the diplomatic community a chance to act before the bomb goes off."[10]
5. In 1972, the IAEA outlined the basis for implementation of safeguards. Among the provisions were included the following 3 points: (a) "to avoid hampering the economic and technological development of the State of international co-operation in the field of peaceful nuclear activities, including international exchange of **nuclear material**; (b) to avoid undue interference in the State's peaceful nuclear activities, and in particular in the operation of **facilities**; and (c) to be consistent with prudent management practices required for the economic and safe conduct of nuclear activities."[11]
6. "Only one quarter of the IAEA's budget is spent on safeguards: The rest goes on administration, and on promoting the spread of nuclear energy to yet more countries."[12]

- Argentina was required to negotiate such a bilateral agreement with Canada covering the contract for a CANDU reactor at Embalse. Such an agreement was concluded in January 1976 and in turn it made necessary the negotiation of a new IAEA-Argentina safeguards agreement (INFCIRC-251), a task which was completed in July 1977. In the midst of this process, Canada announced its Dec. 1976 safeguards policy. **While Canada has demonstrated its willingness to cooperate further with Argentina in a broad range of nuclear matters, Argentina has to date not been prepared to meet the requirements of this policy.** Argentina has clearly and repeatedly been advised of Canada's Dec. 1976 safeguards policy requirements.

1977 - **A Ford Foundation study estimates that by the mid-1980s, South Korea can build up to 36 plutonium bombs a year, just using the waste from nuclear reactors operating in the country.**

1978 - UN Special Session on Disarmament

-**Argentina is building a facility to reprocess weapons-grade plutonium.** Hon. Tommy Douglas, Federal NDP energy critic argued that Argentina's decision to build a reprocessing facility was sufficient grounds for discontinuing the construction of a Canadian reactor in Argentina, **but Minister of External Affairs Don Jamieson rejected the plea.**

- **A US Congressional Report documents that a South Korean weapons exploitation committee unanimously approved a plan to develop nuclear weapons in the early 1970s.**

1979 - By August, 3 NWS and 107 NNWS, including 31 NNWS with significant nuclear activities, had become parties to the NPT.

- **Presidents Carter and Brezhnev initialled SALT II, limiting offensive nuclear weapons**
- **US Congress suspended aid to Pakistan because the country was pursuing a nuclear weapons program.**
- **Several people were killed and injured at the test site in the Tuamotu Archipelago of French Polynesia where France admitted it had been testing devices for a neutron bomb since 1976.**

1980 - **At present 10 NNWS which have substantial nuclear activities (Argentina, Brazil, China, South Korea, India, Israel, Pakistan, South Africa, Spain and Turkey) are not parties to the NPT, and in 4 of these countries (India, Israel, South Africa and Spain) as well as in Egypt (which has signed but not ratified the NPT) unsafeguarded nuclear facilities are in operation.**

- **CBC National News, Dec. 15, revealed that Eldorado Nuclear Limited has illegally been importing uranium from Namibia, labelled as South African uranium. Eldorado defends its actions by saying the ore was not purchased, only imported for processing and returned. AECB denied any knowledge of such imports, agreed they were illegal but defended itself saying it has few staff to investigate such matters.**
- September, NPT Five-Year Review Conference. Non-aligned and developing countries said the outcome was a warning to nuclear powers that they must keep their side of the bargain and scale down their nuclear arsenals. **At the NPT Second Review Conference involving 113 countries, it was acknowledged that no concluding statement could be reached.**

1981 - August 9th, **US announces decision to proceed with development of the nuetron bomb.**

- Nov. 11, **US announces launching of the latest nuclear weapon, the first Trident submarine named USS Ohio. The Trident carries 24 nuclear cruise missiles armed with up to 17 warheads and has the capacity to destroy 408 cities, each with a blast equivalent to 3 to 5 Hiroshimas. There are 29 more Trident submarines planned for the US Navy.**
- **South Africa obtains enriched uranium on the international market for a nuclear power plant project. Framatone, a one-third French government owned company, is processing the uranium fuel rods under an existing contract with South Africa's electrical supply commission. South Africa is suspected of having nuclear weapons.**
- **Early December, France exploded 2 nuclear weapons underground at the South Pacific Atoll of Mururoa.**
- **The Government of Saskatchewan signed an agreement to supply South Korea with uranium.**
- December 1, the US and USSR arms negotiators get down to their first bargaining on their talks to limit the deployment of nuclear missiles in Europe.
- June 7, Israel Armed Forces launched a raid on the Iraqi atomic reactor, Osirak, near Baghdad, and destroyed the reactor to prevent it being used for nuclear weapons.
- August 10 **French Defense Minister Charles Hernu said today the Soviet Union has tested a neutron bomb.**
- **Once every three and a half weeks, an atomic bomb up to 5 times the size of the one dropped on Hiroshima is exploded underground at the US nuclear testing site 65 miles northeast of Las Vegas, Nevada. There have been over 400 such detonations since the Limited Test Ban Treaty in 1963 prohibiting atmospheric tests. The Pentagon admits that 42 of these underground explosions resulted in the release of radioactive gas and dust into the atmosphere. Antinuclear activists charge that this figure grossly underestimates the damage. They say leaks may have occurred in as many as one-quarter of these tests.**
- **South Africa's Wymand De Villiers, Chairman of the Atomic Energy Board, admitted that his country's newly acquired ability to manufacture 45% enriched uranium now enabled it to make a bomb, "though it would be a clumsy bomb."**

1982 - **March 11, Britain announced it would buy the advanced submarine-based US Trident II nuclear missile system — a system that critics contend the country neither needs nor can afford.**

- February 25, Canadian Defense Minister, Gilles Lamontagne, indicated the last nuclear weapons will be removed from Canadian soil soon, perhaps by the end of the year.
- **US asked Canada whether Canadian airspace might be used to test the cruise missile, prior to the missile's planned introduction into NATO inventories next year.**
- March 16, Soviet president, Leonid Brezhnev today declared a unilateral moratorium on deployment of medium-range nuclear missiles in Europe, Radio Moscow reported. Brezhnev also said the Soviet Union plans to pull back a "certain number" of medium-range missiles it has already deployed in the western part of the Soviet Union.
- March 16, President Reagan has rejected a congressional proposal to freeze the number of US and Soviet weapons, saying the
- plan doesn't go far enough and the "verifiable reductions" in arms are needed instead.
- **A US Central Intelligence Agency report says Pakistan will be able to detonate a nuclear device within the next 3 yrs**
- **Libya's Col. Khadafy said the Arab countries should unite and destroy Israel which he said was arming with nuclear weapons and would destroy the Arab world.**
- July 4, **President Reagan announced the initiation of a satellite interceptor program.**
- **A Spanish military officer revealed last November that the country was already producing enough plutonium to make 10 nuclear weapons a year.**
- **US defence spending will reach $1.64 trillion during the next 5 years. That almost incomprehensible figure means more than $100,000 every second.**
- CBC Radio announces in July that the UN Special Session on Disarmament II is a failure.

Sources available in the ICUC office, Box 7724, Saskatoon, S7K 4R4

History of Safeguards & History of Proliferation

(Bold print indicates proliferation)

1945 - **Bomb number 4 from the Manhattan Project is used to start the U.S. weapons arsenal.**

- Nov., Agree Declaration on Atomic Energy, U.S., U.K., Canada and others tried to formulate a way of "eliminating the use of atomic energy for destructive purposes and promiting its widest use for industrial and humanitarian purposes."

1946 - January, after discussions among the US, USSR & UK, the United Nations passed a resolution creating the UN Atomic Energy Commission.

- The US Atomic Energy Act adopted a national policy on atomic power which placed an embargo on the export of nuclear materials and information.

1949 - **First atomic tests by the USSR.**

1953 - President Eisenhower delivers his "Atoms for Peace" speech to the United Nations.

1954 - **U.S. hydrogen bomb (The H-Bomb multiplies the explosive force of the A-Bomb, 1,000 times.)**

1955 - **U.S.S.R. first hydrogen bomb.**

1956 - Canada and India sign a bilateral agreement on the export of a small research reactor called CIRUS.

- After 2 years of negotiations, the Statute of the International Atomic Energy Agency (IAEA) was approved and signed in Oct.

1957 - IAEA came into force on July 29.

- **USSR Intercontinental Ballistic Missile (ICBM) first tested (A land-based missile to carry nuclear warheads intercontinental distances.)**

1958 - **US tested Intercontinental Ballistic Missile (ICBM).**

-First ban on atmospheric testing signed by US & USSR, but a definitive ban on above-ground testing had to wait until 1964 when both had learned enough from their experiments.

1959 - Canada signed a nuclear cooperation agreement with Pakistan covering the provision of a 125 MWe CANDU-type power reactor (Kanupp).

1960 - **US has submarine-launched ballistic missile (SLBM) (A nuclear powered submarine to fire long-range missiles from a submerged position).**

1963 - Limited Nuclear Test Ban Treaty was signed.

1964 - **China explodes a bomb in October.**

1965 - **Five states had nuclear arms and there were signs that more states were moving towards acquiring such weapons.**

- **Canada had been exporting uranium to the United States and the United Kingdom for use in their nuclear weapons programs since 1945.** Prime Minister Pearson ended the policy so uranium would be exported only for peaceful purposes.

1966 - **US has Multiple Warhead (MRV) (Multi-headed missiles increased the number of targets a missile could hit.)**

1967 - Treaty of Tlateloco prohibited nuclear weapons in Latin America.

1967 - **USSR gets Submarine-launched Ballistic Missile (SLBM).**

-**USSR gets Multiple Warhead.**

1968 - Growing international concern finally resulted in the negotiation of the 1968 NPT. Canada endorses the Non-Proliferation Treaty (NPT) on July 22.

1969 - Canada sold to Taiwan a 40 MWe nuclear research reactor. This sale was conditional on Taiwan's concluding with the IAEA a safeguards agreement by which Taiwan would undertake not to use the reactor in such a way as to further any military purpose.

- SALT (Strategic Arms Limitation Talks) begin. **(Then the US and USSR had less than 3,000 strategic warheads; today they have a total of some 15,000 deliverable strategic warheads.)**

1970 - **US has Multiple Independently-targeted Warhead ((MIRV) (Further development of multiple warheads enabled one missile to hit 3 to 10 individually selected targets as far apart as 100 miles.)**

1972 - SALT I ended deployment of anti-ballistic missile weaponry and provided for independent monitoring of the treaty, although it allowed continued arms build-up.

1973 - Canada sold Argentina a 600 MWe reactor. AECL took a loss of $130 million on the CANDU.

1974 - **India exploded a bomb using Canadian technology and US ore.**

- Yellowcake from Canada was being used by **Taiwan.**
- After India's bomb, Canada announced more stringent non-proliferation safeguards covering the export of Canadian nuclear and special material, equipment, facilities and technology to all states, whether NWS (Nuclear Weapons States) or NNWS (Non-Nuclear Weapons States).

1975 - May, the First NPT Review Conference was convened to review the operation of the NPT to ensure that the objective of the preamble and provisions of the Treaty were being achieved. **The conference expressed serious concern that the nuclear arms race was continuing unabated and urged constant and resolute efforts by all states, particularly the NWS, to achieve effective containment of nuclear weapons.**

- **West Germany announced its $4 billion sale of a complete nuclear fuel cycle to Brazil, a non-party to the NPT. (While Brazil put the German facilities under IAEA safeguards, nothing stops Brazil from duplicating the technology and using its own uranium to manufacture explosives.)**
- Korea acceded to the NPT in April.
- **South Korea's attempt to purchase a reprocessing plant from France in 1975 was prevented through US intervention**
- **USSR gets the Multiple Independently-targetted Warhead (MIRV).**
- **Dr. Khan, an ex-patriate Pakistani, steals the plans for an Ultracentrifuge Plant from Holland for Pakistan.**

1976 - Following the announcement of the Dec. 1974 safeguards policy, Canada entered into lengthy negotiations with Pakistan to conclude a bilateral agreement incorporating the requirement of that policy. **By Dec. 1976 it was evident that Pakistan was not prepared to meet Canada's requirements and that it was engaged in negotiating the acquisition of a reprocessing facility from France, when there was clearly no need for such a facility given the stage of development of Pakistan's nuclear program.** In these circumstances, the Canadian government announced that for all practical purposes nuclear cooperation between Canada and Pakistan was at an end.

How Safe are the Safeguards?

1. Besides the questions over the very terms of enforceability, a real problem exists with the numbers and training of inspectors under the system. First, a country must agree to the "designation" of the individual assigned to carry out an inspection. A refusal can be made on the basis of nationality, the safeguards standards of the country of origin of the inspector, or on the basis of linguistic differences.[13] A dispute over designation can be used to defer an inspection.

2. The whole question of notice and designation have created conflicts inside of IAEA. Former IAEA nuclear safeguards inspector, Roger Richter, left the agency in 1981 and told a US Congressional Committee his reasons, using Iraq as an example:[14]

i) "countries have the right to veto inspectors from whatever countries they choose"

ii) "inspectors must give several weeks' notice of planned inspection and obtain a visa"

iii) "design information is limited to describing the reactor, its operating characteristics, such as power and flux, etc." (The Iraqi review, for example, would not include 'hot cells provided by Italy'.)

iv) inspection does not cover the Iraqi radiochemistry laboratory, a pilot processing facility or fuel fabrication (and Iraq continues the exemption of these facilities by a single promise not to produce plutonium.)

v) "natural uranium in the form of U-308 (yellowcake) is not subject to safeguards"

vi) "IAEA does not look for clandestine operations"

vii) inspections are limited to three a year

3. Ironically, Israel used the failure of the safeguards system as a pretext to bomb the "safeguarded" Iraqi reactor on June 7, 1981, contending it was a weapons development site.

4. Successful diversion from "peaceful uses" is one of the most telling signs of the ineffectiveness of controls. In reference to diversion, several telling cases involve US allies. These instances are still largely cloaked in official secrecy, including:

a) 164 kilograms of highly enriched uranium disappeared from the Nuclear Materials and Equipment Corporation in 1964 and 1965. The CIA concluded the diversion was to Israel.

b) In November 1968, 200 tons of uranium ore, supposedly en route to a paint and chemical company in Italy, was transferred off the freighter *Scheersburg A* to an Israeli ship.

In both cases, the appropriate authorities (the AEC and Eurotom, respectively) maintained secrecy. Far from providing "timely warning", American and European bureaucrats smothered public exposure of the information for a decade. Furthermore, no effective sanctions against Israel were ever undertaken.[15]

5. IAEA's Board of Governors in 1978 voted not to release its Special Safeguards Implementation Report, which indicated the inability to reliably detect diversion from reprocessing plants and bulk handling facilities.[16]

6. An indication of the suffocation of public information can be noted by the 1978 expose of a 1974 secret CIA "National Intelligence Estimate". The document had not been made available through normal channels to the US Congress and only came to public view through a clerical error. The text indicates that the CIA was concerned with nuclear weapons development in Japan, Taiwan, Argentina and South Africa.[17]

7. With all its responsibilities, IAEA still depends almost solely upon the auditing of books of specific facilities. Critics have called the effectiveness of such book monitoring "not supportable and dangerously misleading". Yet, the IAEA's annual report in 1979 made the categorical statement that "...it is reasonable to conclude that nuclear materials under IAEA safeguards remained in peaceful nuclear activities."[18]

8. "IAEA has been forced to work within a straightjacket of built-in constraints. It is supposedly the world's top nuclear cop, but it has no police powers. It has no intelligence service of its own. It must depend to a frightening degree on the voluntary co-operation of the various nations it is supposed to monitor and also on the intensely political decisions of the member nations of its Board of Governors."[19]

9. "Even today, the highly industrialized nations — from Canada and Sweden to Germany and Japan — could still make nuclear weapons if they wanted, and in a very short space of time. They have the skill and most of them already have enough highly enriched uranium or plutonium close at hand. But they have all made a political decision not to build a bomb, and the IAEA safeguards tell the world that they are keeping their word. **In those countries, where countries are not building the bomb, the system works well enough. But in countries like Iraq and Pakistan, where they are, the safeguards are anything but safe."**[20]

"OK, let's say they destroy our civilization and we destroy theirs. Now, here's my plan..."

"The arms control and disarmament measures foreseen in the NPT **are unrealized** *and, in particular, we seem to be no nearer to the crucial step of a comprehensive test ban... I should like to note that, of the group of countries which have not yet acceded to the NPT, there are a few which are engaged in significant nuclear activities with existing or potential capability of producing nuclear explosive material. These activities are not subject to IAEA safeguards. This is a cause of serious concern..."*

Sigvard Eklund, former Director-General of IAEA to United Nations Assembly, November 10, 1981

"Three years of jockeying, chiefly on the part of the larger nations, finally produced the International Atomic Energy Agency to which seventy nations eventually subscribed. Unfortunately, the jockeying has continued and the Agency, which represented the hopes of people all over the world, has failed to fulfil those hopes. Originally it was intended to have jurisdiction over atomic energy both for military and for peaceful purposes; but it soon became evident that the Agency could have no voice in military matters, and that it was impotent in the other field as well."

D.M. LeBourdais, *Canada and the Atomic Revolution*, McClelland & Stewart (Toronto: 1959)

Canada and the IAEA

"We have an obligation to share our technology with the developing countries."

Pierre E. Trudeau, Mexico, 1976

Canada has been a leader of the international debates on nuclear weapons from the very beginning. It played a major role in ushering in the nuclear age and served as a member of the UN Atomic Energy Commission (the only non-Security Council member) and a member of NATO. Canada has been deeply involved in the use of the technology as well as the production of uranium. "On the one hand, she has played a role of mediation, moderation, and recognition of the need for global equity. On the other hand, Canada has been a major arms dealer."[21]

While talking of "global equity", Canada's nuclear salesmen, headed by AECL's Gordon Hearst, have appealed to Third World nationalistic attitudes through images of energy independence. "Peaceful uses" has become known internationally as Canada's escape clause, "the Canadian loophole". The clauses on peaceful uses have allowed Canada and the US to trade with virtually any country including those who have not signed and/or ratified the NPT or joined IAEA: Argentina, Brazil, India, Israel, Portugal, South Africa and Spain.

Canada has rested its case upon shallow promises by such countries that they would not seek nuclear weapons. Such promises can prove short-lived, indeed. Trusted statesmen, Jawahalal Nehru, an advocate of nuclear disarmament and peace, said in 1957 that "...we shall never use this atomic energy for evil purposes."[22] Less than 10 years later, India would use Canada's safeguarded sale of reactor to introduce its weapons program.

There is an international contradiction in Canadian nuclear policy that shapes much of its dealings with the world in nuclear trade. Canada has stressed *both* disarmament and the desire to spread the forms of nuclear technology as realatively equal aspects of the NPT. "...Access to nuclear technology and materials" has thus often run counter to restrictions on trade to countries desiring nuclear weapons. Ernest Siddall of AECL in October of 1981 told a Saskatoon audience that the Canadian public was "neurotic" about nuclear issues and that the industry had been safe before regulations had been introduced.[23] While this comment is interesting if only for its paternalism, it also reveals the degree of conflict between the desire for a nuclear marketplace and sales, and the wish for protection from proliferation. The promotion side has been aggressively stated in particular in Canada by crown agencies such as Eldorado and AECL. Nicholas Ediger, ENL president, in 1979 urged Canada not to lead the world in nuclear safeguards. Canada's demand for contracts restricting end-use of technology and ore "can only harm our position in the marketplace".[24]

There is a vast gap between the pro-disarmament declarations of the Canadian government and its deeds through its own firms such as Eldorado (ore sales to South Korea), AECL (reactor sales and bribes to Argentina), etc. Far from a compassionate concern for the Third World, Canadian agencies have been preoccupied with sales. There has even been a turn towards "tied aid" meaning that recipient countries have to spend aid money in Canada, even if better terms are available elsewhere. The desperate attempts to prop up the Canadian nuclear industry are inconsistent with desires for proliferation safeguards. Canada has in fact contributed to proliferation: in India, Pakistan, Argentina and other countries where we may not yet know the story.

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This tabloid was produced by the Inter-Church Uranium Committee with research assistance from Walter Davis. ICUC is a group of Christians from Anglican, Lutheran, Mennonite, Roman Catholic and United Church congregations. ICUC supports a moratorium on uranium mining in Saskatchewan, in order that further research can be done on the unanswered questions of the issue such as Saskatchewan's role in the proliferation of nuclear weapons, the management of wastes and the effects of low level radiation. For further information contact:

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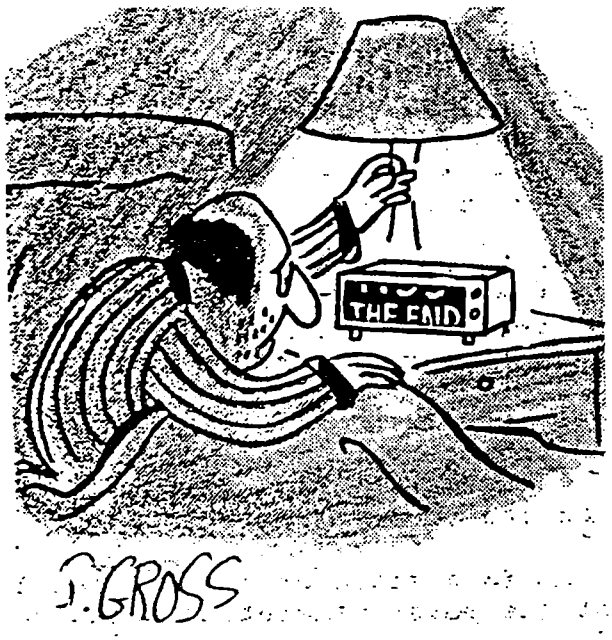


URANIUM=JOBS=BLACKMAIL

THE MYTH OF JOBS

Recently a spokesperson for the uranium industry in Saskatoon said that if Saskatoon was declared a Nuclear Weapons Free Zone the City's economy would suffer greatly. Jobs, including those directly involved in the mining of uranium, as well as those that service the industry, would disappear and spell doom for Saskatoon and Saskatchewan. There is no doubt that a Nuclear Weapons Free Zone declaration would impact on these jobs. But what price do we pay for these jobs?

Those who propagandise the amount of jobs that come from uranium mining have not had their allegations put to public scrutiny by the media so they are able to perpetuate a public hoax. It is constantly being brought to light that public and private funds directed to production of uranium mining have the worst return on money invested, and public money spent in jobs in any other sector would provide a far better return on money invested.

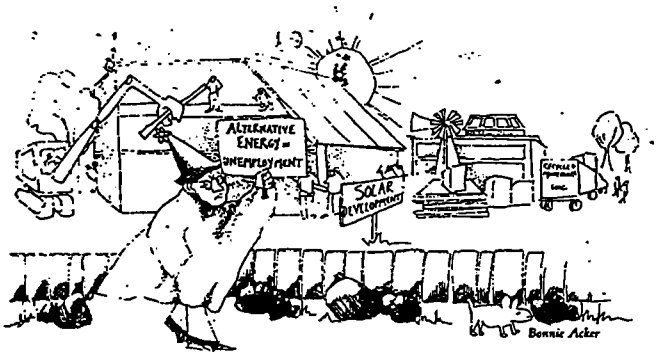
THE COST OF URANIUM MINING JOBS

What the uranium propagandists don't talk about are the huge handouts to uranium companies by the taxpayer. This tax-supported welfare to the uranium industry was focused recently in the announcement of the death of Canada's wealthiest uranium baron, Stephen Roman. Politicians, including the Prime Minister and his wife, plus a retinue of priests and Archbishop Carter, sent him on his way at his funeral. This man left behind a trail of ruined lives. The mythology from the media was that he was a public benefactor. But many of his ventures were no risk government-backed enterprises. He leaves behind a trail of death of miners with lung cancer from the Elliott Lake mines because of the lack of safety measures in the mines. Over five decades, he built up a family fortune of $2 billion in public subsidy.[1]

In 1982, Mark Rose M.P. challenged the then Minister of Energy, Mines and Resources, Mark Lalonde, with figures showing that the average cost of creating a job in manufacturing was $22,000. while in the nuclear industry the average cost was $173,000. - nearly eight times as much![2]

Between 1978 and the mid-1980s the estimated increase in uranium industry jobs was about 5,000 involving capital expenditures of about $1 BILLION OR $200,000 A JOB.[3] The SAME AMOUNT OF MONEY could create MORE THAN 52,000 JOBS if it were SPENT ON CO-OP HOUSING UNITS, SENIOR CITIZEN HOUSING, RENOVATION OF EXISTING HOUSING, DAYCARE AND HOSPITAL RECONSTRUCTION.[4]

In Northern Saskatchewan the employment costs have been higher. At Cluff Lake, projected capital expenditures of $330,000 million were needed to anticipate 714 jobs (about $462,000 per job). Few of these jobs would last more than 10 years.[5] In an upward spiral of taxpayer money, has been the cost per job at the Key Lake Mine. The capital cost was more than $1 million per job, none of which is expected to last more than 15 years.[6]



They would have us believe that no nukes means no jobs.

The high cost of jobs in the uranium industry is not limited to Saskatchewan. In Australia, the Ranger Commission Report estimated that in the construction stage, the amount of capital invested to create one job costs $270,000. After a mine is brought into operation the cost of a job per mine worker is $500,000.

There has been considerable rhetoric about our need to keep mining uranium for the development of nuclear electrical energy and the job creation in this area.

In fact, nuclear power plants are capital, not labour, intensive and syphon money off into maintenance costs. In 1983, Ontario Hydro Chairperson, Milan Nastich, estimated that it would require $330,000 million just to replace the pressure tubes in 4 Pickering reactors.[7] Three years later, interest charges for the Hydro reactors had accumulated to $1.3 billion while depreciation amounted to $665 million.[8] The increasing concern for health and safety for workers and those who live in a wide swath of fall-out from defective nuclear generators at Chernobyl and Three Mile Island has brought the Swedes and Italians to work out a plan to phase out their nuclear generating plants.[9] It looks as if nuclear generating plants, which have been considered a 'quick fix' for facing the oil crisis, have turned out to be an "albatross" for safety and job creation purposes.

IMPACT ON NORTHERN SASKATCHEWAN

Perhaps the most unexamined myth perpetuated by the nuclear industry is that it is a great benefactor for northern development in Saskatchewan. The uranium industry promises to bring native people into a new world of dignity and self-respect as it moves native people off welfare into well-paying jobs in the mines. Although some native people are employed at the mines, the industry can hardly lay claim to enriching the standard of living in the north. The truth is that unemployment on most northern Indian reserves and in most Metis communities is over 80% and chronic poverty is the fact of life.

Using the spectre of uranium development to pretend that northern development is a priority for this government, ANY OTHER DIVERSIFIED ECONOMIC INITIATIVES ARE STALLED AND EXISTING ONES, FORSAKEN. The irony in the present government's programme to create jobs in the north is that GOVERNMENT PROGRAMMES RECENTLY IMPLEMENTED HAVE INCREASED THE BURDEN OF POVERTY AND PROBABLY WILL INCREASE UNEMPLOYMENT.

In 1986 there was a removal of a $400,000 freight subsidy on food to communities in the north. This resulted in higher costs for fresh food and dairy products. In January 1988 there was an increase of 300% in royalty rates on commercial fishing decreasing the self-sufficiency of northern fishermen. Many in the Wollaston area have been able to reduce their dependence on government through commercial fishing. Both the good diet from fresh fish and the income from fishing have been strangled. This curtailing of commercial fishing has been excused to increase the fish for tourists, but tourists are a fickle group who do little to benefit the economic stability of the north.

ALL COSTS MUST BE CONSIDERED

We must face the truth squarely. It is not northern Saskatchewan that benefits from uranium. A handful of jobs and a legacy of untold and unimagined environmental damage hardly qualifies as enhancement to the quality of life of northern residents. The lack of cummulative studies on the impact of all mining activity on Wollaston Lake plus the lack of baseline vegetation, aquatic, animal and human health calls into question the economic and environmental future for northern people.

We have to ask ourselves if economic inefficiency, environmental damage, and the linkage of Saskatchewan uranium to the nuclear arsenal of the United States is worth the billions of dollars being poured into this death-spreading industry. Our society will be judged not by the inheritance we have received from our parents, but by the legacy we leave for our children. Our children will be left with the responsibility of spending many more millions of dollars to repair the damage our myopia has caused.

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NUCLEAR WEAPONS FREE ZONE CAMPAIGN

c/o [redacted] & the

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FOR THE SAKE OF PEACE

We Christian leaders call upon all the people in our province to consider once more the dimensions of this uranium issue. We believe that our political leaders are men and women who also desire to make peace. We hope that in sharing our reflections on this important moral issue, we are being faithful to our prophetic call as Christian people.

Most Rev. Noel Delaquis
Roman Catholic Bishop of Gravelbourg

Mr. Edgar W. Epp
Executive Director,
Mennonite Central Committee (Sask.)

Most Rev. Charles Halpin
Roman Catholic Archbishop of Regina

Dr. John W. Kleiner
Professor of Christian Ethics & Church History
Lutheran Theological Seminary

Bishop G.W. (Lee) Leutkehoelter
Central Canada Synod
Lutheran Church In America

Most Rev. James P. Mahoney
Roman Catholic Bishop of Saskatoon

Most Rev. Blaise Morand
Roman Catholic Bishop of Prince Albert

Dr. Paul W. Newman
Past President, Saskatchewan Conference
United Church of Canada

The Most Rev. Michael G. Peers
Anglican Archbishop of Qu'Appelle

The Rt. Rev. H.V.R. Short
Anglican Bishop of Saskatchewan

Rev. Wendell Stevens
President, Saskatchewan Conference
United Church of Canada

Most Rev. Jerome Weber
Roman Catholic Abbot Ordinary of Muenster

The Rt. Rev. Roland A. Wood
Anglican Bishop of Saskatoon

Affidavit of Linda Katheryn Murphy
sworn before me, this 2nd
day of September, 1999
A Notary Public in and for the Province
of Saskatchewan Being a Solicitor

CHRISTIAN LEADERS CALL FOR A HALT TO URANIUM MINING FOR THE SAKE OF PEACE

"BLESSED ARE THE PEACEMAKERS, THEY SHALL BE CALLED THE CHILDREN OF GOD."

Making peace, a most pressing task of our time, is more than a matter of not declaring war. Peacemakers strive to end all forms of violence against their neighbours, their environment, and themselves.

We Christian leaders believe that a moratorium on uranium mining in Saskatchewan would make a significant contribution to world peace. We ask the people of Saskatchewan to consider again the implications of uranium mining for our future. We ask our political leaders to reconsider their commitments to the uranium industry in the light of the demands of making peace.

This ecumenical statement outlines some of the major reasons for this position.

URANIUM IS...FUELING WEAPONS

Canadian uranium was initially developed to supply the nuclear weapons program in the United States.

Canadian nuclear reactors sold for generating electricity have enabled other countries to develop nuclear weapons. Uranium mined in Saskatchewan is often used in these reactors. Saskatchewan uranium can thus be channelled to fuel weapons.

Attempts at international nuclear safeguards are not working. More and more countries are joining the nuclear weapons "club".

Worldwide proliferation of weapons continues.

URANIUM IS...RISKING HEALTH

The nuclear industry, from uranium mining through reactors to bombs, produces both radiation and highly radioactive "waste".

Ionizing radiation is a threat to human health. It has been shown to induce genetic disease and deformity, spontaneous abortions, leukemia, and cancer.

The problem of waste disposal has not been resolved. Wastes from the mining and milling of uranium produce a low-level radiation that poses a constant threat to health and to the environment.

Other steps in the nuclear fuel cycle produce high-level radioactive wastes that require secure isolation for thousands of years.

It is not possible to give assurances of safety for this number of years into the future. Consequently, the burden of responsibility for assuring waste containment is placed on all future generations.

URANIUM IS... A QUESTIONABLE INVESTMENT

The most active investors in Saskatchewan's uranium industry are a provincial and a federal crown corporation. Low risk factors in the industry's royalty structure, as well as government support services for the industry, have attracted large, private investors. Some of these investors are actively involved in weapons production.

The industry depends on capital intensive technology which creates few jobs in comparison with alternative possibilities. Moreover, the uranium market is filled with uncertainty.

Uranium mining does not provide a viable future for communities. The people of Northern Saskatchewan are directly affected but have very little input into the development of this industry. Alternatives to a uranium-based economy in the North must be developed.

A permanent, alternative economy in the North will benefit all Saskatchewan.

NUCLEAR WEAPONS FREE ZONE CAMPAIGN

Saskatoon votes to become nuclear weapons free zone

Introduction:

October 26, 1988.

After nearly a year of hard work and volunteers' dedication, the Nuclear Weapons Free Zone (NWFZ) Campaign's efforts to have Saskatoon declared a nuclear weapons free zone were successful. A bylaw stating such was passed by voters in the Civic Election with a majority of 11,000.

Sponsorship:

Sponsorship of the campaign was undertaken by two Saskatoon groups, Project Ploughshares Saskatoon and the Inter-Church Uranium Committee.

Ploughshares Saskatoon is an offshoot of the national Project Ploughshares, a division of the Canadian Council of Churches. The Saskatoon group operates at 136 Avenue F South. Its functions are as a peace education and resource centre. Activities have included leading the way in Cruise Missile protests and an annual Peace and Disarmament Week. The Ploughshares Saskatoon office is staffed by volunteers.

The Inter-Church Uranium Committee was formed in 1980, after a successful campaign to block the construction of a uranium refinery near Saskatoon. It is a provincial organization with members from the United, Catholic, Anglican, Lutheran and Mennonite faiths. The goals of ICUC are to provide education about uranium, nuclear and peace issues and to eventually push for an end to uranium mining in Saskatchewan (and the world).

ICUC employs one half-time worker and is located at 136 Avenue F South in Saskatoon.

History:

The history of the NWFZ Campaign is brief but very eventful. Members of the two sponsoring bodies, Project Ploughshares Saskatoon and the Inter-Church Uranium Committee first coalesced in November, 1987. For some time, ...embers of both groups had known ... Saskatoon and Saskatchewan's ...volvement in the nuclear arms ...ce. The organizations became convinced that two things were necessary: an educational campaign and political action.

Because 1988 was the year for Civic Elections, it was decided that the NWFZ Campaign should work towards the adoption of a bylaw declaring Saskatoon a nuclear weapons free zone.

Members based the campaign on the New Zealand model of NWFZ's. There, peace activists had begun by having people declare their homes, offices, churches, etc. as NWFZ's until finally the whole country became a NWFZ.

In Saskatoon, people who wanted to declare their buildings a NWFZ could purchase a decal announcing their intentions.

Initially, the campaign had been directed at the entire province of Saskatchewan. However, as a Civic Election drew nearer, a decision was taken to concentrate on Saskatoon, the world's capital for uranium mining.

The Bylaw:

What had now become the NWFZ Steering Committee involved members of the Lawyers for Social Responsibility in the drafting of a bylaw. This bylaw, if adopted, would legislate against any future nuclear development or involvements. The goal was to do more than simply declare the city a NWFZ, it was to ensure that the declaration was acted upon.

After much time and thought, the legal group drafted a seven point bylaw (see page 4). The bylaw would prevent any local company from engaging in the research, design or manufacture of nuclear weapons or their component parts. It would also prevent future nuclear development, including the construction of a reactor.

As well, it sought to amend the Dangerous Goods Bylaw by having yellow cake/uranium declared a dangerous good and placing restrictions on its movement and storage in Saskatoon. It would also declare Saskatoon a NWFZ and have signs placed at Saskatoon's entrances declaring such.

Finally, the bylaw would express to the federal and provincial governments Saskatoon's opposition to cruise missile testing and the use of uranium for purposes other than medical and therapeutic.

Phase 1: The Petition and Canvassing:

With a bylaw drafted, the goal now was to ensure that residents could vote on it at the next municipal election. Under Saskatchewan's Urban Municipalities Act, a City Council may be forced to hold a vote on a bylaw if petitioned to do so by 5 percent or more of its eligible electors.

'The World At Peace' – sculpture by the Prairie Sculptors, promoted a 'Yes' vote on the nuclear weapons-free zone bylaw in the fall election.

At the time members first started canvassing, the exact number of signatures on the petition/bylaw was not known. But based on turnouts for the 1985 elections, the Steering Committee established a goal of 8,000 signatures.

How to achieve these signatures was the next problem to be tackled. Because one of the goals of the NWFZ Campaign was to educate Saskatoon residents about nuclear issues, a door-to-door canvass was felt to be the best way to achieve results. Members of the campaign could best inform the public about our cause on a one-to-one basis.

Canvassers hit the streets in late and cold January and slowly began the task of education and political action. The canvassers first assembled at a January meeting and after that, gathered every three or four weeks to meet, discuss results and take part in educationals.

Each canvasser had a kit in which they would record each house they visited, indicate support and record decal sales. In addition, canvassers were prepared to answer questions or distribute information sheets on topics that the steering committee had speculated would be key.

Volunteers:

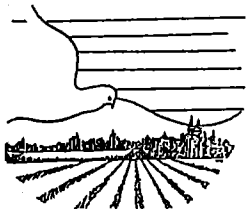
Initially, volunteers for the campaign came from the memberships of the two sponsoring bodies. Later, efforts were made to involve volunteers through organizations.

This method was slow and unfruitful. The success in expanding the number of volunteers came only when the first group of canvassers started to become more active.

In April, there were only 20 canvassers. But as they became more active, the numbers swelled to 50 by mid-May and 70 by Phase 1's end.

Robert Regnier speaking at Campaign's fall meeting.

"The NWFZ Campaign had three options. It could challenge the City's decision in the courts. It could re-organize a new petition, or it could accept the bylaw that City Council brought back.



Peter Prebble MLA speaking at rally.

The key to volunteer recruitment, it may be concluded, comes only as the initial founders of a campaign become active. Recruitment is more successful on a one-to-one basis.

Staff Person:

Until March, many of the organizational duties of the campaign were conducted by ICUC's half-time Staff Person. Because this was a tremendous burden, the campaign decided to hire its own half-time staff person.

The role of the Campaign Coordinator would be to oversee and coordinate canvassers' activities, act as secretary to the steering committee and plan and implement a budget. The Coordinator was hired and began on March 15. Initially, this person was hired for a three-month term (until June 15). This was extended to July 15, then to October 31 and, finally, until November 15. Salary for the first four months was paid for by ICUC and then self-generated by the campaign.

Increased Efforts:

As of April 15, after three months of canvassing, only 1,000 of a hoped for 4,000 signatures had been collected. The decision was made to increase efforts to collect signatures. The door-to-door visiting would continue but canvassing would also take place on downtown street corners and within organizations.

Several changes were made in April to implement an increased effort. Motivational charts were developed to encourage canvassers and also display city-wide results. The number of canvassers was expanded from 20 to 70, not to mention many people who had just taken petitions to "pass around the office." Instead of meeting every three weeks, canvassers met once a week to discuss results.

Overall, the feelings canvassers received from homes they visited were excellent. Residents were relieved and grateful that "someone was finally doing this." Some had concerns over the anti-uranium stand of the bylaw but also recognized the needs for a public forum and discussion on the issue.

Efforts were successful. In June, despite cutting the petitioning by one week, the campaign surpassed its goal of 8,000 signatures, collecting 8,966 (this was later calculated to be 8 per cent of the electorate). Phase 1 of the campaign was a definite success, an estimated 65 per cent of people approached signed the petition.

Dealing with City Council:

After self-scrutiny, the petition was found to contain 8,636 valid signatures. On June 22, members of the NWFZ Campaign presented the City Clerk with our petition. This was then presented to Council on Monday, June 27 in conjunction with an address from one of the campaign's legal representatives. Council referred the petition to the City Solicitor, who would ensure that it was valid.

On July 25, the City Solicitor reported back to City Council. The petition was deemed valid but three clauses (4, 5 and 6) were ruled to not be in the City's jurisdiction. The Solicitor also reported that Council could accept the whole petition and face a challenge of those clauses later, or it could sever the petition and place before the electorate clauses 1, 2, 3 and 7. Council decided to reject the petition in its entirety, promising to prepare its own version of a NWFZ declaration.

Campaign Reaction to City Council:

Members of the campaign were dismayed by Council's reaction but not surprised.

On previous occasions, Saskatoon aldermen had thwarted the wishes of anti-nuclear groups. In 1982, they had dismissed a radioactive waste bylaw on a technicality, not even informing the group of a court appeal date.

In 1979, plans to build a uranium refinery at Warman, a short distance north of Saskatoon, were only halted through the efforts of local residents. Public hearings were held, with the vast majority of people appearing at the hearings opposed to the refinery.

Saskatoon City Council's attitude had apparently not altered much in 1988.

The NWFZ Campaign had three options. It could challenge the City's decision through the courts. It could re-organize a new petition that would only include the in-jurisdiction clauses. Finally, it could accept the bylaw that City Council brought back.

By going to court, the issue might have been tied up in the legal system for years. Our legal advisors felt that our chances of winning in court were not strong either. A new petition would take months to organize and could not be voted on until 1989.

But accepting the City's version of the bylaw would be a start. It would also be a chance to continue the educational public forum. Though the campaign knew the bylaw would be a simple declaration, members were not going to back down on the hard-line stand against uranium operations.

Besides, canvassers and volunteers had worked almost eight months. The steering committee felt it would be fairer to them, and to the 8,636 who signed the petition to continue pressing the issue. Since presenting the petition to Council in June and because of a coinciding international congress on uranium mining, the issue had raged through the media. To continue would be to allow for the continuation of this public forum.

Phase 2: The Fall Campaign:

The Campaign had to wait nearly three months before the City Administration prepared a new bylaw. In August, the steering committee attempted to define a strategy for the fall campaign, centered around the passing of the NWFZ declaration/bylaw. Two points of strategy were developed. First, the campaign, through its literature and media involvements, would continue to push for a review of the uranium industry and its operations despite knowing that the new bylaw would not affect it.

Second, the campaign would encourage people to support civic election candidates who supported our cause. The only way to change Council's opinion was to change the Council.

Through a local coalition of social

Crowd at rally prior to the meeting.

Dr. Gordon Edwards at rally.

groups, the campaign interviewed candidates and established a criteria for acceptance. By October 20, eleven aldermanic and one mayoralty candidates were chosen. These were committed to seeing that the bylaw would be enforced and strengthened and included three incumbents who supported us originally in Council.

Three pieces of literature were developed for distribution. The first was an "interim" pamphlet distributed to 4,000 homes in Saskatoon along with the original NWFZ pamphlet. While waiting for Council to develop a bylaw, this pamphlet would keep the issue on people's minds. The main pamphlet and list of candidates inserted into the pamphlet were distributed to 30,000 homes starting on October 8 and a rate of more than one thousand per day. Volunteers engaged in simple drops of the material rather than visitation.

Originally, a door-to-door canvass as had occurred in phase one was planned. However, of our original 50 to 70 canvassers, only 15 were prepared to do a fall canvass. There may have been several reasons for this: people may not have felt canvassing was necessary with such a simple bylaw; the summer months had seen the campaign all but shut down; canvassers did not have a definite goal – i.e. obtaining a signature; finally the new school year brought with it different commitments for many of the volunteers.

Another major activity of the campaign was the Celebration of Peace Day. The occasion was intended to be a day where residents could gather and show their support for peace and the NWFZ bylaw. It consisted of two parts: an outdoor rally and an indoor public meeting.

At both events, the keynote speakers were Dr. Gordon Edwards of the Canadian Coalition for Nuclear Responsibility and Bob Regnier of the Inter-Church Uranium Committee. Peter Prebble, a Saskatoon MLA and long-time peace activist was a late addition to the agenda. This event was very successful. Over a hundred people braved the day's 70-kilometre per hour winds and cold temperatures before moving indoors.

In conjunction with the Celebration of Peace, a float was built and centred around the theme of "The World at Peace." Members of the Prairie Sculptors constructed the float which consisted of a caricaturized Earth playfully swinging from a rainbow. The float was driven to various locations in the city and used as visual aid to attracting people to the celebration and encouraging them to vote for the NWFZ bylaw and peace candidates.

Another event was the farewell party. At the last City Council meeting before the civic election, members of the campaign gathered outside council chambers to sing "So Long, It's Been Good To Know You," "Auld Lang Syne" and to protest City Council's previous lack of democracy towards the campaign. On the same occasion, the Campaign Coordinator addressed Council with regards to a report from the city's Economic Development Officer.

The Vote and Results:

On October 26, as mentioned previously, the campaign received another success. 35,000 people voted for the bylaw, while 24,000 voted against it. Percentage-wise, it worked out to a split of 60 – 40. However, the uranium industry dismissed the vote result as motherhood and meaningless, later contradicting themselves by describing the closeness as a victory. A subsequent press release from the campaign called the vote a major political and moral victory.

At this writing, the NWFZ Steering Committee had not yet met to prepare a final evaluation of the campaign. It was felt that we could further pressure City Council, though it changed little. The coalition that was established will continue and perhaps expand.

Several things were established during the campaign:

1. The connection between Saskatchewan/Canadian uranium the nuclear weapons industry had been confirmed as determined by the results of our vote, a newspaper poll and a Star-Phoenix article. These alone demonstrate the success of an educational campaign.
2. Peace groups can organize successful campaigns centred around social, political and educational action.
3. Coalitions are important. Throughout the campaign, we had involved several political, social, professional and church associations.
4. Efforts should be made to not suspend activities over the summer months. One of our organizational problems came as a result of very few activities in the summer.

Campaign Budget:

The Campaign's budget can be divided into two phases. During the petition phase, the Inter-Church Uranium Committee had been largely responsible for the campaign's budget with some contribution from Ploughshares and individual donations. ICUC spent approximately $8,000 plus $2,100 for decals from January to July, including salary.

From July on, the NWFZ Campaign took it upon itself to do its own fundraising and fundspending. A fundraising letter was drafted and dropped to 3,500 homes, returning almost $4,000. Grants from churches and associations amounted to $12,000 while the campaign had $2,200 left over from the petition phase. In total, the campaign had raised $18,364. After expenditures and a pay back of $3,600 to ICUC (who can surely use it!) there is a $1,500 surplus which will be banked and saved for future NWFZ-related campaigns.

Final Comments:

The Campaign is a major success. Over 200 people volunteered throughout the year-long struggle for peace and a safer future for our children. As mentioned, several groups from church to professional were involved, represented and educated. Members have acquired definite leadership and political skills. Lasting coalitions have been formed.

The Steering Committee wishes to thank all of its sponsors and workers for "Making Saskatoon a Peace City." The response over the past year has been fantastic! Without everybody's help, time, finances and efforts we could not have met with such success.

Thank you and peace.

The Nuclear Weapons Free Zone Steering Committee:

Ben Smillie, Chairperson
Lorne Penna, Vice-Chairperson
Adele Smillie, ICUC
Peter Prebble, ICUC
Gord Andrews, Ploughshares
Barb Brent, Ploughshares
Barbara Bloom, ICUC
Tom Eremondi, Coordinator

Nuclear Weapons Free Zone Campaign
136 Avenue F South
Saskatoon, Sask.
S7M 1S8
Phone 306-934-3030

(Top) Dr. Gordon Edwards, Peter Prebble MLA, and Prof. Robert Regnier at NWFZ meeting. (Middle photos) Part of the crowd which braved cold winds in October, 1988 to voice support for a NWFZ at the Celebration of Peace rally outside City Hall.

(Right) Unlike Saskatoon City Council, Regina is not afraid to show it is a NWFZ. (Far right) Sculptor Les Potter designed the Celebration of Peace float.

Nuclear Weapons Free Zone Bylaw

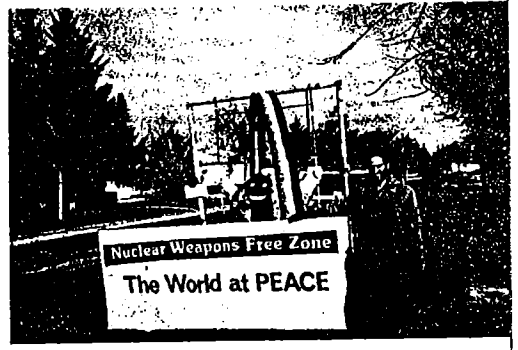
In November, 1987, a bylaw petition was worked out by our Lawyers for Social Responsibility Committee. The bylaw had seven parts:

1. The City of Saskatoon be declared a Nuclear Weapons Free Zone.
2. That signs be erected at city entrances stating the declaration.
3. Stop all investment by the city in corporations which produce nuclear weapons or their components, or are involved in the mining and milling of uranium.
4. The dangerous goods bylaw be amended to specifically include uranium and its derivatives.
5. The amending of the Fire Prevention bylaw to not allow the manufacture, storing, or transportationn of nuclear weapons within the city limits.
6. The Zoning and Development Bylaw be amended by stating that no person, company or corporate body shall use or occupy and no development permit shall be issued for the manufacture, distribution, or storage of nuclear weapons or nuclear weapons components. Furthermore no person, company or corporate body shall construct a nuclear power station or uranium refinery.
7. The governments of Saskatchewan and Canada be informed of Saskatoon's declaration and the city's disapproval of Cruise Missile testing and of the mining and milling of uranium, except for medical and therapeutic purposes.

By June, 1988, the petition with 8,900 signatures on it was taken to city council. We needed a minimum of 6,000 signatures. The City Solicitor said that sections 1,2,3 and 7 were within the jurisdiction of the city. The same solicitor said that the bylaw petition was unseverable. A number of our lawyers said that all seven sections were within the jurisdiction of the city and it was severable, but the NWFZ steering committee felt that if we challenged the solicitor's decision in the courts, this would take too long and we would not get the vote on the ballot in October, 1988. It was agreed to go along with the watered down version of the bylaw petition that had been presented by the city council to the voters.

Lessons from the NWFZ Campaign

1. The NWFZ campaign is the most successful consciousness-raiser for peace that we have had in Saskatoon since we closed down the prospect of Eldorado Nuclear building a uranium refinery at Warman in 1980.
2. The Nuclear Weapons Free Zone campaign was first initiated in New Zealand where eventually 70% of the citizens voted to make their country a NWFZ. They found that the campaign was a good way to keep the politicians honest. The Labour government who adopted this campaign risked defeat if they did not support the campaign. Since then, no American nuclear submarines are allowed in New Zealand harbours and the French are increasingly under pressure to stop testing in the South Pacific.
3. In Saskatchewan the NDP has had its "Damascus Road" experience to phase out uranium mining while out of office. If it comes back into office, we feel confident that a NWFZ campaign throughout the province will keep the NDP honest. We hope the Saskatchewan churches will take up the challenge.
4. We are sufficiently excited with what we have succeeded in doing that we are willing to share our strategy with those who would like to know the procedures to declare their home, village, town or city a Nuclear Weapons Free Zone.
5. We are very aware that Atomic Energy of Canada is on the ropes, with a Candu reactor which, like an "Edsel" car, it cannot sell anywhere in the world. AECL knows that the Canadian people are increasingly suspicious of the nuclear industry, and with no sales, the spinoff effect will gradually phase out uranium mining. We have enough uranium mined at present to supply all nuclear medicine needs for a million years.



This is Exhibit "F" referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999

Stefania Fortugno
A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

Inter-Church Uranium Committee
Box 7724 Saskatoon Canada S7K 4R4 (306) 934-3436

January 21, 1993

FOR IMMEDIATE RELEASE

In 1985, the Inter-Church Uranium Committee expressed how Saskatchewan uranium has historically been used by the U.S. military for the production of nuclear weapons. We now have received information revealing how CAMECO Corporation has in recent years been directly involved in the production of "conventional" weapons.

Throughout the past decade, a significant amount of Saskatchewan uranium was processed at the Seqouyah Fuels Uranium Conversion Facility which turns uranium yellowcake into uranium hexaflouride (for use in reactor fuel) and depleted uranium tetraflouride. For example, in 1986, the Saskatchewan Mining and Development Corporation shipped approximately 480,000 pounds of uranium yellowcake to Sequoyah Fuels (Saskatoon Star-Phoenix, 6/1/86). These shipments continued until November 1992 when the plant was shut down because of a serious accident.

The Seqouyah Fuels corporation had a contract to supply Aerojet Ordnance Tennessee (AOT) with depleted uranium tetraflouride. In 1988, AOT received a licence from the U.S. Nuclear Regulatory Commission to ship from the Sequoyah Fuels plant "up to 1,000,000 pounds of uranium tetra-fluoride (UF4)" to Eldorado Resources Limited's [Cameco's] uranium refinery in Port Hope, Ontario. The Licence states "AOT will supply the UF4 to Eldorado Resources [Cameco] who will use it to manufacture depleted uranium metal for AOT's use in manufacturing depleted uranium penetrators [bullets] on U.S. Department of Defense contracts." The licence covers the period from spring of 1988 to Dec. 31, 1990, (U.S. NRC licence No. XUD8660), the two years preceding the Gulf War.

It is very probable that these bullets were used in the Gulf war. An International Atomic Energy Agency (IAEA) report estimates that tens of thousands of rounds of depleted uranium bullets were fired by American aircraft and British and U.S. tanks. The IAEA estimated that 50,000 tons of radioactive and toxic material was left on the Gulf War battlefield. The contamination is so bad that the " `health hazards generated by shell fragments and similar debris is sufficient to cause some 500,000 deaths among the civilian population of the region' during the next 10 years." (SPOTLIGHT, December 2, 1991)

This raises some very serious concerns about Cameco's operations.

1) Saskatchewan uranium is indeed finding its way into the U.S. military arsenal. Statements made to the contrary are untrue.

2) The existence of this contract raises the question of how many other such contracts Cameco may have signed or are presently negotiating.

3) The provincial and federal governments must investigate and determine if the contract with Aerojet Ordnance Tennessee is illegal. Canada has had a policy forbidding any export of uranium for military purposes since 1965.

4) Finally, and most importantly, the provincial and federal governments MUST CHANGE the guidelines of the two uranium mine review panels to include end use issues. It is clear Cameco is involved in the entire nuclear fuel cycle, from mining to weapons production. In other words, end uses of uranium are part if its mining/business operations.

Contact: Phillip Penna

This is Exhibit G referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999
Stefania Fortugno
A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

Cameco denies uranium it produced used in weapons

By James Parker
of The StarPhoenix

Cameco Corporation was involved in the production of uranium bullets used in the Persian Gulf War, says a group opposed to uranium mining.

A company spokesperson categorically denied the charge Thursday.

The Inter-Church Uranium Committee released a document linking Aeroject Ordnance Tennessee (AOT) and Eldorado Resources Ltd., the federal Crown corporation which merged in 1988 with the Saskatchewan Mining and Development Corporation (SMDC) to form Cameco.

The document, dated March 8, 1988, is an application for an export licence made to the U.S Nuclear Regulatory Commission.

It indicates Eldorado would manufacture depleted uranium metal to be used in the production of armor-piercing munitions.

The application states AOT intended to ship up to 455 tonnes of uranium tetraflouride to Eldorado, which would then use it to produce the metal. The shipments were to take place from 1988 to 1990.

Cameco
CORPORATION

The application indicates Sequoyah Fuels Corporation supplied AOT with the depleted uranium. Both SMDC and Cameco have shipped uranium yellowcake to Sequoyah, which closed last November after an accident.

According to the United Kingdom Atomic Energy Authority, at least 36 tonnes of depleted uranium was left on the battlefield after the Gulf War, the remnants of thousands of armor-piercing rounds fired by coalition forces.

The material is considered to be a major health hazard for the people of Kuwait and Iraq.

"Cameco is, or has been, directly involved in the production of uranium for the end use of weapons production," said Phillip Penna, committee spokesperson.

"It puts into question their assertion that they produce uranium for peaceful purposes only."

Cameco representative Rita Mirwald acknowledged the company does process depleted uranium into metal at its Port Hope, Ont., plant.

However, she said there is no record of any material being shipped to AOT.

Mirwald said Cameco has never entered into a contract which would link it with the American military.

Even if the metal was shipped to the Tennessee company, Mirwald said there was no proof the uranium involved came from Saskatchewan.

Penna said the export application clearly links Cameco to the carnage in the Middle East.

Noting Canada has had a policy forbidding the export of uranium for military purposes, he called upon the provincial and federal government to investigate the contract.

"It's time the people of Saskatchewan asked the hard questions," said Penna.

"If they don't, we'll soon be producing 30 per cent of the world's uranium, much of it for the U.S military."

AEROJET ORDNANCE TENNESSEE

PO Box 399 Jonesborough Tennessee 37659
(615) 753-1200

March 8, 1988
150:88-0178

This is Exhibit H referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999
Stefania Faitugno
A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

United States Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Ms. Betty L. Wright
Licensing Officer

Dear Ms. Wright:

Attached is Aerojet Ordnance Tennessee's (AOT) application to export Uranium tetra-fluoride (UF4) to Eldorado Resources Limited, Port Hope, Ontario Canada.

Should you have any questions, please contact me.

Sincerely,

Charles W. Montford
Manager of Contracts

CWM/fts

Attachment

NRC FORM 7
(12-31)
10 CFR 110

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB
3150-0027
EXPIRES 12-31-87

APPLICATION FOR LICENSE TO EXPORT NUCLEAR MATERIAL AND EQUIPMENT *(See Instructions on Reverse)*

1. APPLICANT'S USE	a. DATE OF APPLICATION	b. APPLICANT'S REFERENCE	2. NRC USE	a. DOCKET NO.	b. LICENSE NO.
	3-8-88			11004040	XU08660

3. APPLICANT'S NAME AND ADDRESS			4. SUPPLIER'S NAME AND ADDRESS *(Complete if applicant is not supplier of material)*		
a. NAME	Aerojet Ordnance Tennessee		a. NAME	Sequoyah Fuels Corporation	
b. STREET ADDRESS	P. O. Box 399, Old 11E Highway		b. STREET ADDRESS	P. O. Box 25861	
c. CITY	Jonesborough	TN 37659	c. CITY	Oklahoma City	OK 73125
d. TELEPHONE NUMBER *(Area Code – Number – Extension)*	615-753-1280				

5. FIRST SHIPMENT SCHEDULED	6. FINAL SHIPMENT SCHEDULED	7. APPLICANT'S CONTRACTUAL DELIVERY DATE	8. PROPOSED LICENSE EXPIRATION DATE	9. U.S. DEPARTMENT OF ENERGY CONTRACT NO. *(If Known)*
2nd Quarter '88	4th Qtr. 1990	1988 - 1990	Dec 31, 1990	-

10. ULTIMATE CONSIGNEE		11. ULTIMATE END USE *(Include plant or facility name)*
a. NAME	Eldorado Resources Limited	Depleted Uranium alloyed metal billets for applicant at address shown in Block 3
b. STREET ADDRESS	One Eldorado Place	
c. CITY – STATE – COUNTRY	Port Hope Ontario, Canada	11a. EST. DATE OF FIRST USE 2nd Quarter 1988
12. INTERMEDIATE CONSIGNEE		13. INTERMEDIATE END USE
a. NAME		
b. STREET ADDRESS		
c. CITY – STATE – COUNTRY		13a. EST. DATE OF FIRST USE
14. INTERMEDIATE CONSIGNEE		15. INTERMEDIATE END USE
a. NAME		
b. STREET ADDRESS		
c. CITY – STATE – COUNTRY		15a. EST. DATE OF FIRST USE

16. NRC USE	17. DESCRIPTION *(Include chemical and physical form of nuclear material, give dollar value of nuclear equipment and components)*	18. MAX. ELEMENT WEIGHT	19. MAX. WT. %	20. MAX ISOTOPE WT.	21. UNIT
	Up to 1,000,000 pounds of Uranium tetra-Hexafloride (UF_4) Estimated total value $1,500,00 8803210498 880308 PDR XPORT XU-08660 PDR	345,000	Depl	88 MAR 11 P7:22	

22. COUNTRY OF ORIGIN – SOURCE MATERIAL	23. COUNTRY OF ORIGIN – IF NOT WHERE ENRICHED OR PRODUCED	24. COUNTRIES WHICH ATTACH SAFEGUARDS *(If Known)*
USA	USA	

25. ADDITIONAL INFORMATION *(Use separate sheet if necessary)* AOT will supply the UF_4 to Eldorado Resources who will use it to manufacture Depleted Uranium metal for AOT's use in manufacturing depleted uranium penetrators on U.S. Dept. of Defense Contracts.

26. The applicant certifies that this application is prepared in conformity with Title 10, Code of Federal Regulations, and that all information in this application is correct to the best of his/her knowledge.

27. AUTHORIZED OFFICIAL	SIGNATURE	b. TITLE
		Manager of Contracts Administration

This is Exhibit 1 referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September 1999

A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

CHRISTIAN LEADERS CALL FOR CRITICAL REFLECTION ON URANIUM MINING AND THE NUCLEAR INDUSTRY IN SASKATCHEWAN

Church Leaders call upon everyone in Saskatchewan to meet their social and moral responsibilities, to consider the issues surrounding the proposed expansion of uranium mines in northern Saskatchewan, and to join the church leaders in calling for a halt to uranium mining.

The Issues we invite you to consider are the following:

1. **The costs of uranium mining to be borne by the present and future generations.**
Nuclear development has been presented by its advocates as economically viable and enhancing to the economy of the province. The past fifteen years of uranium mining have actually been subsidized by massive expenditures of public funds that will never be returned and which should have gone to alternative ways of creating jobs. Approximately one billion dollars of taxpayers' money has been expended by the Government of Saskatchewan to support this industry.

2. **Preservation of the environment from both low- and high- level radioactivity.**
Uranium mining and milling produce enormous amounts of harmful radioactive substances that are contaminating the northern watersheds. Exploration and mining activities have destroyed aboriginal hunting and fishing territories. Commercial fishing is threatened on Saskatchewan's largest lake, Wollaston, by mines that penetrate out into the lake or beneath it. Radon gas emissions from uranium mining wastes will continue to pollute Canada's environment by spreading radioactive fallout over millions of square miles for thousands of years to come.

3. **Hazards of radioactivity from mining uranium.**
Radiation exposure standards for workers in the mines and mills and for the wastes emitted into the Saskatchewan environment are acknowledged to be inadequate by current internationally accepted standards. The health risks for the current generation, and future generations, who reside in the north of Saskatchewan are very high due to the adverse effects of radioactivity on human health, which are now known to include mental retardation in infants as well as leukemia, cancer and genetic defects in all ages. Radon gas emissions have a global impact on human health.

4. **Dumping of high-level radioactive wastes in Saskatchewan from the nuclear industry in North America.**
Because uranium mining exists in Saskatchewan, and with it high volumes of radioactive wastes, the nuclear industry proposes to dispose of high-level nuclear wastes here. Attempts by Atomic Energy of Canada Limited to introduce nuclear reactors into Saskatchewan are part of a long-term plan to establish a waste repository for high-level radioactive waste here. Other provinces and states in North America with nuclear reactors are reluctant to keep radioactive wastes near urban areas and need somewhere to dump them. At present there is no internationally recognized method for permanent disposal of high-level radioactive wastes.

5. **Oppression of aboriginal peoples.**
Uranium mining in the north of Saskatchewan has interfered with the self-determination of aboriginal peoples, inhibited their traditional way of life, and limited their prospects for future development. In exchange for the poorest-paying jobs in the uranium mines, northerners have had to accept the greatest health risks. Uranium mining has not been a solution to the widespread unemployment in the north. As the history of Uranium City has shown, this form of temporary employment produces permanent radioactive contamination and a legacy of toxic waste that harms the northern peoples and remains an expensive public burden long after the mining companies have left.

6. **Nuclear propaganda divides the people of Saskatchewan.**
The nuclear industry has launched well-financed public relations campaigns using millions of taxpayers' dollars to distort the truth by emphasizing the hazards of other energy technologies while ignoring those associated with nuclear power in order to present itself in the most favorable light. This propaganda preys on people's fears of unemployment and economic insecurity for the future of the Province of Saskatchewan. This approach obscures the crucial issues, undermines the Christian responsibility of stewardship, and curtails creative possibilities for employment.

7. **The weapons connection and nuclear proliferation.**
Although the industry denies it, some of Saskatchewan's uranium continues to be used in weapons of mass destruction and other military armaments of the United States, France and other countries. The industry originated in militarism and is still heavily subsidized by governments for military purposes. Even uranium that is used for peaceful purposes produces plutonium as a byproduct which can be used for nuclear weapons years, decades, or even centuries later. Residents of Saskatchewan should study the long history of the use of uranium mined in Saskatchewan for weapons production.

8. **Global responsibility of the people of Saskatchewan.**
Saskatchewan currently produces about 25 percent of the world supply of uranium. This goes largely to foreign countries where there is insufficient regulation of its use, adding to the potential for spread of nuclear weapons and global pollution from radioactive products of nuclear plants.

9. **Appropriate technology for Saskatchewan.**
The nuclear option for producing electrical energy is failing globally as other technologies for conserving energy, or producing electricity, prove to be safer and cheaper. Nuclear power has plunged Ontario Hydro deeply into debt as billion dollar repairs have become necessary. As nuclear power generation declines Saskatchewan will be left with the financial and technical burden of cleaning up the millions of tons of radioactive wastes left over from uranium mining. The present and future taxpayers of Saskatchewan will ultimately bear the economic, environmental and human costs of cleanup after uranium mining.

10. **Economic self-determination for the Province and people of Saskatchewan.**
The economic interests of the foreign uranium mining companies are tied to the larger interests of other governments such as France, Germany, Japan and Korea. Instead of provincial subsidies being re-invested in the provincial economy, profits go to foreign countries.

SASKATOON LOCAL CHURCH LEADERS' GROUP

Mr. Eugene Anderson, President
Saskatoon Council of Churches

Most Rev. Basil Filevich, Bishop
Ukrainian Catholic Eparchy of Saskatoon

Rev. Allan Grundahl, Bishop
Saskatchewan Synod
Evangelical Lutheran Church in Canada

Most Rev. James P. Mahoney, Bishop
Roman Catholic Diocese of Saskatoon

Rev. Bernard de Margerie, Director
Saskatoon Centre for Ecumenism

The Rev. Jim McKay, Chairperson
Saskatoon Inner City Council of Churches

The Rt. Rev. Thomas Morgan, Bishop
Anglican Diocese of Saskatoon

Rev. Orest Olekshy
Holy Resurrection Orthodox Church, Saskatoon

Pastor Vern Ratzlaff
Nutana Park Mennonite Church, Saskatoon

Rev. David Sonmor, Chairperson
Saskatoon General Ministerial Association

Mrs. Linda Westcott
Saskatoon Presbytery, United Church of Canada

November 1993

Western Half Yearly Meeting Religious Society of Friends
October 1995

Prairie Monthly Meeting Religious Society of Friends
January 1996

This is Exhibit D referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999
Stefania Fortugno
A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

Background Information and Analysis

Supplementary materials for the document:

"Christian Leaders Call For Critical Reflection On Uranium Mining and the Nuclear Industry in Saskatchewan"

The following materials provide a one page synopsis of critical information and thinking for each of the ten issues noted in the "Christian Leaders' Call." Obviously, the information presented in the Background Supplement is not exhaustive. Its purpose is to provide the "bare-bones," "no non-sense" reasoning and demonstration which support the claims made in the "Christian Leaders' Call." The Background Supplement can also be used as a study guide and discussion starter for those individuals, groups or congregations who wish to pursue these issues. Should you or anyone concerned and interested about these issues want further information and/or resources please contact the Inter Church Uranium Committee.

1. The costs of uranium mining to be borne by the present and future generations.

A lesson about the ultimate economic impact of uranium mining on the Province of Saskatchewan can be learned from the experience of one of its major competitors, Australia. This is aptly summed up by Alice Cawte in her 1992 book entitled Atomic Australia:

> "Twenty years have passed since Australia's great uranium deposits first inspired the grandiose dreamings of mining companies and politicians alike. The dreams were never realised. Except for one brief period - and then for extraordinary reasons - there was always too much of the mineral and too little demand for it. .... In the next century the market for uranium may pick up but it will always be fragile. No matter which mine the Australian government allows to go ahead, it will survive only with government protection. Uranium is after all a very common element."

In the early 1990's the world price of uranium has reached an historic low, after dropping steadily for more than fifteen years. This trend, which began even before the Three Mile Island accident in 1979, was further exacerbated by the Chernobyl accident in 1986 which has had a devastating effect on world reactor sales. More recently prices have been low because of the glut of uranium as the end of the cold war has released much of the weapons sources of uranium into the world market. The only significant markets for uranium are, after all, nuclear weapons and nuclear reactors.

Meanwhile countries who have used nuclear reactors for some time are starting to see the enormous costs of coping with radioactive contamination, decommissioning nuclear facilities and storing high-level radioactive wastes in perpetuity. In Britain, the cost of decommissioning alone was sufficient to prevent the Thatcher Government's intended privatization of electricity-generating reactors. Cleanup of the massive radioactive contamination around several military facilities in the USA has been estimated to cost as much as $140 billion. In the former Soviet Union and in East Germany, near sites where uranium was mined and refined, the costs of cleanup are also estimated in the many billions of dollars. Nobody has yet put a dollar figure on the ultimate cost of coping with radioactive waste from existing and past uranium mining in Saskatchewan. Ultimately this cost will be borne from the public purse because the mining companies will have moved away before any strong action can be taken, either by the Federal Government of Canada or by the Saskatchewan Government, both of whom have shown indifference to the long-term hazards of uranium mining.

The establishment, operation, and ultimate cleanup of uranium mining in Saskatchewan are highly subsidised by the Federal and Provincial Governments. It is the present and future generations of taxpayers who will be asked to pay for these subsidies for which there is no foreseeable financial return. Uranium mining has been pursued by international companies in a manner similar to the colonialisation of indigenous peoples when Europeans sought the gold of the new world in the 16th and 17th centuries. Aboriginal lands in Australia, the United States, Canada, South Africa, Namibia, Niger, Gabon and the satellite countries of the late Soviet Union and China have been ruthlessly expropriated by governments so that mining companies can remove the uranium quickly without regard to the long-term impact on the environment. The majority of public hearings about the impact of uranium mining, where they were ever held, have been opposed by the general public who were ignored by both mining companies and governments.

In Saskatchewan, mining companies claimed at the Cluff Lake enquiry in 1978 that uranium would fetch $40 a pound within ten years. It is interesting that the same lie was put forward six years earlier in Australia by a Cabinet minister, Connor, who in lobbying for the uranium industry, which included Canadian companies in Australia, said "the price of uranium would rise from $6 to $40 per pound in 1977, and to $100 per pound in 1980". Historically the price of uranium has been declining but the only time it rose from 1960 until now was in the seventies when the international price of uranium was rigged by the formation of a cartel that used a complex scheme of price-fixing, bid-rigging and allocation of markets. The countries were Canada, France, South Africa, Australia and the British giant company Rio Tinto Zinc.

Uranium has been held up as an element with the power of gold and companies and governments have been unable to resist the dream that untold wealth lies in the ground to be exploited. They have been dazzled to the extent that they have failed to account for the long-term damage to the environment. The ultimate sin of omission has been to disregard, or fail to understand, that the end point of all aspects of the use of uranium is radioactive waste that persists for thousands of years. Any short-term economic returns such as job creation must ultimately be paid for in environmental damage, somewhere on the globe, and specifically in northern Saskatchewan. At present, Saskatchewan's uranium is being transported to other jurisdictions at rock-bottom prices, leaving behind inadequate resources to cope with the leftover radioactive materials which will remain dangerous for hundreds of thousands of years.

2. Preservation of the environment from both low- and high-level radioactivity.

All uranium ends up either in nuclear weapons or as high level radioactive waste. Ethically and environmentally it is time to carefully examine the role of Saskatchewan uranium in the world's high level nuclear waste crisis. Saskatchewan currently produces about 25% of the world's uranium. That percentage could rise to 30% if the proposed 12 new uranium mines come on stream. We are therefore responsible for the creation of a corresponding percentage of the world's high level nuclear waste. We do not believe the creation of this waste can be ethically justified.

The chief ethical concern is the creation of wastes which cannot be disposed of safely, that is, we do not know how to neutralize or to render harmless these toxic materials. After being used in a nuclear reactor, uranium fuel bundles become so highly radioactive that when removed from the reactor core they can emit a lethal dose of penetrating radiation at a distance of one meter within a few seconds. Each used fuel bundle contains dozens of highly toxic radioactive materials - fission products and transuranic elements - that do not exist in nature and are exceedingly dangerous to all living things. Most fission products such as cesium 137 and strontium 90 are intensely radioactive but decay significantly in the first several hundred years. However, the transuranic wastes such as plutonium 239 and americium 241 remain dangerously radioactive for tens of thousands of years. Although transuranic materials do not give off much penetrating radiation, they are far more toxic than fission products when incorporated into the body or inhaled. They are some of the most toxic humanly produced materials known to science. No country in the world has yet demonstrated the existence of a safe way to "dispose" of this waste. In fact, what is really meant by "disposal" is perpetual storage for periods of time far exceeding the history of human civilization. The possibility of keeping toxic materials out of the environment of living things forever is an unresolved question. In desperation, some countries such as the United States and Japan have suggested disposal of, i.e. dumping, high level nuclear waste in the ocean.

The oceans have already been used as a dumping ground for lower level and medium level nuclear waste. For example, South Korea has been dumping nuclear waste in the East China Sea. The United Kingdom has dumped nuclear waste in the Atlantic Ocean. And the pressure for more ocean disposal of nuclear waste is growing. At the 1992 Earth Summit in Rio, Canada did not support an initiative calling for an international law to forbid the dumping of radioactive wastes in the ocean.

One of the deadliest transuranic products created in nuclear waste is plutonium. A few millionths of a gram, inhaled, can cause lung cancer. A few thousandths of a gram of plutonium powder, inhaled, can cause death within months due to massive fibrosis of the lungs. The oceans are now being used to transport plutonium from one country to another. For example, when Saskatchewan sells uranium to Japan, Japan transports the spent uranium fuel bundles from its reactors to France. France separates the plutonium from the spent fuel bundles. It then ships the plutonium back to Japan by boat accompanied by one or more military vessels for protection. Because of the extraordinary properties of plutonium, such transport poses health, environmental, terrorist and military risks. Recently, Japan has asked to fly the plutonium from France, across Canada, and back to Japan. This kind of insanity is the ultimate consequence of uranium mining.

3. Hazards of radioactivity from mining uranium.

Workers in uranium mines and milling operations are exposed to levels of ionizing radiation which may be hundreds of times higher than "background radiation". It has been known since the 1930's that uranium miners experience a greatly increased risk of lung cancer from breathing radioactive gas and dust in the course of their work. Nevertheless, the Canadian nuclear association has argued against adopting new radiation protection standards based on the best scientific evidence available because it might make the mining of uranium uneconomical.

Ionizing radiation breaks chemical bonds at random within our cells, and the resulting cellular damage can eventually cause cancer or genetic damage. The hazards of ionizing radiation have been consistently underestimated since the 1950's. Every time an independent scientific organization has studied these hazards, the risk estimates have had to be increased and the "allowable exposure," accordingly, has had to be lowered. For example, in 1959, the ICRP (International Commission on Radiological Protection) suggested an acceptable radiation dose for members of the public would be 500 millirems per year (500 mrem). The most recent ICRP recommendation is for an upper limit of 100 mrem per year for members of the public. These permissible levels are expected to drop even further as we learn more about the health dangers of low level radiation. The most recent report from the United States National Research Council, (BEIR V, 1990) on the health effects of low level radiation, found that the biological damage caused by "low-level" radiation exposure is from four to eighteen times higher than was previously predicted. It is now recognized as a fundamental principle of radiation protection that there is no completely safe level for exposure to ionizing radiation, and that all unnecessary exposures should be avoided. The scientific consensus is that every dose of radiation delivered to a large population will increase the incidence of cancer and genetic damage by a proportional amount. Exposure standards for workers and members of the general public are based on the assumption that some increase in cancer and genetic damage is an acceptable price to pay for the benefits of nuclear power.

Both uranium mining and milling pose significant health risks to workers. Uranium "decays" into about two dozen different radioactive substances. In this process, alpha, beta and gamma radiation is given off. Even small increases in background radiation have been shown to be harmful to human health. Thus it is a peculiar assumption that a naturally occurring hazard which causes cancer and birth defects can be multiplied by six (the ICRP acceptable level in 1959) or by two (the current acceptable level by the nuclear industry) without cause for concern.

Current AECB regulations for uranium workers suggest an annual limit of 50 millisieverts (50 mSv) (5000 mrem), but the most recent recommendations from the ICRP suggest lowering this limit to 20 mSv (2000 mrem). This is still twenty times higher than the proposed new limit for members of the public (1 mSv).

Mining uranium releases large amounts of radon gas into the environment. These releases will continue at an undiminished rate for thousands of years. When inhaled, radon gas emits alpha radiation to the lung tissue and is a known cause of lung cancer. After cigarette smoking, radon gas is the principle cause of lung cancer and is one of the most potent cancer-causing agents known to sciences. Radon daughters (decay products of radon gas) in underground mines are 100-1000 times background levels. In open pit mines, these levels can climb even higher depending on the grade of ore and the weather conditions. Miners are exposed to further radiation from inhaled uranium oxide dust and from thorium 232 and its decay products as well as to external whole-body radiation. Miners can also suffer permanent lung damage from silica dust.

Radium 226 is another radioactive decay product of uranium. It can dissolve in water and concentrates in living tissue, such as bone. It is a known cause of osteosarcoma, a type of bone cancer. These cancers can occur fifteen to twenty years after the exposure. Effluent from uranium mills can contain up to 168 picocuries per liter of radium 226, which is more than thirty times the allowable limit in the U.S. Uranium millers are also exposed to increased levels of thorium 230, which has been implicated as a cause of leukemia.

Radioactive compounds are given off into the air and water surrounding uranium mining and milling operations and can be taken up and concentrated by plants, animals and people living in the north. Many of these compounds remain radioactive for many thousands of years continuing to harm living things beyond all present calculations for health and safety and thus precipitating consequences beyond predictable standards of risk.

4. **Dumping of high-level radioactive wastes in Saskatchewan from the nuclear industry in North America.**

Saskatchewan supplies about one-fourth of the world's uranium production at the moment; most of it passes through other countries' reactors and becomes "their" high-level nuclear waste. In every case, including Canada's, no publically acceptable long-term storage scheme is in place. Most "owner" countries would be delighted if their high-level wastes went back to Saskatchewan for storage and reprocessing. It appears that Atomic Energy of Canada, Ltd., views this as an attractive business opportunity.

The volume of intensely radioactive (hence "high-level") waste from each megawatt of reactor output may seem small, but it accumulates and never really goes away. Many tonnes are already in "temporary" storage at reactor sites worldwide, and nowhere in the world is there a standardly accepted and smoothly working long-term storage facility. In fact, given the long lifetime of radioactivity for some elements in the waste, plus the chemical toxicity and corrosiveness of many chemical compounds in it, secure long-term containers for it may be impossible to devise.

The long-term storage form that has had the most attention is deep burial in supposedly stable rock formations, such as those of the Canadian Shield in Northern Saskatchewan. This "simple" method has several ways to go wrong: groundwater moves at remarkable depths, taking any soluble materials with it; seemingly solid rock fractures and moves at unpredictable places and times; and how does one place warning signs that will be reliably displayed and understood for thousands of years? For all the research attention it has had, deep storage is still held up by serious and continuing technical and political objections.

It would be especially unfortunate if Saskatchewan took on the storage business, since it is located about as far as it could be from all existing power reactors in North America. The seaports at which wastes from the rest of the world would arrive are no closer. Accident-free transportation is inconceivable, so there would be immediate hazards on the highways as well as long-term hazards at the destination.

Still, existing high-level wastes will not vanish and must be stored somewhere, if not in Saskatchewan. That is all the more reason for this Province not to mine more uranium and ship it off to make the high-level nuclear waste problem ever larger.

5. Oppression of Aboriginal Peoples.

"Within a relatively short period, the region's economy could be altered, with uranium emerging as the driving force and government and traditional activities becoming second." This claim appears in the Environmental Impact Statement (EIS) of the Midwest Joint Venture (MJV), a uranium mining project of Denison Mines. Moreover, the EIS goes on to say that, "the industry's activities have helped to change the structure of the northern Saskatchewan regional economy." The economic implications of a dramatically increased dependency on a single non-renewable resource industry for northern Saskatchewan are tremendous. Is northern Saskatchewan to be subjected to the devastating vagaries of boom-and-bust economics that have plagued single-industry economies in rural throughout the world? A notable, and worrisome, recent example is Elliot Lake, Ontario where the uranium mining activities of Denison Mines Ltd., the operator of the proposed MJV project in Saskatchewan, were instrumental in creating boom-and-bust cycles that have left the town completely debt-ridden and on the verge of collapse. In addition, long-term radioactive seepage from over one hundred million tons of radioactive sand dumped nearby may eventually make the entire region a "national sacrifice area" unsuitable for any alternative uses.

The MJV claims that its "12-year project is expected to have an overall positive impact on the social and economic environments in the area," but gives no consideration to the effects of the overall structural changes in the economy and way of life of aboriginal peoples in northern Saskatchewan. The EIS does note certain negative socio-psychological consequences:

> [I]t is uncertain ... whether the negative attitudes and behaviour surrounding employment incomes can change quickly enough to ensure that income from uranium development will be used to contribute to positive community and individual development rather than to already prevalent problems. There is ... considerable debate about the impact of industrial development on the incidence of crime, violence and other socially unacceptable behavior in northern communities.

This statement provides no empirical evidence whatsoever to challenge the validity of these concerns nor are any corrective measures or plans of action proposed to minimize the negative effects foreseen. Meanwhile the existing data from the results of uranium mining at Elliot Lake underscores the seriousness of these concerns.

Furthermore, a close analysis of the proposed MJV project calls into question the positive impact uranium mining projects have on addressing the crisis situation of chronic unemployment in northern communities. Approximately 19 to 38 workers from northern Saskatchewan will be hired during the construction and development of the MJV mine. This represents between two-tenths and four-tenths of one percent of the total labour force population in northern Saskatchewan. (The potential labour force population between the ages of 20 and 44 according to 1989 Statistics Canada figures is 9,406.) Thus, direct employment from the project will have no significant effect on the high unemployment rates in northern Saskatchewan communities.

Moreover, if we assume that the indirect employment benefits cited in the EIS are correct, which uses an employment multiplier of 4.3, and that about one-third of these jobs will be filled by northern Saskatchewan residents, this would mean that operation of the MJV would create a total of about 350 jobs in northern Saskatchewan. This is less than 4% of the total labour force in northern Saskatchewan and would have a marginal impact on reducing the overall unemployment rates in the region. It is also significant to note that the employment multiplier effects cited in the EIS are nearly three times greater than those cited for uranium mining operations in the Canadian Energy Research Institute (CERI) study for Saskatchewan's uranium industry. If the multiplier effects estimated in the CERI study are used, then the MJV project would only create a total of 129 direct and indirect jobs in northern Saskatchewan, less than one and a half percent of the labor force.

The above analysis puts into question the claim that there is a real "economic benefit today," or in the future, for northerners from uranium mining. How can an industry that operates for a decade, provides at best only vague assurances of training and educational opportunities and offers no long-term plans for re-training and employment after the mines close possibly uphold any principles that are remotely related to sustainable development? Meanwhile, that same industry will leave behind huge volumes of toxic radioactive waste material which can serve as a source of environmental contamination for hundreds of thousands of years. Is this awesome legacy to be the price of ten years of marginal employment benefits?

6. **Nuclear propaganda divides the people of Saskatchewan.**

- In February, 1992, the Canadian Nuclear Association (CNA) began a $1.8 million television ad campaign to promote nuclear power. The bulk of this money comes from Canadian taxpayers via Atomic Energy of Canada Limited (AECL), a Crown Corporation that receives about $150 million every year in federal subsidies. Ontario Hydro, the utility that benefits most from nuclear-generated electricity, has contributed nothing to the ad campaign. In fact, Ontario Hydro has cancelled its membership in CNA, as has the Government of Ontario.

- In February, 1992, as part of a sponsorship deal with the Special Olympics, AECL distributed 1,750 tickets to high school students to attend a drama production. With the tickets, the students received a letter inviting them to visit AECL's nuclear information centre and to enter a draw for a mountain bike.

- Agencies that have received money from AECL include: the Special Olympics, the Big Sisters Association of Saskatoon, the Saskatoon Hilltops (football team), the Saskatchewan Heart and Stroke Foundation, Saskatchewan Wildlife Artists Association, Delta Bessborough Curling Classic, two basketball teams (the Candu Kids and the Quarks), the Saskatchewan Nuclear Gazette.

- In the late 1970's, the Saskatchewan Mining Development Corporation provided bursaries for students; visits from public relations personnel with teachers, students, and school counsellors; books for libraries; financial assistance for teacher activities; speakers and resource bureau; a summer program for students; student, teacher, and school board tours of the uranium mines; free distribution of glossy pro-nuclear publications to students; and invitations to science teachers to special panels, symposia and conferences.

- In 1993, a $300,000 mobile exhibit called Uranium Today continues to visit schools throughout the province with its pro-nuclear message. The exhibit, which was unveiled in 1989, is funded by Uranium Saskatchewan, an incorporated group consisting of all the companies involved in mining uranium in Saskatchewan.

- The Devine PC government funded the Futures Caravan, which travelled to Saskatchewan schools with a model of a Candu reactor as its central display.

- The government supported the production of a video on uranium mining funded by the nuclear industry for distribution in schools.

- The Economic Development Board of Saskatoon City Council recommended a nuclear council be formed in the city to encourage the opening of a nuclear industry public information office, that courses on nuclear energy in various educational institutions be provided, and that a program of nuclear administration be established at the University of Saskatchewan.

- AECL has located an information centre in the city and presents displays at various conferences, conventions and meetings on a continuing basis.

There is something very disturbing about "slick" multi-million dollar advertising campaigns, supported and subsidized by democratically elected governments, whose sole purpose is to win public approval for even more government support and even greater subsidies from the public purse. The Canadian public, which has subsidized Atomic Energy of Canada Limited to the amount of seventeen billion dollars, deserves better than to have their own money used to propagandize them. It is particularly alarming when such tactics are directed at school children under the guise of education. Most uranium "information" distorts the current environmental picture by focusing on the environmental hazards of other technologies while ignoring their own and claiming only to provide benefits.

7. The weapons connection and nuclear proliferation.

"The civilian enrichment process has always been a marriage of convenience for the weapons states -- the 'civilian' work brings in extra cash and helps soften the image of bomb factories." (Paul McKay, "Adding Fuel to the Fire: Saskatchewan Uranium Enriches Warheads and the Corporate Pockets of Free-Trade Supporters," This Magazine, February 1988.)

How is this achieved?

The French state agency which designs and builds nuclear bombs is a major player in the Canadian uranium industry. In Canada the French government operates through four corporate fronts: Cogema Canada (100%), Mokta Engineering (75%), Corona Grade (100%), and Seru Nucleaire (100%). Through these companies the French government owns 80 percent of the Cluff Lake mine (2.1 million pounds of uranium in 1987); 36 percent of the Cigar Lake mine (total reserves, 385 million pounds); and 33 percent of the Waterbury uranium deposit. Cogema is also one of the leading uranium brokers in the world, with contracts to sell uranium to countries like Japan, Taiwan, South Korea, and Germany.

Why is this significant?

All of the Saskatchewan uranium handled by Cogema (and the other companies) must flow through an enrichment complex in Pierrelatte in southern France. For technical reasons, only one of every six pounds of uranium delivered from Saskatchewan is processed and shipped to the final utility customer; the other five pounds are useless to electric utilities and stay on site. These five pounds of uranium are used by the French weapons department, the Commission d'Energie Atomique (CEA), in the manufacture of nuclear weapons.

The same process happens in the United States and the United Kingdom. The enrichment plants there are operated by state agencies which also produce bomb materials.

Since the majority of all U.S. uranium imports now come from Saskatchewan, and since the U.S. Department of Defence automatically claims all the depleted uranium not retrieved by uranium producers, it is safe to say that some of Saskatchewan's uranium is finding its way into American bombs.

8. Global responsibility of the people of Saskatchewan.

Proposals are before the Saskatchewan and Canadian governments for 12 new uranium mines in Saskatchewan's north. In the course of evaluating these plans, one of the responsibilities that rests with each of us is to consider the uses to which Saskatchewan uranium has been put and the problems it is creating elsewhere in the world as it moves through the uranium pathway.

Uranium ultimately becomes either high-level radioactive waste or nuclear weapons. Both end points raise important ethical questions.

Originally, the impetus behind the survey, research and development of uranium mining in Saskatchewan was for direct sales to the weapons program in the United States. Saskatchewan started mining uranium in the 1950's exclusively for the purpose of supplying the United States government with the raw material it needed to make atomic bombs. A significant part of the U.S. nuclear arsenal today is made up of uranium of Saskatchewan origin.

Since the late 1960's Saskatchewan has not entered into uranium contracts directly with nuclear weapons manufacturers. Nevertheless, large amounts of Saskatchewan uranium have been used for military applications. Most Saskatchewan uranium exports have gone to the United States for processing in what is called an enrichment plant. Less than 20% of the uranium entering this plant has actually gone on to the owner of a nuclear reactor. The remaining uranium by-product (referred to as depleted uranium) has remained the property of the U.S. Department of Energy. In turn, that uranium has been used to manufacture the outer ring of the hydrogen bomb, to breed plutonium for missiles and to manufacture heavy bullets. This represents a clear violation of the Atoms for Peace Treaty between Canada and the United States.

Saskatchewan has continued to sell uranium to many countries who violate the Non-Proliferation Treaty on Nuclear Weapons. Sales have also continued to countries engaged in nuclear weapons testing. Examples of these sales have been our exports of uranium to South Korea and to France. Sales of Saskatchewan uranium have been made to South Korea during the height of repression in the 1980's and throughout this period the South Korean government has been working on the development of a nuclear bomb. Sales of Saskatchewan uranium are continuing to be made to France despite its persistence in testing atomic weapons in the South Pacific Ocean.

9. Appropriate Technology for Saskatchewan.

Nuclear energy is no longer viewed as an attractive energy source in many countries and provinces. In the United States all orders for nuclear electric generating stations placed since 1974 have since been cancelled!

In place of nuclear generation electrical utilities are aggressively pursuing energy conservation measures, cogeneration systems, and renewable energy projects. In the state of California, for example, energy consumption per capita has declined by about 1% per year since 1977 (California Energy Commission, "Energy Efficiency Report," [P 400-90-003], Publications Office, MS-13, 1516 Ninth St., Sacramento, CA 95814-5512). Based on statements from the Electric Power Research Institute the Commission estimates that there is the opportunity to save another 40% of its present electricity using currently available cost-effective, energy efficient technology.

Unfortunately, here in Saskatchewan, we do not have a single government body with any mandate to pursue energy conservation measures. The electric and gas utilities have made only a token effort in this area in recent years. In the late 1970's, Saskatchewan had become a world leader in residential energy conservation, with important breakthroughs such as the development of super-insulated new and retrofitted residences. The Saskatchewan Conservation House in Regina, completed in 1977, is perhaps the most important energy efficient house built in the world during the decade. Unfortunately, the provincial government department responsible for this progress, the Office of Energy Conservation, was dismantled, and leadership in this area is now gone.

The path to sustainable energy development for Saskatchewan is the aggressive pursuit of energy conservation coupled with the development of benign sources of energy such as biomass, wind energy, and passive solar technologies. Our existing fossil fuels can be used as a transitional energy source. A 1979 study by the Saskatchewan Research Council (D. Thompson and H. Boerma, "Saskatchewan Energy Use and Renewable Energy Supply: Three Scenarios for 2025," Chemistry and Biology Division, Saskatchewan Research Council, Report C 79-4, March, 1979.) projected that this province could achieve 68-78% of its energy needs using only renewable resources. Since that report, impressive new developments have made an even higher percentage possible.

10. Economic self-determination for the Province and people of Saskatchewan.

A large number of the uranium mining companies are partly owned or entirely owned by foreign companies. Cogema, the French nuclear fuel company for the French government, has a share in the Key Lake Mine as well as joint holdings with Cameco at Cigar Lake and Dawn Lake. The McClean Lake Project with the highest estimates of uranium reserves of all Saskatchewan mines - 20,600,000 metric tonnes - is wholly owned by Minatco which is totally owned by the French company, Total. The Cluff Lake mine is 80 percent owned by Amok Ltd., another French company which is 75 percent owned by Cogema and 25 percent owned by the French metals concern, Pechiney. Uranerz a German-Swiss mining company has joint holdings with Cameco in the MacArthur River Project. This pattern which pervades the Canadian uranium mining industry in Saskatchewan means a substantial portion of uranium mining profits leave both Saskatchewan and Canada.

This understanding of who owns and operates the uranium mining industry and who actually receives the profits and benefits is seldom stated. The actual social and economic effects of this industry on the people and environment of both the province of Saskatchewan and Canada as a whole are usually glossed over in government and industry pro-mining statements and documents. Mining advocates have over-estimated the revenue to the province, over-estimated the projected demand for uranium, exaggerated job-benefits, and ignored or downplayed the serious health and environmental costs of this venture.

In terms of generating tax revenues for the province of Saskatchewan, industry estimates of royalty revenues have consistently over-estimated the real revenue dollar amounts by six to twelve times! For example, in 1989, the Saskatchewan government received only $27 million in revenues compared to projections of $165 million to $427 million. Furthermore, these revenues can only continue to decrease as the price of uranium has hit a historic low of less than $8/lb because of a world market glutted by the sale of stockpiles from the former Soviet Union and Eastern Bloc countries. Add to this the public opposition to nuclear power in countries such as the United States where there is no new construction of nuclear plants and the shutting down of much of the nuclear weapons production in the United States and Russia and even Cameco in its 1991 report to its shareholders is forced to admit that the price of uranium is not likely to rise to the high of $43.23 of the late 1970's for decades. Indeed, if ever. The Uranium Resource Appraisal Group under the authority of the Minister of Energy also concluded in its report released by Ottawa in 1991: "Notwithstanding its strong position, Canada's uranium industry faced an uncertain market in 1990, plagued by oversupply and low and volatile prices."

When we add to this short term uncertainty, the long-term certainty that for uranium mining, like all mining and natural resource depletion industries, when the uranium runs out, employment stops, we have economic disaster. No longer is there the possibility of economic self-determination, but local communities and the provincial government are left to grapple with the cost consuming realities of continuing pollution problems and scaling down the infrastructure buildup that took place during mining operations. An example is Elliot Lake, Ontario, which since the closing of the uranium mine has a residential vacancy rate close to 50 percent as the community valiantly attempts to diversify. This cannot take place without provincial assistance and funding. In June 1991, the Ontario Northern Development Minister announced a $250 million economic development package for the Elliot Lake area. Yet, Elliot Lake, like Saskatchewan's Uranium City, may soon be a ghost town.

The social and economic costs of uranium mining are chronically downplayed or not mentioned at all by the uranium companies. The consequences for local fishery resources, the effects on tourism, the dangers of long-term pollution to streams, lakes, aquifers, wildlife and humans, the costs to government for providing and maintaining infrastructure such as the construction and maintenance of all-weather roads are the hidden costs never mentioned by an industry which largely takes its profits and then leaves the local community and the province. The result is that the uranium industry is a hazardous risk to the economy, not an opportunity for economic self-determination.

This is Exhibit K referred to in the Affidavit of Linda Kathryn Murph sworn before me, this 2nd day of September, 1999

Stefania Fortugno
A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

Minister of the Environment | Ministre de l'environnement

[redacted]

This information was released to the wire services on the date indicated. Despite the delay, some releases and speeches are mailed to out-of-town media because the content is not time-dependent or because it will be useful for background files.

FOR IMMEDIATE RELEASE

URANIUM MINING DEVELOPMENTS IN NORTHERN SASKATCHEWAN: RECOMMENDATIONS ON THREE PROJECTS MADE PUBLIC

OTTAWA, 29 October 1993, -- The report of a Joint Canada-Saskatchewan panel reviewing three uranium mining developments in northern Saskatchewan was made public today by both the Minister of Environment and the Designate Minister of Natural Resources.

The joint public review panel recommends that the Dominique-Janine Extension Project be approved, subject to certain conditions. However, the panel finds the Midwest Joint Venture Project unacceptable. Finally, it recommends that the McClean Lake Project be delayed for at least five years.

In assessing the Dominique-Janine Extension Project, the panel concludes that the socio-economic benefits associated with the proposed extension at Cluff Lake would be significant. The health and environmental risks, incremental to those already in existence, could be reduced to acceptable limits provided certain conditions are met. The owner of the Dominique-Janine mine, the Cluff Mining Partnership, is seeking authorization for an extension to its open pit mining operation at Cluff Lake.

The Midwest Joint Venture project, as described in the Environmental Impact Statement and its Amendment, is not acceptable, concludes the panel. The benefits that could be obtained are insufficient to balance the potential risks for health and environment. It therefore recommends that permission to proceed not be granted. The project operator for the Midwest Joint Venture, Denison Mines Limited, was seeking approval to develop an underground uranium mine at South McMahon Lake.

The panel recommends that the McClean Lake Project be delayed for at least five years. This would allow time to validate the proposed pervious surround tailings management system.

.../2

Canada

It would permit collection of community health baseline information and maximization of employment opportunities for northerners through education and training. It would also give the opportunity to assess cumulative biophysical and socio-economic impacts. Total Minatco Ltd, the project operator of the McClean Lake Joint Venture, was proposing development of uranium ore reserves at McClean Lake.

In its recommendations, the panel focuses on the need for greater participation of northern people in employment and training, in monitoring of the uranium developments, and in business opportunities derived from the industry. The panel identifies areas of the uranium mining industry which require new and more stringent regulations: site-specific surface water quality objectives; sediment quality guidelines; and radiation exposure standards. The panel also recommends that a financial guarantee to cover decommissioning and post-decommissioning be secured before project approvals are granted.

This panel was established in August 1991 under the federal environmental assessment and review process and the Saskatchewan environmental assessment process. It was given a three-fold mandate: to review the environmental, health, safety and socio-economic impacts of the proposed uranium mine developments; to determine from its review whether each project was acceptable or unacceptable; and to provide full opportunities for public consultation and review. On those three projects, the panel conducted public hearings in March, April and May of 1993 in Regina, Saskatoon, Black Lake, Wollaston Lake, La Ronge, Prince Albert, Buffalo Narrows, Ile-à-la-Crosse and La Loche.

The proposals to mine ore at two other proposed production mines in northern Saskatchewan will be the subject of separate reviews being conducted by the same joint public review panel. The present report on the review of the Dominique-Janine Extension, the McClean Lake project, and the Midwest Joint Venture is presented with the understanding that its recommendations will not in any way prejudice those which will be made in the future reports reviewing the Cigar Lake and McArthur River projects.

The Joint Panel's report addresses a wide range of very complex issues. The federal government and the Atomic Energy Control Board have indicated today that the new Government will want to give all the recommendations very careful consideration. While not bound by the Panel's recommendations, the federal Government will announce its decision on the three projects after careful study of the Panel's report.

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Copies of the report are available from:

The Federal Environmental
Assessment Review Office (FEARO)
200 Sacré-Coeur Blvd., 14th Floor,
Hull, Quebec K1A 0H3
Tel: (819) 994-2578

Uranium Mine Development
Room 420, 1955 Smith St.
Regina, Saskatchewan
S4P 2N8
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For more information on the joint review:

Guy Riverin or
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Hull, Québec
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(819) 953-2754

Greg McGuire
Director General, Office
Environmental Affairs
Natural Resources Canada
Tel: (613) 992-9924

(Aussi disponible en français)

This is Exhibit L referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999

Stefania Fortugno

A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

DOMINIQUE-JANINE EXTENSION, McCLEAN LAKE PROJECT, AND MIDWEST JOINT VENTURE

Report of the Joint Federal-Provincial Panel on Uranium Mining Developments in Northern Saskatchewan

Saskatchewan

Canada

Uranium Mining Developments in Northern Saskatchewan: Dominique-Janine Extension, McClean Lake Project, and Midwest Joint Venture

Report of the Joint Federal-Provincial Panel on Uranium Mining Developments in Northern Saskatchewan

October 1993

JOINT FEDERAL/PROVINCIAL PANEL ON URANIUM MINING DEVELOPMENTS IN NORTHERN SASKATCHEWAN

The Honourable Pierre Vincent
Minister of the Environment
Room 581, Confederation Building
House of Commons
Ottawa, Ontario
K1A 0A6

The Honourable Bernhard Wiens
Minister of Saskatchewan Environment
and Resource Management
Room 348, Legislative Building
Regina, Saskatchewan
S4S 0B3

The Honourable Barbara Sparrow
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Resources
Room 322, West Block
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Secretary General
Atomic Energy Control Board
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Ottawa, Ontario
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Panel Report on the Dominique-Janine Extension, the McClean Lake Project and the Midwest Joint Venture Project

In accordance with the mandate announced in April, 1991, the Joint Federal/Provincial Panel on Uranium Mining Developments in Northern Saskatchewan is pleased to submit the attached report.

Our review has been completed under the terms of reference provided at the time of our appointment in August, 1991. The documents supplied by the proponents have been subjected to a thorough technical review and public meetings have been held in La Loche, Ile-à-la-Crosse, Buffalo Narrows, Prince Albert, La Ronge, Wollaston Lake, Black Lake, Saskatoon and Regina.

On the basis of this review, we recommend that the Dominique-Janine Extension should be allowed to proceed, subject to certain conditions stated in the report. This recommendation is based on the conclusion that the project will provide substantial benefits in the form of employment, business opportunities and royalties, while causing only a small incremental increase to existing environmental and health risks.

Canada

Saskatchewan

We further recommend that the Midwest Joint Venture project not be allowed to proceed. The expected benefits from this project are meagre, while the chances for negative health and environmental impacts are great.

For the McClean Lake Project, we have concluded that the socio-economic benefits to northern Saskatchewan could be increased and the health and environmental risks reduced to an acceptable level by a modest delay, primarily to provide time for education, training and research. We recommend, therefore, that this project be delayed for at least five years, and that its approval at that time be subject to the conditions outlined in the report.

The panel also recommends that the findings and conclusions described throughout the report be given careful consideration by governments, the proponents and other interested parties.

Respectfully,

Donald G. Lee
(Chairperson)

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APPENDICES

EXECUTIVE SUMMARY

The major recommendations arising from our review of the Dominique-Janine Extension, the McClean Lake Project, and the Midwest Joint Venture are summarized in this section. These recommendations have been formulated by assessing the balance between the potential benefits and risks to the region and to the province.

Because the people who live in northern Saskatchewan would experience the greatest impacts of these projects, particular importance has been placed on their concerns and aspirations. An improvement in educational levels would permit northerners to take greatest advantage of the employment opportunities presented by development of these mines. A spacing of the start-up dates of approved projects over a number of years would allow education programs to keep pace with the labour demands. A delay in some of the projects would also leave time for the implementation of monitoring regimes, the completion of baseline health studies, and the improvement in tailings management systems.

This report is presented with the understanding that its existence will not limit our ability to review the two additional projects contained in our mandate—the Cigar Lake and McArthur River developments. Readers should not assume that these recommendations prejudice, in any way, those that might be made on the basis of these forthcoming reviews.

The information in chapter 1 of the following report defines the scope of the report; the discussion in chapter 2 provides a summary of the important issues associated with uranium mining in general; and chapters 3, 4 and 5 deal with the specific projects.

The Dominique-Janine Extension

The socio-economic benefits associated with the proposed extension of the Dominique-Janine mine at Cluff Lake would be significant. The health and environmental risks, incremental to those already in existence, could be reduced to acceptable limits provided certain conditions are met. The proponent has, in the past, demonstrated respect for the local environment, concern for worker health, and interest in the socio-economic well-being of the residents of the impacted communities. We recommend approval of this project subject to implementation of the following conditions:

1. establishment of a new Human Resource Development Agreement in which Cogema be required to select a minimum of 50% of its new employees from residents of the primarily-impacted communities and a minimum of 30% from residents of the secondarily-impacted communities. These conditions should also apply to contractors and sub-contractors;
2. agreement on a form of revenue sharing that is acceptable to the majority of the impacted communities;
3. establishment of a monitoring committee (as described in section 2.2.6) for the Cluff Lake Mine;
4. provision of a financial guarantee to cover decommissioning and post-decommissioning costs;
5. adoption of the exposure standards recommended in Publication 60 of the International Commission on Radiation Protection (ICRP-60) without allowing the collective dose to increase;
6. completion of a review of worker health training programs;
7. establishment of mechanisms for conducting an epidemiological study of the health of current and former workers at the Cluff Lake mine;
8. establishment of an air quality monitoring program using moss pillows and development of a system for monitoring the quality of the groundwater in the vicinity of the Claude pit;
9. evaluation and selection of a different option for deposition of waste rock. Only innocuous waste should be disposed of in Cluff Lake. Options for disposing of other waste rock in the Claude and Dominique-Janine pits should be evaluated. The Claude pit should be decommissioned by filling it with rock capped by clean overburden;
10. establishment of a research fund to support the search for innovative ways of reducing the volume of effluent released and the quantity of chemicals required to treat contaminated water;
11. development of site-specific water quality objectives, establishment of a program to reduce contaminated mine water inflows, and assessment of the possible impacts to the Island Lake watershed;
12. specification of total environmental loading for the mine, and development of a material-balance for contaminants in all liquid effluent;
13. evaluation of alternative oxidants that could replace sodium chlorate in the leaching process and thereby permit recycling of mill effluent;
14. use of the Environmental Transfer Pathway model (ETP/AECB) as the focus for an integrated monitoring program, and the assessment of cumulative effects;
15. agreement that the decommissioned Dominique-Janine pit not be connected to Cluff Lake, and that Claude Creek not be rerouted to flow through the decommissioned pit; and
16. evaluation of alternative methods of tailings disposal, with the goal of closing down the present tailings management facility as soon as possible.

The Midwest Joint Venture

The Midwest Joint Venture project, as described in the EIS and its Amendment, is not acceptable; the benefits that could be obtained are insufficient to balance the potential risks. It is,

therefore, recommended that permission to proceed should not be granted for reasons that are presented in chapter 4.

The McClean Lake Project

It is recommended that the McClean Lake project be delayed for at least five years.

This would allow time to obtain more experience with pervious surround tailings management facilities, to acquire comprehensive community health information, to maximize employment opportunities to northerners through education and training, to discuss further the larger issues, and to assess cumulative biophysical and socio-economic impacts.

Its approval at that time should be contingent on fulfillment of the following conditions:

1. evaluation, by the regulatory agencies, of the pervious surround tailings pit at Rabbit Lake after several more years of operation;
2. collection and evaluation of baseline data on groundwater flow patterns and water quality. In particular, the panel recommends that accurate flow rates be determined for the streams in the Collins Creek watershed and that the modelling of predicted impacts on the receiving waters be revised accordingly;
3. development of plans to reduce contaminated mine-water inflows;
4. evaluation of alternative oxidants that could replace sodium chlorate in the proposed milling process;
5. participation in the establishment of a research fund to support the search for innovative ways to reduce the volume of effluent and quantity of chemicals required to treat contaminated water. The panel also recommends that site-specific water quality objectives be developed for the McClean Lake project. In addition, the total environmental loading should be specified and a material-balance developed for all contaminants in the liquid effluent;
6. use of the Environmental Transfer Pathway model (ETP/AECB) as the focus for integrating the monitoring program at McClean Lake. The general design of the monitoring program should be the same as that at other uranium mines. This would guarantee a consistent replication of treatments for biological effects monitoring and eventually produce the database required for the study of cumulative effects. The results of biophysical monitoring at McClean Lake should be reviewed by the independent monitoring committee recommended in section 5.4.3;
7. assessment of cumulative effects using the ETP/AECB model and validation of the results by use of a whole ecosystem approach to monitoring, as specified in section 2.3.1 and section 5.3.7;
8. decommissioning plans that include filling of mined-out pits with waste rock capped by clean overburden;
9. adoption of sediment quality guidelines for Saskatchewan and institution of a program to monitor sediment quality in the Wollaston Lake drainage system;
10. adoption of a Human Resource Development Agreement that includes employment objectives of 30% (75 workers) of the initial workforce from the Athabasca Basin and 40% (100 workers) from the rest of northern Saskatchewan, with the balance (30%, 75 workers) coming from southern Saskatchewan or elsewhere. After the mine has been in operation for three years, these objectives should be changed to require the selection of a minimum of 50% of all new employees from residents of the primarily-impacted communities and a minimum of 30% from the residents of secondarily-impacted communities. These conditions should also apply to contractors and subcontractors;
11. agreement on a form of revenue sharing that is acceptable to the majority of impacted communities;
12. establishment of a monitoring committee (as described in section 2.2.6) for the McClean Lake Project;
13. provision of a financial guarantee to cover decommissioning and post-decommissioning costs;
14. adoption of the exposure standards recommended in Publication 60 of the International Commission on Radiation Protection (ICRP-60), without allowing the collective dose to increase;
15. implementation of a program to collect and analyze changes in indicators of community health for the impacted communities, and formulation and implementation of remedial health strategies; and
16. further public discussion of the larger issues identified in section 2.5 of this report.

1.0 INTRODUCTION

1.1 Review Process

In April, 1991, the governments of Canada and Saskatchewan announced a joint federal-provincial environmental assessment review to study uranium mine developments in northern Saskatchewan (see figure 1). To be included in the review were proposals for the Dominique-Janine Extension, McClean Lake, and Midwest Joint Venture. The review was also to include proposals for operating mines at McArthur River and at Cigar Lake. Each project proposal was at a different stage of development, and would progress through the sequences of the review process when appropriate. A panel was appointed in August, 1991.

Three proposals are being considered in this part of the review: the Dominique-Janine Extension at Cluff Lake; a proposed new mine at McClean Lake; and a proposed new mine, the Midwest Joint Venture (MJV), at South McMahon Lake.[1]

For the three proposals being considered, Environmental Impact Statement (EIS) Guidelines were drafted by Saskatchewan Environment and Public Safety[2] in November, 1989, December, 1989 and March, 1990, respectively, in accordance with the provincial *Environmental Assessment Act.*

Subsequently, the Atomic Energy Control Board (AECB) referred the new uranium mine proposals (the MJV and McClean Lake projects) to the federal Minister of the Environment for public review under Section 12(b) of the *Environmental Assessment and Review Process (EARP) Guidelines Order.*

The proposed expansion of an existing uranium mine (the Dominique-Janine Extension) was also referred for review. Because the AECB had concluded that the adverse environmental effects of the proposal might be significant, it cited Section 12(e) of the *EARP Guidelines Order* as the basis for the referral.

The proposals for the Dominique-Janine extension, the McClean Lake new mine, and the Midwest Joint Venture new mine were at similar stages of development. The panel decided, on behalf of all stakeholders, that it would be most expeditious to combine the public hearing phase of the review for these three proposals.

The panel reviewed the Environmental Impact Statements (EISs) from the three proponents and their subsequent responses to the panel's requests for additional information. The panel also reviewed comments provided by government agencies and public presenters.

Participant funding of $200,000 was made available to help the public take part effectively in the review. The funds were intended to assist recipients in reviewing EISs and in preparing for and participating in the public hearings.

As required by its terms of reference, the panel then conducted public hearings in March, April and May of 1993. The sessions were held in Regina, Saskatoon, Black Lake, Wollaston Lake, La Ronge, Prince Albert, Buffalo Narrows, Ile-à-la-Crosse and La Loche.

After the public hearings, the panel prepared the following report, which assesses the acceptability of the proposed Dominique-Janine Extension, the McClean Lake new mine, and the Midwest Joint Venture new mine. In accordance with our terms of reference, recommendations are made on whether or not each project should be allowed to proceed, and in each case reasons are provided.

This report is submitted to the federal Minister of Environment, and the designated Minister of Natural Resources;[3] the Saskatchewan Minister of Environment and Resource Management; and to the Atomic Energy Control Board.

1.2 Panel

1.2.1 Membership

The Joint Federal-Provincial Panel on Uranium Mining Developments in Northern Saskatchewan was appointed on August 22, 1991. **Donald Lee**, Head of the Department of Chemistry at the University of Regina, is Chairperson of the panel. Other panel members are:

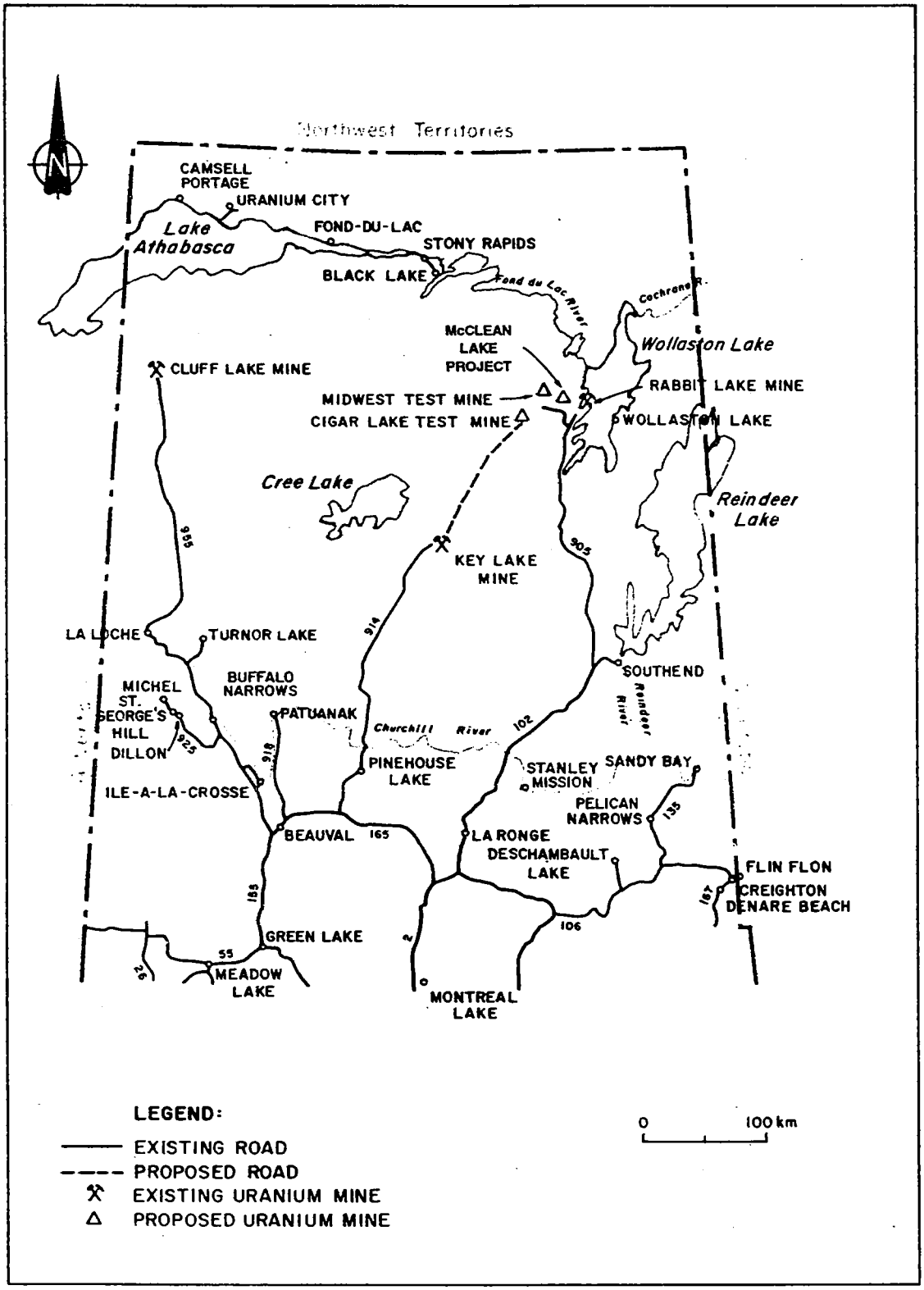
- **James Archibald**, Associate Professor of Mining Engineering, Queen's University;
- **John Dantouze**, Vice-chief, Prince Albert Tribal Council;
- **Richard Neal**, Associate Dean (Academic), and Professor of Biology, College of Arts and Sciences, University of Saskatchewan; and
- **Annalee Yassi**, Associate Professor and Director of Occupational and Environmental Health, Faculty of Medicine, University of Manitoba.

[1] The proponent of the extension at Cluff Lake is the Cluff Mining Partnership, comprised of Cogema Resources Ltd. (80%) and Corona Grande Exploration Corporation (20%).
The proponent of the McClean Lake project, at the time of the public hearings, was Total Minatco. Other participants in the joint venture were Denison Mines Limited (22.5%) and OURD (7.5%). At the start of the public hearings, the proponent for the Midwest Joint Venture was Denison Mines Limited. During the public hearings, Total Minatco became project operator and major shareholder (56%), with Denison Mines Limited (19.5%), OURD (4.5%) and Uranerz Exploration and Mining Limited (20%) as other shareholders.

[2] Saskatchewan Environment and Public Safety became Saskatchewan Environment and Resource Management in March, 1993.

[3] Natural Resources is a new department and includes the previous department of Energy, Mines and Resources. The Minister of Natural Resources is the Minister responsible for the Atomic Energy Control Board (AECB). It was the AECB which requested the Minister of the Environment to conduct a public review.

Figure 1
Location of Existing and Proposed Projects



Biographies of the panel members are in Appendix A.

1.2.2 Mandate

The panel was given a three-fold mandate: to review the environmental, health, safety and socio-economic impacts of the proposed uranium mine developments; to determine from its review whether each project was acceptable or unacceptable; and to provide full opportunities for public consultation and review.

Complete terms of reference for the panel are in Appendix B.

This report on our review of the Dominique-Janine Extension, the McClean Lake project, and the Midwest Joint Venture is presented with the understanding that its existence will not limit our ability to review the Cigar Lake and McArthur River projects. Readers are cautioned not to assume that these recommendations will in any way prejudice those which will be made in the future reports. We reserve the right to complete a full and fair review of the Cigar Lake and McArthur River projects in a fashion that is independent from, and unbiased by, the reviews described in this report.

2.0 GENERAL ISSUES AND RECOMMENDATIONS

During the public hearings many participants raised issues that are relevant to all of the proposed projects. While some of these issues are very general (e.g. the educational levels of people living in northern Saskatchewan) and others more specific (adoption of ICRP-60, for example), they are the same or similar for all of the projects and are, therefore, most efficiently addressed in a collective fashion. These common issues are described in this chapter along with the presentation of a number of recommendations that flow from their consideration. Descriptions of the individual projects and recommendations pertaining to each are presented in subsequent chapters.

2.1 Nature of the Recommendations

Assessing the acceptability of a project under environmental review involves a balancing of potential benefits against potential risks. While establishing such a balance is never easy, it is more straightforward when a majority of the benefits are expected to accrue to the same people who are required to accept the greatest risks. In the case of uranium mining, however, a proper balance is more difficult to reach because northern people are expected to accept the greatest environmental and health risks while the economic benefits are shared more universally. Many of the recommendations in this report are made in an attempt to rectify this situation. To do so, it is necessary to minimize the potential for environmental damage and to maximize the likelihood that a substantial portion of the socio-economic benefits derived from uranium mining will remain in northern Saskatchewan. Regional risks, associated with the possible contamination of air, land and water, must be exceeded by socio-economic benefits to justify a continuation or expansion of the uranium industry.

Concerns were raised regarding end uses and other larger issues impacting on whether uranium mining should be allowed to proceed in northern Saskatchewan. However, the terms of reference provided to us prohibit such considerations from influencing our recommendations, and we have proceeded accordingly.

We have made a positive recommendation for the acceptance of one project (chapter 3) because substantial benefits in the form of employment, business opportunities and royalties may be obtained with only a small incremental increase to existing environmental and health risks. For another (chapter 4), we have made a negative recommendation because the potential benefits are meagre and the chances for negative health and environmental impacts great. For the third project (chapter 5), we have determined that the socio-economic benefits to northern Saskatchewan could be increased and the health and environmental risks reduced to an acceptable level by a modest delay, primarily to provide some time for education, training and research.

[4] R. M. Bone, *The Geography of the Canadian North* (Toronto: Oxford University Press, 1992), p. 38-70.

2.2 Participation of Northern People

> *But we did not give up either our right to govern our lives, or the right to make our living from the resources that dene nené (our land) can provide. This means that, regardless of issues about jurisdiction, we insist on being directly included in all aspects of determining how the resources are used.*
>
> Black Lake and Fond du Lac First Nations Represented by Chief J. Martin, D. Deranger, E. Boneleye, P. Robillard and A. Adam, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 19, 1993, p. 208.

Few people have had to adapt to new economic and social situations more quickly and completely than the people of northern Saskatchewan. Circumstances have forced them to change from a nomadic hunting economy (in effect prior to contact with Europeans) through a fur trapping/trading economy, and into the present resource-based wage economy, in about 300 years.[4] It is not surprising that they have found the transition difficult and that many are now forced to rely on transfer payments (welfare) from central governments.

When one reviews the conditions that many northern people must endure, it is natural to ask the question, "What could have been done to avoid this situation?" However, it is much more important to consider questions such as, "What can now be done to improve conditions?", and "What is a fair and reasonable response to the current aspirations of northern aboriginals to regain a measure of ownership over their traditional lands and take control of their own destiny?" A wise and generous answer to the latter two questions on the part of the people of Canada, as represented by their governments, could go a long way toward righting past injustices and allowing the people of northern Saskatchewan to create a brighter future for themselves and their descendants. We recognize that a Royal Commission[5] is currently assessing aboriginal issues, and look forward, along with the people of northern Saskatchewan, to their recommendations. Our report focuses only on the impacts of uranium mining; the Commission's mandate with respect to aboriginal issues is larger.

We must realize that measures taken with respect to the mining industry in general, and uranium mining in particular, can provide, at best, only a small portion of the solution to the problems associated with northern development. However, they could be part of the total solution and, since the mining companies appear to be genuinely committed to working for

[5] *The Royal Commission on Aboriginal Peoples*, co-chaired by René Dussault and Georges Erasmus.

an improvement of conditions in northern Saskatchewan, an opportunity to explore creative alternatives exists.

Throughout the public hearings, people in northern Saskatchewan continuously lamented their lack of control in an area that had traditionally been "their land". It is apparent that the wish by aboriginal peoples to be in charge of their own region is partly an economic issue and partly a spiritual longing to be reunited with their cultural history.

We support the people of northern Saskatchewan in their wish to be accepted as equals (if not masters) when developments are being planned for their region of the province. Although as a consequence of the 1930 *Resources Transfer Agreement* legal ownership rests with the Crown (i.e. the people of Saskatchewan), we do not believe that it is in Canada's best interests to continue to deny the people of northern Saskatchewan a measure of ownership over their traditional lands and/or the resources contained therein. Because the economic and social problems faced by the people of northern Saskatchewan are so severe and encompassing, there is little doubt that, if allowed to remain unresolved, they will eventually have a highly adverse effect on the entire provincial economy. It is, therefore, incumbent upon us from both a compassionate and a materialistic point of view to take whatever measures are available to provide the people of northern Saskatchewan with an opportunity to secure their own future. Existing treaties, that were likely executed between two very unequal partners, should not be allowed to prevent governments from taking actions that would empower the northern people to be responsible stewards of their traditional lands. Outright or joint ownership could provide northerners with an economic base and, at the same time, foster a sense of dignity and responsibility that would be hard to achieve in any other way.

> *...You know, the treaties promised us that as long as the sun shines, the rivers flow, even rocks are not moved, that we would continue to use the land and utilize the land forever...and if we were given free roam and access to the land, that also gives us certain rights to do whatever we wanted to with the land. We didn't give up those rights....*
>
> Senator Chicken (translated by A. Adam), *Transcript of Public Hearings*, Black Lake, Saskatchewan, April 13, 1993, p. 107.

In the following paragraphs, we have restated a number of suggestions that were brought to our attention and which we believe would assist northern people to govern their lives and to make a living from the resources that their land can provide, as expressed in the quotation that opened this section.

2.2.1 Revenue Sharing

> *There's all different kinds (of) ideas about revenue sharing. Our region is so different between Black Lake, Fond du Lac, Wollaston, Uranium City...If there's any revenue sharing...it should be brought down to a community, each community.*
>
> P. Bougie, *Transcript of Public Hearings*, Black Lake, Saskatchewan, April 13, 1993, p. 89.
>
> *To establish a formula for revenue sharing and ensure that it is directed in an orderly manner is difficult but it is possible. We would like to have the opportunity to participate; it would be a good problem for northern people to have.*
>
> T. Tornquist, *Transcript of Public Hearings*, La Ronge, Saskatchewan, April 16, 1993, p. 6.

An increase in economic activity usually leads to an increase in jobs and business opportunities, and the benefits extend far beyond those directly employed in an industry. However, it is important to recognize that these benefits are much more limited in northern Saskatchewan. Only a small proportion of the northern labour pool can be hired by the uranium mines, and the business opportunities for northerners, while important, are much more limited than for southern Saskatchewan. Furthermore, much of the money that is paid to northern workers and businesses by the uranium mines will flow south because goods in the south are cheaper and more available. Thus, most northerners receive little, if any, benefit from the uranium mining industry because the economic system of the region fails to redistribute the wealth. A new method of sharing the wealth created by the uranium mines is required, to allow more people of the region to benefit.

It is essential that an equitable form of revenue sharing be worked out with northern people before additional projects are approved. This need has been consistently advocated by panels such as ours for the past fifteen years. Both the Cluff Lake[6] and the Key Lake Boards of Inquiry[7] made strong recommendations in this regard, and, in our report on the McArthur River Underground Exploration Program, we have noted that, "*it is northern people who must tolerate the intrusion of*

[6] *Final Report, Cluff Lake Board of Inquiry*, E. D. Bayda, Chairman, 1978, p. 206.

[7] *Key Lake Board of Inquiry Report*, R. W. Mitchell, Chairman, 1981, p. 50.

mines, and it is they who bear the greatest risk of environmental damage or social disruption by these developments." [8] They should, therefore, share more generously in any benefits (royalties, crown mineral disposition fees, corporation capital taxes and surcharges, corporate income taxes, municipal property taxes and crown surface lease fees) that are derived from the mines. Disbursement of the net revenues, estimated conservatively at $488.3-million for the years 1980-1992,[9] into the general provincial coffers does not seem equitable and leaves the residents of northern Saskatchewan with the impression that resources are being taken from "their land" with no direct compensation. The mechanism by which this compensation should take place will likely pose a difficult problem for the provincial government and we will not attempt to offer advice on how revenue sharing should be achieved. **However, we recommend that no new uranium mining developments be undertaken until a form of revenue sharing, acceptable to the majority of impacted communities, has been agreed upon.**

2.2.2 Human Resource Development Agreements

Human Resource Development Agreements are the instruments through which northerners are guaranteed an equitable share of the jobs that will be made available in these projects. Despite a high rate of unemployment among northerners, the mining companies have only succeeded in obtaining, at best, about 50% of their workforce from northern Saskatchewan. Cogema stated that 52% of the current workforce at its Cluff Lake mine are northerners,[10] while the Cameco Corporation has established a goal of having 50% northern employment by 1995.[11]

Increasing northern participation in the workforce appears to be a fairly complex problem. On one hand, we heard that workers, some of them with experience, were available and anxious to work in the mines, while on the other hand, we were told that, because educational levels are low, companies have difficulty recruiting qualified personnel. If this information is correct, there is an abundant supply of unskilled labour available, but a scarcity of people in northern communities who have sufficient training to fill many of the positions that exist at the mine sites and in the company offices. This problem can only be solved, as discussed below, by provision of appropriate training for northern people. An orderly, planned increase in mining activity (as opposed to a rapid expansion) would most likely be of the greatest benefit to northerners as far as employment is concerned. **We are, therefore, recommending that the start-up of any approved projects be spread over a number of years and that the companies work together with the appropriate agencies to ensure that training keeps pace with development.** Using this approach, the Human Resources Development Agreements could be renegotiated to guarantee that a much larger percentage of the **new** employees hired for these projects come from northern communities—a goal of 80% would seem obtainable. These goals should apply to all levels of employment, including administrative and executive positions. The employment objectives should also apply to on-site contractor or sub-contractor employees.

2.2.3 Definition of a Northerner

A question closely related to the human resources agreements is the way in which a "northerner" is defined for purposes of calculating employment percentages. The present definition—a person who has spent one-half of his/her life, or at least ten years, as a resident of northern Saskatchewan—was criticized on several occasions because it includes many people who are now residents of southern Saskatchewan, and because it does not give any preference to people of aboriginal descent.

Formulation of a new definition will be a difficult task because it must not be a racist statement, and because it should not restrict, in any way, a person's freedom of movement within the province. Some of these difficulties may be resolved through the natural flow of human activities. For example, since most residents of the northern communities expressed a wish to remain there, the current tendency to move south once they become regular wage-earners will be reduced when northern communities have better schools and services available. Similarly, there appears to be little need to distinguish between aboriginals and non-aboriginals because an increasing majority of residents of most northern communities can claim at least partial aboriginal ancestry.[12,13] The question ultimately becomes, "Which communities should be considered when defining a northerner, and how should persons be counted who were formerly residents of the north and now live in the south?" This could also prove to be a difficult question to resolve by consultation with northern people because each community wishes to have the most-favoured status. For example, the people of La Loche, since theirs is the closest community to Cluff Lake, believed that they should be given priority for jobs at that mine,[14] while the Athabasca communities expressed the opinion that they should have first chance

[8] *McArthur River Underground Exploration Program*, report by the Joint Federal/Provincial Panel on Uranium Mining in Northern Saskatchewan, January, 1993, p. 4.

[9] *Interim Report: Information from the Government of Saskatchewan requested by the Joint Federal/Provincial Panel on Uranium Mining in Northern Saskatchewan for the Cigar Lake and McArthur River Projects*, SERM, May, 1993, p. 83.

[10] L. Bear, *Transcript of Public Hearings*, Regina, Saskatchewan, March 22, 1993, p. 71.

[11] J. McIntyre, *Transcript of Public Hearings on the McArthur River Underground Exploration Program*, Saskatoon, Saskatchewan, December 4, 1992, p. 6.

[12] R. M. Bone, *The Geography of the Canadian North*, (Toronto: Oxford University Press, 1992), p. 190, reports that 75.1% of the population of northern Census Divisions in 1986 were of aboriginal origins.

[13] E. Weick, *Health in the Context of Uranium Mining in Northern Saskatchewan*. (Ottawa: ESAS Inc., 1992), p.6, notes that only the four larger urban centres (Air Ronge, La Ronge, Creighton and Flin Flon) have substantial non-aboriginal populations.

[14] Despite being the closest community to the Cluff Lake Mine, only one person from La Loche is currently employed by Cluff Mining according to L. Bear, *Transcript of Public Hearings*, La Loche, Saskatchewan, April 20, 1993, p. 26.

at the available jobs because all of the mines are located somewhere in the Athabasca Basin.[15]

We believe that it would be preferable to reduce the emphasis placed on the definition of a northerner and replace it with a regulation requiring the companies and their contractors to select a substantial percentage of their new employees from the impacted communities. Each mine should be required to define, in consultation with the province, a number of primary and secondary impact communities (located north of the old Department of Northern Saskatchewan boundary) from which they would hire primarily and in which they could offer incentives for the people to obtain appropriate training. Most of the new employees would then be expected to come from the communities of greatest impact; for example, 50% would come from the primary impact communities and 30% from the secondary impact communities. Workers from other parts of northern Saskatchewan and those who move south could still be counted as northerners for statistical purposes, but would not be considered as residents of the impacted communities when new hiring took place. This arrangement would encourage the mining companies to focus their educational and training programs more directly toward those communities that are expected to experience the greatest environmental and social impact of each particular mine.

2.2.4 Education and Training

Improved education and training opportunities are required if northern people are to become equal partners in the development of that part of Saskatchewan. The ability to obtain a sound kindergarten to grade 12 (K-12) education without having to leave home has long been taken for granted by people living in southern Saskatchewan. Similar opportunities should be made available to the citizens of northern Saskatchewan. It is unfair, for example, to expect students to come south to complete their high school grades. Teenagers and their parents experience enough stress without also having to adjust to a different culture. The inevitable consequence of such a system is an unusually large number of drop-outs. The situation with respect to drop-outs is improving where schools are available,[16] but all communities do not have access to a high school. We also heard that the teaching of science and mathematics in northern schools is considered by some parents to be below the standards maintained in southern Saskatchewan.[17] If this is true, every effort should be made to correct the situation; a resource-based economy requires graduates who have a good understanding of science and technology.

It is clear that every effort is being made to improve both the quality and accessibility of K-12 education. This work should be supported and encouraged to the maximum extent possible. A good basic education, in addition to equipping northern people to become leaders in their own territory, allows for the possibility of employment beyond the boundaries of northern Saskatchewan and provides entrance requirements for institutions of higher education. With a very large population of children and young adults,[18] it seems likely that not all of the young people in northern Saskatchewan will be able to find employment without venturing out into the larger world. A K-12 education will enable northerners to do that more easily and more successfully.

It is also important to provide post-secondary training for specific jobs and occupations. At the present time, training for mine-related employment is facilitated by the *Mineral Sector Task Team* which includes representatives from the northern mineral industry, Northlands College, Employment Canada, the Prince Albert Tribal Council, the Métis Society and the provincial Departments of Economic Development, and Education, Training and Employment. Through close cooperation with the mining companies and careful planning, an attempt is being made to "*maximize the hiring, training and advancement of northern people in the region's mineral sector*".[19] We applaud this initiative and encourage its continuation. When coupled with a planned expansion of the industry, it should be possible to obtain a majority of new employees from the impacted communities.

Programs that enable and encourage northerners to enter apprenticeship programs should also be promoted. In addition to employment in the mining industry, an individual with appropriate qualifications in one of the trades has opportunities for employment beyond the boundaries of northern Saskatchewan. Competent electricians, plumbers, etc. are in widespread demand. The presence of tradespeople in local communities could also lead to an improvement of the standard of living in the North.

2.2.5 Northern Business Opportunities

> *The continuing development of the uranium industry in Northern Saskatchewan is integral to the improvement of economic conditions to the north. It's a development that not only provides direct benefits, but it also creates the wealth, workforce, and attitude necessary to start improving the economy.*
>
> J. Roberts, *Transcript of Public Hearings*, La Ronge, Saskatchewan, April 15, 1993, p. 72.

A number of northern residents indicated that increased participation in the mining industry by local businesses could be beneficial to the development of northern communities. The ability to call on local people for services could also be an asset for the mining companies in certain instances.

[15] J. J. Mercredi, *Transcript of Public Hearings*, Black Lake, Saskatchewan, April 13, 1993, p. 30; G. Fern, ibid, p. 38.

[16] R. McKay, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 3, 1993, p. 169.

[17] D. Dewar, *Transcript of Hearings*, Buffalo Narrows, Saskatchewan, April 19, 1993, p. 87.

[18] E. Welck, *A Socio-Economic Overview of Uranium Mining in Northern Saskatchewan*, (Ottawa: ESAS Inc., 1992), p. 3.

[19] R. McKay, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 3, 1993, p. 165.

Participation by local contractors would be encouraged by the establishment of company information offices staffed by people who, in addition to informing northerners of employment and business opportunities, were capable of providing assistance in the preparation of bids and/or proposals. In some cases, it might also be advantageous to all concerned if preferential treatment were given to bids received from northern contractors. The availability of start-up capital for business ventures (provided either by governments or proponents) would also assist northerners in their attempts to participate in mining activities, or in other business ventures of their choice.

These mining developments are in a region traditionally used and controlled by northern people and it seems only fair that they should be provided with an opportunity to benefit, not only through employment and revenue sharing, but also by the development of business expertise within their communities. **We therefore urge proponents and governments to create conditions under which the ability of northerners to participate in available business opportunities is maximized.**

2.2.6 Monitoring Committees

> *How can we have our elders better understand what is going on here? How can they be more involved?*
>
> E. Benoanie, *Transcript of Public Hearings*, Wollaston Lake, Saskatchewan, April 14, 1993, p. 106.

There is a need for the people of Saskatchewan to be reassured that the mines are operating in compliance with all regulations and that northern economic benefits are being maximized through appropriate hiring practices and policies related to business opportunities. However, it is clear from the hearings that neither the word of company executives nor of officials from the regulatory agencies will be accepted without a certain amount of scepticism. To be completely believed, information must come from knowledgeable and trusted members of the local communities. It would therefore appear that the objective of providing the citizens of Saskatchewan with accurate and believable information concerning the mines could be achieved most effectively by formation of a monitoring committee for each mine. Such a committee, composed of members elected by each of the primary impact communities, along with one or two knowledgeable persons appointed by the provincial government, could meet at the mine site with mine officials and representatives of the regulatory agencies two or three times a year to receive and scrutinize reports on the operation of the mine, and to observe site conditions. In turn, the committees,[20] which could derive their legal standing from regulations introduced by the appropriate government departments, would be required to issue annual public reports on their findings.

The regulations governing the committees should be stated in such a way that it is clear the committees can neither interfere with the operation of the mine nor attempt to formulate or influence policy. Their function would be one of receiving, evaluating and transmitting information in an understandable and unbiased fashion.

In addition, as the levels of education improve in northern Saskatchewan, the regulatory agencies would be wise to recruit members for their boards and technical staffs from the regions in which the mines are located. Having people from the northern communities actually involved in the regulation of the mines would help to demystify the work of the agencies and increase public confidence.

2.3 Biophysical and Related Concerns

The primary biophysical concern expressed by the public was contamination of the environment by radionuclides and heavy metals. Other contaminants, such as sulphates and chlorides, were of less concern. Contaminants can be released into the environment during the operational phase of the mines and long into the future. Consequently, proper decommissioning of the mines and long-term containment of contaminants were also major issues. Residents of the Athabasca region should be able to hunt, fish, harvest plants, drink the water, and use the land throughout the region without fear of being poisoned by past, present or future mining activity.

The following is a sample of the questions asked by the public.

- What are the background, i.e., pre-mining development, levels of the various contaminants in the region?
- What changes have occurred at the existing mine sites?
- Are the air, soil, water, sediments and biota being monitored adequately?
- Who checks to see that monitoring is done properly?
- How can the air and liquid effluent emissions be reduced?
- Are the air and water quality objectives appropriate for the region?
- Are there guarantees to ensure that the mine sites will be properly decommissioned?
- How will contaminants, especially the radionuclides and heavy metals in the tailings, be contained in the long term?
- What plans are there for the long-term monitoring of decommissioned mine sites?

[20] We suggest that these committees could consist of six people appointed for six-year terms (on a staggered basis to ensure continuity). Costs could be shared by government and the mines with government providing *per diem* and the mines providing transportation and accommodation. Alternatively, a more arms-length arrangement of costs could be made by providing grants that would be administered by a third party such as one of the Tribal Councils.

- Do the effects of different mines overlap and accumulate to produce regional effects? What are the cumulative effects?

In summary, the biophysical issues of most concern to the public were monitoring of the environment; the effects of liquid effluent and aerial emissions on the biota; the long-term containment of contaminants in the tailings; decommissioning; and cumulative effects. Each of these concerns is expanded upon in the following sections.

2.3.1 Monitoring

The reasons for monitoring the environment at each mine site have been discussed by Swanson[21] and Dirschl et al.[22] It is important to know what is there before mining begins; what changes will or have occurred during the operation of the mine; and how the environment will recover or be restored after decommissioning. This should include data on changes in the biota, and on the concentration of various radionuclides and heavy metals in specific ecosystem components.

Monitoring at the existing mines has concentrated on water, and then, with decreasing emphasis, on air, aquatic sediments, soil, and biota. Researchers have developed a voluminous database on chemical contaminants, but with little understanding of the impact of the various chemicals on the surrounding biota[23] and local inhabitants (section 2.4.2.1). There is a lack of integration in the monitoring of the various aspects of the environment and a possible lack of understanding of the rationale for monitoring some ecosystem components.

The panel recommends that a common model such as the Environmental Transfer Pathways model (ETP/AECB)[24] be used as the focus for integrating the monitoring program. This model is powerful, flexible and easy to use. It integrates airborne and water-borne emissions from multiple sources and predicts contaminant concentrations through time in specific components (air, water, sediment/soil, plant and animal species) at specific locations. The model may be used to predict the concentrations of a specific contaminant, such as arsenic, to which biota or humans may be exposed. This allows an assessment of environmental impacts or probable health risks, providing the biological effects of the contaminant are known. Alternatively, the cumulative radiation dose from all radionuclides may be estimated for humans obtaining their food and water from the immediate area of a mine-site. Thus, the main *"purpose of the proposed modelling is to determine if the food chains within local ecosystems could transfer significant quantities of radionuclides* or other contaminants *to any possible future inhabitants, so that their natural ecosystems can be fully protected from any potential...damage...The objective of the modelling is to protect future generations, their native food sources and the entire sustaining ecosystem from any deleterious effects...."*[25]

The ETP/AECB model is of limited value by itself. It is vital that it be validated by a carefully designed monitoring program which can determine whether the predictions of the model have any resemblance to reality. The model can help design the monitoring program in three main ways. First, it can identify key components that should be measured (monitored). Second, it can identify key processes, such as the transfer rates of contaminants between components, which may require quantification or further study. Third, it may suggest where permanent monitoring sites should be located relative to the expected concentration gradients of contaminants, as well as identify potential control (unimpacted) monitoring sites.

The ETP/AECB model and similar models used by the proponents in their Environmental Impact Statements suggest that the following components should be monitored: air, soil, terrestrial plants, a terrestrial vertebrate such as the snowshoe hare, groundwater, surface water, aquatic sediments, benthic invertebrates, and fish. Air and water should be monitored throughout the year. The remaining ecosystem components should be monitored on a two-year cycle, until the various sampling problems have been overcome, and then on a longer cycle as the changes slow down. In the post-decommissioning phase, the cycle may be five to ten years or even longer.

A carefully designed monitoring program will help to determine the impacts of the various emissions on the biota. However, it is difficult to isolate the impacts of mining on the biota from impacts on the biota caused by other factors. Therefore, an adequate monitoring program must include simultaneous monitoring of control areas, replication of treatments at independent sites, careful selection of sample sites and components, and use of standard methodologies to provide data that can be compared between sites and through time. **The panel recommends that the general design of the monitoring programs should be the same for all uranium mines.** This will guarantee the consistent replication of treatments required to determine biological impacts and eventually produce the database necessary for the study of cumulative biophysical impacts (see section 2.3.6).

The design of the monitoring program is the responsibility of the regulatory agencies in consultation with the mine operators. At present, data collection is the responsibility of the mine operators, with periodic independent samples collected by the regulatory agencies acting as an audit. This operates effectively for chemical monitoring, but monitoring of the biota will require a different audit. For the latter, the panel suggests

[21] S.M. Swanson, *Cluff Lake: Status of the Environment Report*, (Saskatchewan Research Council Publication No. E-2200-2-E-91, 1991).

[22] H.J. Dirschl, N.S. Novakowski, and L.C.N. Burgess, *An Overview of the Biophysical Environmental Impact of Existing Uranium Mining Operations in Northern Saskatchewan* (Ottawa: ESAS Inc., 1992).

[23] Swanson, *Cluff Lake: Status of the Environment Report.*

[24] Atomic Energy Control Board, *Cumulative Impact of Uranium Mining in Northern Saskatchewan*, Submission to Public Hearings, Saskatoon, Saskatchewan, May 4, 1993.
B. Zgola, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 4, 1993, p. 1-22.
D. Lawson, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 4, 1993, p. 22-45.

[25] Environment Canada, Western and Northern Region, Submission to the Public Hearings, Saskatoon, Saskatchewan, May 4, 1993.

that species' samples be retained permanently so that identifications and counts can be confirmed independently.

Finally, there is the issue of trust as discussed in section 2.2.6. Can one trust a company to monitor its own activities, and are the regulatory agencies too involved with the companies to provide independent, objective assessment of the data? The natural tendency of the proponents is to interpret the data in the most favourable and optimistic way. For this reason, **the panel recommends that biophysical monitoring be among the subjects reviewed by the Independent monitoring committees, proposed in section 2.2.6.**

2.3.2 Liquid Effluent

Mines deal with large volumes of contaminated water. The contaminated water comes from mine water inflow; from precipitation collected after it has percolated through ore stockpiles and special wastes; from the milling process; and from pore water expressed from the tailings. Treatment with chemicals precipitates most of the radionuclides and heavy metals which are then deposited in the tailings management facility. The resulting effluent has a high concentration of total dissolved solids (TDS) and a low concentration of radionuclides and heavy metals.

The method of water treatment involves an environmental trade-off, whereby the mitigation of one problem (containment of metals and radionuclides) creates or exacerbates another problem (increased salinity). The effluent is saline because the high TDS content consists largely of chloride and sulphate salts. This is fatal for some organisms and adversely affects others, particularly in a region such as northern Saskatchewan where the water normally has an extremely low TDS content. The environmental impact of increased salinity is acceptable for two reasons. It is less harmful than elevated concentrations of radionuclides and metals, and the salinity change in the receiving waters is not permanent. After decommissioning, when water treatment stops and the concentration of TDS drops to background levels, those organisms that have been eliminated because of the change in salinity can reinvade and become reestablished.

The dispersal of radionuclides and metals is not entirely prevented by the method of water treatment because the total environmental loading[26] of various contaminants can still be considerable if sufficiently large volumes of effluent are released. Even though the concentrations of radionuclides and metals are very low, the large volume of effluent means that surprisingly large amounts of these elements are released. For example, at Cluff Lake a total of 12,816 kg of uranium was released in 8,181,769 m^3 of water during the seven-year period, 1982-1988.[27] Similarly, the Department of Fisheries and Oceans has calculated that *"...over the anticipated life of the project, this will result in the discharge of approximately 103,230 kg of uranium"*[28] in treated effluent discharged from the McClean Lake project.

The spread of radionuclides and metals is limited because they are adsorbed by the sediments and suspended particulate matter, to a degree determined by factors such as the nature of the sediments and the speed of water flow. Contaminants will spread less if the effluent is released into a bog or lake where the water is in contact with rich organic sediments for a long period, than if released into a river or lake with a large turnover rate.

The two problems posed by liquid effluent are antagonistic; a decrease in one (salinity) leads to an increase in the other (total environmental loading of radionuclides and metals). Moreover, they are resolved in incompatible ways. In the first case, the effluent should be diluted as rapidly as possible to flush the salts from the system; in the second, the aim is to confine the effluent for as long as possible to allow time for contaminants to be adsorbed from solution.

One procedure that is compatible for both problems is to reduce the volume of effluent by decreasing mine-water inflow and by recycling water in the milling process as much as possible. A second compatible resolution is to remove radionuclides and metals from the contaminated water by other processes, such as adsorption onto organic particles or ion exchange columns.[29] Both solutions require further research.

The panel has three recommendations regarding the release of liquid effluent. **First, a research fund should be established to support the search for innovative ways to reduce the volume of effluent and the quantity of chemicals required to treat contaminated water.** The objectives should be a "zero effluent" mill, and liquid effluent from the other mining operations with low concentrations of all contaminants, not just radionuclides and metals. The research fund could be established at either the federal or provincial level and be administered by the appropriate regulatory agency. Funds could be obtained by placing a modest environmental tax on the total environmental loading of key contaminants in the liquid effluent.

Second, site-specific surface water quality objectives, appropriate for the Athabasca region rather than for Saskatchewan as a whole, should be developed. The present Saskatchewan Surface Water Quality Objectives (SSWQO), applicable for southern Saskatchewan where there is often a high concentration of TDS in the water, are not always appropriate for the Athabasca region. Where the SSWQO and the Canadian Water Quality Guidelines differ, the more stringent should apply. In addition, the new objectives should include a uranium water quality guideline for aquatic biota, and guidelines for any other significant ions or elements which are presently excluded.

[26] Total environmental loading = concentration of contaminant in effluent x volume of effluent released.

[27] T.P. Hynes, *The Impacts of the Cluff Lake Uranium Mine and Mill Effluents on the Aquatic Environment of Northern Saskatchewan*, M.Sc. Thesis, University of Saskatchewan, p. 40.

[28] *Position and Technical Review of the Response to the Uranium Mines Review Panel Request for Additional Information concerning the Complementary McClean Lake and Midwest Projects, McClean Lake Project*, Department of Fisheries and Oceans, Central and Arctic Region, Submission to Panel, March, 1993.

[29] *Technical Position on Dominique-Janine Extension*, Environment Canada. Submission to Panel, May, 1993.

Third, the total environmental loading should be specified for all contaminants. Each mine should be required to develop a material-balance for all contaminants released in its effluent. The mines should be able to account for the spread of contaminants in the watershed. The estimates could be checked by the monitoring program.

2.3.3 Air Emissions

The primary concern expressed by the public with respect to aerial emissions was the release of radon (and the subsequent deposition of radon progeny) from mine ore bodies, ore stockpiles, waste rock, the mill, water treatment facilities and tailings. Radioactive dust was also a concern.

For many people, the central question, however, is to what extent do radon and radon progeny from mining activity represent a regional or even global health hazard? On the one hand, "*... radon mixes very rapidly with the atmosphere, and the presence of even large radon sources cannot readily be detected a short distance away. Furthermore radon has a short radiological half life (less than four days) and the levels therefore cannot build up over a long period of time.*"[30] "*On the other hand, the tailings continue to release radon for over 100,000 years. And if the tailings are not isolated from the atmosphere, the sum of exposures for all those years could be large in absolute terms... Basically,...radionuclides are pumped out of the tailings area and over very large areas of land. And what we have is radioactive fallout onto vegetation consisting mainly of those polonium isotopes....*"[31]

Regional radon concentration data[32] indicate that the values for northern communities are as low as, or lower than, those for southern communities in Saskatchewan. However, elevated concentrations of radon progeny, particularly polonium-210, near the uranium mines could present a health risk if incorporated into food chains.[33] If the levels of radon progeny are elevated within a 5-10 km radius of a mine, and mines are developed so that tailings pits are in close proximity to one another, measurable cumulative effects could result. This could have a significant impact for inhabitants of the region choosing to obtain a substantial part of their food from the area, as noted in section 2.4.2.1.

This risk is difficult to assess because of inadequate monitoring of the aerial deposition of contaminants around the mine sites.[34] An improved monitoring program (see section 2.3.1) would address this problem. Secondly, the flux of radon from tailings management areas in the long term will depend on how they are decommissioned (see section 2.3.4). Finally, the future spatial pattern of development of uranium mines is not known, although several mines may be developed in the area to the west of Wollaston Lake. Future risks from the combined effects could be investigated by cumulative effects modelling (see section 2.3.6).

Because of its potential negative impact on the environment, all reasonable measures should be taken to minimize the release of radon and to thereby mitigate health risks by reducing the deposition of radon progeny. Measures should also be taken to reduce the creation and release of radioactive dust to a practical minimum.

2.3.4 Tailings

Most of the radionuclides and metals contained in the ore body are deposited in the tailings management facility. The long-term containment of these dangerous contaminants is vital.

There are two tailings management design concepts used in Saskatchewan. The first stores the tailings above ground. Contaminants are contained in the long term by covering the tailings and encapsulating them above the water table. However, some seepage of precipitation through the cover will always occur, resulting in continuous seepage through the tailings and the lowest seal of the downstream impermeable barrier. "*...there is no known way to achieve near absolute contaminant immobility and thus a maintenance-free condition*".[35]

The second type stores the tailings in a pit below the water table using a pervious surround method. This involves lining the pit with a very permeable layer and placing the tailings in the centre. The enclosed tailings are expected to consolidate and become more dense than the surrounding layer. The contaminated water expressed from the tailings as they consolidate is pumped from the bottom of the pit to the water treatment plant. After the site is decommissioned, water ideally will move around the tailings through the more permeable surroundings so that, theoretically, contaminants will only be released by diffusion, a very slow process. "*...through this method, the radionuclides and other chemical contaminants can be virtually immobilized within the tailings deposit. In theory, the method appears to be flawless but only time will tell and, as yet, not enough time has passed to enable a final assessment.*"[35]

Both methods of tailings management must contain contaminants for tens of thousands of years before they will cease to be a radiological hazard. Moreover, the non-radioactive toxic metals, such as arsenic, will persist forever. Perhaps wisely, the public fears that whatever can go wrong, will go wrong. For example, the cover or dikes encapsulating the above-ground tailings may erode and fail, allowing rapid dispersal of contaminants into the air and surface waters. Thus, the long-

[30] L. D. Brown, *Risk Assessments for Exposure of the Public to Ionizing Radiation*, Submission to Public Hearings, Saskatoon, Saskatchewan, May 7, 1993, p. 3.

[31] G. Edwards, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 19, 1993, p. 80.

[32] *A Cross-Canada Outdoor Radon Survey*, B. Grasty (1991), together with the results from a follow-up survey completed in 1992. Submitted to the panel by Mineral Industry Environmental Protection Branch, SERM, April 26, 1993.

[33] M. Shiell, *Biophysical Aspects of High-Grade Uranium Mines*, Submission to Public Hearings, Saskatoon, Saskatchewan, May 5, 1993.

[34] H.J. Dirschl et al, *Biophysical Environmental Impact*, p. 81.

[35] H.J. Dirschl *et al*, *Biophysical Environmental Impact*, p. 77.

term storage of these harmful substances needs to be studied very carefully.

One suggestion made to improve the safety of the tailings storage would be to remove thorium-230 and radium-226 from the tailings.[36] These two elements have half-lives of 80,000 and 1,622 years, respectively, whereas the other elements in the uranium decay series have half-lives ranging from a fraction of a second (polonium-214) to a few decades (lead-210). Thus, the removal of thorium-230 and radium-226 would reduce the radiological hazard of the long-term storage of the tailings. The concentrated thorium and radium would comprise a small volume, permitting more expensive methods of containment to be considered for these elements.

A second suggestion concerns the cover for the in-pit, pervious surround method.[37] If the tailings were covered with successive layers of glacial till, waste rock and overburden rather than with water, the tailings should consolidate still further as a result of the increased pressure. This should make it even more difficult for water to flow through the tailings and disperse contaminants, and should minimize the flux of radon to the atmosphere (see section 2.3.3).

Such suggestions require careful study and research. **The panel concludes that research funds are required to examine innovative techniques for the management of the tailings.** Funds could be created and administered in a similar way to that proposed for funding research on liquid effluent (see section 2.3.2).

> *And now here the uranium companies are asking us to increase the level of experimentation in a major way when the verdict isn't nearly in on the first round of experiments in waste management.*
>
> V. Drummond, *Transcript of Public Hearings*, Prince Albert, Saskatchewan, April 21, 1993, p. 146.

2.3.5 Decommissioning and Post-Decommissioning

Following uranium extraction, the mine site and surrounding environment should be restored to approximately their original state. The inhabitants of the Athabasca region should be able to use the territory in traditional ways: hunting, fishing, trapping, and gathering berries and herbal medicines. The way in which the site is decommissioned should be in part under the control of the inhabitants of the region. For example, they should be involved in decisions about whether open pits should be allowed to fill with water (contaminated at least in the short term), or whether they should be filled with waste rock topped by glacial till.

The public was adamant that decommissioning costs are the financial responsibility of the mining companies and not of the government (i.e., the taxpayer). Much of this concern stems from the unsatisfactory way in which mines near Uranium City were abandoned when they were no longer profitable. For example, it appears that it is going to be costly to complete corrective work at the Gunnar Mine site.[38] Furthermore, because of poor initial planning, it seems likely that it will not be possible to restore the site as completely as is desirable and in as acceptable a fashion as the public expects for modern mining operations. This situation must not be allowed to reoccur.

The projects under consideration have been described in such a way that preliminary plans for decommissioning and site restoration have been established and agreed upon in advance; however, it is also necessary to have a guarantee that corporate funds will be available to execute these plans regardless of the financial health of the owners. Without such guarantees the public would not be protected from future costs if the mine owners were unable to provide the required funds. The guarantee should cover the possibility of an unexpected cessation of operations prior to completion of the project as well as the costs associated with decommissioning and site-restoration after the ore has been completely extracted as envisaged in the Environmental Impact Statements.

The public was also insistent that, because of the long-term hazard of contaminants, the mine-site should be monitored long after the mines have closed. Clearly, funds are also required for post-decommissioning monitoring.

During the public hearings, we were told that there are several ways in which a company could provide such guarantees. Insurance, performance bonds, trust funds, an irrevocable letter of credit and a pledge of assets were mentioned as possibilities.[39] Other jurisdictions, such as British Columbia, have introduced programs that require deposition of "reclamation securities" at the commencement of a project and a periodic re-evaluation to ensure that potential decommissioning and post-decommissioning costs have not expanded to exceed the value of the securities on deposit.[40] While not wishing to suggest the exact form it should take, **we recommend that a financial guarantee to cover the decommissioning and post-decommissioning costs of a project be secured from the proponent before that project is approved.**

2.3.6 Cumulative Effects

Cumulative biophysical effects are complex because the effects may be cumulative in several ways.[41] Effects may:

[36] G. Edwards, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 19, 1993, p. 82.

[37] Environment Canada, Western and Northern Region. Submission to the Public Hearings, Saskatoon, Saskatchewan, May 4, 1993, p. 26-28.

[38] R. Barsi, *Transcript of Public Hearings*, Regina, Saskatchewan, March 23, 1993, p. 111.

[39] K. Haapanen, *Transcript of Public Hearings*, Regina, Saskatchewan, March 23, 1993, p. 388.

[40] *Guidelines for Mineral Explorations: Environmental, Reclamation and Approval Requirements*, Ministry of Energy, Mines and Petroleum Resources, Province of British Columbia, 1992.

[41] H. Sadar et al, *Assessing Cumulative Effects of Saskatchewan Uranium Mines Development*, December, 1992.

- be cumulative through time;
- be cumulative in space (multi-sources of contaminants from a single mine, several mines, or mines plus other activities in an area);
- be a combination of several different contaminants on a single species; and/or
- impact one or more species through ecosystem alterations.

A good example of cumulative effects through time is shown with the issue of total environmental loading, discussed in section 2.3.2. The concentration of a contaminant may be extremely low in the liquid effluent but the total amount of the contaminant released may be large because of the enormous volume of effluent. If the contaminant is adsorbed by aquatic sediments, its concentration may increase in the sediment to levels above that observed in the water column. This process of concentration of contaminants by aquatic sediments has been observed for molybdenum and uranium at the Cluff Lake mine,[42] although the biological effects are unknown at this time. Thus, compliance with regulations, such as Saskatchewan Surface Water Quality Objectives, does not necessarily prevent the accumulation of some contaminants, over time, to potentially harmful concentrations. There is a need for limits on total environmental loading of contaminants and for an accounting of the fate of all contaminants released, as recommended in section 2.3.2. **The panel recommends that the Saskatchewan government adopt sediment quality guidelines similar to those of the Ontario government.**

A contaminant may also be released from several sources at a single mine, or from different mines, resulting in spatial cumulative effects. One example is the release of radon from mine workings, waste rock, ore stockpiles, the mill, the tailings management area, and the water treatment plant at a single mine. The various emissions must be considered together to determine how they overlap and potentially augment one another. Another example is the release of liquid effluent from different mines into the same watershed or convergent watersheds. In considering the cumulative impacts of different mines it has been argued that, *"In provincial monitoring procedures, existing sources are monitored to the point where measures do not exceed background. This provides the point at which the potential for cumulative impacts is generally considered to be zero. Provided there is no overlap in areas, there is no cumulative or "combined" impact".*[43] This is true for most species in ecosystems because the individual members of those species live entirely within the sphere of influence of a single mine. However, it is not necessarily true for the few species, such as barren ground caribou or humans, which range over an area that may include several mines. In the latter case it can be argued that the exposure to contaminants is additive if there is more than one mine in an individual's home range. For example, exposure would be approximately doubled if there were two mines rather than a single mine in an individual's home range, and so on. Thus, spatial cumulative effects need to be assessed carefully on a case-by-case basis.

Organisms are not affected on a contaminant-by-contaminant basis but by the combined effects of all contaminants, and other forms of disturbance. For example, an organism may be very sensitive to changes in salinity,[44] although the precise mix of ions may also be important. The interactive effects of the various contaminants are extremely varied. They may be greater than the sum of the individual effects taken independently (i.e., synergistic), such as the health risk of radiation and arsenic discussed in section 2.4.1.2. In contrast, the effects of different contaminants may also be antagonistic. For example, the toxic effects of ammonia and many other contaminants are reduced as the hardness[45] of the water increases.

The cumulative effects through time and space, and between different contaminants, can be modelled and assessed in a preliminary way by the Environmental Pathway model (ETP/AECB) discussed in section 2.3.1. However, the cumulative biological effects are impossible to predict in detail because the effects on organisms are species-specific, and ecosystem processes are extremely complex. Moreover, ecosystems can compensate for some environmental changes. For example, if an increase in the salinity causes the elimination of a species, the effect on the structure and function of the ecosystem may be minimal if that species is replaced by a similar, more salinity-tolerant species. From a practical point of view, the main assessment of cumulative biological effects will require a well-designed monitoring program. The latter requires that whole ecosystems be studied by monitoring key components and processes, as discussed in section 2.3.1. Such a program should identify major changes in ecosystem structure and function, and measure contaminant concentrations in important species that may be harvested by humans.

We recommend that a program designed to monitor cumulative biological effects be implemented for the Cluff Lake site and the west side of Wollaston Lake before further development is allowed.

2.4 Health Issues

Health is widely accepted as being more than the absence of disease; it is a state of physical, mental and emotional well-being. The terms of reference of the panel reflect this broad understanding by encompassing socio-economic effects along with environmental and health considerations. All three potential impacts on health (i.e. direct physical effects, socio-economic effects, and psychological effects) have, therefore, been included in our analysis of the possible effect of the proposed uranium mines on worker and community health.

[42] T. P. Hynes, *Impacts on Aquatic Environment.* S. Swanson, *Cluff Lake: Status of the Environment Report.*

[43] R. Zukowsky, *Perspectives on Cumulative Impact Assessment in Saskatchewan.* Submission to Public Hearings, Saskatoon, Saskatchewan, May 4, 1993, p. 4.

[44] Salinity is defined as a measure of the total amount of soluble salts (ions) in water or soil.

[45] Hardness is defined as the concentration of calcium and magnesium in soil and water.

2.4.1 Occupational Health and Safety

The occupational health and safety hazards facing uranium miners include those associated with all mining operations as well as those specific to uranium mining. Thus, in addition to musculoskeletal injuries; respiratory diseases, including silicosis; heavy metal toxicity; and vibration and noise-induced injuries, uranium miners encounter radiation-related diseases.

2.4.1.1 Radiation Health Risks

It is now internationally accepted that ionizing radiation carries a greater risk per dose of exposure than had been thought previously. This acceptance is based on new scientific evidence, which recognizes that each milliSievert (mSv) of exposure is actually associated with 2-4 times greater risk than had been appreciated when the former standard was applied. The International Commission on Radiation Protection (ICRP), therefore, has recommended decreasing the allowable occupational exposure from 50 mSv annually, to 20 mSv per year averaged over 5 years. The new standard also includes contributions from all sources of radiation exposure. The level of acceptable risk was chosen because it corresponds to a one in 10,000 mortality risk per year (0.4% lifetime risk of occupationally-induced death). This is comparable to occupational risk in other industries and is therefore thought to be acceptable.[46] However, some labour organizations and environmental groups believe it is still unacceptably high, and continue to question the science on which it is based.[47]

> *...relatively low doses spread among a relatively high population of workers do not produce fewer detriments than a high dose spread among a small group of workers.*
>
> D. Anderson, *Transcripts of Public Hearings*, Saskatoon, Saskatchewan, May 17, 1993, p. 24-25.

In 1991, the AECB published Consultative Document C-122 to invite public comment on the adoption of the ICRP-60 exposure standards. A presenter pointed out that some of the proposed workplace designs would exceed the proposed 20 mSv/year limit, and another urged caution in adopting the ICRP-60 standards because, "*In the case of uranium mining where the ability to modify exposure of workers is limited, imposition of lower dose limits is unlikely to reduce the collective dose. In fact, it may be that by forcing uranium mining companies to adopt job rotation schemes, the collective dose, and the consequent risk, may be increased.*"[48] Another presenter cited the *Ham Commission's*[49] warning that using miners for shorter time periods without reducing the total exposure would probably increase the number of cancer victims.[50]

We agree with these cautionary comments, but also recognize that there is a consensus of scientific opinion indicating that a tightening of standards is warranted. **It is, therefore, recommended that measures be taken to implement the standards recommended by ICRP-60 before approval of any additional uranium mines; measures must also be taken to ensure that collective doses are not permitted to rise.**

In addition to complying with established radiation standards, uranium mining companies are required to implement the concept of ALARA (As Low As Reasonably Achievable) risks.[51] It is not permissible to use a certain method if a comparable, but safer, method is available. This principle recognizes that unnecessary exposure is unacceptable, even if regulations are not exceeded. In our opinion, ALARA is an important concept, one that the proponents and regulators should vigorously promote. During the hearings, it appeared that some proponents had not used their past experience to develop a good understanding of the significance of health effects attributable to radiation exposures. This is worrisome given the importance of this understanding as a motivator in applying the ALARA principle.

Of equal importance to the application of good regulations and the observation of the ALARA principle is the insistence upon maintaining actual (not approximate, estimated or average) exposure records. Instrumentation for this purpose is now available and **we recommend that the use of personal dosimetry which measures both alpha and gamma radiation become standard practice in uranium mines.**

2.4.1.2 Combined Effects of Radiation and Heavy Metals

Some Saskatchewan mines contain high concentrations of arsenic and nickel, both known to be carcinogenic, as well as uranium. A study of Ontario miners has suggested that there is a synergistic effect between radiation and arsenic exposure.[52] This finding implies that the risk of lung cancer to

[46] M. Measures; D. Brown. *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 7, 1993.

[47] M. Schmidt, "The New Recommendations of the International Commission on radiological Protection—No Progress for Radiological Protection", *International Perspectives in Public Health*, Vol. 7, (1991), p. 20-28; "Permitting Unacceptable Risks: The New International Commission on Radiological Protection Radiation Safety Standards", *Friends of the Earth*, London, England, (February, 1991).

[48] T. Meadley, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 19, 1993, p. 230.

[49] *Report of the Royal Commission on the Health and Safety of Workers in Mines*, James Ham, Chairperson, 1976.

[50] S. Helliar, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 17, 1993, p. 199.

[51] D. Brown, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 7, 1993, p. 200-201.

[52] R.A. Kusiak, A.C. Ritchie, J. Muller, J. Springer, "Carcinoma of the Lung in Ontario Gold Miners: Possible Aetiological Factors." *British Journal of Industrial Medicine*, April, 1991.
R.A. Kusiak, A.C. Ritchie, J. Muller, J. Springer, "Lung Cancer Mortality in Ontario Uranium Miners", draft paper issued for comment, October 15, 1991; subsequently accepted for publication in the *British Journal of Industrial Medicine*, 1993.

miners employed in mines with both a high grade of uranium and a high concentration of arsenic may be considerably greater than predicted from the sum of the individual exposures. A similar situation may also exist for nickel and other mining exposures, although this has not been well studied (see section 2.4.1.3).

Whether the risks of arsenic, and possibly nickel,[53] in the presence of radiation are synergistic or additive, it is clear that miners working in such mines are likely at greater risk than their counterparts in mines which contain little or none of these heavy metals. It would, therefore, seem reasonable that the regulated exposure limits should be adjustable to account for variations in mining conditions. **It is recommended that the proponents voluntarily reduce exposure limits for underground mines containing high concentrations of arsenic, and that regulators establish site-specific combined exposure limits that would approximate an acceptable risk.**[54]

> *The hazards posed by the high-grade uranium ore are exceedingly multiplied by the intimately associated very large amounts of high-grade arsenic...*
>
> J. Stmad, *Speaking Notes for Public Hearings*, Saskatoon, Saskatchewan, May 5, 1993.
>
> *...the Saskatchewan limits will probably be amended to reflect the evidence of increased cancer risk from inorganic arsenic....*
>
> J. Alderman, *Speaking Notes for Public Hearings*, Saskatoon, Saskatchewan, May 4, 1993, p. 3.

2.4.1.3 Epidemiological Studies

Much of the information regarding the health effects of mining has come from epidemiological studies. These studies of the distribution and determinants of disease have served as the basis for identifying hazards, quantifying risk and setting standards to control these risks. During the late 1940's and into the 1950's, as uranium mining expanded, excess lung cancer was documented in US uranium miners as a result of an epidemiological study conducted by the US Public Health Service.[55] Since then, many other groups of underground miners have been documented to have increased risk of lung cancer. This has generally been thought to be related to the radon contamination in underground mines. Recently, however, the role of other cancer-causing exposures in mines has also been actively explored.

To date, four epidemiological studies of Canadian uranium miners have been conducted and all have shown increased risk of lung cancer.[56] The Ontario Miners' study followed the mortality experience of over 50,000 miners who worked in Ontario uranium mines by linking the list of miners to the Canadian National Mortality Database, internationally renowned for its comprehensiveness. The exposure to radon progeny for the period before 1968 had to be estimated by linking work histories with area measurements, as personal dosimetry information was not available during the early years. The uranium miners showed a significant increase in overall deaths and specifically deaths from lung cancer. Excess mortality from lung cancer in Ontario gold miners (exposed to large concentrations of arsenic) was also found.[57] This is when the authors realized that exposure to arsenic and radon decay products was particularly problematic. A follow-up of these miners confirmed that the risk of death due to lung cancer was greatest among uranium miners, who had also worked in gold mines.[58]

Workers employed in the Port Radium mine were also found to have a significant excess in lung cancer deaths. A study of over 8000 workers employed between 1948 and 1980 at Beaverlodge Uranium Mines was also conducted. A much greater excess of lung cancer was found in Beaverlodge miners compared to the Ontario and Northwest Territories miners, which has raised many questions. Smoking appeared unlikely to have accounted for much greater risks. Apparently, a follow-up study of these miners has been conducted, but it is not known to the panel[59] whether the much greater risk (per working level) experienced by these miners was related to faulty exposure estimates or other explanations.

There have been major improvements in mining techniques and ventilation standards in mines during the past few decades. Exposure standards have also been reduced and it would appear that mining conditions are now better than ever before. Without appropriate study, however, it is impossible to provide quantitative verification of this assumption. As discussed in the previous section, some of the changes may, in fact, be detrimental to the overall health of miners. The only way that one can properly ascertain the consequence of any changes is through a thorough epidemiological study. Such a

[53] Internationally respected committees on cancer have consistently concluded that there is strong evidence that some types of nickel are carcinogenic. While the Ontario-based studies have confirmed increased cancer with some types of nickel exposure, and have also found increased lung cancer in nickel miners, the carcinogenic agent in nickel mines is still the subject of investigation.

[54] Acceptable risk is considered to be one in 10,000 occupational-induced mortalities per year as recommended in ICRP-60.

[55] National Research Council, Biological Effects of Ionizing Radiation Committee (BEIR IV), *Health Risks of Radon and Other Internally Deposited Alpha Emitters*, (Washington, DC: National Academy Press, 1988).

[56] M. Measures, "Exposure and Dose Limits for Workers and Members of the Public in Canada," *Submission to Public Hearings*, Saskatoon, Saskatchewan, May 7, 1993, p.9.

[57] R.A.Kusiak, A.C. Ritchie, J. Muller, J. Springer, "Carcinoma of the Lung in Ontario Gold Miners: Possible Aetiological Factors", *British Journal of Industrial Medicine*, April 8, 1991, p. 808-817.

[58] R.A.Kusiak, A.C. Ritchie, J. Muller, J. Springer, "Lung Cancer Mortality in Ontario Uranium Miners". Draft paper issued for comment, October, 15, 1991; later accepted for publication in the *British Journal of Industrial Medicine*, 1993.

[59] At the time of the hearings, this report was unavailable.

study would compare the health impacts on miners from the Uranium City era with those from the more modern mines at Rabbit Lake, Key Lake and Cluff Lake. It would compare open-pit and underground mines and provide data on whether the effects of various miner rotation/shift patterns could be evaluated from a health perspective. It could also be used to predict future risks and perhaps suggest ways in which they could be mitigated. While an adequate latency period is required before any results could be truly reassuring, beginning a study now (15 years after commencement of the modern mines) would still be useful.

With the introduction of personal dosimetry monitoring, as recommended in section 2.4.1.1, the continuation of this epidemiological study into the future would permit comparisons to be made using actual, not average or estimated, exposures. Proper monitoring would also provide the data required to gain insight on questions surrounding the possible additive or synergistic effects of arsenic, nickel, or other mining exposures. **For these reasons, it is recommended that arrangements be made to conduct an on-going epidemiological study of all Saskatchewan uranium miners (past, present, and future). It is recommended that the study begin as soon as possible, and that the results be promptly communicated to the public.**

> *The reality for workers has been that when experts disagree, the worst case scenario has generally proven to be the one that is closest to the truth.*
>
> Communications, Energy and Paperworkers Union of Canada, *Submission to the Public Hearings*, Saskatoon, Saskatchewan, May 18, 1993, p. 4.

2.4.1.4 Noise Reduction

The control of noise in mines is an occupational health and safety issue that merits particular comment. Excessive noise is a safety factor because it can cause fatigue, and interfere with communication, thereby increasing the chance of an accident or an injury. It is also a direct health concern because it can cause hearing loss or damage.

Saskatchewan Labour's brief indicated that "*...amendments to the Occupational Health and Safety Regulations will probably place more emphasis on noise reduction*".[60] **We agree with this objective and urge that regulations which place emphasis on noise reduction be introduced.**

[60] J. Alderman, *Speaking Notes for Public Hearings*, Saskatoon, Saskatchewan, May 4, 1993, p. 3.

[61] G. Telfer, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 4, 1993, p. 201-204.

2.4.1.5 Importance of Worker Involvement

> *...If education, monitoring and dose reduction programs are to be effective,...they must be developed and implemented with full participation of the worker who knows better than anyone else what is going on in the workplace, and how conditions can be improved.*
>
> G. Telfer, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 4, 1993, p. 203.
>
> *As workers have to accept a risk, they should do so on the basis of full participation and a complete understanding of the issues involved.*
>
> J. Alderman, *Speaking Notes for Public Hearings*, Saskatoon, Saskatchewan, May 4, 1993, p. 2.

Worker education and formal worker involvement in health and safety are crucial to worker protection. Saskatchewan's proposed new *Act Respecting Occupational Safety and Health* (Bill 56) will recognize this reality and require the establishment of joint workplace safety and health committees with defined responsibilities. **The proposed legislation (Bill 56) would promote a higher level of assurance in the health and safety of the proposed new mines and its timely adoption is recommended.**

A union representative who appeared before the panel indicated that union members wanted mining jobs, but believed that much could be done to further reduce risks to workers.[61] He also contended that occupational health and safety committees function best in unionized workplaces, and expressed particular concern for health and safety of workers of non-unionized mine contractors.

The brief from the union also referred to a computer-based training course on radiation safety,[62] which has been used at Cluff Lake. We suggest that this type of learning tool should continue to be developed, adapted as needed, and made available to all workers in this industry.

2.4.1.6 The Need for Occupational Health Professionals

With the advent of the Workplace Hazardous Materials Information System (WHMIS) and other worker right-to-know initiatives, workers are asking more questions about health hazards and the potential work-relatedness of their health problems. Occupational health matters, important in any workplace, are particularly fundamental with respect to uranium

[62] *All About Radiation*, a self-teaching interactive video produced by the Canadian Institute for Radiation Safety, Saskatoon.

mines, because of radiation-related health issues. While physicians working in northern Saskatchewan have taken initiatives to assist workers/patients with such concerns, the resources and training needed for these often complex assessments seem to be insufficient.[63] Limited availability of occupational physicians' time may severely restrict the number of visits and the extent to which occupational health concerns can be addressed. **The proponents should ensure adequate availability of knowledgeable occupational health professionals.**

2.4.1.7 Socio-Economic Related Health Impacts

Proposed workcamp amenities and site facilities have been described in the EIS, along with a discussion of issues related to worker lifestyle. The latter included existing or proposed measures regarding alcohol, tobacco and drugs, recreation and entertainment needs, and food and accommodation. We note that the impact of the mines in these areas is likely to be positive. In workcamp situations, however, attention should be paid to both primary prevention measures, and to early identification of problems followed by counselling and rehabilitation as needed.

The way in which workers are hired, fired or promoted can either increase or reduce stress depending on the perceived fairness of the process followed. This is particularly important when minorities are involved. **The need for culturally-sensitive orientation and counselling to ease the adjustment of aboriginal people into full-time industrial employment is evident.**

Most workers who addressed the issue of worker lifestyle strongly supported the 7 day-in/7 day-out shift concept. Although there are hardships associated with the commuting lifestyle, there are also problems related to boom-and-bust mining towns. **On balance, the panel finds the 7 day-in/7 day-out concept acceptable. There is, however, a need for the proponents to provide on-site counsellors who can help workers resolve family/work conflicts and related issues.**

The proceedings of a conference held in Saskatoon[64] reported a number of cautionary observations about the 7 day-in/7 day out rotation. For example, it noted that health and safety implications of rotational schedules and the extended workday are still not well understood and need further study. The conference also noted that diet is an important issue associated with the employment of a native labour force; to avoid digestive problems, it was advised that country foods (fish and game) be included in the diet. With respect to family stress, the conference summary cited a survey in which three-quarters of the respondents had an overall negative view of the commuting system and about 60% of the remainder had some negative comments, with spouses more negative than miners. It was noted that 67% of long-distance commuting miners were married, and 92% were male. The conference urged the hiring of more women, the hiring of couples, subsidized and private telephone lines and social events for families.

The panel also noted that very few of the women presenters supported uranium mining development, and that few women have been hired in this industry. More obvious opportunities for women in this industry might offset some of their concerns.

The panel concludes that flexibility to accommodate family needs should be encouraged and that special attempts should be made to provide employment opportunities for a growing pool of well-qualified northern women.

2.4.1.8 The Psychological Health of Workers

The importance of traditional harvesting and gathering activities to the spiritual well-being of aboriginal people was stressed throughout the public hearings. Many people stated that working at the mines does not negate these activities; in fact, some presenters noted that uranium mining development can actually enhance the potential for continued traditional activities. In any event, work arrangements that permit employees to engage in traditional activities will promote their health and well-being.

Risk, or the perception of risk, can also have a strong effect on the psychological health of workers. Everyone accepts certain risks daily; driving a car, walking across a street and almost everything else we do involves risk. Usually such risk does not impact on health from either a physical or a psychological perspective. However, if, in order to find employment, one is forced to accept risk or engage in an activity which he or she may feel is potentially detrimental, it may have a psychological effect on his/her health and sense of well-being. It is, therefore, important to understand those factors that contribute to the acceptability of the risks associated with uranium mining. These are discussed further in section 2.4.2.5.

2.4.2 Community Health Impacts

> *...the data from Saskatchewan Environment and Resource Management, as well as Saskatchewan Labour, indicates that within a few kilometres of existing uranium mining sites that radiation levels are back to background. Therefore, unless there is an emergency spill, there should be no direct negative impact on the physical health of people who live in the areas surrounding the mines...Even though it is much easier to study a biomedical impact like cancer than a socio-health impact like employment, both issues are relevant and important to the health of northern residents.*
>
> J. Lyster, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 7, 1993, p. 207.

[63] D. Dewar, *Transcript of Public Hearings*, Buffalo Narrows, Saskatchewan, April 19, 1993, p.104-105.

[64] *Long Distance Commuting in the Mining Industry: Conference Summary*, edited by M. Shrimpton, K. Storey, Centre for Resource Studies/Energy Mines and Resources Conference, November 1990, Saskatoon, Saskatchewan.

2.4.2.1 Contamination of Air, Water and the Food Chain

There is a fundamental concern that chemicals from uranium mines may enter surface or groundwater, thereby contaminating drinking water, and fish. The potential terrestrial contamination of edible local foods (including terrestrial wildlife), and the consequent effect on human health must also be considered. In this regard, the need for proper environmental monitoring (section 2.3) is evident.

Some presenters raised concern about a potential link between uranium mining and adverse health effects such as cancer, birth defects, spontaneous abortion and a myriad of other problems. A calculation of health risk to someone eating caribou daily was conducted by experts from the Bureau of Radiation and Medical Devices, Health and Welfare Canada.[65] Various tissues from the caribou in Baker Lake were found to contain elevated concentrations on polonium-210 and lead-210, which were associated with a calculated total dose to the consumer of 1.41 mSv/year. Using the ICRP-60 risk coefficient, a lifetime cancer risk of 0.5% is calculated, compared to the background cancer risk of about 20%. This level of increased risk is small, roughly equivalent to the risk associated with natural background radiation. Whether or not this incremental level of risk is acceptable is the subject of debate. The lack of environmental health risk assessment data makes any conclusions regarding the health concerns of the impacted communities problematic. **Appropriate studies are needed to more fully assess environmental health risk to human populations caused by the possible contamination of air, water and the food chain.** Such studies should be conducted as part of the comprehensive community health studies recommended in section 2.4.2.6.

2.4.2.2 Transportation of Dangerous Goods

Residents of some of the villages along northern highways raised concerns related to the transportation of dangerous goods over roads that pass near or through their communities. We also heard from individuals familiar with the trucking industry who described precautions taken during the transportation of dangerous goods. Although we do not wish to recommend new legislated requirements in this area, we urge that care be taken to ensure the safe handling of materials, and that emergency training and response capabilities be available to all impacted communities. It is the proponents' responsibility to share information concerning the materials being transported, and their safe handling and emergency response measures, with the communities.

> *...whatever you get out of the uranium mine is transported within the town of La Loche...if there was a spill here....What kind of precautions are we going to take within the community?*
>
> I. LeMaigre, *Transcript of Public Hearings*, La Loche, Saskatchewan, April 20, 1993, p. 107.

[65] *Health Assessment of Po-210 in Caribou from the NWT*, memo submitted to the Public Hearings by D. Lawson, Saskatoon, Saskatchewan, May 4, 1993.

2.4.2.3 Socio-Economic Impacts on Health

Some concern was expressed that mine employment could cause community health problems through the influx of money, drugs and alcohol into the communities. For example, the presence of a few large wage-earners may increase the despair of those unable to obtain employment and thereby contribute to community disharmony. On the other hand, the panel heard from many young people who want the jobs and business opportunities provided by the mines, and who look to those who have been employed in the mines as positive role models.

In some of the communities, living conditions are poor, often lacking basic sanitation and infectious disease control measures. Depressed social, psychological and economic conditions have produced a situation that is inadequate from a health perspective.

Rapid population growth in some communities has resulted in the presence of a number of young people who need to establish their self-worth either through traditional land-use activities or employment. **Recognizing this reality, the panel concludes that economic development is imperative to the health and well-being of northern peoples.**

The role uranium mining could play in this needed development was the subject of many presentations. In addition to jobs and business opportunities, positive benefits reported include the establishment of an air transport system and the creation of roads which presently link many northern communities. Such transportation networks have found strong acceptance by most communities.

On the other hand, public concern was expressed that some of the community health problems may be partially attributable to the increasing development of public roads, and the consequent availability of alcohol, etc. No studies are available, however, to assess concerns that increasing community health risk has developed as a direct result of mining activity. This emphasizes the need for the comprehensive health studies recommended in section 2.4.2.6.

2.4.2.4 Environmental Protection, Development and Health

The importance of preservation of the environment to the health and well-being of individuals, their communities and future generations was a common theme at the public hearings.

Several presenters discussed various socio-economic philosophical perspectives; one stated that developmentalists see their goal as creating a comfortable and efficient lifestyle

through an understanding of how things work (science), producing the most efficient tools (technology), and advancing as quickly as possible (progress). She contrasted this with environmental and native traditionalist values which stress responsibility as stewards of the earth—locally, regionally and globally in this and future generations. She and other presenters challenged the developmentalist values as seeing "*...the environment as existing to serve humanity's need to prosper*".[66] The dichotomy between the wish for a pristine environment and the need for economic development may cause internal conflict and consequent health problems. Decision makers should recognize that the ideology of development is not embraced by all.

2.4.2.5 The Acceptability of Risk

The presence of health risk can have a profound effect on the physical and psychological health of a community. The acceptance of such a risk is usually linked to a variety of factors, some that may have little to do with scientifically quantifiable exposures, doses or documented effects. The perception of a risk can often be just as damaging as its actual presence. Every effort should therefore be made to provide impacted communities with a sound basis for judging the extent of a risk or the lack thereof. The following principles should be carefully considered when proponents and governments expect communities to accept the risks associated with the intrusion of uranium mines onto their lands.

- The most important determinant of acceptability of risk is whether or not that risk is voluntary. The right to say no makes saying yes much more acceptable. Letting people of the north decide was a major theme in numerous presentations.

- The distribution of risks and benefits must be perceived to be fair; those who must endure the greatest risks should reap the greatest benefits.

- Trustworthiness is an essential element in the acceptability of uranium mining. Monitoring committees, composed largely of people from the impacted communities, may be able to provide information that northerners will trust.

- Health risks associated with memorable catastrophic events are more feared. The fact that the world first learned of nuclear technology from Hiroshima and Nagasaki cannot be ignored.

- Health risks from "natural" versus "man-made" sources cannot be compared. The fact that radon levels in basements may be greater than radon levels in some mines is irrelevant to many people.

- A risk is deemed more acceptable if there is a good moral reason for accepting it; conversely, if a risk offends an individual's moral standards, it is unacceptable. The possibility that uranium mining may contribute to global problems has caused many people to view it as an immoral activity. Few communities would wish to accept a risk that could contribute to the proliferation of nuclear weapons or similar problems.

- Some of the uncertainties regarding the potential long-term health impacts of uranium mining relate to the inherent complexity of the issues and the absence of sufficient study. Education could lead to a better understanding of this industry and a consequent decrease in the uncertainty of its impacts by the public. It is not clear to the panel how this information could best be conveyed nor whether a more sophisticated understanding would lead to better acceptance or more widespread rejection of uranium mining.

Proponents and regulators should take these factors into consideration when they are dealing with impacted communities.

> *Many people feel an uneasiness when uranium mining is mentioned. They don't have anything definite that they can put their finger on.*
>
> C. Bradek, *Transcript of Public Hearings*, Prince Albert, Saskatchewan, April 21, 1993, p. 139.

2.4.2.6 Disease Causation and Community Health Data

Some northerners raised questions about possible links between a wide variety of health problems in their communities and the existence of uranium mines. While some of the health concerns in question are not likely attributable to the mines on toxicological or radiological grounds, a more indirect link may exist. The unexplained increase in congenital anomalies,[67] for example, while based on very small numbers, demands study and consequent prevention. However, the lack of baseline health data on northerners has made the evaluation of the health impacts of uranium mining difficult.

The social health impact of uranium mining, positive or negative, defies assessment without a comprehensive community health study. **The panel, therefore, recommends that a comprehensive health study of northern people be conducted as a "baseline" against which any future impact of uranium mining can be assessed.**. This will require a combined effort of federal and provincial authorities, together with extensive participation by the communities. We also urge federal and provincial community health educators to seek better understanding of community perceptions of disease causation and to work with the community leaders to formulate remedial strategies.

[66] C. Stang, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 17, 1993, p. 4.

[67] J. Irvine, D.C. Gillis, L. Tan, S. Chiu, L. Liu, D. Robson, "Lung, Breast and Cervical Cancer Incidence and Survival in Saskatchewan Northerners and Registered Indians (1967-86), (Whitehorse, Yukon: 8th. International Congress on Circumpolar Health, 1990).

> *Surely, from a common sense point of view, the evaluation of health of people who must frequent either the mines or their environs is more important than any other aspect of mine operation.*
>
> B. Forgay, *Transcript of Public Hearings*, Regina, Saskatchewan, March 22, 1993, p. 314.
>
> *The Bayda Inquiry, many years ago, came out with the suggestion that there should have been a baseline health study done of northerners before further uranium development proceeded.*
>
> D. Dewar, *Transcript of Public Hearings*, Buffalo Narrows, Saskatchewan, April 19, 1993, p. 86.

2.5 Larger Issues

> *Here we are asked to break down the nuclear industry, frame by frame, to examine only three uranium mining proposals and their artificially discrete impacts. We are asked to view uranium mining as though it occurs in isolation from nuclear power, nuclear weapons, and the scramble to find a high level waste repository in Canada.*
>
> S. Fortugno, *Speaking Notes for Public Hearings*, Saskatoon, Saskatchewan, May 17, 1993, p. 5.

2.5.1 Sustainable Development

Saskatchewan's Round Table on Environment and Economy recently published a report outlining eight principles of sustainable development for the province.[68] Of the principles enunciated (environmental/ economic reality, environmental/economic integration, adaptability, renewability, efficiency, stewardship, sufficiency and accountability), the one most difficult to apply to mining is "renewability". It is, of course, impossible to mine ore in a fashion that is completely renewable. Once the ore has been removed, refined and used elsewhere, it will never again be renewed in the sense, for example, that a forest which has been harvested can be replanted. The report of the Round Table puts it this way:

> *The concept of sustainable development applies to non-renewable resources in a different way than it does to renewable resources. The mining of any given ore body is not sustainable, but the mining industry as a whole can continue over time. As mineral deposits are mined, new deposits are discovered while new technologies and products reduce the need for these minerals.*[69]

In addition, it is possible to apply the principle of renewability in the sense of site decommissioning and reclamation. Restoration of the land, water and air to predevelopment quality will allow nature to again flourish and renew the mine site.

The *Mining Advisory Committee* of the Round Table has expanded on the concept of sustainability as it applies to mining and published a list of seven characteristics of sustainable mining developments, the central one being:

> *Sustainable mining balances economic growth and protection of the environment by sensible trade-offs that consider all costs and benefits in the decision-making process.*[70]

During the public hearings, there was considerable discussion of whether or not uranium mining could be considered a sustainable development. Although the arguments were substantial on both sides of the question, we are of the opinion that uranium mining can, if properly done, meet the criteria of the province as expressed in the report of the Round Table. However, it is clear that whether or not uranium mining will be significant in the future of northern Saskatchewan, it is not indefinitely sustainable and it will not be the entire answer to northern development. Governments would, therefore, be wise to simultaneously promote other forms of economic activity.

> *If it is indeed the case that northerners are being given a choice only between uranium mines and continued desperate poverty, then I'd say they're being given no choice at all.*
>
> J. McPherson, *Transcript of Public Hearings*, Sasktoon, Saskatchewan, May 8, 1993, p. 2.

Several opponents of these projects suggested a variety of possible alternatives to uranium mining (for example, ecotourism, fisheries, native crafts, expanded wild rice farms and other forms of agriculture such as berry picking) that are more in keeping with the objectives of sustainable development. However, many of these possibilities are not mutually exclusive with uranium mining and should be actively promoted and encouraged regardless. **The best future for sustainable development in northern Saskatchewan lies in a planned and diversified economy. Uranium mining may be one of its components.**

Many presenters noted that the World Commission on Environment and Development, which popularized the concept of sustainable development, called for a broadening of environmental assessment to include strategic policy issues and their implications. As was noted in section 2.4.2.5, some

[68] *Conservation Strategy for Sustainable Development in Saskatchewan*, Province of Saskatchewan, 1992, p. 5.

[69] Ibid, p. 29.

[70] *Sustainable Development in Mining*, Province of Saskatchewan, 1991, p. 3.

presenters have taken issue with the limits of the panel's mandate.

> *I urge this Board of Inquiry to choose sustainability for us and our children and grandchildren.*
>
> A. S. Taylor, *Transcript of Public Hearings*, Regina, Saskatchewan, March 22, 1993, p. 294.

2.5.2 Alternative Energy Sources

Several members of the public pointed out that selection of alternative energy sources could reduce the need for nuclear power and the consequent environmental damage associated with uranium mining. Coal, hydro, natural gas, wind, solar, biomass and geothermal are alternatives that could be considered as possible replacements for nuclear power. However, as detailed in the report of another review panel,[71] each of these possibilities also comes with certain environmental or economic disadvantages—burning coal or natural gas contributes to the greenhouse effect, hydro electric dams cause flooding, wind is site-specific, solar is currently uneconomical, and so on. It is apparent that there are certain risks and trade-offs associated with the generation of power from any source of energy.

There is, however, one approach that is completely benign as far as the environment is concerned; conservation is an effective way of reducing the need for additional energy. It is apparent that this is a favoured option of large segments of the population and it is one that should receive serious consideration from government.

> *We do not need nuclear power,*
> *And we do not need uranium mines.*
> *We need to learn to use the*
> *power of the wind and the sun,*
> *And leave consuming ways behind.*
>
> O. Dancer and J. Dancer, *Transcript of Public Hearings*, La Loche, Saskatchewan, April 20, 1993, p. 50.

2.5.3 Local and Global Economics of Uranium Mining

Representatives from the provincial and federal governments reported that the demand for new uranium ore (in excess of present inventories, fuel stocks from Western countries available for re-processing, and material originating from the former Soviet Union) will exceed supply for at least the next decade.[72,73] At present, however, nuclear power utilities worldwide maintain an inventory of uranium sufficient to meet power generating demands for a minimum period of two years. Similarly, large proven uranium reserves exist in Australia and countries of the former Soviet Union which could affect the demand for Saskatchewan uranium if they were brought into production. In addition, large uranium ore bodies other than those under current review have been delineated in northern Saskatchewan.

Offsetting potential impediments to the sale of Saskatchewan uranium are factors which will contribute to a slow, but steady, rise in world demand for uranium. According to information provided to the panel, several countries, such as Japan, South Korea and France, are expanding their nuclear power industries and will continue to require additional guaranteed sources of uranium supply. Elsewhere, older nuclear reactors are being dismantled and replaced by fewer but larger units with significantly greater power generating capacities than those which they are replacing.[74]

Australia has a legislated policy restricting production of uranium to only three mines to minimize environmental loading and to maintain a high price for the product.[75] Australia also had a floor price policy until about 1988 whereby uranium could only be sold at prices above a certain level, thus assuring minimum guaranteed royalty returns to the government. By restricting the inventory of uranium available for international sale, and maintaining a minimum sale price, Australia limited its capability to produce and sell uranium. This may have favoured Saskatchewan producers.

Existing inventory will ensure a surplus of uranium until at least the middle of the present decade. However, some predictions suggest that supplies of newly-mined uranium will be unable to meet demand in the following ten- to fifteen-year period. Some projections show a steady, though moderate, increase for nuclear power demand, of approximately 1.6% per year until 2010.[76] Based upon this and varied production scenarios, the average annual growth rate of Western world uranium requirements until 2005 is also estimated to approximate 1%. It is therefore feasible that, after approximately 1995, increased uranium production may be necessary to keep pace with world uranium demand.

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[71] *Saskatchewan Electrical Energy Options*, Saskatchewan Electrical Energy Options Review Panel Final Report to SaskPower, November, 1991.

[72] R. Williams, *Transcript of Public Hearings*, Regina, Saskatchewan, March 22, 1993, p. 207-208.

[73] R. Clayton, *Transcript of Public Hearings*, Regina, Saskatchewan, March 23, 1993, p. 222-223.

[74] R. Williams, *Submission to Public Hearings*, Saskatoon, Saskatchewan, March 22, 1993, Figure 12 and p.(iii) - Summary.

[75] R. Williams, *Submission to Public Hearings*, Saskatoon, Saskatchewan, May, 1993, p.33.

[76] R. Williams, *Submission to Public Hearings*, Regina, Saskatchewan, March 22, 1993, Figures 7 and 8.

> *...existing operational facilities in the traditional supplier countries cannot meet projected Western world reactor requirements. The shortfall in production may be met by the expansion of certain existing operations, by the development of a small number of new projects....*
>
> R. Williams, *Submission to Public Hearings*, Saskatoon, May 18, 1993, p.34.

The forecast of increased demand implies that uranium prices should remain at, or increase above, present commodity levels. Historically, however, prices have tended to be lower than predicted; no proven method for accurately predicting price levels has been developed.

The panel recommends that control of industry production be considered. As well, the establishment of a minimum pricing policy should be examined. The Australian model permitted that country to retain its share of the world uranium market and to maintain a reasonably high commodity price. If similar pricing controls were to be established in Saskatchewan, the province would realize higher royalty returns on the product sold, even if unregulated production throughout the world were to result in a lowering of the international commodity price. With a planned development of Saskatchewan's reserves, sufficient to meet anticipated world demands, the province might retain its share of world production while maintaining a firm product price.

2.5.4 Regulatory Agencies

2.5.4.1 Northern Involvement

There is a perception that regulatory groups, at both federal and provincial levels, deal too intimately with proponents of uranium mining ventures to maintain objectivity. Without participation, northerners feel excluded from the regulatory process.

Regulatory agencies such as Saskatchewan Labour, the Mineral Industry Environmental Protection Branch and the Atomic Energy Control Board appear to have few northern employees. Coincidentally, northern communities lack information concerning mine occupational mishaps, regulation implementation, regulation enforcement and penalty assessment. **Regulatory agencies should endeavour to recruit aboriginals into their operations to mitigate perceptions of bias and to facilitate public confidence.**

2.5.4.2 Harmonization of Government Activities

Many federal and provincial government agencies are involved in the regulation of the uranium mining industry. Although each has a specific mandate, they attempt to work together for the common good of the uranium mining industry and the public. In some cases, regulators may be duplicating effort, at unnecessary cost. Currently, guidelines and regulations governing radiation safety, surface water quality and other factors exist at both federal and provincial levels. Such regulations may have differing standards, and may not incorporate the most recent internationally-recognized limits. **The panel perceives a need for the harmonization of federal and provincial activities relating to mine regulation and enforcement.**

2.5.4.3 Foreign Ownership

A 50% Canadian ownership rule applies to all companies operating in Canada. This regulation states that companies which are more than 50% owned by foreign nationals (Cogema and Total Minatco, for example) require either special dispensation (called *grand-fathering* for previously-operating companies) or federal ministerial waivers. **All proponents, venture participants and operating uranium mining companies which are being reviewed in this report have been exempted from the ownership regulations, with the result that approval of these projects would place a substantial portion of the uranium industry under the control of foreign ownership.** Some presenters stated that this is an unhealthy situation and that federal ministerial waivers should be used more restrictively.

2.5.5 The Nuclear Fuel Cycle

> *We regard the nuclear industry as the major health hazard to the people of the world...*
>
> M. Repo, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 19, 1993, p. 249.

2.5.5.1 Nuclear Power

The concept of nuclear energy as a source of power is one with a relatively short history of application; it is also the least understood and least trusted of all available energy options. Despite the observation that nuclear power does not contribute to atmospheric pollution by the production of carbon dioxide and other flue gases, significant public concern about nuclear power issues was communicated. For example, the report of another panel, referred to us, notes:

> *It should be clearly appreciated that there are widely held and deeply felt concerns about nuclear safety, waste disposal and other issues which must be recognized and addressed... There are...some fundamental philosophical objections to nuclear power generation which are held by a significant proportion of the general public. These concerns are much broader than the generation of electrical energy within Saskatchewan. They initiate with the mining of*

uranium in Saskatchewan and its utilization in various forms throughout the world.[77]

2.5.5.2 Non-Proliferation Treaty

Although nuclear weapons proliferation is outside the mandate of the panel review, many participants expressed concern regarding this topic. Many perceive the end uses of Saskatchewan uranium to be detrimental to the general public good. Rather than being used solely to benefit society through power/energy production, uranium is and has been seen to be utilized for weapons production.

> *...perhaps the greatest shortcoming of Saskatchewan's involvement in uranium mining is that any benefits gained from uranium mining are experienced by the current generation of Saskatchewan residents while the problems created are left behind for future generations of Saskatchewan residents and citizens of the globe to grapple with.*
>
> P. Prebble, *Transcript of Public Hearings*, Regina, Saskatchewan, March 23, 1993, p. 291.

Participants noted that specific proponents, such as Cogema, are wholly-owned subsidiaries of foreign governments heavily involved in military weapons research, fabrication and testing. Accordingly, mining proponents are viewed as a direct part of the chain leading to weapons production. Should such companies be given approval for mining, they will continue, in the perception of some members of the public, to enhance the development of weapons and promote proliferation. The *Nuclear Non-Proliferation Treaty*, of which Canada is a signatory, prohibits the use of uranium in the production of enriched uranium for military applications. However, there is no process whereby exported Canadian uranium can be separated from uranium derived from other sources. Therefore, no proven method exists for preventing incorporation of Canadian uranium into military applications.

Current Canadian limitations on end uses of uranium provide no reassurance to the public that Canadian uranium is used solely for non-military applications by purchasers. **The panel wishes to bring concerns related to the possible use of Saskatchewan uranium for weapons to the attention of the government.**

2.5.5.3 High Level Waste Disposal

Many members of the public perceive that there is no safe method of long-term storage or disposal of nuclear fuel wastes. Under existing regulations, used nuclear fuel from Canadian reactors is stored at the reactor site either by submerging it in water pools, or by placing it in above-ground caskets. Such storage requires continuous monitoring and care by site staff in perpetuity.

A generic waste storage concept is the subject of review for a separate FEARO panel.[78] Intended for permanent disposal, the concept is based on a non-retrievability scenario with nuclear fuel waste being placed in deep underground repositories.

Neither nuclear waste storage nor an examination of the Canadian nuclear fuel storage concept is part of our panel's mandate.

2.5.6 Joint Review Process

Members of the public raised the following specific concerns about the efficacy of the Environmental Assessment Review process for judging the proposals submitted.

- The degree of participation by provincial and federal government departments was uneven. The panel received considerable technical information from some government agencies, but was unable to obtain sufficient information from others. Of the information received, some was extensive, technically suitable and well prepared, whereas other information was of limited benefit to either the public or the panel.

- Some participants found the length of time provided during technical sessions insufficient for asking questions and obtaining information from available experts. Similarly, technical presenters did not always have sufficient time to present all relevant information or to respond to public and panel questions.

- Some participants were concerned that undue emphasis would be placed on technical rather than non-technical considerations such as values, theological and spiritual beliefs, morality, and fairness. The panel has endeavoured to ensure that this was not the case.

- In the northern communities visited, only the proponents were allotted time to make presentations at each and every location. Since the proponents presented primarily the beneficial impacts of the proposals, an unrealistic image may have been created for members of the public. The suggestion was made that, if opponents of proposals were given similar time to present the negative factors of the proposals, fairer public consideration of issues could be achieved.

- The panel maintains its position that procedures which permitted only local residents to make presentations at community public hearings were fair and just. This participation format avoided public appearances by out-of-community residents that would have been repetitive for the panel. At many sites, due to the large number of local participants eager to make presentations, the addition of extra-community speakers would have taken up considerable time, and might have inhibited local participation.

[77] *Saskatchewan Electrical Energy Options*, Saskatchewan Electrical Energy Options Review Panel Final Report to SaskPower, November, 1991, Section 3.3.2.4, p. 21-22.

[78] Environmental Assessment Panel on the Nuclear Fuel Waste Management and Disposal Concept.

- A concern was raised that only three of the uranium mining proposals were being reviewed at this time, with other mining proposals being reviewed separately. Particular concern was expressed that it might not be possible to properly assess cumulative effects.

- The lack of legal process by which the public hearings were conducted was considered a positive feature. In particular, members of northern communities participated with less perceived restraint. The panel believes that legal procedures during public hearings require considerable expense to develop and maintain, and inhibit public input.

- The EIS review process should be streamlined to prevent unnecessary and lengthy delays in the approval or rejection process. Present review intervals may take in excess of 3-5 years. In the Midwest Joint Venture proposal, for example, initial project review began in 1989, and has only now reached the public hearing review phase. Proponents are concerned that lengthy review processes may detrimentally affect the economic viability of ventures. Fixed contract intervals and development start-up schedules often determine the financial success of ventures, as well as the long-term cost to establish, maintain and conduct the EIS review itself.

- Many of the recommendations of the earlier Key and Cluff Lake inquiries, following public consultation and reviews similar to those conducted by this panel, have not been acted upon. The public perception is that recommendations made by the present panel may also not be acted upon by government. This would defeat the intent of the review process and negate the considerable efforts made by the panel, members of the public, proponents, and government departments to conclude a full and fair review.

Future environmental review panels and both federal and provincial branches of government should evaluate these public concerns. Government response should be prompt to all issues brought forward in this report. Reasons for accepting or rejecting recommendations should be clearly stated for public dissemination.

> *...the frustrations you may hear today...is because there's been so many promises, so many panels, but basically nothing has been done.*
>
> His Worship B. Belanger, *Transcript of Public Hearings*, Ile-à-la-Crosse, Saskatchewan, April 16, 1993, p. 36.

2.5.7 *Public Acceptance of Uranium Mining*

A public opinion survey ascertained that approximately three-quarters of the provincial population were in favour of the continuation of uranium mining.[79] It was noted that women were less supportive than men. General opposition to this industry by 25% of the population suggests that opponents can not be dismissed as a small group of environmental or anti-nuclear activists. Moreover, as noted by one presenter, a *Star Phoenix* poll found that more than two-thirds (67.4%) of the respondents did not want uranium sold for use in nuclear weapons.[80]

The "deep ecologist" view would suggest that a moratorium on all such activity be instituted; persons should strive to live in harmony with the pristine environment, avoiding any potential for disruption. On the other hand, the "pragmatic" view suggests that poverty is currently a greater threat to the health of northerners than is radiation.

Ideally there should be no necessity to choose between jobs and the environment; sustainable development principles suggest that the two can coexist. Some environmentalists argue that uranium mining could be rejected, with the needed economic development provided through alternative non-mega-project options. Uranium mining proponents, on the other hand, insist that the environment can be maintained and restored to an almost pristine state, posing no direct or indirect threats to human health or well-being.

Thus, the philosophy brought to the specific recommendations in the following chapters is one of proceeding with cautious development. This should be done to ensure the maximum benefit to the people of Saskatchewan, and particularly to the impacted communities.

> *Saskatchewan is a leader in the uranium industry. It has developed competitive mines, a highly skilled workforce, and the technical expertise second to none.*
>
> E. J. Hinz, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 14, 1993, p. 271.

[79] D. Fast, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 4, 1993, p. 233-246.

[80] *Star Phoenix*, October 22, 1988, p. 1.

3.0 THE DOMINIQUE-JANINE EXTENSION

3.1 Project Description and Site Map

The Cluff Mining Partnership is seeking authorization for an extension to its open pit mining operation at Cluff Lake. The Cluff Mining Partnership is comprised of Cogema Resources Ltd. (80%), which is the operator of the partnership, and Corona Grande Exploration Corporation (20%). In the balance of the report, Cogema Resources Ltd. will be referred to as the responsible party for the proposal under review.

The proposed Dominique-Janine Extension is approximately 75 km south of Lake Athabasca and 15 km east of the provincial border with Alberta, in the southern portion of the Carswell Structure. The water systems in the area of the site drain through interconnected lakes and small rivers into the Douglas River, which flows northwest, eventually emptying into Lake Athabasca.

Since early 1980, the Cluff Mining Partnership had been mining and milling ore from several deposits adjacent to the proposed Dominique-Janine Extension. Open-pit extraction of ore from the northern part of the Dominique-Janine ore body began in early 1989, and was completed by the end of December, 1991.

Data from a drilling exploration program indicated that the zone of mineralization for the Dominique-Janine ore body extended continuously southward from the open pit to the edge of Cluff Lake. Mining this additional mineralization, a 10-million cubic metre open pit project, is the purpose of the Dominique-JanineExtension proposed for review by Cogema (see figure 2).

The Dominique-Janine Extension, approximately 650 m long by 350 m wide, would extend 100-150 m into Cluff Lake. The southern rim of the pit would be approximately 25 m below the current lake level, and the final pit floor might be as much as 125 m below. Construction of a perimeter dam around the southern rim of the Dominique-Janine Extension open pit, to control the inflow of lake water into the pit, has been proposed. Dewatering wells would be installed between the dam and the pit rim to control seepage which might pass under or through the barrier wall; water collected in these wells during the mining period would be pumped back to Cluff Lake. Additional rock mined from the proposed extension would be placed under water in Cluff Lake. Although the original EIS envisaged also putting special waste in the dike, the revised project description proposes to dispose of the special waste in the mined-out Claude Pit. The rationale for underwater waste disposal is to minimize oxidation of the waste rock and subsequent generation of acid.

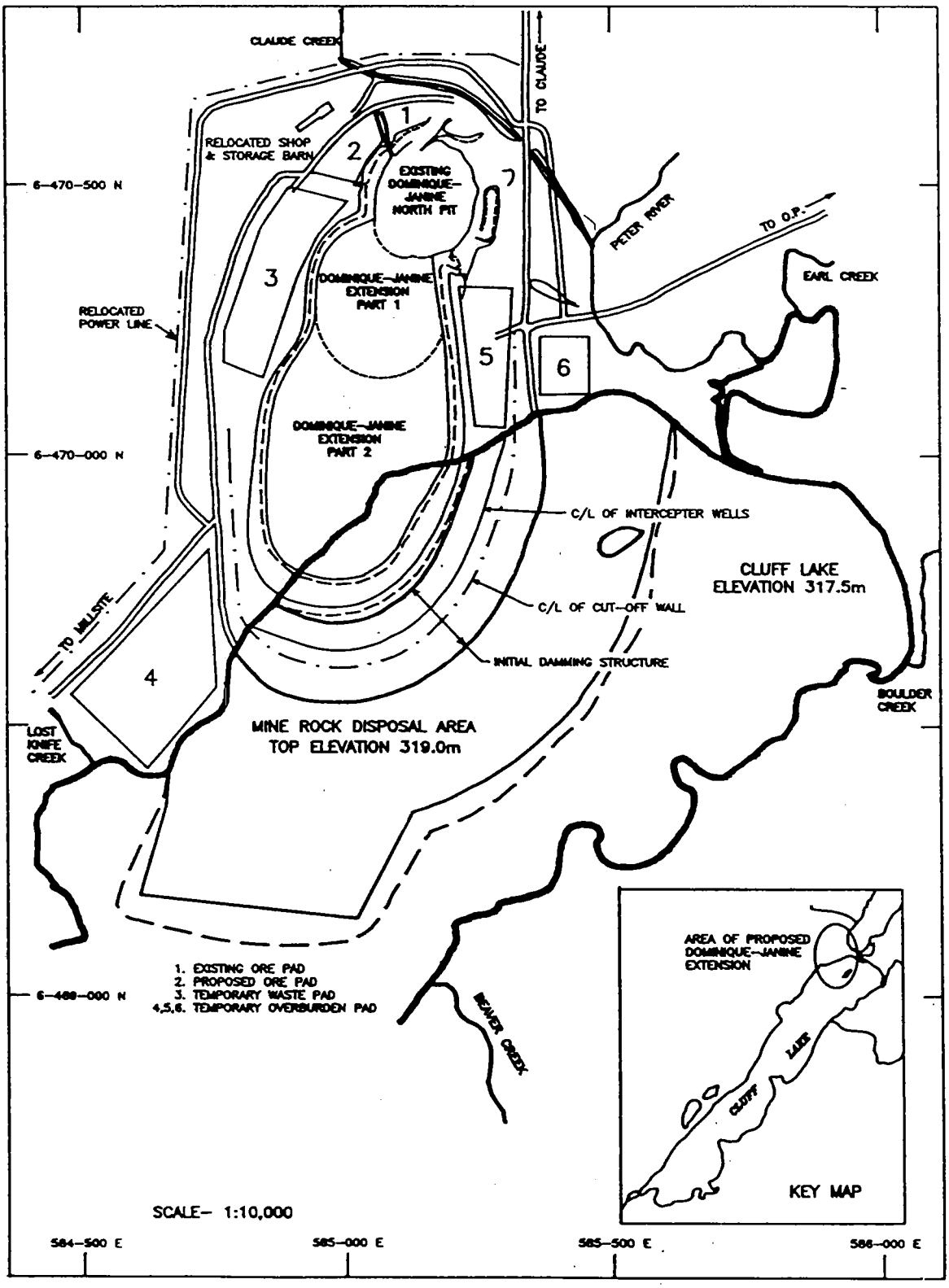
During decommissioning, Cogema proposes the reclamation and revegetation of ground surface areas after the removal of all constructed surface structures and buildings. Accumulated waste rock in Cluff Lake would create a new dry land area which would also be reclaimed and vegetated. The dam structure would be left intact, with water flooding the pit progressively until the level reached that of Cluff Lake. Cogema would monitor the quality of the pit water until provincial regulatory limits were met. At that time, it is proposed that a channel be constructed to connect the pit with Cluff Lake.

3.2 Recommendations

The socio-economic benefits associated with this proposed extension to the Dominique-Janine mine at Cluff Lake will be significant. The health and environmental risks, incremental to those already in existence, could be reduced to acceptable limits provided certain conditions are met. The proponent has, in the past, demonstrated respect for the local environment, concern for worker health, and interest in the socio-economic well-being of the residents of the impacted communities. With the expectation that these positive attitudes will continue, we recommend approval of this project subject to implementation of the following conditions:

1. establishment of a new Human Resource Development Agreement in which Cogema be required to select a minimum of 50% of its new employees from residents of the primarily-impacted communities and a minimum of 30% from residents of the secondarily-impacted communities. These conditions should also apply to contractors and sub-contractors;
2. agreement on a form of revenue sharing that is acceptable to the majority of the impacted communities;
3. establishment of a monitoring committee (as described in section 2.2.6) for the Cluff Lake Mine;
4. provision of a financial guarantee to cover decommissioning and post-decommissioning costs;
5. adoption of the exposure standards recommended in Publication 60 of the International Commission on Radiation Protection (ICRP-60) without allowing the collective dose to increase;
6. completion of a review of worker health training programs;
7. establishment of mechanisms for conducting an epidemiological study of the health of current and former workers at the Cluff Lake mine;
8. establishment of an air quality monitoring program using moss pillows and development of a system for monitoring the quality of the groundwater in the vicinity of the Claude pit;
9. evaluation and selection of a different option for deposition of waste rock. Only innocuous waste should be disposed of in Cluff Lake. Options for disposing of other waste rock in the Claude and Dominique-Janine pits should be evaluated. The Claude pit should be decommissioned by filling it with rock capped by clean overburden;

Figure 2
Dominique-Janine Extension



10. establishment of a research fund to support the search for innovative ways of reducing the volume of effluent released and the quantity of chemicals required to treat contaminated water;

11. development of site-specific water quality objectives, establishment of a program to reduce contaminated mine water inflows, and assessment of the possible impacts to the Island Lake watershed;

12. specification of total environmental loading for the mine, and development of a material-balance for contaminants in all liquid effluent;

13. evaluation of alternative oxidants that could replace sodium chlorate in the leaching process and thereby permit recycling of mill effluent;

14. use of the Environmental Transfer Pathway model (ETP/AECB) as the focus for an integrated monitoring program, and the assessment of cumulative effects;

15. agreement that the decommissioned Dominique-Janine pit not be connected to Cluff Lake, and that Claude Creek not be rerouted to flow through the decommissioned pit; and

16. evaluation of alternative methods of tailings disposal, with the goal of closing down the present tailings management facility as soon as possible.

3.3 Biophysical Concerns

3.3.1 Air Quality

Public concern over the release of radioactive dust and radon (along with the subsequent deposition of radon progeny) has been discussed in section 2.3.3. This concern could be assessed more critically if a better designed monitoring program were prepared.

The results of monitoring air quality at Cluff Lake have been reviewed by Swanson[81] who concluded that high-volume sampling should be continued, but that the use of dustfall jars for monitoring aerial deposition should be replaced by a system using "lichen/moss pillows". Preliminary use of the latter in 1985-86 yielded interesting results. Some data suggest that most aerial deposition of contaminants occurs within 3 km of the mill but other data indicate a much larger radius of deposition. A better designed monitoring program would settle this issue.

The panel recommends that air quality monitoring be augmented by the use of "moss pillows" to map the aerial deposition of contaminants. Such a procedure need not be conducted yearly, but could be part of a comprehensive system of ecosystem monitoring conducted two or three times each decade.

[81] Swanson, *Cluff Lake: Status of the Environment Report.*

[82] *Review of the Cogema Environmental Impact Statement, Dominique-Janine Extension, Addendum A and B,* Atomic Energy Control Board, submission to the panel, March 18, 1993, p. 2.

3.3.2 Hydrogeology

Cogema proposes to dewater the extended Dominique-Janine (D-J) pit using interceptor wells in the dam and pumping from sumps in the bottom and walls of the pit. Uncontaminated water would be discharged into Cluff Lake, and contaminated water diverted for water treatment before discharge into Island Lake. The volume of contaminated mine-water that would require treatment prior to discharge to the environment is not known at this time. There is a possibility of exceeding the capacity of the water treatment facility; it would need to be more than doubled if all of the intercepted water required treatment. Cogema has stated that it would expand the water treatment plant, if necessary, but has not evaluated the overall impacts to the aquatic environment should this scenario become a reality. The panel notes that this concern is shared by the AECB[82] and will, therefore, be addressed during the normal licensing procedure. A recommendation to reduce the volume of contaminated mine-water inflow is made in section 3.3.4.

There is also a concern that water from Claude pit, which will have special wastes placed in it, may flow and pollute nearby water bodies.[83] **The panel recommends that groundwater around Claude pit be monitored to determine if contaminants would move from the pit.**

3.3.3 Waste Rock Management

For management purposes the waste rock is classified into one of three categories: special waste (containing 0.05%-0.1% U_3O_8, and readily soluble material); other waste rock, with a potential acid-generating capacity; and clean waste rock. The clean waste rock would be used to construct a dam to separate the D-J pit from Cluff Lake; the special waste would be placed in the mined-out Claude pit and covered with till or other waste rock; and the bulk of the other waste rock would be placed in Cluff Lake to form a large flat area reaching to 1-2 m above lake level. The objective of the subaqueous disposal for the majority of the waste rock is to prevent its oxidation and subsequent generation of acid.

There are three main concerns. First, the classification of waste rock is an issue. The Mineral Industry Environmental Protection Branch of Saskatchewan considers special waste to be 0.03%-0.1% U_3O_8 rather than the criterium used by Cogema. In addition, it may be difficult to separate clean waste rock from waste rock with acid-generating potential under field conditions. Second, the placement of the bulk of the waste rock in Cluff Lake may cause problems of turbidity that would adversely affect the water quality of the lake. Third, if the disposal of rock in Cluff Lake fails to prevent acid generation, it would be an extremely difficult problem to mitigate.

These concerns, together with others relative to the decommissioning plans for the D-J and Claude pits (see section 3.3.8), would be addressed if all of the waste rock, with the

[83] *Technical Review of the Dominique-Janine Extension,* Department of Fisheries and Oceans, submission to panel, January, 1993.

exception of that required for the dam, were disposed of in the Claude and mined-out D-J pits. Special waste could be disposed of in both pits allowing Claude to be decommissioned prior to the complete excavation of the D-J extension. With a suitable cover of clean overburden, it might not be necessary to separate innocuous and potentially acid-generating waste rock. Waste rock disposed of in this fashion would not be exposed to atmospheric oxygen, nor subject to wind and wave erosion, as would be the case if it were placed in Cluff Lake.

The panel recommends that only innocuous waste be disposed of in Cluff Lake and that options for disposing of other waste rock in the Claude and Dominique-Janine pits be fully evaluated. The Claude pit should be decommissioned by filling it with rock, capped with clean overburden, as opposed to allowing it to flood.

3.3.4 Surface Waters and Fisheries

The panel has requested additional information on the Island Lake watershed (specifically on cumulative environmental impacts, aquatic community structure, aquatic bioaccumulation, and predicted impacts to the aquatic environment).[84] The proponent is currently conducting a field study, but the final report will not be available until the end of 1993 or early 1994.[85] **The panel notes, however, that sufficient background information to assess impacts to the Island Lake watershed will have been collected prior to any expansion of mining at Cluff Lake and recommends that the regulatory agencies evaluate the impacts before a licence is granted.**

Issues relating to the release of liquid mine effluent (in this instance into the Island Lake watershed) are discussed in section 2.3.2. That section provides the rationale for the following three recommendations. **First, the panel recommends that the Cluff Lake mine participate in the establishment of a research fund to support the search for innovative ways of reducing the volume of effluent released and the quantity of chemicals required to treat contaminated water. Second, the panel recommends that site-specific water quality objectives be developed for the Cluff Lake mine. Third, the panel recommends that the total environmental loading be specified for the Cluff Lake mine and that a material-balance be developed for all contaminants in the liquid effluent.**

There are two further specific recommendations related to reducing the volume of effluent. First, it may be possible to reduce the volume of contaminated mine-water inflow by placing a network of dewatering wells around the entire pit, not just in the dam structure. If the intercepted water were sufficiently clean to be released directly into Cluff Lake, effluent loading to the Island Lake watershed would be reduced. **The panel recommends that attempts be made to reduce contaminated mine-water inflows.** Second, because the Cluff Lake mill uses sodium chlorate as an oxidant in the leaching circuit, the mill effluent contains a high chloride content and, therefore, cannot be recycled. There may be alternative oxidants that could be used in the leaching circuit which would allow the mill effluent to be recycled, thereby reducing effluent loading to the receiving environment. **The panel recommends evaluation of alternative oxidants that could replace sodium chlorate in the Cluff Lake mill.**

3.3.5 Wildlife and Terrestrial Habitat

It is unlikely that the D-J extension by itself would have major impacts on the terrestrial environment. Rather the concern is with possible cumulative effects (see section 3.3.7) and whether certain rare plants, that are known to occur in the Cluff Lake area, might be affected by mining activity. **The panel notes that Cogema Resources Ltd. has undertaken an inventory of rare plants around Cluff Lake, the results of which should be available to the regulatory agencies before licences to proceed are granted.**

3.3.6 Monitoring

The panel's general recommendations on monitoring are dealt with in section 2.2.6. Some of the particulars of air quality monitoring have been recommended in section 3.3.1. Monitoring of the aquatic environment should focus on the Cluff Lake drainage system and the Island Lake watershed. In keeping with the arguments advanced in section 2.3.1, **the panel recommends that the Environmental Transfer Pathway model (ETP/AECB) be used as the focus for integrating the monitoring program at Cluff Lake.** The general design of the monitoring program should be common to all uranium mines. This will guarantee the consistent replication of treatments required to determine biological effects monitoring and eventually produce the database necessary for the study of cumulative biophysical impacts.

3.3.7 Cumulative Effects

The location of the Cluff Lake mine is such that cumulative biophysical effects involving other uranium mines are likely to be so small as to be undetectable. Thus, the cumulative effects of concern will be those involving a single mine; these have been discussed in section 2.3.6.

Probably the most significant cumulative effect at Cluff Lake would be that generated by the liquid effluent over time. Metals and radionuclides are being concentrated in the sediments and it is not known how this would impact aquatic ecosystems in the Island Lake watershed (see sections 2.3.6 and 3.3.4). **The panel recommends cumulative effects be assessed using the ETP/AECB model and that a whole ecosystem approach to monitoring be adopted, as specified in section 2.3.1.**

Sediment quality guidelines should be established, as discussed in section 2.3.6.

[84] *Request for Additional Information on the Dominique-Janine Extension*, Joint Federal/Provincial Panel on Uranium Mining Developments in Northern Saskatchewan, October, 1992.

[85] *Dominique-Janine Expansion Project Request for Additional Information by the Joint Federal/Provincial Panel*, Terrestrial Aquatic Environmental Managers Ltd., May, 1993.

3.3.8 Decommissioning and Site Reclamation

Cogema proposes to decommission the mined-out Dominique-Janine pit by allowing it to fill with water. Once the quality of the pit water meets the Saskatchewan Surface Water Quality Objectives, the proponent plans to breech the dam wall, connect the flooded pit to Cluff Lake, and to reroute Claude Creek so that it drains through the flooded pit.

As indicated in section 3.3.3, the panel recommends that the Claude pit be filled with waste rock and capped with till. The balance of the waste rock would then be deposited in the D-J pit. However, since there would not be enough rock to completely fill the D-J pit, it would be partially flooded. In such an event, **it is recommended that the Dominique-Janine pit not be connected to Cluff Lake and that Claude Creek not be rerouted to flow through the decommissioned pit.** Containment of contamination is more desirable than dilution.

There is also concern about the long-term containment of tailings and associated contaminants in above ground structures (see section 2.3.4). **The panel recommends that Cogema evaluate alternative methods of tailings disposal that are less subject to surface erosion and infiltration by precipitation than the present tailings management facility.** The objective is to close down the use of the present tailings management facility as soon as possible.

The need for a decommissioning fund, guaranteed to be available regardless of the financial capabilities of the mine owners, has been discussed in section 2.3.5. In keeping with the arguments advanced therein, **it is recommended that a financial guarantee to cover decommissioning and post-decommissioning costs be secured before the D-J Extension is approved.**

3.4 Socio-Economic Concerns

> With the economic times so uncertain, mining and exploration in northern Saskatchewan is one of the very few bright spots the province has.
>
> L. Wolkowsky, *Transcript of Public Hearings*, La Ronge, Saskatchewan, April 16, 1993, p. 24.

3.4.1 Human Resource Development Agreement

During the public hearings, Cogema indicated that it anticipated a large percentage of the new employees for the expansion of the D-J pit would be northerners.[86] **It is, therefore, recommended that a new Human Resource Development Agreement be established in which Cogema be required to select a minimum of 50% of its new employees from residents of the primarily-impacted communities and a minimum of 30% from the secondarily-impacted communities.** (A further rationale for this recommendation can be found in section 2.2.2.)

3.4.2 Revenue Sharing

The need for governments to establish a mechanism for sharing revenues with the impacted communities has previously been discussed in section 2.2.1 and **it is strongly recommended that the Dominique-Janine Extension not be allowed to proceed until a form of revenue sharing, acceptable to the majority of impacted communities, has been agreed upon.**

3.4.3 Monitoring Committee

The establishment of a monitoring committee for the mine site would provide a mechanism through which the public could receive information from an independent source about the operation of the mine with respect to biophysical impacts, results of health studies, compliance with regulations, employment practices and other economic opportunities for northerners. **It is, therefore, recommended that the provincial government establish a monitoring committee (as described in section 2.2.6) for the Cluff Lake mine.**

3.5 Health Concerns

3.5.1 Occupational Health

The panel was favourably impressed with the safety record of Cogema, and with its efforts to train workers regarding health hazards. However, it is important to continue to promote the highest possible level of worker health, safety and well-being. The proponent's commitment to this area, along with the involvement of its union, the vigilant efforts of the regulators, and the watchful eye of a community monitoring committee should permit this project to proceed with an acceptable degree of risk.

The general comments in section 2.4.1. apply to this project as well. Specifically, **the exposure standards recommended in ICRP-60 should be adopted, without allowing an increase in the collective dose, and mechanisms for conducting an epidemiological study of worker health should be promptly put into place.**

The workers from Cogema who appeared before the panel spoke highly of the worker monitoring and notification program at Cluff Lake. **Nonetheless, the panel believes that improvements can be made in worker notification; i.e. by providing more easily understandable explanations of the significance of the reported numbers.** Consultation with adult educators in the impacted communities may assist the authorities at Cluff Lake in identifying methods to best accomplish this goal. The proponent should also ensure sufficient availability of occupational health practitioners to address worker health concerns.

[86] M. Poissonnet, *Transcript of Public Hearings*, La Loche, Saskatchewan, April 20, 1993, p. 132.

3.5.2 Community Health

The proponent has made efforts to inform the impacted communities concerning mine issues. With the assistance of the proposed monitoring committee, similar attention should be directed to the other health concerns discussed in chapter 2.

4.0 MIDWEST JOINT VENTURE

4.1 Project Description and Site Map

At the time public hearings began, Denison Mines Limited, as project operator for the Midwest Joint Venture (MJV), was seeking approval to develop an underground uranium mine at South McMahon Lake. The MJV was comprised of Total Minatco Ltd. (56%), Denison Mines Limited (19.5%), OURD [Canada] (4.5%), and Uranerz Exploration and Mining Limited (20%). During the hearings, the panel learned that Cogema Resources Ltd. would be purchasing the project. At the close of the public hearings on May 20, 1993, the panel was unclear with respect to the ultimate ownership of the Midwest Joint Venture.

The uranium deposit which MJV proposes to develop is located close to Points North and about 20 km west of the McClean Lake site. It is connected to Highway 905 by a 2 km local access road.

Mineralization was discovered in 1977 and by 1980, 442 holes had been drilled in an attempt to delineate the deposit. An Environmental Impact Statement was submitted in 1981 for a proposal including open pit mining and on-site milling of the ore. A formal review was not initiated in 1981, due to a corporate decision to defer development of the project. Ownership of the project changed in 1987 with Midwest Joint Venture acquiring the property and becoming the operator.

Midwest Joint Venture obtained approvals in 1988 to proceed with an exploration program to assess underground conditions including the geotechnical and hydrogeological environment, and to gather data to evaluate potential mining methods. MJV's 1991 proposal and its subsequent amendment are based on information collected from the test mining project.

In 1991, Midwest Joint Venture applied for approval to construct and develop an underground mine, a mill and a tailings disposal area. This proposal was amended in September, 1992, to reflect the decision by the MJV and Total Minatco to develop their respective ore bodies on a complementary basis. The Midwest Joint Venture now proposes to mill its ore at the proposed McClean Lake mill or at Cameco's Rabbit Lake mill. Its tailings would be disposed of in either the JEB open pit, (enlarged to provide the required capacity), or the Rabbit Lake pit. The MJV proposal now also includes the building of a plant at the mine site for treatment of contaminated surface and underground water (see figure 3).

The Midwest ore body lies under the Mink Arm of South McMahon Lake. Because most of the exploration holes drilled into the ore body were not cemented off, it is proposed that Mink Arm be dewatered to minimize flow of surface water into the underground workings.

The shaft sunk for the test mine would be deepened a further 60 metres, and used for initial underground development from the west side of Mink Arm. This shaft would later become the primary ventilation exhaust shaft, in conjunction with a smaller shaft specifically constructed for additional ventilation capacity. A production/air intake shaft would also be sunk to a depth of 220 metres on the east side of Mink Arm.

It is proposed that the mine would be developed on three levels: the drill level, the haulage level, and the drainage level.

Ore mining would occur during a six-month "summer" period. The main Midwest ore body, with an average grade of 6.2% uranium, would be mined from above, with drillers protected from radiation by a layer of barren rock. High grade ore would be removed on a lower level by shielded or remotely operated machinery. Lower grade ore would be mined manually by benching, a modified conventional method.

Ore would be either transferred directly to trucks for haulage to a mill, or stockpiled temporarily on the surface near the headframe.

4.2 Recommendation

The Midwest Joint Venture project, as described in the EIS and its Amendment, is not acceptable; the benefits that could be obtained are insufficient to balance the perceived risks. It is, therefore, recommended that permission to proceed should not be granted for reasons summarized in the following sections.

4.3 Potential Risks

Presenters at the public hearings raised several concerns about the acceptability of this project. Those project-specific concerns determined to be most significant include:

- the use of unacceptable mining methods;
- mining, in confined underground spaces, of an ore that contains high concentrations of uranium, arsenic and nickel;
- the existence of over 600 exploration bore holes, most of them uncapped, in the vicinity of the ore body;[87]
- the need to transport high grade ore on a public highway;
- the potential for environmental damage through the release of contaminated effluent into the Smith Creek watershed and the need to dewater an area of several square kilometres around the mine site;
- uncertainties in the disposal of mill tailings containing high concentrations of toxic heavy metals; and
- the contribution of this proposed mine to the combined effects of all of the mines (existing and proposed) in a relatively small area on the west side of Wollaston Lake.

[87] *Midwest Uranium Project Environmental Impact Statement*, August, 1991, Volumes 1 and 2. On page 1-1, it states that three holes were drilled in 1977; on page 1-2, it mentions 439 more between 1978 and 1980; and on page 5-11, the number has increased to "more than 600", due to additional exploration.

Figure 3
Midwest Joint Venture Site Plan

Each of these concerns and their attendant risks is briefly discussed below.

4.3.1 Unacceptability of Mining Methods

Midwest Joint Venture proposes the use of two underground mining methods for ore extraction. The first technique, a standard manual benching method that requires direct worker access, is proposed for use in low grade ore zones. The second, the Non-Entry Vertical Panel (NEVP) method in which workers are not in direct contact with the ore, is proposed for mining in higher grade ore zones. For manual benching, some mining analogs exist at the Cluff Lake Mine where it has been shown that implementation of appropriate ventilation and dust control strategies can restrict worker radiation exposure to acceptable limits. However, MJV has indicated that the average geological grade of low-grade ore approximates 1.8% U_3O_8 with some spot grades being higher.[88] The indicated low-grade ore composition is approximately double that of Cluff Lake ore and eighteen times that of the average ore grade mined in Elliot Lake, Ontario. The EIS does not justify the use of the manual benching method nor satisfactorily indicate ore grade limits to differentiate site selection between the two principal mining techniques. Thus, the proposed benching method would expose workers to elevated risks due to gamma radiation and radon progeny.

During test mining of the Midwest deposit, high grade ore was removed using the blind raise boring technique. However, this method was eventually rejected for full-scale mining in favour of the NEVP method proposed in the EIS. Using this technique, underground workers are restricted from direct access to the orebody by a considerable thickness of inert waste through which remote drilling of blast holes and ore extraction operations are conducted. Broken ore is removed on an underlying haulage level utilizing either remotely controlled or shielded equipment. Any mechanical breakdowns of equipment, excavation failures or ore blockages at extraction sites would, however, require worker access to the equipment and sites to permit removal and repair. Under such conditions, workers who are not adequately shielded, either by design or by accident, would be likely to incur excessive gamma exposure.

Substantial risk to worker health is, therefore, associated with the proposed mining methods.

4.3.2 Radiological and Chemical Toxicity of the Ore

The MJV ore reserves, currently estimated at 361,000 tonnes, contain high concentrations of both arsenic (As) and nickel (Ni) as well as uranium (U).[89] Typical core samples contained 1.08 - 9.62% As, 0.94 - 4.80% Ni and 0.25 - 11.8% U.[90] Since arsenic and nickel are toxic and uranium is both toxic and radioactive, inhalation or ingestion of ore dust could cause chemical and radiological health impacts on the workers. All three exposures (arsenic, nickel and alpha radiation) have been linked to elevated risks of lung cancer, as discussed in section 2.4.1.

Of particular concern is the possible synergistic effect resulting from occupational exposure to high concentrations of both uranium and arsenic as discussed in section 2.4.1.2. The potential health risk when all three exposures are present has not been adequately studied. In confined underground spaces, workers might undergo continuous exposure to toxic, radioactive dusts causing an unacceptable level of occupational health risk.

4.3.3 Uncapped Bore Holes

During the exploration phase of this project, over 600 bore holes were drilled in an attempt to define the location and quality of the ore body. These holes, the majority of them remaining uncapped and open, now present a sizeable risk to the health of miners attempting to remove ore from below, as they create a potential for unrestricted flow of surface and subsurface radioactive water into the mine workings.[91]

Ground water at the Midwest Joint Venture site characteristically exhibits the presence of high concentrations of radon which can pose serious worker exposure and health problems if adequate interception and drainage is not provided. Despite the proposed dewatering of Mink Arm, significant groundwater inflows would continue to occur through the overlying, altered Athabasca sandstones, especially during the development stage of the proposed mine.[92] The installation of dewatering wells to systematically drain the overlying rock strata would reduce, but not eliminate, inflow through these drill holes. Any undrained portions of subsurface waters and additional quantities of surface waters due to local rainfall would remain unaffected by dewatering. Such radon-bearing water would, therefore, pose a hazard to underground workers.

Should failure of all or part of the dewatering system occur, rapid build-up of mine water inflows might result.[93] During test mining, three water-bearing drill holes were intercepted by the single access drift that was being advanced. Such holes were successfully capped, at depth, and it was possible to transport water flows away from worker-occupied sites. However, should drill hole interceptions occur within unoccupied sites, where remotely controlled equipment must be used, the ability to cap them becomes problematic. Consequent excess water and radon/radon progeny inflow to the mine would create an additional exposure risk to workers.

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[88] *Midwest Uranium Project Environmental Impact Statement*, August, 1991, Volume 2, "Project Description", Section 5.3.7, p. 5-74.

[89] *Midwest Uranium Project Environmental Impact Statement*, August, 1991, Volume 2, "Project Description", Section 5.2.1.3, p. 5-9.

[90] *Midwest Uranium Project Environmental Impact Statement*, August, 1991, Volume 2, "Project Description", Section 5.2.2.1, Table 5.2.1.3, "Analyses of Typical Ore Samples."

[91] *Midwest Uranium Project Environmental Impact Statement*, August, 1991, Volume 2, *Project Description*, Section 5.3.2.2, p. 5-47

[92] *Midwest Uranium Project Environmental Impact Statement*, August, 1991, Volume 2, *Project Description*, Section 5.2.3.3, p. 5-32

[93] *Midwest Uranium Project Environmental Impact Statement*, August, 1991, Volume 2, *Project Description*, Section 5.2.3.4, p. 5-33

4.3.4 Transportation Hazards

Midwest Joint Venture proposes to transport mined ore over a considerable distance (30-50 km) for milling. This might put worker health at risk due to possible radiation exposure created by release of radioactive dust and the proximity of truck drivers to large volumes of high grade, gamma-emitting ore. While the concept of complementary utilization of existing or proposed mills is commendable, the potential exposure of transport workers to radiation and dust must be considered.

The need to transport large volumes of ore using Highway 905 could also present a significant health risk to the public. Increased traffic, along with the inevitable accidents and spills, could cause both physical and psychological effects on community health. In addition, mine-related traffic accidents could inconvenience travellers and could have a serious impact on various local businesses that depend on Highway 905.

The proponent has indicated that a plan to directly link the Midwest and McClean Lake sites, thereby reducing road length and consequent driver exposure, was considered and rejected. Adoption of such a closed, direct haul route to the McClean Lake mill would also have reduced potential public exposure to possible radioactive contaminants, and decreased traffic disruption on Highway 905. No reason has been presented by the proponent for rejecting this transport option.

4.3.5 Surface Water Impacts

In order to reduce mine water inflows, MJV proposes to pump the water in Mink Arm over an already constructed dam into South McMahon Lake and to remove subsurface water by the installation of a number of dewatering wells in the vicinity of the mine. In the short-term, this would have a drastic effect on the environment; all aquatic life in Mink Arm would be destroyed, bogs and fens would dry up, and terrestrial vegetation would suffer from the lack of moisture in the soil. The long-term effects, although difficult to predict, would depend to a large extent on the decommissioning and restoration programs employed.

During mining, all treated mine water would be released into North McMahon Lake. Such releases, projected to range between 61,000 - 400,000 m^3/month during the entire project lifetime, would contain substantial amounts of various dissolved solids. The achievable effluent concentrations of the sixteen principal contaminants to be released into North McMahon Lake have been modelled and several metals, such as cadmium, copper, and nickel (as well as ammonia) are expected to exist at levels higher than provincially-legislated standards.

Furthermore, as discussed in section 2.3.2, surface water impacts reflect only the transient state of water quality. In many respects, total loading to the watershed, and particularly to the sediments therein, is more important. These have not been adequately addressed by the proponent.

4.3.6 Hydrogeological Impacts

Midwest Joint Venture proposes to dewater the Mink Arm of South McMahon Lake, as well as subsurface zones about the Midwest orebody. The consequences of dewatering would be a depression of the existing groundwater table and reduction of hydrogeologic flows over at least the eleven-year period of mining.

As with the other mine proposals, the panel and regulators consider the assessment of baseline hydrogeologic data to be very important in determining the impacts of a mining operation on the environment. Midwest's assessment of existing hydrogeologic conditions is based on data collected over one decade ago, and limited to data from areas lying largely within the MJV lease boundaries. The proponent has not evaluated recent hydrogeologic conditions of its lease or of regional areas adjacent to it. Nor has MJV done an assessment of the predicted hydrogeologic flow disruptions expected to result from dewatering. Accordingly, the baseline data and flow modelling presented are inadequate for the purpose of environmental assessment.

4.3.7 Disposal of Mill Tailings

Because the MJV ore is laden with toxic heavy metals, particularly arsenic and nickel, the mill tailings and effluent would necessarily contain the same elements. The problems associated with the disposal of such dangerous tailings have not been adequately addressed by the proponent. Their suggestion that disposal would take place at either the JEB or the Rabbit Lake sites overlooks the fact that neither of these disposal facilities has been approved to accept MJV tailings.

Safe disposal of mill tailings, a major environmental concern of several presentations at the public hearings, has not been adequately addressed by the proponent.

4.3.8 Cumulative Impacts

Cumulative impacts on that portion of the Athabasca Basin west of Wollaston Lake and south of Hatchet Lake (approximating the Smith Creek and Collins Creek watersheds) might be considerable. Several existing or potential mining operations are close to the MJV site. While the area actually used by the mining operations would be small, the overall effect of the operations, with the possibilities for interconnecting roads and power lines, would be widespread. Some of the lakes and streams would become unsuitable for fish and it is likely that most of the game animals would leave the area. As a result, the entire area might become unproductive for traditional hunting, fishing and gathering activities. Even if opportunities for such activities were not eliminated, local people might choose not to use land adjacent to the mines as a source of food. Approval of the MJV project would further increase this problem.

When this portion of the Athabasca Basin is viewed in a regional context, it is evident that several existing and potential mining operations are close to the Midwest Joint Venture/McClean Lake sites. The risk of air pollution, particularly by the release of radon and its progeny, increases when several mining sites are located in the same area.

Similarly, cumulative impacts to the Smith Creek and Collins Creek watersheds have not been examined in sufficient detail. Total downstream deposition quantities, sites of deposition and the capabilities of sediments, biota, etc. to absorb such discharges have not been adequately addressed. In particular, little attention has been paid to the possibility that milling of the MJV ore, with its high nickel and arsenic content, could cause an increase of contaminants in the mill effluent. As discussed in section 5.3.4, this could result in enhanced risk to the Collins Creek watershed.

> *When we look around in our communities here in the Athabasca region, we have a lot of water which we still enjoy...our water is still fresh. When you look at the water and rivers in south Saskatchewan, and North and South Saskatchewan River, how many people are going to go down to the shore and make tea with that water? That's why when we see those types of things, we see that you can't enjoy a cup of tea from that water, that we want to protect our future water resources as well.*
>
> B. Sandypoint, *Transcript of Public Hearings*, Black Lake, Saskatchewan, April 13, 1993, p. 62.

4.4 Potential Benefits

Benefits associated with this project include the following:

- employment, particularly for northerners;
- business opportunities; and
- royalties and taxes.

The potential for each of these benefits to contribute to improved socio-economic conditions is briefly discussed in this section.

4.4.1 Employment

The complementary Midwest Joint Venture/McClean Lake mining proposal forecasts the creation of approximately 95 new jobs at the MJV site. It is not clear how many of these jobs would be seasonal since mining is proposed only for summer months. Some positions at the JEB mill would also be extended. Based on present hiring practices by mining companies within the Athabasca Basin, about 50% of these positions would be filled by northerners. An obvious benefit would result.

4.4.2 Business Opportunities

Approval of this project would provide mining contractors, engineering firms, and related businesses with an opportunity for more work. Presenters at the public hearings indicated that such possibilities would be welcomed by the Saskatchewan business community, particularly in the present economic climate. This project could, therefore, provide needed economic benefits.

It appears, however, that the work associated with the MJV mine would be of most benefit to firms operating from the southern part of the province; the proposal does not offer substantial business opportunities to the north, nor does the EIS propose contracting practices or surface lease agreement clauses significantly favouring northern development. Direct benefits to the northern economy through increased business opportunities for northerners would, therefore, appear to be minimal.

> *...objectivity is difficult to maintain after seeing years and years of so-called northern development result in continual poverty, social problems, unemployment, substandard health services, etc.*
>
> His Worship B. Belanger, *Transcript of Public Hearings*, Ile-à-la-Crosse, Saskatchewan, April 16, 1993, p. 31.

4.4.3 Royalties and Taxes

Low uranium prices during the last decade have provided little assurance that present and future uranium mining ventures can remain economically viable. Oversupply of uranium, with consequent low prices, has caused the provincial royalties during the period of 1978-1992 to be much less than expected. Several public hearing participants expressed concern that, if prices remain low (or drop even further), negligible benefits from this non-renewable resource would accrue.

Although the MJV mine was initially proposed in 1991 as a stand-alone project, the Amendment issued in October, 1992, suggested the situation had significantly changed in a period of only a few months. It appeared that an independent mine was now no longer viable as indicated by the statement, "*...given the conditions of today's markets, it is doubtful that the Midwest project would be economical on a stand-alone basis*".[94] The impression is thereby left that the financial viability of the project is tenuous. It is difficult to justify the environmental damage this project would cause when its profitability may be doubtful. Low profitability would also reduce possible revenue sharing with northern communities.

4.5 Risks Versus Benefits

An objective assessment of the risks and benefits described in the preceding sections requires the conclusion that the project not be allowed to proceed. The substantial risks to worker and community health, along with significant potential for environmental damage, are not balanced by the projected economic benefits.

[94] *Complementary McClean Lake and Midwest Projects*, Midwest Project Environmental Impact Statement Amendment, 1992, p. 1-3.

5.0 McCLEAN LAKE PROJECT

5.1 Project Description and Site Map

At the time public hearings began, Total Minatco Ltd. was proposing development of uranium ore reserves at McClean Lake. Total Minatco Ltd. is a wholly owned subsidiary of TOTAL, an integrated oil and gas company based in Europe, and, with 70% interest, was to be the project operator of the McClean Lake Joint Venture. The other participants in the joint venture were Denison Mines Limited, with a 22.5% interest, and OURD (Canada), with 7.5%. During the hearings we were informed that the project would be purchased by Cogema Resources Ltd. At the close of the public hearings on May 20, 1993, the panel was unclear with respect to the ultimate ownership of the McClean Lake project.

The McClean Lake site is in northern Saskatchewan about 12 km northwest of the existing Rabbit Lake mine, and about 350 km north of the town of La Ronge. Access to the project site is by a private road from Provincial Highway 905, or by use of the airstrip at Points North.

Mineralization was discovered at McClean Lake (the McClean Lake North deposit) in January, 1979. Further exploration resulted in the discovery of the McClean Lake South deposit; the Sue A, B and C deposits, about 2.5 km to the east; and the JEB deposit, about 9 km north. Total Minatco proposes the development of the McClean Lake deposits as an underground mine and the JEB and Sue A, B and C deposits as open pit operations.

The McClean Lake deposits, at a depth of about 160 m, would be accessed by a ramp. Vertical shafts would be used for ventilation, minewater pumping and backfill transport. An ore transfer pad would be built to store ore from the underground mine temporarily before it is transported to the main stockpile. Contaminated water would be pumped approximately 2 km to the water treatment plant at the Sue site.

The open pit mining operations for the JEB and Sue A, B and C deposits would involve overburden stripping and waste rock mining, followed by mining of the ore zones. A lined ore storage pad for the stockpiling of ore would be located close to the JEB pit. The pad would be used by mining operations at all six ore bodies. Waste rock and overburden would be placed in prepared areas close to the open pits, and might be used subsequently for construction activities if tests showed the material to be suitable.

The Sue A, B and C pits would have a waste rock disposal site, a water treatment plant, contaminated-water holding ponds, and treated-water monitoring ponds.

The McClean Lake proposal includes the building of a mill complex where ore would be processed to produce yellowcake. A water treatment facility would be built at the mill complex, located near the JEB pit. Water collected by the drainage systems for the ore storage pad would be processed here, as would JEB minewater, collected runoff, and tailings seepage water. It would also treat mill process waste streams and tailings decant water from the mill. Treated water would be pumped to Sink Lake for regulated discharge through Vulture Lake to McClean Lake (see figure 4).

Tailings from the milling process would be deposited in the mined-out JEB pit for disposal using the pervious surround concept. This would require that the ore from JEB be removed and stored while the pit is being prepared to receive the tailings.

Ancillary facilities would include a shop and change rooms at the Sue site; offices, warehouses, shops, change rooms, a power generator plant, contaminated water storage ponds and treated water monitoring ponds at the mill site; fans and air heaters, electric power generators, minewater sedimentation ponds, a waste rock disposal area and an ore transfer pad at the McClean Lake underground mine site; and a camp designed to accommodate construction and production crews for all sites, to be built 800 m from the mill.

All active areas would be linked by roads and power lines. Pipelines would be used to transport minewater from the McClean Lake underground mine to the Sue Water treatment plant, and from the Sue and JEB treatment plants to Sink Lake.

It is proposed that the McClean Lake project and the Midwest Joint Venture be developed in a complementary way, with the McClean Lake site developed first, and the Midwest Joint Venture brought into production by 1999. Ore from the Midwest site would be milled at the JEB mill; tailings from the Midwest operation would also be disposed of in the mined-out JEB pit.

5.2 Recommendations

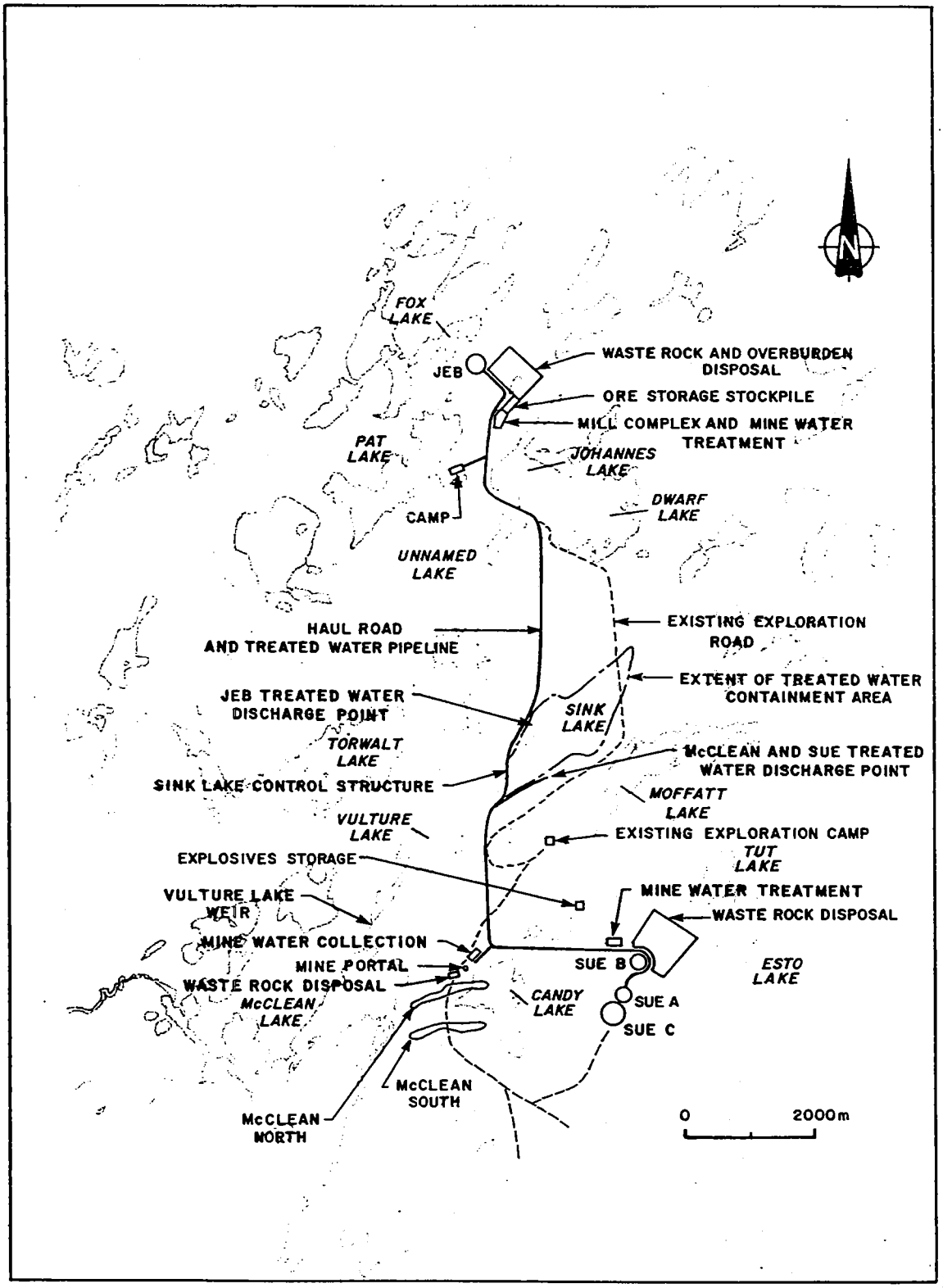
It is recommended that the McClean Lake project be delayed for at least five years.

This would allow time to obtain more experience with pervious surround tailings management facilities, to acquire comprehensive community health information, to maximize employment opportunities to northerners through education and training, to discuss further the larger issues, and to assess cumulative biophysical and socio-economic impacts.

Its approval at that time should be contingent on fulfillment of the following conditions:

1. evaluation, by the regulatory agencies, of the pervious surround tailings pit at Rabbit Lake after several more years of operation;
2. collection and evaluation of baseline data on groundwater flow patterns and water quality. In particular, the panel recommends that accurate flow rates be determined for the streams in the Collins Creek watershed and that modelling of predicted impacts on the receiving waters be revised accordingly;
3. development of plans to reduce contaminated mine-water inflows;

Figure 4
McClean Lake Project



4. evaluation of alternative oxidants that could replace sodium chlorate in the proposed milling process to permit recycling of mill effluent;

5. participation in the establishment of a research fund to support the search for innovative ways to reduce both the volume of effluent and quantity of chemicals required to treat contaminated water. The panel also recommends that site-specific water quality objectives be developed for the McClean Lake project. In addition, the total environmental loading should be specified and a material-balance developed for all contaminants in the liquid effluent;

6. use of the Environmental Transfer Pathway model (ETP/AECB) as the focus for integrating the monitoring program at McClean Lake. The general design of the monitoring program should be the same as that at other uranium mines. This will guarantee a consistent replication of treatments for biological effects monitoring and eventually produce the database required for the study of cumulative effects. The results of biophysical monitoring at McClean Lake should be reviewed by the independent monitoring committee recommended in section 5.4.3;

7. assessment of cumulative effects using the ETP/AECB model and validation of the results by use of a whole ecosystem approach to monitoring, as specified in section 2.3.1 and section 5.3.7;

8. decommissioning plans that include the filling of mined-out pits to surface with waste rock capped by clean overburden;

9. adoption of sediment quality guidelines for Saskatchewan and institution of a program to monitor sediment quality in the Wollaston Lake drainage system;

10. adoption of a Human Resource Development Agreement that includes employment objectives of 30% (75 workers) of the initial workforce from the Athabasca Basin and 40% (100 workers) from the rest of northern Saskatchewan, with the balance (30%, 75 workers) coming from southern Saskatchewan or elsewhere. After the mine has been in operation for three years, these objectives should be changed to require the selection of a minimum of 50% of all new employees from residents of the primarily-impacted communities and a minimum of 30% from the residents of secondarily-impacted communities. These conditions should also apply to contractors and subcontractors;

11. agreement on a form of revenue sharing that is acceptable to the majority of the impacted communities;

12. establishment of a monitoring committee (as described in section 2.1.5) for the McClean Lake Project;

13. provision of a financial guarantee to cover decommissioning and post-decommissioning costs;

14. adoption of the exposure standards recommended in Publication 60 of the International Commission on Radiation Protection (ICRP-60) and measures to prevent the collective dose from increasing;

15. implementation of a program to collect and analyze changes in indicators of community health for the impacted communities, and formulation and implementation of remedial health strategies; and

16. further public discussion of the larger issues identified in section 2.5 of this report.

5.3 Biophysical Concerns

5.3.1 Air Quality

There is general concern over the release of radioactive dust and radon, with the subsequent deposition of radon progeny, as discussed in section 2.3.3. This concern could be assessed more critically if a well designed program, such as the one proposed by the proponent, were used to monitor radon and dust, together with radionuclide and metal uptake in soil, lichen, vascular plants and the snowshoe hare. The monitoring of vegetation and wildlife should occur on a three-year cycle and start before mine excavation to provide required baseline information.[95] **The panel notes the commitment given by Total Minatco to establish a comprehensive air quality and aerial contaminant deposition monitoring program.** A delay in the start-up date of this project will provide the proponent with an opportunity to accumulate comprehensive air quality baseline data before mining begins.

The issue of cumulative effects associated with aerial emissions from a complex of mines or proposed mines to the west of Wollaston Lake is dealt with in section 5.3.8.

5.3.2 Hydrogeology

Review participants expressed concern about the lack of information on groundwater patterns, retardation factors, etc. While such information appears to be of little more than academic interest to the proponent,[96] the Saskatchewan Mineral Industry Environmental Protection Branch considers background and baseline data to be very important in determining the effects of an operation on the environment.[97] **The panel shares this latter assessment and recommends that baseline data be collected on groundwater flow patterns and water quality.** Further rationale is provided for this recommendation in section 5.3.4.

[95] *Complementary McClean Lake and Midwest Projects, McClean Lake Project, Environmental Impact Statement, Additional Information Requested by Uranium Mines Review Panel*, Total Minatco Ltd., November, 1992, Deficiency Number 3.35.

[96] *Complementary McClean Lake and Midwest Projects, McClean Lake Project, Environmental Impact Statement, Additional Information Requested by Uranium Mines Review Panel*, Total Minatco Ltd., November, 1992, Deficiency Number 3.28, p. 2.

[97] *Technical Review of McClean Lake Project - Additional Information Requested by Uranium Mines Review Panel*, Saskatchewan Mineral Industry Environmental Protection Branch, January 28, 1993.

5.3.3 Waste Rock Management

The proponent proposes to dispose of most of the waste rock, mined from the JEB and Sue sites, in surface rock piles adjacent to the mined-out open pits. About 2% of the waste rock would be classified as special waste (0.03%-0.1% U_3O_8) and would be disposed of mainly in the Sue C open pit. Most of the waste rock from the McClean Lake underground mine would be used as backfill as the ore body is mined out.

The main consideration for the management of waste rock seems to be cost; it is least expensive to dispose of it on the surface. However, concerns about contaminated leachate from the rock piles affecting the water quality of the adjacent flooded pits have not been addressed. There has been no consideration of using the waste rock from one open pit as fill for another, even where there are closely situated open pit mines to be developed in sequence (as in the Sue A, Sue B, and Sue C mines).

The management of waste rock needs to be considered as part of an integrated decommissioning of the mines. As discussed in section 5.3.9, we favour filling all mined-out pits with waste rock, capped by clean overburden.

5.3.4 Surface Water and Fisheries

Surface waters are affected in three main ways by the proposed mining activity. First, liquid effluent (derived from the mill, the tailings treatment facility, the stockpiles and contaminated mine water) would be released into Collins Creek by way of Sink Lake, Vulture Lake and McClean Lake. Second, Candy Lake would be drained while the McClean underground mine is being constructed and in operation. The lake would be refilled and restocked with fish after the mining operation is completed. Third, surface water bodies would be created in the flooded Sue open pits and above the tailings in the JEB pit.

The impact of the release of liquid effluent would be major and will be considered at length below. The draining of Candy Lake would be of a temporary nature and is subject to the *Fish Habitat Compensation Agreement* which is the mandate of the Department of Fisheries and Oceans. The creation of lakes by the flooding of open pits should be avoided, as discussed in section 5.3.9.

In assessing the impact of liquid effluent on the receiving waters, it is important to know the flow rates for streams in the Collins Creek watershed. Unfortunately, the historic data are of questionable value. Thus, the proponent has developed a synthetic set of data, based on flow rates for Thyme Hill River, that seems to correlate well with the limited available data. However, the uncertainties associated with this approach are considerable. For example, is the storage capacity of Sink Lake sufficient to delay the release of effluent during periods of low water flow? **In an attempt to avoid unacceptable impacts on the quality of the surface water, the proponent should determine accurate flow rates for the streams in the Collins Creek watershed and model the predicted impacts on the receiving waters accordingly.**

[98] *McClean Lake Project, Environmental Impact Statement Amendment*, Total Minatco Ltd., September 1992, Section 2.

Some of the general issues relating to liquid effluent are discussed in section 2.3.2. The discussion therein is particularly relevant to McClean Lake because of the large volume of effluent that would be created by that proposed project. The volume is estimated to average approximately 3,760,000 m^3 a year over the 18 years of the project, but in some years it would be almost double this amount.[98] Using the proponent's data it is possible to calculate the average total environmental loading (total mass released in effluent) for various contaminants. For example, almost 400 kg each of arsenic and nickel, more than 2,000 kg of uranium, and more than 13,000 tonnes of total dissolved solids would be released on average each year. Thus, the release of contaminants in the liquid effluent would be substantial. It is not surprising to learn that the Saskatchewan Surface Water Quality Objectives would be exceeded for many contaminants in Sink Lake, Vulture Lake and even part of McClean Lake.

The proposed impacts to Sink Lake, Vulture Lake, McClean Lake and Collins Creek are not acceptable because there is good evidence to suggest that the volume of effluent could be lowered substantially in at least two ways. First, the volume of contaminated mine-water requiring treatment could be decreased by intercepting groundwater with a network of dewatering wells around each open pit. Uncontaminated groundwater could be released directly into the watershed. **The panel, therefore, recommends that contaminated mine-water inflows be reduced.** Second, the proponent plans to use sodium chlorate as an oxidant in the milling process for ores with a low arsenic content. If this is done, it will not be possible for the mill effluent to be recycled because of its high chloride content. The use of alternative oxidants, which allow the mill effluent to be recycled, would reduce chloride loading in the effluent. **The panel, therefore, recommends the evaluation of alternative oxidants that could replace sodium chlorate in the proposed mill, to permit recycling of mill effluent.**

The rationale for the following three recommendations may be found in section 2.3.2. **First, the panel recommends that the McClean Lake mine participate in the establishment of a research fund to support a search for innovative ways to reduce both the volume of effluent and quantity of chemicals required to treat contaminated water. Second, the panel recommends that site-specific water quality objectives be developed for the McClean Lake mine. Third, the panel recommends that total environmental loading be specified for the McClean Lake mine and that a material-balance be developed for all contaminants in the liquid effluent.**

> *I must stress that you have to watch the water because water is how we sustain our life.*
>
> T. Dzeyllion, *Transcript of Public Hearings*, Wollaston Lake, Saskatchewan, April 14, 1993, p. 128.

5.3.5 Tailings Management

Tailings management can also have a substantial deleterious effect on the quality of surface water downstream from the mine site. For this project, it has been proposed that the mined-out JEB pit be used as a pervious surround disposal facility to contain mill tailings from both the McClean Lake project and the Midwest Joint Venture mine. The use of one tailings facility for two projects should be environmentally beneficial because it would reduce the proliferation of such sites. Placement of the tailings in a pit would also decrease the likelihood of surface water contamination (but raises the spectre of possible ground water contamination).

Despite these theoretical advantages, we were reminded by the public that the pervious surround method for tailings containment has not yet been adequately tested. The only such pit in the Athabasca Basin, the nearby Rabbit Lake facility, has not been in operation long enough to demonstrate its viability. It is the panel's opinion that it would be prudent to observe the operation of that facility for a few more years before deciding on whether or not to license another. **This is one of the primary reasons why we are recommending a delay in the start-up of this project for at least five years. The time interval will provide the regulatory agencies with an opportunity to observe and evaluate the facility at Rabbit Lake; it will also undoubtedly provide the proponents with information that can be used to improve the design of the JEB facility.**

> *...no new pervious surround tailings until the pilot project at Rabbit Lake is proven. That's my position.*
>
> M. Shiell, *Transcript of Public Hearings*, Regina, Saskatchewan, March 22, 1993, p. 269.

5.3.6 Wildlife and Terrestrial Habitat

The area of the proposed McClean Lake project is not highly productive and wildlife populations are low. The main concerns of the public related to possible widespread contamination of the area, including the vegetation and wildlife, by radionuclides and metals. This concern is discussed in sections 5.3.7 and 5.3.8.

One rare plant has been found in wetland habitats in the project area and could be impacted by mining development. The panel concludes that this risk is acceptable, given that these habitats are commonly found throughout the region. However, the proponent should undertake to implement all reasonable measures to protect such habitats from disruption.

5.3.7 Monitoring

The proponent has developed a comprehensive monitoring program that would start before mine excavation in order to provide adequate baseline information.[99] While the proposed monitoring program for the terrestrial environment is satisfactory, the corresponding program for the aquatic environment requires modification. In particular, the division of monitoring activities into core and second-level components, whereby the latter would only be monitored if certain, unspecified action levels in core components were exceeded, is not acceptable. It is suggested, instead, that all of the second-level components be monitored on the same basis as core components, with the possible exception of radionuclide and heavy metal content of benthic invertebrates. Otherwise, the overall design and rationale of the proposed monitoring program is consistent with the general philosophy discussed in section 2.3.1. In keeping with the arguments therein, **the panel recommends that the Environmental Transfer Pathway model (ETP/AECB) be used as the focus for integrating the monitoring program at McClean Lake.** The general design of the monitoring program should be the same as that at other uranium mines. This will guarantee a consistent replication of treatments for biological effects monitoring and eventually produce the database required for the study of cumulative effects. The results of biophysical monitoring at McClean Lake should be reviewed by the independent monitoring committee recommended in section 5.4.3.

A delay in the start-up date for this project would allow the proponent to establish a monitoring program and obtain considerable baseline data before mining starts.

5.3.8 Cumulative Biophysical Effects

There is considerable potential for cumulative effects arising from the McClean Lake project. It involves five mines (JEB, Sue A, Sue B, Sue C, and McClean underground) which are located within a 10-20 km radius of several other ore bodies that have been or could be mined in the future (Dawn Lake, MidWest, Eagle Point, Collins Bay A, Collins Bay B, Rabbit Lake, Horseshoe, and Raven). Indeed, it is not a question of whether or not there will be cumulative environmental impacts, but of their magnitude.

Three cumulative biophysical impacts are of potential concern: impact on surface waters; concentration of contaminants by aquatic sediments; and airborne dispersal of contaminants.

Liquid effluent from the McClean Lake project would drain via Collins Creek into the west side of Wollaston Lake, approximately 40 km north of where effluent from the existing Rabbit Lake mine is discharged via Effluent Creek into Hidden Bay on Wollaston Lake. Preliminary assessments[100] suggest that cumulative effects from the two mines (and also from the two more distant mines at Cigar Lake and Key Lake) on the water

[99] *Complementary McClean Lake and Midwest Project, McClean Lake Project, Environmental Impact Statement, Additional Information Requested by Uranium Mines Review Panel*, Total Minatco Ltd., November, 1992, Deficiency Number 3.33 and Deficiency Number 3.35.

[100] "Cumulative Impact of Uranium Mining in Northern Saskatchewan", Atomic Energy Control Board, *Submission to Public Hearings*, Saskatoon, Saskatchewan, May 4, 1993.
McClean Lake Project, Environmental Impact Statement, Amendment, Total Minatco Ltd., September, 1992, Section 3.

quality of Wollaston Lake would be impossible to detect. Nevertheless, the McClean Lake project would add one more polluted watershed to the west side of Wollaston Lake. Consequently, there would be a worsening in water quality in this region which might affect the traditional use of the land by local communities (see section 5.4.4).

The enormous volume of effluent expected to be discharged by the project and high total environmental loading of many contaminants (see section 5.3.4) would result in large quantities of metals and radionuclides being accumulated in the sediments of Sink, Vulture, McClean and Kewen Lakes. Furthermore, contamination would mainly occur in the top 10 cm of the sediments. This is where aquatic macrophytes are rooted and is also the environment for bottom-living animals. The proponent's EIS indicates that by the end of the project the sediment quality in Sink and Vulture Lakes would exceed the "severe effects level" of the Ontario Sediment Quality Guidelines for arsenic, cadmium, copper, and nickel. This level indicates concentrations at which prolonged disturbance of the sediment dwelling community can be expected, with resultant harmful effects on the majority of bottom-living species. This impact on the sediment-dwelling community is expected to persist for a long time. The proponent's modelling analysis of sediment quality indicates that sediment quality in Sink and Vulture Lakes would exceed the Ontario Sediment Quality Guidelines for arsenic and cadmium for at least 100 years following the proposed decommissioning of the project. Clearly, plans should be developed to minimize or mitigate these effects before mining begins. We also note that Saskatchewan has no guidelines for sediment quality.

The remaining cumulative impact of concern is that radon, radon progeny, and radioactive dust emissions would overlap with those of nearby mines to produce a wider, regional effect. Preliminary modelling by the proponent indicates that radon from McClean Lake, at concentrations elevated above background levels, would overlap with radon from the proposed Midwest mine and the existing Rabbit Lake mine. Similarly, there would also be overlap of elevated dust concentrations from the McClean Lake and Rabbit Lake mines. However, the zone of overlap is predicted to be at very low concentrations, at about one-thirtieth of background levels for radon, for example.

Residents of the Athabasca region, particularly those in the Wollaston Lake area, will continue to be concerned about the possible deterioration of water and air quality, and whether the plants, fish and wildlife that they harvest are contaminated. **The panel shares these concerns and recommends that cumulative effects be assessed using the ETP/AECB model and that the results be validated by using a whole ecosystem monitoring approach, as specified in sections 2.3.1 and 5.3.6. We also recommend that the Saskatchewan government adopt sediment quality guidelines similar to those of the Ontario government.**

[101] R. McKay, *Transcript of Public Hearings*, Saskatoon, Saskatchewan, May 3, 1993, p. 163.

5.3.9 Decommissioning and Site Reclamation

The flooding of the Sue pits and the tailings-filled JEB pit is objectionable. For example, the proponent's model for the flooded Sue pits suggests that the Saskatchewan Surface Water Quality Objectives for arsenic, copper and nickel would be exceeded for at least 500 years. Moreover, in assessing the water quality of the flooded pits, the effect of leachate from the surface waste rock piles has not been included. There would be sufficient waste rock to completely fill all of the pits and thereby reduce the problem of leachate from this source to a minimum, as well as eliminate the concern over water quality in the flooded pits. **The panel recommends that all open pits be filled to surface with waste rock and capped with clean overburden.**

Plans for the reclamation of Candy, Sink, Vulture, McClean and Kewen Lakes would require the approval of the Department of Fisheries and Oceans.

It is recommended that a financial guarantee to cover decommissioning and post-decommissioning costs be secured before the McClean Lake Project is started. The need for such a guarantee for all mines has previously been discussed in section 2.3.5.

5.4 Socio-Economic Concerns

5.4.1 Education and Training

During the public hearings, the Executive Director of Northern Education described a Consortia Training Plan[101] that has been developed to address emerging labour market and training issues. This plan requires cooperation between employers and educators to ensure that there will be an approximate balance between the number of jobs available and the number of trained personnel. Such a plan will work best if sufficient time is made available to design the project and train the workers. In order for this Consortia Training Plan to work most effectively, several new projects should not begin at the same time. It will be easier to prepare for a gradual increase in employment opportunities. **Many of the workers required for the McClean Lake project will require more extensive training than, for example, the new workers at the Dominique-Janine extension at Cluff Lake.** This is one of the reasons why we are recommending that the Dominique-Janine Extension be allowed to proceed as soon as the specified conditions are met, but that the start-up of the McClean Lake Project be delayed for at least five years. Given sufficient lead time for training, it should not be difficult for the operating company to meet the employment objectives outlined in the proposed Human Resource Development Agreement described below.

5.4.2 Human Resource Development Agreement

In section 2.2.2 we have recommended that the Human Resource Development Agreements include provisions requiring

80% of all new employees for existing mines to be drawn from the primary and secondary impact communities. However, for a new mine this goal may be too ambitious. In their submission to the panel, officials of the McClean Lake Project suggested that hiring would include 40-75 workers from the Athabasca Basin, 50-100 workers from other northern Saskatchewan communities and 75-160 workers from southern Saskatchewan, for a total of 250 employees.[102] Delaying this project for approximately five years would provide a greater opportunity for education and training prior to start-up and thereby give the company a better chance of meeting its upper estimates for hiring from the Athabasca Basin and northern Saskatchewan. **It is, therefore, recommended that the Human Resource Development Agreement for the McClean Lake Project include employment objectives of 30% (75 workers) of the initial workforce to be recruited from the Athabasca Basin and 40% (100 workers) from the rest of northern Saskatchewan with the balance (30%, 75 workers) coming from southern Saskatchewan or elsewhere. After the mine has been in operation for three years, these objectives would be replaced by those pertaining to existing mines, i.e. 50% of all new employees must be from the primarily-impacted communities and 30% from the secondarily-impacted communities, as described in section 2.2.2.**

5.4.3 Revenue Sharing and Monitoring Committee

Delaying the start-up of this project by at least five years would also provide sufficient time for the province to work out a revenue-sharing program that is acceptable to the impacted communities, and to establish the regulations required to govern the selection and activities of a monitoring committee. **It is recommended that the project not be allowed to proceed until a form of revenue sharing acceptable to the impacted communities has been implemented and a monitoring committee for this project has been appropriately established.** It should be noted that McClean Lake officials have already indicated their concurrence with the suggestion that a monitoring committee be established for the project with representation from the impacted communities,[103] similar to the recommendation we have made in section 2.2.6.

5.4.4 Inherent Rights

Before a new mine site is established, there must be a clear understanding of any residual inherent rights that may exist and how compensation would be provided for the loss of those rights if mining interferes with the use of the land for traditional hunting, fishing, trapping and gathering activities. The province of Saskatchewan has acknowledged that the *Natural Resources Transfer Agreement* which is part of the *Constitution Act, 1930* "*...guarantees Indian people the right to hunt, fish and trap for food on unoccupied Crown land or other lands to which they have a right of access*".[104] The way in which aboriginal people are to be compensated for the loss of these rights when land, which had traditionally been unoccupied, is used for other purposes should be clearly established before developments are allowed to begin. In the specific case of the McClean Lake Project, a substantial area of dry land, as well as several lakes, streams and bogs, would be affected and it is our opinion that, although the area may not be in current use by any specific person, it is still a parcel that would be subtracted from the total amount of land available for traditional uses. **The panel recommends that the loss of inherent rights on that particular parcel of land be recognized and the families or communities involved be compensated by the province.**

It is recognized that arriving at an acceptable form of compensation for the loss of these inherent rights may take considerable time, and a delay in the project would provide an opportunity for this concern to be settled before start-up. We are aware that these and similar issues may be considered by the *Royal Commission on Aboriginal Peoples*, and a delay would permit governments to also have the benefit of its recommendations before approval of this project is considered.

5.4.5 Cumulative Effects

Mining of any non-renewable resource cannot be sustained indefinitely. To be sustainable development, within the definition of the Brundtland Report, the mining of uranium must "*...meet the needs of the present without compromising the ability of future generations to meet their own needs*".[105] Sustainability of the industry as a whole can, however, be achieved over a long period of time by sequential development of various deposits.[106]

Mineral reserves are depleted as deposits are mined out, and are subsequently replenished by new discoveries, or by technological advances that make lower grade deposits economic to develop. Innovations in developing alternate energy sources may even eventually eliminate the demand for uranium. However, it is important not to mine out current reserves unless the market demand coincides with the amount of ore being produced. Otherwise, the natural environment will have been disrupted for no sound cause.

Coinciding with the cycle of development of mineral resources is the accompanying employment and spin-off economic development which result from mining activity. The side benefit of direct and indirect employment is the positive impact most often cited by those supporting the continuation of expansion of uranium mining. Negative impacts can thus be accepted,

[102] W. Keyes, *Submission to Public Hearings*, Saskatoon, Saskatchewan, March 19, 1993.

[103] K. Haapanen, *Transcript of Public Hearings*, Regina, Saskatchewan, March 23, 1993, p. 155.

[104] *Interim Report: Information from the Government of Saskatchewan requested by the Federal/Provincial Panel on Uranium Mining in Northern Saskatchewan for the Cigar Lake and McArthur River Projects*, SERM, 1993, p. 4.

[105] G. Brundtland, *Our Common Future*, World Commission on Environment and Development, Oxford University Press, 1987.

[106] *Conservation Strategy for Sustainable Development in Saskatchewan*, Saskatchewan Round Table on Environment and Economy, 1992.

within regulatory standards, provided there are offsetting positive impacts, such as employment.

The potential positive effect, i.e., more employment for northern aboriginals, would be greatly diminished if the projects were allowed to proceed before there were enough trained and educated northern aboriginals available to fill the jobs created. **Therefore, the McClean Lake project should be delayed until a sufficient supply of skilled and educated workers from the impacted communities exists to satisfy the employment demands of this project and existing mines.**

A delay in development would have a second advantage; the overall amount of job dollars being injected into the northern economy from uranium mining could be sustained at a more constant level by a postponed development at McClean Lake. **If the latter project were phased into production as others, i.e. Cluff Lake and Rabbit Lake, were mined out, a continuity of employment would occur, thereby avoiding a boom-bust cycle.**

5.5 Health Concerns

5.5.1 Occupational Health

The comments and recommendations discussed in section 2.4 apply to this project. While several of the components of the project do not pose health risks that are greater than those posed by existing uranium mines, some components of the project are troublesome. From an occupational health viewpoint, Sue C and the underground mine constitute situations of high grade uranium ore and high arsenic concentration. The underground mine poses particular concerns in this regard, as underground mines tend to be associated with higher levels of worker exposure. Section 2.4.1.2 addressed the issue of the synergism of arsenic and radiation. The complexities of dose, dose rate, age at exposure, and concomitant risk factors such as cigarette smoking, as well as arsenic and radiation, all affect the health risks associated with this project. Before approval is granted, the proponent and the regulators must be able to address these complexities and assure the public that the level of health risk associated with the combined exposures in these mines is within acceptable limits.

5.5.2 Community Health

Several community health concerns were identified in section 2.4.2. The extent to which uranium mining has had a positive, negative or no impact on health in the impact communities cannot be evaluated due to the unavailability of sufficient environmental health risk information and the lack of community health data. **The panel therefore recommends that a community health assessment be undertaken before the McClean Lake project is approved.** The community health concerns may be surmountable, with the use of appropriate technology and monitoring. However, the uncertainty factor (as discussed in section 2.4.2.6), the public uneasiness concerning larger issues (section 2.5), and the likelihood of watershed contamination (section 5.3.4) make the assessment of the potential community health risks impossible at the present time. Provision of sufficient time for further public discussion could also promote consensus among the people of Saskatchewan concerning the issues surrounding uranium mining.

JOINT FEDERAL-PROVINCIAL PANEL

ON

URANIUM MINING DEVELOPMENTS IN NORTHERN SASKATCHEWAN

Donald Lee
(Chairperson)

James F. Archibald

John Dantouze

Richard Neal

Annalee Yassi

APPENDIX A

PANEL MEMBER BIOGRAPHIES

DONALD LEE (Chairperson)

Dr. Lee is Head of the Chemistry Department at the University of Regina and Past President of Luther College. A native of Saskatchewan, he has a Master of Arts degree from the University of Saskatchewan, a Ph.D. in Chemistry from the University of British Columbia and has completed post doctoral studies at Harvard University. Dr. Lee has been a member of the faculty at the University of Regina since 1967 and has served as a visiting professor at Stanford University and as a visiting scientist at the University of Oslo. He has published over ninety scientific papers and numerous non-scientific articles.

Active in community affairs for many years, Dr. Lee has been Chairman of the Saskatchewan section of the Chemical Institute of Canada, Executive Member of the Saskatchewan Association of Independent Schools, a national official of the Canadian Amateur Swimming Association, and President of the Regina Optimist Dolphin Swim Club.

JAMES F. ARCHIBALD

Dr. Archibald received his Ph.D. in Mining Engineering at Queen's University and is now an Associate Professor in the Department of Mining Engineering at Queen's. His work experience is primarily in the academic field with some associated private consultation. Dr. Archibald is a member of the Canadian Institute of Mining and Metallurgy (CIM), the CIM Backfill Sub-Committee (Rock Mechanics Group) and the American Institute of Mining Engineers.

Dr. Archibald's research interests include measurement and control of radiation hazards in underground mines, mine ventilation systems, *in-situ* stress analysis, rock burst prediction and structural mine design evaluation. Dr. Archibald is a member of the High Level Waste Disposal Scientific Review Group examining the concept of deep geologic disposal of nuclear fuel waste.

JOHN DANTOUZE

Mr. Dantouze is a Vice-chief of the Prince Albert Tribal Council, with responsibilities encompassing treaty issues, First Nations self-government, and a variety of program, service, and policy areas. Previously, Mr. Dantouze was Prince Albert Tribal Council Community Planning Advisor for the Athabasca Indian Bands of Fond du Lac, Black Lake and Hatchet Lake in northern Saskatchewan.

Mr. Dantouze also sits as an advisor on the Caribou Management Board and the Athabasca Task Force Committee on northern Health Services. He recently participated in the Saskatchewan Environmental Assessment Review Commission formed to review the province's environmental assessment review process, and acted as a Dene interpreter when the Commission visited the Athabasca region of northern Saskatchewan.

RICHARD NEAL

Dr. Neal is Associate Dean (Academic) and Professor of Biology in the College of Arts and Science, University of Saskatchewan. He received both his Bachelor of Science and Ph.D. in Zoology from the University of Southampton, U.K. Dr. Neal has been a member of the Department of Biology at the University of Saskatchewan since 1968, and has taught extensively in the field of Biology.

Dr. Neal's research interests include population ecology and a broad range of environmental issues, including impacts of uranium mine and mill effluent on the aquatic environment in northern Saskatchewan, effects of pesticides on prairie ponds and duck populations, and revegetation of lands salinized by potash mine tailings. Dr Neal is actively involved in a number of professional organizations and has been the Chairman of the Environmental Advisory Committee for the City of Saskatoon.

ANNALEE YASSI

Dr. Yassi is an Associate Professor and Director of the Occupational and Environmental Health Unit, in the Department of Community Health Science, University of Manitoba. She is also the Director of the Department of Occupational and Environmental Medicine at the Health Sciences Centre in Winnipeg. Dr. Yassi received her Bachelor of Science degree in 1974 from McGill University and her M.D. in 1977 from McMaster University. She obtained a Master of Science degree in Community Health, (Epidemiology/Occupational and Environmental Health) in 1985 from the University of Toronto, and is a Royal College Fellow in both Community Medicine and Occupational Medicine.

Dr. Yassi has served as an occupational physician for the Manitoba Federation of Labour Occupational Health Centre; she has also served as the principal medical consultant for the Manitoba Hazardous Waste Management Corporation. She has conducted numerous health hazard evaluations and has been involved in several environmental impact assessments affecting Native communities. She was also a member of the Canadian Public Health Association's Task Force on Human and Ecosystem Health.

APPENDIX B

TERMS OF REFERENCE FOR THE ENVIRONMENTAL ASSESSMENT REVIEW OF URANIUM MINING DEVELOPMENT

MANDATE

1. The panel shall review the environmental, health, safety and socio-economic impacts (hereinafter referred to as "impacts") of the proposed uranium mine developments (listed in Schedule A) in northern Saskatchewan and assess their acceptability.

   In assessing the acceptability of the proposed developments, the panel will include in its review and consider:

   a) the historical experience with past and existing uranium mining operations in Saskatchewan;

   b) the cumulative impacts of existing operations and the proposed developments;

   c) the short and long term impacts of the proposed projects, spanning their construction phase, operating period, decommissioning phase and post-decommissioning phase;

   d) the impact of employment and socio-economic opportunities afforded northern residents by the proponents and the measures necessary for implementation of those opportunities;

   e) the adequacy of measures proposed by the project proponents to protect environmental quality and to safeguard worker health and safety, and whether the measures can be expected to meet the requirements of Canadian and Saskatchewan law, regulations and policies applicable to uranium mine developments;

   f) the adequacy of monitoring, enforcement and compliance systems to ensure that measures necessary for mitigating adverse impacts can be implemented; and

   g) the benefits afforded by the proposals.

2. The panel shall determine from its review whether a project is acceptable or unacceptable.

   In concluding that a project is acceptable, the panel may recommend that specified minimum terms and conditions, including any mitigative measures or any other measures relating to the impacts under the panel's review, be implemented where it considers these necessary for the protection of health, safety and the environment or for dealing responsibly with socio-economic concerns. The panel may also suggest measures that it considers would enhance the acceptability of the proposals.

   If the panel concludes a project is unacceptable, it shall provide its reasons for this conclusion.

3. In fulfilling its mandate, the panel shall provide full opportunities for public consultation and review.

REVIEW PROCEDURES

Detailed written procedures for conducting the review shall be established by the panel and made available to the public.

TECHNICAL EXPERTS

The panel may secure the services of independent technical experts to assist and advise on complex technical and/or socio-economic issues related to its mandate. Such experts will also be available to respond to inquiries from review participants.

STAGES OF THE REVIEW

Schedule A lists the five proposals to be reviewed by the panel. The five proposals have been referred due to potentially significant or unknown adverse environmental effects and public concern.

While all of the proposals are in the planning stage, some are further advanced than others. Environmental Impact Statements (EIS) have been prepared for the first three proposals listed in Schedule A, one of which (Dominique-Janine extension) is associated with the existing operating uranium mining facility and two of which are for new uranium mining facilities. EIS documents have yet to be prepared for the last two proposals listed in Schedule A. The panel will take the differing stages of these projects into consideration in scheduling its review.

The panel will seek public comment on the three available EIS's and determine their adequacy before proceeding to public hearings. When the panel is satisfied with the information provided, including that with respect to the cumulative impacts, it may report on one or more of these projects to the Ministers as described in the following stages of the review. The panel shall submit its final report(s) on these proposals within 18 months of its appointment.

In reviewing the remaining two proposals, the panel will conduct scoping sessions in appropriate communities to solicit public comment and, based on these comments and its own consideration, prepare and issue Guidelines to the respective proponents for the preparation of EIS's. The cumulative impacts of these two proposals will be considered when the EIS

documents have been submitted. The stages of the review following submission of these documents to the panel are outlined below. The panel shall submit its final report(s) on these two proposals within 18 months of receipt of the proponents' EIS's.

1. **Review of Information**

   a) Review of the available information on the environmental, health, safety and socio-economic impacts of the uranium mining industry in Saskatchewan to date. The information and any related reports prepared will be made available to the public.

   b) Review of the past performance of the uranium mining industry in providing employment and socio-economic opportunities to northern residents. The information and any related reports prepared will be made available to the public.

   c) Review by the panel of Environmental Impact Statements (EISs) submitted by the proponents. The EISs will also be made available to the public for review and written comment.

   d) The panel may draw on proponents, technical agencies from within federal or provincial governments, independent experts and the public for available information.

2. Should the panel, after reviewing the above information and considering public comments, deem an EIS deficient it may request additional information from the project proponent.

3. Once the panel is satisfied with the information provided, it will announce public hearings for the project in question. If appropriate, the hearings may be structured to address more than one project.

   For the purposes of promoting public awareness and facilitating public comment, the panel will hold meetings and/or hearings in the appropriate northern communities, Regina, Saskatoon and in such other Saskatchewan communities as the panel may think necessary.

4. When the panel is in a position, following the completion of public hearings, to provide a report on its findings, conclusions and recommendations relevant to a specific project, it will submit the report to the federal Ministers of Environment and of Energy, Mines and Resources and to the Saskatchewan Minister of Environment and Public Safety.

   The panel should, to the extent possible, ensure that the timely review of a specific project is not jeopardized by delays in the review of another project included in its mandate.

LINKAGE TO OTHER POLICY PROCESSES

The panel is not expected to interpret its mandate so as to duplicate the work of other public inquiries and policy processes or to focus on national or international issues which are not directly related to the impacts of the proposals.

However, concerns may be raised by the public which extend beyond the impacts of direct concern to the panel, and in such cases the panel will ensure that the public is provided a reasonable opportunity to express these concerns.

SCHEDULE A

EIS Submitted

1. Dominique-Janine Extension
   Amok Ltd.[107]

2. South McMahon Lake Project
   Midwest Joint Venture (Denison Mines Ltd.[108])

3. McClean Lake Project
   Minatco Ltd.

EIS to be Prepared

4. McArthur River Project
   McArthur River Joint Venture (Cameco Corporation)

5. Cigar Lake Project
   Cigar Lake Mining Corporation

[107] Responsible party for Dominique-Janine Extension is now Cogema Resources Ltd.

[108] Responsible party for Midwest Joint Venture is now Total Minatco.

APPENDIX C

PANEL ACTIVITIES

- Joint public review announced and Terms of Reference issued by Robert de Cotret, Minister of the Environment, and Grant Hodgins, Minister of Saskatchewan Environment and Public Safety, April 18, 1991

- Joint Review Panel members appointed by Beattie Martin, Minister of Saskatchewan Environment and Public Safety and Jean Charest, Minister of the Environment, August 22, 1991

- Panel toured all proposed mine development sites, October 1-6, 1991

- Panel's Operational Procedures released December 19, 1991

- EISs received and released for a 90-day public review as follows:

  Midwest Joint Venture, December 19, 1991
  (deadline date for submissions–March 20, 1992)
  McClean Lake Project, January 13, 1992
  (deadline date for submissions–April 13, 1992)
  Dominique-Janine Extension at Cluff Lake, March 31, 1992
  (deadline date for submissions–June 30, 1992)

- Deadline date for public submissions for MJV and McClean Lake extended to May 29, 1992

- Scoping Meetings for Cigar Lake and McArthur River announced January 7, 1992, to begin February 7, 1992

- Dates and locations of Scoping Meetings announced January 22, 1991, as follows:

February 7, 1992	Ben McIntyre School, Uranium City
February 8, 1992	Fond du Lac Band Hall, Fond du Lac
February 10, 1992	Community Hall, Stony Rapids
February 10, 1992	Community Hall, Black Lake
February 11, 1992	Hatchet Lake Band Hall, Wollaston Lake
February 12, 1992	Arena Hall, La Loche
February 13, 1992	Complex Hall, Buffalo Narrows
February 14, 1992	Community Hall, Ile-à-la-Crosse
March 2, 1992	Ramada Renaissance, Regina
March 3, 1992	Holiday Inn, Saskatoon
March 4, 1992	Marlboro Inn, Prince Albert
March 5, 1992	Kikinahk Centre, La Ronge

- Modifications to the Midwest Joint Venture and McClean Lake projects issued May 6, 1992

- Technical Reviews of Midwest Joint Venture and McClean Lake projects, as prepared by Ecologistics Limited, issued May 29, 1992

- Draft Guidelines and Government Information Requests for Cigar Lake and McArthur River issued June 1, 1992, for public review until July 3, 1992

- Summary Report on Scoping Meetings for Cigar Lake and McArthur River, prepared by Quadra Planning Consultants Ltd., issued August 19, 1992

- Guidelines for the Preparation of Environmental Impact Statements and Government Request for the Cigar Lake and McArthur River projects issued September 11, 1992

- Request for Additional Information issued to Amok Ltd. on October 7, 1992

- EIS Amendments for Midwest Joint Venture and McClean Lake issued October 30, 1992, for a public review period ending November 30, 1992

- EIS on McArthur River Project Underground Exploration Program, July 1992, and Addendum, October, 1992, referred to Joint Panel for public review on October 29, 1992, with review period ending December 2, 1992

- Dates and locations for Public Hearings on McArthur River Underground Exploration Project announced November 1, 1992, as follows:

December 3, 1992	Hotel Saskatchewan, Regina
December 4-5, 1992	Holiday Inn, Saskatoon
December 6, 1992	Community Hall, Fond du Lac
December 7, 1992	Community Hall, Black Lake
December 8, 1992	Hatchet Lake Band Hall, Wollaston Lake
December 9, 1992	Community Hall, Pinehouse
December 10, 1992	Kikinahk Centre, La Ronge

- Response to Panel's Request for Additional Information from Total Minatco on the McClean Lake project issued on December 15, 1992, for a public review period ending January 15, 1993

- Panel issued commissioned reports December 15, 1992, as follows:

  – *Health in the Context of Uranium Mining in Northern Saskatchewan*, Ed Weick, ESAS

- *An Overview of the Biophysical Environmental Impact of Existing Uranium Mining Operations in Northern Saskatchewan*, Dr. Herman Dirschl, ESAS
- *A Brief Historical Review of the Beaverlodge Mining Area of Northern Saskatchewan*, R. Barsi and Dr. A.W. Ashbrook
- *A Socio-Economic Overview of Uranium Mining in Northern Saskatchewan*, Ed Weick, ESAS
- *Review of the Cluff Lake and Key Lake Reports*, L. Vigrass

- Response to Panel's Request for Additional Information from Midwest Joint Venture issued on December 23, 1992, for a public review period ending January 22, 1993

- Panel issued specialists' report, *Assessing Cumulative Effects of Saskatchewan Uranium Mines Development*, on January 8, 1993

- Panel submitted McArthur River Underground Exploration Program report to federal and provincial governments, on January 15, 1993

- Cogema's (formerly AMOK) Response to the Panel's Request for Additional Information issued February 8, 1993, for a public review period ending March 5, 1993

- Public Hearings dates and locations announced on February 19, 1993, and extended dates announced March 26, 1993. An additional change in the dates of the Hearings was announced on April 26, 1993. Hearings were held as follows:

March	22-24, 1993	Hotel Saskatchewan, Regina
April	13, 1993	Community Hall, Black Lake
April	14, 1993	Hatchet Lake Band Hall, Wollaston Lake
April	15-16, 1993	Kikinahk Centre, La Ronge
April	16, 1993	Friendship Centre, Ile-à-la-Crosse
April	19, 1993	Complex Hall, Buffalo Narrows
April	20, 1993	Arena Hall, La Loche
April	21, 1993	John M. Cuelenaere Library, Prince Albert
May	3-5, 1993	Holiday Inn, Saskatoon
May	7-8, 1993	Holiday Inn, Saskatoon
May	17-20, 1993	Holiday Inn, Saskatoon

APPENDIX D

SUBMISSIONS TO PANEL

APPENDIX D-1

REFERENCED BY ALL THREE REVIEWS

D-1.1 Oral Presentations Made At Public Hearings

Alam, Rabbi
Algoma Manitoulin Nuclear Awareness (Ed Burt)
Alto Construction (Ron Kunkel)*
Anderson/Fast Marketing Solutions (Doug Fast)*
Association of Consulting Engineers of Saskatchewan (E.J. Hinz)*
Athabasca Airways (Jim Glass)
Atomic Energy Control Board (George Jack, Mary Measures, Dalsu Baris, Bernie Zgola, Tom Viglasky, Larry Chamney, Kevin Scissons, Rick McCabe, Ron Moore, Fred Ashly)*
Augier, Danny
Ayotta, Ivan

Battlefords Awareness Movement (Laird Brittin)*
Batty, Linda
BCP Engineering Ltd. (Gary Cabalt)*
Beauvin, Marie
Beaver Eye, Joe
Bell, Jack*
Benoanie, Ed
Bethel United Church, Council of (Judy Howsam, Helen Smith-McIntyre, Mary Jean Roy)*
Big Eye, J.B.
Big Eye, Maurice
Black Lake and Fond du Lac Bands (Chief Joe Martin, Pierre Robillard, Donald Deranger, Edwin Boneleye)*
Boan, Derek*
Bougie, Paul
Bouvier, Vye*
Bradek, Carla
Brady Development Corporation, Pathway to Success Program (Michelle Harding)
Brent Construction (Russ Clunie)

Brucy, Martin
Bryce, Elizabeth*
Bryson, Mike*

Canadian Coalition for Nuclear Awareness (Gordon Edwards)
Canadian Labour Congress and the Saskatchewan Federation of Labour (Don Anderson)
Canadian Nuclear Association (The Honourable John Reid, Ian Wilson)*
Canadian Union of Public Employees, Saskatchewan Division (Glen Makahonuk)*
Carle, Gordon
Case, Leila
Chambers, Doug
Chary, Srini*
Cheecham, Roy
Chevalier, Malann
Chicken, Senator Louis
Christie, Larry
Churchill Métis Labour Management Board (Max Morin)
Cisyk, Dave
Citizens Concerned about Free Trade (Marjaleena Repo, David Orchard)*
Clark, Peter
Clay, Colin P.*
Cominco Engineering Services Ltd. (Will Brandsema)*
Communications, Energy and Paperworkers' Union of Canada (R.E. Neilsen)*
Communications, Energy and Paperworkers' Union, Local 48 (Geoff Case and Del Josephson on behalf of John Case, Sid Schmidt, John Case)*
Community Services Health Clinic (Michael Wilson, Michael Murphy)*
Conlon, Art (on behalf of Sharon Aubin)*
Conwest Construction (Oliver (Bob) Cromwell)*
Crush, Terry
Cummings, Rick
Curry, Bill
Cusitar, Murray
CUSO (Don Kossick, Marlene Larocque, Jacqui Barclay)*

Daigneault, Tony
Dancer, Joys
Dancer, Oriole
Deranger, Donald*
Denechezhe, Sophie*
Denison Mines Ltd. (Andy Rickaby)*
Dewar, Dale
Dillen, Ken*
Dobbin, Murray (presented by David Geary)
Drummond, Val
Dumais, William
Dzeyllion, Martin
Dzeyllion, Tony

Energy, Mines and Resources Canada (Richard Williams, Greg McGuire, Grant Feasby, Ron Edwards)*
Environment Canada (Dennis Lawson, Bill Howard)*
Environmental Engineering Research Unit, University of Saskatchewan (Lee Barbour, John Gillis)*
Epp, William*

Favel, Brian
Favel, Jim
Favel, William
Federation of Saskatchewan Indian Nations (Vikas Khaladkar on behalf of Chief Roland Crowe)
Fern, George
Fisher, Linda*
Fisheries and Oceans Canada (Bruce Fallis)*
Fitzsimmons, Michael
Flood, Peter*
Forgay, Beryl*
Fortugno, Maria*
Fortugno, Stefania*
Francis, Mai
Froese, Dan*
Froese, Joe

Gagne, Louise*
Garrett, Jim*
Geary, David*
George, Isabelle*
George, Chief Louis
GML Integrated Environmental Management Ltd (Raymond Van de Woestyne)*
Gramiak, Connie*
Greenfield, Dave
Greenpeace (Stan Gray)*
Guillet, Raymond

Harding, Jim*
Hardy, Naomi
Harrison, Phil
Hauta, Shirley*
Hawkins, Valerie*
Health and Welfare Canada (Jerry Shaw)*
Helliar, Stephen*
Hellmuth, Ralph*
Herman, Cecile
Herman, Emil
Herman, Lester
Holden, Joe*
Howe, Eric*

Ile-à-la-Crosse, Town of (His Worship Buckley Belanger)*
IndEx'93 (Barb Klassen)*
Indian and Northern Affairs Canada (George Cornwell)*
Inter-Church Uranium Committee (Phillip Penna, Michael Poellet)*
Interprovincial Association on Native Employment (Roberta Burns)*
Inuit Tapirisat of Canada (Jamie Kneen, Joan Scotti)*
Iron, Joe Sr.
Irvine, J.*

J.P. Enterprises (J.P. Proulx)
Jacek, Sister Regina
Jack, Bob
Janvier, Diane
Janvier, Jacob
Jensen, Debbie
Johnson, Harold
Josie, Martin
Josie, Sarazine

May 193

May 6 Janice Hughes
1:30.

Kennedy, Ray
Kilborn Western Inc. (Ted Bassett)*
Kirshner, David
Kitsaki Development (J.P. Roberts)
Klassen, Cameron
Kramer Ltd. (Garry Ewen on behalf of Tim Kramer)
Kyle, Croft

Laban, Jimmy
La Loche Airways (Craig Schnell)
Lamont, Tom*
LaRiviere, Tom*
La Ronge and District Chamber of Commerce (Peter Kelly)*
La Ronge Economic Development Committee, Town of (Scott Robertson)*
La Ronge, Town of (His Worship Morris Gabrush)*
Lau, Victor
Le Maigre, Ida
Le Maigre, Mark
Lindner, Degen*
Loewer, Roland
Logue, Maureen

McDonald, Bart
McIntyre, Lawrence
McKay, Norma
Paul McKay
McPherson, Jean*
Malboeuf, Norma
Meadow Lake Heritage and Future Development Association, and Meadow Lake District Chamber of Commerce (Eric Roberts)
Mercredi, Germaine
Mercredi, John James
Mercredi, Robert
Métis Society of Saskatchewan (Norman Hansen)
Métis Society of Saskatchewan, Local 126 (Robert Doucette, Deb Hopkins)*
Metke, Bill*
Montgrande, Sharon
Montour, L.
Morin, Jeff
Morin, Gordon
Morin, Sharon
Morin, Vital
Mumm, Maggie*
Murphy, Linda
Myers, David*

Naldzil, Alfred
Norsask Native Outreach Inc. (Vicky Marinuk, Antoinette Le Maigre, Doreen Morin)*
North Saskatoon Business Association (Ed Stevens)*
Northeast Economic Development Association (Torance Tomquist)*
Northern Explosives Ltd. (Larry Wolkowsky)
Northern Mining Coordinators (Les Erikson)*
Northern Resource Trucking Ltd. (Roger Olyowsky, Chief Harry Cook, Dwayne Hounsel)*
Northwatch (Lloyd Greenspoon)
Northwest Credit Union (Bill Jeffrey)

O'Conway, Marcie
Onyskevitch, Morris*

Parrott, Dan
Partnership, The (Betty Anne Latrace-Henderson)*
Pedersen, Gil*
Pedersen, John*
Pedersen, Yens (on behalf of Jean Sloan)*
Peerenboom, Laurie*
Pelican Narrows, Northern Village of (Torance Tomquist for Ron Canada)*
Penna, James*
Pinehouse, Village of (His Worship Peter Smith, Greg Ross)
Pokebusters (Karen Weingeist)
Porcupine Plain Opportunities Programs (Carl Kwiatkowski)
Powder, Danny
Powder, Dennis
Powder, Steve
Prince Albert Citizens for Energy Alternatives (Steve Lawrence)*
Prince Albert Development Corporation, Security Services (Raymond Sanderson)*
Project Plow Shares (Ellen Gould)
Pronteau, Gilbert

Quigley, Tim*

Rachar, Paul
Ratt, Brian
Regan, Gerald
Regnier, Bob
Robillard, Archie
Robillard, Chief Dan
Robillard, Dennis
Robillard, Henry
Robillard, Mervin
Robillard, Simon
Robillard, Ted
Rogalla, Dieter* European Parl't
Rushton, Michael*

Sachacherl, Ugo*
Salt, Reg*
Sanderson, Lillian
Sandypoint, Billy
Saskatchewan Association of Rural Municipalities (Val Kononoff, Jim Angus)*
Saskatchewan Conference of the United Church of Canada, The Church in Society Committee (Sylvia Thompson)*
Saskatchewan Construction Association Inc. (Jim Chase)*
Saskatchewan Education, Training and Employment (Ray MacKay)*
Saskatchewan Energy and Mines (Ray Clayton, Jane Forester)*
Saskatchewan Environment and Resource Management (Ron Zukowsky, Ron Barsi, Bruce Smith, Greg Vogelsang, George Lucas)*
Saskatchewan Environmental Society (Peter Prebble)*
Saskatchewan Executive Council (Frank Bogdasavich)*
Saskatchewan Government Employees' Union (Fiona Bishop, Dale Holmberg)*
Saskatchewan Health (Danni Boyd, Jane Lyster, Kathy Chisholm, Gloria Sills, Leonard Hamm)*
Saskatchewan Indian and Métis Affairs (Victor Taylor)*

Saskatchewan Labour (John Alderman, Denis Brown)*
Saskatchewan Mining Association (Bob Cunningham)*
Saskatchewan Municipal Government (Ron Styles, Brian Goffin)*
Saskatchewan Natural History Society (Jim Elliott)*
Saskatchewan Social Services (Brenda Righetti)*
Saskatchewan Urban Municipalities Association (Alderman Ted Cholod, His Worship Buckley Belanger)*
Saskatchewan Young New Democrats (Keith Jorgenson)*
Saskatoon Chamber of Commerce (Albert Johnson)*
Saskatoon, City of (Peter McCann)*
Saskatoon Economic Development Authority (Dick Pinder)*
Saskwatch (Paul Hanley, Larry Morris)*
Sayezi, Donald
Sayezi, Jimmy
Sayezi, Max
Scarfe, Albert*
Schlichemeyer, Cheryl*
Senior Environmental Organization of Regina (Verena Catikkas)*
Sentar Consultants Ltd. (Donald Somers on behalf of Stella Swanson)*
Septre Controls Ltd. (Stan Powell, Larry Bohn)*
Shiell, Maisie*
Shumard, Shirley
Siemens Transport (Brian Smith)*
Simpson, Graham*
Six Seasons Catering (William Smith)*
Smillie, Adelle*
Sproule, Cathy*
Stang, Carol*
Stmad, J. G.*
Swider, Rick
Sydiaha, Stephanie
Sylvester, Donnie
Sylvester, Linda
Symis, Marie
Synergy Today (His Worship Bill Childerhose)*

Tavini-Huiraatira-Polynesian Liberation Front (Remuna Tufariua)*
Taylor, Allan S.*
Telesis[3] (John Scharf, Bud Burrell)*
Thyssen Mining Construction of Canada Limited (Andrew Fearn)*
Tron Power Ltd. (Ron Hemeon)*
Tsannie, Chief Joe*
Twin Rivers Educational Environmental Society (read by Yens Pedersen for Val Shockey)*

United Steelworkers of America, Local 8914 (Gordon Telfer)*
University of Saskatchewan (Bill Stolte)*
Uranium Coalition (Marvin Resnikoff)*
Uranium Saskatchewan Association Inc. (Tim Meadley)*

Vector Enterprises (Bob Heath)*

Wartman, Mark
Watson, Ron
Wells, Stewart*
West Wind Aviation (Dennis Goll)*
Whitehawk, Joe
Weingeist, Karen
Wiercinski, Criss*
Winnipeg Coordinating Committee for Disarmament (Philip Kienholz)*
Woods, Bob
World Uranium Hearings (Guenter Wippel)*

N. Yanke Transfer Ltd. (Russell Marcoux)*
Yole, Sharon

*A written submission was supplied to accompany the oral presentation, and is available for public review.

D-1.2 Written Submissions

Beverly and Kaminuriak Caribou Management Board (Jerome Denechezhe)
BIG MOUNTAIN Aktionsgruppe, Team Frankfurt (Wolfgang Sandkühler)
Breti, Sybil
Concerned Citizens of Manitoba (Anne Lindsey, Dave Taylor)
Fort Qu'Appelle Peace and Justice Committee (N.L. Rowell)
Fortugno, Frances
Government of the Northwest Territories (Titus Allooloo)
Huculak, Jim
Indigenous Women's Network (Lea Fouchée)
McConnell, Madage
NO-Candu Coalition (Diana Chown)
NUEXCO Information Services (Thomas C. Pool)
Orchard, R. Lyle
PA Foundry Ltd. (Merriett Hewitt)
Penna, Marion
Peoples' Organization Against Nuclear Power and Nuclear Weapon, Gävle, Sweden (Thorild Dahlgren)
Pike, C.
Pomroy, Brent
Thomas, Patricia
Trendocher, Loretta
UNECO (Ken Smith)

APPENDIX D-2

DOMINIQUE-JANINE EXTENSION

D-2.1 Oral Presentations Made at Public Hearings

Buffalo Narrows Airways (Dennis O'Brien)
Cogema Resources Inc. (Michel Poissonnet, Liz Quarshie, Lyle Bear, Stan Penner)*
Communications, Energy and Paperworkers' Union, Local 48 (Geoff Case and Del Josephson on behalf of John Case, Sid Schmidt, John Case)*
Forester, John
Gardiner, Abraham
Gardiner, Rodney (read by Joe Whitehawk)*
LaFleur, Jim
Meneley, W. A.
Piercy and Associates (read by A.R. Garden of McPherson, Leslie and Tyerman, for Harold Piercy)*
Petit, Frank
Quarshie, Ellis*

D-2.2 Written Submissions

Atomic Energy Control Board (George Jack)
Beaver Foods Ltd. Limited (R. J. Henderson)
Environment Canada, Western and Northern Region (B. M. Burns)
Fisheries and Oceans, Central and Arctic Region (P.H. Sutherland)
Flett, Alex, Edward, and Timmy
Health and Welfare Canada (Jerry Shaw)
Inuit Tapirisat of Canada (Jamie Kneen)
Saskatchewan Environment and Public Safety (Technical comments from provincial departments and agencies)
Saskatchewan Environmental Society (Peter Prebble)
Saskatchewan Natural History Society (Jim Elliott, Donald Harron)
Shiell, Maisie
The Uranium Coalition (prepared by Radioactive Waste Management Associates)

APPENDIX D-3

McCLEAN LAKE

D-3.1 Oral Presentations Made at Public Hearings

Brown, Adrian
Corman, Jim
Halbert, Bruce
Hamlet of Wollaston Lake/Hatchet Lake Band Joint Committee (Chief Joe Tsannie, Jack Bell)*
La Ronge/Air Ronge Economic Development Committee (Scott Robertson)*
Points North Freight, (George Eikel)*
Total Minatco Ltd. (Ken Haapanen, Al Morrish, Dennis DeWinter, Walter Keyes)*
Visions North Community Futures Committee (Angus Pratt)*

D-3.2 Written Submissions

Atomic Energy Control Board (George Jack)
Environment Canada, Western and Northern Region (B. M. Burns)
Fisheries and Oceans (P.H. Sutherland)
Fond du Lac Indian Band, Black Lake Indian Band, and Prince Albert Tribal Council Health and Welfare Canada (Tim Bonish)
Indian and Northern Affairs Canada (Clifford S. Starr)
Inuit Tapirisat of Canada (Jamie Kneen)
Joint Review Committee, Hamlet of Wollaston Lake and Hatchet Lake Indian Band (Her Worship Flora Natomagen, Chief Joe Tsannie)
Saskatchewan Environment and Public Safety (Technical comments from provincial departments and agencies)

Saskatchewan Environmental Society (Peter Prebble)
Saskatchewan Natural History Society (Jim Elliott, in cooperation with Donald E. Harron))
Shiell, Maisie
The Uranium Coalition (Prepared by Radioactive Waste Management Associates)

APPENDIX D-4

MIDWEST JOINT VENTURE

D-4.1 Oral Presentations Made at Public Hearings

Hamlet of Wollaston Lake/Hatchet Lake Band Joint Committee (Chief Joe Tsannie, Jack Bell)
La Ronge/Air Ronge Economic Development Committee (Scott Robertson)*
Midwest Joint Venture (Joe Anderson, Herb Fredericksen)*
Montell, Jacques
Points North Freight (George Eikel)*
Rickaby, Andy
Visions North Community Futures Committee (Angus Pratt)*

D-4.2 Written Submissions

Atomic Energy Control Board (George Jack)
Environment Canada (B.M. Burns)
Fisheries and Oceans (P.H. Sutherland)
Fond du Lac Indian Band, Black Lake Indian Band, and Prince Albert Tribal Council
Health and Welfare Canada (Jerry Shaw)
Joint Review Committee, Hamlet of Wollaston Lake and Hatchet Lake Band (Chief Joe Tsannie)
Saskatchewan Environment and Public Safety (Technical comments from provincial departments and agencies)
Saskatchewan Natural History Society (Jim Elliott, in cooperation with Donald E. Harron)
Shiell, Maisie

APPENDIX E

BIBLIOGRAPHY OF REVIEW DOCUMENTS

APPENDIX E-1

REFERENCED BY ALL THREE REVIEWS

- ***A Brief Historical Review of the Beaverlodge Mining Area of Northern Saskatchewan***, by R.G. Barsi and Dr. A.W. Ashbrook, October, 1992
- ***An Overview of the Biophysical Environmental Impact of Existing Uranium Mining Operations in Northern Saskatchewan***, prepared by Environmental-Social Advisory Services Inc. (Herman J. Dirschl, Principal), October, 1992

- ***A Socio-Economic Overview of Uranium Mining in Northern Saskatchewan***, prepared by Environmental-Social Advisory Services Inc. (Ed Weick, Principal), October, 1992
- ***Assessing Cumulative Effects of Saskatchewan Uranium Mines Development***, prepared by an independent team of specialists (Principal authors: M. Husain Sadar, David R. Cressman, and Dianne C. Damman)
- ***Health in the Context of Uranium Mining in Northern Saskatchewan***, prepared by Environmental-Social Advisory Services Inc. (Ed Weick and Dr. John O'Neil, Principals)
- ***Review of the Cluff Lake and Key Lake Reports***, by L. W. Vigrass, September, 1992
- **Uranium Library**, compiled by D.W. Lawson, L. Raymond, D.M. Shiskowski, Environment Canada

APPENDIX E-2

DOMINIQUE-JANINE EXTENSION

- ***Environmental Impact Statement: Dominique-Janine Extension, Main Document,*** Amok Ltd/Ltée, February, 1992.
- ***Environmental Impact Statement: Dominique-Janine Extension, Addendum***, Cogema Canada Ltd/Ltée, January 1993.
- ***Cluff Lake Status of the Environment Report***, Stella Swanson, Editor, October 29, 1990

APPENDIX E-3

McCLEAN LAKE

- ***McClean Lake Project, Environmental Impact Statement,*** Total Minatco Ltd., August 1991.
- ***Complementary McClean Lake and Midwest Projects, McClean Lake Project Environmental Impact Statement***, Total Minatco Ltd., September 1992.
- ***Complementary McClean Lake and Midwest Projects, McClean Lake Project Environmental Impact Statement, Additional Information Requested By Uranium Mines Review Panel***, Total Minatco Ltd., November 1992.
- ***McClean Lake Project, Environmental Impact Statement, Additional Information Transmission Line Tap***, Total Minatco Ltd., March 1993.
- ***Technical Review of the Minatco Limited Environmental Impact Statement for the Proposed McClean Lake Uranium Development***, prepared by Ecologistics Limited, May 21, 1992.

APPENDIX E-4

MIDWEST JOINT VENTURE

- ***Midwest Uranium Project, Environmental Impact Statement***, Midwest Joint Venture, Denison Mines Limited (Operator), August, 1991.
- ***Complementary McClean Lake and Midwest Projects, Midwest Project Environmental Impact Statement Amendment***, Midwest Joint Venture, September, 1992.
- ***Complementary McClean Lake and Midwest Projects, Midwest Project, 1991 Environmental Impact Statement, Additional Information Requested By Uranium Mines Review Panel***, Midwest Joint Venture, November, 1992.
- ***Technical Review of the Midwest Uranium Project Environmental Impact Statement***, prepared by Ecologistics Limited, May 25, 1992.

This is Exhibit "1" referred to in the
Affidavit of Linda Kathryn Murphy
sworn before me, this 2nd
day of September 1996
Stefania Fortugno
A Notary Public in and for the Province
of Saskatchewan, Being a Solicitor

THE UNIVERSITY OF MANITOBA

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September 30, 1996

Chief John Damouzie
Prince Albert Tribal Council
Prince Albert, Saskatchewan

Dear John,

RE: The Panel Process at this point-in-time

It does not surprise me that you have come to the same conclusion that I came to several months ago, namely that I could no longer rationalize my ongoing participation in the Panel. As you know, I, too, wanted to stay and strive to do my job on the Panel as conscientiously as possible. To quote from my message to Don Lee April 12, 1996:

> "First, I want to reiterate that I think that it is cynical to be proceeding to "Public" Hearings when the public will not have the information they need to properly evaluate the EIS. It was clear to me at our meeting Tuesday that there is a political and industrial agenda that we must follow. As much as I am tempted to quit on principle, I realize that this would be exactly what some "stakeholders" would want, and having spent almost 5 years in this process, having had to fight attempts to get me to quit all along, I am not about to do so now."

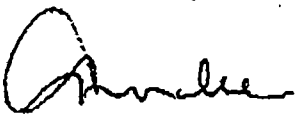
As you know, the Panel's changing of the dates of public hearings, in disregard for my previous commitments, made the situation extremely difficult for me. I therefore wrote to the Minister of the Environment, Honorable Sergio Marchi, to explain the situation. I am enclosing a copy of this letter for your information. As there was no resolution, I was effectively pushed off the Panel. I was glad that you were remaining on the Panel to represent what had become the minority view on the Panel, namely that the process should not proceed until information is brought forward as to how the people of the North would concretely benefit from mining of uranium at this time. As you may recall, I prepared a report for our Panel meeting in April outlining my views on the importance of obtaining the information requested by the Panel with respect on impacts on Northern Saskatchewan communities, revenue sharing, economic viability of the project, community health concerns, etc. I was extremely dismayed that you and I were not able to persuade our colleagues on the Panel to stand firm in seeking this information.

You should already have a copy of the various documents I am enclosing. Please feel free to use them in whatever manner is appropriate. To reiterate the conclusion on page 5 of my report to the Panel:

> "The Panel has been operating since August 1991. A huge amount of effort and taxpayer resources have come into the process. These projects have immense potential benefits, and have immense potential risks. To rush into Public Hearings without all the information needed to assess the acceptability of the proposals would be a serious error."

I wish you the best of luck in your efforts to ensure that the concerns of the Northern communities are indeed addressed.

Yours sincerely,



Annalee Yassi, MD, MSc, FRCPC
Director
Occupational and Environmental Health Unit
University of Manitoba

AY/sb

encl:

Request for Additional Information for the MJV Project

Preamble

This Panel with the environmental impact assessment (EIA) procedures it has been following, has been on the cutting edge of EIAs in Canada, and has been heralded as a model among many authorities. The announcement of a joint federal/provincial environmental impact assessment panel in April 1991 represented a first in that it was a first joint federal/provincial EIA panel for the province of Saskatchewan. It is also the first panel in Canada to be charged with assessing 5 different proposals, rather than just one.

The Panel has always adhered closely to its legislative framework and terms of reference. It has operated in a manner that has been open and fair to all participants, while at the same time showing some flexibility, to change procedures as it had learned from past experiences (eg. holding Information Meetings with the proponent before Public Hearings in this last round of assessments).

The proposals themselves also represent a qualitatively different challenge and opportunity than had ever been faced in EIAs in Canada. These mines represents the largest and richest ore bodies in the world, orders of magnitude more potentially profitable than any previous developments in uranium mines in Saskatchewan, or perhaps anywhere. The richness of the ore, combined in some situations with high mineralization (e.g. high arsenic and nickel levels), while posing potentially enormous profits to its owners, pose potentially devastating effects to the environment, the workforce and the surrounding communities in present and future generations. As such, the importance of comprehensively evaluating both the risks and the benefits presented by these uranium deposit discoveries merits the very scrutiny it is receiving.

While there are various governmental procedures in place to license mining operations, to monitor their operations and to enforce regulations accordingly, the EIA review process is the only step in the approval process in which active public input is sought. The purpose of Public Hearings is to ascertain the acceptability of the proposals and to formulate recommendations to government accordingly. In order for the public to assess the extent to which it finds the proposals acceptable, the public must have access to all information it needs to assess the benefits as well as the risks associated with the proposal. To proceed to Public Hearings with major deficiencies in the information required for this assessment would seriously undermine the purpose of this exercise, wasting considerable tax dollars in this expensive process, and likely leaving many members of the public angry and frustrated that the information they require for proper input had not been assembled. The Panel, therefore, cannot proceed to Public Hearings with major deficiencies in the information needed to assess the benefits and the risks of the proposals.

General Assessment

The proponent has failed to address requests for additional information in a large variety of areas. In the four submissions received by the Panel, major deficiencies were noted with a high degree of consensus that there would be merit in having the proponent respond to these outstanding issues in advance of the conduct of public hearings related to the proposed development. It was noted that otherwise several issues would likely never be addressed (as they would fall outside the regulatory process), highlighting the necessity of acquiring this information at this stage. As noted, for example, by the Department of Fisheries and Oceans: "The forum for addressing such specifics should logically proceed the conduct of public hearings. In the absence of having such information provided in the present response from the proponent, it appears questionable whether such information will be forthcoming." Environment Canada identified two issues that were not addressed adequately: "these two issues are unlikely to be addressed during the regulatory process .... - it is only ever done in preparation of EIS." Comments submitted by RWMA on behalf of the ICUC identified many important issues that have not yet been resolved. Similarly, the AECB noted that their concerns had not been addressed with respect to mining, worker radiological impacts, ore

transportation, handling and milling, and environmental impacts. They noted in several instances that an assessment could not be completed "as there is insufficient information". They noted that the present document seems to be presenting contradictory conclusions on the effectiveness of a pervious surround and that this must be clarified. With respect to a major concern on the effectiveness of the proposed pit in protecting the water quality of the adjacent water bodies they stated "Cogema should be required to address this before or during this public hearings." In addition, the Panel notes that the information necessary to assess the benefits of this project has not been forthcoming. As noted in the submissions, some of the information requested by the Panel was dismissed by the proponent; words such as "cavalier" were used to characterize the response.

Although there are many areas in the Request for Additional Information that have not been adequately addressed, which should be addressed for the public to be able to provide full input, and for the Panel to be able to make appropriate recommendations, the following specific deficiencies deserve particular comment:

1.1 Impacts on Northern Saskatchewan Communities

Statement of the Deficiency: The proponent was asked to provide a description of the socioeconomic impacts on northern communities. While there has been extensive improvement in this area from what was originally contained in the EIS, many statements were made that were not substantiated. Not only has the proponent failed to predict the benefits by region or community, in fact, the proponent has failed to predict the benefits to the province or country either. (The proponent's reason for failing to address this request for information likely relates to its failure to respond to Panel request #9.1, addressed below.)

How the information already available fails to respond to one of the requests made by the Panel: The proponent answered this request in generalities with unsubstantiated statements and assertions. For example, the proponents states: "Economic impacts for northern communities are generally enhanced by preventing delays and development of these projects." This statement is not substantiated. An argument can be made that a delay would be useful to northern communities, as it would allow for greater training of northern residents so as to be able to obtain a greater number of better job and business opportunities. This statement, therefore, is deficient unless substantiated with facts and figures. Similarly, the proponent states that "negative economic impact linkages between uranium mining in northern Saskatchewan communities have been avoided or minimized for projects undertaken since the 1970's because the mine sites are located far away from established communities and have not caused any significant damage to residents or to traditional resources used by the communities." The proponent fails to address the issue of whether communities suffer economic impacts by virtue of their best trained and highest wage earners leaving the communities. This unsubstantiated statement therefore is deficient. The proponent states: "The Midwest project will sustain other economic benefits beyond existing jobs, eg. business impacts and Northern Revenue Sharing Trust Account (NRSTA) revenue sharing impacts. No attempt has been made to predict the magnitude of these benefits by region or community." The proponent notes that the NRSTA "provides assistance to northern communities other than First Nation reserves." The proponent also notes that: "Currently, no portion of the royalties or taxes collected by the province or Canada goes directly to the northern communities." Information and analysis to substantiate the assertion that northern communities will benefit is therefore lacking. The proponent's response suggests that no serious attempt was made to seek the information requested by the Panel.

Why it is essential to receive this information before the public hearings start: Public Hearings, particularly Public Hearings in the north, would be severely impaired by failure to obtain the information requested. It is likely that individuals who have appeared previously before the Panel, and who were reassured that this information would be sought and brought forward, would feel frustration and anger that

Statement of the Deficiency: The very important points brought up by the Department of Fisheries and Oceans, Environment Canada, the ICUC and AECB outline a long series of deficiencies are all valid deficiencies.

How the information already available fails to respond to the requests made: Refer to the submissions for elaboration.

Why it is essential to receive this information before the public hearings start: In some cases, some of the issues would have be addressed before the licensing procedure is completed through AECB. In other cases, as noted in the general comments above, if the information is not made available now, it likely never will be. Moreover, even if information would be made available during the licensing process, it would not be available for public input at that time. As such, it is essential that this information be received prior to the public hearings, so that the huge effort made by many individuals and organizations to read these documents, research the areas, and attend Public Hearings to offer their comments to the Panel could be truly respected.

Conclusion

The Panel has been operating since August 1991. A huge amount of effort and taxpayer resources have come into the process. These projects have immense potential benefits, and have immense potential risks. To rush into Public Hearings without all the information needed to assess the acceptability of the proposals would be a serious error.

There have been many "firsts" associated with the Panel to date: this is the first joint panel between Canada and Saskatchewan; it is the first panel to review 5 mining proposals rather than just one; the Panel instituted the unprecedented procedural change of adding Information Meetings with proponents between receipt of the EIS and formulation of deficiency statements. If it is essential, or even highly desirable, for additional information to be sought a second time before proceeding to Public Hearings, this should, and must be done.

Canada

Saskatchewan

This is Exhibit N referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999
Stefania Fortugno
A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

NEWS RELEASE

URANIUM MINING PANEL ANNOUNCES RESIGNATION OF PANEL MEMBER

Regina, August 23, 1996: Dr. Donald Lee, Chairperson of the Joint Federal-Provincial Panel on Uranium Mining Developments in Northern Saskatchewan, announced today the resignation of Dr. Annalee Yassi from the panel. Dr. Yassi cited the difficulty of accommodating the panel's schedule and external time commitments as reasons for her resignation. Dr. Yassi has been with the panel since its inception in August of 1991, and has made a strong contribution to its review of proposals for the McArthur River Exploration Project, the Dominique-Janine Extension, the Midwest Joint Venture, and the McClean Lake mine.

Dr. Yassi is an Associate Professor and the Director of the Occupational and Environmental Health Unit, Department of Community Health Science at the University of Manitoba. She is also the Director of the Department of Occupational and Environmental Medicine at the Health Science Centre in Winnipeg. She has provided the panel with expertise in the areas of radiological and community health issues.

Dr. Yassi made a significant contribution to the environmental assessment reviews, raising the awareness of all participants—industry, governments, environmental groups and the general public—on many concerns relevant to the development of uranium mining in the northern regions of Saskatchewan. The panel is appreciative of the knowledge and perspective she brought to the reviews.

Dr. Lee indicated that the resignation would not affect the panel's plans for holding public hearings. The public hearings for the Cigar Lake and McArthur River proposals begin in Regina on September 4, 1996.

- 30 -

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PRINCE ALBERT GRAND COUNCIL

PRESS RELEASE

from

Vice Chief John Dantouze

This is Exhibit O referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999

Stefania Fortugno

A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

NORTHERN SASKATCHEWAN URANIUM MINING DEVELOPMENT

The Joint Federal/Provincial Panel Chairperson, Dr. Don Lee and the Government of Saskatchewan claim that I resigned from the Panel because of "conflicting interests of his roles - as an elected leader of his people and a member of an independent environmental review team". I reject this allegation.

Their allegation demonstrates that the fundamental problem in the Panel process is not any conflict between my political obligations to the Athabasca First Nations and my mandate on the Panel, but the pressures from the federal and provincial governments and the mining industry to proceed prematurely with decisions in their favour. My "interest" is the same in both my roles; to ensure that uranium mining only proceeds where it is clearly of primary benefit to northern people.

My former Panel colleague, Dr. Annalee Yassi (Faculty of Medicine, Dept. of Community Health Sciences, University of Manitoba) confirmed the real conflict in the Panel process in her correspondence to Dr. Lee shortly before her resignation, by stating "there is a political and industrial agenda that we must follow".

Dr. Yassi resigned from the Joint Federal/Provincial Panel August 15, 1996, primarily over her concerns that the public hearings were proceeding without adequate information from the proponents in a number of critical areas. Dr. Yassi and myself were out voted by the other three (3) Panel members on this question of the adequacy of information. As a result the Midwest hearings proceeded this past spring and summer without addressing the deficiencies that Dr. Yassi and I had identified.

In a memo (attached) to the Joint Panel in April 1996 identified the major areas of proponent information deficiencies which should be addressed before proceeding to public hearings, including

- impacts on northern Saskatchewan communities,
- revenue sharing,
- community health concerns
- biophysical impacts

With respect to Revenue Sharing, Dr. Yassi stated:

> **"These new mining developments represent quantitatively greater potential profit for its proponents, with the largest ore bodies and richest ore in the world. If the options for revenue sharing are not clearly articulated, complete with the pros and cons of each, it is quite unlikely that the situation for the Athabasca Basin will change dramatically, not withstanding the small number of people who will benefit from job and business opportunities, and greater training. Public Hearings, particularly in the northern communities, would be considerably more meaningful if the proponent was made to answer this question, and clearly describe innovative means by which the people of the Athabasca Basin could share in the revenue created by these rich ore deposits directly, and without the constraints imposed upon federal and provincial governments to their legislative mandates. The Panel is aware that some innovative means have been discussed by various mine owners. They must be brought out of the**

boardroom and into the EIS process for a full airing by all stateholders. The Panel simply cannot make considerable progress on the issue of benefits to the north unless this is done. Moreover, the benefits potentially associated with this proposal cannot be ascertained".

The Premier and the Panel Chairperson have stated that the Athabasca Chiefs and Northern Mayor's request for direct negotiations is inappropriate at this time and would undermine the integrity of the environmental panel review process. The Premier is reported to have stated that direct discussion with northern leaders will not be possible until the Panel review report is completed in approximately six months. This delay tactic is transparent.

The Panel in its review of earlier projects has already made recommendations in relation to the major issues of improving employment and business opportunities, creating independent northern community capacity for environmental monitoring and compliance and revenue-sharing. Direct discussions on how government and industry can implement these recommendations and other northern priorities will not undermine the panel review process. On the contrary, it is the continuing refusal of the governments of Saskatchewan and Canada to fully implement the Panels and northerners recommendations that is the real threat to the integrity of the Panel.

The Saskatchewan government's senior representative to the Panel, Mr. Tony Penikett, confirmed the position of northerners in his presentation to the Panel in Black Lake on June 7, 1996, where he stated "we acknowledge - the province of Saskatchewan - acknowledges that First Nations have certain claims to jurisdiction and to revenues. But we cannot work out these claims in an uranium environmental assessment process".

Finally we must challenge the Province's game of trying to divide the people from their leaders. The Premier and the Minister of Northern Affairs (Hon. Keith Goulet) have stated that northerners have been and will continue to be heard. The Athabasca Chiefs and Northern Mayors have been elected to represent their people; we have stated that the measure of truly being heard is that it results in genuine efforts to respond and engage the speakers. Northern leaders intend to exercise their mandate to represent their people and insist on direct discussion and negotiations with the Premier on these issues. The Panel process neither prevents nor replaces government to government discussions and negotiations.

We urge the Premier and his government to respond to the request of the Athabasca Chiefs and Northern Mayors to begin this direct process in Wollaston Lake now! There is no legal, procedural or technical reason to delay this meeting. If there is the political will to resolve our differences we should meet now.

To employ the Premier's hockey analogy: I and other northerners have never been in the game, we have either been in the stands or the penalty box. We have a team and we want ice time.

This is Exhibit P referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999

Stefania Fortugno

A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

Before the Joint Federal-Provincial Panel on U Mining on Cigar Lake and McArthur River

Statement by Marvin Resnikoff, Ph.D.* on behalf of the Saskatchewan Uranium Coalition La Ronge, Saskatchewan August 12, 1997

This statement focuses on the tailings management facility (JEB Pit) proposed for McClean Lake, Midwest Joint Venture and Cigar Lake tailings. We have reviewed the environmental impact statements for Midwest Project and Cigar Lake Project, prepared by the Cigar Lake Mining Corporation and Cogema Resources Incorporated (the proponents), respectively, as well as subsequent volumes prepare by the proponents. We have compared the response of the proponents with our submissions and statements before this Panel dating back to 1992. This is our conclusion: after numerous questions and several additional volumes of responses by the proponents, nothing in the original tailings management proposal has changed. In fact, it appears that the proponents plan to simply reword the documents and re-work the data until the proposal is approved, without changing any of their initial rationale or engineering decisions. Maybe this is a problem with the FEARO process— a large amount of information is developed, questions are raised and answered, but more information does not necessarily lead to action. In this case it may have only led to more, and higher-priced consultants. I realize that the AECB will subsequently license the facility and can place conditions on the license, but the AECB licensing process is not one in which the public generally participates to the same extent as in the FEARO process.

The single small change to the proposal has been a return to the previously proposed pervious surround proposal for JEB Pit, as opposed to the new natural surround proposal. Yet this decision was not made in the interest of safety, but because, "Cogema Resources came to the conclusion, and in May 1996 submitted a report to the regulatory agencies, indicating that the time required for the remaining environmental assessment process and regulatory licensing for the sub-aqueous paste tails is not compatible with the

* Assisted by Anne Champion, RWMA

timing of the scheduled start of production..."[1] The proponents intend to revert to the natural surround proposal after the approximately two years it may take to gain regulatory approval. So, despite all questions that have been raised, no essential elements of the original design have been changed. Most alarmingly, contingency and decommissioning plans are still vague and sufficient dollars have not been set aside. Some of the proponents' responses have raised more questions.

In this statement I wish to discuss the issues that have been raised and only partially answered. Cutting through the web of paper, I want to lay the issues before the Panel in as brutally honest a way as possible, since this may be the last opportunity before the Panel makes its recommendations. I also wish to suggest recommendations for the Panel's consideration. Finally, I want to sum up what we consider to be the total environmental impact of these mining proposals.

JEB Pit

The basic outline of the tailings management proposal is the following. Because of the extremely adverse operating conditions in northern Saskatchewan, tailings with a toothpaste-like consistency from the Cigar Lake and Midwest Joint Ventures would be pumped into the JEB Pit underwater, and the more dense McClean Lake tailings would initially be deposited without the water cover. This would lead to frozen tailings, which will thaw over time once the water cover is introduced. The proponents are presently using sidewells and a bottom sump to keep the JEB Pit dry; the same system would be used after tailings deposition begins, to control the water level in the Pit and draw off radium-rich water. Approximately 2.64 teraBecquerels each of radium-226 and thorium-230, much of it bound to the silty tailings, some of it in pore water, would be deposited in the JEB Pit. If no consolidation occurred, not all of the tailings would fit into the Pit. The total volume of the JEB Pit is 4,165,000 m^3, while the total unconsolidated volume of tailings would be 7,000,000 m^3. The consolidated volume, according to the proponents, would be 3,500,000 m^3. To consolidate the tailings, the pore water will be removed by pumping the sidewells and the bottom drain which will be covered with a filter material (sand). Radium-rich water from the JEB Pit will be treated and sent to McClean Lake, the radium-rich sludge will be returned to the JEB Pit. At the completion of mining and milling, a mounded sand and rock overburden will cover the Pit and depress the contents, further consolidating the pit contents. The treatment plant will continue to operate, with sludge placed in a burial "vault" on the upgradient edge of the JEB Pit. According to the

[1] Cigar Lake Mining Corporation, *The Cigar Lake Project Environmental Impact Statement, Addendum*. September 1996, p.1-1.

proponents, most of the radium-226 will be adsorbed on the silt and largely rendered immobile. Studies by the proponents show radium-226 concentrations in pore water declining over time. Radium-226 concentrations in immediately adjacent Fox Lake will be below Saskatchewan Surface Water Quality Objectives (SSWQO). In our opinion, the system will not operate as advertised, tailings may not consolidate as planned, and any number of malfunctions of the drain, pump and well system could occur. Subsequent reasoning and reports by the proponents have become more convoluted. As we discuss, realistic alternative plans should be developed and assessed.

Consolidation

In previous comments to the Hearing Panel, we questioned whether the bottom sand filter would become plugged with tailings particles and be rendered ineffective. The pervious surround method improves the ability of the bottom pumps to draw water from the pit by placing a permeable sand layer around the tailings. The pervious surround layer is more permeable than sandstone. However, the proponent has admitted that plugging of the sandstone with tailings might take place[2] when discussing possible migration of radioactivity from the pit. Plugging of sandstone was cited as a benefit, but the proponents only considered the consequences of a three meter plugged ring around the tailings pit[3]. Plugging of most of the pervious surround (during subaerial deposition) or natural surround media (during subaqueous deposition) would prevent excess water from leaving the pit and eventually force it out along the few available pathways. We consider plugging at the bottom of the pit likely. If this were to occur, the proponents have argued that pumping from the bottom drain could then be increased, yet they don't address the consequences of increased pumping. Additional fines and radioactivity would be drawn into the water treatment plant. Since radium-226 may attach to fine particles, this could mean increasing Ra-226 concentrations in the pumped water. These effects have not been quantified by the proponents. If the bottom sump were plugged, contaminated pit water could also exit the sides of the pit and be drawn through the perimeter wells. Additional treatment capacity would be needed. Other than stating this could be easily and quickly done, the proponents have not estimated the costs nor detailed their plans, even though an additional 12-15,000 m^3 of water may have to be treated every day[4].

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[2] Cogema Resources Incorporated, *The Midwest Project Environmental Impact Statement, Addendum*. October 1996, p.G-17.

[3] Cigar Lake Mining Corporation, *The Cigar Lake Project EIS, Tailings Management—Additional Information*, April 1997, p. G-17.

[4] Cigar Lake Mining Corporation, *The Cigar Lake Project EIS, Tailings Management—Additional Information*, April 1997, p. A-8.

The time necessary for the tailings to consolidate, and therefore, the extent of the monitoring period after decommissioning the Tailings Management Facility has not been clarified by the proponents. Their estimate of 13 to 15 year monitoring period seems too short to establish "a long term stable condition"[5] for a site which contains radionuclides whose activity continues for thousands of years. Water pressed out of the tailings during consolidation is expected to continue collecting in the sump, mix with groundwater and precipitation and run-off and be pumped and treated; an average of 1,600 - 1,900 m^3 of water every day for 20 years after placement of the initial sand and waste rock cover. Monitoring and water treatment will be discontinued after "measured pore water pressures have dissipated." At that time, the final waste rock and till cover will be placed and re-vegetated.[6]

This final decommissioning method, chosen to facilitate consolidation raises major new concerns. The proponents propose to place a cap on top of the tailings pit consisting of two meters of rock fill on top of two meters of sand placed directly on top of the tailings. According to the proponents, the weight of the cap will consolidate the tailings. The problem is this - boulders would be placed on top of tailings which have the consistency of toothpaste. Waste rock and equipment are likely to sink into the tailings, displacing the tailings upwards. Rather than being consolidated, the tailings are more likely to flow over the edge of the JEB pit and be subsequently washed into Fox Lake. The proponents argue that the sand acts as a filter, preventing the tailings from rising upwards, and the rocks from sinking downwards. The method has no support in the EIS and their arguments are unconvincing. The proponents need to give more thought to this scheme, which definitely requires testing before implementation, especially with regard to the ratio of sand to water, to prevent the sand and the remaining surface water in the pit from acquiring a consistency through which the boulders could sink.

The consolidation of the tailings depends on the weight of the rock and sand placed on top of it, but it is not clear that there will be room for the necessary amounts. *If* the amount of tailings to be placed in the pit has not been underestimated and *if* consolidation has occurred as modeled, than the tailings will be just four meters below the rim of the pit at the time of placement of the initial cover.[7] If subsequent consolidation occurs as planned, then the top of the initial cover would reside just below the rim. But if the tailings do not consolidate as planned, the proponents have also argued that additional waste rock could be added, but the plans are not laid out in detail. For example, when will the waste rock be added to the tailings pit? Before or after milling stops? Will there

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[5] *Ibid*, p.12-1.
[6] *Ibid*, p.13-3.
[7] Cogema Resources Incorporated, October 1996, p.F-9.

be money to fund this extra work? At some point, the proponents will have to decide whether the consolidation process is working. If waste rock is added before milling has ceased, will additional tailings be added after waste rock? Of course, additional waste rock will add to the pit volume, and since the margin for extra volume is so small, some of the tailings may not fit into the JEB Pit. The proponents must clarify this contingency plan, and ensure that it will be funded if it becomes necessary.

Other contingency plans to enhance consolidation are similarly unconvincing. Wicks to draw water from the pit mass have not been shown to be effective with tailings to the depths of those planned for the JEB Pit. The proponents have not shown that the conditions are the same as the cited Cluff Lake reference.

In our opinion, the likely future fix if consolidation is not effective is to abandon the approach by filling the JEB Pit and then using the Sue C Pit for the over-run. The proponents would make this change by amending their AECB license. This would probably not occasion the FEARO process. Since we consider this the most likely long-term possibility, it is our position the environmental impact of this alternative be evaluated now before this Joint Panel and the public.

Pore Water Concentrations

The primary new information brought forth by the proponents in the April 1997, *Tailings Management, Additional Information* (Cigar Lake Mining Corporation) is the disappearance of the 60 meter wide fault structure. According to the proponents, this fault is now to be replaced with a fracture zone. The effect of this observation is to reduce the radium-226 loading in Fox Lake, the southern basin of which is only 120 m from the lip of the JEB Pit. This heartening information is countered with new data from sidewells, indicating total flow into the JEB Pit has approximately doubled, from 1220 cubic meters per day (m^3/day) to 2,400 m^3/day. Furthermore, there appears to be preferential groundwater withdrawal; pumps on the western edge of the JEB Pit, near Fox Lake, withdraw more water than those at other locations.

Despite this increased flow into the JEB Pit, proponents continue to maintain the hydraulic conductivity is a very low 10^{-7} m/s, rather than the more likely 10^{-5} m/s, an issue raised by the AECB. The proponents support their claim of lower conductivity with the observation of negligible de-watering impact on Fox Lake water levels. That is, this new information about preferential flow paths does not lead proponents to the conclusion there

are concentrated flow paths towards Fox Lake[8] and therefore, the proponents argue, contamination will not enter the lake via these pathways. The proponents reasoning is suspect; it does not appear to be based on the volumes of water being pumped, nor does it take into account the flow of water into Fox Lake from other sources. The proponents seem to be making contradictory conclusions here: on the one hand, pore water can be drawn through sandstone by perimeter wells, but once pumps are turned off, radium-226 will not pass, according to the proponents. We have not had time to test this hypothesis, but the proponents own conductivity measurements belie these conclusions. The actual measurements indicate a much more complicated network of flow paths than the proponents have taken into account with their use of geometric mean conductivities. Measured hydraulic conductivities range wildly, by factors of 10, 100, and 1000 around the geometric means.[9] In our opinion, modeling should be re-executed using preferential flow paths and higher conductivities.

Finally, in this new volume of the EIS, the proponents have sizably decreased the radioactivity source term by claiming that radium-226 concentrations in pore water decrease over time by a factor of sixty. Thus, while the groundwater discharge to Fox Lake has increased, the radium-226 flux actually decreases over time since, according to the proponents, radium-226 becomes immobilized in the tailings and does not remain in the pore water.[10]

The proponents base their reduced radium-226 in pore water on observations of pore water concentrations at operating tailings management facilities (Table 5.5). Several of these pits are above ground and, in our opinion, bear little resemblance to the situation at the JEB Pit. Two tailings pits in Saskatchewan resemble the proposed pit - the Rabbit Lake Pit and the Deilmann Tailings Management Facility. The Rabbit Lake Pit shows a decline in pore water concentration from 150 Bq/L to 30 Bq/L, a factor of 5. The Deilmann Tailings Management Facility shows a decline from 153 Bq/L to 76 Bq/L, a factor of 2. In our opinion, this does not justify a reduction of Cigar Lake radium-226 pore water concentrations from 300 Bq/L to 5 Bq/L, a factor of 60.

The proponents also now claim that the faults have become fracture zones, with a more dispersed plume and lower discharge concentrations. The sand lenses, formerly continuous, have now become discontinuous, thereby increasing the travel time. Some of this new information has been determined by the "observational method."[11]

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[8] Cigar Lake Mining Corporation, April 1997, p.16-5.
[9] *Ibid*, Table 6-2.
[10] *Ibid*, p.16-11.
[11] *Ibid*, pp. 16-4, 16-5.

SENES consultants have raised a new issue, the presence of uncapped boreholes in Fox Lake (3 plugged, 2 of unknown status). This direct path from the JEB Pit to Fox Lake could increase Ra-226 concentrations in the lake by a factor of 3.5.[12] These boreholes should be plugged before tailings are deposited in the JEB Pit.

Contingency Plans

The proponents have responded to numerous issues in this proceeding with contingency plans that are quite vague and un-quantified. Several of these are collected here. Because of the nature of extractive industries, the time to set aside decommissioning and contingency funds is at the beginning, not when the last ton of ore is being extracted, and operating budgets have expired. The reality is, extractive industries float bonds and take out loans to pay for large initial capital expenditures and licensing actions such as the one before this Panel and the AECB. These loans and bonds are amortized over time. At the end, these monies are repaid and little cash remains for decommissioning and contingencies. At the end of the mining operation, the licensing body AECB is then in the difficult position of having to balance costs with public health benefits, with little available money to meet possible costs. Elliot Lake should be our guide. Rio Algom and Denison Mines had little money remaining for decommissioning. Further, many tailings piles have now become wards of the Province and the Federal Government. Thus, the time is now to make recommendations and begin to set aside money for contingencies.

- **Water treatment.** Additional treatment capacity may be needed if the JEB Pit leaks radionuclides. Sidewell pumping may have to increase, and this water may have to be treated. If the bottom drain becomes plugged, additional pumping implies that more water would have to be treated. The proponents simply state, "Expansions to the water treatment plant could be completed in a very short time."[13] No dollar estimates are provided. Money should be set aside in a contingency fund.
- **Pit expansion.** If consolidation of tailings does not occur as predicted, or if tailings volumes are greater, the proponents may need additional capacity. This may be obtained by expanding the JEB Pit near the surface. Sidewell pumps would have to be relocated. Or, Sue Pit C may have to be employed. Again, the proponents do not defend their contingency option (expanding the JEB Pit) on an engineering or economic basis, they simply state it as a possibility. Money should be put into a contingency fund.

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[12] *Ibid*, p.17-31.
[13] *Ibid*, p.16-27.

- **High permeability ring.** If leakage from the JEB Pit is too high, the proponents may blast a high permeability ring around the JEB Pit. Because of its proximity to Fox Lake, it is unclear exactly how this will be accomplished. The probable costs of this procedure should also be set aside in a contingency fund.
- **Pit cover.** Covering the pit will be a difficult task, requiring sand and waste rock. After consolidation, sand and topsoil will be added. Whether this can be done satisfactorily and safely is not a given, yet this procedure gets almost no attention in the Environmental Impact Statements or their supporting documents. Procedures should be detailed and money set aside in a contingency fund.
- **Waste rock.** Waste rock, formerly targeted for Bizarre Lake, may be disposed of in Sue Pit C, or used for a cover at the JEB Pit. Costs for this operation would also have to be set aside.

No substantive changes to the proponents design plans have taken place, but numerous contingency plans have been floated. These plans must be made concrete and financing must be assured.

Total Impact of Mining and Milling

Since this may be the last opportunity to appear before this Panel to discuss these uranium mining and milling projects in Northern Saskatchewan, we wanted to summarize our concerns about these projects for the Panel and the AECB.

Uranium mining activity in Northern Saskatchewan has increased rapidly over the past several years. In addition to existing operations at Rabbit Lake, Key Lake, and Cluff Lake, mining operations have been approved at the McClean Lake Project site, which includes the JEB Pit. This Panel is reviewing the proposals by Cogema Resources, Inc. and the Cigar Lake Mining Corporations for mining at the Midwest and Cigar Lake sites, respectively. Both operations would make use of the McClean Lake mill and JEB Tailings Pit, operated by Cogema, by transporting uranium ore from mining to milling sites, and would involve expansion of the McClean Lake facilities. A third proposal for the McArthur River Project is also under consideration.

Each mining proposal has environmental impacts at the respective mining and milling sites. Radioactive particulates would be released to the air and toxic and radioactive materials would be released to the water. See Figure 1 for a schematic diagram of the movement of ore, mine waste, water and contaminants for the various projects in northern Saskatchewan.

Mine sites

At Cigar Lake, high-grade uranium ores will be mined underground using water jets to cut the rock. Phase I of the Cigar Lake project will take 11 years, and will produce over 8,000 tonnes/year of U_3O_8 from the rich eastern part of the ore body. Phase II will last longer (28 years), and will produce about 2,700 tonnes/yr. Waste rock from the mining operation will be dumped into Bizarre Lake, which is 3 km northwest of the mining site (see Figure 2). Under the consortium's original proposal, a total of 36% of the volume of Bizarre Lake would be filled in by this waste rock, which will be bulldozed far enough into the lake to remain underwater. A trench would have been maintained in the middle of the deep lake to accommodate fish. As a result of heavy metals leaching out of waste rock, arsenic levels in the waters of Bizarre Lake could exceed the SSWQO (SSWQO) within 20 years of the start of operations.[14] We, and other interested parties have raised serious objections to this proposal. We have suggested that the proponent transport this waste rock to the Sue C Pit at McClean Lake instead.

The wastewater from Cigar Lake mine operations will be treated, and 28.5 m^3 hour will be discharged to a muskeg bog southwest of the site.[15] From the muskeg, it will drain into Aline Lake, and thence into Aline Creek, Seru Bay and Waterbury Lake.[16] The intent is to meet the SSWQ Objectives in the center of Seru Bay, a huge body of water which will have a dilating effect on the effluent. It is expected that the muskeg bog will not be able to meet the SSWQO's until 5 years after closure. The bog sediments will tend to concentrate heavy metals and radionuclides, so the bog sediments could remain highly contaminated. The contaminated sludges removed during the treatment process will be sent to the mill if sufficiently high in uranium. Otherwise, the sludge will be disposed of directly into the JEB Pit.

At Midwest, water will be used for such mining operations as drilling and jet boring, ore handling, ore stockpile and paste preparation, and in the freeze and backfill plants. Recycled ground water from mine inflow will be the main source of industrial water. As needed, water from South McMahon Lake will be used as another industrial water source[17] (see Figure 3). To reduce the volumes requiring treatment, treated water

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[14] Cigar Lake Mining Corporation, *Cigar Lake Project Environmental Impact Statement, Main Document*, 1995, pp. 3-116 to 118.
[15] *Ibid.*, pp. 5-10, 5-17 and Fig. 3.4.3.1.
[16] Cigar Lake Mining Corporation, *Cigar Lake Project Environmental Impact Statement –Executive Summary*, 1995, pp. 7, 14.
[17] Cogema Resources Incorporated, *Midwest Project Environmental Impact Statement, Main Document*, August 1995, p.2-57.

will be recycled as much as possible, and the ore zone will be frozen.[18] Potable water will be trucked in from the nearby Points North facility. Waste rock will be stockpiled, with some rock to be returned to the underground mine, some to be dumped in the Sue C pit at the McClean Project site (see Figure 4), and some to remain near Mink Arm of South McMahon Lake. Similar to our recommendation regarding Cigar Lake waste rock, the MJV waste rock should be disposed of in the Sue C Pit. Our working principle here is to minimize the areas that will remain contaminated after mining operations end.

The liquid wastes from Midwest operations, along with site run-off water, will go to a wastewater treatment plant at Midwest. The plant is intended to remove most of the radium, arsenic, and other radionuclides and metals from the wastewater and will have a capacity of 6,000 m^3/day. A surge pond will hold water before treatment, and three monitoring ponds will hold the treated effluent for testing before it is released to Mink Arm. Almost 39 million m^3 of total discharge to Mink Arm can be expected from 1998-2009. These projections apparently assume that flow occurs from January to December in most years,[19] although the EIS states elsewhere that mining at Midwest will take place only from May to October. It is unclear from the EIS how discharge to Mink Arm can be maintained throughout the winter.

The ore that will be mined at Midwest has a very high uranium grade and is also rich in arsenic, nickel, and sulphates. The monthly mean concentrations of arsenic, copper, lead, nickel, total suspended solids, uranium, zinc, lead-210, and radium-226 predicted by the proponent for Mink Arm are at the Saskatchewan Recommended Wastewater Quality Criteria limits.[20] Since Mink Arm is very shallow and has the lowest flushing rate in the area, it is likely the concentrations will exceed the SSWQO and that this highly contaminated wastewater will have a significant effect on aquatic life. Essentially MJV will be using Mink Arm as its operating basin, drawing water from it for mining uses and discharging treated, but still contaminated, water back to the lake. Again, sludges from Midwest mine water treatment will be milled if they contain sufficient uranium, or sent directly to the JEB Pit.

Wastewater from the McClean Lake mining operation, will go to the Sue water treatment plant. Sludges will be sent to the McClean Lake mill and the treated effluent will go to Sink Lake, along with treated effluent from the JEB Pit. Sink Lake is another

[18]Figure 2.1.5.1 shows the water treatment plant schematic, and Figure 2.1.5.2 shows the Midwest Project Water Balance.
[19]Cogema Resources Incorporated, *Midwest Project Environmental Impact Statement*, August 1995, Table 2.1.5.3, "Predicted Effluent Quantities."
[20]*Ibid.*, Table 2.1.5.4

shallow lake, also expected to exceed SSQWO during mining and milling operations. The McClean Lake operation involves open pit mining at Sue A, Sue B and Sue C pits and the JEB Pit. The McClean Lake mine itself will be an underground mine.

Surface water discharges associated with the McClean Lake Project's mill, tailings pit, and mines (McClean and Sue A, B, and C) will all feed into what is now a small lake, Sink Lake. This water will come from the perimeter wells surrounding the JEB pit and from the JEB and Sue water treatment plants. Estimated dewatering flows from the JEB pit will be 7,000 m^3 day initially, with peak flow in early 1997 at 32,000 m^3 day.[21] Over the operating life of the pit, the total volume of "intercepted ground water" is estimated at 30 million m^3. The JEB water treatment plant will treat wastewater streams from the mill's operations, run-off from waste rock and ore stockpiles and the mill area, and ground water pumped from below and above the tailings at the JEB pit. The Sue plant will handle wastewater from the McClean Lake mines. In all, approximately 95 million m^3 of cumulative flow will be discharged to Sink Lake.[22] This is about equal to the total water consumption of Saskatoon for two years.[23]

In order to mitigate the effects of this much additional water on downstream ecosystems, Cogema will dam Sink Lake and release its contents gradually.[24] Sink Lake will become a reservoir. Over the 40 year duration of the project, an average volume of six times the natural volume of Sink Lake will be discharged into it each year. Because of the dam, the lake will hold 5 million m^3 of water,[25] over 12 times its natural volume.

Despite water treatment efforts, water quality in Sink Lake will be poor. Cogema's EIS predicts that maximum mean monthly concentrations of the following constituents will exceed SSWQO: ammonia, arsenic, cadmium, nickel, selenium, total dissolved solids, zinc, and uranium. Lead and radium-226 are predicted to exceed the standards at the 95th percentile values of contamination. There are no Water Quality Objectives for molybdenum, sulphate, vanadium, lead-210, or thorium-230, but these contaminants will greatly exceed background levels. Downstream lakes will also be contaminated.[26] Predicted maximum mean concentrations of arsenic, cadmium, copper

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[21]Cigar Lake Mining Corporation, July 1995, p.11-6.
[22]Cogema Resources Incorporated, August 1995, Table 3.3.12.5.
[23]Based on use estimates from personal communication between Saskatoon Water Treatment Plant, Saskatoon, Sask. and K Knowlton/RWMA, Oct.20 1995.
[24]*Ibid.*, pg.3-8 and Fig.3.2.1.
[25]Cigar Lake Mining Corporation, July 1995, p. 11-40.
[26]Cogema Resources Incorporated, August 1995, Table 3.6.4.12.

and nickel in Sink Lake sediments in the 16th year of McClean Lake/JEB operations will exceed "severe effect" levels.[27]

Mill Site

There is no doubt that the proposed mining sites, mill and JEB tailings disposal pit will contaminate the environment. The northern Saskatchewan ores contain high-grade uranium but are also rich in other radionuclides and heavy metals, which will become important contaminants. Large amounts of wastewater will be generated, and even after treatment, this wastewater will contaminate the shallow lakes into which it is discharged. The projected maximum concentrations for arsenic, uranium, radium-226 and other contaminants in Sink Lake will exceed the SSWQO. Concentrations of arsenic, cadmium and nickel in Sink Lake sediments after just 16 years of receiving mill effluent will exceed "severe effects" levels. The water in the JEB Pit will receive radioactive porewater from the tailings below, and if any untreated pond water escapes from the pit, it will endanger surrounding surface waters. These impacts have previously been discussed in the section on the JEB Pit above.

Uranium milling will release particulates into the air, and radon will emanate from the waste rock and tailings. Huge piles of waste rock will be left on the ground surface, and at the Cigar Lake site, waste rock will be bulldozed into Bizarre Lake and will eventually occupy much of the lake's volume. Because of heavy metals leaching out of this waste rock, arsenic levels will exceed regulatory limits just 20 years after operations begin. Several other lakes will be drained dry as ground water is pumped from around the JEB Pit.

The uranium ores contain large amounts of radium-226, which will be concentrated throughout milling and disposal operations and will ultimately be sent to the JEB pit. Since radium-226 is especially mobile in water, the migration of radium-226 away from the tailings pit is of particular concern. Contamination from the tailings pit will eventually escape and enter the local ground water system. Cogema predicts that plumes of sulphate, radium-226, arsenic and molybdenum will develop around the pit. The plumes will move outward and eventually reach at least as far as Fox and Pat Lakes. With the operators of several proposed and operating sites each relying on downstream dilution to dissipate the effects of their particular operation on local surface water, ground water and air, the cumulative effect of regional mining activities is a crucial concern. The

[27] *Ibid.*, Table 3 6.4.15

combined impact of *all* the proposed projects must be weighed in deciding whether to approve the Midwest and Cigar Lake proposals. The proponents must place their proposals in the context of all other mining operations in the area. This is absent from both what the Panel required and the proponents provided.

This is Exhibit Q referred to in the Affidavit of Linda Kathryn Murphy sworn before me, this 2nd day of September, 1999
Stefania Fortugno
A Notary Public in and for the Province of Saskatchewan, Being a Solicitor

URANIUM MINING
In Northern Saskatchewan

"Is It Worth The Risk?"

Factsheet Series
Media/Educational Kit

October 1992
- Updated -

prepared by

Campaign For Nuclear Phaseout
Radioactive Waste Management Associates
Uranium Coalition
Jamie Kneen (Inuit Taparisat Coalition)

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French Connection 1996

The French Connection – Uranium Mining in Saskatchewan

by Graham Simpson

Graham Simpson is a member of the Interchurch Uranium Committee Educational Cooperative (ICUC) in Saskatoon, Saskatchewan, Canada. He teaches crop science and plant ecology in the College of Agriculture at the University of Saskatchewan in Saskatoon and holds a Masters in Agriculture from the University of New Zealand and a Doctorate in Plant Physiology from the University of London, England.

The uranium mines in the Athabaska basin of northern Saskatchewan in Canada currently contribute nearly one third of the world's primary uranium production. The three current mining operations at Cluff Lake, Key Lake and Rabbit Lake together contributed 25 million pounds of uranium oxide in 1995. The region also has four projects in various stages of development at Cigar Lake, McArthur River, McLean Lake and Midwest Lake. These will replace existing mines as their reserves are depleted in several years.

A major factor in the increased investment in this area has been the extremely high grades of ore. The Key Lake mine is the highest grade uranium operation in the world with reserves of 182 million pounds of uranium oxide at an average ore grade of two per cent uranium. The McArthur River mine, projected to come into operation soon, has reserves of 416 millions pounds at an average grade of fifteen per cent. This latter mine will require retrieving the highly radioactive deposits underground with remote robotic machinery, a move away from the current open-pit mines. The ore will then be mixed with waste rock to reduce the radiation exposure during the milling process.

Increased uranium mining activity is leading to a major buildup of radioactive wastes in the tailings of the mines that could eventually pollute the many lakes and streams that drain this whole area into Hudson Bay. The mining has already adversely affected the aboriginal hunting and fishing activities. The Saskatchewan Government is a major partner, along with Uranerz of Germany (which operates the Key Lake and Rabbit Lake mines and will operate the McArthur River mine) and Cogema of France, in the ownership of these mines.

Uranium mining activity is also creating the economic and political pressure to make Saskatchewan accept high level radioactive waste from the nuclear industry of eastern Canada. In 1992 the Saskatchewan Government entered into an agreement with Atomic Energy of Canada Limited (AECL) to jointly fund research on the development of small nuclear reactors and thus consider the problem of nuclear waste disposal. The Federal Government watchdog for the nuclear industry, the Atomic Energy Control Board (AECB), is currently strongly criticising results of a ten-year $400 million study by AECL for a design concept for deep underground storage of high-level wastes somewhere in the rock of the Canadian Shield (the hard pre-Cambrian rock which stretches across large sections of Canada, from the Atlantic coast to the Rockies). Manitoba, where the underground testing of geological formations has been carried out, has already passed a law to prevent nuclear waste storage so northern Saskatchewan is now a prime target for such a site.

The incentive for taking on an underground waste repository is the prospect of an investment of up to $13.3 billion over 28 years to construct the facility. The potential jobs and construction work attracted the attention of some aboriginal bands in Saskatchewan, who are considering their own reserve lands as potential sites for the waste repository. In the past the uranium mining companies have argued that they would provide jobs to northerners, particularly aboriginals, since mining is the only alternative to the traditional hunting and trapping. However, all the key long-term and managerial jobs have gone to non-aboriginals who fly in from the southern cities for stays of several working weeks.

In 1994 the Lac La Ronge aboriginal band acquired a substantial interest in the company, Northern Resource Trucking, which has the sole-rights for the next six years for transporting ore to the mill for Key Lake, Rabbit Lake and McArthur River projects. Aboriginal frustration about lack of employment opportunities and damage to their traditional lands by the uranium mining industry is thus shifting to the notion that by actively associating themselves with the industry they may gain some benefits. It is this desperation for employment and need for a share of the economic side of the industry that has made them vulnerable to the overtures from AECL to accept a high-level waste repository. At the same time that the mining companies claim they are encouraging aboriginal participation, the Provincial Government overturned the recommendation by the Federal-Provincial Environmental Assessment Panel that the aboriginal bands affected by the mines should have a direct share in government royalties from the uranium mines.

Opponents of the uranium mining industry in

Saskatchewan, such as the Interchurch Uranium Committee Educational Cooperative, or the Saskatchewan Environmental Society, are weakly funded from volunteer contributions. By comparison, the nuclear and uranium industries have spent millions of dollars in public advertising and within the educational system to overemphasise the economic benefits and downplay the negative sides of uranium mining. Lack of education in the remote north has made it very difficult for northerners and aboriginals to understand the issues and organise any resistance to the mining companies which have invested millions of dollars in exploration and construction of the mines and mills. This has further increased a feeling of being denied their own development in territory that has been occupied for centuries by the indigenous peoples.

Paradoxically, it is not the citizens or the Government of Saskatchewan that are showing sensitivity about the plight of the northern indigenous people. Instead, it is the Big Mountain Action Group in Munich, Germany, that has become sensitized about the vulnerability of these aboriginal communities affected by the uranium mining in northern Saskatchewan. In 1994 a vanguard of four volunteers from this organization arrived in Saskatchewan to assess how to provide educational support to aboriginals in the north so that they are better able to determine their own futures and avoid the current and post-mining effects of the uranium industry.

The general public of Saskatchewan is split on the issue of uranium mining and the nuclear industry with their attendant long-term health and environmental hazards. The mining companies aided by AECL have spent a lot of money and effort on trying to win over the public to accept all aspects of the uranium and nuclear industries as safe occupations without environmental hazards. Both the Provincial and Federal Governments have been pro-active in encouragement of uranium mining despite considerable opposition from within the ruling political parties. In 1994 the Premier of Saskatchewan overruled the recommendations of a Joint Federal-Provincial Environmental Assessment Panel set up to consider whether the McArthur River and other highly radioactive deposits should be mined. The Panel had recommended a halt until the human and environmental risks were fully evaluated.

A further wrinkle in the uranium mining in Saskatchewan is the move in the last few years by Cogema to dominate ownership of uranium mines. Cogema is the French company that supplies uranium for both military purposes and to nuclear power plants in France. The Federal Government of Canada has, in theory, a binding agreement with all countries that purchase Canadian uranium that it can only be used for peaceful purposes. The agreement was long ago shown to have no teeth when India used uranium from a Canadian-built reactor to develop its first atomic bomb. Given the magnitude of the supply of uranium currently going to France from Saskatchewan it is hard to see how the French Government can claim it is not using Canadian uranium in the recent bomb tests in the south Pacific at Mururoa, or in its existing supply of nuclear weapons. The Federal Minister of Energy in Ottawa, Ann McLellan, recently admitted to the Canadian public that it is impossible to ensure that no Canadian uranium finds its way into French nuclear weapons and armaments.

Cameco Corporation is the principal mining organization currently dominating active Saskatchewan uranium mines. The Provincial Government of Saskatchewan, through the Crown Investment Corporation, holds 29.5 per cent of the shares in Cameco. In recent weeks the value of the shares has almost doubled from $40 to $70. The opposition party argues this would bring a windfall income to the financially-strapped Government if sold to the public. Proponents of the uranium industry argue the high share values are due to the success of the uranium mines. However spot prices of uranium on the international market have only changed by a small amount in the same period and it seems more likely that investor enthusiasm is related to the fact that Cameco has diversified into gold mining ventures in the central Asian state of Kyrgyzstan. The recent increases in world gold prices cannot cover up the fact that in 1994 Cameco only increased its net earnings from $73 million to $81.1 million and in the coming year it will have to begin paying graduated royalties after avoiding them until now by using exploration credits.

It is impossible to ensure that no Canadian uranium finds its way into French nuclear weapons and armaments

Because of the current poor economic climate throughout Saskatchewan and Canada, both Federal and Provincial levels of government have chosen to ignore public concerns about the long-term costs and environmental hazards from both the wastes produced in mining uranium and the storage of high-level wastes from nuclear reactors. The cost to future generations of these mega-projects has never been seriously considered until recently when the first Canadian reactors were forced to shut down due to age and malfunctions. The billions of dollars that will have to be found from public funds to deal in the future with the end-products of the uranium pathway are likely to outweigh the short-term gains that have been claimed for nuclear electricity-generating plants and nuclear weapons.

Uranium mines have a habit of becoming exhausted, so the uranium mining industry in Saskatchewan is finite. The enthusiasm of the current Government for this industry may turn to abhorrence when the full economic and environmental and social costs have become clear to the general public. The old saying that "not everything that glitters turns out to be gold" may well apply for the Government of Saskatchewan when the long-term results of mining uranium in Saskatchewan come home to roost.

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Uranium

Campaign for Nuclear Phase Out

Campagne contre l'expansion du nucléaire

Nuclear fuel and weapons production begins with uranium, an extremely heavy metal occurring naturally as an underground ore in many regions of the world, including Canada, Australia, South Africa, the U.S. and France. Once mined, uranium ore is milled, refined and in some cases enriched to be used as fuel for nuclear reactors, as components in nuclear weapons or as both.

Canada is the world's largest producer and exporter of uranium. Canada is also home to the world's largest uranium corporation, Cameco, formed in 1986 by the amalgamation of two crown-owned companies, Eldorado Nuclear Limited and the Saskatchewan Mining and Development Corporation. Uranium mines now operate in Saskatchewan and Ontario; mining has previously occurred in the Northwest Territories; exploration has happened all across Canada. British Columbia implemented a seven-year moratorium on mining in 1980, while Nova Scotia has a moratorium on both mining and exploration.

The uranium industry, despite slumping prices, is attempting to expand in both Saskatchewan and the Northwest Territories.

Although there are some benefits to uranium mining, such as export revenues and employment -- in the form of hazardous and relatively short-term jobs -- these are far outweighed by the negative impacts that uranium mining has on the environment, the economy, Native communities and health.

Health Hazards

Uranium gives off energy as it disintegrates and changes into many different substances, each also disintegrating and producing radioactive energy. (See chart on page 3.) The greatest danger that these materials pose to health is in the release of low-level radiation that can penetrate cells and alter molecules in the human body required for normal functioning.

There has been much debate about the harmful effects of atomic radiation on health: cancer, leukemia, birth defects, and genetic damage which can be passed on to future generations. Recent reports, such as the "BEIR V" in the United States, have concluded that atomic radiation is much more damaging than previously estimated. Most scientists concur that there is no amount of radiation exposure that can be regarded as safe.

Uranium as a naturally-occurring substance is harmful and can leak radioactive decay products such as radon gas into the environment. It is particularly dangerous when brought to the surface and milled. People, animals and plants are then more readily exposed to radioactive emissions from the crushed rock and from radioactive solids and gases which are disseminated into the environment.

When radon gas is released by mining activity, it can travel thousands of miles in a matter of days, staying close to the ground because of its heavy nature. At the same time, more radon is produced by the piles of tailings.

Many people have died from cancer as a result of chronic exposure to even small doses of radon gas. Several countries (but not Canada) have implemented programs to help people monitor the amount of radon in their homes.

Radon also produces radioactive decay products, known as "radon progeny". Inside the body, these materials can cause lung cancer, blood diseases, kidney damage and reproductive problems. As radon gas drifts through the air, it deposits these radon progeny on the ground where they enter plants and animals.

Of all the by-products of disintegrating uranium, thorium has the longest half-life (76,000 years). It is especially toxic to the liver and kidneys. Thorium emits gamma radiation which can penetrate the body from an external source., emitting radiation that penetrates the body from great distances. It does not have to be taken into the body to be harmful.

Radium is a radioactive heavy metal produced by decaying uranium. At one time, radium was used to

make glow-in-the-dark paint. Many people who used or manufactured this paint died from bone cancer or cancer of the sinus or mastoid (a bony extension of the skull found behind the ear). Because of this, radium is used today only in small quantities for medical purposes. Most of it is now discarded as a waste by-product despite its dangerous nature.

Danger To Miners

Though every one of us is susceptible to the dangers of uranium mining, those most at risk are the miners who bring uranium to the surface. Radon progeny attach themselves to microscopic dust particles which are inhaled by miners. These radioactive particles lodge deep in the lungs, often doing irreparable damage to the lung tissues.

In Canada, ample evidence points to the deadly nature of uranium mining. In 1982, the Thomas/MacNeil report, published by the Atomic Energy Control Board, revealed that uranium miners who work for 50 years at maximum legal radiation exposure limits would have a four times greater chance of contracting lung cancer than members of the general public. At that rate, one out of every five Canadian uranium miners would be expected to die of lung cancer.

The 1980 report "The Health Dangers of Uranium Mining", by the British Columbia Medical Association, prepared on the occasion of the B.C. Royal Commission on uranium mining, warned of a "gradually flowering crop of radiation-induced cancers among miners". The Royal Commission paved the way for the British Columbia government to impose a seven-year moratorium on uranium mining.

The proposed Cigar Lake mine in Saskatchewan will pose an even greater threat to uranium miners because of its very high radiation levels. Explorations there have revealed an ore body containing up to 60% pure uranium compounds -- 500 times more concentrated than similar ores in the Elliot Lake region of Ontario. Mining officials, gleeful over the discovery, have called Cigar Lake's ore body "pure uranium". Robots may have to be used to mine it.

The discovery of the Cigar Lake ore body has alarmed environmentalists and workers. One United Steel worker noted that Cameco will use untested methods of mining to extract the uranium, thus essentially treating workers as guinea pigs.

Despite concerns about increased radiation exposure, the Saskatchewan government has pushed ahead with Cigar Lake plans. It has exempted the mine from public hearings, requiring instead only a 30-day period for public review of the mining company's Environmental Impact Statement.

Environmental Disasters

Uranium can spell problems for the environment in several ways. First, consider the impact of the mining process itself. In order to mine uranium, huge areas of land are dug up and left barren for years. The milling process uses toxic chemicals such as ammonia gas, hydrochloric acid, kerosene and hydrogen peroxide. These chemicals are regularly dumped into the environment.

But the greatest environmental risk is from uranium mill wastes, the "tailings" of rock which are left after the uranium has been crushed. These tailings contain 85% of the radioactivity of the original ore in the form of decay products which are continually being regenerated. Uranium tailings also leach toxic chemicals such as acids, arsenic, nitrates, and heavy metals. The tailings are stockpiled in heaps, usually called "tailings ponds". In Canada, the amount of tailings stored at sites is estimated to be 175 million tonnes.

The problem of how to dispose of these wastes -- and who will do it -- has never been satisfactorily addressed. Many uranium tailings heaps have actually been abandoned when the mines closed down. Those tailings are left exposed to the air, into which they disseminate radon gas and radioactive dust, spreading radioactive fallout over vast areas for hundreds of thousands of years. Studies have tracked the uptake of such radioactive materials by plant species in the Northwest Territories to caribou and, ultimately, to the region's Inuit. In Ontario in the 1970s, the entire Serpent River system, a 55-mile network of streams, lakes and rivers, was unfit for human use because of leached tailings from Elliot Lake.

Even in modern uranium mines, breakdowns and errors in waste management systems have caused numerous polluting accidents. Saskatchewan's Rabbit Lake Mine spilled more than two million litres of radioactive water into Wollaston Lake when a valve failed. Uranium companies claimed such accidents would never happen, but they happen frequently. In 1990, the International Uranium Congress reported that over 150 spills have occurred at three mine sites in Saskatchewan since 1980. Most of these spills resulted in the dumping of radioactive or otherwise contaminated water into the environment.

The Weapons Connection

Uranium, mined and milled, has two ultimate destinations: nuclear reactors and nuclear weapons. (See our other fact sheets for further information on reac tors, wastes and weapons.) Even though Canada has no nuclear weapons, its role as an exporter of

nuclear fuels and technology makes it a critical player in the worldwide arms race. Our uranium began being used to produce U.S. nuclear weapons in 1942. The first atomic bombs dropped on Japan used uranium from Canada and the Congo. Canada's uranium and nuclear technology have also assisted countries like Britain, France and India to develop nuclear weapons.

Canada currently exports uranium to a dozen countries, including the United States, France, Great Britain and South Korea. Since 1965, Canadian officials have claimed that our uranium is used only to fuel nuclear reactors, basing their claim on a complex system of "safeguards" designed to verify that nuclear materials and/or facilities supplied by Canada are not being used to produce bombs. However, these safeguards are not enforceable and can be terminated at any time.

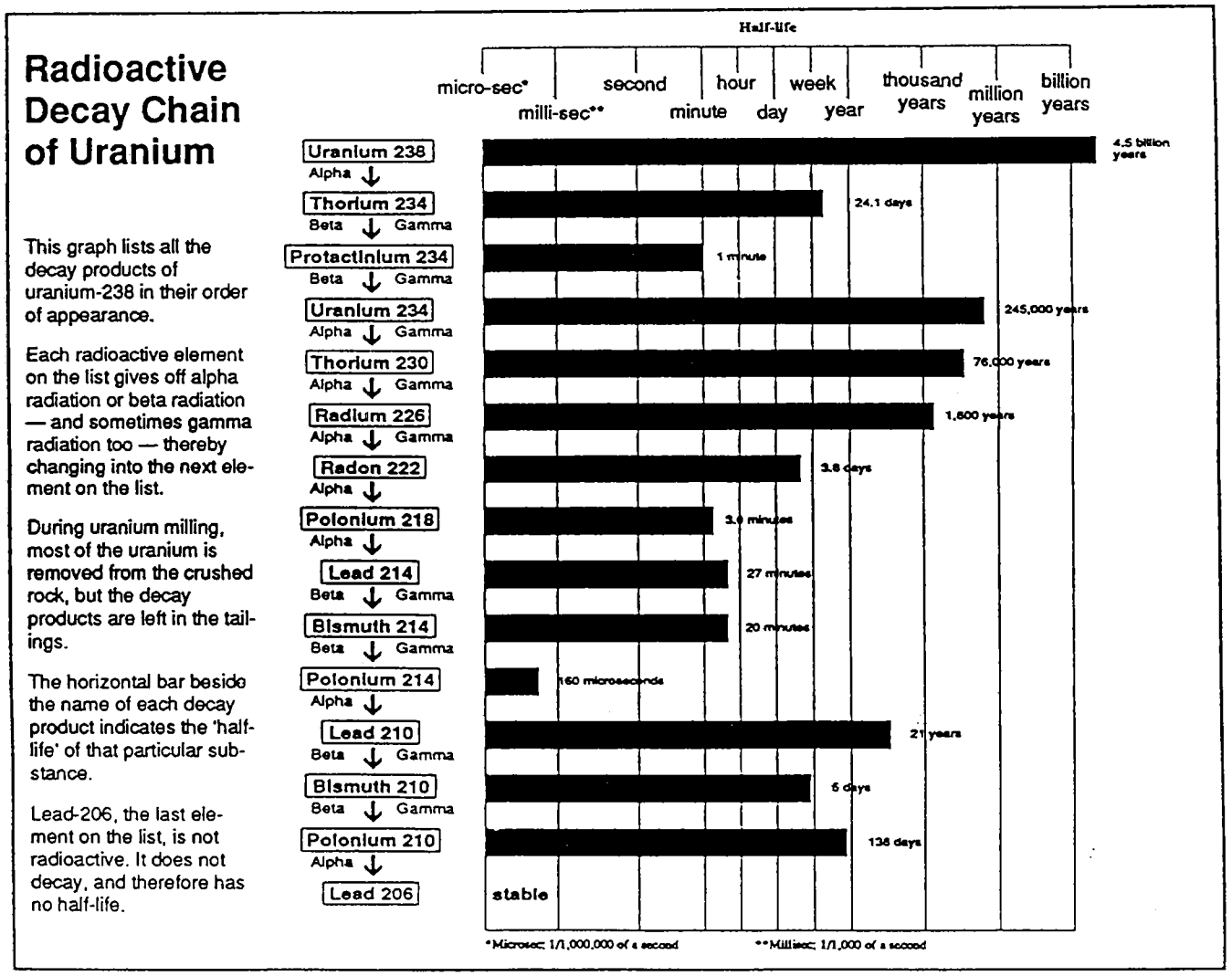
Canada remains the largest exporter of the key ingredient for nuclear weapons and sells it to most of the same countries that use it to make nuclear weapons.

In fact, most of the uranium Canada sells to the United States ends up in stockpiles for nuclear weapons. The enrichment process leaves behind five pounds of "depleted uranium" for every pound of enriched product. This depleted uranium is not safeguarded at all, but it is an important ingredient in hydrogen bombs, "target rods" for plutonium production, and military cannon shells.

Canadians must ask themselves if they want their country to continue to be a major player in nuclear arms build-up. If the answer is no, then stopping exports of uranium to countries with nuclear weapons is a sensible start.

Economic Disasters

Given the health, environmental and military risks connected with uranium mining, why has it been condoned and subsidized for so many years? One of the reasons is the lure of short-term economic activity and jobs. Uranium mines have generally operated in



desperately poor regions of Canada where employment is badly needed.

When all the factors are accounted for, however, it becomes evident that uranium mining is an economic failure. Between 1978 and the mid-1980s, the uranium industry created approximately 5,000 jobs with expenditures of $1 billion, translating into more than $200,000 per job. The transportation equipment industry required less than one-third that capital per existing job in 1990, while service industries such as daycare and housing could have created ten jobs with the same investment.

Furthermore, the development that uranium mining does bring is strictly of the "boom and bust" variety. When the mine runs out, so do the jobs. This can result in the creation of ghost towns. Uranium City was a victim in 1982 when Eldorado Nuclear closed its Beaverlodge mine. A town of more than two thousand people now has only two hundred. Recent layoffs at Elliot Lake in Ontario and several mines in Saskatchewan have meant the loss of more than 3,000 jobs.

The worldwide glut of uranium has contributed to many layoffs in the uranium industry. Prices for uranium in1990 were at an historic low, resulting in lower than expected revenues. In 1989, the Saskatchewan government received only $27 million in revenues from uranium mining, compared to 1978 expectations of between $185 and $427 million. These low prices have also allowed many countries to stockpile our uranium; even if world prices were to increase, countries could use their stockpiles instead of importing our uranium.

Many promote "sustainable development" as the solution to the world's environmental problems. Uranium mining, milling, and waste disposal are clearly not sustainable. Neither are the uses -- civilian and military -- to which uranium is put. In the interest of promoting sustainable energy and security policies, Canada should phase out uranium mining and uranium exports.

-- June, 1991

Recommended Reading and Viewing

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Special thanks to The Inter-Church Uranium Committee for their research and writing, and to Friends of the Earth for producing this fact sheet.

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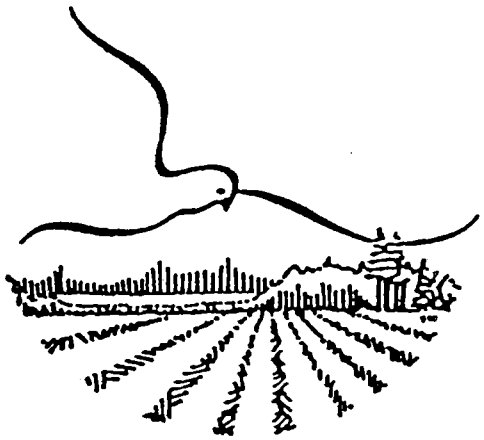


The Uranium Coalition

FACT SHEET #2

URANIUM MINING
Air and Water Quality

Uranium is a radioactive element used primarily to produce fuel for nuclear reactors. At present, Canada is the world's largest producer of uranium, mainly from mines located in Saskatchewan. Only about 20 percent of the uranium produced is used domestically, the vast majority is exported to countries such as the United States, France, Great Britain and South Korea.

With three uranium mines and mills active in northeastern Saskatchewan and nine more mines proposed in 1992, and Canada producing one third of the world's uranium, local residents, tourists, downstream users, and all citizens concerned with the long-term health of the environment are justifiably worried about radioactive and chemical contamination of the air and water.

Adverse effects on air quality are of major concern because contaminants from the mines will be hazardous for, at least, 250,000 years. Long-lived pollutants are a hazard not only to workers in the mines but to local residents and citizens throughout Canada. Uranium mining produces a dangerous gas, radon gas, that can travel thousands of kilometers in just a few days.

Adverse effects on water quality are a major concern because the groundwater in northeastern Saskatchewan is very shallow. It is within a few meters of the surface of the earth. In addition, there are numerous lakes and rivers immediately adjacent to the mines. There are 30,000 persons living in the mining region. These native peoples depend on fish and game for subsistence.

Sources of Contamination

Before being mined, uranium ore is found deep beneath the ground. Little of the contained radioactivity is accessible to the environment. Mining brings this rock to the surface (see figure on page 3). Most of the existing and proposed mines in Canada are what is known as open pit mines, mines where giant earth-moving equipment gouge the ore out of the earth, leaving behind acres and acres of exposed pits. As an example, Cameco's B-zone pit at Collins Bay is 915 meters long, 300 meters wide and 61 meters deep.

As the overburden is stripped away, mounds of waste rock are produced. Some of this is dumped back into the pit, the rest remains on the surface of the earth in waste rock piles. Large quantities of dust and particulate are produced during the construction of the pits, removal of the ore, and by heavy truck traffic.

Once on the surface of the earth, the ore is pulverized—again producing clouds of dust—and dissolved with chemicals, including sulfuric acid. The uranium is separated out. The waste rock and residues left over after processing, known as tailings are then left at the surface of the earth where harmful radioactive and toxic chemicals readily leach into the streams, lakes and the ground water system. Various radioactive particulates, plus an inert radioactive gas, radon, escape from the tailings and waste rock, and are carried downwind and into the atmosphere.

The Dangers of Radioactivity

Uranium is a radioactive element which means that it is unstable and breaks down or decays. As it decays, the uranium emits energy in the form of radiation. The uranium continues to break down into what are known as "daughter" elements, such as radium, thorium, radon, bismuth, lead and polonium. Each of these equally radioactive daughter elements decays into the next element at a different rate ranging from milliseconds to thousands of years. Finally, the uranium becomes a

Canadian and International Radiation Limits

Public	
Canada	5.0 mSv per year
U.S.	0.25 mSv per year
U.K.	0.5 mSv per year
West Germany	0.33 mSv per year
ICRP	1.0 mSv per year
Workers	
Canada	50 mSv per year
U.S.	50 mSv per year
U.K.[2]	15 mSv per year (averaged over 10 years)
Sweden	15 mSv per year (averaged over 5 years)
ICRP[4]	20 mSv per year (averaged over 5 years)
Miners (alpha limits, in addition to the above worker limits)	
Canada	4 WLMs per year
U.S.[5]	1 WLM* per year
most other countries	0
Radon (action levels)	
Canada	800 Becquerels per cubic meter
U.S.	150 Bq/m³
U.K.	200 Bq/m³
ICRP	200 Bq/m³

**WLM = working level months*

[1] U.S. Environmental Protection Agency Limited
[2] Recommendation of U.K. National Radiological Protection Board
[3] ICRP Recommendation, 1985
[4] Draft ICRP Recommendation, February 1990
[5] Recomendation of the U.S. National Institute for Occupational Safety and Health

stable, nonradioactive isotope of lead.

Although milling operations remove uranium from ore, 85 percent of the dangerous radioactivity remains in the tailings and waste piles. The radiation released is a health risk to humans, animals and plants because it penetrates cells and alters their structure increasing the risk of cancer, leukemia, birth defects and genetic damage.

Each of the radioactive elements that are in the uranium decay chain have specific characteristics that pose distinct problems in terms of human health and in terms of finding ways to adequately sequester the hazardous materials from the environment for the long time periods that are required. Thorium has the longest radioactive decay half-life (see Glossary) of the uranium daughters—76,000 years. It emits alpha radiation which is extremely damaging internally, especially toxic to the liver and kidneys. These radioactive elements need not be ingested as food or drinking water to cause damage. Radon gas released from the crushed rock during mining operations and present in the tailings piles is particularly damaging when inhaled. It has long been associated with increased incidence of lung cancer among uranium miners.

Air Pollution

Miners work in close proximity to all sources of radiation, the ore, the waste rock and the tailings piles and they breathe the dust and radon-contaminated air. In 1982, the Thomas/MacNeil report, published by the Atomic Energy Control Board, showed that uranium miners who work for 50 years at maximum legal radiation exposure limits would have a chance four times greater than that of the general public in contracting lung cancer. At that rate, one out of every five Canadian uranium miners would be expected to die of lung cancer. This estimate is probably low, since unions have kept poor records of inactive miners.

In 1988, the United Steelworkers of America issued a report that stated over 270 uranium miners in northern Ontario had died from lung cancer due to exposure to radon gas.

And in the U.S., where large numbers of Native Americans have worked in uranium mines, the statistics are equally disturbing. Lung cancer used to be rare among Navajos. However, in 1982 a report noted that lung cancer was up by 85 percent in Navajo uranium miners. (*Surgeon 92*)

The pattern extends around the world. According to Dr. Gordon Edwards, Director, Canadian Coalition for Nuclear Responsibility, "Statistical evidence gathered on uranium miners and other hard rock miners in Canada, Sweden, Czechoslovakia, and Colorado has demonstrated an unquestionable correlation between lung cancer incidence on the one hand and cumulative exposure to radon gas and radon daughters on the other hand." (*Edwards 87*)

The higher the grade of ore or the higher the concentration of the uranium, the more radioactivity and the higher the risk to humans and the environment. The average uranium ore mined in Saskatchewan is 4 percent uranium, however, the proposed new mine at Cigar Lake consists of an extremely high grade ore body—averaging 9 percent pure uranium. This concentration is 90 times that of the uranium mined at Elliot Lake and so dangerous that it may have to extracted by robots—although how it would be milled and

what would be the safeguards for the workers have not been spelled out.

Radon and Radium

Radon is not only dangerous to workers in the uranium mines. It is dangerous to indigenous people who live near the mines and to people who live hundreds of miles away. Radon is highly mobile. It can travel thousands of kilometers in a few days. Because it is relatively heavy, the gas stays close to the ground, where it deposits the elements it breaks down into—such as polonium, lead and bismuth—into human lungs, on plants, in water supply systems, and in animals.

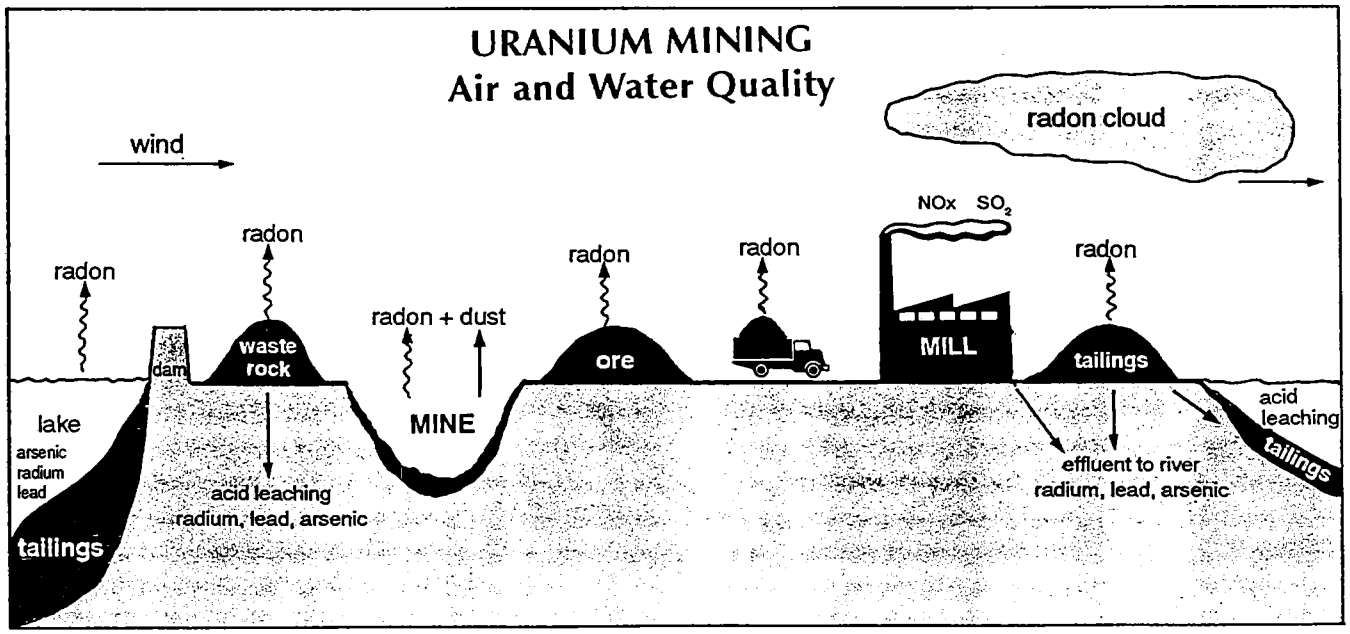
One of the insidious aspects of this decay chain is that sometimes the emitted material is an easily dissolved solid, such as radium, then it becomes a gas, radon, then, again it becomes a solid when it decays to bismuth, polonium and lead. And, like all forms of radioactivity, during this dispersion process, the materials are odorless and invisible. Only sensitive instruments can detect its presence.

Unlike the person who sees diesel fuel belching out of a truck or black clouds puffing out of a smoke stack, the person whose lungs are being invaded by radon has no idea that she or he is breathing dangerous pollutants.

Radon is a by-product of the radium—made famous by Madame Curie who first discovered that it was a radioactive substance. The radium is present in uranium mill tailings, rock waste piles and the excavated areas of the mines. It has a half-life of 1600 years. Radium is water soluble. This means the radium will travel along underground water courses, streams and rivers and be deposed in the sediment of lakes and streams. If there is a fluctuating water level in these contaminated bodies of water, the radium-contaminated soil will be exposed to wind, the radium re-suspended and carried to its next destination. And , of course, radon gas continues to be emitted by the particles of radium, wherever they have landed.

Dr. Gordon Edwards states, "There is no scientific evidence to support the view that there is a 'safe dose' of radon—that is, a dose so low that there is no increased incidence of lung cancer associated with it. On the contrary, the available evidence clearly indicates that the increase in lung cancer is either proportional to or more-than-proportional to the excess radon dose." (*Edwards 87*)

Unfortunately, radium and radon are not the only dangerous radionuclides wafting away from uranium mine operations. Thorium with its half-life of 76,000 years and uranium with its half-life of 3.4 billion years also hitchhike on the wind, to be deposed on plants and in animals. In other words, these hazardous materials enter the food chain and stay there literally for thousands of years. These daunting time spans are hard to comprehend. If, for example, the original indigenous people dug up uranium and left it sitting on the earth's surface about 10,000 BC, they still would



GLOSSARY

Half-life. The time required for half of a radioactive substance to lose its activity. For example, in 29 years half of a given quantity of strontium-90 will decay away. In another 29 years, only a quarter of the original quantity will reman.

Alpha radiation. A positively charged particle, identical to the nucleus of a helium-4 atom, consisting of two protons and two neutrons, emitted by uranium, radium and radon.

Leachate. The polluted liquid containing the soluble components of waste which leaks from a landfill, tailings pile or waste rock.

be suffering from the health impacts of that activity.

There are other airborne contaminants of concern at uranium mines. Unpaved roads, vehicles, storage tanks, as well as the mine and mill are sources of contamination. If there is an accident at the plant, or malfunction of air pollution control equipment, various heavy metals, such as lead and arsenic are emitted. Of particular concern is arsenic. At the McClean Lake and Midwest Joint Venture Project, the concentration of arsenic in the ore is about 5.8 percent, yet the company has not taken into consideration what are the expected health impacts from dispersion of this material.

The cumulative impact from all of these emissions both radioactive and chemical have not been addressed by the companies promoting the siting of new mines in Saskatchewan. In Fact Sheet 7, *Cumulative Effects of Uranium Mining in Saskatchewan*, Radioactive Waste Management Associates details the potential cumulative impact of radon generated by mining all Saskatchewan reserves. The radon will be distributed throughout the Northern Hemisphere, affecting almost four billion persons. Almost a half million lung cancers will result from long-term radon releases from abandoned tailing piles.

In addition to operating and proposed mines, in Saskatchewan there is "a legacy of 40 abandoned mines in the area, as well as abandoned tailings, some of which were pushed into lakes, and all of which allow radon and radioactive dusts to freely escape to the atmosphere." (*Lawrence 92*)

Water Pollution

The process of purifying uranium requires large quantities of water. At Rabbit Lake about 10 million cubic meters of water are used per year. This water is used in various aspects of the mining process, such as producing chemicals like sulfuric acid. This acid is used to dissolve the uranium in the ore so that the uranium can be separated and removed.

The mill effluent is regularly treated and then piped into holding ponds, local streams and lakes. Although treated the effluent contains significant amounts of sulfuric acid, arsenic, and lead. The sediments of lakes receiving this effluent become highly toxic. The poisons leach from holding ponds and lakes into the surrounding environment. Around former mills at Elliot Lake, local streams and lakes are a yellow-brown color and vast acres of trees and plants have died, leaving a veritable moonscape in which nothing—no birds, fish or animals—lives.

There is also an intensely acidic seepage from tailings and waste piles. And as we have already seen, there is a centuries-long seepage of radioactive toxins such as radium, thorium, and uranium. Other pollutants are spewed out by on-site diesel generators.

Attempts to Stabilize Tailings Piles

In an attempt to stabilize tailings piles and limit radon emissions the piles have been treated in basically two ways. The tailings piles are slurried into a giant hole. In the case of Rabbit Lake, the hole used was previously a lake. The lake was pumped out to permit access to the uranium buried beneath the lake's waters, the uranium was mined, then the hole created during the excavation of the uranium was re-filled with uranium tailings. Pumps at the bottom of the pit suck out water, drastically lowering the water table in the surrounding region and killing off trees and plants.

The tailings piles are also pushed into already existing ponds or lakes. The enormous volume of material raises the water level of the lakes and requires the construction of dams to prevent contaminated water from spilling into the surrounding

environment. The dams are usually earthen berms with carbon steel piers—structures that will last a fraction of the time of the toxic wastes behind the dams. Already, dams have failed at Key Lake and Stanroc (Elliot Lake, Ontario).

Placing the materials contaminated with radium under water does reduce the production of radon. However, there are other undesirable impacts of this method of stabilizing tailings piles. First of all both radium and arsenic will be present in solution and thus ready to move along underground and surface streams. The damming and draining of lakes, plus the creation of new artificial lakes, greatly alters the natural water table levels and groundwater paths. Aside from destroying lakes or parts of lakes, these practices have two potentially negative effects on the area's water quality. The first is that pumping out of pit areas produces a cone of depression of the water table and increases the flow of groundwater into the pit and the surrounding area—which often includes lakes. This is a concern because the groundwater may be extremely saline, as at Cluff Lake, and cause an increase in the salinity of the nearby freshwater lakes. This could be toxic to fish and other flora and fauna.

Pumping also changes the water levels in the nearby water courses and lakes. This could result in the loss of spawning areas for some species of fish or the death of other shallow-water species sensitive to water depth. For example, at Midwest Jint Venture's project, fish spawning areas in S. McMahon Lake will be lost and dewatering Mink Arm will increase the level of S. McMahon Lake and discharge to Smith Creek for 12 weeks—long enough to drown many shallow water species. Furthermore, fluctuations in water levels due to pumping may cause flooding and flushing of the bottoms of waste rock piles. This results in acid generation and release of toxic chemicals in solution to the environment and nearby water supplies.

Tailings piles have also been covered with vegetation to try to prevent the tailings, which have the consistency of sand, from blowing about in the wind. Unfortunately, placing vegetation on the pile actually increases the amount of radon that gets into the air—the radon travels up cracks in the soil made by roots. Furthermore acid seepage from the bottom of the piles is a constant problem. Originally, the idea was to drain and treat the leachate for a few years, until the pile dried out. But because of the wet climate and subarctic temperatures in northern Saskatchewan, the piles are drying out very slowly.

Unfortunately, because these mines are located in a subarctic terrain, the tailings piles freeze and consolidate very slowly. Consequently, leachate continues to slowly seep out of the pile. The concern here is that uranium mining companies will leave before the radioactively contaminated water in the tailings pile is completely removed and treated, leaving the cleanup job to the Province. As the centuries pass by, the contaminated leachate gradually spreads out from the pile. Present in these piles are not only radioactive elements such as thorium, radium and uranium but also the chemicals used to dissolve out the uranium in the first place, such as sulfuric acid. Known poisons, such as arsenic, are also present.

At Cluff Lake, a new technique was used to stabilize mill tailings piles—the material was placed in concrete vaults. But within a year, the radioactive mill tailings began leaking. (*Prebble 92*)

In addition to the problem with mill effluent dumped in nearby lakes, unstable and leaking mill tailing piles, and leachate-producing waste rock piles, all of the Saskatchewan mines have had a high incidence of accidental releases of contaminants into water systems. There have been over 50 spills since 1981. In one instance at Key Lake, a large spill of radioactive water went undetected for days. (*Prebble 92*)

These are some of the significant impacts on both air and water quality from uranium mining. Unfortunately, environmental impact statements prepared by the mining companies for the development of new mines in Saskatchewan have downplayed some of these impacts and entirely omitted others. In the meantime, Canadian radiation standards are not consistent with international standards.

Canadian Radiation Standards

Beryl Forgay, a Saskatchewan resident who has studied radiation issues, stated that in every respect Canadian radiation standards are much lower than internationally accepted standards; they are based on an outdated 1977 International Commission on Radiological Protection report and are actually becoming less, not more, stringent (see table). This view is corroborated by the National Film Board of Canada: "In recent years

Canadian authorities have been accused of relaxing exposure standards for atomic radiation rather than tightening them. Indeed, within the last decade, the maximum permissible concentration of radium in Canadian drinking water was increased by a factor of three, the maximum permissible concentration of uranium in water is also being increased. New regulations (1990), proposed by AECB over the objections of organized workers affected by the regulation ...[would] increase the maximum permissible intake of many radioactive substances in the workplace." (*NFB 91*)

Dr. Rosalie Bertell, Director of Research of the International Institute of Concern for Public Health in Toronto, Canada, states that it is hard to understand why radiation exposure limits are being relaxed when "so much new research is available documenting human illness associated with the present permissible exposure levels." Dr. Bertell asserts this movement is dictated more by the politics of the nuclear industry since "increasing allowable radium levels in drinking water... [is] reducing the clean-up costs for the uranium mining companies." (*Bertell 87*)

Citizens in Saskatchewan and Canada need a full accounting of all the anticipated air and water quality impacts of uranium mining before the decision is made to move forward with the construction of six new mines.

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Surgeon 92. Surgeon, H., Regional Officer, United Steelworkers of America, 1988, quoted by Julia Sinclair in "Compilation of Submissions received by Saskatchewan Uranium Mine Review Panel at Scoping Meetings for the McArthur River Joint Venture and Cigar Lake Project, February 7 through March 5, 1992," p.77.

The Uranium Coalition

Comments on Environmental Impact Statements for the Cigar Lake and Midwest Joint Venture Proposals

The Cigar Lake and Midwest Joint Venture Projects are two of three uranium mining, milling and disposal operations proposed in northern Saskatchewan whose Environmental Impact Statements were released in 1995 (the other is McArthur River). As detailed in this fact sheet, both projects would create several serious environmental health problems in Saskatchewan, as well as occupational safety problems for workers at the mines.

The two sites together will release 134 million cubic metres of radioactive and chemically contaminated waste water into local shallow lakes and streams in northern Saskatchewan. The Cigar Lake ore contains up to 20% uranium, over 100 times the amount found elsewhere in Canada and the US. Tailings containing 85% of the radioactivity of the original ore, in the form of decay products such as radium, will be deposited in the JEB pit, once an open-pit mine at McClean Lake. The pit will concentrate the radium, which, along with other contaminants, will last for anywhere from 250,000 to over 1 million years.

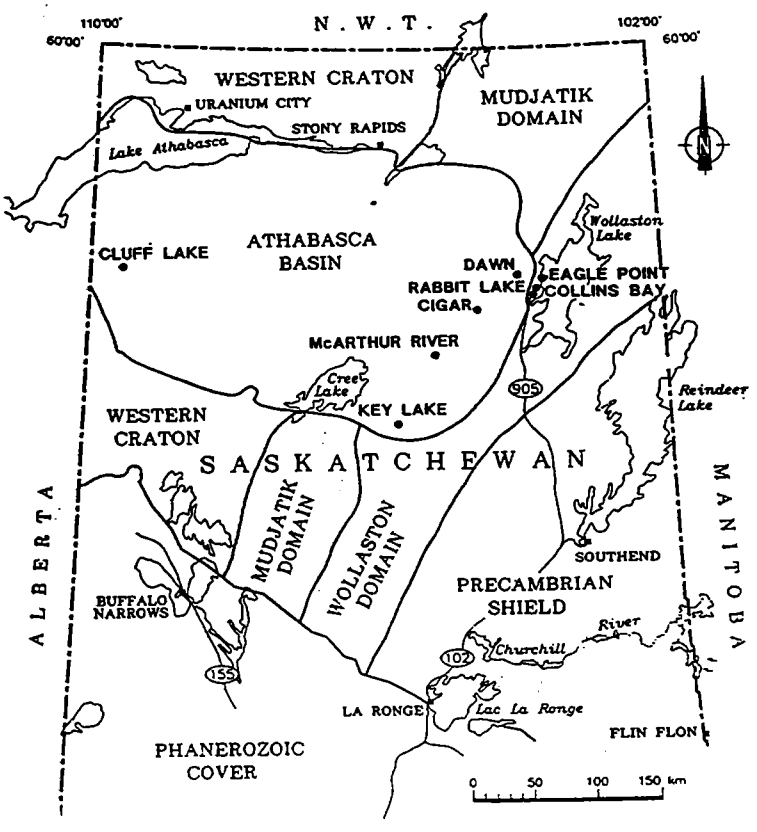
Canada produces 30% of the world's uranium, most of which comes from northern Saskatchewan. In addition to Midwest and Cigar Lake, there are five other existing or planned uranium operations in this region: McClean Lake, McArthur River, Rabbit Lake, Key Lake, and Cluff Lake (see Fig. 1). The combined environmental effects of these seven projects on the region's surface water, ground water and air could have far-reaching impacts.

The Proposal

Both the Cigar Lake and Midwest proposals involve the development of underground working mines, surface facilities, and water collection and treatment facilities. Mined ore would be crushed to a slurry and thickened while still underground, then pumped to the surface for storage. From there the uranium ore slurry would be trucked to McClean Lake for milling. The tailings, which are the pulverized- and- treated radioactive rock left over after the uranium has been extracted, will then be sent to the JEB pit for disposal.

The Problems

As with the other proposed mines in northern Saskatchewan, there are four major areas of concern: (1) the release of radionuclides, heavy metals, and other chemical contaminants from the tailings and waste rock into the groundwater, surface water, and air; (2) lack of adequate decommissioning plans; (3) lack of contingency plans in case action must be taken to reduce environmental contamination in the future; and (4) cumulative regional environmental impacts of uranium operations in northern Saskatchewan.



This fact sheet details the environmental effects which must be weighed in considering whether to approve the proposed mining operations.

1) Water and air contamination

The large amounts of wastewater produced by the mines, mill, and pit will contaminate the lakes into which it is discharged, even after treatment. Waste rock will be a source of arsenic, nickel, sulphate, and radium and radon contamination. Radon will emanate from the mill and from the tailings facility as well. Pumping associated with the JEB pit will lower the water table enough to dry up or lower several nearby lakes, and plants and animals in fragile wetlands will die.

a) Surface water contamination

Cigar Lake

Over 28 cubic metres per hour of treated wastewater will be discharged to a muskeg bog southwest of the mine site. As a result, it is expected that the bog will not be able to meet Saskatchewan's Water Quality Objectives, and that the bog sediments will tend to concentrate heavy metals (such as arsenic, nickel, and sulphate) and radionuclides.

Waste rock from the mining operation will be dumped into Bizarre Lake, 3 km northwest of the mine site, filling 36% of the lake's volume. As a result of heavy metals leaching out of the rock, arsenic levels in Bizarre Lake could exceed water quality objectives within 20 years after the start of operations.

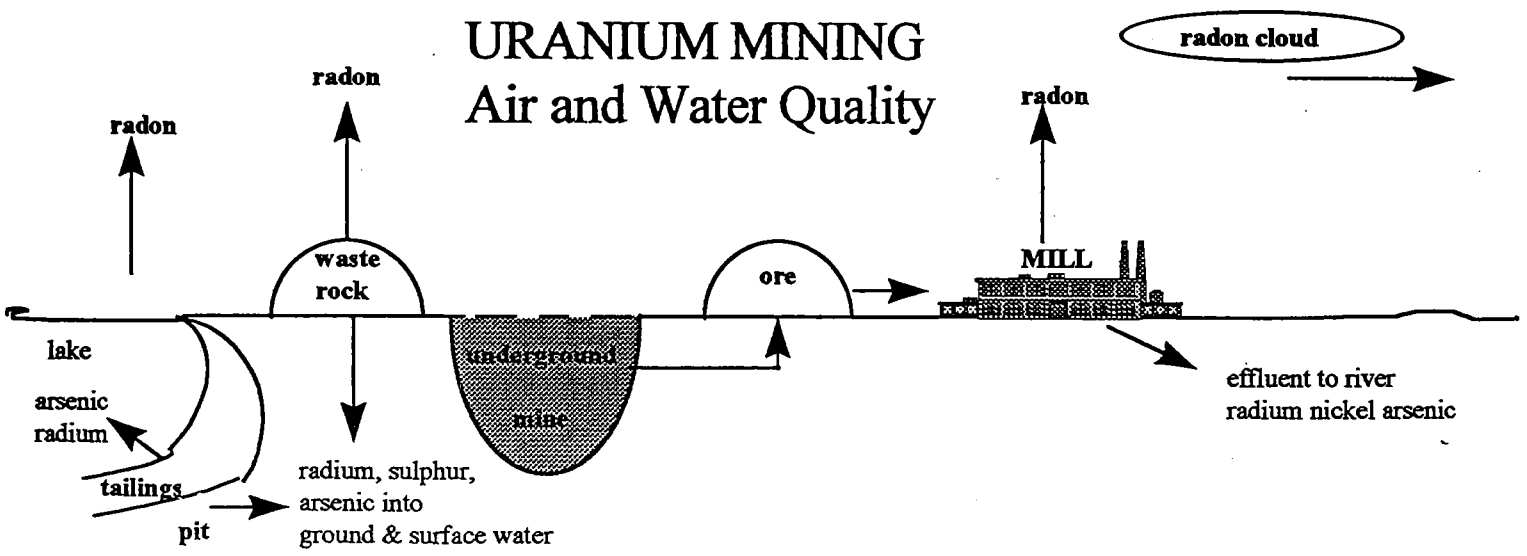
Midwest

Liquid wastes from Midwest operations will go to an on-site wastewater treatment plant, which is expected to handle 6,000 cubic metres per day. Three monitoring ponds will hold the treated effluent before it is released to Mink Arm, from where it then goes to Hatchet Lake. Almost 39 million cubic metres of total discharge to Mink Arm can be expected from 1998 to 2009.

As mentioned earlier, the uranium ore at Midwest is very high grade, and is rich in arsenic, nickel, and sulphate. The monthly mean concentrations of arsenic, lead, uranium, and other contaminants predicted for Mink Arm are already at water quality objective limits. Also, Mink Arm is very shallow, and the influx of highly contaminated wastewater will have a significant effect on aquatic life.

McClean Lake/JEB Pit

At the McClean Lake Mill, liquid wastes and groundwater pumped from the perimeter wells surrounding the JEB pit will go to a wastewater treatment plant, then be discharged into Sink Lake. Over the disposal period, about 95 million cubic metres of water, an amount equal to the total water consumption of the city of Saskatoon over two years, will be sent to Sink Lake. In order to mitigate the effects of this much additional water on downstream ecosystems, Cogema, the French nuclear company that's handling the tailings, will dam Sink Lake and release its contents gradually, turning the lake into a reservoir. The Sink Lake



reservoir will hold 5 million cubic metres of water, over 12 times the lake's natural volume.

Despite water treatment efforts, water quality in Sink Lake will be poor. Cogema predicts that maximum mean monthly concentrations of ammonia, arsenic, uranium, and other contaminants will exceed Saskatchewan Surface Water Quality Objectives.

b) Groundwater contamination

Most of the concerns with groundwater contamination at Cigar Lake and Midwest involve the disposal of tailings in JEB pit. It is clear that contaminants from the pit will escape to some degree, and that these will mix with uncontaminated regional ground water.

Plumes of sulphate, radium, arsenic and molybdenum will be found in the groundwater around JEB. The plumes will move outward toward Fox and Pat Lakes. This is important because fresh water will be pumped from Pat Lake for use at the mill and as drinking water for workers at the camp.

Pumping and removal operations will cause groundwater to flow toward the pit. The water table will be lowered in adjacent areas, decreasing lake elevations and, according to the EIS, "several lakes may become completely dewatered." One of these would most likely be Pat Lake. Furthermore, fragile wetland habitats will be destroyed as organic layers become dried out and species are displaced.

c) Air contamination

Uranium mining operations affect air quality through particulate emissions during milling, especially during yellowcake drying operations. Uranium left in the waste rock will break down into other substances, one of which is radon gas, which is extremely hazardous to human and animal health. Radon and the radioactive particles into which it decays are concentrated locally, but they do become distributed in the Northern Hemisphere atmosphere. There they add to the background dose of radiation affecting everyone's health. Furthermore, it should be remembered that if in the future the JEB tailings do not remain underwater, the radon emanation rate will be increased by a factor of 25.

2. Decommissioning plans

Decommissioning refers to those steps taken to ensure that the site is left as safe and natural as possible. Decommissioning plans for the mines, and especially for JEB Pit operations, are sketchy. The frequency of ground water monitoring after the pit's closure is unspecified. Radium-rich sludges leftover from wastewater treatment will be placed on the uphill side of the pit, under just three metres of soil and rock. Erosion and settlement could expose the sludges. Finally, the amount of radium leaching from the tailings has been underestimated.

Plans for a cover at the pit are unclear, and it appears uncertain that all materials will fit within the JEB excavation. Furthermore, the effect of tailings consolidation on the elevation of the cover has not been considered. It is possible that the elevation of the top of the cover would drop below the water table, allowing a lake to form above the tailings.

3. Contingency Plans

It is not clear that all of the material intended for JEB pit will fit inside, and contingency plans for enlarging the pit are of doubtful value. The EIS states that if the pit needs to be bigger, its upper part would be enlarged to accommodate the additional volume. But in the years to come, if pit capacity is exceeded or if it starts to flood with greater-than-expected volumes of ground water, more excavation may be exceedingly difficult to accomplish without disrupting the pumping operations.

Contingency plans for remediation in case of excessive ground water contamination around the JEB pit are unconvincing. Cogema has proposed blasting a ring around the pit, creating a path that would divert the ground water around the tailings rather than through them. This requires that the ring of intact rock around the tailings have low permeability, meaning it does not conduct water well. But the rock has no such property. In fact, the rock surrounding the pit has a relatively high hydraulic conductivity. Also, this "hydraulic cage" blasting method will be used when high levels of contamination have already managed to escape from the pit and have been detected downstream.

4) Cumulative Impact

Over the forty years of its operation, JEB pit will receive a total of 3.26 million cubic metres of thickened paste tailings from the Cigar Lake, Midwest, and McCLean Lake mines combined. All tailings and some of the waste rock from Midwest will end up in JEB. Both the Midwest and Cigar Lake mines, mills, and pits will produce large amounts of wastewater, which, even after treated, will contaminate the lakes into which they are discharged.

The operators of the Midwest, Cigar Lake, and McClean Lake mining sites rely on dilution in large lakes downstream to lessen the effects of their effluent on surface water quality. But these lakes either directly or indirectly receive effluent from all three sites. The Cigar Lake EIS finds that none of these downstream lakes will be significantly polluted. However, the assessment fails to account for the increasing risk of accidents as the overall level of mining activity increases.

Air emissions can also have a cumulative effect. Radon gas will distribute itself throughout the Northern Hemisphere and cause a large number of latent cancer fatalities which are not discussed in the Environmental Impact Statement. Radon gas in the air knows no boundaries. For the population in the Northern Hemisphere, the company has not considered the total dose commitment, that is, the total radiation dose to all people for the time the tailings remain hazardous. Each radiation dose a person receives, however small, increases the probability of cancer.

The uranium ores contain large amounts of radium, which will be concentrated throughout the milling and disposal operations. Since radium is especially mobile in surface water and ground water, the migration of radium away from the tailings pit is of particular concern. Contamination from the tailings pit will eventually escape and enter the local ground water system. Cogema predicts that plumes of sulphate, radium, arsenic and molybdenum will develop around the pit. The plumes will move outward and eventually reach at least as far as Fox and Pat Lakes.

With the operators of each of the proposed and operating sites relying on downstream dilution to dissipate the effects of their particular operation on local surface water, ground water and air, the overall effect of all the sites on the region's environment is an important concern. All of these environmental impacts must be weighed in deciding whether to approve the Midwest and Cigar Lake proposals.

Date:March 1996

Source Document:
Comments on Environmental Impact Statements for the Cigar Lake and Midwest Joint Venture Proposals (October 27, 1995), Radioactive Waste Management Associates, 526 West 26th Street, New York, NY 10001.

The Uranium Coalition consists of Big River Citizens for Energy Alternatives, The Northern Village of Green Lake, The Saskatoon Community Clinic, The International Uranium Congress, Pokebuster's Citizen's Coalition, The Archdiocese of Keewatin-LePas and the Inter-Church Uranium Committee. The Coalition participates in the Federal-Provincial Environmental Review Processes currently underway. For more information, contact ICUC at

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The Uranium Coalition

FACT SHEET #5

REVIEW OF McCLEAN LAKE
Environmental Impact Statement

The McClean Lake Project is one of six new uranium mines proposed in northern Saskatchewan in 1992 (two others are reviewed in fact sheets #4 and #6 in this series).

The mining in the JEB and Sue A, B, and C open pits will involve removing the soil and layers of rock to mine the ore bodies. There will be two water treatment plants near these mines to treat all contaminated waters flowing to and from the mines. The remaining waste rock and tailings (processed rock) will be deposited in the mined-out pits.

The McClean ore body will be developed as an underground mine with access by a ramp. Sink Lake will be developed as a storage reservoir to permit the treated effluent to be discharged to the Collins Creek watershed. A dam will be built at the outlet of Sink lake, expanding its capacity to retain water.

The Project

Minatco Ltd. is proposing a huge complex involving four open-pit mines and one underground mine. The McClean Lake Project is located in northern Saskatchewan approximately 350 kilometers north of La Ronge (a town approximately 400 kilometers north of Saskatoon). It is also 12 kilometers northwest of the Cameco uranium mine at Collins Bay.

The Problems

Radioactive Waste Management Associates [RWMA] critically reviewed the EIS released in January, 1992. As with the other proposed mines in northern Saskatchewan, they expose four areas of concern: (1) the release of acids, heavy metals, and radionuclides from the tailings, waste rock and "temporary" ore stockpiles to the air and water; (2) lack of adequate decommissioning plans; (3) lack of details on how the tailings management area will be prepared; and (4) the amount of reserve ore being proposed from this and other projects currently being reviewed.

1. Air and Water Contamination

Rock containing uranium ore will be mined from below the earth and waste rock will be deposited at the earth's surface. The waste rock, tailings, and stockpiles will create a permanent source for air and groundwater contamination.

a) Air Quality

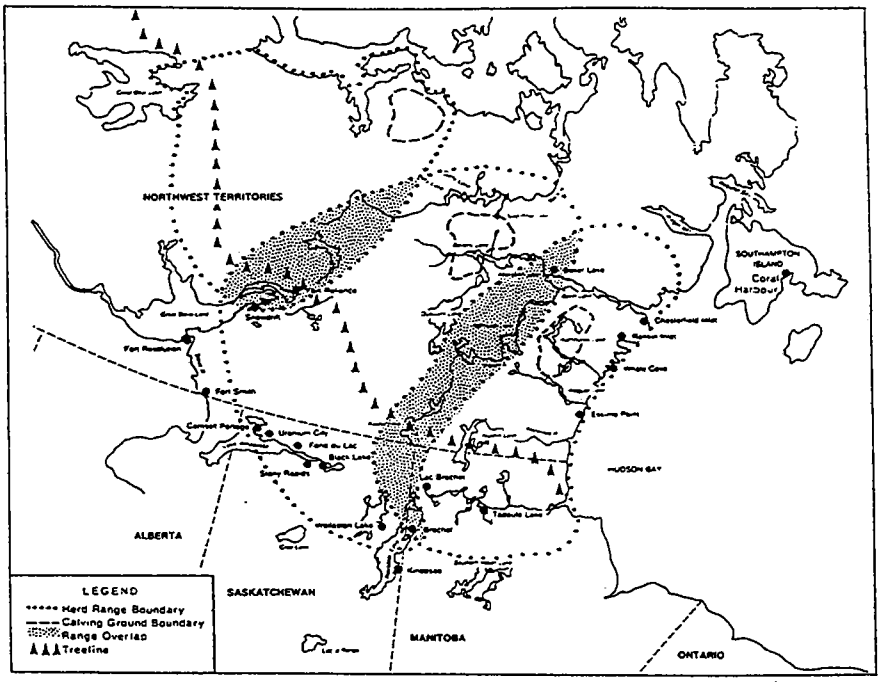
The air will be polluted in two ways: radioactive and chemical pollutants. Radioactive pollutants consist of gases, the most dangerous being radon gas (see fact sheet #1) and radioactive particles. Chemical pollutants consist of suspended particulate matter, sulphur dioxide (SO_2) and nitrous oxides (NOx), the common cause of acid rain. Pollution will come from the following: construction, underground mining, stockpiling, milling operations and tailings disposal, the acid plant operation, power production and vehicles.

Once this pollution is in the air it will go where the wind takes it. The EIS only discusses the impact on people, animals and plants from boundaries they define. The area of land and wildlife is considered 500 km^2—the area that would encompass the home range for a moose (see enclosed graphic). This does not consider that more than one home range may intersect this boundary and that more moose may be directly affected.

People are considered in a 20-kilometer radius circle from McClean Lake and Collins Creek plus 6 populated places beyond their property. However, radon gas will be released to the air and be

distributed throughout the Northern Hemisphere, affecting approximately four billion persons. Radioactive Waste Management Associates has calculated hundreds of thousands to millions of lung cancers can be caused by radon gas releases from tailings at the Elliot Lake, Ontario uranium mining complex. The method of calculation RWMA used was developed by consultants for the Atomic Energy Control Board (AECB). These methods were not applied by Minatco to their project.

RWMA projects that similar results are expected to hold for all the existing and proposed mines in northern Saskatchewan, where much greater quantities of uranium will be recovered. The same four billion persons will be further affected by such mining.



b) Water Quality

The EIS gives information on the kinds of waste water that will be coming into and leaving the operation. But it does not add up the totals—the total amount of radiation that everyone will receive over the lifetime of the radioactive substances. Since the life of these radioactive substances can affect us and our children's children for thousands of years, should this not be a concern of Minatco as well?

For now Minatco proposes to treat waste waters in two treatment plants. This treatment involves storing some of the waste water in ponds and releasing it to the water system very slowly. Waste water that is highly contaminated will be further treated. This treatment will only be done during the life of the project.

There are problems with this way of letting contaminated water into the environment. Amounts of radioactivity may not in this generation affect any one individual. But it is the nature of radioactive substances to accumulate in the food chain over time becoming again stronger for future generations. These kind of effects over long periods of time have not been calculated by Minatco for the McClean Lake Project. As was pointed out in the FEARO panel's Technical Review of the McClean Lake EIS (May 21, 1992): "Although there are reference to extensive wetland areas surrounding the mine site, impact to wetlands are not addressed" [p. 6] and "...the model of hydrogeological impacts has not been validated with field data...." [p. 7]

Surface water from this area ultimately drains into Wollaston Lake. Trace contaminants will eventually reach the North Atlantic affecting all communities and habitat along the way. Minatco's modeling of this complex groundwater path is not adequate. In the Technical Review, comment #33 states: "...estimates of stream flow in Collins Creek are crucial to further modeling of hydrological and water quality impacts"—but the model only uses real data for 1989, neglecting data from five other years.

Releasing effluent (waste water) into the nearby lakes does reduce (by dilution) the potential impact to any single individual, that is, the individual probability of developing cancer is proportional to the amount and type of radioactive material ingested. But, since there is no lower threshold for cancer and genetic effects caused by radioactive materials, it is the total radiation dose to the population which must be estimated. The total radiation dose, during the hazardous life of these radioactive materials, will determine the total number of projected cancers and genetic effects.

2. Decommissioning Plans

After Minatco is finished with this mine they are still responsible for the care of the land they used.

The EIS does not show clearly how this care will be accomplished or funded. The plans are too general and monitoring does not include the vegetation, wetlands and socioeconomic effects. The plans do not even meet with the Atomic Energy Control Board's regulations.

Table 1. Saskatchewan Uranium Mines and Reserves

Deposit Name	Mass of Ore (million tonnes)	Average Grade (% U308)	Mass of Waste Rock (million tonnes)	Mass of Tailings (million tonnes)
McClean Lake (total)*	20.6	3.2	11.2	0.9(dry)
McClean	5.6	2.4		
JEB	2.4	3.0		
Sue A	0.8	1.5		
Sue B	0.8	0.8		
Sue C	11.0	5.7		
MJV*	0.36	4.5	0.68	0.7
Cluff Lake (1992 total)	21.8	0.87	20	1.35
DJN extension*	0.85	5.9 kg/ton	20	0.85
Rabbit Lake (4 old mines)	4.7	2.06	13.2	5.0
Collins Bay A & D, EaglePt	~6	~2.5	3.35	5.5
TOTAL	**54.3**		**68.4**	**14.3**

* refer to proposals reviewed in this fact sheet series

data in this table come from the respective EIS's

After mining is complete and the buildings have been shut down the long-term sources of contamination to the water environment will be from the tailings piles, the open pits, the waste rock, special waste piles and contaminated sediments in Sink and Vulture Lakes. Movement of this contamination will occur as leaks throughout the groundwater system.

Operation of the pit dewatering and water treatment facility will be maintained for about two years after the end of tailings to allow further removal of pore water from within the tailings and thus eliminate the potential for direct release of contaminated pore water from the tailings. Of course, treated waste water will continue to be released to say nothing of what happens to the "treated" part of the "treated waste water".

The Sue open pits will be flooded with treated water from the Sue water treatment plant after mining activities cease. If necessary, the upper benches of the pit will be reshaped and covered with soil to encourage natural vegetation to grow back. The waste rock stockpiles will be contoured in order to reduce visual impacts. Some of the waste rock overburden will be radioactive and release radon gas. If potential contamination of surface water by runoff from stockpile exists, it will be covered with compacted till and revegetated.

Underground works will be carried out "in accordance with all current regulations." The ore stockpiles will be cleaned up thoroughly, the impervious clay or plastic liners removed and the areas graded to near original contours. The liners will be placed in the tailings management facility before it is decommissioned. Mill facilities, water treatment plants will be dismantled. Contaminated equipment will be placed in the tailings depository as well as contaminated sediments in all ponds. All areas will be graded, contoured and natural vegetation will be encouraged. Nevertheless, the important environmental impact will be the placement of a large quantity of radioactive material on the surface, presenting a hazard to future generations.

3. Tailings Preparation

A below grade system, the "pervious surround method" was chosen. This means that the pits will be specially prepared and used for long term storage. This method consists of three basic elements: a pit dewatering system; a permeable envelope (a sand liner for the pit); and a top cover (of a specified mixture of rock, sand and soil).

A pumping system at the bottom of the pit will draw contaminated waste water from the tailings through the permeable material. The idea being that ground water would not seep into and out of the tailings freely and that waste water in the tailings would be controllably and forcibly removed. The EIS however does not state what will be done with the pumped waste water nor is it specific about how this will work for the lifetime of the contaminated substances.

The pit chosen in the EIS is a previously mined out one called JEB. They assure the public that the pit could hold the tailings (900,000 dry tonnes—the

equivalent of a football field filled to 180 metres high) but they do not calculate the effect of adding tailings from the Midwest Joint Venture Project.

4. Reserves of Uranium Ore

The deposits of the McClean Lake Project are relatively high grade with proven reserves estimated to be 20.6 million tonnes averaging 3.2 percent of uranium (called yellowcake). The McClean Lake project is one of the largest in terms of the quantity of tailings and waste to be generated and its ore is very high grade.

Table 1 gives an overview of the size of the uranium industry's plans in northern Saskatchewan and the quantity of waste and tailings that will be generated if the projects are permitted to go ahead.

Conclusion

These projects will operate for a relatively short period of time, the next 15 to 20 years, and then be gone, leaving a permanent legacy that will cause negative health effects far into the future.

The EIS only estimates what people and the environment will receive in each year or in any one given year. They do not calculate what future generations of people, animals, or plants will receive for the life of these hazardous wastes. Such calculations have been done by RWMA for Elliot Lake, Ontario. Is it not up to the public to set the standards rather than Minatco?

It is recommended that Minatco should make these calculations as well as calculations for all the optional ways possible to deal with contaminated air, water, and rock.

November 1992

Special thanks to Carol Stang.

The Uranium Coalition consists of eight participant groups who have come together for the purpose of participating in the various Federal-Provincial Environmental Review Processes currently underway.

For more information, contact ICUC Educational Cooperative or one of the following Coalition members.

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Source documents:

Comments on McClean Lake Project EIS, Radioactive Waste Management Associates, New York, NY, May 28, 1992.

An Approach to the Calculation of Dose Commitment Arising from Different Methods for the Long-Term Management of Uranium Mill Tailings, Summary Report, Atomic Energy Control Board, INFO-0097.

An Approach to the Calculation of Dose Commitment Arising from Different Methods for the Long-Term Management of Uranium Mill Tailings Through Aquatic Pathways, Technical Appendix, Atomic Energy Control Board, INFO-009, 1983.

Atmospheric Dispersion of Radionuclides from Uranium Mill Tailings Disposal Sites, Technical Appendix, Atomic Energy Control Board, INFO-0097 (App), 1983.

The Uranium Coalition

FACT SHEET #6

REVIEW OF CLUFF LAKE
Environmental Impact Statement

Amok Ltd. proposes to extend the Dominique-Janine North uranium open pit mine southwards into the northern part of Cluff Lake, by damming it off and draining the dammed area (two others are reviewed in fact sheets #4 and #5 in this series). They contend that this is a good proposal because: (1) it will allow them to access one third of their reserve (850,000 tons) of high grade ore (5.9 kg/ton U)—which will last for another 20 years—thus keeping the mine open and providing employment for about 300 people for that long; (2) it will be an open pit operation which will allow them to maintain a lease requirement that they employ over 50 percent natives (this issue is dealt with in the socioeconomic fact sheet); (3) the waste rock will be disposed of underwater in the lake (on the lake side of the dam that will separate the extension from the lake), thus greatly reducing contamination from oxidation and acid formation; and finally (4) this scheme is less environmentally harmful than their first proposal of draining the entire lake.

The Project

Amok Ltd. who owns 80 percent of the Cluff Lake site is 75 percent owned by the French nuclear fuel company, Cogema and 25 percent owned by the French metals concern, Pechiney. Amok has been mining uranium at the Cluff Lake site in northwestern Saskatchewan since 1980. The other 20 percent of the Cluff Lake site is owned by the Canadian company, Cameco.

The site is located in an isolated, unpopulated area 75 kilometers south of Athabasca Lake, 15 kilometers east of the Alberta border and 250 kilometers north of the nearest town, La Loche. The area has low, strongly glaciated topography, marked by southwest-northeast trending gentle hills and valleys with abundant lakes. Cluff Lake is by far the largest lake in the area and it drains to the southwest into the Douglas River, which in turn drains to the northwest to the Peace and Slave Rivers then into the Great Slave Lake and McKenzie River and ultimately into the Arctic Ocean.

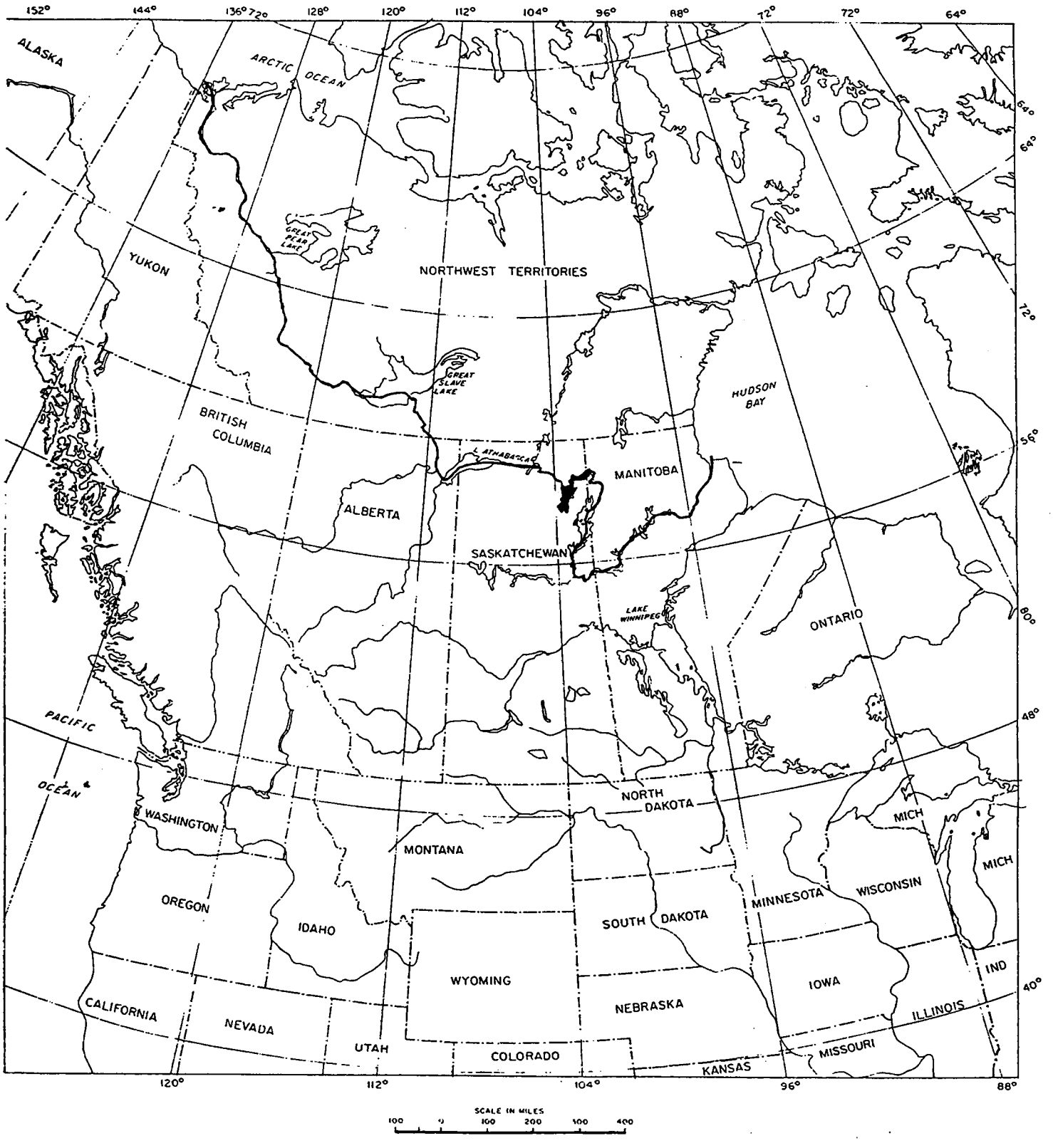
Amok Ltd. expects to reflood the pit and leave the site totally, "walk away," by 2010. During the operational period about 50 hectares of natural vegetation will be removed, and they expect a permanent habitat loss in the pit area of about 10 hectares. All mining of the proposed extension is scheduled over a seven-year period and is expected to be completed by the year 2000 under the present development scenario.

The Problems

Radioactive Waste Management Associates [RWMA] critically reviewed the EIS released in February, 1992. are a public interest consulting firm consisting of scientists. They have been hired by the Uranium Coalition to help critically review the Cluff Lake Environmental Impact Statement released by Amok in February 1992. The Environmental Impact Statement (EIS) lacks sensitivity to the effects uranium mining has on the local environment, the regional environment of the Athabasca Basin/Watershed, and to the larger world picture.

Four areas of concern are detailed in this fact sheet: 1) the lack of clarity of the effect of mining and storage of waste piles on the water systems; 2) the lack of details on the capacity, storage sites and releases of harmful substances to the environment; 3) the lack of adequate research on the proposed dam; and 4) an exposure of some of the underlying assumptions.

Wollaston Lake is a valuable fishery resource and a unique watershed in that the lake drains in two directions. To the west it flows to Lake Athabaska, then into the MacKenzie River and on to the Arctic Ocean. To the east it flows into Reindeer Lake and then into the Churchill and on to



Hudson Bay (see dark markings). Contamination of this lake would be a tragedy. Uranium mining companies propose to build 9 new uranium mines within 15 miles of Wollaston Lake. Each mine will a source of radioactive tailings, regular spills, radioactive waste rock and effluent with heavy metals and radionuclides.

1. The Hydrology of Cluff Lake

Even though destroying some of the area around the lake and the northern part of the lake itself is apparently acceptable, what about the broader-scale contamination of the water system? The north end of the lake appears to have abundant deep saline springs, and a complex hydrologic system. Any leakage through the dam, or contamination from waste buried in the lake, or from the tailings pile will pollute the entire lake and ultimately the Douglas River.

Hydrology refers to the knowledge of the water systems both above and under ground. This understanding is of fundamental importance for predicting the direction and speed of transport of contaminants in groundwater. It is particularly important for calculating the seepage through and stability of the south wall (the dam) of the proposed Extension pit. Unfortunately, many critical detailed data related to the flow characteristics at the northern end of Cluff Lake are not presented in the EIS and are apparently still unknown.

"Looks as if the clean-air crowd turned out in force."

The hydraulic conductivity in the entire drainage basin area decreases rapidly with depth and so groundwater flow is shallow and confined mainly to the glacial overburden and the top few meters of bedrock. A regional topographic divide, which drains northward, is located about 40 kilometers south of Cluff Lake. Just to the northeast of the lake is a mass of metamorphic rock which obstructs groundwater flow. Generally northward flowing water is diverted around it; and the flow is diverted upwards and into faults. Discharge is into streams and lakes with the major recipient in the area being Cluff Lake. In fact, the major discharge of regional groundwater flow is into the northern end of Cluff Lake—exactly where the extension pit is proposed.

It is unknown whether the regional groundwater flows into Cluff Creek from Cluff Lake or if it continues from Cluff Lake as underflow, not resurfacing until it reaches the Douglas River [EIS, p. A-7]. Clearly, a better knowledge of the flow paths of groundwater is critical in making meaningful estimates of contaminant transport.

Finally, Amok Ltd. claims in their Executive Summary that the dam will function as "a watertight curtain to prevent Cluff Lake water from seeping into the mining area." The EIS does admit that groundwater seepage (of high salinity water) into the pit will be significant and very difficult to predict and that it is a major concern that the high salinity groundwater not be released into Cluff Lake [Executive Summary, p. 14]. In the event this does occur however, they do not indicate how it would be dealt with.

2. Tailings and Contaminant Releases

There are two specific concerns regarding the tailings piles and waste rock piles.

First, the EIS is not specific about the capacity of the tailings management area to deal with the increased volume of waste from radionuclides in the waste rock, the streams into which it discharges and the potential for acidification.

Secondly, Amok Ltd. proposes that "waste rock removed from the pit side will be disposed of underwater along the lake side of the damming structure, adding to the dam as mining proceeds downward. Ultimately the plan is to put all waste rock under water to prevent leaching. Leaching is the ability of harmful substances to rinse out of the waste rock and tailings piles. The EIS claims this will lessen the potential for the contamination of

the air and water.

The EIS admits that there is not yet enough data on the distribution of rock types and from leach tests to make reasonable estimates regarding the acid-generating potential of the proposed mine. The EIS notes the dangers more than once.

For example, "The potential for acid generation from some samples is clearly indicated, however the rate and duration of acid generation cannot be predicted from static testing..." [EIS Supporting Document IV, p. 20]. The need for more detailed classification of samples by the mine geologists, prior to testing, is essential to develop an understanding of the variability of acid generation.

The EIS also states that even if the waste is beneath water most of the time, seasonal fluctuations in the lake level (of 30 to 40 cm) may cause a significant volume of waste rock to be flushed and potentially add radioactive (radium) and non-radioactive (arsenic) pollutants to the lake water [EIS Supporting Document IV, p. 40].

In fact, all that is known is that the present above ground waste piles do generate acid and that one way to prevent this in the future is to bury the rock underwater. Is this the most optimum or even acceptable way to deal with the waste? Such examples point to the EIS's own doubt on the matter.

3. Stability of the Dam

The EIS does not characterize the ability of the company to carry out what is in fact an ambitious engineering project. The geologic/engineering properties of the lake bed are not well known. Two of those properties are the continual seepage of large amounts of water, which has already been noted. The other is the presence of radioactive and non-radioactive elements prior to mining operations and potential levels after operations stop.

For example, during initial development of the pit, Amok Ltd. predicts anywhere from 7.6 to 189 cubic metres of water per day will seep in. This seepage will be pumped, treated and discharged to Snake Creek and Island Lake, and ultimately into the Douglas River. However, Amok Ltd. concludes [p.4-11] that "The short term impacts (less than 20 years) on water quality will be minor and the long term impacts on water quality of Cluff Lake will be non-existent." Is it Amok's role to determine what is minor and thus acceptable?

4. Underlying Assumptions

Unfortunately whether the short and long-term impacts on air and water quality will be major or minor, and indeed whether these impacts are acceptable is for the federal panels and the public, not Amok, Ltd., to decide. Amok's role at this stage is to quantify the effects to the environment. Sufficient data are not supplied for the public, the review panel, or the government to make well informed decisions. The concern here is that the company's has not met its responsibility to present the evidence for the public's to draw conclusions.

November 1992

Source Document:

Comments on the Cluff Lake Environmental Impact Statement. Radioactive Waste Management Associates, 306 West 38th St., Rm. 1508, New York, NY, 10018, June 29, 1992.

Special thanks to Carol Stang.

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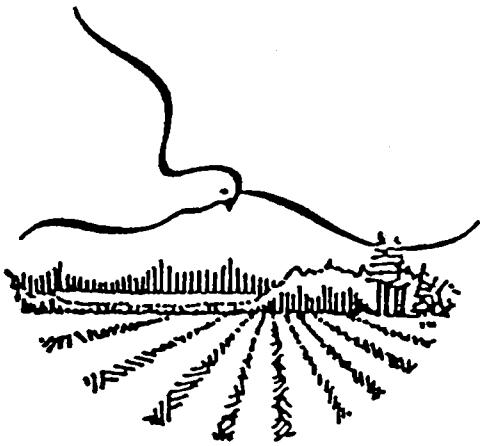


The Uranium Coalition

FACT SHEET #7

URANIUM MINING
Cumulative Effects

At present, Canada is the world's largest producer of uranium, mainly from mines located in Saskatchewan. Only about 20 percent of the uranium produced is used domestically, the vast majority is exported to countries such as the United States, France, Great Britain, Japan and South Korea.

A large number of the uranium mining companies are partly owned or entirely owned by foreign companies (see table 1). Cogema, a French corporation has a share in Key Lake. The McClean Lake Project is wholly owned by Minatco which is totally owned by the French company, Total, and Cluff Lake is 80 percent owned by Amok Ltd., another French company. This pattern which pervades the Canadian industry means a substantial portion of uranium mining profits leave Canada.

Throughout Saskatchewan, only 1,000 persons are employed by the industry, with only a small portion of these jobs going to severely underemployed indigenous populations. Currently, there are three mines active in northeastern Saskatchewan and nine more proposed (see table 2).

The long term, cumulative effects of uranium mining at these 12 mines plus the 40 already abandoned mines in Ontario and other parts of Canada are enormous. For the currently operating and planned mines, estimated uranium reserves are over 35.5 million tonnes (see table 1). Each mine will bring to the surface of the earth huge quantities of rock that will be crushed, pulverized, processed—leaving behind mountains of dangerous mill tailings and waste rock piles. And as the ore is brought to the surface radioactive elements contained in the rock have access to the air and water. Elements that will be dangerous for *thousands* of years.

The mills which process ores are also immense. The Rabbit Lake mill which is located near Wollaston Lake in northeast Saskatchewan, can process about 540,000 tonnes of ore a year. Approximately 2.5 million tons of waste rock a year must be removed to reach the high-grade ore at Rabbit Lake. Chemically removing this much uranium requires about 50,000 tonnes of sulfuric acid a year and about 10 million cubic meters of water. This is about 0.02 percent of the Ottawa River as it passes Canada's capital.

Bringing so much radioactive ore to the earth's surface, using so much water and chemicals and leaving so much waste, inevitably has major effects on the Saskatchewan, indeed, the world's environment.

Because this material is radioactive it has properties that make it particularly difficult to isolate from the environment for the large number of centuries required. The radioactive uranium breaks down into other elements, such as radium, thorium, radon and polonium. Radon, the inert radioactive gas, is released to the air from the

Table 1. Uranium Mining Companies and Reserves

Mine	Company	Uranium Reserves*
Key Lake	Cameco	2,556,000
Rabbit Lake	Cameco	6,945,000
Cluff Lake	Amok Ltd	2,179,000
McMahon Lake	Midwest Joint Venture	361,000
McClean Lake	Minatco	20,600,000
Cigar Lake	Cameco/Cogema	1,888,000
McArthur River	Cameco/Uranerz	2,370,000
Dawn Lake	Cameco/Cogema	686,000

*in metric tonnes (source: Cameco 1991 Annual Report)

tailings pile, and radioactive thorium, radium, polonium and lead are released to the water or suspended by wind into the air. Arsenic, lead and other heavy metals are also released to water. Sulfuric acid poisons nearby streams and lakes. The health effects resulting from these releases, both in contemporary populations and in succeeding generations is clearly the most important detrimental effect resulting directly from the mining of uranium.

Though radon has a half-life of only 3.8 days, it is distributed throughout the Northern Hemisphere by prevailing winds. It is during this period of existence as radon that the nuclide can readily diffuse out into the atmosphere and disperse. Both the radium from which the radon is derived and the various byproducts, such as lead and polonium, are chemically active. Thus they will either be held in a chemical matrix or be taken up in solution in water, but cannot diffuse freely through the air.

Thorium-230, the precursor of radium and radon gas, has a half-life of 80,000 years. This means it will take, at least, 1,600,000 years for the thorium to decay to the point where it is no longer hazardous. Throughout these eons of time, thorium will be year-in and year-out producing radium and the hazardous radon gas. It is well-established that inhalation of radon increases an individual's chances of getting lung cancer.

Once released to the atmosphere, radon is distributed throughout the Northern Hemisphere, potentially affecting four billion persons. Contractors for uranium mining companies calculate the radon doses to local people and conveniently ignore the total dose to the larger number of persons in the Northern Hemisphere.

How can we estimate this total dose?

In the table, the estimated ore reserves are shown. The total radioactivity that will eventually be brought to the earth's surface by mining these uranium reserves is potentially very large. Although some of the radioactivity is extracted and ends up in fuel for nuclear power plants, over 85 percent of the radioactivity remains in tailings piles and waste rock piles. Covering all tailings with water greatly reduces the potential radon releases, according to the uranium mining companies, by up to a factor of 10,000. This assumes that earth and rock dams remain stable for hundreds of thousands of years and the tailings remain covered with water. If the tailings and waste rock were not covered with water, the potential releases could be up to 320,000 curies a year. This scenario is more likely given the performance of dams at already abandoned sites (see below). Earthfill dams simply cannot last the requisite thousands of years. Furthermore, there are no plans to regularly maintain dams in the future. Assuming tailings and waste rock become uncovered, the potential lung cancers to people in the Northern hemisphere, due to radon gas alone, can range up to 500,000 over all time. This figure for a potential 500,000 lung cancers does *not* include other cancers that result from exposure to hazardous materials at former uranium mines.

Table 2. Proposed Schedule for Mine Exploration and Development

Mine	Construction	Operation
Key Lake		1983-2017
Rabbit Lake	1992-1994	1993-2004
Cluff Lake	1992-1994	1993-2003
McMahon Lake	1992-1994	1994-2002
McClean Lake	1992-1994	1994-2003
Cigar Lake	1994-1996	1996-2021
McArthur River	1995-1997	1997-2017

Covering tailings with water, while greatly reducing radon emissions, can lead to dissolving in water of radium and arsenic. At the Rabbit Lake tailings pit which was formerly Rabbit Lake, the arsenic and radium concentrations are expected to exceed the regulatory limits established by the provincial government. Future persons who drink this water will develop cancer and genetic and other health effects. Fish and wildlife will also be affected. Uranium mining companies have not made these estimates.

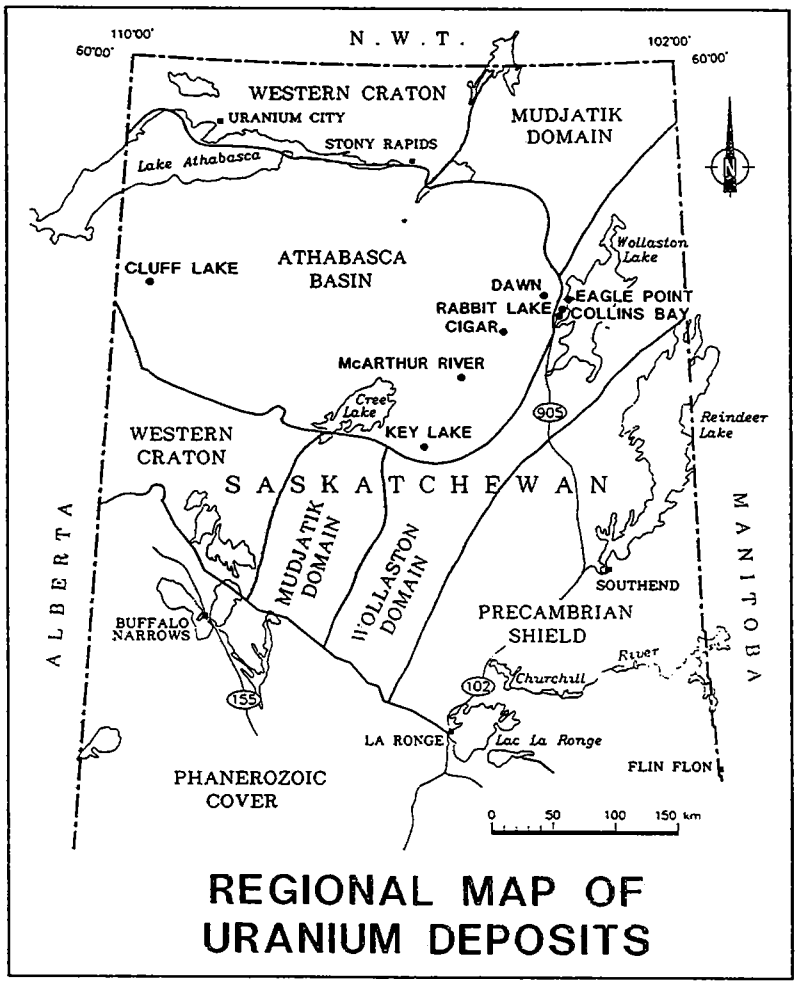
Unfortunately, radon is not the only radionuclide dispersing into the environment around uranium mines. Thorium with its half-life of 80,000 years and uranium with its half-life of 3.4 billion years will also travel by wind, stream, and underground seepage. As these dangerous elements enter the food chain, they will contaminate plants, fish, animals and humans. The total radiation doses for the full hazardous lives of these radionuclides must be calculated. Unfortunately, this has not been done by the uranium companies.

Some of the problems one can expect at currently operating mines once they are shutdown and at the 40 mines that are already closed-down include wind and water erosion of mill tailings piles, collapse of dams, seepage of contaminants underneath dams, contamination of nearby lakes and streams, destruction of lakes and streams through acidification, destruction of flora and fauna, exposure of supposedly covered tailings piles, radon escaping through vegetated covers, and catastrophic releases as a result of earthquakes or floods.

A quick look at some of Canada's abandoned mines demonstrates the magnitude of the problem. For example, the Quirke mine near Elliot Lake, Ontario was shut down in 1990. Here, there are 45 million tonnes of tailings occupying an area of 192 hectares. These are contained behind eight dams. There are also 25 hectares of settling ponds maintained in place by two more dams. The dams are earthfill on grouted bedrock foundations. This large area will be saturated with water in an attempt to reduce the generation of acid and heavy metals that could impact on the nearby Serpent River. Water will be kept in place by an earthfill embankment 250 meters long and 25 meters high. (*Golder 92*)

It is not credible that these dams will last the *hundreds* of thousands of years required to prevent dispersion of acids and heavy metals in the tailings or long-lived radioactive contaminants inside the tailings.

At the abandoned Nordic mine in the Elliot Lake region only 11 years after closure of the uranium mine, seepage was discovered that had migrated underneath the tailings dam. At Nordic, the tailings pile is 85 hectares and down to a depth of 10 meters. A plume of water containing various heavy metals was found 400 meters downgradient of the dam in 1979 and a plume of water containing radium was found 15 meters downgradient (*Blair 86*). If there has been this amount of migration in only 11 years since "decommissioning" of the mine, one can only wonder what the extent of migration will be after several hundred years.



REGIONAL MAP OF URANIUM DEPOSITS

Other abandoned mills in the Elliot Lake region include Lacnor, Stanroc, Spanish American and Pronto mines. All of these mines plus the Nordic mines had a high content of pyrite in the ores which means a long-term problem with acid generation from the tailings piles. The amount of tailings left behind by the uranium mining companies at these five sites equals 24 million tonnes of tailings (*Beak 86*). The total mill tailing accumulation at Elliot Lake is 150 million tonnes (*RWMA 92*).

Another abandoned mine where there has been problems with a dam constructed a relatively short period of time ago is the Agnew Lake mine where, only eight years after construction of the tailings dam, repairs were necessary. A slurry wall and a hypalon synthetic liner were added to the dam to minimize seepage to a nearby trout stream (*Beak 86*). The longevity of these repairs is open to question.

The problem of underground seepage from tailings ponds and tailings piles at abandoned mines is not well understood. According to Beak Consultants, "there is a general lack of Canadian data on seepage rates below decommissioned tailings sites... A U.S. site where underground seepage has been studied in some detail is in the Grant's Mineral Belt in New Mexico. This study indicates that, because of the particular geologic structure of the area, about 50 to 70 percent of tailings pond water is 'lost' through seepage into the ground (*Beak 86*)."

Aside from the long-term impacts of dam failures and seepage underneath dams, erosion of tailings piles also needs to be monitored. The Nordic tailings pile is eroding and a river channel appears to be forming within it. Frost can add to unpredictable erosion patterns (*RWMA 92*). And at Elliot Lake, acidic conditions are deteriorating concrete spillways and sluices, increasing the likelihood of major dam breaks in the future.

As yet, neither the provincial government of Saskatchewan nor the government of Canada has calculated the total cumulative health effects and economic costs of all of the uranium mining in Canada, both present and past.

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The Uranium Coalition

FACT SHEET #8

URANIUM MINING
Social and Economic Effects

Uranium is a radioactive element used almost exclusively for nuclear fuel and weapons production. Uranium is naturally occurring in rocks and is found in the earth in sufficient quantity to be economically profitable to mine in the former Soviet Union, South Africa, Australia, the United States and Canada. At present, Canada is the world's largest producer of uranium, mainly from mines located in Saskatchewan. In 1990 Canada had a 30 percent share of the western world production of uranium. Only about 20 percent of the uranium produced is used domestically, the vast majority is exported to countries such as the United States, France, Great Britain, Japan and South Korea. (*EMR 91*) See figure 1.

The actual social and economic effects of this industry on the people and environment of both the province of Saskatchewan and Canada as a whole are usually glossed over in government and industry pro-mining statements and documents. Mining advocates have over-estimated the revenue to the province, over-estimated the projected demand for uranium, exaggerated the job benefits, and ignored or downplayed serious health and environmental impacts.

Most particularly, the long-term impact of radionuclides that will be toxic for, at least, 250,000 years simply does not appear in government and company reports.

The Uranium Market

In terms of generating tax revenues for the province of Saskatchewan, industry estimates have consistently over-estimated the dollar amounts by six to 12 times. For example, in 1989, the Saskatchewan government received only $27 million in revenues compared to projections of from $165 to $427 million. The estimated versus the real revenues are shown in figure 2. These revenues can only continue to decrease as the price of uranium has hit a historic low of less than $8/lb and as the world uranium market is glutted by the sale of stockpiles from the former Soviet Union and Eastern Block countries. This glut is occurring at a time when public opposition to nuclear power has brought orders for new nuclear plants to a standstill in the U.S. Orders in third world countries are also depressed.

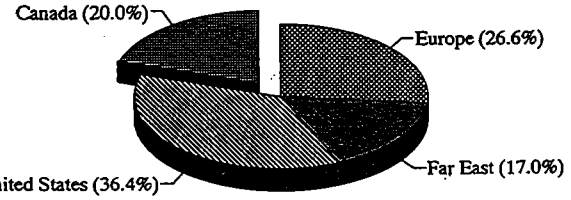
Furthermore, the ending of the cold war has basically shut down the nuclear weapon production complex in the U.S. and the (former) USSR further reducing the demand for uranium.

Although the exported uranium is required by law to be used for only peaceful purposes (that is, nuclear power plants), Canadian uranium can be used in a country like the U.S. or Britain for commercial fuel, thereby freeing up other non-restricted uranium for weapons production or option of nuclear submarines. Thus, critics of the industry say, Canadian uranium indirectly contributes to production of nuclear weapons and to non-peaceful uses.

Certainly on a worldwide basis demand for uranium is down to less than $8 ($U.S./lb U_3O_8) and the price of uranium is not likely to rise to the high of $43.23 of the late 70's for decades, if ever. (*Cameco 91*)

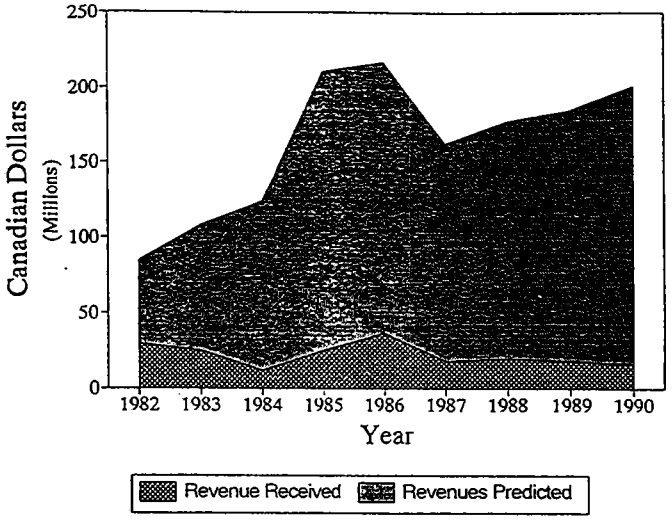
Unfortunately, companies promoting develop-

Fig. 1. Canadian Uranium Contracts



Canadian uranium contracts. Over one third of Canadian uranium is under contract with the U.S. Only 20 percent of Canadian uranium remains in Canada.

Fig. 2. Uranium Revenue v Predictions



Uranium revenues versus predictions. Real revenues have generally been a factor six to 12 times predicted royalty revenues.

ment of Saskatchewan's uranium have little basis for their glowing predictions regarding future demand. For example, the Midwest Joint Venture in its 1989 environmental impact statement on a proposed uranium mine at S McMahon Lake, states 342 nuclear power plants in 20 countries produced 17 percent of the Western World's electricity, and that capacity is expected to grow by 21 percent by the year 2000. Uranium required to fuel existing reactors totaled approximately 121 million pounds of U_3O_8 in 1989, and, according to the EIS, is projected to increase by 17 percent by the year 2000. The EIS also reports that "Western World" uranium production in 1989 totaled 93 million pounds, 24 percent less than demand. The 28-million pound gap was filled by drawdown of inventories, which are expected to be depleted by the mid-1990s, or longer if one includes uranium dumped on world markets by the former Soviet Union. (*Goldman 92* and *MJV 91*)

The EIS does not cite a single reference for any of these estimates. It provides no indication of the substantial uncertainty involved in such projections, nor any details of how these projections were made. Yet, as noted above, changes in these Eastern economies have completely upset the nature of the uranium market. The former Soviet Republics have dumped so much uranium into the market that prices have dropped to their lowest level in more than two decades. Factors such as, will the addition of Midwest Joint Venture production prolong the present glut in the market and further suppress the price of uranium, are not addressed.

Presumably, the expectations of increased demand include Ontario Hydro's former plans to expand its capacity to include nine new nuclear power plants, which the utility dropped in 1992. Many reactor projects around the world have been recently canceled and delayed. Do the projected increases in demand reflect these changes? The availability of lower-cost ores from Saskatchewan, combined with the low-cost Russian exports, are largely responsible for the demise of the Elliot Lake mining operation in Ontario. Will future supplies from Southern and Eastern countries with low-cost labor similarly undercut demand for Saskatchewan uranium in the future?

Mining is inherently subject to the vagaries of the market. The already desperately poor local economies of Northern Saskatchewan become victims of destabilizing boom/bust cycles. The stated government objective of sustainable development for the Northern communities of Saskatchewan is not possible, if the economies are to be based exclusively on mining—especially with the present low price of uranium. A recent government report concluded: "Notwithstanding its strong position, Canada's uranium industry faced an uncertain market in 1990, plagued by oversupply and low and volatile prices." (*EMR 91*)

Like all mining and natural resource depletion industries, when the uranium runs out, employment stops. Then local communities must deal with continuing pollution problems and scaling down the infrastructure buildup that took place during mining operations.

Elliot Lake, Ontario has a residential vacancy rate close to 50 percent as the community gamely attempts to diversify. This cannot take place without provincial funding. In June 1991, the Ontario Northern Development Minister announced a $250 million economic development package for the Elliot Lake area. This economic transfusion may not be enough to save Elliot Lake from becoming a ghost town.

A Job Bonanza: Myth or Reality?

If industry forecasts of projected revenue from uranium mining are unreliable, estimates regarding job benefits to the local population are also subject to question.

One of the major benefits touted by the uranium industry for their continued and expanding mining operations in Saskatchewan is the creation of jobs in areas plagued by poverty and high unemployment. Northern Saskatchewan has a significant population of indigenous peoples—63 percent of the 30,000 residents are of aboriginal descent, including Cree,

Dene and Metis peoples. Traditionally, fur trade, hunting and fishing provide the livelihood. According to the environmental impact statement developed for the Midwest Joint Venture project (*MJV91*), traditional income no longer provides adequate income for indigenous peoples, in part because of the declining demand and prices for furs. (*Goldman 92*) Not referenced by the mining companies is the deleterious impact of earlier mining activities on animal habitat, decline of game animals and destruction of fishery resources.

In fact, uranium mining provides few jobs and little tax revenue. In 1991, uranium mining throughout Canada employed less than 2500 people and more than half of these worked at Elliot Lake, Ontario. At Elliot Lake, less than 50 percent of the jobs went to Northerners—mainly in service or laborer positions. Because about 40 percent of northern Saskatchewan residents over the age of 15 have received less than a grade nine education, most professional and technical positions are filled with workers from outside the region.

At a new mine in the planning stages, Midwest Joint Venture, direct employment from the mine will not have a significant effect on high unemployment rates. About 19 to 38 workers from northern Saskatchewan will be hired during the construction and development of the mine—representing only 20 to 40 percent of the total labor force. And approximately 86 workers from northern Saskatchewan will be hired during the operations phase of the mine equaling about 1 percent of the total labor force population in northern Saskatchewan. (*Goldman 92*)

MJV's proposed mining operation under Mink Arm of S McMahon Lake (see Fact Sheet #4) is an underground mine with medium-sized reserves. Both McClean Lake (see Fact Sheet #5) and Eagle Point have considerably larger reserves. Generally, underground mines produce more jobs than open pit mines where much of the extraction is performed by giant earth moving machines that replace laborers.

Another unreliable claim regarding supposed economic benefits of uranium mines is indirect employment. According to the Midwest Joint Venture project, the multiplier effects—which represents the number of jobs that would be generated in the service, transportation, food, supplies and other services—is three times greater than those cited in a study by the Canadian Energy Research Institute for multiplier effects in Saskatchewan, and 65 percent greater than the effects for Canada as a whole. The Canadian Energy Research Institute study demonstrated that the multiplier effect was so low for indirect jobs created by Saskatchewan mining operations because most of the supplies purchased by the industry were from companies located outside of the province, in Ontario.

An additional uncertainty associated with uranium mining company claims regarding job benefits resulting from the development of new mines is the question of what percentage of the jobs expected to be filled by native people actually will be filled by this group, rather than filled by other employees at nearby mines—employees that have recently immigrated north from southern Saskatchewan? This question is not addressed by the companies. (*Goldman 92*)

There are few, if any, educational benefits to the workers in terms of job training and any difficulties experienced by Northerners in adjusting to a wage job. For those few indigenous peoples who actually do obtain jobs at the mines, the prospect for long-term employment is very limited. The jobs last only so long as the mine is in operation, maybe, 10 years. And there is an extremely high risk in terms of health. The long-term health hazards and costs remain for future generations.

The Dangers of Radioactivity

Uranium is a radioactive element which means that it is unstable and breaks down by emitting particles. In the process what are known as "daughter" elements, including radium, thorium, radon, and polonium are created until finally the material becomes a stable, nonradioactive isotope of lead. Each of these equally radioactive elements decays into the next at a different rate ranging from milliseconds to thousands of years.

Although, during milling operations, the high-grade uranium is removed, 85 percent of the dangerous radioactivity remains in the tailings and waste piles where it may leak into the water or air. The radiation released is a health risk to humans, animals and plants because it penetrates cells and alters their structure increasing the risk of cancer, leukemia, birth defects and genetic damage. Thorium, with the longest radioactive decay half life of the uranium daughters at 76,000 years, emits alpha radiation, especially toxic to the liver and kidneys.

These radioactive elements need not be ingested to cause damage. Radon gas is damaging to the lungs. Released from the crushed rock during mining operations, it can travel thousand of miles in a few days. Aside from the documented dangers of inhaling radon, because it is relatively heavy the gas stays

close to the ground. Radon gas radioactively decays to solid radioactive particulates which may then enter the food chain via plants and animals.

Miners, face the highest risks from these dangerous elements. They work in close proximity to all the sources of radiation. The ore, the waste rock and the tailings piles constantly emit dust and radon-contaminated air that the workers breathe. According to Dr. Gordon Edwards, director of the Canadian Coalition on Nuclear Responsibility, "Statistical evidence gathered on uranium miners and other hard rock miners in Canada, Sweden, Czechoslovakia, and Colorado has demonstrated an unquestionable correlation between lung cancer incidence on the one hand and cumulative exposure to radon gas and radon daughters on the other hand."

In addition , the Thomas/MacNeil report published by the Atomic Energy Control Board in 1982 showed that uranium miners who work for 50 years at the maximum radiation limits would have a four times greater chance of contracting lung cancer than members of the general public. One of the proposed new mines is at Cigar Lake where an ore body averaging 9 percent pure uranium has been discovered. This concentration is 90 times that at Elliot Lake and so dangerous that it may have to be mined by robots—although how it will be milled and what will be the safeguards for the workers are not spelled out.

The cost to the government of long term health care of miners who become sick from working in the mines or of their families that contract diseases as a result of living in a contaminated environment and eating contaminated food is not addressed by the uranium mining companies.

Hidden Costs

Other social and economic costs of uranium mining are chronically downplayed or not mentioned at all by the uranium companies. Some of these include the impact of mines on local fishery resources, the effect on tourism—there are fly-in tourist lodges near a number of planned mines, the consequences of long-term pollution by both radionuclides and heavy metals, like arsenic, cadmium, copper, zinc, and sulfates of streams and lakes or destruction of lakes by damming and draining, the cost to local governments of maintaining all-weather roads in the harsh, winter environments, the impact on local industries (there is a substantial wild rice business near the proposed McArthur River mine), the impacts on wildlife, including moose, beaver, caribou, bald eagles, and ospreys.

The long-term aspects of uranium mining pollution are only indirectly alluded to or downplayed in statements by the uranium mining companies, particularly the fact that radionuclides present in mill tailings piles will be hazardous for hundreds of thousands of years. A typical approach is that taken by the authors of the environmental impact statement of Midwest Joint Venture. They say "the recovery process in nearby McMahon Lake may take an extended period of time, perhaps decades." (*MJV 91*) Clearly, the recovery process is *not* going to be a matter of decades. It will be a matter of centuries.

A final aspect of the uranium industry that deserves comment is the risk to the economy—if uranium mining companies go bust. With the extremely depressed uranium ore prices and uncertain markets, and a record of uranium companies grossly over-estimating markets as at the now closed-down Elliot Lake mine, the prospect of companies going bankrupt is real. Citizens need to know what measures the federal and provincial government have taken or will take to protect them against such a contingency.

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The Uranium Coalition

FACT SHEET #9

THE SASKATCHEWAN URANIUM INQUIRIES

The Hearing Process

There are two separate panel reviews:

1. Five projects—involving ten actual mines—are being reviewed by a joint federal-provincial panel.

On this panel:

Don Lee (chairman), chemistry professor University of Regina

John Dantouze, community planning advisor, Prince Albert Tribal Council

Annalee Yassi, doctor and public health specialist, University of Manitoba (Winnipeg)

James Archibald, mining engineering professor, Queen's University (Kingston, Ontario)

Richard Neal, biology professor, University of Saskatchewan (Saskatoon)

2. The Eagle Point mine is being reviewed by a separate, federal (FEARO*) panel

On this panel:

Ken Hindmarsh (chairman), pharmacy professor, University of Saskatchewan (Saskatoon)

Ronald Martin, dentist , Fond do Lac Band member

Charles Pelley, mining engineering professor, Queen's University (Kingston, Ontario)

Dennis Lehmkuhl, biology professor, University of Saskatchewan (Saskatoon)

*Federal Environmental Assessment Review Office

(The processes for these reviews are outlined elsewhere.)

THE SASKATCHEWAN URANIUM INQUIRIES

How did these inquiries start?

1. Federal laws require environmental review of large projects where the federal government is involved. Provincial laws require a review wherever environmental effects could be serious.

- Laws have been in place, but were not enforced before the Supreme Court decisions on Rafferty-Alameda and Oldman dams.
- The 1989 mine-water spill at Rabbit Lake mine got wide public and media attention.
- The Hatchet Lake Band (and then-Chief Ed Benoanie), the Prince Albert Tribal Council, Ray Funk (MP) and Keith Goulet (MLA) called for inquiry into all uranium mining activity.
- Government agencies promised to hold an environmental assessment on the five new projects—instead of a full public inquiry.

Federal government:

Atomic Energy Control Board
Indian and Northern Affairs
Environment Canada

Provincial government:

Saskatchewan Environment and Public Safety

2. Pressure from "concerned public" led to the panel review for the Eagle Point mine.

- The test mine was never legally assessed

under federal laws.

- Wollaston Lake elders wanted to stop the test mine from being dug before an environmental assessment was done.
- The Hatchet Lake Band was prepared to take the federal government to court to stop the test mine, but this never happened.
- Only the "production mine" will be reviewed.

After all the hearings are over, the panels will make recommendations to government. They could recommend:

1. The mines should not be allowed to open.
2. The mines can go ahead, but only under certain conditions.
3. The mines can go ahead as planned.

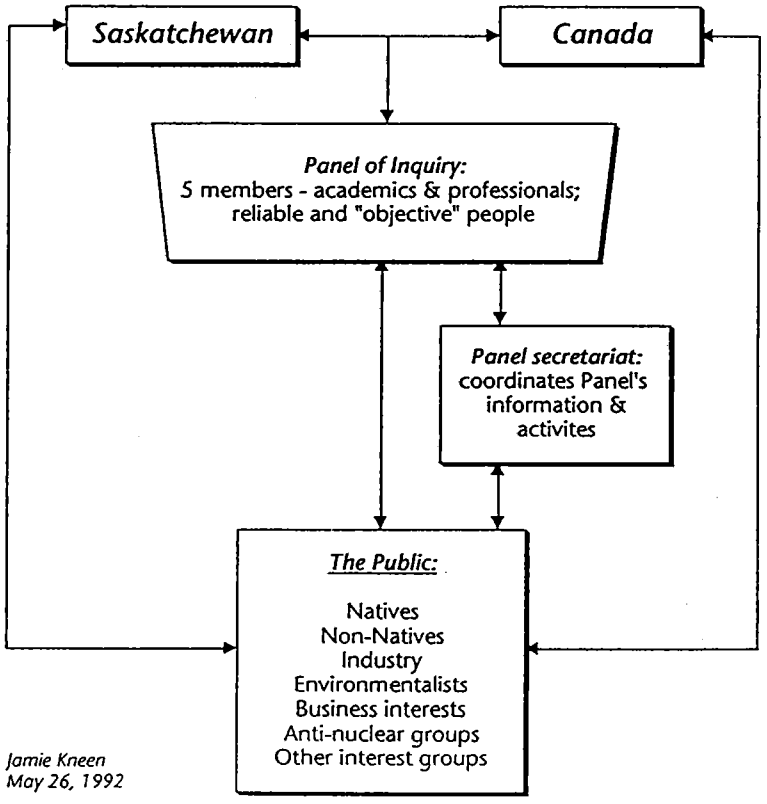
Whatever recommendations the panels make will need to have their reasons, and will have to take into account:

- environmental protection regarding spills, tailings, etc.
- worker health and safety measures
- protection of Aboriginal traditional culture, language, and way of life
- employment, training, and contracting commitments

Government decisions may follow the panels' recommendations—or ignore them—or anything in between. Political pressure will affect these decisions.

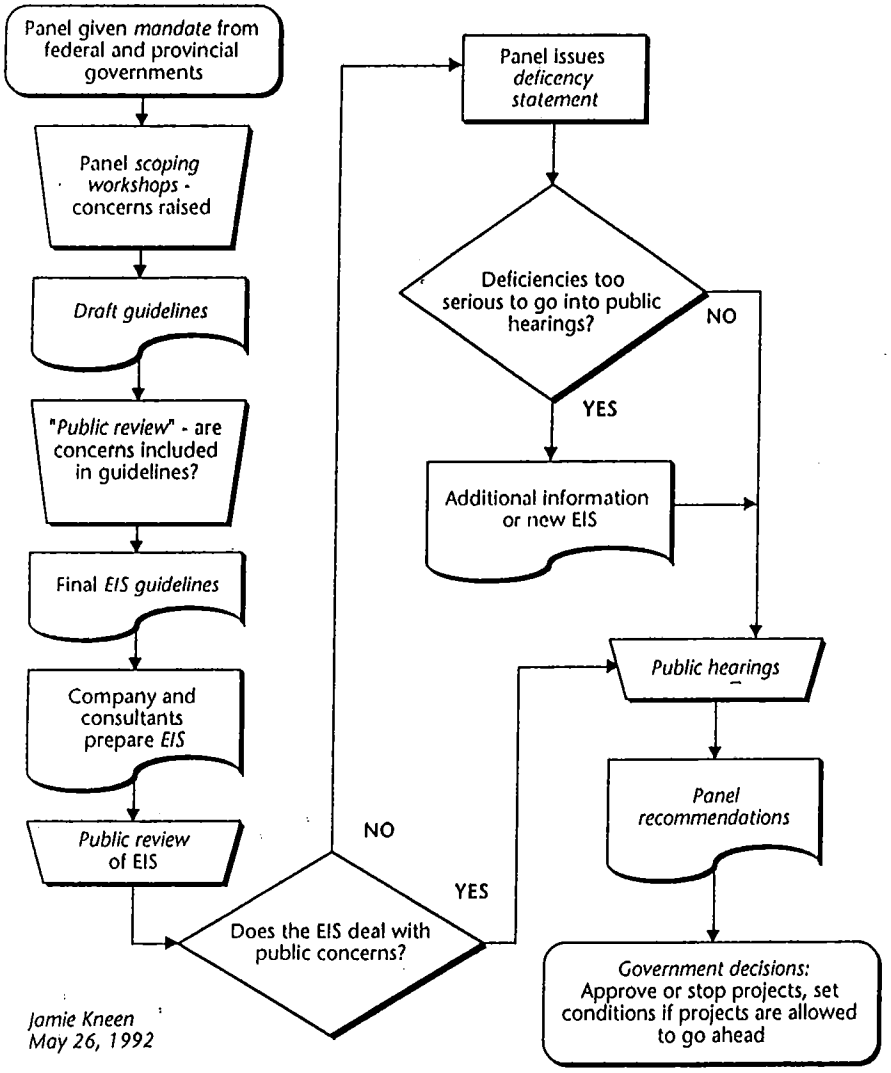
- Government policies on energy, economic development, social development, environment
- Industry
- Native leadership
- Public
- Environmental groups

The Joint Saskatchewan-Canada Review Panel
Lines of Authority



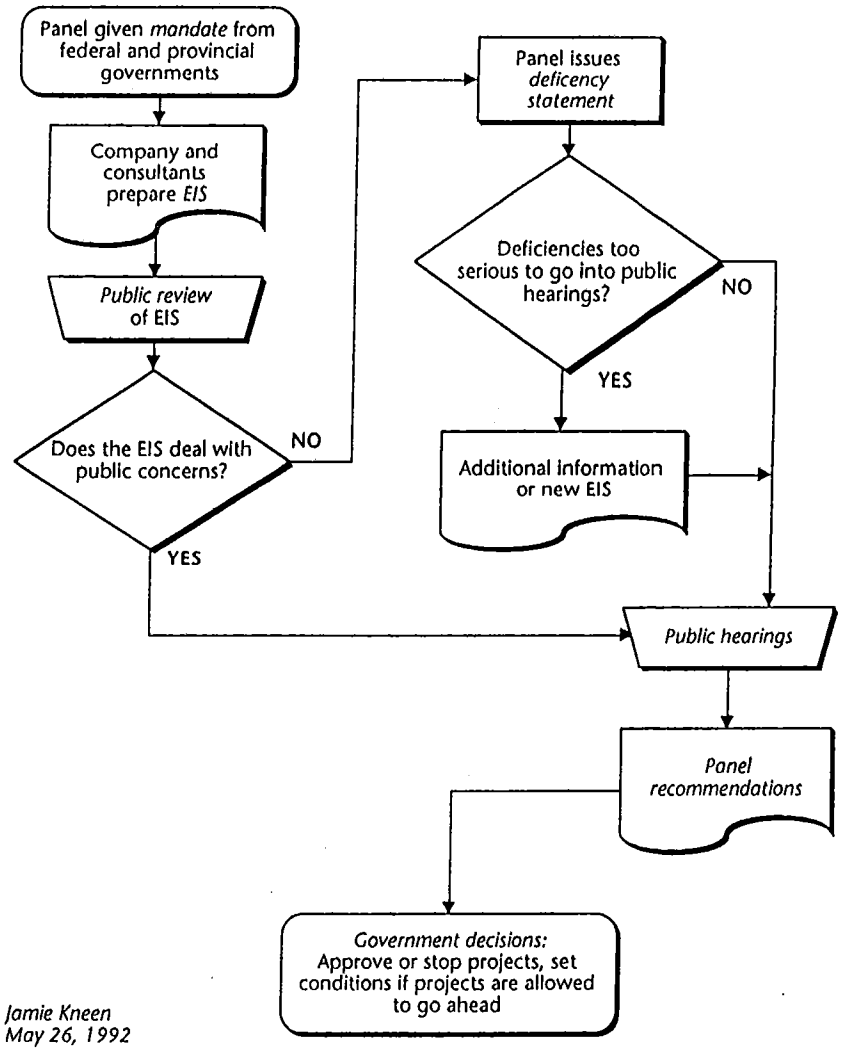
Jamie Kneen
May 26, 1992

Steps in joint review process for proposed Cigar Lake and McArthur River uranium mines



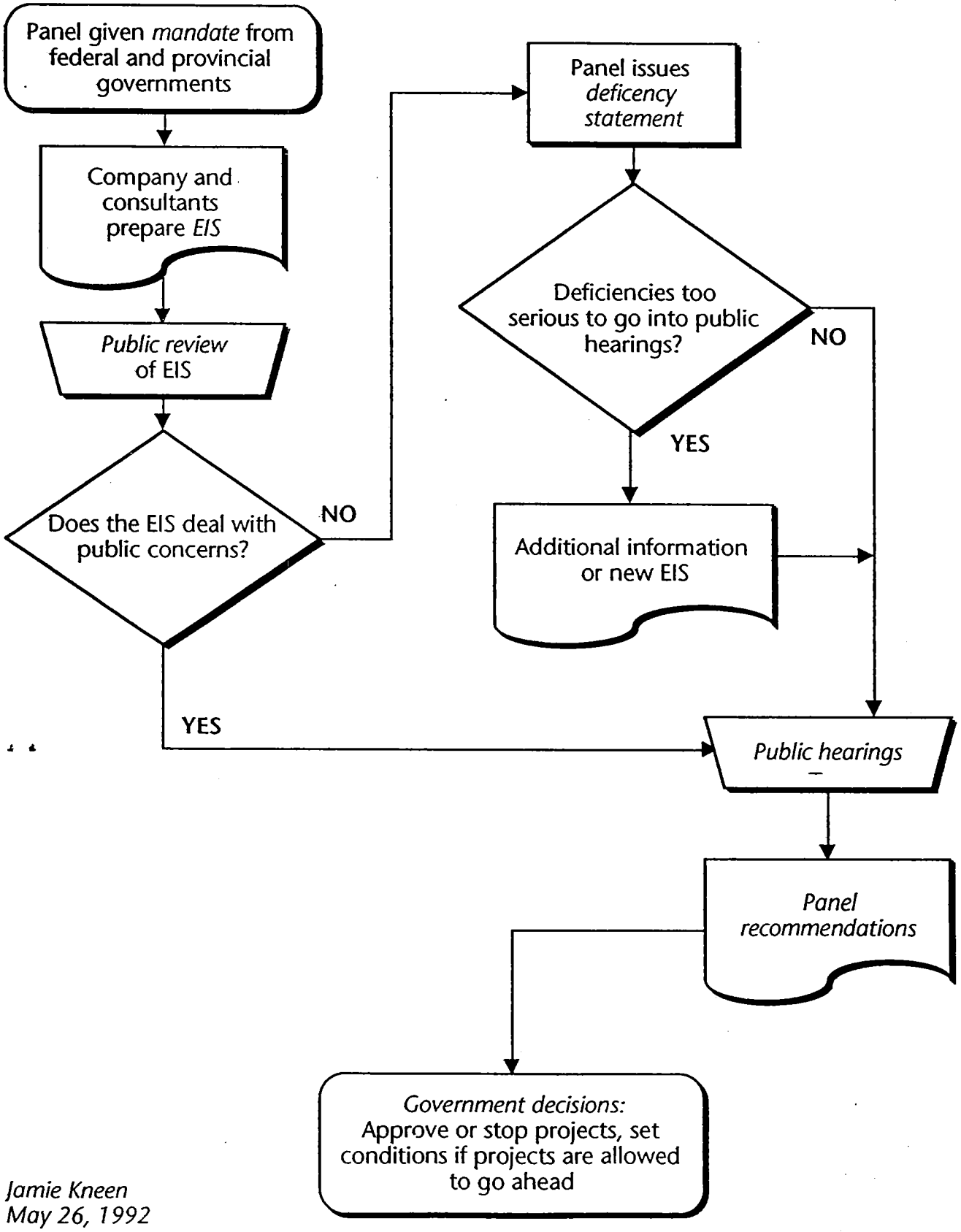
Jamie Kneen
May 26, 1992

Steps in joint review process for proposed McClean Lake, Amok, and Midwest uranium mines



Jamie Kneen
May 26, 1992

Steps in federal (FEARO) review process for proposed Eagle Point uranium mine



Jamie Kneen
May 26, 1992

The Uranium Coalition

FACT SHEET #10

REVIEW OF

RABBIT LAKE JOINT VENTURE ENVIRONMENTAL IMPACT STATEMENT

Two companies, Cameco Corporation and Uranerz Exploration and Mining Limited, have requested to the Atomic Energy Control Board (AECB) for a licence to expand uranium mining at the Rabbit Lake Operation. These two companies are the Rabbit Lake Joint Venture. "This [project] would involve expansion of the mining of the Eagle Point ore body beyond the current test mining operation, plus the new mining of the Collins Bay 'A' and 'D' Zone ore bodies".[1]

Cameco proposes to mine the Collins Bay A and D zones by damming off parts of Collins Bay as had been done for the Collins Bay B zone (mined from 1985-1991). The Eagle Point mine is an underground mine wholly submerged under Wollaston Lake. The three projects are expected to begin in 1993 (winter) and be finished in 10 years.

Their proposal is being reviewed only by the Federal Environmental Review Panel and not the Saskatchewan Government. This is different than the other mines being proposed for exploration and expansion in Northern Saskatchewan. The Saskatchewan government is not involved because they have already given a go ahead to an exploratory test mine at Eagle Point.

THE PROJECT SITE

The Rabbit Lake Operation is located in northeastern Saskatchewan. The original Rabbit Lake is 3.2 km west of Wollaston Lake. Other mines are close to or on Collins Bay, which drains into Wollaston Lake. This mine complex is approximately 40 km from the nearest village of 800 people who live across the lake at Wollaston Lake.

THE PROBLEM

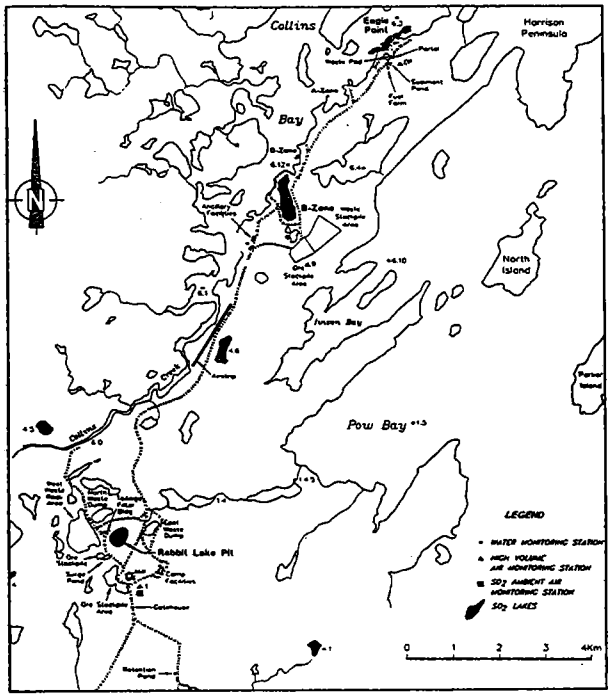
The Environmental Impact Statement, released in June 1992, was critically reviewed for the Uranium Coalition by Radioactive Waste Managements Associates (RWMA). RWMA, a public interest consulting firm consisting of scientists, is based in New York. They have done similar assessments of the uranium mining complex at Elliot Lake, Ontario.

This fact sheet will be concerned with the following problems in the EIS: 1) the lack of input of people's concerns and a selectivity of information presented to give a favourable picture; 2) there is a story to be told regarding why this environmental assessment is only a federal review and not a joint federal-provincial review; 3) there are serious questions regarding the geological features unique to this proposal; and 4) it is important to raise the basic biological concerns of irradiation.

1. Public Involvement

The public has not been clearly or fully informed about their role in the process. What is wanted of people generally in an environmental review process? To ask questions, read documents, analyze the situation, and give feedback based on their experiences and areas of expertise. One does not have to be a scientist to be involved. It does not take experts to call people in

governments and companies to be accountable for their actions, especially when those actions are deemed unacceptable by people concerned about the welfare of others and the environment.



Source: Addendum to the EIS Collins Bay A-Zone, D-Zone and Eagle Point Development

Public involvement is hampered by a language in the documents Cameco and Uranerz produce that is difficult to understand. For example the Executive Summary to the EIS claims that

> *in 1991, the Atomic Energy Control Board [the federal regulatory body] decided that, although the environmental impacts of the project were known and mitigable with known technology, there was sufficient public concern to warrant referral to the Federal Environmental Assessment Review Office for a panel hearing before proceeding to full production.*[2]

The terms "known and mitigable" are difficult to understand. The term "known" in this instance is questionable because there is much in the EIS that is admittedly unknown or the EIS gives the impression that the lack of information is permissible. The term mitigate is defined in the Oxford Dictionary to "reduce the severity of." In this context the term "mitigable" seems to mean that the known technology can reduce the severity of the impact of uranium mining on the environment. By implication, simply having the 'knowledge' makes the project acceptable by Cameco and the government. This does two things, first it underestimates the real and measurable impact on the health of the environment and the people. Secondly, it undermines the weight of the concern the people, locally, regionally, nationally and internationally, have about this project.

The public has not been fully informed on two levels. The first level has been the selective presentation of facts. Jamie Kneen, who works for the Inuit Taparisit of Canada, remarks that Cameco and Uranerz note only those local public concerns that can be definitively answered or scientific evidence presented to pacify the reader and giving the impression the local people are favourable. Kneen states:

> *The EIS only notes meetings or visits where the project was NOT mentioned as a concern; likewise, the only meeting cancellations or non-appearances mentioned are those of residents or representatives of the local people. Meetings cancelled by the proponent, although plentiful, are not documented.*[3]

The second level is how the public has participated in being informed about the project, giving input into monitoring and decision making procedures. Monitoring refers to the way levels of radioactive and non-radioactive contamination are measured in air, water, and animals. It makes a difference if the local people have a say in where monitoring stations are located and if they regularly receive reports of the results. According to Kneen:

> *local knowledge is only presented in the EIS where observations or concerns that have been publicly stated can be discredited or denied. There seems to have been no attempt to incorporate local environmental knowledge in baseline information or monitoring programs. Nor has there been any evident attempt to respond to concerns in a human and culturally-sensitive manner; individuals' fears are not answered with demonstrated results, but rather discounted as having no basis in scientific fact.*[4]

2. The History

The Rabbit Lake Operation began in 1975 as an open pit uranium mine. This was accomplished by draining the entire Rabbit Lake. From 1985 to 1991 the operation expanded to include Collins Bay B-Zone located a few kilometres northeast of Rabbit Lake. The drained and mined out Rabbit Lake was used as a waste pit for the tailings and waste rock from the Collins Bay B-Zone Project.

An environmental impact statement was completed in August of 1987 for a test mine at Eagle Point and the new mines at Collins Bay. This was submitted only to the Environmental Assessment Branch of the Saskatchewan Environment and Public Safety Department of the provincial government. It was only a result of public pressure regarding the spill at Rabbit Lake in November 1989 of over 2 million litres of waste fluids into Wollaston Lake did the federal government finally take action. In spring of 1991 the AECB announced this project be referred to the Federal Minister of Environment for a public review by a panel.

A federal environmental panel does not carry as much weight as a joint federal-provincial panel. Nevertheless, the company claims proper procedures were followed:

> *In 1987 an Environmental Impact Statement for the mining of the new ore bodies was submitted to the regulatory agencies. After an extensive review, including the public review required by the Saskatchewan Environmental Assessment Act, Saskatchewan issued ministerial approval to proceed.*[5]

What the report does not state was that the "extensive" public review consisted of two written submissions (from ICUC and Maisie Shiell), with only one public meeting (at Wollaston Lake) and only a month to prepare these submissions.

It took a massive spill to persuade the Wollaston Lake Band Council to demand a stop of the test mine through the courts, if necessary, or a full public inquiry. It took one and a half years for the AECB to respond with a process that is less authoritative and comprehensive. The provincial government (Saskatchewan Environment and Public Safety) gave the company a fine.

The test mine stretches the limits of what a test mine is commonly understood to be. The mine is fully operational, it is now only a matter of a green light from the federal government to put this test mine into full production. Thus only the "production mine" is being reviewed.

Therefore this federal panel may not carry as much weight because if mining is already set up and actually begun, a 'no' from this panel will be redundant.

3. The Geology

Beyond the concerns raised about every other uranium mine in the world there are some concerns unique to the mines and waste disposal systems at the Rabbit Lake Operation.

The water from Wollaston Lake drains in two directions. The drainage is relatively slow compared to other water systems. The water from this lake does eventually reach both the Hudson Bay and the Arctic Ocean. Toward the east the water feeds the Churchill River System. This system is used by many other people and animals along the way. The EIS fails to mention these important details.

The Eagle Point mine will be an underground mine beneath the lake. The EIS does not clarify how close these underground operations will come to the lake bottom in Collins Bay. They do not show where this mine will be in relation to surrounding fracture zones or earthquake fault lines.

Cameco and Uranerz acknowledge that unanticipated inflows (flooding) of lake water could be introduced into the Eagle Point mine. Significant flooding can bring with them large amounts of radon gas making rescue and clean-up operations difficult and dangerous. The companies, in the EIS, do not describe how such a disaster would be dealt with.

The addendum, however, does address this issue. It clarifies that the distance between the bottom of Collins Bay and the area mined would be about 50 to 70 metres. Potential floods are not described, only to say, without documentation, such a flood would have no effect on Collins Bay.

The new mines at Collins A and D-Zones are also problematic. The dyke design has already been applied to Collins Bay B-Zone, except that in the case of B-Zone the uranium deposit was not completely submerged. However, there is no information

in the EIS about where else in the world this design has been used and the successes and problems that have been encountered. There is also no discussion in the EIS about the worst case scenario in which the dyke might break causing catastrophic mixing of water and radioactive rock.

The companies also want to put tailings in the mined out Rabbit Lake pits from A-Zone, D-Zone and Eagle Point Projects. It is not known whether the Rabbit Lake and B-Zone pits can accommodate the waste and tailings from all the mines. Also, the extreme cold of the north poses some difficulties with consolidation of the tailings and waste rock piles. Consolidation here refers to the necessity of removing contaminated water from the tailings and waste rock before it is left for long-term storage. The average frost free period is approximately 90 days. This is not long enough to allow the huge amount of rock and water to thaw in the summer and be removed by the company before they leave the area for good.

4. Biological Concerns

The biological concern has been addressed to the first EIS(1986) by ICUC. Here they note the scientific definition of irradiation. The *Penguin Science Dictionary*, in its definition of irradiation says in part

> *. . . even small doses may be used for sterilization of food owing to the sensitivity of biological cells to irradiation by ionizing radiation.*

It is this "sensitivity of biological cells" that makes irradiation - especially alpha-emitting radiation (see fact sheet #1) - so dangerous to biological food chains in the Wollaston Lake water system. Risks come from radionuclides in the Uranium-238 series, especially Radium-226. If these radionuclides get into the living animals and plants they will accumulate in the food chain posing problems not only for the plants and animals themselves but for the people as well. Uranium has its daughter, Radium, which has its own daughters. These elements emit particles which cause damage at the cellular level and they 'live' for varying lengths of time from seconds to thousands of years.

March 1993

Source Documents:

Comments on the Collins Bay A-Zone, D-Zone and Eagle Point Development; Revised 1992 EIS. Radioactive Waste Management Associates, 306 West 38th St., Rm. 1508, New York, NY, 10018, September 25, 1992.

Comments on the Environmental Impact Statement (EIS) Collins Bay A-Zone, D-Zone and Eagle Point Development (Rabbit Lake Joint Venture, 1992). Inuit Tapirisat of Canada, Suite 510, 170 Laurier Ave. W., Ottawa, ON, K1P 5V5. September 28, 1992.

A Submission to the Federal Environmental Assessment Panel Reviewing the Proposed Development of the Rabbit Lake Uranium Mining Facility, Northern Saskatchewan. Saskatchewan Environmental Society, P.O. Box 1372, Saskatoon, SK, S7K 3N9. September 25, 1992.

Environmental Impact Statement 1992 Executive Summary: Collins Bay A- and D-Zones and Eagle Point Development. Cameco Corporation and Uranerz Exploration and Mining Limited.

Special thanks to Carol Stang

The Uranium Coalition consists of eight participant groups who have come together for the purpose of participating in the various Federal-Provincial Environmental Review Processes currently underway.

For more information, contact ICUC Educational Cooperative or one of the Coalition members found on back cover of the "Is It Worth the Risk?" Educational/Media Kit.

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1. AECB News Release, April 18, 1991
2. *Environmental Impact Statement 1992 Executive Summary: Collins Bay A- and D-Zones and Eagle Point Development*, Cameco Corporation and Uranerz Exploration and Mining Ltd., June, 1992. p. 1.
3. Jamie Kneen, *Comments on the Environmental Impact Statement: Collins A-Zone, D-Zone and Eagle Point*, p. 6.
4. Ibid., pp. 2-3.
5. Executive Summary, p. 1.

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1993 FEARO URANIUM MINE PANEL

PANEL RECOMMENDATIONS NOT FOLLOWED

FEDERAL FEARO PANEL, CHAIR HINDMARSH

"The Panel concludes that there is insufficient information to reach an informed decision on the environmental effects of mining the A-Zone and D-Zone orebodies. The Panel recommends that mining of the A-Zone and D-Zone orebodies not proceed until information on waste-rock management and decommissioning is obtained and until Cameco has demonstrated that both short- and long-term adverse environmental impacts are mitigable."

NOT FOLLOWED. BOTH LEVELS OF GOVERNMENT HAVE APPROVED THE PROJECTS.

"The Panel recommends that the Joint Review Group be restructured and expanded to create an Environmental Management Committee for the Rabbit Lake operation...The Panel concludes that in order for the committee to be effective, the following should be considered for membership: (1) present members of the Joint Review Group (2) Athabasca Basin Communities, including Wollaston Lake (3) informed environmental interest groups, for example, the Saskatchewan Environmental Society (4) the scientific community (5) other federal departments, for example, Fisheries and Oceans and Health."

NOT FOLLOWED.

FEDERAL-PROVINCIAL FEARO PANEL, CHAIR LEE

"It is recommended that the McClean Lake project be delayed for at least five years." (This includes the following deposits: JEB deposit, McClean Lake underground deposit, Sue A deposit, Sue B deposit, Sue C deposit)

NOT FOLLOWED. ALL DEPOSITS WERE APPROVED FOR DEVELOPMENT 23 DECEMBER 1993.

"We recommend that no new uranium developments be undertaken until a form of revenue sharing acceptable to the majority of impacted communities has been agreed upon."

NOT FOLLOWED.

"We were reminded by the public that the pervious surround method for tailings containment has not yet been adequately tested. The only such pit in the Athabasca Basin, the nearby Rabbit Lake facility, has not been in operation long enough to demonstrate its viability. It is the panel's opinion that it would be prudent to observe the operation for a few more years before deciding on whether or not to license another."

NOT FOLLOWED.

All Panel decommissioning recommendations have not been followed. For example, with respect to the Sue Pits and the JEB pit the Panel rejected the proposal by Cogema and Total to flood the mined out pits. It noted: "The flooding of the Sue Pits and the tailings-filled JEB pit is objectionable." It pointed out that the proponent's model for the flooded Sue pits suggests that the Saskatchewan Surface Water Quality Objectives for arsenic, copper and nickel would be exceeded for at least 500 years. "The Panel recommends that all open pits be filled to surface with waste rock and capped with clean overburden."

NOT FOLLOWED. IN MINISTERIAL APPROVAL.

"No proven method exists for preventing incorporation of Canadian uranium into military applications. Current Canadian limitations on end uses of uranium provide no reassurance to the public that Canadian uranium is used solely for non-military applications." The Panel recommends, as one of the sixteen conditions that should be fulfilled during the delay of at least 5 years in the five McClean Lake deposits, "further public discussion of the larger issues..." associated with uranium mining.

NOT FOLLOWED.

For further information and to get on the mailing list contact:

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Uranium Coalition

of 1992

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The Keewatin-Le Pas Archdiocese
Archbishop Peter Sutton
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(204) 623-6152
Fax: (204)623-6121

The Northern Village of Green Lake
Mayor Rod Bishop
Box 128
Green Lake, SK S0M 1B0
(306)832-2131
Fax: (306)832-2124

International Uranium Congress
2138 McIntyre St.
Regina, SK S4P 2R7
(306)585-4034
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Community Health Services
(Saskatoon) Association
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