IN THE MATTER OF THE *ENERGY RESOURCES CONSERVATION ACT* R.S.A. 2000, C. E-10

AND THE *OIL SANDS CONSERVATION ACT*, R.S.A. 2000, C. 0-7 Section 10 and 11 and Sections 3, 24, and 26 of the *Oil Sands Conservation Regulation*

AND IN THE MATTER OF THE *CANADIAN ENVIRONMENTAL ASSESSMENT ACT*, 2012, SC 2012, c 19, s 52;

AND IN THE MATTER OF A JOINT PANEL REVIEW BY THE ALBERTA ENERGY RESOURCES CONSERVATION BOARD AND THE GOVERNMENT OF CANADA, REGARDING:

JACKPINE MINE EXPANSION PROJECT

SHELL CANADA LIMITED;

CEAR Reference number: 59540

ERCB Application No. 1554388

SUBMISSION BY THE OIL SANDS ENVIRONMENTAL COALITION

OCTOBER 1, 2012

Corrected November 20, 2012

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DESCRIPTION OF INTERVENERS

1) The Oil Sands Environmental Coalition (OSEC) is a coalition of Alberta public interest groups with a longstanding interest in the Athabasca Oil Sands area. OSEC was formed to facilitate more efficient participation in the regulatory approvals process for oilsands applications. Its members include:

   a) **The Fort McMurray Environmental Association (FMEA),** consisting of residents living in and around Fort McMurray who are concerned about the effects of oilsands development on human health, the ecosystem and the socio-economic quality of life in the municipality of Wood Buffalo and who may be directly and adversely affected by the adverse environmental and socio-economic effects of the Jackpine Mine Expansion ("JPME" or the "Project").

   b) **The Pembina Institute**, an Alberta-based non-profit environmental research and a policy analysis organization with members across Alberta. One of The Pembina Institute's objectives is to minimize the environmental impacts associated with fossil fuel development in Alberta. The Institute has monitored the health and environmental implications of oilsands development since the mid 1980's and has been particularly active in the assessment and management of long term, chronic and cumulative impacts. The Institute has an interest in lands near Fort McKay, and in close proximity to the proposed projects. The interest consists of a license to occupy lands on the Muskeg and Athabasca Rivers for recreational purposes, such as camping and boating. The description of the lands subject to the license is attached as **Appendix A**.

   c) **The Alberta Wilderness Association (AWA)**, founded in 1965, is a province-wide conservation group with 4,400 members. AWA is the oldest wilderness conservation group in Alberta dedicated to the completion of a protected areas network and the conservation of wilderness throughout the province. Its mandate is "to defend Wild Alberta through awareness and action." AWA focuses on raising awareness about the importance of protecting biodiversity, important wildlife habitat, and watershed areas across Alberta, including areas of ecological significance in the oilsands region of Alberta.

2) OSEC's primary objectives are:

   a) monitoring the environmental implications of oilsands development, and

   b) minimizing the environmental impacts associated with oilsands development in the Athabasca Oil Sands region.

3) OSEC has been engaged in reviewing and assessing oilsands development since the mid 1980's and has been particularly active in the assessment and management of long-term chronic and cumulative impacts. OSEC has provided evidence and/or submissions to the Energy Resources Conservation Board (ERCB) or Joint Review Panels (JRP) at several hearings, including the following:

   a) The 1993 Syncrude expansion hearing (under the name Syncrude Environmental Assessment Coalition)

b) The 1997 Syncrude Aurora Mine (Pembina Institute and Toxics Watch)

c) The 1998 Shell Canada Muskeg River Mine Project

d) The 1999 Suncor Millennium Project

e) The 1999 Syncrude Canada Mildred Lake Upgrader Expansion

f) The 1999 PanCanadian Christina Lake Project

g) The 2000 Petro-Canada McKay River Project.

h) The 2002 TrueNorth Fort Hills Project (AWA and OSEC).

i) The 2003 Joint Panel Review of the CNRL Horizon Project.

j) The 2003 Joint Panel Review of the Shell Jackpine Mine Phase 1 Project.

k) The 2006 Suncor Voyageur Expansion Project

l) The 2006 Shell Albian Muskeg River Mine Expansion Project

m) The 2006 Imperial Kearl Project

n) The 2010 Total Joslyn North Mine Project

4) Members of OSEC participated actively from 2000 to 2008 with other stakeholders in the Cumulative Environmental Management Association (CEMA) to develop environmental management systems that are intended to preserve and to protect the long-term ecological integrity of the Athabasca Oil Sands region from industrial development. OSEC members' specific involvement included:

a) Member of CEMA Board (2005-2008, as well as one OSEC member serving on board 2010-present);

b) Officer at large – CEMA Management Committee;

c) Co-chair of NO_x/SO_2 management working group (NSMWG);

d) Member of the Sustainable Ecosystems Working Group (SEWG);

e) Member of the Surface Water Working Group (SWWG);

f) Member of the Reclamation Working Group; and

g) Member of the Watershed Integrity Task Group.

5) OSEC members continue to assist with the planning and management of environmental assessment and monitoring in the region through other regional multi-stakeholder groups:

a) Wood Buffalo Environmental Association (WBEA)
   - FMEA was a founding member of WBEA and served on the Governance Committee for 20 years. Currently two representatives of OSEC are members and one member sits on the WBEA –Human Exposure Monitoring Program.

b) The Alberta Biodiversity Monitoring Institute (ABMI)

6) OSEC has a long-standing practice of working pro-actively with oilsands proponents, in order to resolve issues when possible. OSEC has met with Shell Canada ("Shell") regarding the Jackpine Expansion project.

7) The Pembina Institute has published the following research reports about oilsands in Alberta:

- *Oil Sands Fever: The Environmental Implications of Canada's Oil Sands Rush* (2005)
- *The Climate Implication of Canada's Oil Sands Development* (2005)
- *Carbon Capture and Storage: an Arrow in the Quiver of a Silver Bullet to Combat Climate Change – A Canadian Primer* (2005)
- *Troubled Waters, Troubling Trends* (2006)
- *Down to the Last Drop: The Athabasca River and Oil Sands* (2006)
- *Death by a Thousand Cuts: The Impacts of In Situ Oil Sands Development on Alberta's Boreal Forest* (2006)
- *Thinking Like an Owner: Overhauling the Royalty and Tax Treatment of Alberta's Oil Sands* (2006)
- *Carbon Neutral by 2020: A Leadership Opportunity in Canada's Oil Sands* (2006)
- *Haste Makes Waste: The Need for a New Oil Sands Tenure Regime* (2007)
- *Royalty Reform Solutions: Options for Delivering a Fair Share of Oil Sands Revenues to Albertans and Resource Developers* (2007)
- *Danger in the Nursery: Impact on Birds of Tar Sands Oil Development in Canada's Boreal Forest* (2008)
- *Catching Up: Conservation and Biodiversity Offsets in Alberta's Boreal Forest* (2008)
- *Taking the Wheel: Correcting the Course of Cumulative Environmental Management in the Athabasca Oil Sands* (2008)
- *Under-Mining the Environment: the Oil Sands Report Card* (2008)
- *Fact or Fiction: Oil Sands Reclamation* (2008)
- *Carbon Copy: Preventing Oil Sands Fever in Saskatchewan* (2009)
- *Upgrader Alley: Oil Sands Fever Strikes Edmonton* (2009)
- *Cleaning the Air on Oil Sands Myths* (2009)
- *Pipelines and Salmon in Northern British Columbia: Potential Impacts* (2009)
- *The Waters That Bind Us: Transboundary Implications of Oil Sands Development* (2009)
- *Heating Up in Alberta: Climate Change, Energy Development and Water* (2009)
- *Carbon Capture and Storage in Canada: CCS and Canada's Climate Strategy* (2009)

- *The Pembina Institute's Perspective on Carbon Capture and Storage* (2009)
- *Climate Leadership, Economic Prosperity: Final Report on an Economic Study of Greenhouse Gas Targets and Policies for Canada* (2009)
- *Tailings Plan Review: An Assessment of Oil Sands Company Submissions for Compliance with ERCB Directive 074* (2009)
- *Drilling Deeper: The In Situ Oil Sands Report Card* (2010)
- *Opening the Door to Oil Sands Expansion: The Hidden Environmental Impacts of the Enbridge Northern Gateway Pipeline* (2010)
- *Northern Lifeblood: Empowering Northern Leaders to Protect the Mackenzie River from Oil Sands Risks* (2010)
- *Keystone XL in context: oilsands and environmental management* (2011)
- *Oilsands and climate change: How Canada's oilsands are standing in the way of effective climate action* (2011)
- *Oilsands Performance Metrics Summary Report* (2011)
- *Full disclosure: Environmental liabilities in Canada's oilsands: Perspective for investors* (2011)
- *Solving the Puzzle - Environmental responsibility in oilsands development* (2011)
- *Pembina Institute's input on the draft Lower Athabasca Integrated Regional Plan* (2011)
- *The link between Keystone XL and Canadian oilsands production* (2011)
- *Developing an environmental monitoring system for Alberta* (2011)
- *Life cycle assessments of oilsands greenhouse gas emissions* (2011)
- *Pipeline and tanker trouble - The impact to British Columbia's communities, rivers, and Pacific coastline from tar sands oil transport* (2011)
- *Responsible Action - An assessment of Alberta's greenhouse gas policies* (2011)
- *Backgrounder: EU fuel-quality directive. Reducing greenhouse gas emissions through transportation fuel policy* (2012)
- *In the Shadow of the Boom - How oilsands development is reshaping Canada's economy* (2012)
- *Backgrounder: Lower Athabasca Regional Plan (LARP) performance backgrounder* (2012)

1. NATURE AND SCOPE OF INTERVENERS' INTENDED PARTICIPATION

OSEC intends to participate in this hearing by:

a) examining the witness panels of Shell, the Government of Alberta (if they are in attendance at the hearing), the Government of Canada and it reserves its right to ask questions of other witnesses as necessary;

b) presenting an expert witness panel responding to Shell's application and the issues described herein (Section IV); and

c) making final argument.

In addition to OSEC's in-house experts, Dr. David Schindler and Dr. Glenn Miller will also be called as expert witnesses on behalf of OSEC, to speak to matters set out in sections 5.4 and 5.5 of this submission. Their CVs are appended. The remaining OSEC panel member's CV's will be provided at the hearing.

2. REQUESTED DISPOSITION

OSEC respectfully requests that the Joint Review Panel (the panel or JRP) conclude that:

a) the Project will cause significant adverse effects that will not be mitigated, and
b) approval of the Project is not in the public interest — environmentally, socially or economically — of the people of Alberta and Canada, with specific regard to the grounds outlined below.

A. Environmental

The cumulative impacts of the Project on northeastern Alberta's air, land and water systems exceed science-based limits and/or thresholds causing irreversible harm to the region:

1. Terrestrial
    a. The Project will cause significant adverse cumulative impacts on wildlife that are inconsistent with the Integrated Resource Plan, CEMA Terrestrial Ecosystem Management Framework, and Alberta's and Canada's mandate of environmental protection and sustainable development.
    b. The Project's Planned Development Case (PDC) predicts exceedance of the 14% maximum intensive zone recommendation of the CEMA Terrestrial Ecosystem Management Framework.
    c. The proponent has failed to propose adequate mitigation to address significant adverse impacts on 13 of 22 species at risk and valued wildlife species.
2. Impacts to wetlands
    a. The project will result in significant adverse cumulative effects to wetlands, and significant adverse cumulative effects to old growth forest, both directly and indirectly, through loss of wetlands.
3. Air exceedances and acid deposition
    a. Air quality levels exceeding regulated regional "Level 4" maximum limits for annual concentrations of nitrogen dioxide under the Base Case and the Application Case.
    b. Current air quality in the region is at the threshold of Level 3 triggers requiring immediate management action, including restrictions on new emissions sources.
    c. Potential acid input levels exceeding the critical load for two acid deposition management framework regional grids under Alberta's Acid Deposition Management Framework.
    d. Potential acid input levels exceeding critical load for 21 lakes in the region under the Base Case and 23 lakes under the PDC.
4. Water quality concerns and impacts to the Muskeg River Basin
    a. The project will cause unacceptable damage to the Muskeg River Basin; poor modeling and the lack of credible monitoring data downplays major impacts to fish, fish habitat and the Muskeg River.

5. End Pit Lakes (EPLs)
    a. Shell has not demonstrated that EPLs are technically or economically feasible. The creation of EPLs remains a great and untested experiment that is likely to have long-term and significant adverse effects.
    b. The Project's proposed EPLs pose unacceptable risks relating to adjacent tailings seepage rates, total load of contaminants continually being released into the EPLs and discharge of contaminated water into the receiving waters. With only modeling results to base water quality decisions, use of pit lakes to dilute/treat EPL water is experimental at best and could have a substantial impact on receiving waters.
6. Water withdrawals
    a. The project will contribute to unacceptable damage to the Athabasca River during periods of low flow, particularly due to the repeated multiple-year failure of the Governments of Alberta and Canada to implement the promised and necessary zero-withdrawal Ecosystem Base Flow (EBF) policy.
7. Greenhouse Gas (GHG) management
    a. The proposed project will contribute to the failure to meet the policy goal of the Government of Canada to reduce GHG emissions by 17% below 2005 levels by 2020.
    b. The proposed project will contribute to failure to meet the policy goal of the Government of Alberta to reduce GHG emissions by 50MT below business as usual by 2020.

B. Social

1. The project will contribute to unacceptable and unnecessary adverse cumulative socio-economic effects to the community of Fort McMurray.

C. Economic

1. In economic terms, externalities such as air pollution are additional costs associated with initiating and sustaining industrial development that are typically not fully borne by the industry. EIA's generally "do not provide a sufficient base of information adequate to support public-interest decision-making"[1] and negative externalities are excluded from the EIA process. It is recognized that analytical rigour and completeness is key to EIAs, particularly in the assessment of the costs associated with the environmental (and human health) aspects that would result from the project going ahead.[2]
2. Lack of evaluation of the project's externalities impedes the ability to determine the "public interest" question: "is the project expected to provide a net positive

[1] Pearce, D., G. Atkinson, and S. Mourato. 2006. *Cost-Benefit Analysis and the Environment – Recent Developments*. Paris: Organisation for Economic Cooperation and Development (OECD).

[2] Pierre Gosselin, Steve E. Hrudey, M. Anne Naeth, André Plourde, René T Errien, Glen Van Der Kraak, and Zhenghe Xu, 2010. *The Royal Society of Canada Expert Panel: Environmental and Health Impacts of Canada's Oil Sands Industry*. http://www.rsc.ca/documents/expert/RSC%20report%20complete%20secured%209Mb.pdf.

contribution to the welfare of society as a whole?" Recent oilsands EIA final reports reviewed by the Royal Society of Canada fell short of providing what others[3] deem necessary to allow for an adequately informed determination of whether a given project is in the public interest.

[3] See: Pearce, D., G. Atkinson, and S. Mourato. 2006. *Cost-Benefit Analysis and the Environment – Recent Developments*. Paris: Organisation for Economic Cooperation and Development (OECD).

3. CONDITIONS

In the event that the panel recommends the Project proceed, OSEC requests the conditions listed below be imposed to mitigate some of the adverse effects of the Project.

On May 10, 2012, OSEC made a motion to compel information regarding the status of the various recommendations made by past oilsands panels. These recommendations were made to mitigate the effects of projects but it appears such recommendations have not been implemented or information regarding follow-up on the recommendations has not been made public. There is no system for reporting by Alberta and Canada and their regulatory agencies on their responses to the recommendations or the status of the implementation of the panel's recommendations. Although the federal Minister of Environment issues a report accepting the overall recommendation made pursuant to the *Canadian Environmental Assessment Act* as to whether the project will cause significant adverse effects, the implementation of specific recommendations is not transparent. It appears Canada does not have a system for tracking recommendations because in its response to OSEC's motion, Canada indicated it would require significant time to provide the information requested. The panel can, and should, make any recommendations for mitigation and follow-up a precondition to its ultimate findings in relation to the public interest and significance of adverse effects.

Because of the above, OSEC requests that

- any mitigation measures relied upon by the panel be identified and tested as part of the public hearing process;
- the panel rely on conditions to the extent possible, not recommendations;
- utilize the statutory powers under the *Canadian Environmental Assessment Act* to specify the follow-up programs required to implement and assess the effectiveness of proposed mitigation; and
- require contingency mitigation in the event the preferred mitigation is ineffective.

3.1 CONDITIONS REQUESTED

I. To address terrestrial impacts and impacts to species at risk:

Prior to approvals being granted and commencing construction, Shell Canada should be required to develop and submit a verifiable mitigation strategy for compensatory off-site mitigation in order to achieve a net positive impact on habitat for species at risk and other valued wildlife species. The mitigation strategy should include the following features:

- a requirement for the purchase and conservation of ecologically significant private boreal forest lands, the restoration of existing (non Project-related) disturbance footprints in northeastern Alberta; or
- strategies to retire harvest rights on public lands on a 3 hectare offset per 1 hectare of project disturbance basis, using accepted models for biodiversity offsets used elsewhere in North America and globally.

Prior to approvals being granted, an opportunity for the panel and participants to review and test the adequacy of the mitigation strategy should be provided.

II. To address impacts to wetlands:

- a viable mitigation plan for compensatory off-site mitigation to compensate for impacts to wetlands and to old growth forest.
- replacement of wetlands at the same extent that they occurred on the landscape pre-development. For wetland types, functions and area that Shell is unable to replace on site, a biodiversity offset mitigation strategy for wetland disturbance that requires the restoration of degraded wetlands or the purchase and conservation of existing wetlands that would otherwise be degraded or destroyed. A requirement of a 3:1 ratio for replacement wetland area to disturbed wetland area is typically prescribed by Alberta's current wetland policy for the White Area.
- a similar biodiversity offset mitigation strategy be required for old growth forest that would otherwise be degraded or destroyed at the same ratio that it occurred on the landscape pre-development.

III. To address air quality and acid deposition:

- monitoring programs must also be undertaken and be intensive enough in spring to ensure that spring melt pulses are not causing damage to aquatic ecosystems.
- delayed start-up of operations until 2033, which is when estimated emission estimates indicate that NO_2 sources in the region will no longer risk exceeding regulated air quality limits.
- a net-zero contribution to potential acid input (PAI) emissions either through 1) onsite reductions, 2) through offsets within the same grid, or 3) an offset equivalent to the new source garnered from other sources in the grid. Alternatively, a PAI offset of deposition neutrality garnered from other grid cells if they are adjacent to the grid cells in exceedance [4]
- credible evidence that NO_2 emissions can be fully mitigated to net-zero contribution to the exceedance of regulated air quality limits.
- evidence that the already approved Base Case capacity can operate in the region without exceeding regulated target or critical loads. Otherwise, no further sources of PAI emission should be approved in grid cells 57o×111o and 57o×112o.

IV. To address water quality concerns and impacts to the Muskeg River Basin:

- an independent (non-government, non-industry) and improved science-based monitoring scheme, designed and operated by the best available scientific minds, be fully implemented.

[4] Slightly modified from the ADMF management actions, given that no Acid Deposition Management Zone has yet been identified for the region.

- current developmental impacts on the Muskeg River Basin are thoroughly investigated, an appropriate monitoring and thorough management plan is implemented, and mitigation measures are in place to repair damage to date. The management plan must include up-to-date assessments of past projects and mitigation that corrects problems caused by past development before new developments are considered. It must also contain scientific assurances that fish populations will be recovered in the Muskeg River Basin.

V. To address issues of concern pertaining to End Pit Lakes:

- an assessment should be provided by Shell and reviewed by the Panel and participants of the technical and economic feasibility of the proposed EPLs and alternatives that will be used if it is unsuccessful.
- evidence should be provided by Shell on the modeled salinity and contaminant load of recycled water and pore water that will be pumped into an EPL.
- Shell should be required to undertake full-scale field studies of the rates of decay of the critical contaminants found in EPLs.
- prior to construction of the EPLs, discharge standards from pit lakes into receiving waters should be established in order to limit the contaminant load that can be discharged from EPLs.
- total maximum contaminant loads should be established for each receiving water at a level that will maintain a healthy ecosystem in order to prevent cumulative effects degradation of the streams and lakes.
- results from a scalable research EPL must be available and scientifically verified before EPLs are approved without detailed contingency plans (alternatives) for the likelihood that EPLs do not perform as anticipated.

VI. To address water withdrawals:

- water withdrawals should be prohibited during periods of low flow below 87 cms to ensure the Project does not contribute to anticipated damage to the river during low flow periods in the absence of an EBF.
- water withdrawals should not be permitted until the Phase 2 Framework, including an EBF for the Athabasca River, is implemented.

VII. To address greenhouse gas (GHG) emissions:

- a GHG emissions reduction target for the Project equal to the emissions of a conventional oil and gas operation of similar size at start-up.
- an operational carbon capture and storage system in place by 2020.
- a GHG target of carbon neutral for the Project by 2020 through onsite reductions or offsets.

4. ASSESSING IMPACTS AND EFFECTIVENESS OF MITIGATION

The panel's responsibilities — to determine if the Project is in the public interest and determine if it will create significant adverse effects — are onerous. We believe it would assist the panel in discharging its responsibility to protect the public interest and make its assessment of the residual impacts, if it ensured that mitigation will, in fact, be implemented and knew the status of its previous recommendations, and commitments made by the proponent on which the panel and ERCB relied upon – particularly as it relates to Shell's projects and the projects in the Muskeg River basin.

In relation to the Jackpine Mine the panel concluded "that the project is unlikely to result in significant adverse environmental effects, provided that the mitigation measures proposed by Shell and the recommendations of the panel are implemented" (emphasis added)(Joint Panel Report EUB Decision 2004-009 at p. IX). In order to determine if the Jackpine mine should be permitted to expand, it is important for the panel to know the impacts of the existing mine, whether its recommendations were implemented, and whether any implemented recommendations were effective. This will assist the panel in assessing the impacts of the expansion, and what conditions should be imposed if the expansion is approved. For ease of reference, the panel's recommendations from the 2004 Jackpine Decision are attached as Appendix EE.

Shell also made several commitments as part of its application for the JPME, which the panel relied upon: "The Panel expects that Shell will adhere to all commitments it made during the consultation process, in the application, and at the hearing, to the extent that those commitments do not conflict with the terms of any approval or licence affecting the project or any law, regulation, or similar requirement Shell is bound to observe. The Panel expects Shell to advise the EUB if, for whatever reasons, it cannot fulfill a commitment." (at p. 97). These are attached as Appendix D.

It has been 40 years since the first oilsands project was approved, yet Shell's assessment of the potential impacts of the JPME still relies heavily on unverified models, or models with limited verification that does not relate to the current biophysical condition of the area assessed and impacts that have already occurred. Environment Canada noted this problem in relation to water monitoring in all environmental assessments of oilsands development to date:

> "Performance Monitoring is site/facility-specific and would be conducted after development has occurred. This type of monitoring would be used, for instance, to verify and/or validate whether predictions made through Environmental Impact Assessment (EIA) process were accurate. Currently little performance monitoring is conducted and the indicators and parameters used during the EIA process have little to no connection to the local accumulated state and effects monitoring discussed above. It is critical that performance monitoring be conducted or there will be no

> mechanism to improve ability to predict impacts of specific developments or to identify whether EIA predictions were accurate".[5] .

OSEC asks that the panel require and use actual data and monitor results in its assessment to the extent possible. It is time that the panel's work is informed by a solid foundation of facts.

Credible assessment and mitigation requires verification, but little information is provided to the panel regarding the results of the mitigation and monitoring it has imposed in the past or even whether it has been undertaken. Have past EIA predictions been reasonably accurate? At the first Jackpine hearing, Shell recognized it was important to establish if its predictions were accurate. For example, in relation to aquatics, it commitments included "A comprehensive water quality monitoring program will be developed to confirm that the conservative mitigation measures described in the EIA are effective in achieving the level of predicted protection" and that "Shell is committed to conducting detailed in-stream monitoring to verify impact predictions." (see Appendix D. p. 9 - Vol 7 - Suppl 2)

OSEC requests that the panel require and examine the data to assess whether predictions about impacts and mitigation effectiveness have, in fact, been valid. This includes the results of Shell's monitoring of the impacts of its existing mines and mitigation, and results of the implementation of the recommendations made by previous panels to mitigate cumulative effects and project-specific effects.

Aside from the obvious risks of inaccurate projections, there is little utility in the panel relying upon mitigation that will not be implemented or that will not be effective. Therefore, it is a necessary step in discharging the panel's responsibilities to ascertaining the status of previous mitigation that relates to the potential impacts of this new Project. The fundamental purpose of the Panel's assessment is to identify the potential impacts of the Project so that the Panel and regulators can ensure they are avoided or managed so that irreparable harm does not occur.

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[5] Environment Canada. (March 22, 2012) *Lower Athabasca Water Quality Monitoring Program Phase* 1

5. FACTS AND REASONS FOR REQUESTED DISPOSITION

5.1 TERRESTRIAL ISSUES

OSEC's terrestrial issues of concern posed by the Project are presented in the following three themes:

i. Failure to implement terrestrial regional management plans as proposed by CEMA

ii. Inadequate terrestrial mitigation

iii. Impacts to wildlife and species at risk

The Project and the PDC will result in significant adverse impacts on wildlife that will not be mitigated to insignificant by the proponent's proposed mitigation. Specifically, the cumulative impacts to wildlife described in the Shell JPME application:

a) are the highest levels of regional wildlife impacts ever described in an oilsands project application considered by a Review Panel and indicates significant adverse effects on wildlife;

b) are inconsistent with the policy direction of the Fort McMurray Athabasca Oil Sands Sub-Regional Integrated Resource Plan (IRP) and federal and provincial legislated policies of Sustainable Development;

c) exceed CEMA Terrestrial Ecosystem Management Framework thresholds for losses to wildlife habitat;

d) exceed CEMA Terrestrial Ecosystem Management Framework thresholds for the allotted area available for intensive development, and;

e) exceed previous panel assessments of significant adverse effects for 13 out of 22 valued species and species at risk assessed by the proponent.

Although the Lower Athabasca Regional Plan[6] (LARP) was approved in August 2012, the Biodiversity Management Framework — the central element that would further inform decision-making as it relates to biodiversity — does not yet exist; it is planned to be developed in 2013[7]. In the absence of regulated limits for biodiversity and wildlife, the panel must take a science-based and evidence-based approach in judging whether the cumulative impacts of development on wildlife are in the public interest.

Based on concerns from regulators and stakeholders, Shell was required to submit a more comprehensive cumulative effects assessment that included forestry, fire and an updated (longer) list of reasonably foreseeable oilsands projects. In OSEC's opinion, the new assessment is still unacceptably conservative, as it does not include mandatory

[6] Government of Alberta. Lower Athabasca Regional Plan 2012-2022 (2012).

[7] Ibid. p28

exploration of existing oilsands leases, or planned development consistent with stated industry expansion goals.

That said, due to a growing list of oilsands projects, and proper modeling of future forestry and fire disturbances, the new assessment now shows a higher level of cumulative impact to wildlife and biodiversity at the regional level than any oilsands assessment previously tabled. The significant impacts identified in the updated Shell assessment are more consistent with those identified by the Government of Alberta in scenario modeling conducted for the Government of Alberta[8] as part of the Lower Athabasca regional planning process, and obtained through a Freedom of Information request by the Pembina Institute. This report shows that under a Base Case scenario where mitigation is not improved, or developments slowed, a 50% loss in biodiversity indicators is projected.

Table 1.3-1 of Shell's September 7, 2012, update presents the actual cumulative impact of the PDC on wildlife habitat compared to the natural or pre-industrial condition. If the Shell JPME and other proposed projects are approved, 13 of 22 assessed species will lose more than 20% of their high value habitat in the 2.3 million hectare terrestrial Regional Study Area (RSA). High value Canada Warbler habitat is predicted to decline by 61% from the natural condition, high value woodland caribou habitat is predicted to decline by 47% from the natural condition, high value black-throated green warbler habitat is predicted to decline by 44% from the natural condition, and high value barred owl habitat is predicted to decline by 43% from the natural condition. It should be noted that these significant impacts are also conservative, as the Shell PDC does not include many of the reasonably foreseeable disturbances that were outlined in OSEC's previous adequacy submission.

Remarkably, Shell describes many of these impacts as "insignificant" because the "resiliency of populations in the RSA has not been compromised". This conclusion is without merit. In reaching this conclusion, Shell has ignored substantial existing panel, CEMA and policy guidance on significance of predicted wildlife habitat losses in northeastern Alberta. It also demonstrates a misunderstanding of the term "significant adverse effect", with Shell proposing that regional extirpation of a species is not a significant adverse effect. Such an approach sets a dubiously low bar, and one that is inconsistent with the *Canadian Environmental Assessment Act* (not to mention contrary to the requirements of the federal *Species at Risk Act*), the work of CEMA and previous panel decisions. In the Total Joslyn Mine Decision, the panel concluded, based in part on evidence from Environment Canada, that a 20% loss of habitat would indicate a significant adverse effect (or any net harm for species at risk):

The Panel believes a more precautionary threshold of 20 per cent loss of habitat as an indicator of significance of effects on valued wildlife is appropriate. For species at risk,

[8] Alces Group (2009) Lower Athabasca Regional Plan ALCES III Scenario Modeling. Summary and Technical Results for Scenario Package 1. p5.

the Panel is of the view that any net harm (negative impact) to an individual of the species, its residence, or its critical habitat would constitute a significant adverse effect.[9]

Regional goals for wildlife

The proposed level of impact on valued wildlife species and species at risk clearly exceeds ecological thresholds, the policy direction of the Fort McMurray Athabasca Oil Sands Sub-Regional IRP, and the consensus recommendations of regional stakeholders on acceptable levels of impact to wildlife habitat. This level of impact is also contrary to the fundamentals of legislated policy for environmental protection. For example, the *Environmental Protection and Enhancement Act* (RSA 2000 c. E -12) states that: "the protection of the environment is essential to the integrity of ecosystems and human health and to the well-being of society" and one of the purposes of this statute is "sustainable development, which ensures that the use of resources and the environment today does not impair prospects for their use by future generations" (s.2).

The LARP states that:

> *Within the Lower Athabasca Region, integrated resource plans have been developed which identify objectives for long term management of specific landscapes. These plans represent the Government of Alberta's resource management policy for public lands and resources and are intended to be a guide for decision-makers.*

The Fort McMurray Athabasca Oil Sands Sub-Regional IRP[10] is still the guiding plan for the region until it is reviewed or replaced. Some of the broad wildlife objectives of the plan are:

- To minimize damage to wildlife habitat and, where possible, to enhance the quality, diversity, distribution and extent of productive habitat.
- To maintain, and, if possible, to enhance the diversity, abundance and distribution of wildlife resources for Native subsistence, recreational and commercial benefits. Such resources include the following:

    (a) Black Bear - To maintain, within the current range of distribution, the current fall population of 300 black bears and encourage greater harvests to increase recreational benefits beyond the current level.

    (b) Ungulates - To maintain the current wintering population of 200 deer. To maintain habitat to support, throughout the current range of distribution, a wintering population of 2000 moose. Currently, the population of about 1000 moose is kept low by natural predation and hunting. Special

[9] Joint Review Panel established by the Federal Minister of the Environment and Energy Resources Conservation Board, Report of the Joint Review Panel, ERCB Decision 2011-005: Joslyn North Mine Project, Total E&P Joslyn Limited Alberta (2011), p21

[10] Government of Alberta. The Fort McMurray Athabasca Oil Sands Sub-Regional Integrated Resource Plan (2002). p19-21.

management techniques may be able to return this population to its previous, higher levels.

(c) To maintain upland and aquatic habitats required to retain the current furbearer populations.

- To protect wildlife species considered sensitive to disturbance or environmental change (e.g., pileated woodpecker) and to promote increased populations and distribution of species considered rare or endangered (e.g., wolverine, woodland caribou).
- To promote and develop opportunities for both consumptive (e.g., hunting, trapping) and nonconsumptive (e.g., viewing, photography) uses associated with wildlife.

Clearly, projected habitat losses in the 20-60% range over an area far larger than the IRP (projected impacts within the IRP area itself would be significantly higher than those in Shell's Regional Study Area) are not consistent with the IRP direction to maintain habitat and promote increased populations of rare and endangered species.

The CEMA Terrestrial Ecosystem Management Framework (TEMF)[11], which with the continued delay in setting land management thresholds by the Government of Alberta, represents the most appropriate guidance for the JRP in determining whether proposed wildlife impacts are in the public interest and to inform the broad IRP directive to maintain wildlife habitat.

The TEMF makes specific comments on the projected trajectory of development in the Regional Municipality of Wood Buffalo and recommendations for management strategies that are required to ensure the regional environment is protected.

The Pembina Institute participated on the CEMA working group that developed the TEMF from 2006 until 2008. The working group included representatives from the oilsands industry, the forest industry, the Governments of Canada and Alberta, aboriginal representatives and environmental organizations. The TEMF was supported or conditionally supported by 19 industry, non-governmental organization and aboriginal members of CEMA.

The CEMA TEMF includes two management thresholds that are of importance to the JRP. OSEC is aware that the CEMA TEMF has not yet been fully adopted by the Government of Alberta, but due to delays in implementation of these elements of the LARP, it still represents the best guidance for the JRP on responsible development that balances economic, social and environmental outcomes. Previous oilsands panels have pointed to the importance of the TEMF in determining the significance of cumulative

[11] Sustainable Ecosystems Working Group of the Cumulative Environmental Management Association. The Terrestrial Ecosystem Management Framework. (2008)

effects. In the decision report for the Total Joslyn North Mine[12], the panel included a section, under the heading *"Integration of the Terrestrial Ecosystem Management Framework"* that noted:

The Panel is concerned that TOTAL—a member of CEMA—did not take into account the applicable methodologies, results, and triggers discussed in the Terrestrial Ecosystem Management Framework. In the absence of any other guidelines or thresholds, the Panel finds that it would have been particularly relevant and useful for TOTAL to use the framework to better inform its cumulative effects assessment on terrestrial components. The Panel recognizes the importance of CEMA's work on the cumulative effects in the oil sands region. The Panel recognizes that the framework was prepared in the context of the geographic area of the [Regional Municipality of Wood Buffalo] rather than in the context of a project cumulative effects assessment, such as the assessment TOTAL was required to do. The Panel finds that some of the triggers discussed under the framework could have been useful as thresholds to determine what to consider as a significant effect for some wildlife species….Overall, the Panel finds that TOTAL's cumulative effects assessment, together with the information provided at the hearing, is sufficient for the Panel to make its determination about the significance of cumulative effects; however, the improvements noted in this section would have made the assessment more accurate and better assisted the Panel in reaching its conclusions.

In its decision report, the panel recommended that:

The Panel believes that the Terrestrial Ecosystem Management Framework provides useful ways to manage cumulative effects on wildlife within the area of the [Regional Municipality of Wood Buffalo]. The Panel agrees with [Environment Canada] that the Lower Athabasca Regional Plan and its frameworks could be important tools for managing cumulative effects in the Lower Athabasca Region. The Panel recommends that [Sustainable Resource Development] use the Lower Athabasca Regional Plan process to protect key habitats for species at risk and to provide source habitat for species recolonization in the oil sands area. The Panel also recommends that recommendations made by CEMA in the Terrestrial Ecosystem Management Framework be considered by the Government of Alberta for inclusion in the Lower Athabasca Regional Plan.[13]

Key thresholds identified in the TEMF include:

- Constraining the Intensive Zone (area of oilsands projects under development at a quarter township level) to between 5% and 14% of the Regional Municipality of Wood Buffalo at any time.[14]

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[12] Joint Review Panel established by the Federal Minister of the Environment and Energy Resources Conservation Board, Report of the Joint Review Panel, ERCB Decision 2011-005: Joslyn North Mine Project, Total E&P Joslyn Limited Alberta (2011), p87

[13] Ibid, p92.

[14] Sustainable Ecosystems Working Group of the Cumulative Environmental Management Association (2008). The Terrestrial Ecosystem Management Framework. p22.

- The key environmental management objective for the Regional Municipality of Wood Buffalo is to maintain wildlife indicators within 10% below the lower limit of the natural range of variation.[15]

Both of these CEMA TEMF thresholds have been exceeded by the 2012 PDC described in the Shell JPME assessment. Details or these exceedances are described below.

CEMA threshold: No more than 14% of Regional Municipality of Wood Buffalo **under intensive zone**

The PDC appears to exceed the recommended intensive zone limit identified by the CEMA TEMF. Since the Shell JPME assessment does not include an up-to-date map showing the planned footprint of the PDC for the Regional Municipality of Wood Buffalo, OSEC used the PDC maps included in the Teck Frontier project assessment that shows the actual planned oilsands footprint, in addition to the Cenovus Grand Rapids Pelican Lake Project PDC. Since the Teck and Cenovus assessments were both completed in 2011 and followed a similar terms of reference, this is comparable to the Shell JPME PDC.

[15] Sustainable Ecosystems Working Group of the Cumulative Environmental Management Association (2008). The Terrestrial Ecosystem Management Framework. p17.

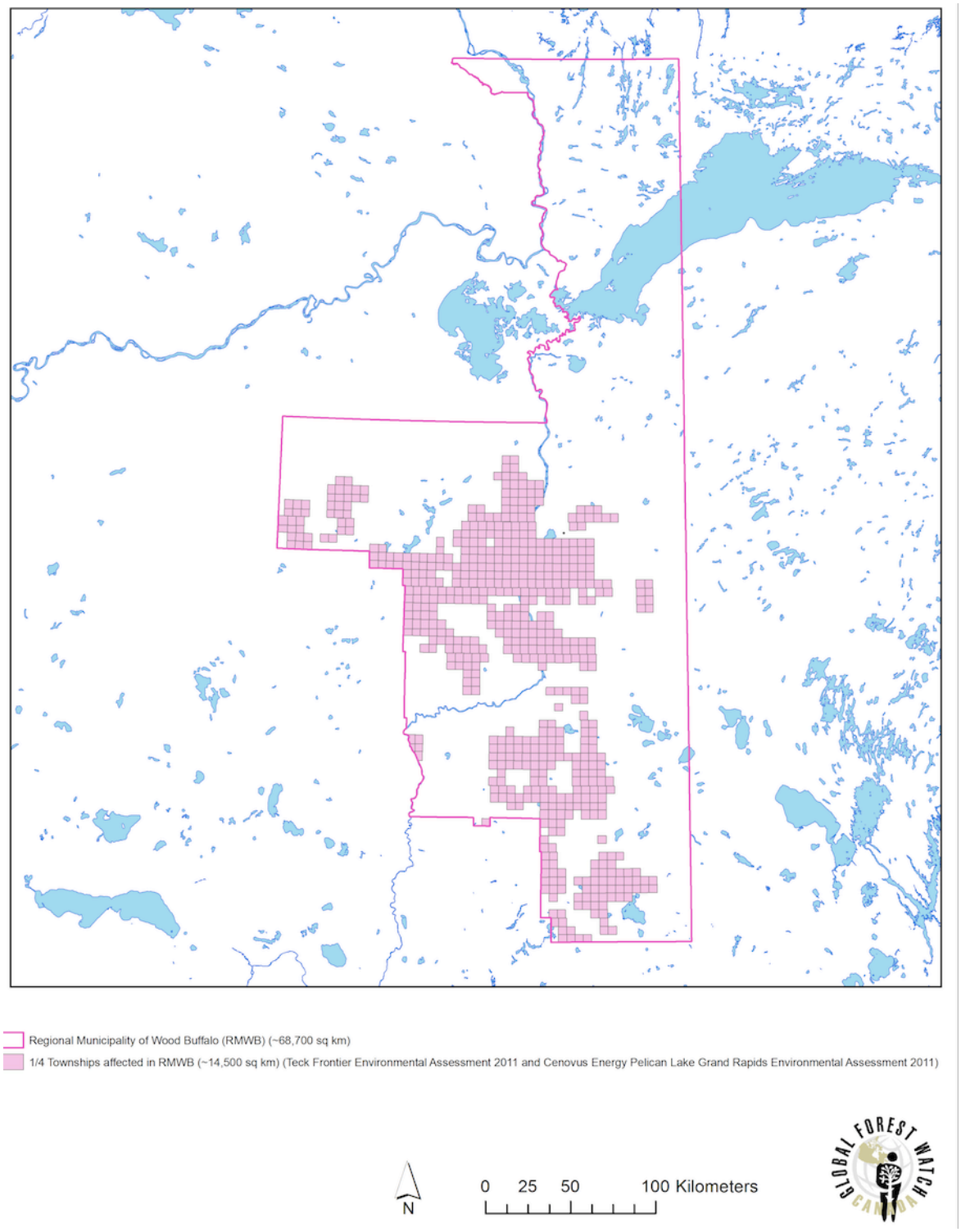

Figure 1: Quarter townships planned for intensive development using CEMA Terrestrial Ecosystem Management Framework methodology

Figure 1 shows the area of planned intensive development in the Regional Municipality of Wood Buffalo. Using the methodology identified in the CEMA TEMF, any quarter

township with in situ or mining oilsands development is considered intensive zone for the purposes of the recommended intensive zone threshold. Quarter townships of proposed and approved oilsands projects now cover 14,500 km^2 of the 68,700 km^2 Regional Municipality of Wood Buffalo — 21% of the region. Concurrent development of just these PDC planned projects, would exceed the highest level of intensive development zone recommended by CEMA. Future oilsands projects will likely further exacerbate these impacts as 51% of the municipality has been leased for oilsands development.

CEMA recognized that while 60-80% of the Regional Municipality of Wood Buffalo should be available for oilsands development, that the area of intensive zone should be limited at any one time, and move around once adequate reclamation of existing intensive areas was demonstrated. The JRP must now adjudicate which planned oilsands projects must be rejected or deferred in order to achieve the recommended regional landscape objective that will maintain the balance between environmental and economic outcomes for the region.

CEMA threshold: Wildlife habitat limit of 10% below limit of natural range of variability

According to supporting work for the TEMF conducted by CEMA, the lower limit of the natural range of variation is typically 10-20% below the average natural condition[16]. Therefore, any projected declines in habitat more than 20-30% of the Pre-Industrial Condition could be considered a breach of CEMA's recommended wildlife thresholds. CEMA indicator thresholds that are likely exceeded by the impacts of the PDC include old growth birds, moose, caribou and fisher.

In discussing the determination of the public interest, the Board stated:
"The existence of regulatory standards is an important element in deciding whether potential adverse impacts are acceptable and whether a proponent has satisfactorily accounted for these externalities…..Where no sanctioned thresholds exist, it is especially critical that the Board weigh the impact of potential adverse effects on the public and the efficacy of the mitigative measures designed by a proponent to minimize these impacts to acceptable levels."[17]

Despite Shell's curious conclusion of no significant adverse effects for most wildlife species, it is clear that the cumulative effects of reasonably foreseeable disturbance on wildlife do indeed exceed thresholds for significant adverse effects, contradict the policy direction of the Fort McMurray Athabasca Oil Sands Subregional IRP, and exceed the management threshold recommendation of CEMA. For these reasons, the project is not in the public interest. Shell has not identified adequate mitigation to address these impacts,

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[16] Silvatech Group. Indicator Synthesis: Selection Rationale, Monitoring Results and Monitoring Considerations for Key Indicators of the Terrestrial Ecosystem Management Framework, prepared for the Cumulative Environmental Management Association (2008). See pages 18, 23, 29, 35, 41 and 46.

[17] Decision 2001-33: EPCOR Power Development Corporation and EPCOR Generation Inc., Rossdale Power Plant Unit 11 (RD 11).

nor has any regional mitigation been identified that would ensure that wildlife objectives will be met for the region.

The Government of Alberta has made many public pronouncementsabout managing using limits and a cumulative effects approach[18], such as:

Alberta's system for assessing the environmental impacts of new developments has a history of being done on a project-by-project basis. This approach worked at lower levels of development activity. However, it has not worked as well in addressing the combined or cumulative effects of multiple activities and high rates of development that we have come to experience in Alberta.

Regional plans will adopt a cumulative effects approach that includes managing the impacts of existing and new activities. It will be based on our understanding of environmental risks and socio-economic values which will be used in setting environmental objectives, and then managing within those objectives.

Managing within objectives must include the ability for panels to reject projects where approval would result in exceedance of limits or objectives – especially if the proponent has made no serious effort to address known adverse cumulative effects to wildlife, as is the case for the JPME. Wildlife, unlike air or water cannot be managed by "end of pipe" improvements, as no project can be developed without incrementally disturbing wildlife habitat. The Shell JPME assessment has shown that the PDC exceeds these limits. To manage within the limits in the public interest of Albertans and Canadians the panel must deny the approval of the Shell JPME until reclamation of existing projects is able to demonstrate appropriate wildlife habitat will be maintained regionally.

At previous oilsands hearings, OSEC has argued that old fashioned terrestrial mitigation focused on uncertain reclamation at some point in the future is inadequate in a landscape that will be impacted as significantly as northeastern Alberta and has identified the need for offsite compensatory mitigation to address impacts to wildlife. The panel agreed with OSEC's perspective and the decision report for the Total Joslyn mine[19] made the following recommendation:

The Panel recommends that prior to any authorization of the project, Alberta Sustainable Resource Development consult with Environment Canada as appropriate, and work with TOTAL to ensure that additional mitigation, such as using offsite offsets, avoiding high quality habitat, and conducting research, be identified to ensure that the project would not cause significant adverse effects on species at risk. The new wildlife mitigation plan should not only deal with mitigating impacts on species at risk and valued wildlife, but

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[18] Government of Alberta "Cumulative Effects Management" https://landuse.alberta.ca/MANAGINGOURLANDS/CUMULATIVEEFFECTSMANAGEMENT/Pages/default.aspx (accessed September 10, 2012)

[19] Joint Review Panel established by the Federal Minister of the Environment and Energy Resources Conservation Board, Report of the Joint Review Panel, ERCB Decision 2011-005: Joslyn North Mine Project, Total E&P Joslyn Limited Alberta (2011), p157.

should also reduce the overall cumulative effects to wildlife. These additional measures should be provided to Alberta Environment for inclusion in any Environmental Protection and Enhancement Act approval it may issue.

Based on that recommendation, a conservation agreement has been signed between Total and Environment Canada that has resulted in a commitment to defer mining development on an additional oilsands lease as a compensatory offset to mitigate impacts on species at risk[20]. After repeated requests, OSEC was able to obtain a copy of the Conservation Agreement from Environment Canada in April 2012, six months after it had been signed.

While OSEC believes that the Total recommendation and conservation agreement may result in some mitigation of impacts on species at risk, we are concerned that such a critical form of mitigation is being developed in isolation between Canada and the proponent. Moreover, OSEC is concerned that the efficacy of this mitigation has not been validated and there is limited opportunity for stakeholders, or the panel, to monitor its delivery. Neither OSEC nor the panel has any way of knowing if the offset established is credible, additional, or representative of the wildlife habitat that will be disturbed by the Total Joslyn project. In short, the panel has no way of knowing whether the conservation agreement will result in the reduction of significant adverse effects to less than significant.

There are many available and achievable ways to meet a requirement to compensate for habitat damage associated with the Project. Options include purchase and conservation of ecologically equivalent private lands, reduction of other land impacts through the retirement of other industrial tenures, additive restoration of historic disturbances off-lease, or permanent deferral of other oilsands tenures. Shell, in partnership with Alberta Conservation Association, has purchased lands for conservation such as the *True North Forest*[21]. However, this has not been tabled as mitigation and, while it is a promising first step and charitable activity, the area is too small to mitigate impacts associated with the JPME and it has not been demonstrated that such lands achieve a no net adverse impact on wildlife.

It is unfortunate that Shell has not identified and submitted mitigation to address these concerns, despite evidence that projected cumulative impacts of JPME are now greater than those identified in the Total Joslyn application. Given the clear direction from the panel in the Total Joslyn hearing, OSEC is surprised that Shell has not provided a mitigation plan to address significant adverse effects to wildlife that can be tested at a hearing.

Clearly, the cumulative effects of reasonably foreseeable disturbance on wildlife will have significant adverse effects that Shell has not provided a plan to adequately mitigate. As such, the project is not in the public interest and should not be approved. OSEC requests that evidence of compensatory mitigation to provide net positive impact on

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[20] Total E&P Canada Limited and Her Majesty the Queen in Right of Canada As Represented by the Minister of Environment. Conservation Agreement (2011).

[21] Shell Canada, "The Shell True North Forest. "http://www.shell.ca/home/content/can-en/environment_society/true_north/ (accessed July 7, 2012)

species at risk and valued wildlife species be a pre-condition of any project approval. If there is potential for significant adverse effects, it is imperative that the panel has the necessary information to determine if and how these impacts can and will be mitigated, and to what extent. We request that mitigation be required as conditions and the mitigation be transparent and verifiable. The panel is responsible for protecting the public interest and the public interest must not only be served, but seen to be served. We seek to avoid the situation of the Total offset plan, which lacked transparency and verification.

5.2 IMPACTS TO WETLANDS AND OLD GROWTH FORESTS

The 2012 Jackpine Application Case on its own will result in unacceptably high likely adverse regional cumulative impacts on wetlands and old growth forests, and should cause the panel to reject Shell's application. The significant adverse impacts of the Application Case are exacerbated in the PDC.

Foote (2012) outlines the ecological significance of wetlands in the oilsands landscape:

"*Wetlands contribute special ecological functions and values. They accumulate carbon and also slow water runoff resulting in longer time intervals for water infiltration and groundwater recharge. Wetlands also moderate storm water run-off, attenuating flood pulses for down-gradient receiving systems. The soils of most wetlands in the oil sands region are very active habitats for microbial communities. When contaminant levels are moderate, natural microbe communities can transform, sequester, bind, and isolate many undesirable materials from the water column, purifying water (Frederick 2011). Wetlands are also disproportionately valuable for wildlife, concentrating insect, fish, bird, and mammals in closely linked food chains. Wetlands provide aesthetic, recreational, cultural, and spiritual values for naturalists, hunters, and anglers.*"[22]

Shell's May 2012 submission Appendix 1, Table 4.3-1, states that from Base Case to JPME and Jackpine Mine Phase 1, 12,613 ha of wetlands (91% of the resource) before reclamation in the Local Study Area will be lost or altered due to project footprint and to indirect effects of groundwater drawdown. The majority of these wetlands are peatlands (bogs and fens).

Regionally, Shell's September 2012 submission states that from Pre-Industrial Case (PIC) to 2012 JPME Application Case, an estimated 126,531 ha of wetlands will be lost or altered in the Regional Study Area (12% of the resource) before reclamation due to project footprint and to indirect effects of groundwater drawdown (Table 2.3-5, p. 25). From the PIC to the PDC, an estimated 185,872 ha of wetlands will be lost or altered in the Regional Study Area (18% of the resource) before reclamation due to project footprint and groundwater drawdown (Table 3.3-5, p. 84). The assumption outlined in Shell's September 2012 submission is that it has the conservatively assumed for effects before reclamation that developments are operating simultaneously with fully cleared and disturbed footprints with no reclamation activities (p. 2).

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[22] Foote, L. (2012). Threshold considerations and wetland reclamation in Alberta's mineable oil sands. *Ecology and Society* **17**(1): 35.p. 4 in PDF version, http://www.ecologyandsociety.org/vol17/iss1/art35/

If indeed all wetland loss and disturbance during the project's life has been adequately accounted for, considering the expert assessment cited below of wetlands reclamation prospects on oilsands mining leases, then the Shell pre-reclamation assessment is not conservative. Rather, it is highly likely, and likely to extend even into closure and far future for peat wetlands and for old growth (over 100 years old) forests. Cumulative projects' site clearing and groundwater drawdown significantly changes soil salinity and hydrology. The best reclaimed wetlands on process-affected oilsands mining sites to date are salt marshes that are low in species biodiversity compared to the prevailing pre-disturbance freshwater peat wetlands (see citations below). Shell estimates that, at closure, reclamation loss of wetlands will be 74% of the resource at the Local Study Area level (May 2012, Table 4.3-1), 12 % of the resource at the Regional Study Area level from PIC to 2012 JPME closure (Sept 2012, Table 2.3-5) and 12% of the resource from PIC to PDC far future (Sept 2012, Table 3.3-5). Even if closure reclamation succeeds in reducing areal wetland loss, the JRP should proceed with a realistic assumption that the biodiversity value of this landscape will be significantly less, and that this wetland loss has a further transformative effect on forest fires and forest age (see citations below).

Rooney et al. (2012) assert that peat wetlands destroyed by open pit mining will not be replaced. "Constraints imposed by the postmining landscape and the sensitivity of peatland vegetation prevent the restoration of peatlands that dominated the premining landscape."[23] A number of reasons are given for this, including: absence of an Alberta wetland policy requiring compensation for boreal wetlands; hilly post-closure topography replacing a pre-mining landscape that was mainly level; and the sensitivity of peatland vegetation to the high conductivity and ion concentration of the salt, metals and naphthenic acids present in the post-mining landscape.[24]

Foote likewise states that meaningful peat wetland re-creation will not occur in the post-mining leases:

"*...peatlands, the primary class of wetland cover throughout the oil sands region, cannot feasibly be replaced because of insufficient available area, time requirements for peat development, gaps in reclamation knowledge, and expense. Peat accumulation is a complex nonlinear process (Clymo 1992) dependent on simultaneous accumulation and decomposition with a positive balance. Restoration of fen peatland conditions requires stable and calcium-rich groundwater of low salinity flowing into low gradient areas with a fairly stable climate and low fire frequency. Even with these exacting conditions, at 1 to 3 mm of peat accumulation per year, approximately one to three centuries would be needed to generate the 30 cm minimum of accumulated peat to technically qualify as a peatland."*[25]

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[23] Rooney, R.C., S.E. Bayley and D.W. Schindler, (2012). Oil Sands Mining and Reclamation Cause Massive Loss of Peatland and Stored Carbon. Proceedings of the National Academy of Sciences 109(13): 4933-4937. p. 1 http://www.pnas.org/content/109/13/4933.full.pdf+html

[24] Ibid., p. 3.

[25] Foote, p. 4.

These wetland biologists state that the marsh wetlands planned for post-closure leases will not achieve the biodiversity of the pre-industrial sites. Foote states that:

"Fens are typically replaced with emergent lacustrine [lakeshore] wetlands on salt-affected soils with low permeability. Because the bitumen resides on, and is overlain, by ancient marine sediments, salts are liberated by the hot water used to separate oil from sediment yielding salt concentrations of 4000 to 6000 microsiemens in the tailings. This is approximately 10% seawater strength, too high for all common nonmarine wetland plants, fish, amphibians, and most insects, so the community diversity of plants and animals is reduced ... focusing only on replacement of landforms and soil conditions is insufficient. A broad consideration of the processes and requirements of entire ecological communities is required otherwise plant occupancy for crucial microbial, insect, and wildlife components will be missed."[26]

Rooney et al. also note that efforts to date to create shallow and open water wetlands area instead of peat wetlands have been less successful at restoring biological integrity than the upland habitat that has been certified to date.[27]

Foote notes that the current approach to assessing 'equivalent land capability' under the *Environmental Protection and Enhancement Act* is deficient:

"*The concept of equivalent land capability is based on a regional forestry classification called the Land Capability Classification for Forest Ecosystems (Leskiw 2004) and it may not fully capture nonmarket ecological goods and services specific to wetlands such as groundwater recharge, nutrient processing, flood attenuation, aquatic pollution abatement, biodiversity, aesthetics, or cultural values."*[28]

Rebecca Rooney, the lead author of the literature cited above and a PhD candidate at University of Alberta, explains the gap in reclaimed wetlands assessment that motivates her current research:

"*Development of an oil sands wetland reclamation evaluation tool is urgently needed. Firstly, although industry reports that 5609 ha of land have been reclaimed, only 104 ha have been assessed for certification and this did not include any wetland habitat. Thus, industry continues to carry the reclamation liability. Secondly, without a method for evaluating the success of past reclamation projects we cannot learn from them or employ an adaptive management strategy. Thirdly, expansions and new developments in the Athabasca oil sands region are being approved at an unprecedented pace and scale. Approvals are issued on the premise that reclamation of wetlands in the region is*

[26] Ibid., p.4-5.

[27] Rooney et al, p. 3.

[28] Foote, p. 6.

possible; however, without an evaluation tool, it remains unproven that restoring the functionality of wetlands in the region is technically and scientifically feasible."[29]

Rooney et al. (2012) discuss the effects of replacing peatlands primarily with forested uplands. The understory vegetation will no longer be plants that can deposit up to several meters of peat, but instead will be plants that accumulate much less carbon in the soil. Age structure will be reduced for two reasons: first, reclaimed forests will begin as seedlings and take 50 to 70 years to reach maturity. Second, loss of peatlands will mean a shift to a drier forest, and drier forests are more susceptible to fire. A more fire-prone forest will mean a younger forest.[30]

Old growth forest potential in the Regional Study Area is estimated by Shell at 356, 582 ha in the Pre-Industrial Case and is estimated to decrease by 60, 242 ha (Shell 2012, p. 27). This represents 17% of the old-growth forest potential in the area. Shell has not taken into account the increased susceptibility to fire of forests in the post-reclamation landscape that will be significantly drier because of extensive peat wetland loss. As a result, Shell has under-estimated the loss of old-growth forest potential. This loss will exacerbate the already significant adverse consequences regionally to the at-risk Canada warbler, because it is an old-growth forest specialist species.

Foote recommends that threshold management – agreed-upon development limits to prevent exceedance of ecological thresholds for wetland impacts in the mineable oilsands region - be used to limit irreversible wetland loss: "*Because it is not possible to satisfactorily predict postmining wetland reclamation in advance, I suggest that negotiated thresholds may help development move toward a more acceptable way of mining and reclaiming wetlands."*[31]

Species that favour peatland and wetland habitat and that are listed under the *Species at Risk Act* include the woodland caribou, rusty blackbird and yellow rail.

Because of these likely far-reaching and irreversible effects to wetlands and old-growth forests, OSEC views residual adverse effects to biodiversity in the regional study area for the 2012 JME Application Case as 'significant' for species, ecosystem and landscape-level effects.

Shell has not identified adequate mitigation to address these significant adverse effects, nor has any regional mitigation been identified to address these vegetation and wildlife impacts for the region.

The JRP should recommend against approval of the Shell JPME due to significant adverse cumulative effects to wetlands, and to significant adverse cumulative effects to old growth forest both directly and indirectly through loss of wetlands.

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[29] R. Rooney, "Alberta Oil Sands", retrieved at http://www.biology.ualberta.ca/faculty/suzanne_bayley/?Page=6444 [Last retrieved September 24, 2012]

[30] Rooney et al, p. 3.

[31] Foote, p. 9.

5.2.1 Project impacts contrary to wetlands policy intent and expectations

Albertans support maintaining functioning wetland area as a provincial goal. A key goal of Alberta's Water for Life strategy is to develop a wetland policy and supporting action plan to achieve sustainable wetlands.[32] In 2007, the Alberta Water Council Wetland Policy Project Team held extensive public consultations on the development of a provincial wetland policy that would extend to the Green Area (public lands), including the mineable oilsands region. Consultation results included:

"*Overall, 90% of workbook respondents and 86% of workshop participants agreed (either strongly or somewhat) that [wetland] conservation was important to them, even if it meant foregoing other land-use activities".*[33]

"Overall, 90% of workbook respondents agreed (either strongly or somewhat) with the proposed policy goal [to maintain or increase wetland area (and hence wetland functions) in Alberta]. The workshop participants were asked an abbreviated version of the question and 90% of them also agreed (either strongly or somewhat) that the policy goal should be to maintain or increase wetland area."[34]

The Government of Alberta released a Wetland – Policy Intent draft in October 2010 as part of its development of a provincial wetland policy. It states that the policy would promote 'avoidance' of negative impacts on wetlands as "the primary and preferred response", 'minimization' of negative impacts on wetlands "where avoidance is not possible" and "as a last resort, and where avoidance and minimization efforts are not feasible or prove ineffective, compensation is required."[35]

The uncompensated loss of wetlands associated with the JPME application is at odds with this policy direction and the expectations of Albertans. Shell has estimated at closure a 74% loss of wetland resource in the Local Study Area, a 12% loss at closure of wetlands resource in the Regional Study Area for the PIC to 2012 JPME Application Case, and a 12% loss at far future of wetlands resource for the PIC to PDC. As noted above, these figures seem optimistic given post-reclamation biodiversity loss and expected drier prevailing conditions. Given the increased loss of wetlands associated with the Project, in direct contradiction to both the intent of Water for Life and Alberta's draft wetland policy, OSEC believes that the Project is clearly not in the public interest.

5.2.2 Peatland loss and carbon storage and sequestration impacts

In Western Canada, peatlands continue to act as net carbon sinks.[36] Cumulative carbon storage and sequestration effects from peatland loss were not considered by Shell.

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[32] Alberta Water Council. Annual Report 2007. http://www.albertawatercouncil.ca/

[33] Alberta Water Council Wetland Policy Project Team. 2008. Talking with Albertans about a New Wetland Policy and Implementation Plan: What We Heard Summary. p. 6

[34] Ibid., p. 8.

[35] Government of Alberta (2010). Wetlands – Policy Intent. Draft. p.5.

[36] The Alberta GPI Accounts: Wetlands and Peatlands available at: www.pembina.org

Rooney et al. (2012) include carbon storage loss in their analysis of oilsands mines' environmental impacts from peatland loss. They estimate the effects of 10 mines approved as of late 2011: "… tallies [of greenhouse gas emissions from mining and upgrading oil sands bitumen] completely neglect the carbon emissions resulting from peatland loss, yet our analysis suggests that carbon storage loss caused by peatland conversion could be equivalent to 7-y [years] worth of carbon emissions by mining and upgrading (at 2010 levels)."[37]

Rooney et al. also estimate the reduced carbon sequestration potential due to peatland loss from the 10 oilsands mines approved to date:

"*Scaling up, as with carbon storage, this equates to 5,734–7,241 t C/y (21,025– 26,550 t CO2/y) lost due to approved mines. The reclaimed landscape will sequester carbon at a much lower rate, determined by complex interactions between plant species (and the chemical composition of their litter), climate, soils, management, and the fire regime… [the result of several cited studies] "suggests that conversion of peatlands to uplands with peat soil amendments transforms a relatively permanent carbon storage pool (historical peatlands) to a temporary one that leaks carbon rather than sequesters it*."[38]

5.2.3 Compensatory off-sets required

Since impacts to peatlands are permanent and cumulative, if the Shell JPME is approved, it is essential that approval conditions require mitigation strategies to focus on conservation offsets to ensure peatland resources are conserved elsewhere. Opportunities to compensate for wetland losses exist. For example, Suncor's Northern Habitat initiative attempts to offset disturbances associated with its oilsands development through the conservation of ecological significant boreal forest lands. Shell Albian committed to provide funds for the acquisition and protection of private boreal forest lands (including wetlands) to offset impacts associated with development of the Muskeg River Mine Expansion Project. However, no wetland compensation is proposed by Shell to mitigate wetland losses that will occur if JPME is approved.

5.3 AIR EMISSION ISSUES

The Project and the Base Case and Application Case describe unacceptable impacts on regional air quality that will not be appropriately mitigated by the proponent. Specifically, the cumulative impacts resulting from air emissions described in the Shell JPME application include:

1) Air quality levels exceeding regulated regional Level 4 maximum limits for annual concentrations of nitrogen dioxide under the Base Case and the Application Case;

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[37] Rooney et al., p. 4.

[38] Ibid., p. 5

2) Current air quality in the region is at the threshold of Level 3 triggers requiring immediate management action including restrictions on new emissions sources;
3) Potential acid input levels exceed the critical load for two acid deposition management framework regional grids; and
4) Potential acid input levels exceed the critical load for 23 lakes in the region.

5.3.1 Air pollution emissions

The Project is a major source of air pollution emissions, in particular of nitrogen dioxide (NO_2). As noted in the application, the planned JPME will result in an additional 5.8 tonnes per day of NO_x emission into the regional airshed each day (equivalent to 2,117 tonnes per year).[39]

NO_2 emissions are classified as a "Criteria Air Contaminant" in Canada, as they are of concern for their potential impact on human health. According to the World Health Organization, long-term exposure to NO_2 reduces lung function growth and increase bronchitis symptoms in asthmatic children.[40]

Epidemiological studies have shown that symptoms of bronchitis in asthmatic children increase in association with long-term exposure to NO_2. Reduced lung function growth is also linked to NO_2 at concentrations currently measured (or observed) in cities of Europe and North America. In order to protect human health, the World Health Organization recommends maintaining long-term (annual average) concentration levels of NO2 below 40 $\mu g/m^3$.

NO_2 emissions have also been identified as one of the primary precursors to ground-level ozone and fine particulate matter.[41]

5.3.1.1 Air pollution objectives

In Alberta, there are objectives for regional concentrations of NO_2 in the atmosphere. The Alberta Ambient Air Quality Objective sets an upper threshold for annual concentrations of NO_2 to 45 $\mu g/m^3$.[42]

In addition to the Air Quality Objective, new regulations through the Lower Athabasca Regional Plan (LARP) also establishes triggers, limits, and management actions for air pollution.

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[39] Shell Canada Ltd., Joint Review Panel Supplemental Information Requests, May 2012. Appendix 3.2: Air Emissions and Prediction, Pg. 3.

[40] World Health Organization, "Air quality and health", http://www.who.int/mediacentre/factsheets/fs313/en/index.html (accessed September 3, 2012)

[41] Environment Canada, "Pollution and Waste: Nitrogen dioxide, which has the molecular formula NO2", http://www.ec.gc.ca/toxiques-toxics/Default.asp?lang=En&n=98E80CC6-1&xml=81D26E2F-EA49-41E1-803D-ACBCCB5778EC (accessed September 5, 2012)

[42] Government of Alberta, "Alberta Ambient Air Quality Objectives: Nitrogen Dioxide", Effective June 15, 2011.

As defined in the LARP, "[t]he ambient air quality limits and triggers in the framework are based on accepted Alberta ambient air quality objectives."[43] Figure 2, below, illustrates the LARP triggers and limits for NO_2.

Schedule A: Air Quality Management Framework Limits and Triggers

Table A-1. Annual Ambient Air Quality Triggers and Limits for NO_2 and SO_2

Description	NO_2	SO_2
Limit[1]	45 µg/m³ (24 ppb)[1]	20 µg/m³ (8 ppb)[1]
Trigger for Level 3	30 µg/m³ (16 ppb)	13 µg/m³ (5 ppb)
Trigger for Level 2	15 µg/m³ (8 ppb)	8 µg/m³ (3 ppb)

Triggers and limits apply at continuous air monitoring stations as reported through the Clean Air Strategic Alliance Data Warehouse.

[1] Annual air quality limits are based upon Alberta Ambient Air Quality Objectives.

Figure 2: LARP air quality triggers and limits[44]

As described in the LARP Air Quality Management Framework, the air quality limits apply across the Lower Athabasca Region in order to achieve the regional objectives.[45] As defined in the Framework, the overarching objective of this plan is to ensure that: "[r]**eleases from various sources are managed so that they do not collectively result in unacceptable air quality**." Therefore, as defined by the LARP's regional objectives and provincial policy direction, the intent of the Air Quality Management Framework includes[46]:

- Prevention of pollution through employment of the best available technology economically achievable.
- Continuous improvement.
- Keeping clean areas clean.

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[43] Government of Alberta. Lower Athabasca Regional Plan 2012-2022 (2012), Pg. 49.

[44] Government of Alberta. Lower Athabasca Regional Plan 2012-2022 (2012), Pg. 73

[45] Government of Alberta. Lower Athabasca Regional Plan 2012-2022 (2012), Pg. 19.

[46] Government of Alberta. Lower Athabasca Regional Air Quality Management Framework for Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2), 2012, Pg. 8 & 20.

- Managing air quality so as to avoid ever exceeding the limit.

The Plan outlines specific management intentions for the different trigger levels. These are defined in Figure 3, below.

Table 4. Annual Ambient Air Quality Level Descriptions

Level	Description	Management Intent
Level 4	Ambient air quality exceeding air quality limits	Improve ambient air quality to below limits
	Limit	
Level 3	Ambient air quality below but approaching air quality limits	Proactively maintain air quality below limits
	Trigger	
Level 2	Ambient air quality below air quality limits	Improve knowledge and understanding, and plan
	Trigger	
Level 1	Ambient air quality well below air quality limits	Apply standard regulatory and non-regulatory approaches

Figure 3: LARP Air Quality Management Framework management intentions as define by trigger levels[47]

The plan also defines mitigation actions for trigger levels. For examplen the plan states:[48]

- Trigger Level 3: "Within the response protocol, appropriate management actions for Level 3 are required to ensure that the annual average air quality limit is not exceeded."
- Trigger Level 4: "In Level 4 for the annual ambient air quality triggers and limits, the acceptable ambient air quality limit has been exceeded, and mandatory actions are required so the air quality limit is no longer exceeded." It also notes that "Alberta Environment and Sustainable Resource Development retains the responsibility to implement an emissions-reduction plan for the affected area."

It is clear that upon passing the Trigger Level 3, some form of management action must be implemented in order to ensure that emissions do not continue to increase and exceed the limit (Trigger level 4). In order to achieve these management actions, the plan

[47] Government of Alberta. Lower Athabasca Regional Air Quality Management Framework for Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2), 2012, Pg. 21

[48] Government of Alberta. Lower Athabasca Regional Air Quality Management Framework for Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2), 2012, Pg. 29

outlines several tools that can be used for air quality management. They include, but are not limited to:

- Restrictions on further emission sources
- Emission reduction requirements to allow for new sources
- Emission caps
- Approval conditions or restrictions

OSEC is not aware of any government management activities that will improve air quality below trigger level 3. The Project will have significant adverse effects that are not in the public interest, and therefore, should not be approved.

In summary, regulations under the LARP indicate that air quality in the oilsands region must be managed to ensure that concentrations for NO_2 do not exceed the limit (Trigger Level 4 as set by the Air Quality Objective) but also that key management actions are implemented at earlier thresholds, including:

- proactive management below the limit,
- continuous improvement,
- pollution prevention, and
- keeping clean areas clean.

While modeling results will not be used to determine an official exceedance, the LARP specifically recognizes the role of dispersion modeling undertaken for Environmental Impact Assessments as a tool to evaluate the effects of a proposed project in the context of the framework and to identify the need to manage releases.[49]

5.3.1.2 Cumulative effects of development: Base & Application Case

When considering the Project, it is necessary to compare projections of air quality relative to the limits established by the Air Quality Objective and the LARP.

According to Shell's air quality modeling for the Base Case and Application Case, average ambient air concentrations of NO_2 will exceed the LARP level 4 limit and therefore will be above the Alberta Ambient Air Quality Objective legal limit of 45 $\mu g/m^3$. In the Base Case alone, Shell's assessment notes that the maximum annual concentrations for NO_2 will reach levels of[50]:

- 90.3 $\mu g/m^3$ (45.3 $\mu g/m^3$ above the legal limit) in the Local Study Area,
- 139.8 $\mu g/m^3$ (94.8 $\mu g/m^3$ above the legal limit) in the Regional Study Area, and
- 52.6 $\mu g/m^3$ (7.6 $\mu g/m^3$ above the legal limit) in regions of the Regional Study Area even when developed areas are excluded from the calculation.

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[49] Government of Alberta. Lower Athabasca Regional Air Quality Management Framework for Nitrogen Dioxide (NO_2) and Sulphur Dioxide (SO2), 2012, Pg. 33

[50] Shell Base, Application, and Planned development cases, Source: Shell Canada Ltd., Joint Review Panel Supplemental Information Requests, May 2012. Appendix 3.2: Air Emissions and Prediction, Table 4.2-1

In Figure 4, below, the Regional Study Area modeled values for Shell's Base, Application, and Planned Development Cases are compared with the LARP NO_2 triggers. For reference, the figure also includes current (2011) annual averages for two monitoring stations and the Shell Pre-Industrial Case.

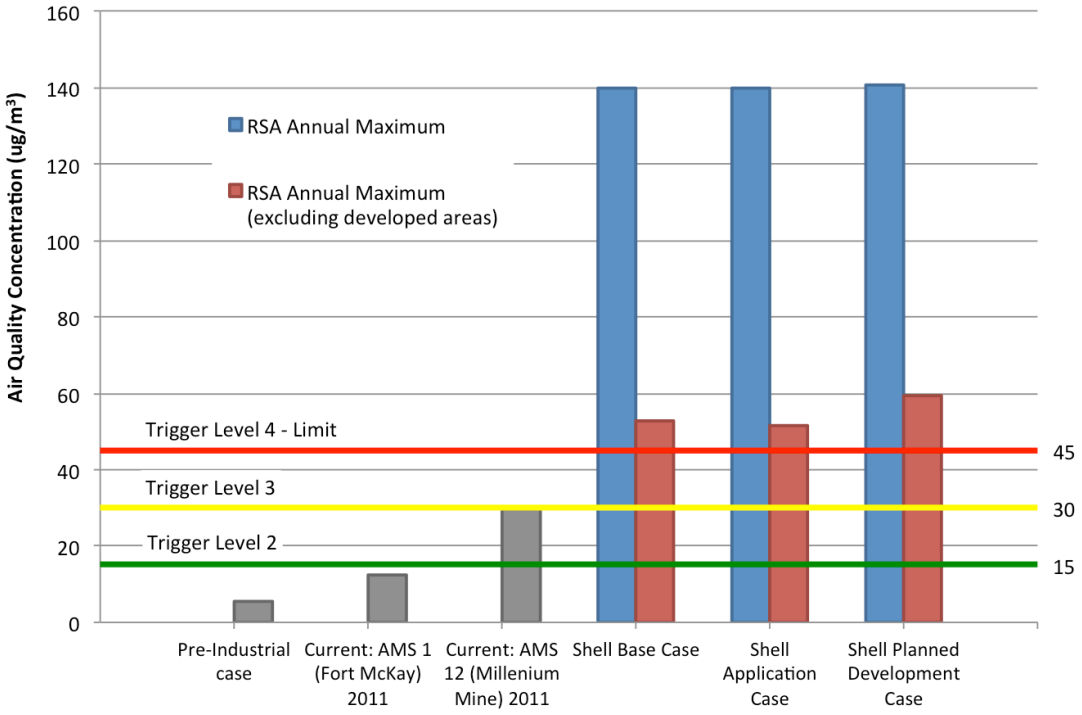

Figure 4: Annual concentrations of NO_2. Shell EIA modeled[51] cases compared to current measurements[52], Shell pre-industrial scenario[53], and LARP triggers.

As shown above, Shell's analysis makes it very clear that if the already approved oilsands projects are built as outlined in the Base Case, the cumulative impact of NO_2 in the region will reach unacceptable levels.

When comparing the Pre-industrial Case to the AMS 12 station (2011 annual average), the increasing trend of impacts from industrial developed are evident. In 2011, the operating capacity of oilsands was 2.1 million barrels per day.[54]This current level of development will drive NO_2 concentrations from 5.5 µg/m^3 (pre-industrial) to 29.7 µg/m^3 (AMS 12, 2011), just below the LARP Trigger Level 3. If this trend continues, an

[51] Shell Base, Application, and Planned development cases, Source: Shell Canada Ltd., Joint Review Panel Supplemental Information Requests, May 2012. Appendix 3.2: Air Emissions and Prediction, Table 4.2-1

[52] Current levels taken from: Wood Buffalo Environmental Association, "Annual Report 2011", July 2012. AMS 1 Station: Table T27, AMS 12 Station: Table T6.

[53] Pre-development, source: Shell Canada Ltd., Response to JRP August 15, 2012 Supplemental Information Requests, September 2012.

[54] Calculated from source: Oilsands Review, *Oilsands Projects – In situ projects & Mining projects*, http://www.oilsandsreview.com/statistics/projects.asp (Accessed May 8, 2012)

exceedance of the LARP Trigger Level 3 will require legal management action from the Government of Alberta to ensure that emissions do not exceed Trigger Level 4. Considering that 5.1 million barrels per day have already been approved (nearly 2.5 times the current level of development),[55] significant increases in NO_2 emissions in the region are to be anticipated. This is consistent with Shell's Base Case, which will clearly exceeds the trigger 4 level.

While analyzing the Figure 4, it is important to take the following 2 points into consideration:

1. Developed vs. Non-Developed Areas: Shell presents air quality data for the Regional Study Area in terms of the maximum that occurs in the region and the maximum that occurs in the region when all development areas are excluded. Excluding developed areas where oilsands leases exist significantly decreases the maximum. However, as noted in Shell Application (2007), while this has been an accepted approach among oilsands proponents, "there is no specific regulatory guidance in Alberta regarding the exclusion of developed areas".[56] Further, there is no discussion of exclusion of developed areas in the LARP Air Quality Management Framework. In fact, the framework provides regional objectives and therefore it is implicit that the air quality limits apply across the region.[57] Even when developed areas are excluded, the Base, Application, and Planned Development Cases all still exceed the annual NO_2 limit.
2. Small Application Case Decreases: as illustrated in the figure, modeled concentrations of NO_2 are slightly decreased in the Application Case relative to the Base Case. The reductions occur as a result of updated calculations for the existing Jackpine Mine Phase 1 that present lower number for Phase 1 emissions in the Application Case than in the Base Case. As stated in the assessment, "[t]he apparent decrease in the annual NO_2 prediction is due to a lower mine fleet NO_2 emissions intensity in the Application Case".[58] This is important to note as the Jackpine Mine Expansion represents a proposal to increase NO_2 emissions – even when this is not reflected in a comparison of the Base Case with the Application Case.[59]

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[55] Calculated from Oilsands Review, *Oilsands Projects – In situ projects & Mining projects*, http://www.oilsandsreview.com/statistics/projects.asp (Accessed May 8, 2012)

[56] Shell Canada Ltd., Jackpine Mine Expansion & Pierre River Mine Project, Volume 3, Pg. 3-39.

[57] Government of Alberta. Lower Athabasca Regional Air Quality Management Framework for Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2), 2012, Pg. 13 & 19. Also note, triggers apply at continuous monitoring stations (including industrial stations) in the region (See: Government of Alberta. Lower Athabasca Regional Plan 2012-2022 (2012), Pg. 46-47).

[58] Shell Canada Ltd., Jackpine Mine Expansion & Pierre River Mine Project, Volume 3, Pg. 3-57.

[59] For further detail, see Shell Canada Ltd., Jackpine Mine Expansion – Supplemental Information, December 2009. Volume 1, Pg. 18-2. Which states: "The Jackpine Mine **– Phase 1 mine fleet emissions** in the Base Case are derived from the emissions in the Shell Jackpine – Phase 1 **application (Shell 2002).** They reflect the mine fleet information and emission standards that were available when the application was being prepared for submission. In the **Application Case**, the integrated Jackpine Mine mine fleet and

5.3.1.3 Shell model analysis

As noted in Shell's assessment, the models for NO_2 concentrations under the different scenarios include inputs for mine fleet emissions based on assumptions that should moderately over-predict the volume of emissions. As shown in Figure 5, the mine fleet emissions levels used to calculate the Base Case are above the levels anticipated by Shell in their estimated model.

Figure 3.2-1 Estimated 2012 Base Case Mine Fleet NO_X Emissions From Oil Sands Mining Operations

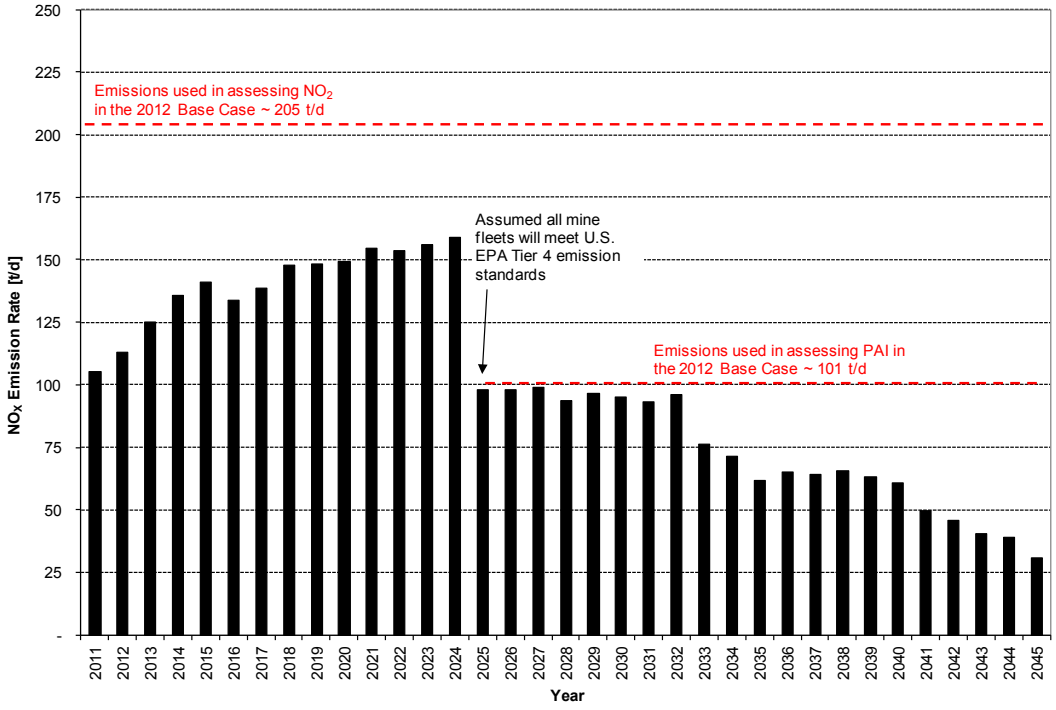

Figure 5: Shell's estimated Base Case mine fleet NO_2 emissions over time.

While assuming slightly higher than expected emissions from the mine can result in moderately higher emissions concentrations calculated for the different cases, it must be put in context.

The margins by which the NO_2 limit is exceeded (in the Regional Study Area including developed areas) is very significant. Also, considering that current levels, as indicated by the monitoring station AMS 12, are already essentially at the LARP Trigger Level 3, emissions increases anticipated from the Base Case will likely continue to dramatically exceed the legal limit whether or not the mine fleet emissions are over-predicted.

Pierre River Mine mine fleet **emissions were estimated based on the latest mine fleet data and the current and future emission** standards."

Shell has also provided no other modeled data by which to compare less conservative calculations. In the absence of that information, the Project must be evaluated according to their current assessment.

It is also important to note that (described above), not only is the objective of the LARP Air Quality Management Framework to prevent air quality limit exceedances; it is also to achieve "continuous improvement" and "keeping clean areas clean". In accordance with these objectives, emissions growth beyond current levels must be mitigated. Alternatively, the approval of new sources of emissions ought to be deferred until emissions drop below current levels. According to Shell's mine fleet estimate, under the current policy environment, NO_2 emissions do not drop until 2025 and are not significantly below current levels until 2033.

5.3.1.4 Conclusions for air quality

Shell states a commitment to adopt Tier IV trucks within their mine as they become available (in compliance with federal requirements). Tier IV mine fleet vehicles do represent a significant improvement in NO_2 emissions relative to lower Tier models, but are inadequate mitigation to achieve acceptable regional air quality.

Given that air quality under the Base Case is already modeled to exceed legal limits, no further emissions sources should be approved until it can be clearly demonstrated that industry-wide emissions have decreased to levels that will be below legal limits under base-case operating capacity. At this time, only projects with the net equivalent of zero NO_2 emissions should proceed. Given that the Project would emit a further 2,117 tonnes of NO_x in the regional airshed, it clearly should not be approved.

5.3.2 Acid forming emissions

As described by Shell, the long-term accumulations of sulphur and nitrogen compounds have been associated with the acidification of terrestrial and aquatic ecosystems.[60] The Project is a major source of both SO_2 and NO_x emissions (see Air pollution emissions, Section 5.3.1).

5.3.2.1 Acid deposition regulation

The Alberta government has a very clear objective for limiting the effects of acid deposition in the province. As stated, "Alberta is being proactive by establishing maximum allowable levels for acid deposition before significant adverse environmental effects are observed".[61] This objective is to be achieved under the Acid Deposition Management Framework (ADMF), developed by CEMA and adopted by Alberta

[60] Shell Canada Ltd., Jackpine Mine Expansion & Pierre River Mine Project, Volume 3, Pg. 3-84.

[61] Government of Alberta, "Acidifying Emissions", http://environment.alberta.ca/02830.html , Updated February 2012.

Environment. It describes target and critical acid deposition loads for soil types and includes management actions for when these levels are exceeded.[62]

The ADMF is designed not only to prevent acid deposition from reaching irreversible levels[63] but also to prevent an acidification problem from developing in areas already defined as clean.[64]

The ADMF establishes 5 levels of acid position deposition rates: Background, Current, Monitoring Load, Target Load, and Critical Load. The levels are defined in terms of the unit Potential Acid Input (PAI) measured in kg of acid equivalent (H+) per hectare, per year or keq H+ ha^{-1} yr^{-1}. Monitoring, Target, and Critical levels are defined over 1-degree (latitude and longitude) grids for different soil types (low sensitivity, moderately sensitive, and sensitive).

All of the Northeastern quarter of Alberta is considered to be "sensitive" soils.[65] Therefore, the ADMF defines the following deposition loads for the Shell Regional Study Area:[66]

Critical Load:

- "the highest load that will not lead to long-term, harmful changes to a receptor"
- 0.25 keq H+ ha^{-1} yr^{-1} for sensitive grid cells

Emission Reduction Management: Implementation of more restrictive management processes

Target Load:

- "the level of deposition that consider the critical load and is practically and politically achievable"
- 0.22 keq H+ ha^{-1} yr^{-1} for sensitive grid cells

Emission Minimization Management: Management of new and expanding emission sources with focus on emission minimization. Monitoring and study of receptor sensitivity are to be conducted.

Monitoring Load:

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[62] Alberta Environment, Alberta Acid Deposition Management Framework (2008), Forward

[63]The ADMF Notes: "As structured and applied, the management framework should all but eliminate the possibility that the critical load will be exceeded within any grid cell". See: Alberta Environment, Alberta Acid Deposition Management Framework (2008), Pg.10.

[64] The ADMF notes: "the Strategy is designed to prevent an acidification problem from developing in areas already identified as clean. This is embodied in the nationally adopted principle of "keeping clean areas clean". This principle supports use of best available technology to minimize acidifying emissions in regions where acidification problems do not currently exist." See: Alberta Environment, Alberta Acid Deposition Management Framework (2008), Pg. 1.

[65] Alberta Environment, Alberta Acid Deposition Management Framework (2008), Pg. 6.

[66] Ibid., Pg. 3 & 7.

- "the level of deposition predicted or estimated by a dispersion model and deposition model that trigger monitoring and/or research"
- 0.17 keq H+ ha^{-1} yr^{-1} for sensitive grid cells

Emission Minimization Management: Management of new and expanding emission sources with focus on emission minimization.

5.3.2.1.1 Management Actions

The management actions that occur when Target and Critical levels are exceeded are of particular importance. They can be summarized as follows:

Exceedance of Target Load[67]

- Development of an Acid Deposition Management Plan for regions where cells exceed the target load (Acid Deposition Management Zone). The plan will include:
  - A program to evaluate emissions reductions necessary to reduce deposition to less than the target load
  - A process to allocate emission reduction target to regulated emission sources (modification of approvals accordingly)
  - Approval of new emission sources only in a manner that will not increase deposition in the grid cell and will meet reduction targets for the zone
- Conditions for approval of licensed sources (10 tonnes per day of SO_2+NO_x)
  - An offset equivalent to the new source garnered from other sources in the grid
  - An offset of deposition neutrality garnered from other grid cells if they are within the Acid Deposition Management Zone

Exceedance of Critical Load[68]

- As structured for Target load exceedances, this condition should not occur
- In the event that a critical load is predicted or observed, an emission reduction management plan (as described for Target Load exceedance) shall be developed by the stakeholder and shall be developed on an accelerated schedule.

5.3.2.1.2 Exceedances

Exceedances of load levels are determined by Alberta Environment and Sustainable Resource Development acid deposition assessments that occur on a 5-year cycle.[69] The

[67] Ibid., Pg. 7 to 9.

[68] Alberta Environment, *Alberta Acid Deposition Management Framework* (2008), Pg. 10.

[69] Alberta Environment, *Alberta Acid Deposition Management Framework* (2008), Pg. 5.

first assessment was completed in 2004 and the next assessment is scheduled for some time in 2012.[70]

This represents a challenge when evaluating proposed oilsands projects. Exceedances and management actions are triggered by 5-year assessments of current conditions, and therefore, fail to account for already approved oilsands projects that have not yet started operation. Currently, of the 5.1 million barrels per day of capacity already approved, approximately 3 million barrels per day of approved capacity will not yet be operation in the 2012 assessment cycle.

5.3.2.2 Cumulative effects of development: Case & Application Case

As Shell describes in their application, there are 20 ADMF grid cells overlaying the air modeling region. The proposed project is located in grid cells 57°×111°, 58°×111°, 57°×112° and 58°×112°.[71] The approximate location of the Jackpine Mine Expansion is illustrated in Figure 6 relative to the nearby ADMF grid cells.

Figure 6: Location of proposed project relative to ADMF grid cells. Produced via Google Earth ©.

[70] Government of Alberta, "Acidifying Emissions", http://environment.alberta.ca/02830.html , Updated February 2012.

[71] Shell Canada Ltd., Jackpine Mine Expansion & Pierre River Mine Project, Volume 3, Pg. 3-88.

According to Shell's air emissions modeling (shown below in Figure 7**),** Potential Acid Input deposition rates are predicted to exceed critical levels for two of the grid of the 4 grid cells in close proximity to the project.

Table 4.3-2 2012 Base Case, 2012 JME Application Case and 2012 Planned Development Case Gross Potential Acid Input Predictions for 1° by 1° Grid Cells

Grid Cell Centre[a]	1995 Background[b] [keq/ha/yr]	2012 Base Case[c] [keq/ha/yr]	2012 JME Application Case[c] [keq/ha/yr]	2012 PDC[c] [keq/ha/yr]
58°×113°	0.040	0.067	0.068	0.080
58°×112°	0.033	0.090	0.090	0.131
58°×111°	0.030	0.104	0.106	0.135
58°×110°	0.024	0.065	0.066	0.079
58°×109°	0.030	0.054	0.054	0.062
57°×113°	0.054	0.096	0.096	0.123
57°×112°	0.047	**0.267**	**0.268**	**0.364**
57°×111°	0.043	**0.297**	**0.304**	**0.397**
57°×110°	0.044	0.121	0.121	0.147
57°×109°	0.044	0.087	0.087	0.102
56°×113°	0.075	0.109	0.109	0.138
56°×112°	0.060	0.122	0.122	0.160
56°×111°	0.065	0.186	0.186	0.245
56°×110°	0.062	0.144	0.144	0.180
56°×109°	0.062	0.111	0.111	0.129
55°×113°	0.117	0.132	0.133	0.142
55°×112°	0.102	0.131	0.131	0.146
55°×111°	0.099	0.167	0.167	0.191
55°×110°	0.092	0.154	0.154	0.175
55°×109°	0.073	0.106	0.106	0.119

(a) The 1° by 1° grid cells are centred on the listed latitude and longitude.

(b) Background PAI values were determined by Alberta Environment (AENV) using the RELAD model (Cheng 2001), except where noted.

(c) The predictions include the background PAI predicted by AENV (Cheng 2001).

Note: Values in bold indicate Potential Acid Input predictions that are higher than the 0.25 keq/ha/yr critical load for sensitive ecosystems.

Figure 7: Shell's acid deposition modeling data results[72]

These exceedances are predicted to occur first under the Base Case, then the degree of exceedance increase in the Application Case and subsequent PDC.

As Shell summarizes: "*[t]he predicted PAI levels in grid cells 57^o×111^o and 57^o×112^o are higher than the 0.25 keq/ha/yr critical load for sensitive ecosystems. These two grid cells contain most of the oil sands development in the region, including the JME development area and existing, approved and planned open-pit mining operations*".[73]

In addition, Shell's air emission modeling also predicts critical load exceedances for the acid deposition rates over 23 lakes in the region. As shown in Figure 8, 21 lakes are already predicted to exceed critical acid input loads under the Base Case. With the

[72] Shell Canada Ltd., Joint Review Panel Supplemental Information Requests, May 2012. Appendix 3.2: Air Emissions and Prediction, Table 4.3-2, Pg. 41.

[73] Shell Canada Ltd., Joint Review Panel Supplemental Information Requests, May 2012. Appendix 3.2: Air Emissions and Prediction, 41.

additional emissions from the proposed project and other planned development, a further 2 lakes are also predicted to exceed critical levels (PDC).

Table 6.2-1 Acid Input and Nitrogen Deposition Rates for 23 Lakes With Planned Development Case Exceedances of the Critical Load

Lake Identifier[a]	Lake Name/ Original Identifier	Distance [km][b]	Direction[b]	pH	Critical Load [keq H^+/ha/yr]	Lake Net PAI [keq H^+/ha/yr]			
						Calibrated Background[c]	2012 Base Case	2012 JME Application Case	Planned Development Case
81	L1[e], L1[f]	29	E	6.3	0.18	0.08	0.21	0.21	0.23
464	PM1[g]	29	E	4.2	-0.27	0.04	0.17	0.17	0.20
150	P27[g], P27[f]	34	ESE	5.2	-0.02	0.03	0.14	0.14	0.16
82	14[h], 170[i], L4[e], A170 (L4)[f]	34	ESE	6.0	0.07	0.12	0.23	0.23	0.25
83	L7[e], L7[f]	42	ESE	6.4	0.19	0.11	0.21	0.21	0.23
437	P72(e)	74	NW	5.9	0.48	0.45	0.48	0.48	0.49
469	PT2[g]	74	NW	5.0	0.23	0.39	0.42	0.42	0.43
34	UNL1[j]	98	SSE	6.1	0.04	0.05	0.25	0.25	0.28
40	L11[j]	100	S	6.0	0.08	0.13	0.23	0.23	0.26
39	L10[j]	101	S	5.8	0.02	0.08	0.18	0.18	0.21
97	Clayton	105	NNW	4.3	-0.08	0.01	0.03	0.03	0.04
115	21[i], A21[f]	109	S	5.0	-0.07	0.13	0.21	0.21	0.24
116	24[i], A24[f]	113	S	4.7	-0.10	0.03	0.10	0.10	0.13
117	26[i], A26[f]	114	S	5.6	0.01	0.03	0.11	0.11	0.14
143	25[i], 25 (287)[f]	115	S	5.2	-0.05	0.03	0.10	0.10	0.13
144	27[i], 27 (289)[f]	116	S	6.5	0.03	0.02	0.08	0.08	0.12
179	31[i]	116	S	5.6	-0.06	0.06	0.13	0.13	0.16
96	28[h], L28[e], L28[f]	117	NW	5.2	-0.01	0.04	0.06	0.06	0.06
178	30[i]	118	S	5.2	-0.10	0.02	0.09	0.09	0.12
145	28[i], 28 (290)[f]	119	S	5.9	0.02	0.02	0.09	0.09	0.12
118	29[i], A29[f]	119	S	5.8	0.00	0.02	0.08	0.08	0.10
95	29(j), L27(g)	122	WNW	6.3	0.07	0.05	0.07	0.07	0.08
121	59[i], A59[f]	173	SSW	5.2	0.02	0.04	0.06	0.06	0.08

[a] Identifier used in Volume 3, Figure 5.5-3 of the EIA showing lake locations.
[b] Distance and direction relative to the JME plant site.
[c] Estimated background acid input based on measured nitrate and sulphate concentrations in lakes (EIA, Appendix 3-13, Section 6.2).
[d] Estimated nitrogen deposition rates from the AENV RELAD modelling (Cheng 2001).
[e] Identifier used by Saffran and Trew (1996).
[f] Identifier used by RAMP (2004).
[g] Identifier used by WRS (2004) for one hundred ponds sampled within the Oil Sands Region during September 2000.
[h] Identifier used by Erickson (1987).
[i] Identifier used by Syncrude (2000).
[j] Identifier used by previous EIAs.
Notes: Lake net PAI values above the critical load are shaded.
Percentage changes were calculated based on data with more than two decimals.

Figure 8: Shell's acid deposition modeling for lakes in the Regional Study Area.[74]
Note: critical levels vary by lake, see column 6 "Critical Load".

5.3.2.3 Shell mine fleet emission model analysis

The models for NO_2 concentrations under the different scenarios include inputs for mine fleet emissions (shown in Figure 5) based on modestly conservative assumptions, according to Shell. However, unlike the air quality model predictions, the Potential Acid Input model used a far less conservative value for mine fleet NO_2 emissions (shown on the lower red line on the figure).

5.3.2.4 Conclusions for acid deposition rates

In accordance with the objectives of Alberta's ADMF, it is in public interest to avoid exceeding critical acid deposition levels in the lower Athabasca region and to strive towards maintaining or reducing the current levels of acid input in the region.

While no grid cells areas are currently exceeding critical loads in the oilsands region, modelled data provided by Shell's data indicates that when the oilsands development

[74] Figure from A3.2 2012, Pg. 126

already approved under the Base Case is operational, PAI levels are expected to exceed the critical levels for two grid cells and 21 lakes (23 lakes under PDC).

As the ADMF clearly states, areas with currently low levels of acid deposition must be maintained and an acid deposition plan must be enacted in regions exceeding target levels in order to prevent regional deposition from exceeding critical levels. While these management actions may not be required at this time under the framework, it is clear that approved oilsands projects are already dramatically breaching the intent of the ADMF.

As such, with the Project emitting a further 2,117 tonnes of NO_x and 7.3 tonnes of SO_2 each year in the already constrained regional airshed, the adverse effects of this project are clearly significant and they are not sufficiently mitigated.

5.4 IMPACTS TO WATER QUALITY IN THE MUSKEG RIVER BASIN

Dr. David Schindler's Expert Report is attached as Appendix A.

5.5 END PIT LAKES - UNCERTAINTY AND LONG TERM RISKS TO WATER QUALITY

Dr. Glen Miller's Expert Report is attached as Appendix B.

5.6 WATER WITHDRAWALS AND PROTECTION OF THE ATHABASCA RIVER

5.6.1 Project impacts

The Athabasca River would be the primary source of process water for the Project. Water requirements for the expanded Jackpine Mine will exceed the existing water licence allocation from the Athabasca River. The maximum annual makeup water requirements for the expanded Jackpine Mine will exceed the Jackpine Mine – Phase 1 Stage 1 licence allocation of 65.3 Mm^3/a in 2018. An application will be made under the *Water Act* to increase the annual Stage 2 allocation by 18 Mm^3/a, to 53.5 Mm^3/a.[75]

The Project's cumulative impact with existing and approved projects will result in changes to Athabasca River flows during various phases of projects, including construction, operation and closure. During mine operation, muskeg drainage and overburden dewatering will increase the flows while closed-circuit operations will reduce flows. After closure, reclaimed surfaces will have different runoff characteristics than the natural basin and will increase runoff to Athabasca River.[76]

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[75] Stage 2 of the Jackpine Mine – Phase 1 water licence reduces the allocation to 35.3 Mm3/a. This allocation will not be enough to support the expanded Jackpine Mine. Application for the Approval of the Jackpine Mine Expansion Project, Volume 1: Project Description (2007) P. 10-10, 10-11.

[76] Shell Canada Limited Surface Water Hydrology Assessment Jackpine Mine Expansion & December 2007 Pierre River Mine Project. P 6-344

Total peak water withdrawals for the 2012 Planned Development Case is approximately 34.6 m3/second compared to 27.6 m3/second for the Application Case.[77] If the quantity of water being withdrawn from the Athabasca River is constrained for short periods of time during exceptional low-flow periods, Shell proposes that it will be able to maintain process water requirements from water inventory in the external and in-pit tailings ponds and from a raw water storage facility.[78]

Shell has assessed its water needs for the integrated Jackpine Mine operations and sized water storage to allow for only 30 days of no withdrawals from the Athabasca River. [79] While Shell believes that during periods of constrained water withdrawal from the Athabasca River the amount of stored water will allow both the base Jackpine Mine operations and the Jackpine Mine Expansion to maintain regular operations, 30 days storage is not considered a best practice.[80] It is also inconsistent with other recent mine plans and approvals (for example Total Joslyn Mine, ERCB decision 2011-005).

The existing network of flow and water level monitoring stations in the region are operated by RAMP and Shell's own monitoring.[81] To date, a number of independent commentators and government reports have indicated that water monitoring in the Athabasca region is inadequate.[82] Due to RAMP's reported problems with the existing sampling programs, a general lack of understanding of baseline conditions and inadequate analytical capabilities, it is inappropriate to draw conclusions regarding new projects or impacts based on RAMP data.

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[77] A2 Cumulative Effects, May 2012 Project No. 10-1346-0001, p. 85-87

[78] Application for the Approval of the Jackpine Mine Expansion Project Volume 1: Project Description (2007) P. 10-10, 10-11

[79] Aquatics, SIRS 292 – 312, page 13-14.

[80] See: http://www.total-ep-canada.com/upstream/joslyn.asp for a description of Total's 90-day operational water storage system.

[81]Application for the Approval of the Jackpine Mine Expansion Project Volume 1: Project Description (2007) P. 10-10, 10-11

[82] The critical reviews focused on either provincial or federal responsibilities in the management of surface and/or groundwater in the Athabasca region: 1) *Royal Society of Canada Expert Panel*; 2) Oilsands Advisory Panel, *A Foundation for the Future: Building an Environmental Monitoring System for the Oilsands*, report to the Minister of the Environment (2010) http://www. ec.gc.ca/pollution/default.asp?lang=En&n=E9ABC93B-1; 3) Commissioner of the Environment and Sustainable Development, Auditor General of Canada, "2010 Fall Report of the Commissioner of the Environment and Sustainable Development," http://www.oag-bvg.gc.ca/internet/English/ parl_cesd_201012_e_34435.html; 4) Alberta Innovates – Technology Futures, 2010 *Regional Aquatics Monitoring Program (RAMP) Scientific Review* (2011). http://www.ramp-alberta. org/UserFiles/File/RAMP%202010%20Scientific%20Peer%20 Review%20Report.pdf. 5) Water Monitoring Data Review Committee, *Evaluation of Four Reports on Contamination of the Athabasca River System by Oilsands Operations*, report to the Government of Alberta (2011) http://environment.alberta. ca/03380.html and 6) Environment Canada, *Lower Athabasca Water Quality Monitoring Program: Phase 1. Athabasca River Mainstem and Major Tributaries* (2011), 5. http://www.ec.gc.ca/Content/C/C/D/ CCD671FE-57FE-4030-B205-9478C7640982/WQMP_ENG. pdf

5.6.2 Background

Oilsands mining operations in northeastern Alberta require substantial amounts of water, particularly from the Athabasca River. Although the per-barrel use of water has decreased, the steady increase in production and cumulative water withdrawals from the Athabasca River, particularly during low flow periods,[83] represent a risk to the aquatic ecosystem. Industrial withdrawals are especially a risk for the Lower Athabasca River as it has experienced a 30% decrease in average low flows over a 40-year period.[84]

The Athabasca River's flow greatly varies throughout the year, with high flow periods during the summer months and low flow periods during the winter months. Too much water withdrawn from the Athabasca River, particularly during low flow periods, will compromise the ecological integrity of the river and the natural areas that rely on the river's seasonal flows, such as the Peace Athabasca delta.

During low flow periods, the Athabasca River is susceptible to low oxygen levels, which are known to be "detrimental to the eggs and fry of fall-spawning species such as lake whitefish and bull trout."[85] Low flows are stressful for fish and other aquatic life, as water quality may change, habitat availability is reduced, and food sources may decrease.[86] Because water withdrawals have a direct influence on flow, altered flows reduce the available habitat and it is thought that withdrawing water during low-flow winter periods jeopardizes the overwintering survival of many fish and other aquatic species.[87] Maintenance of the quantity and quality of winter habitat may be the primary factor regulating the carrying capacity of northern rivers.[88] High flow periods are also critical to the integrity of the river system since the high flows "shape the morphometry of river channels" and "flood the shallow side channels and mouths of tributaries...which are critical nursery habitats for young fish and other organisms."[89]

The establishment and enforcement of an Ecosystem Base Flow (EBF) for the Athabasca River is a missing and long overdue element of responsible oilsands development. An

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[83] The oil sands mining industry's existing and anticipated water demand is small compared with the volume of water in the river during periods of high flow, or even compared with the river's average annual flow; in winter, however, the industry's demand accounts for a much greater proportion of the natural water supply.

[84] Squires, A. J., C. Westbrook, and M. G. Dube, "An approach for assessing cumulative effects in a model river, the Athabasca River basin" in *Integrated Environmental Assessment and Management* 6 (1): 119–134. (accessed February 14, 2011).

[85] Schindler, David W. et. al. 2007. Section 1: Future Water Flows and Human Withdrawals in the Athabasca River. In Running out of Steam? Oilsands Development and Water Use in the Athabasca River-Watershed: Science and Market Based Solutions. http://www.ualberta.ca/~ersc/water.pdf p. 6

[86] Bradford, M.J., and J.S. Heinonen. 2008. Low flows, instream flow needs and fish ecology in small streams. Canadian Water Resources Journal, 33:165–180.

[87] Ibid.

[88] Power, G., R.S. Brown, and J.G. Imhof. 1999. Groundwater and fish – insights from northern North America. Hydrological Processes, 13:401–422 as cited in Lebel, Mathieu, Tony Maas, and Robert Powell. 2011 *Securing Environmental Flows in the Athabasca River*. WWF-Canada.

[89] Schindler, David W. et. al. 2007. p. 7

EBF is "a low-flow threshold below which all water withdrawals should cease."[90] Below this threshold, aquatic and biotic life requires all of the available water in the river and withdrawals would pose unacceptable risk to ecological integrity of the River.

The Phase 1 of the Water Management Framework does not include an EBF and is inadequate without it.[91] The government of Alberta noted that the Phase 2 plan would include an EBF, "to ensure the aquatic ecosystem will be sustained into the future" and that it would further utilize "scientific and traditional knowledge of the lower Athabasca gathered over the years to assess possible limitations established in Phase 1."[92] Alberta committed to begin implementation of the Phase 2 plan no later than over two years ago in September 2010,[93] recognizing that the Phase 1 plan was only an interim framework.

The absence of an adequate framework to protect the Athabasca River was noted by previous Joint Review Panels. Despite numerous recommendations from Joint Review Panels over the past 8 years, the Governments of Canada and Alberta have failed to complete the management framework. Furthermore, the impact of a protective EBF on industry would likely be negligible at the EBF threshold explored by past multi-stakeholder efforts (87 m^3/sec), which corresponds to the one-in-a-hundred year weekly average low flow for the winter period in the lower Athabasca River.[94] Statistically, only legacy producers would be affected by an EBF at this level on average once in a century.[95]

Six years ago, the Radke report, *Investing In Our Future: Responding to the Rapid Growth of Oil Sands Development,* noted that "over the long term the Athabasca River may not have sufficient flows to meet the needs of all the planned mining operations and maintain adequate stream flows."[96] Similarly, the National Energy Board also indicated that water withdrawals are not sustainable.[97] Recognizing the environmental, social and economic benefits of an EBF, past panels reviewing oilsands mine projects have noted:

Jackpine Decision Report (2004):

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[90] Lebel, Matt. et. al. 2011. *Securing Environmental Flows in the Athabasca River*. World Wildlife Fund. http://assets.wwf.ca/downloads/wwf_canada_athabasca_report.pdf p. 5

[91] Schindler, David W. et. al. 2007. p. 11

[92] Government of Alberta. 2007. Athabasca River Water Management Framework. http://environment.alberta.ca/documents/Athabasca_RWMF_Highlights.pdf. p. 5

[93] Government of Alberta. 2007. Athabasca River Water Management Framework.

http://environment.alberta.ca/documents/Athabasca_RWMF_Highlights.pdf. p. 5

[94] Ohlson, D., G. Long, and T. Hatfield. 2010. Phase 2 Framework Committee Report. Report submitted to Alberta

Environment / Fisheries and Oceans Canada, and the Cumulative Environmental Management Association.

[95] Lebel, Mathieu, Tony Maas, and Robert Powell. 2011 *Securing Environmental Flows in the Athabasca River*. WWF-Canada.

[96] Radke, Doug. 2006. Investing In Our Future: Responding to the Rapid Growth of Oil Sands Development p.112 and p.133.

[97] National Energy Board. 2006. Canada's Oil Sands: Opportunities and Challenges to 2015: An Update. http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/lsnd/pprtntsndchllngs20152006/pprtntsndchllngs20152006-eng.pdf p. 38

> *..the Department of Fisheries and Oceans (DFO) collaborate with Alberta Environment (AENV) in the establishment of instream flow needs (IFN) for the Athabasca River in the event that the Cumulative Environmental Management Association (CEMA) fails to meet its timelines.*[98]
>
> *With respect to IFN, the Panel agrees that there is a need for CEMA and AENV to implement a management system prior to water withdrawals by Shell for the project. The Panel expects CEMA to make its recommendation for an IFN management system to AENV by the end of 2005. The Panel recommends that AENV establish IFN for the Athabasca River in collaboration with DFO in the event that CEMA fails to meet its timelines. The Panel supports AENV amending existing Water Act licences for IFN management, if that becomes necessary.* [99]

Imperial Kearl Decision Report (2007):

> *Phase II of the Water Management Framework be implemented by January 1, 2011, in keeping with the stated commitments of the Governments of Alberta and Canada.*
>
> *DFO and AENV incorporate an ecological base flow into the final Water Management Framework for the Athabasca River.* [100]

In the Kearl decision report the Panel noted that "*The Joint Panel believes that water could be the factor that limits oil sands development*" and, "*The Joint Panel concludes that with implementation of Phase I of the joint AENV/DFO Water Management Framework and completion of the work proposed in Phase II and in the above recommendations, significant adverse environmental effects associated with water withdrawals from the Athabasca River for use in the KOS Project are unlikely*." [101]

The 2007 Joint Review Panel for the Kearl Oil Sands Project strongly recommended that both the Fisheries and Oceans (DFO) and Alberta Environment (AENV) incorporate an EBF in the Final Water Management Framework. The federal government accepted the panel's EBF Recommendation and in the DFO's response, committed to incorporating an EBF in the final water management plan,[102] however there is still no EBF in place. With multiple oilsands operations under construction and in the planning phase, in combination with the impacts of changing climate, "it is clear that under the [current] Management Framework, there will be insufficient water for future oil sands development".[103]

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[98] EUB/CEAA Joint Review Panel Report (EUB Decision 2004-009) (February 5, 2004) p.1

[99] EUB/CEAA Joint Review Panel Report (EUB Decision 2004-009) (February 5, 2004) p. 30-31

[100] EUB/CEAA Joint Review Panel Report (EUB Decision 2007-013) (February 27, 2007). p.2

[101] EUB/CEAA Joint Review Panel Report (EUB Decision 2007-013) (February 27, 2007). p.74

[102] DFO. 2007. The Government of Canada's Response to the Environmental Assessment Report of the Joint Review Panel on the Kearl Oil Sands Project. http://www.ceaa.gc.ca/052/document-html-eng.cfm?did=22841 . Canadian Environmental Assessment Agency, Canadian Environmental Assessment Registry 05-¬07-¬16237.

[103] Schindler, David W. et. al. 2007. p. 7

Furthermore, in 2010, DFO's Canadian Science Advisory Secretariat noted in the summary of its Science Advisory Report that, "Although uncertainty exists around what constitutes an ecosystem base flow (EBF), there was concurrence that a flow should be established for the Lower Athabasca River below which there would be no water withdrawal. Participants agreed that this flow should be established using a precautionary approach…" [104]

5.6.3 Recommendations

The industry and stakeholder committee considering the Phase 2 Athabasca Management Framework agreed in principle to an EBF established at 87 cubic metres per second (cms) on the Lower Athabasca River as an important contributor to protecting the integrity of the River system.[105] First Nations and the Pembina Institute have recommended an EBF of 100 cms as a precautionary approach until a more scientific consensus can be reached. See *Solving the Puzzle*[106] and *A Review of Lower Athabasca River Instream Flow Needs Phase 2 Water Management Framework: Fishes and their Habitat*[107] for further discussion on this metric. The implementation of an EBF can be effectively mitigated through the construction of water storage facilities and other mitigation options upstream of mine operations, which would help supplement water needs during low flow periods. Newer projects including Total E & P Canada's Joslyn mine have responsibly planned for 90 days of water storage and are thus able to cease or limit withdrawals during low flow periods.[108]

The Governments of Alberta and Canada have not met previous panel recommendations to implement a Phase 2 framework for the Athabasca River that includes an EBF beyond which further water withdrawals would be prohibited. Since the recommendations made in 2007 have not been completed, it is time for the panel to act on previous panel statements and limit oilsands development until protection of the Athabasca River can be assured. We strongly urge the panel to not make further circular statements that conclude

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[104] DFO. 2010. Science Evaluation of Instream Flow Needs (IFN) for the Lower Athabasca River. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/055. Page 3. Available from: http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2010/2010_055-eng.html

[105] Olson, D., G. Long and T. Hatfield. 2010. Phase 2 Framework Committee Report. Report submitted to Alberta Environment / Fisheries and Oceans Canada, and the Cumulative Environmental Management Association. "The EBF threshold the P2FC explored, 87 m3/sec, was calculated by averaging the weekly one-in-a-hundred-year low flows for weeks 1 through 11 in the lower Athabasca River. For reference, the lowest weekly average flow observed over the 50-year period of record (1958-2007) was 88 cubic metres per second." (Lebel, 2011)

[106] Grant, Jennifer, Simor Dyer, Marc Huot, Danielle Droitsch (2011) Solving the Puzzle: Environmental Responsibility in Oilsands Development. http://www.pembina.org/pub/2210

[107] Athabasca Chipewyan First Nation and Mikisew Cree First Nation, (2010) A Review of Lower Athabasca River Instream Flow Needs Phase 2 Water Management Framework: Fishes and their habitat. http://www.ceaa.gc.ca/050/documents_staticpost/cearref_37519/44815/A07.pdf

[108] See: http://www.total-ep-canada.com/upstream/joslyn.asp for a description of Total's 90-day operational water storage system. This system exceeds industry standards and reduces the impact of water withdrawal from the Athabasca River during low flow conditions in winter months, when aquatic life conditions are most sensitive.

no significant environmental effects based on a proposed policy action that has not been implemented. Until the Phase II framework with a binding EBF is implemented, there is significant risk to the Athabasca River during periods of low flow.

Given the failure of governments to act over the past 8 years, the panel must judge the current application on the merits of the current policy environment – that is, no protection of the Athabasca River during periods of low flow.

5.7 GREENHOUSE GAS MANAGEMENT AND CLIMATE CHANGE

Greenhouse gas emissions emitted anywhere in the world contribute to climate change, and, if unmitigated, will have significant adverse effects. It is the responsibility of all countries contributing GHG emissions to the atmosphere to play a role in avoiding reducing emissions below levels consistent with dangerous climate change. This is particularly true for Canada and the province of Alberta who have made formal commitments to reducing their emissions.

As a result of inadequate climate change policies and significant forecast increases of oilsands GHG emissions, both the government of Canada and the government of Alberta are currently failing to reduce emissions to levels in compliance with their 2020 policy commitments. The Shell Jackpine Expansion Project will further increase Canadian GHG emissions, making it an even greater challenge for Alberta and Canada to meet their respective climate change policy commitments.

Meeting federal and provincial climate change commitments is in the public interest for Albertans, Canadians, and the global community. Unless Shell is willing to fully mitigate the GHG emissions associated with the Jackpine mine expansion, it is in the public interest not to approve this project.

5.7.1 GHG emissions of the Jackpine Mine Expansion

In the original 2007 JPME application, Shell provides GHG emission data for 2 project scenarios. Scenario 1 includes an asphaltene-fired cogeneration system while Scenario 2 includes a natural gas-fired cogeneration system. In a 2012 update, Shell states that they are no longer seeking an approval for an Asphaltene Energy Recovery system.[109] We are not aware of any further updates to GHG emission profiles from the proposed Project, therefore, it will be assumed that GHG emissions will be in alignment with Scenario 2 (2007).

The JPME represents a significant source of new GHG emissions. As outlined in Scenario 2, the Project will produce a total volume of GHGs amounting to 1.18 Mt CO_2e each year over the project life.[110] This would represent an increase of 2.5% in Alberta's

[109] Osler, Hoskin and Harcourt LLP, Terms of Reference for the Jackpine Mine Expansion Project CEAR Reference Number 10-05-59540, Response to Letter Dated January 9, 2012 (January 18, 2012) Page 6.

[110] Shell Canada Ltd., Jackpine Mine Expansion & Pierre River Mine Project, Volume 3, Pg. 3-106.

oilsands emissions (based on 2010 levels)[111] and an increase of Alberta's provincial emissions by 0.5% (based on 2010).[112] It is important to note that these figures do not reflect any emissions beyond the proposed Project boundaries that would occur directly as a result of the Project's approval (e.g. does not include upgrader emissions, refining emissions, and emissions associated with the combustion of the refined products). The current regulatory approach of examining only emissions directly on site and attributable to the project fails to consider these very significant sources of additional GHG emissions.

While it is the absolute emissions (total per year) of a project that are of relevance to climate change, it is also useful to examine the emissions intensity of a project proposal. Efforts to meet climate change commitments require significant reductions in emissions from all sectors. For example, in the oilsands industry, these reductions in absolute emission can be achieved by limited the total operating capacity of oilsands (assuming intensity remains constant) or by decreasing the emissions per barrel (assuming operating capacity remains constant). However, according to Shell's figures, the proposed Project does not reflect any emissions intensity improvements beyond already approved project.

The GHG intensity for the Jackpine mine expansion is 32.3 kg CO_2e per barrel of bitumen produced.[113]

This emissions intensity is the same value as estimated for the Jackpine Mine Phase-1 project approved in 2004.[114] In spite of a difference of 8 years, the proposed Project does not represent any level of improved technology (in terms of GHG emission intensity) over the existing facility.

5.7.2 Emissions in Context

5.7.2.1 Planned growth of oilsands GHG emissions

In order to fully understand the climate change implications of the JPME, it is necessary to consider the proposed Project in the context of the existing oilsands approvals. Unlike other substance emissions, at this time a comparison of GHG emissions relative to PIC, Base Case, Application Case, and PDC is not required. Shell also did not include such an assessment on a voluntary basis, in spite of Environment Canada's requests for a PDC emission inventory. Shell stated:

"Cumulative GHG emission estimates for the PDC are not required under the FTOR or JRP TOR; however, EC regularly publishes GHG emission estimates for industrial

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[111] Environment Canada, Canada's Emissions Trends 2012 (August 2012), available at http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=253AE6E6-5E73-4AFC-81B7-9CF440D5D2C5

[112] Environment Canada, Canada's Emissions Trends 2012 (August 2012).

[113] Shell Canada Ltd., Jackpine Mine Expansion & Pierre River Mine Project, Volume 3, Pg. 3-106.

[114] According to the decision report date, the Shell Jackpine Mine Phase 1 was approved in 2004. See: Alberta Energy and Utilities Board, Joint Panel Report EUB Decision 2004-009, "Shell Canada Limited: Application for an Oil Sands Mine, Bitumen Extraction Plant, Cogeneration Plant, and Water Pipeline in the Fort McMurray Area", February 5, 2004. http://www.ercb.ca/decisions/2004/2004-009.pdf

sectors. Table 5 of the EC document "Canada's Emissions Trends", dated July 2011, provides GHG estimates for the oil sands sector and other industrial sectors in Canada through 2020. Therefore, the information requested is already available and EC can, if it so chooses, submit this document to the JRP."[115]

In the absence of a Base Case assessment, Figure 9 illustrates actual oilsands emissions from 1990 to 2010 along with Canada's 2012 emission trend analysis forecast for 2020.

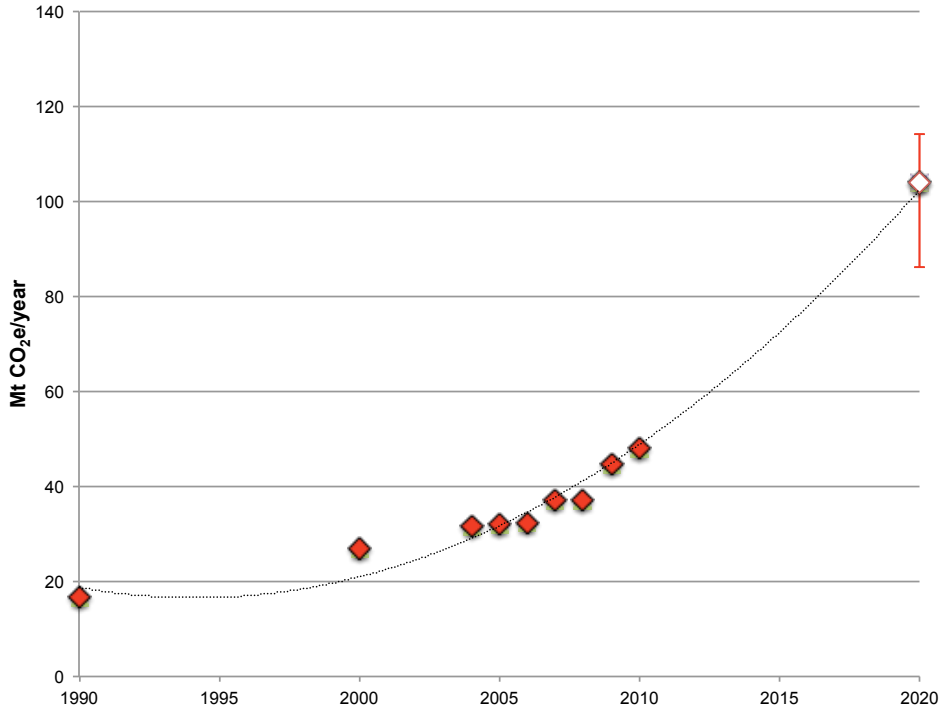

Figure 9: Oilsands emissions growth from 1990 to 2010 and forecast 2020 emissions[116]

The key values for oilsands emission forecasts (from the figure above) are summarized below:

- 1990
  - 1990 GHG emissions were 16.8 Mt per year
- 2010
  - Oilsands production was cited as 1.61 million barrels per day in 2010[117]

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[115] Osler, Hoskin and Harcourt LLP, Terms of Reference for the Jackpine Mine Expansion Project CEAR Reference Number 10-05-59540, Response to Letter Dated January 9, 2012 (January 18, 2012) Page 23.

[116] Values for 1990-2008, Source: Environment Canada, National Inventory Report: Greenhouse gas sources and sinks in Canada 1990-2008, Part 1, 2010. Available at http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=492D914C-2EAB-47AB-A045-C62B2CDACC29.

The value for 2009 was provided in an e-mail communication from Environment Canada officials.

Values for 2005 update, 2010, and 2020, source: Environment Canada, Canada's Emissions Trends 2012 (August 2012).

- 2010 GHG emissions were 48 Mt per year
- 186% increase in emissions relative to 1990 levels

- 2020
  - 116% increase in emissions relative to 2010 levels
  - Oilsands production was modelled as 3.26 million barrels per day in 2010[118] (this is approximately 64% of currently approved oilsands capacity)

From this data, it is clear that GHG emissions growth in the oilsands has been substantial and, without actions by regulatory panels, emissions will continue to increase well into 2020.

For further context, by 2020, Alberta and Canada's emissions are forecast to be 285 Mt per year and 720 Mt per year, respectively.[119] Therefore, by 2020, the oilsands are forecast to represent 36.4% of Alberta's GHG emissions and 14.4% of Canada's emissions. Figure 10 compares oilsands sub-sector emissions (extraction & upgrading) from 2010-2020 with other Canadian sub-sectors.

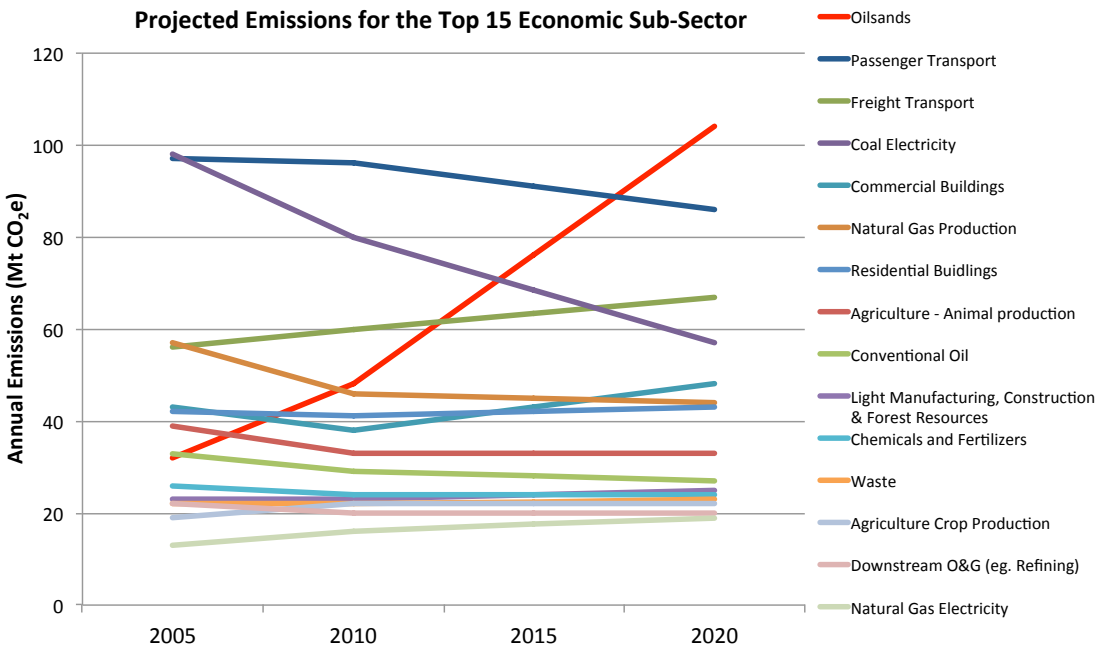

Figure 10: Oilsands emissions relative to other economic subsections (trend analysis)[120]

The significance of oilsands GHG emissions to Canada's (and Alberta's) climate change commitments is very clear. Where commitments require significant reductions in

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[117] Environment Canada, Canada's Emissions Trends 2012 (August 2012). Pg. 25.

[118] Environment Canada, Canada's Emissions Trends 2012 (August 2012). Pg. 25

[119] Environment Canada, Canada's Emissions Trends 2012 (August 2012). Pg. 33

[120] Environment Canada, Canada's Emissions Trends 2012 (August 2012).

emissions across all sub-sectors, the oilsands sub-sector stands out with the highest rate of emissions growth from 2010 to 2020.

Despite a stated federal commitment to reduce GHGs, there are no federal regulations in place to ensure emissions from the oilsands are mitigated. Therefore, it is important for the panel to carefully consider whether approval of the JPME is consistent with, or undermines, Canada's and Alberta's stated GHG reduction goals.

5.7.2.2 Federal climate change commitments

In 2009, Canada signed the Copenhagen Accord, committing the country to reduce its GHG emissions to 17% below 2005 levels by 2020.[121] This commitment matches reduction targets set by the United States.

Environment Canada's annual GHG trend reports compare outcomes under Canada's current climate policies relative to Canada's 2020 climate targets. Under current federal and provincial policies, Canada is failing to meet 2020 targets by nearly 50%.[122] The 2012 estimate is reproduced below in Figure 11.

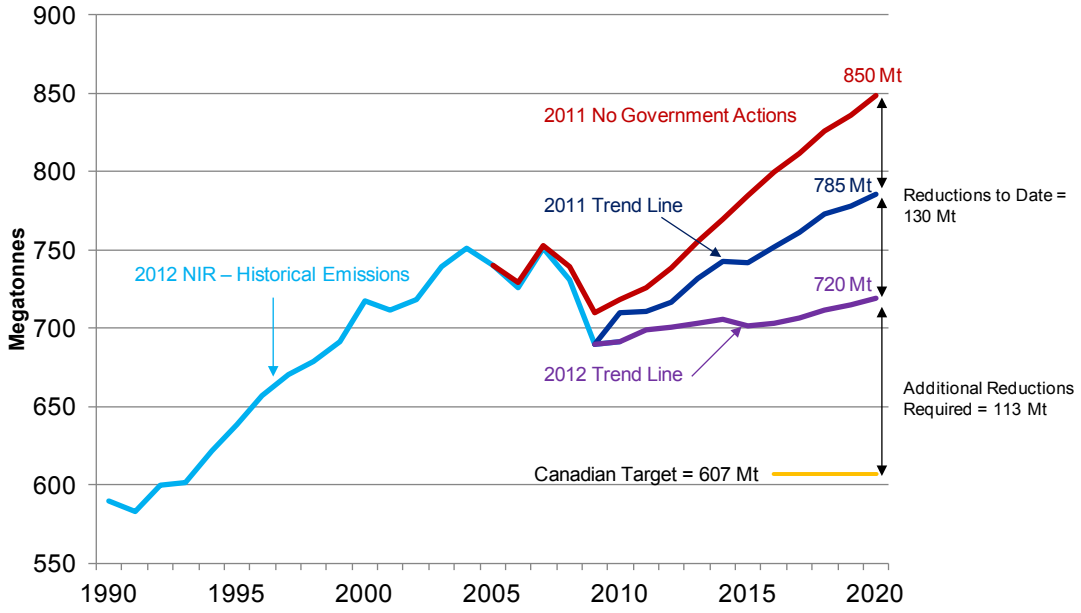

Figure 11: Canada's climate policy reductions relative to 2020 targets[123]

[121] Environment Canada, Canada's Emissions Trends 2012 (August 2012). Pg. 8.

[122] It can be argued that Canada is further than 50% away from its target given that 25 Mt of the reductions to date result from new accounting rules established by the UN for forestry and land-use change. This new accounting was applied only to current emissions not retro-actively to 2005 levels upon which Canada's targets were set. For more details, see: Pembina Institute Blog, P.J. Partington, "Are we there yet? Closing the gap on Canada's climate commitments", Available at http://www.pembina.org/blog/643

[123] Environment Canada, Canada's Emissions Trends 2012 (August 2012). Pg. 5.

As shown above, Canada's current climate change policies are failing to meet reduction commitments for 2020.

As summarized by the National Round Table on the Environment and the Economy:

"*Despite making progress in reducing GHG emissions, Canada is not on track to achieve the federal government's 2020 reduction target of 17% below 2005 levels. Canada will not achieve its 2020 GHG emission reductions target unless significant new, additional measures are taken. More will have to be done. No other conclusion is possible*."[124]

Narrowing the focus to oilsands, the federal government has failed to enact appropriate regulations to mitigate the GHG impacts of large industrial emitters. In 2007, it announced a framework for managing industrial emissions. It committed to enacting regulations limiting industrial GHG emissions by January 1, 2010.[125] Since this time, the federal government has taken the approach of applying sector-based regulations, starting with the coal-fired electricity sector. In September 2012, final coal-fired electricity sector regulations were announced.[126] To date, no announcement has been made for oil and gas sector regulations.

In summary, the business-as-usual emissions growth forecast for the oilsands sub-sector will make it very challenging for Canada to meet its 2020 climate change commitments. Not surprisingly, an assessment of current policies shows that the federal government is currently not on track to meet its commitments under a business-as-usual approach. Approval of the JPME is exacerbates this problem, and is therefore not in the public interest.

5.7.2.3 Provincial change commitments

Alberta has also adopted its own set of GHG targets and regulations[127] independent from Canada's commitments. The most recent version of Alberta's climate change plan,[128] published in 2008, sets a target to reduce annual emissions 50 Mt below business-as-usual by 2020, and a goal of halting the growth in Alberta's absolute GHG emissions by that year. This 2008 plan adds a target to halve business-as-usual emissions in 2050, and

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[124] National Round Table on the Environment and the Economy, "Reality Check: The State of Climate Progress in Canada", http://nrtee-trnee.ca/reality-check-the-state-of-climate-progress-in-canada (Accessed September 20, 2012).

[125] Government of Canada, Turning the Corner: Regulatory Framework for Industrial Greenhouse Gas Emissions, 2008, available at http://www.ec.gc.ca/Publications/C16DAFD9-E250-46DC-8B26-53F0DF2E7A75%5CTurning-The-Corner-Regulatory-Framework-for-Industrial-Greenhouse-Gas-Emissions.pdf

[126] Environment Canada, News Release: Harper Government moves forward on tough rules for coal-fired electricity sector, September 5, 2012, http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=4D34AE9B-1768-415D-A546-8CCF09010A23

[127] Province of Alberta, *Climate Change Emissions Management Act, Statues of Alberta*, 2003, Chapter C-16.7. Current as of July 1, 2009.

[128] *Alberta's 2008 Climate Change Strategy: Responsibility / Leadership / Action* (Edmonton, AB: Alberta Environment, 2008). Available at http://environment.gov.ab.ca/info/library/7894.pdf

also states this target as a 14 per cent reduction in annual emissions below the 2005 level. Alberta's climate change plan is illustrated below in Figure 12.

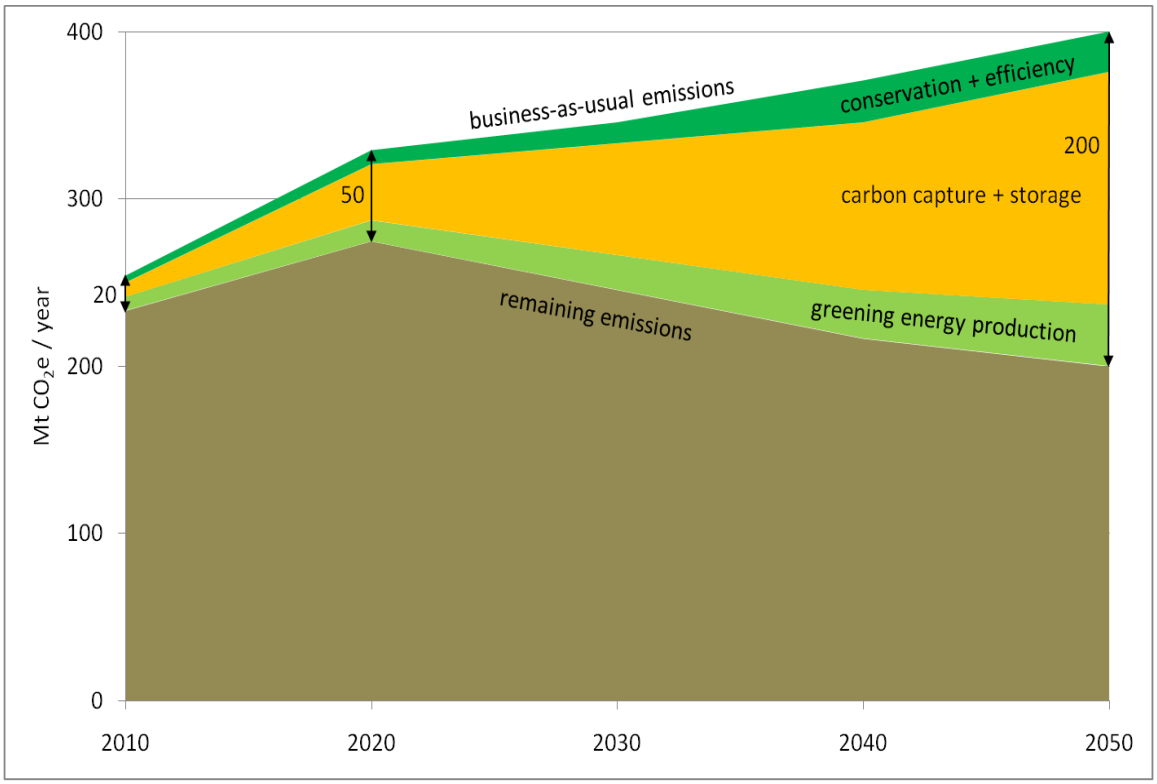

Figure 12: Alberta's climate change policy[129]

Note: The figure is reproduced faithfully from the Alberta plan, with one exception: we have included the commitment to a 20 Mt reduction in annual emissions in 2010, not depicted in the equivalent figure in the plan. The plan quantifies the size of the wedges only graphically pre-2050, but explicitly in 2050: 24 Mt for conservation and efficiency, 139 Mt for CCS, 37 Mt for greening energy production.

In terms of policy strength, Alberta's GHG emissions reduction targets for 2020 (50 Mt CO_{2e} reductions per year) fall short of requirements for Alberta to meet its fair share of reductions for Canada commitments (83 Mt CO_{2e} reductions per year) and substantially below science-based targets (146 Mt CO_{2e} reductions per year).[130] However, given that the Alberta government regulates oilsands, it is still important to compare Alberta's climate change policies with respect to the oilsands industry and to the proposed Project.

[129] Alberta's 2008 Climate Change Strategy: Responsibility / Leadership / Action (Edmonton, AB: Alberta Environment, 2008).

[130] Matthew Bramley, Marc Huot, Simon Dyer, Matt Horne, Responsible action? An assessment of Alberta's greenhouse gas policies (Pembina Institute: 2011), available at http://www.pembina.org/pub/2295 Table 6, Pg. 37.

To date, Alberta has not yet conducted a comprehensive review of the effective of its climate change relative to its climate change targets. However, the Pembina Institute's 2011 report *Responsible Action? An assessment of Alberta's GHG policies* evaluates the total anticipated 2020 GHG emission reductions from Alberta's policies relative to Alberta's 50 Mt CO_{2e} per year reduction commitment.[131]

According to this report under business as usual, Alberta is at best going to achieve less than 14 Mt of reduction per year by 2020, less than one third of its 50 Mt per year climate change commitment. Figure 13, below, provides an illustration of the emissions reductions achieved by Alberta's policies relative to the total reduction target for 2020.

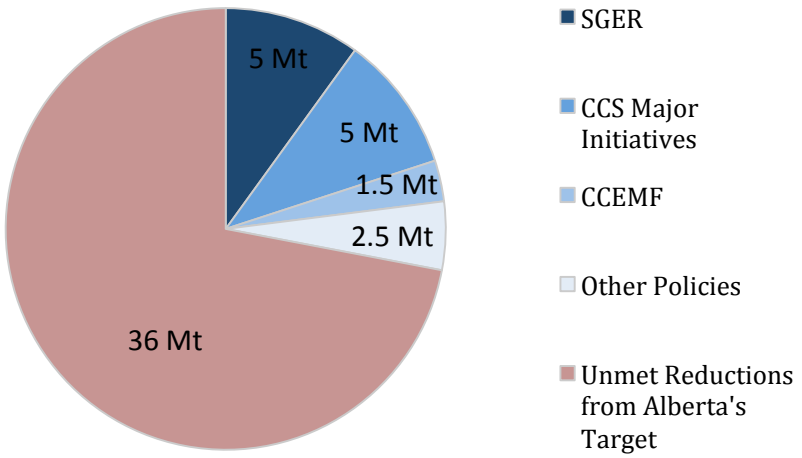

Figure 13: evaluation of effectiveness of Alberta's climate change policies relative to Alberta's 2020 target of 50 Mt reductions relative to business as usual.[132]

As noted earlier, the Project will produce a total volume of GHGs amounting to 1.18Mt CO_{2e} each year while 36 Mt of reductions already required. Therefore, were the panel to reject the JPME, this would contribute to helping achieve 3.2% of Alberta's remaining reduction target. Approving the JPME further undermines Alberta's stated GHG reduction goals.

5.7.2.4 Effectiveness of Regulations applicable to proposed project

As noted in the sections above, projected growth in the oilsands emissions are substantial. Forecast show oilsands emissions growing from 48 Mt CO_{2e} per year in 2010 to 104 Mt CO_{2e} per year in 2020 (this represents only approximately 64% of the oilsands already approved). In the context of Alberta's predicted failure to reduce emissions relative to its 2020 target, the oilsands emissions growth present a substantial further challenge for Alberta's climate change contributions.

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[131] Matthew Bramley, Marc Huot, Simon Dyer, Matt Horne, *Responsible Action? An assessment of Alberta's greenhouse gas policies* (Pembina Institute: 2011).

[132] Ibid., Table 2, Pg. 7-9.

As identified in *Responsible Action*, the strength of Alberta's climate change policies alone are largely incapable of mitigating the oilsands emissions and are inconsistent with its stated reduction commitments. As explained below, Alberta's key GHG emission policy applicable to the oilsands is not sufficient to drive significant on-site reduction in emissions. Therefore, if Alberta is to meet its stated GHG emission policy goals, it will be necessary for panels to recommend limiting the pace of oilsands expansion.

Alberta's Specified Gas Emitters Regulation

In 2007, the Alberta government released the *Specified Gas Emitters Regulation* for large GHG emitters, which took effect on July 1, 2007.[133] This policy is directly applicable to the majority of oilsands development. This regulation requires large emitter facilities (facilities emitting over 0.1 Mt CO_{2e} per year) to meet a 12% intensity reduction in GHG emissions relative the project's baseline.[134] Facilities with emissions higher than their targets can comply by making payments of $15 per tonne CO_2e into the Climate Change and Emissions Management Fund (see below) and by purchasing offset credits from projects in Alberta.[135]

Two key limitations of this policy prevent it from driving deep reductions in oilsands emissions:

1. The regulation required emissions reduction on an intensity basis of only 12%. At most, the policy could only drive oilsands emissions down 12% at the facility level. However, because the regulation is intensity-based, as the oilsands sector grows, absolute emissions from the oilsands will continue to grow.
2. The option to pay into the fund as a compliance option essentially establishes a ceiling price on carbon in Alberta. There is no economic reason why a facility would invest in on site reductions costing higher than this rate.

Carbon capture and storage is one technology that, in theory, could significantly decrease oilsands emissions. However, as shown in Figure 14, CO_2 capture costs[136] in the oilsands are an order of magnitude greater than the ceiling price on carbon in Alberta. Therefore, under Alberta's current policies, it is very unlikely that carbon capture and storage will result in the necessary reductions across the oilsands industry.

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[133] Alberta Environment, "Alberta first province to legislate greenhouse gas reductions," news release, March 8, 2007. Available at http://alberta.ca/home/NewsFrame.cfm?ReleaseID=/acn/200703/21142336C71FD-D012-F54F-468B7C8FB604858B.html.

[134] Province of Alberta, Specified Gas Emitters Regulation, Alberta regulation 139/2007, with amendments up to and including Alberta Regulation 127/2011.

[135] Ibid.

[136] In addition to the CO_2 capture costs, other costs are associated with transporting the captured CO_2 to the storage site in a pipeline and underground storage.

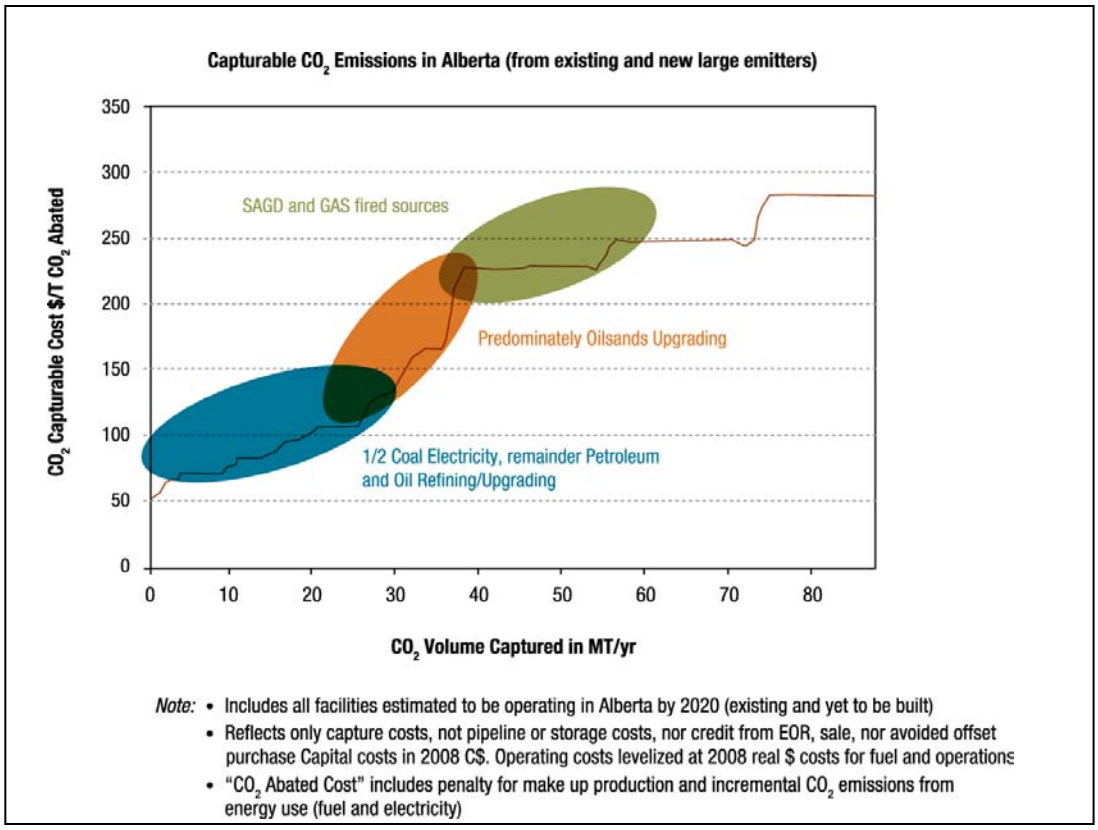

Figure 14: Carbon capture cost[137]

In summary, under Alberta's current policies, Alberta is failing to achieve its climate change reduction commitments for 2020 and Alberta's policies are not sufficient to drive deep reductions in the oilsands sector.

5.7.2.5 Compliance of the Project with current regulation

Ultimately, both Alberta and Canada are failing to meet their respective climate change commitments. At both government levels, the insufficiency or absence of climate policies allow the oilsands emissions to grow well past 2020, essentially unmitigated.

Without sufficient policies in place, approval of new oilsands projects may make it impossible for the governments to achieve their climate change commitments unless all new projects have a net-zero impact on GHG emissions in the province (and significant reductions are achieved in all already approved oilsands projects). By this standard, Shell's mitigation efforts for the JPME are insufficient.

At the project level, Shell does outline general mitigation measures in a GHG emission management plan for the proposed Project. Shell's key proposed mitigation measures are summarized as follows:[138]

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[137] Carbon Capture and Storage in the Alberta Oil Sands — A Dangerous Myth (Godalming, UK: WWF-UK, 2009), 29. Available at http://www.co-operative.coop/Corporate/PDFs/Tar%20Sands%20CCS.pdf.

- Mitigation efforts at other Shell projects where feasible (carbon capture and storage, efficiency, renewable energy, etc.)
- Designing CO_2 capture ready facilities were practical and economical
- Applying best practices to minimize fuel consumption
- Optimization and continuous improvement of efficiency
- Providing high-efficiency equipment and heat recovery equipment when warranted by size and economic considerations

These mitigation plans are very vague and in most cases are not specific to the proposed Project but rather are general across all of Shell's operations. Many of the measures (e.g. best practices to minimize fuel consumption) are simply standard operating principles for an economically and socially responsible operator. Furthermore, Shell is careful to limit their outlined mitigation efforts to measures that satisfy economic considerations. There is no clear commitment or specific measures identified to fully mitigate the absolute GHG emissions of the proposed Project. In their 2012 letter, Environment Canada adds that an outstanding issue with the Project application is its failure to demonstrate how Shell's planned or existing measures will contribute to minimizing or reducing GHG emissions in alignment with Canada's commitment to reduce emissions by 17% below 2005 levels by 2020.[139]

Therefore, is clear that at the project level, the JPME emissions are not adequately mitigated.

5.7.3 Summary

Immediate action is required to reduce GHG emissions and limit the global impacts of climate change. Because of inconsistency between climate policy commitments of Alberta and Canada and the regulations that are supposed to achieve those commitments, and Shell's failure to make voluntarily commitments to full emissions mitigation, the Project creates an undue environmental impact on the global climate.

OSEC believes the panel is bound by the public interest, and the policy commitments of Alberta and Canada to reduce GHG emissions. If the panel concludes by review of the evidence presented that Alberta's GHG regulations and Canada's lack of GHG regulations are unable to achieve Alberta's and Canada's GHG reduction targets, then rejection of the JPME is warranted. Approving a further oilsands project is clearly irrational.

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[138] Osler, Hoskin and Harcourt LLP, Terms of Reference for the Jackpine Mine Expansion Project CEAR Reference Number 10-05-59540, Response to Letter Dated January 9, 2012 (January 18, 2012) Page 23.

[139] Environment Canada, Re: Shell Canada's Jackpine Mine Expansion Project, Adequacy review of Shell Canada's May 15, 2012 updated information, August 2, 2012, Attachment 2.

5.8 SOCIOECONOMIC ISSUES

5.8.1 Growth

The pace of growth in Fort McMurray due to oilsands development has severely taxed the ability of the current municipality to plan effectively for development.[140]

The Regional Municipality of Wood Buffalo has experienced sustained economic growth as a result of the abundance oilsands deposits in the region. Between 2008 and 2010, the Municipality has seen a 1.0% increase in population over two years, which is lower than the 7.4% average annual growth rate between 2000 and 2010. The annual average growth of Canada and Alberta for the same time interval was 1.2 % and 2.8 %, respectively. The rapid pace of population growth is expected to resume as new oilsands projects come on stream in the next decade.

The connection between population growth and oilsands activity was evident when regional growth stagnated between 1989 and 1999, before the next major investments in the oilsands. The total population growth in Fort McMurray between 1989 (33,698) and 1999 (36,876) was 9.4%

While the high rate of population growth has been occurring since the late 1990's, what has changed in the last 5 years is the increased numbers of temporary workers that reside in project accommodations. The emergence of work camps as the dominant form of housing for construction workers began in about 2000. Since 2000, the project accommodation population has increased by 295% or an average of 17.1% annually.

Although the economic downturn temporarily impacted the growth rate of the region, forecasts from the Municipality's Planning and Development Department indicate that the municipality might reach a population of 205,000 by 2028. The population in Fort McMurray is forecasted to increase to 133,000 by 2028. The forecast is based on data from June 2009.

5.8.2 Cost of Living

Although wages are typically higher in Wood Buffalo, it is important to note that the cost of living, especially for housing and transportation, is also higher than in many parts of Canada. Costs in the urban setting of Fort McMurray are lower compared to costs in outlying communities.

Here are some examples of the cost differences between Wood Buffalo and the rest of Alberta:

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[140] Government of Alberta. 2006. *Investing in our Future: Responding to the Rapid Growth of Oil Sands Development*, page 49. Available at: http://www.alberta.ca/home/395.cfm

Table 1: Examples of living expense costs per year

Item/Service	Wood Buffalo	Alberta
Food	$14,569	$8,430
Shelter	$26,701	$14,235
Clothing	$5,472	$3,115
Transportation	$21,492	$10,103
Health & Personal Care	$5,930	$3,189

When thinking about how the potential for higher income compares to higher costs, it is important for people considering moving to Fort McMurrary to think about their own situation. Information about average income does not mean that everyone earns the same amount; in fact, it means that there are people earning more than average, and people earning less than the average.

While there are people who earn a lot of money and don't have problems paying for things like housing and basic needs, not everyone in Wood Buffalo earns high wages. As in every other Canadian city, there are jobs in the area that service industry and retail. These jobs usually pay more in the municipality than in other parts of the country, but it is important to consider whether higher wages will be enough to cover the higher cost of living, especially for households with one wage earner.

5.8.2.1 Housing

Fort McMurray housing prices are the highest in the province. There are many opportunities to earn high wages in Wood Buffalo. In 2011, it was projected that 64% of households will have an income of over $100,000; conversely, this means that 36% of households earn less than $100,000.

According to the Canadian Mortgage and Housing Corporation, affordable dwellings cost less than 30 per cent of before-tax household income. Thus, if a household spends more than 30 per cent of its income on housing, it is not affordable. For example, using the April 2011 two-bedroom average of $2,152 per month, average annual household income would have to be $86,080 or more for housing to be affordable. In June 2009, with the average two-bedroom costing $2,177, average annual household income would have to be $87,080 or more for housing to be affordable.)

Table 2: Apartment rental rates and vacancy rate, Fort McMurray[141]

	Average rent ($/month)*	
	October 2010	**October 2011**
Bachelor suite	$1,405	$1,406
1 Bedroom	$1,792	$1,694
2 Bedroom	$2,210	$2,049
3 Bedroom	$2,525	$2,270
	Vacancy rate	
	4.6%	3.4%

*Damage deposit is usually one month's rent

Table 3: Average housing prices in Fort McMurray[142]

Type of Home	Dec 2010	Nov 2011	Dec 2011
Single Family	$685,970	$755,181	$729,092
Multi Family	$419,422	$408,005	$387,244
Duplex	$443,786	$512,235	$550,983
Mobile Home			$41,500
Mobile home/Land	$387,923	$449,015	$436,993

Average selling price of a single family dwelling

- decreased 3.5 % from November 2011 to December 2011
- increased 6.3% from December 2010 to December 2011
- in 2007 was $588,633
- in 2008 was $682,149
- in 2009 was $634,332
- in 2010 was $676,047

[141] Information courtesy of the Canada Mortgage and Housing Corporation, Rental Market Report, Alberta Highlights, Fall 2011.

[142] Information courtesy of the Fort McMurray Real Estate Board

- in 2011 was $734,294

Average price= total value divided by total number sold.

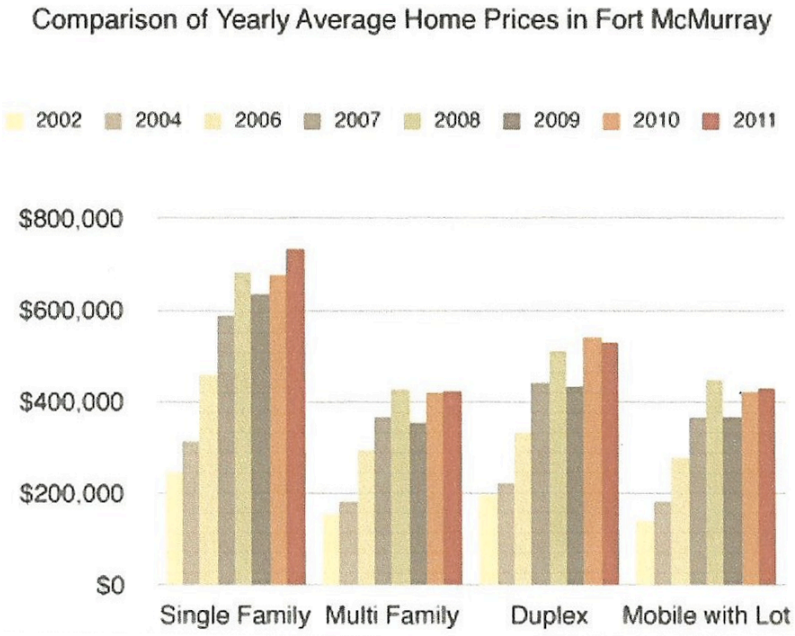

Figure 15: Comparison of yearly average home prices in Fort McMurray

Average cost of rooms for rent (may include utilities and usually furnished) ranges from $600 to $1,100 per month, but are usually found around $850 to $950 per month for a furnished room in a house. Some rentals are for room and board, and most include use of a shared kitchen and/or living space.

Cost for motels and hotels in Fort McMurray, for one person in one room (without tax), ranges from $140 to $300 per night. Hotels and motels fill up quickly during busy times (e.g., during plant turnarounds or maintenance shutdowns) and patrons may have to book months in advance.

For RV parks in Fort McMurray, the cost per day ranges from $25 to $40. Most serviced spots are $33 to $38 per night, or $1,000 to $1,200 per month. Prices range with services provided. Length of stay is limited at recreational parks. Not all services (e.g., sewer) are available year-round. Serviced spots are not always available.

Housing Costs

In many communities, one of the biggest costs for families is housing, and Fort McMurray is no different.

With so many job opportunities in the municipality over the past five to ten years, many people moved to the area in a short period of time. The population of Wood Buffalo increased by 141% from 1999 to 2008. The main service area of Fort McMurray is surrounded by Crown land and, therefore, there is limited land available for residential

development. In the recent past there has been very low availability of rental housing and homes to buy, resulting in high rental and real estate costs.

Housing costs in the Urban Services Area of Fort McMurray are the highest in the province. In 2010, the average price of a single-family home was $676,000 and the average monthly rent for one-bedroom apartment was over $1,500.

The housing market has improved and rental vacancy rates have gone from less than 1% in 2008 to almost 10% in October 2010. As more people are expected to move here, resulting from increased oilsands production, rental vacancy rates will likely drop again.

Subsidized and transitional housing is available to help qualifying families and individuals find shelter in the area, but the waiting period can be long. Through subsidized housing the rental rate is based solely on the family's income. There are shelter programs and temporary housing; however they do not always have space available.

5.8.2.2 Child Care

In Fort McMurray, there are a number of day care facilities as well as family day homes. There are also after-school programs available in the community where families can either drop in or register children for classes or activities.

Historically, the demand for child care has grown faster than the number of spaces available, as there are often waiting lists, especially for full-time child care facilities.

Child care in Fort McMurray is among the most expensive in the province. The Government of Alberta has recognized this problem and provides higher rates of support for parents in Fort McMurray than in other parts of the province.

5.8.3 Transportation

Highway 63 is the main north/south route to and through Fort McMurray. The highway was completed in the 1970s and was designed to service a population of roughly 25,000. By 1999, the intersection of highway 63 and King Street serviced 20,000 vehicles per day and has been the site of many high-profile fatalities.

Alberta has several dedicated high-load corridor routes throughout the province, including one from the Nisku area south of Edmonton, along Highway 63 through the Fort McMurray area, and to the various oilsands plant sites to the north. The oversized loads must follow the high-load corridor route

The oversized loads are comprised mainly of construction equipment, vessels, coke drums and pipes, and they vary in size and weight. As the cost for items such as fuel, royalties and environmental levies increase, loads are strategically becoming larger to reduce the number of trips required to move them. Loads are currently limited by maximum width, height and weight. The volume of oversized loads can vary significantly depending on the construction projects active in the oilsands sites. In 2010, there were a total of 1040 oversized loads issued permits to travel to the Fort McMurray area, and the monthly volumes ranged from a low of 49 loads to high of 136 loads. These monthly

volume measurements were taken at a period when oilsands development activities were relatively low.

In Fort McMurray specifically, the numerous constraints which have been encountered along the high-load corridor route are as follows:

- Utilities, such as the major pipelines that follow Highway 63.
- Existing geotechnical factors, such as unstable valley slopes.
- The Athabasca River crossing
- Road improvements, such as interchanges that are required to address high volumes of traffic from existing developments along the Highway 63 corridor as well as future development.

The provincial highway network throughout the municipality is composed of Highway 63, Highway 881, and Highway 69. These highways are experiencing increasing traffic volumes mainly due to the development of resources within the municipality. This is causing serious traffic-related safety and delay issues. Trucks carrying large and oversize equipment often occupy two traffic lanes that cause other traffic on the highway to be delayed.

Highway 63 is the primary access to the municipality and serves as a commuter highway, truck route, dangerous goods route, and the only arterial route through Fort McMurray. In Fort McMurray, Highway 63 experiences high morning and evening peak hour traffic generated by oilsands employees travelling to the plant sites. South of Fort McMurray, Highway 63 experiences significant southbound p.m. peak traffic on Thursday and significant northbound p.m. peak traffic on Sunday as a result of worker shift changes at the major oilsands facilities.

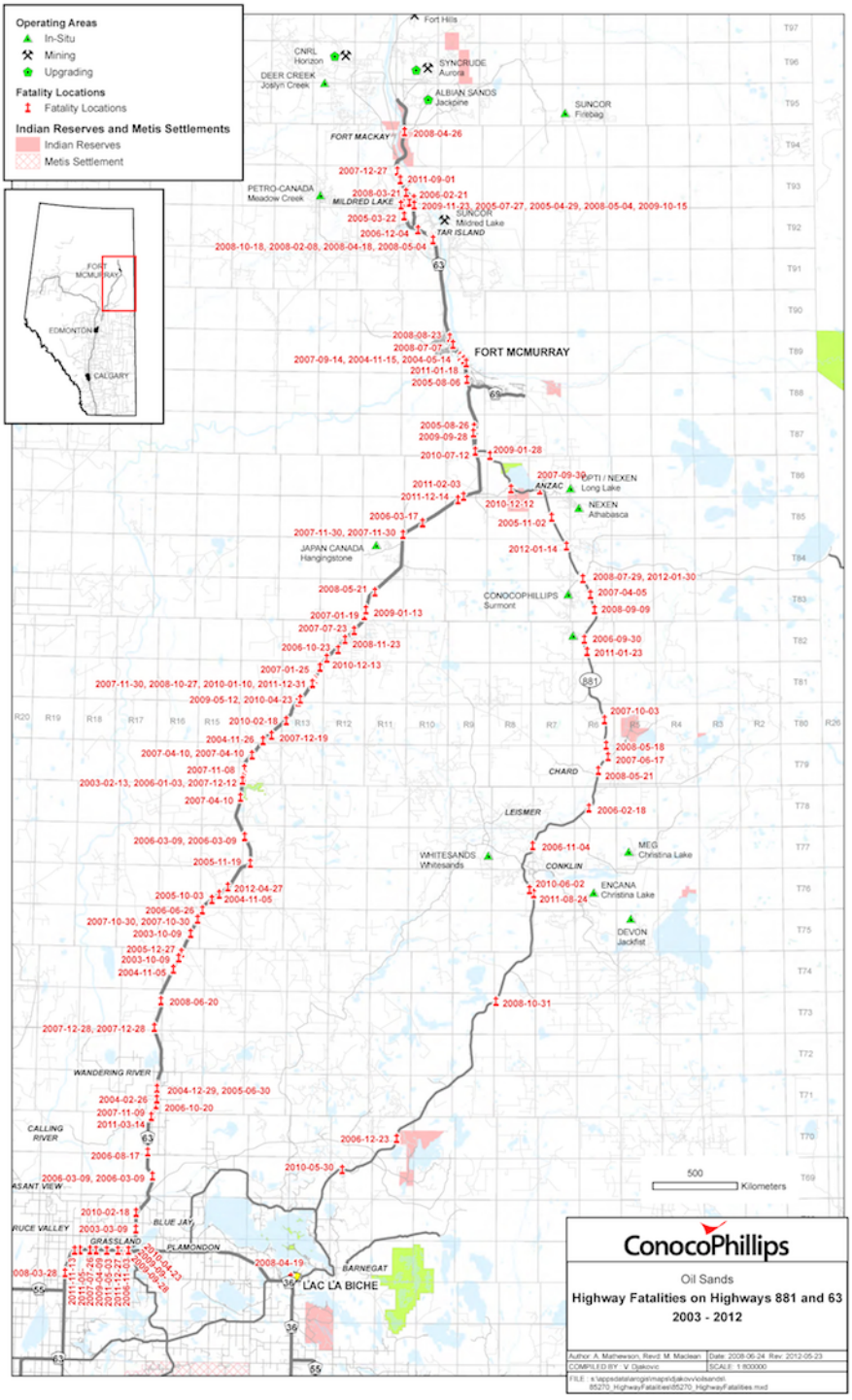

Figure 16. Highway 63 and 881 fatalities from 2003-2012.[143]

[143] Conoco Phillips. 2012. Accessed from the http://twin63now.ca/ website: http://twin63now.ca/wp-content/uploads/2012/05/Map-of-Fatalities-on-Highways-63-and-881-from-2003-to-2012.jpg.

Highway 881 links to Highway 63 approximately 17 kilometres south of Fort McMurray. This highway is a major secondary access into the municipality providing a connection from Lac La Biche to the south and is a major route that carries traffic serving the in situ oilsands projects in the southern part of the municipality. Highway 881 also provides an alternative route to Fort McMurray. Traffic volumes and poor design of both highways 63 and 881 have resulted in an unacceptable number of fatalities (Figure 16).

Highway 69 begins at the intersection of highway 63 and proceeds through Fort McMurray in an easterly direction. Highway 69 provides access to the residential development of Saprae Creek, the Fort McMurray airport, Mackenzie Industrial Park, and CN intermodal terminal at Lynton.

Challenges with the Existing Transportation Network

The municipality's rapid growth in the past few decades has been mainly driven by large scale investment in oilsands projects. This growth has resulted in significant pressure on the municipality's transportation network. Transportation issues are a growing concern in the municipality. With rapid growth in oilsands development and production activities, the number of personal vehicle and commercial travel has increased dramatically on the highways. This has resulted in increased traffic incidents and delays that increase travel time for workers. Currently, highway 63 is the only highway that carries commuter traffic to the oilsands plants. Because of this, any roadway incidents cause significant delays to the highway traffic.

The heavy rail transportation system in the municipality has been serving the lumber industry. Recently, rail transportation extended its service to the oilsands industry to transfer petroleum by-products from the oilsands plants to other markets. This alternative mode of transport is not well developed to facilitate the oilsands industry and to reduce heavy load traffic on highways.

The northern rural community of Fort Chipewyan is located on the shores of Lake Athabasca. The primary mode of transportation to and from the community is by air travel. During winter, a winter road is constructed from north of Fort Mackay to service this community. The winter road is a critical for the community to stockpile goods for the remainder of the year.

In 2007, the municipality completed a report on Mobile Workers to determine the general characteristics and the impact of the presence of mobile workers in terms of service, traffic, and money spent. The report shows that private vehicles remain the most popular way to get in and out of the region and to travel within the municipality. It estimates that 46% of workers tend to arrive in the municipality by private cars, 30% by airplane, and 24% by bus. Trips within the municipality are mostly made by passenger vehicles; 75% of trips are made by privately-owned vehicles and 25% of trips are made by bus.

Population and Employment Model

The population target was one of the primary inputs to the transportation demand analysis. Recently the municipality has adopted a target population of 204,000 people in the municipality by 2028, based on the municipality's Population and Employment

Projection Model. The model uses an employment-based methodology to project population. The model is driven by oilsands activity, based on construction and operations employment associated with oilsands projects. The model also calculates spinoff activity that can be expected to result from direct oilsands activity that is captured locally.

The Regional Municipality of Wood Buffalo anticipates a total population of 133,000 people in Fort McMurray and 71,000 people within the municipality outside of Fort McMurray by 2028, including 58,000 people in the Project Accommodations sector.

Table 4: Fort McMurray population predictions[144]

Location	2013	2018	2023	2028
Fort McMurray	80,000	90,000	106,000	133,000
Rural Communities	11,000	10,500	11,500	13,000
Project Accommodations	26,000	31,500	39,500	58,000
Total	**117,000**	**132,000**	**157,000**	**204,000**

The employment projections for the Regional Municipality are primarily based on direct, indirect, and induced oilsands activity. The timing, production, and capacity of oilsands projects are the key factors that affect the total employment generated by those projects. The oilsands related employment projections are based on assumptions regarding the volume of total oilsands activity in the municipality.

[144] Regional Strategic Transportation plan RMWB- Best practise in Urban Transportation planning 2010 Annual conference of transportation association of Canada. Halifax N.S

LIST OF APPENDICES

A. Expert Submission – Schindler

B. Expert Submission - Miller

C. License of occupation

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