



BOARD DECISION NR 2014-01
NRCB Application No. 1001

Parsons Creek Aggregates Limestone
Quarry Project near Fort McMurray

February 2014

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SECTION 1: INTRODUCTION

1.1: The Application

On June 8, 2010, Parsons Creek Aggregates (PCA or the Applicant) applied to the Natural Resources Conservation Board (NRCB or Board) for an approval to construct, operate and reclaim a limestone quarry project (the Project) in the Regional Municipality of Wood Buffalo (RMWB) (see Figure 1). PCA is a joint venture between Graymont Western Canada Inc. and Lehigh Hanson Materials Limited, each party holding a fifty percent ownership interest. Graymont Western Canada Inc. holds the rights to all metallic and industrial minerals under Alberta Metallic and Industrial Mineral Lease No. 9404120901 (MAIM lease) and will continue to hold all operating level approvals and authorizations. PCA stated that Lehigh Hanson Materials Limited will be the managing partner and responsible for operations of the limestone quarry.

The Project is located on 390 hectares of Crown land located north of the Fort McMurray Urban Service Boundary, east of Highway 63 and along the Athabasca River. The legal land description for the Project is Sections 7, 8, 18, 19, 30 and 31 of Township 90, Range 9, and a portion of NE ¼ Section 36 in Range 10 of the same township, all West of the 4th Meridian. The Board has included two maps to assist readers of this decision report. Figure 1 identifies existing and potential residential and commercial development in Fort McMurray proximate to the Project. Figure 2 identifies the Project area, mine blocks, mine phases and buffers in the original application.

Concurrent with filing its application to the NRCB, PCA filed an environmental impact assessment (EIA) with Alberta Environment and Sustainable Resource Development (ESRD, formerly named Alberta Environment). A Joint Notice of Filing advising parties of the application submitted to the NRCB and of the *Environmental Protection and Enhancement Act (EPEA)* and *Water Act* applications and the EIA filed with ESRD was issued by the NRCB and ESRD on August 23, 2010. This notice was published in the Edmonton Journal, Fort McMurray Today and Alberta Sweetgrass newspapers. The NRCB also direct mailed the joint notice to a list of stakeholders identified by PCA.

The NRCB works with ESRD to coordinate its application requirements with the final terms of reference established for the EIA. Applicants, stakeholders and the regulatory review process benefit from a common filing that serves the NRCB's application and ESRD's EIA information needs. While the NRCB and ESRD conduct separate reviews of the common filing, they work together to compile a combined statement(s) of additional information required from an applicant. This is done by way of supplemental information requests (SIRs).

Supplemental information requests were directed to PCA on five separate occasions: December 23, 2010 (SIR #1), October 12, 2011 (SIR #2), July 17, 2012 (SIR #3), October 24, 2012 (SIR #4) and January 2, 2013 (SIR #5). PCA provided responses to SIR #1 on July 29, 2011, to SIR #2 on May 14, 2012 (supplemented on June 6, 2012), to SIR #3 on September 19, 2012, to SIR #4 on November 19, 2012, and to SIR #5 on January 2, 2013. By letter dated January 16, 2013, ESRD advised the NRCB that it deemed the EIA complete pursuant to Section 53 of *EPEA*.

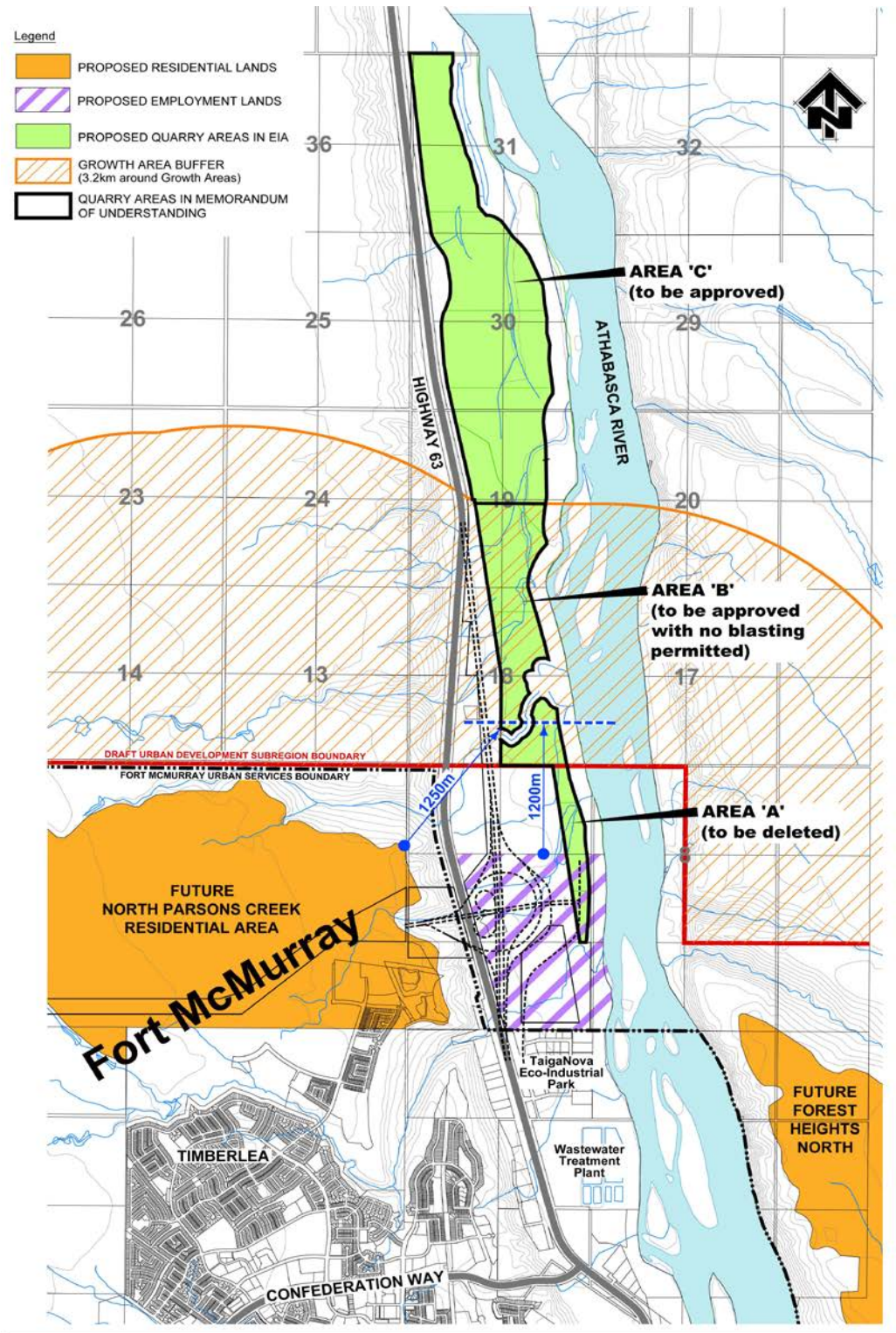


Figure 1: PCA Site Location (obtained from the August 13, 2013 MOU between PCA and the RMWB and modified to include Fort McMurray location)

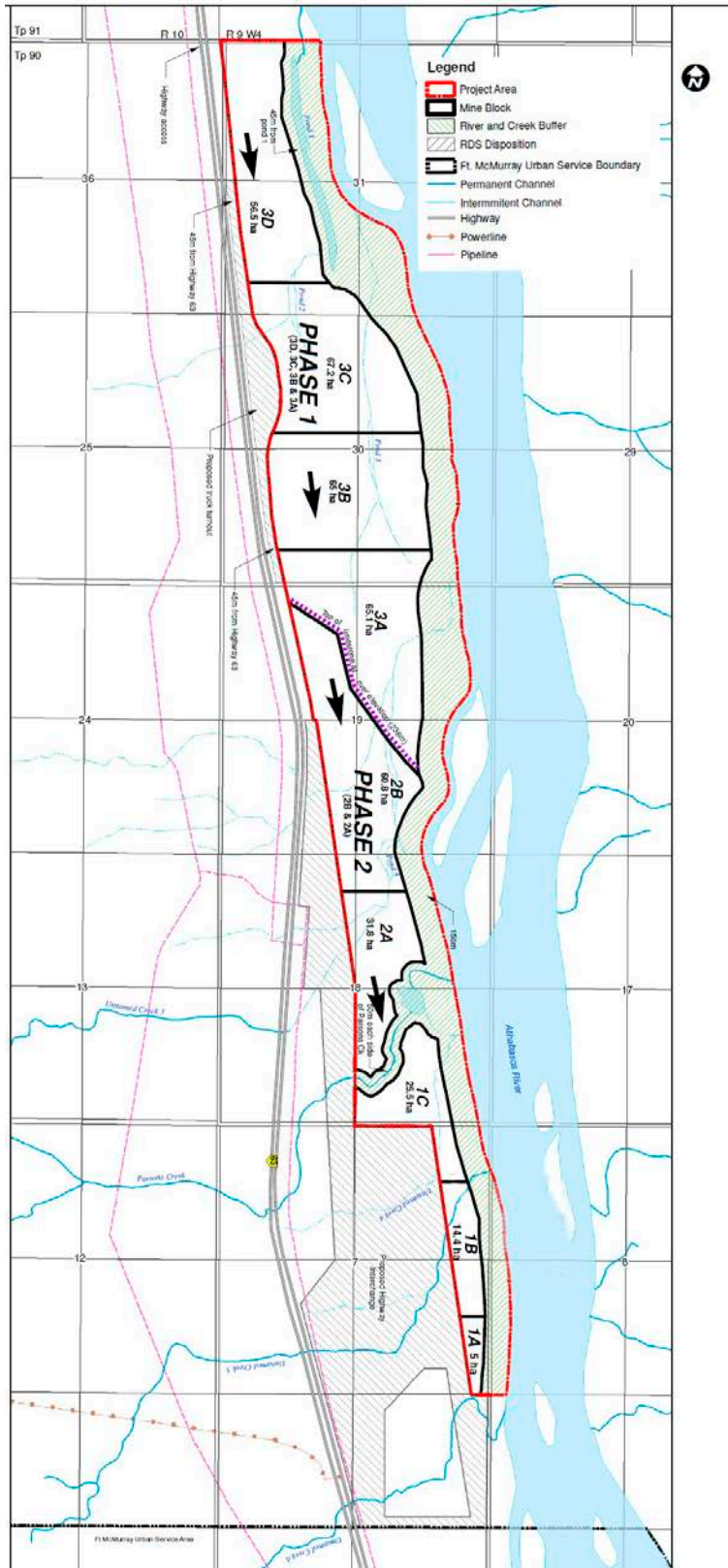


Figure 2: Project Area Mine Blocks, Mine Phases and Buffers (modified version of PCA Application Figure A.1-3, Part A, Project Introduction)

The NRCB established a division of the Board (the Panel) consisting of Vern Hartwell (Chair), Jim Turner and Donna Tingley to consider the application. The Panel, accompanied by legal counsel and the NRCB's CEO, conducted a site visit on October 12, 2011. The site visit included a fly-over of the MAIM lease area and a motor vehicle tour of the area focusing on Highway 63 and the Timberlea subdivision. The ground components of the site visit were restricted to public roads. The Board did not include any participants in the site visit.

The Board issued a Notice of Application dated February 18, 2013 asking that parties having concerns or objections to the Project file written submissions with the Board. The NRCB issued a Joint Notice of Pre-Hearing Meeting and Notice of Hearing on July 8, 2013 informing parties that a hearing may be conducted and inviting submissions from parties wishing to make presentations at a pre-hearing meeting.

Public input to the NRCB review included written statements of concern and objections as well as oral evidence and advocacy. Input in the form of statements of concern or objections to the Project were filed with the NRCB by the Athabasca Chipewyan First Nation, Fort McKay Industry Relations Corporation (on behalf of the Fort McKay First Nation and Métis Local 63), Mikisew Cree First Nation, Alberta Transportation, RMWB and JH Drilling Inc. The statements of concern filed in advance of the Board's notice form part of the record and have been considered by the Board.

In response to the Board's Notice of Application, written objections were received from JH Drilling Inc., RMWB and Alberta Transportation. Alberta Transportation conditionally withdrew its objection by letter dated June 21, 2013. The RMWB withdrew its objection on August 13, 2013 and provided the NRCB with a memorandum of understanding (MOU) between it and PCA. Neither Alberta Transportation nor the RMWB attended the pre-hearing meeting conducted in Fort McMurray on August 14, 2013.

In its Pre-Hearing Meeting Decision Report dated September 5, 2013, the Board determined that JH Drilling Inc. was not a directly affected party and dismissed its objection. JH Drilling Inc. had submitted SML application 090054 to ESRD for a sand and gravel lease overlying a portion of the PCA limestone deposit and as such, advised the Board that ESRD had deferred consideration of the lease application pending its review of the NRCB reasons for decision on the PCA application. JH Drilling Inc. provided the Board with a copy of the *Alberta Aggregate (Sand and Gravel) Allocation Policy for Commercial Use on Public Land*.

In reaching the conclusion that the commercial interests of JH Drilling Inc. were unrelated to the social, economic or environmental effects associated with the PCA Project, the Board acknowledged that the current Alberta aggregate allocation policy includes the principle that surface material leases may be issued in order to liquidate the deposit and make the most beneficial use of the resource. However, the NRCB mandate does not extend to commenting on the merit of development activity that is independent of the PCA application. More specifically, the Board's mandate does not include any authority over sand and gravel operations or the related provincial leasing and permitting process. The Board determined that the decision of ESRD whether to allocate sand and gravel interests that overlie the PCA limestone interests does not contribute to the assessment of the NRCB application.

As the Board concluded on September 5, 2013 that a hearing was not required, it proceeded directly to the consideration of PCA's application. On October 2, 2013 the Board sent a written request to PCA to provide a consolidated list of commitments as well as further details on compliance with the *Lower Athabasca Regional Plan (LARP)*, fisheries issues, project

implementation, financial responsibility and specific issues arising from the MOU between PCA and the RMWB. PCA filed a response to the Board's request on November 6, 2013.

1.2: Basis of Decision

The Board is directed by the *Natural Resources Conservation Board Act (NRCBA)* to review PCA's application to determine whether, in the Board's opinion, the proposed limestone quarry is in the public interest. In determining the public interest, the Board must have regard to the social and economic effects of the Project and the effects of the Project on the environment. In assessing the various effects, the Board's assessment must take into account the existing or background circumstances so that the effects of all relevant impacts may be considered on a cumulative basis. In the actively growing Fort McMurray area, assessing and forecasting the background circumstances can be challenging.

In considering the public interest, the Board is cognizant that most issues involve effects that are not singularly environmental, social or economic, but rather affect these categories concurrently. Understanding the likelihood and magnitude of these various effects may involve simple reasoning in some instances and complex assessment and judgment in others. As a starting point the Board chose to examine whether there is justification for the Project, because, in the event the Board were to conclude that the Project was not economically viable or that the Applicant was not capable of conducting the Project, even minimal negative social, economic or environmental effects might not be acceptable. Accordingly, the first issues considered in assessing the application were the need for the Project and its economic viability.

Only after concluding that the Project is both needed and viable, did the Board go on to assess in detail the effects that would likely result and the mitigative measures that may be taken to reduce any negative effects. In doing so, the issues addressed by the Board include the following:

- Air quality
- Human health
- Noise
- Land use
- Transportation
- Socio-economic impacts
- Soils and terrain
- Conservation and reclamation
- Surface water hydrology
- Hydrogeology
- Vegetation
- Wildlife
- Aquatic resources
- Historical resources
- Traditional knowledge
- Palaeontological resources

PCA made numerous commitments in its application that were subsequently compiled and recorded in a single document provided to the Board as part of the November 6, 2013 filing. While many of those commitments are referenced in this report, the complete list is available on

the NRCB's website. Interested parties may also obtain a copy of the list of commitments by contacting the NRCB. PCA made these commitments either to avoid, mitigate or offset adverse project effects or to enhance project benefits. PCA has asked the NRCB to assess the application having regard for the Project's predicted effects based on those commitments. The Board accepts this assessment approach and consequently, has included a provision in its Form of Approval that adopts those commitments.

Having stated that any NRCB approval is subject to the commitments included in the application, the Board believes that this statement must be interpreted in a manner that respects the nature of the Project, the NRCB's mandate and the mandate of government regulators. Simply stated, the NRCB's reliance on those commitments and the forecasted outcomes allows it to assess the Project's social, economic and environmental effects and reach a conclusion whether the Project is in the public interest. As such, it is the anticipated outcomes that are important rather than the PCA commitments made to achieve those outcomes. Further, environmental impact assessments and NRCB applications involve predictions that are based on informed expert assumptions and opinions. Project implementation and actual experience may not fully align with those assumptions and opinions and an NRCB approval must operate in a way that accounts for such variance without undermining the integrity of the approval or the public interest process.

Other variables, unforeseen by the Board or an applicant, may occur that require a pragmatic consideration of the NRCB conditions included in an approval. For example, the PCA Project requires other provincial approvals that may prescribe action or constrain certain aspects of the Applicant's operation with the result that one or more of the commitments or conditions either serve no purpose or require modification to remain relevant.

The NRCB application process involves the one-time consideration of an application that, when it results in an approval, provides a conditional authorization to proceed with the prescribed activity. In recognition that it is not involved in the ongoing regulation of projects, NRCB imposed conditions are generally phrased in a manner that returns oversight and management responsibility to provincial government departments. In providing a clear statement of desired outcomes in its reasons for decision and in engaging the technical and regulatory expertise of provincial ministries, the NRCB is confident that the integrity of the public interest decision is preserved.

The NRCB is confident that parties responsible for ongoing compliance with an NRCB approval will guide their decisions in a manner that respects the requirements to implement the Project in accordance with the specified conditions, including the requirement to satisfy commitments made by the Applicant. While NRCB approvals need to be interpreted in a manner that makes them relevant to evolving circumstances, fundamental changes may require the direct involvement of the review and variance provisions included under s. 25 of the *Natural Resources Conservation Board Act*.

1.3: Notes on Content

An application to the NRCB is required to include all material included in any EIA required by ESRD. Through this process, applicants provide a comprehensive technical assessment of a project's impacts on the environment and community. In the broad sense, all of this information contributes to the Board's understanding of a project's social, economic and environmental effects.

However, in rendering its written decision, the Board actively chose to address the Project's effects that have the potential to influence the public interest assessment. Conversely, this decision report does not address those effects that were determined to be immaterial to the Board's public interest determination. This does not mean that the Board failed to have regard for the entire application record; rather, it reflects the pragmatic necessity to focus on components that further the task of understanding the relevant social, economic and environmental effects in order to determine whether the Project is in the public interest.

1.4: Public Consultation

PCA stated that its public consultation program was initiated with the distribution of the Public Disclosure Document in June 2006. PCA's consultation plan included steps to identify and meet with stakeholders, and to provide timely updates through newsletters, face-to-face meetings and open houses. PCA conducted an open house on November 9, 2010 at which it presented displays illustrating various aspects of its Project and had technical specialists available to discuss the Project. Stakeholders were contacted through a direct mail newsletter and by advertisement of the open house in the Fort McMurray Today newspaper.

PCA established a distinct First Nation Consultation Plan that identified the Mikisew Cree First Nation, Athabasca Chipewyan First Nation, Fort McKay First Nation, Fort McMurray #468 First Nation and Chipewyan Prairie Dene First Nation. This plan committed to track the date of any communication, form of contact, conversation summary, potential issues and decisions taken or actions required. PCA included a number of update reports on the consultation plan in its application.

One of the stated purposes of the overall consultation process was to develop a means to address stakeholder concerns through mitigation or project design modification. In its application, PCA included a list of mitigation measures and project modifications it adopted to address stakeholder concerns. In June 2010 PCA reported that it had reached industry relations corporation agreements or agreements in principle with the Fort McKay First Nation, Chipewyan Prairie First Nation and the Mikisew Cree First Nation.

PCA reported that ongoing consultation resulted in a confidential agreement with the Mikisew Cree First Nation and, in the list of commitments provided to the Board in November 2013, that the Fort McKay First Nation and Athabasca Chipewyan First Nation were "*at the signing stage for similar agreements.*" As stated previously, an MOU between PCA and the RMWB has been provided to the Board.

1.5: Need for the Project and Project Viability

PCA stated that oilsands driven construction in the immediate vicinity of Fort McMurray requires a consistent supply of high quality aggregate product. Current aggregate demand for the Fort McMurray Urban Service Area was stated to exceed 1,000,000 tonnes on an annual basis, which was forecast to grow to 2,000,000 tonnes during the next 15 to 20 years. Current supply is provided by the Susan Lake Pit (sand and gravel) and the Hammerstone Quarry (limestone), 80 kilometres and 60 kilometres north of Fort McMurray, respectively. PCA stated that the locations of current reserves relative to the Fort McMurray Urban Service Area can affect rock product costs as a result of increased haul distances.

PCA stated that end uses for crushed limestone aggregate include railway ballast, filter rock, base course or as an aggregate component for concrete and asphalt. Limestone fines can be used in producing drilling mud additives and for specialized environmental applications, such as an acid neutralizer.

The Board accepts that there is a consistent and growing demand for aggregate in the Fort McMurray region and is satisfied that PCA has identified an economic limestone reserve. In considering the need and the demand for the Project, the Board has also considered whether the associated benefits would be incremental or redistributive. While the Board is aware that other sources for limestone are currently available in the service area, the distance and associated hauling costs favour a conclusion that a significant portion of the benefits will be incremental as end users can be expected to minimize the transportation component.

SECTION 2: SOCIO-ECONOMIC IMPACTS

2.1: Socio-Economic Impacts

2.1.1: Views of the Applicant

2.1.1.1: Introduction

Parsons Creek Aggregates (PCA) conducted a socio-economic impact assessment to evaluate the potential benefits and costs of the Project on the local, regional and provincial economy and social infrastructure. PCA employed Alberta Finance input-output multipliers to estimate the Project's direct, indirect and induced effects on Alberta's gross domestic product (GDP), household income and employment.

On August 9, 2013 the Regional Municipality of Wood Buffalo (RMWB) and Graymont Western Canada entered into a memorandum of understanding (MOU). The MOU outlined a number of commitments made by PCA, including a proposal to use mechanical surface mining techniques in Area "B" (see Figure 1). PCA indicated that its initial investigations showed that the use of surface miners in other quarries around the world are proving to be economically equivalent with conventional drilling and blasting techniques. The Applicant and RMWB agreed that aggregate extraction in Area A (see Figure 1) would be incompatible with RMWB's land use and quality of life objectives, and therefore would not be mined. PCA indicated that excluding Area A would reduce the overall life of the Project by approximately two years, and the total mineable product would be reduced from 58 million tonnes (Mt) to 53.5 Mt.

According to PCA, the proposed limestone quarry is expected to be in operation for approximately 33 years. Final reclamation would take place in years 34 to 38. PCA indicated that the Project would supply crushed and screened limestone rock products for use in the construction of local infrastructure, residential housing and oilsands projects in the Fort McMurray area. PCA anticipated that limestone fines, a by-product of production at the Project, would be sold as a drilling mud additive or an amendment for acidic soils.

PCA provided statistics and forecasts showing substantial growth in the region attributed to the oilsands industry (e.g. bitumen production grew from 350,000 barrels per day in 1990 to more than one million barrels per day in 2008). PCA reported that despite a slowing in the oilsands industry during the global economic recession of 2008 and 2009, more than \$44 billion in oilsands projects were planned, under construction or completed by 2009. PCA forecasted significant demand for construction aggregate that included major roadwork along Highway 63, the new interchange on Highway 63 bordering the Project, Parsons Creek and Saline Creek Plateau housing developments (forecast to house 40,000 people), construction and redevelopment of health and school facilities, and improvements to municipal facilities and infrastructure.

2.1.1.2: Economic Impacts

PCA indicated that economic impacts of the Project on regional and provincial economies were expected to be small but positive. Economic benefits were projected during the Project construction and operation phases. PCA stated that the construction phase would inject \$22.8 million into the provincial GDP, with additional household income effects of \$15 million. PCA estimated that the construction phase would employ nine person-years and require \$29.5 million in capital expenditures. The majority of mining equipment purchases would be procured from outside of Alberta. Project capital expenditures are depicted in Table 1 below. Construction would require site preparation, including logging and stripping, and the development of pit access, stockpiling area, scales and other access roads. PCA stated that local contractors would be hired where possible, but acknowledged that contractors from outside the region might also be required.

PCA stated that changes to the Project as a result of the August 2013 MOU were not expected to significantly alter construction costs or the associated economic benefits for the regional or provincial economies.

Table 1: Project Capital Expenditures by Region

Functional Area	Expenditure ¹ (\$ 000's)					Total	Percent of Total (%)
	Regional Study Area	Other Alberta	Other Canada	Foreign			
Preparatory Work ²	60	2,930	760	300		4,050	14
Labour	310	2,240				2,550	9
Materials	240	2,160	1,710	3,540		7,650	26
Equipment	60	4,150	870	10,130		15,220	52
Total	670	11,490	3,340	13,710		29,470	100
Percent of Total (%)	2	39	11	47		100	
Notes:							
1) Numbers might not calculate precisely due to rounding							
2) Includes permitting, licensing and engineering							

2.1.1.3: Operations

PCA proposed to begin operating the quarry and handling facility in the north portion of the Site and then move southward, operating the quarry eight hours

per day, six days a week, for five months of the year during the initial start up phase of the Project. PCA indicated that hours of operation would be expected to increase as the Project approached peak production, starting in year ten. In the August 9, 2013 MOU, PCA indicated that blasting activity would only occur between the hours of 9 am to 5 pm and only in Area C (see Figure 2).

PCA estimated that by year 10, the quarry would begin operating at its maximum capacity (for limestone production), as depicted in Table 2, below. At peak production, the total annual workforce for operations would not be large, with total on-site employment estimated at 12 full time equivalent positions. PCA estimated that operational expenditures for labour, equipment, materials and energy would average \$3.5 million annually. Operational expenditures were projected to contribute \$3.56 million and \$1.5 million, respectively, on GDP and household income levels. The Project's direct, indirect and induced employment impacts were estimated at 31 person-years annually. PCA stated that it is committed to supporting local Aboriginal communities by using an open bidding process to employ Aboriginal peoples, and using Aboriginal businesses for trucking and other business contracts.

Table 2: Estimated Annual Limestone Production

Estimated Limestone Production (million tonnes/yr)	Year(s) of Project Operation
0.25	1-2
0.50	3-4
0.75	5-6
1.0	7-8
1.5	9-10
2.0	10+

2.1.1.4: Municipal, Provincial and Federal Taxes

PCA stated that the Project's annual municipal property tax payments to RMWB would be approximately \$0.5 million annually. Operations equipment and facilities would be portable, with no foundation, and would likely not contribute to the assessment base of the municipality.

The Government of Alberta applies mineral royalty rates to the production of limestone. PCA indicated that, as of October 2009, royalty rates for limestone were set at \$0.0441 per tonne. Based on that rate, the estimated royalty payments would be approximately \$11,000 to \$66,000 per year for the first nine years of operation. Once peak production is reached in year 10, royalty payments were estimated at \$88,000 per year. PCA estimated the net present value of royalties paid over a 35 year period at approximately \$650,000, using an eight percent discount rate.

PCA stated that the Project would generate annual federal and provincial tax payments. Forecasts provided by PCA estimated the annual federal and provincial tax payments in the range of \$4.0 to \$6.5 million. Approximations were provided based on a range of possible market prices for aggregate and assumptions about the profitability of the Project. Based on an operational life of 35 years, the net present value of a future stream of tax payments was estimated to be in the range of \$30 million to \$45 million.

2.1.1.5: Social and Infrastructure Impacts

PCA provided resident and non-resident population growth statistics for RMWB. The resident population in urban areas of RMWB (Fort McMurray and Sapræ Creek) experienced significant growth between 1999 and 2008, averaging 7.6 percent annually and reaching a total of 71,168 people in 2008. During the same time period, the non-resident population grew from 3,568 to 28,343 people, or approximately 26 percent annually. This population is located primarily in industrial work camps. PCA recognized that population growth is the primary driver of service provider impacts in the region. PCA stated that, under the assumption that Baseline Case projects proceed, the urban population of the region is expected to grow by approximately 3 percent annually, reaching 96,000 persons by 2018. The post 2009 growth rate was predicted to be lower than the pre-2009 growth rate due to the emergence of operation camps for facilities located outside a daily commuting distance from Fort McMurray, and technological advancements in the oilsands sector.

PCA indicated that the region faces social infrastructure and service pressures due to regional population growth, a large migrant workforce that has few family support networks in the region, and social stressors related to competing family and work demands. PCA stated that social infrastructure shortages and challenges continue for the public and private sector due to a high cost of living, stressful working conditions for existing staff who are coping with staff shortages, and RMWB's relatively remote location. PCA stated that it would offer employee assistance programs to its employees, including housing support via a northern living allowance.

PCA provided details regarding planned initiatives underway by government and industry in response to social infrastructure challenges in the study area. Some of these responses include: the 2009 Government of Alberta release of *Responsible Actions: A plan for Alberta's Oil Sands*, additional funding for child care in the region, monthly cost-of-living allowances for all employees who work for provincially funded organizations in Fort McMurray, expanded RCMP detachments and Regional Emergency Services, a new fire hall, new recreational facilities, and a number of provincial based initiatives which would be available to all municipalities including RMWB. PCA stated that it is committed to support specific community programs and initiatives where possible. Examples included the local food bank, homeless shelters and outreach programs.

PCA stated that because the Project would have a negligible effect on population, it would also have a minimal effect on social service providers, housing and municipal services.

2.1.2: Views of the Panel

The Panel concludes that the methodology used by PCA to assess the socio-economic impacts of the Project is appropriate. In its November 6, 2013 submission to the Board, PCA asserted that the projected economic and social impacts of the revised Project as a result of the MOU would not be significantly different than the original application. The MOU removed Area A (a reduction of 4.5 Mt of mineable product); shortened the Project by two years and specified the use of only mechanical surface mining in Area B, which PCA asserted would be economically on par with conventional drilling and blasting. The Panel is satisfied with PCA's assertions, given the relatively small reduction in total tonnage to be mined and the two year reduction in the lifespan of the Project.

Project construction and operational expenditures impact the local and provincial economy and are measured by direct, indirect and induced influences on GDP and household income effects. An additional source of economic benefit to the public includes the redistribution of federal and provincial taxes and provincial royalty levies. PCA estimated the impact on GDP to be \$22.8 million stemming from construction, and an annual impact of \$3.56 million associated with on-going quarry operations. Estimated royalty levies associated with aggregate extraction would be \$88,000 annually at peak production. PCA estimated total provincial and federal tax payments to be in the order of \$4.0 to \$6.5 million annually, once peak production is reached in year 10. In accepting PCA's estimates, the Panel concludes that the PCA application is somewhat unique for the Fort McMurray area, in that the overall economic benefits are relatively small given the scale and longevity of the Project. The Panel concludes that the benefits from this Project to the public purse are primarily through taxes and that royalties will not add significant revenue to the Province.

The Panel also notes that economic growth pressures in the Fort McMurray area, as depicted by PCA, will require substantial supplies of aggregate and limestone products. The RMWB and PCA state in the MOU:

The parties agree that Fort McMurray is likely to experience a significant shortage of aggregates for local infrastructure and construction projects and that a nearby supply of aggregate material from the proposed PCA quarry could support the sustainable development of Fort McMurray.

The Panel agrees that it is more likely than not that the region will require significant quantities of aggregate to support current and future infrastructure, construction and oilsands projects. The Panel further concludes that local and regional demand for aggregate and associated limestone products adequately justify the Project need.

The Panel acknowledges and agrees with the Applicant's analysis of social infrastructure pressures in the study area. PCA estimated the total labour and population impact from the Project to be 31 person-years annually. PCA asserted that the Project would have a relatively minimal impact on local and regional population growth and demand for social infrastructure and services. The Panel concludes that the Project will not add significantly to the social infrastructure and service needs in the region.

While the Panel recognizes that PCA will require a relatively small and specialized workforce at the Project, the Panel encourages PCA to fulfill its commitment to employ Aboriginal people where possible. In addition, the Panel notes and recommends that

PCA fulfill its commitments to work with local community stakeholders throughout the life of the Project to support community programs.

SECTION 3: HISTORICAL RESOURCES, TRADITIONAL KNOWLEDGE AND PALAEOLOGICAL RESOURCES

3.1: Historical Resources, Traditional Knowledge and Palaeontological Resources

3.1.1: Views of the Applicant

Alberta historical resources are protected under the *Historical Resources Act*. The Minister responsible for the Act can direct a person “to carry out an assessment to determine the effect of the proposed operation or activity on historic resources in the area where the operation or activity is carried on...” [s.37(2)(a)]. PCA obtained Archaeological Permit #2007-244 from Alberta Tourism, Parks, Recreation and Culture in order to conduct a historical resources impact assessment (HRIA).

According to PCA, current knowledge suggests that the region has been almost continuously occupied for the last 10,000 years. PCA conducted a non-random foot traverse and visual inspection of recent disturbances and river cut banks to identify any exposed archaeological and historic period resources. PCA reported that a total of 463 shovel tests were conducted. A site file search by PCA did not reveal any known pre-contact sites within the Project area.

The HRIA field work identified a single pre-contact archaeological site and five land use sites (recent cabins) within the Project area. The discovered pre-contact site included three productive shovel tests identifying a small scatter of stone artifacts within a twenty-five by fifteen metre area on the west bank of an abandoned meander of the Athabasca River. Twenty-five other shovel tests over the same area were negative. Although the identified site lies within the Project area it is not currently proposed for impact as it is located in a buffer zone for Pond 1. PCA committed to provide quarry staff with training to recognize and report any evidence of aboriginal historical artifacts and to ensure documentation by a historical resources professional and protection where warranted.

PCA approached First Nations and Métis members in order to collect traditional land use and environmental knowledge in relation to the Graymont metallic and industrial mineral (MAIM) lease. The Fort McKay First Nation and Métis Local #1935 were identified as groups who required further investigation into their traditional knowledge. A Fort McKay First Nation Traditional Knowledge Report (FMFN TKR) was included as part of the application to the NRCB. The initial proposal PCA received from Métis Local #1935 involved significantly more work and expense than PCA anticipated and the parties agreed to an annual work program that involves a yearly PCA financial contribution towards Métis Local #1935’s “Mark of the Métis” cultural retention project.

According to PCA, traditional knowledge is passed on orally and provides an understanding of the particular natural environment that has accumulated over countless generations. This information can serve to aid Western scientific disciplines in analyzing project effects. It greatly aids in understanding the effects on Aboriginal culture and the cumulative effects of past and existing activities to both culture and the environment. The FMFN TKR addressed the primary and secondary effects of the Project during construction, operation and reclamation. Components of the study included scoping sessions, an elders’ advisory group meeting, a site visit with Fort McKay First Nation members, a home interview and a report review and verification. The FMFN TKR

stressed the importance of land-based resources to the culture and well-being of community members. The FMFN TKR pointed out that socio-economic studies of impacts to traditional land use show that traditional activities such as hunting and gathering had been negatively affected by resource development in the region.

Other concerns expressed in the FMFN TKR included the increasing interference of industrial development, cut lines and roads on traditional activities such as trapping, hunting and berry picking. One of the core issues identified in the FMFN TKR related to Fort McKay First Nation members pointing out the apparent conflict between the Applicant's proposal to reclaim the Site in "*as natural a state as possible, with human recreational use being a priority.*" The FMFN TKR concluded that land of recreational value to humans would likely not be good moose habitat and that if PCA was going to make recreational land, it would be better done closer to the City of Fort McMurray.

Fort McKay First Nation members recommended that at least the north half of the MAIM lease be reclaimed as close as possible to its original state in an effort to encourage moose to return. PCA committed to work with the Fort McKay First Nation to ensure that their traditional land use and traditional environmental concerns regarding conservation and reclamation are met. PCA stated that it would provide access to the Project lease for any Aboriginal groups who wish to continue their current activities on those parts of the lease that are not under extraction. PCA formally committed to "*selected First Nation involvement in detailed reclamation planning through formal agreements.*"

Palaeontological resources were assessed by PCA as part of the application to the NRCB. Both invertebrate and vertebrate fossils are found in the Devonian age Moberly Member limestone located within the MAIM lease. The invertebrate fossils are relatively common and individual specimens are typically not unique, while the vertebrate fossils will be quite rare and can provide unique information about the species. The mining project would expose palaeontological resources that otherwise would not be discovered. However, this benefit would be somewhat diminished as many fossils, including those of high heritage value, might not be identified and collected prior to crushing.

PCA proposed a management plan that includes a "Discovery Protocol" to address the preservation of high heritage value fossils. The Discovery Protocol includes a sampling program, an education program for mine workers on what to look for, and occasional site visits by a professional palaeontologist to evaluate the potential of new horizons and to examine fossils set aside by workers. PCA will provide its management plan to the Royal Tyrrell Museum of Palaeontology and to Alberta Culture for review. PCA requires a clearance under the *Historical Resources Act* for the Project.

3.1.2: Views of the Panel

While the Board accepts that the level of work to date only provides a cursory assessment of the archaeological resources that may be present within the MAIM lease site, it concludes that the assessment represents a reasonable pre-disturbance evaluation. The information provided and PCA's commitments represent a practical approach to identifying and preserving archaeological historical artifacts. In reaching this conclusion the Board notes that the approach was developed collaboratively with the First Nations that were included in PCA's consultation process.

The Applicant made a number of commitments that directly respond to the First Nations' desire to preserve opportunities for traditional land use through the life of Project and following reclamation. For example, a progressive reclamation plan that would limit the total acreage under extraction at any one time to 205 acres and the total of both active extraction and reclamation to a maximum of 400 acres was developed at least in part through PCA's relationship with area First Nations. A similar and related commitment to reclaim the northern MAIM lease lands "*to a natural environment condition including a mix of planted grasses, bushes, trees, ponds and wetland areas in order to support ongoing wildlife use of this area*" represents a targeted goal of respecting traditional land use by First Nation communities. The Board understands that there will be an adverse impact on traditional activities during the life of the quarry and that reclamation will not fully restore these lands to their current capacity for traditional use. Having said that, the Board finds that the commitments made by PCA remain important to mitigate effects on traditional land use both during extraction and reclamation.

The Panel believes that the "Discovery Protocol" proposed by PCA should contribute to the preservation of high heritage value fossils. Having regard for the management plan presented and the need for a *Historical Resources Act* clearance, the Board finds that the PCA Project represents an opportunity to provide insight into palaeontological resources that would otherwise not be recovered.

SECTION 4: AIR QUALITY, HUMAN HEALTH, AND NOISE

4.1: Air Quality and Human Health

4.1.1: Views of the Applicant

4.1.1.1: Introduction

Parsons Creek Aggregates (PCA) conducted an air quality and human health risk assessment (HHRA) to evaluate potential effects of the proposed Parsons Creek Resources Aggregates Project (the Project) on air quality and human health. PCA indicated that air emissions would be generated from portable crushing/screening operations, hauling, limestone extraction and the quarry vehicle fleet (through diesel fuel combustion).

According to PCA, air chemicals of potential concern (COPC) include carbon monoxide (CO), nitrogen dioxide (NO₂), fine particulate matter (PM_{2.5}), and sulphur dioxide (SO₂) as well as non-criteria pollutants [i.e., volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and metals].

PCA identified three potential air quality issues associated with the Project:

- Criteria and non-criteria air contaminants – industrial emissions of air contaminants associated with Project operations and from surrounding industrial and urban sources;
- Ozone (O₃) formation – as a result of photochemical reactions with oxides of nitrogen (NO_x) and VOCs; and,
- Acid deposition – emissions of potential acid forming substances such as SO₂ and NO_x.

4.1.1.2: Air Quality Assessment

PCA indicated that the air quality local study area (LSA) was a 20 km by 20 km square centred on the Site. It also indicated that the regional study area (RSA) had a north to south extent of about 300 km and an east to west extent of 250 km.

PCA used the CALPUFF dispersion model in its air quality assessment for the Project. According to PCA, the dispersion model used three-dimensional meteorological fields developed by the CALMET model. PCA indicated that use of the CALPUFF/CALMET modeling system is compliant with the *Air Quality Modeling Guideline* developed by ESRD to ensure consistency in the use of air quality models in air quality assessments. PCA stated that the receptor grid spacing used in the modeling ranged from 20 m along the Project boundary where maximum impacts are expected, to 2000 m in the area beyond 10 km from the Project. In addition, 12 sensitive receptors were included in the modeling.

In its application, PCA described three emission scenarios including Baseline Case (existing and approved emission sources), Application Case (Baseline plus

Project emissions) and Cumulative Effects Assessment (Application Case plus announced future development) (CEA). In subsequent responses to Supplemental Information Requests, PCA substituted the scenario name CEA with Planned Development Case (PDC). PCA also included a Project-only scenario, which compared the Application Case and Baseline Case predictions to determine the relative impact of the Project.

PCA indicated that air quality modeling predictions were only made for areas outside the Project fenceline and included all regional area sources when reporting maximum concentrations. According to PCA, ambient air concentrations for predicted maximum 1-hr, maximum 24-hr, 8-hr (for CO only) and annual averaging periods were modeled. Project impacts were based on the predicted concentrations in relation to the respective Alberta Air Ambient Quality Objectives (AAAQOs).

PCA was of the view that the Project contribution above Baseline predictions was negligible for hourly predictions at the LSA and RSA Maximum Points of Impingement (MPOI) and at sensitive receptors. PCA summarized that the predicted 1-hour LSA maximum in the Application Case would be less than the Baseline Case because the sand and gravel operation would end before the completion of limestone mining.

Criteria air contaminant concentrations for the Baseline Case, Application Case, Project-only and PDC were predicted using dispersion modeling (Table 3). PCA predicted that the AAAQO for $PM_{2.5}$ would be exceeded at the RSA and LSA MPOI, but would not be exceeded at any sensitive receptors in the Baseline or Application cases. According to PCA, the predicted $PM_{2.5}$ exceedances in the Baseline Case at the fenceline were primarily due to emissions from the sand and gravel operations. In the Application Case, PCA stated that exceedances were predicted at and just outside the southwestern fenceline and were associated with Site activities. It also predicted that the LSA maximum ground level concentration for $PM_{2.5}$ would exceed AAAQO for the PDC, which PCA attributed to the result of modeled growth of oilsands industry, traffic and urban sources.

According to PCA, the number of days with $PM_{2.5}$ exceedances was 12, 16 and 21 for the Baseline Case, Application Case and PDC, respectively. Of all the modeled receptors, exceedances occurred at 168 receptors for the Baseline Case, at 209 receptors for the Application Case, and at 735 receptors for the PDC. It claimed that the Project contributions above Baseline predictions would be negligible to small for all locations. PCA indicated that it would manage potential fine particulate matter exceedances through a dust management plan, which was not considered in the modeled predictions.

PCA reported that the predicted concentrations of SO_2 , NO_2 , CO, VOCs, PAHs and metals would not exceed AAAQO at any of the receptors for any of the modeled cases. At the same time, according to Table 3, the maximum predicted annual average concentration of NO_2 for the PDC was at the objective limit, and the maximum 1-hr of SO_2 indicated exceedances for the Baseline, Application, and PDC cases (Table 3).

PCA estimated that the Project contributions to the maximum ozone concentration would be negligible since it claimed O₃ forming conditions are not present within this region of Alberta. PCA indicated that it would support regulatory initiatives that review ozone levels in the region to ensure AAAQO are met.

PCA indicated that greenhouse gas (GHG) sources from the Project would include the emissions from diesel powered vehicles and process equipment. PCA estimated that these emissions would represent 0.014 percent of the total annual Alberta GHG emissions (223 Mt CO₂E/yr) and 0.0044 percent of the total annual Canada GHG emissions (747 Mt CO₂E/yr). According to PCA total GHG emissions predicted for the construction, operation and decommissioning phases were 0.003 Mt, 1.04 Mt and 0.004 Mt, respectively.

PCA conducted potential acid input (PAI) modeling as part of the air quality assessment. The modeling predicted that the maximum annual PAI in the RSA would be approximately 2.9 keq/ha/yr in the Baseline and Application cases and approximately 3.9 keq/ha/yr in the PDC. PCA concluded that Project contributions to predicted PAI deposition in the region would be negligible. According to PCA the predicted maximum PAI in the LSA was 0.52 keq/ha/yr in the Baseline Case, 2.74 keq/ha/yr in the Application Case, and 2.84 keq/ha/yr for the PDC. PCA noted that small incremental areas with deposition of 0.25 keq/ha/yr were also predicted around the Project disturbance. PCA stated that in the LSA, PAI predictions were largely driven by emission sources beyond the LSA.

**Table 3: Predicted Criteria Air Contaminant Concentrations within the LSA
(Table 4-1 of Supplemental Information Request Response #4)**

Species	Case					AAAQO
	Background	Project-Only	Baseline	Application	PDC	
SO₂ (µg/m ³)						
Maximum 1-hr	7.0	5.8	682	682	682	450
24-hr	5.0	1.7	77	77	77	125
Monthly	4.0	0.54	14.1	14.1	14.5	30
Annual	3.0	0.46	8.2	8.2	8.4	20
NO₂ (µg/m ³)	Background	Project	Baseline	Application	PDC	AAAQO
Maximum 1-hr	-	199	185	203	226	300
Annual	-	40	29	44	45	45
CO (µg/m ³)	Background	Project	Baseline	Application	PDC	AAAQO
Maximum 1-hr	458	3,873	2,783	4,367	4,387	15,000
8-hr	415	1,581	1,459	2,161	2,244	6,000
PM_{2.5} (µg/m ³)	Background	Project	Baseline	Application	PDC	AAAQO
Maximum 1-hr	17	103	217	122	170	80
24-hr	7.0	27	43	43	47	30

4.1.1.3: Human Health Risk Assessment Methodology

According to PCA the methodology used to conduct the HHRA was based on protocols outlined by the Canadian Council of Ministers of the Environment, Health Canada, the United States National Research Council and the United States Environmental Protection Agency (US EPA). PCA indicated that the HHRA included the following components - problem formulation, exposure and toxicity analysis, risk characterization, and risk management.

The four human receptor groups considered by PCA in the HHRA included temporary visitors (e.g. hunter/trapper, recreational user), seasonal Aboriginal residents, permanent community residents, and commercial employees.

Potential COPC (both carcinogenic and non-carcinogenic substances) exposure pathways assessed in the HHRA included acute and chronic inhalation, and local

game, garden produce, and chronic soil consumption. According to PCA, potential health risks were also assessed for mixtures of chemicals with similar health endpoints such as respiratory irritants.

PCA calculated Risk Quotient (RQ) values for non-carcinogens, and incremental lifetime cancer risk (ILCR) values for carcinogens to evaluate potential health effects associated with assessment cases. According to PCA, predicted RQ and ILCR values of 1.0 or less indicate negligible health risk, while values greater than 1.0 indicate potential health risk.

4.1.1.4: Human Health Risk Assessment Predictions

PCA predicted potential health risks for the Baseline, Project-only and Application cases in accordance with requirements for HHRAs in the EIA terms of reference developed by ESRD and Alberta Health and Wellness for industrial projects. COPC identified by PCA in air emissions included regulated substances such as nitrogen dioxide (NO₂), carbon monoxide (CO), fine particulate matter (PM_{2.5}), and sulphur dioxide (SO₂), as well as non-criteria contaminants (PAHs, VOCs and metals). PCA predicted NO₂, PM_{2.5}, and SO₂ concentrations, based on 1 year meteorological datasets, that were compared to current and old health based Toxicity Reference Values (TRVs). According to PCA, the HHRA focused on addressing health risks from exposure to PM_{2.5}, rather than PM₁₀, since it believed PM_{2.5} might play a larger role in affecting human health.

PCA predicted that air concentrations for the Aboriginal, Commercial and Resident Groups' receptors for NO₂, PM_{2.5} and SO₂ would all be below old and current TRVs. However, 1-hour NO₂ concentrations were predicted to exceed current TRVs at the RSA MPOI in the Baseline Case, Application Case and PDC on an acute basis. PM_{2.5} concentrations were predicted to exceed acute and chronic health based guidelines at the RSA MPOI and exceed acute health based guidelines at the LSA MPOI. According to PCA, SO₂ concentrations were predicted to exceed old and current TRVs for acute health based guidelines at the RSA and LSA MPOI.

4.1.1.5: Short-Term Health Risk

Based on the predicted air quality results, PCA determined that, with the exception of PM_{2.5}, acute RQ values did not exceed 1.0 for any of the individual COPC, or for any chemical mixtures under the Baseline or Application cases. PCA stated that there were no exceedances of AAAQO at any of the receptors for any of the cases. PCA stated that predicted COPC air concentrations were less than health-based guidelines and that additive interactions of the COPC were not predicted to result in health effects. Therefore, PCA concluded that health risks for these COPC and mixtures were considered negligible.

PCA acknowledged that PM_{2.5} was predicted to exceed health based guidelines at the RSA and LSA MPOI. PCA stated that PM_{2.5} would not be exceeded at any sensitive receptors in the Baseline and Application cases. PCA further explained that the LSA maximum ground level concentration for PM_{2.5} was predicted to be

located on the fenceline. PCA concluded that the Project contribution above Baseline predictions would be negligible to small for all locations.

4.1.1.6: Long-Term Health Risk

PCA reported that predicted chronic RQ values for non-carcinogens did not exceed 1.0 for any of the individual COPC and chemical mixtures under the Baseline or Application cases. PCA concluded that health risks for these COPC and mixtures were considered negligible.

PCA reported that maximum predicted ILCR values were less than 1 in 100,000. PCA determined that the ILCR from the Project and Future industrial sources are negligible.

4.1.1.7: Air Emissions Management and Monitoring

PCA committed to the following measures to reduce the environmental effects of air emissions from the Project:

- Dust control measures (e.g., watering/oiling roads) would be implemented to ensure a high level of dust suppression (98 percent) sufficient to maintain acceptable air quality.
- A preliminary Dust Management Plan (DMP) would be followed by PCA staff and contractors during project activities and operations to limit dust transfer to adjacent properties.
- Haul routes would be re-graded at least once a month between May and October to remove fine materials.
- Diesel motors in new haul trucks would comply with the US EPA Tier IV standards.
- The speed of haul trucks, service vehicles and other mobile equipment would be limited to 20 km/hr within quarry operating areas.
- During drilling and blasting, water foggers or sprays would be deployed to reduce dust emissions, dust collectors would be regularly maintained and blasting activities would occur under low wind conditions (less than 30 km/hr).
- The crushing/screening plant would be located below grade (within quarry excavations) to reduce particulate emissions.
- Lift heights and discharge distances to the top of stock piles would be minimized, and if further suppression were required, transfer points would be partially enclosed.
- Quarry mining operations would be suspended if prevailing winds from east to west were greater than 50 km/hr.

In addition, PCA committed to monitor the following:

- Wind forecasts would be monitored regularly by the quarry manager during operational phases to anticipate the need for mitigation measures and allow for next day planning.
- PM_{2.5} would be monitored continuously using laser/optical technology to support its DMP.

4.1.2: Views of the Panel

The Panel relied on PCA's air dispersion modeling used for determining the predicted ambient ground level concentrations as a result of air emissions from the Project. The Panel notes that PCA used the ambient ratio method to predict ambient NO₂ concentrations, a method accepted by ESRD for environmental assessments done in the Regional Municipality of Wood Buffalo.

In light of potential air quality impacts associated with the Project and predicted elevated PM_{2.5} concentrations in the LSA, the Panel requires as a condition that PCA undertake PM_{2.5} monitoring and implement a dust management plan, as outlined by PCA, to the satisfaction of ESRD. The Panel further requires that should the monitoring indicate exceedances, PCA must develop a mitigation plan and implement that plan to the satisfaction of ESRD. Mitigation could include PCA acquisition of new diesel motors which meet Tier IV standards.

The Panel considers any predicted exceedances of AAAQO to be a serious matter calling for action. Likewise, the PAI assessment which finds a potential for acid deposition to exceed critical loads in the area surrounding the Project raises a concern. Therefore, as a condition of approval, the Panel requires PCA to actively contribute to regional processes addressing air quality issues, with the goal of achieving reductions in emissions. These processes would likely involve soil, vegetation and surface water monitoring initiatives.

The Panel has had regard for the *LARP* Air Management Framework which sets the ambient air quality triggers and limits for nitrogen dioxide and sulphur dioxide. These limits will apply to PCA's operations.

The Panel concludes that the impacts of the air quality emissions from the Project can be mitigated with the implementation of the commitments made by PCA and required conditions of this approval.

4.2: Noise

4.2.1: Views of the Applicant

Parsons Creek Aggregates (PCA) conducted an environmental noise impact assessment to evaluate potential effects of the proposed Parsons Creek Resources Aggregate Project (the Project). The assessment included a baseline noise assessment, generation of a noise model for the Project, and comparison of the resulting modeled noise levels to the Alberta Energy Regulator (AER) Directive 038 on Noise

Control (formerly ERCB Directive 038). PCA acknowledged that the Project would have an impact on noise.

PCA stated that the existing sand and gravel pit at the north end of the Site was included in the baseline noise assessment as well as in the modeled Application Case for the first ten years. Noise sources from the sand and gravel operation included surface mining equipment, gravel crushing equipment, and loading equipment. PCA indicated that existing industrial operations north and south of the Project were considered relatively minor compared to traffic noise and were not included in the noise assessment.

PCA noted that potential residential receptors in the area surrounding the Site include the future residents of the Parsons Creek residential subdivisions and the current and future residents within the Timberlea residential subdivision. PCA stated that the Timberlea subdivision would be more than 1,500 m from the Project. An additional residential area has been proposed to the southeast of the Project (on the east side of the Athabasca River; Forest Heights) but was not included in the assessment, as no specifics of the subdivision were known at the time of assessment.

PCA identified a Trapper's Cabin within the buffer area between the Project and Athabasca River that had recently been rebuilt by the current trap line leaseholder (the Leaseholder). PCA indicated that the cabin was intended to be occupied most weekends during the September to May trapping season by the Leaseholder and/or assistants. PCA felt that a good working relationship had been maintained with the Leaseholder, stated that a trapper compensation agreement was in place, and anticipated that a future compensation agreement would fully compensate for any impacts to the trapping operation resulting from the Project. PCA did not believe that the Trapper's Cabin would meet the intent of the AER Directive for a seasonal dwelling and that noise calculations at this location would not be useful. PCA identified the future Parsons Creek residential subdivision as the only residential receptor to be included in the impact assessment.

PCA outlined that noise has the potential to also affect wildlife, as sensory disturbance can reduce habitat effectiveness and may result in habitat avoidance, changes in animal behavior, and changes in wildlife movement patterns. Mitigation measures relating to noise disturbance on wildlife were included in the wildlife section of the application and were not included in the noise assessment.

PCA stated that a noise monitoring survey was completed and that noise modeling was conducted to meet requirements of the AER Directive 038. Baseline daytime noise levels were dominated by traffic, particularly along Highway 63, and unidentified construction activities in the area.

PCA presented modeled noise scenarios for the Baseline Case and for various time periods during Project operation (i.e., years 1-10, 10-20, 20-30, and 30-40). Some noise sources were not included in the model due to difficulties in modeling them (e.g., back-up beepers). PCA stated that mitigation measures would be possible for most of these types of noise sources, should any concerns or complaints be raised during operation. PCA identified that vegetative sound absorption was included in the noise model, assuming that the trees on the edge of the hill to the west of the Site would remain, regardless of subdivision development.

During initial modeling, PCA indicated that night-time sound levels would be met for all time period ranges assessed, and identified that receptors would include the facilities for Northlands Forest Products and the Fort McMurray Urban Service Area and the current residential subdivisions. PCA highlighted that all initial modeling was conducted with assumptions and requirements regarding noise mitigation for the crushing equipment. These assumptions required that all of the screening, crushing, and power generation equipment be housed in mobile/temporary buildings (at a minimum metal clad, lined with sound absorptive insulation material, and have minimal openings), that an earthen berm noise barrier be built along the north end of the Project during years 1-10 (with a required height of five metres above grade for the length of the north side), and that all of the internal combustion engines be equipped with properly operating high grade exhaust silencers. PCA believed further noise suppression would be achieved by locating the portable crushing-screening spread below grade and positioning finished aggregate stockpiles around the active areas.

PCA also presented the results of noise modeling without equipment enclosures or berms and stated that predictions indicated that night-time noise levels might exceed AER Directive 038 permissible sound levels for some of the 1,500 m boundary theoretical receptors for each of the four different operational locations. PCA noted that in these situations, the exceedances would be in locations where there are no residential receptors, and felt that since the Directive is complaint driven, minimal impact would be experienced because there are no people in these areas to complain. PCA summarized that the results of noise modeling without equipment enclosures or berms indicated that night-time noise levels during years 1-30 would be below permissible sound levels at the residential receptors (Parsons Creek North and South). During years 30-40, the noise levels were modeled to exceed the permissible sound levels for the Parsons Creek North residential receptor.

PCA committed to noise mitigation for the operation such that noise levels at the residential receptors would not exceed the AER Directive 038 permissible sound levels. PCA stated that the full extent of required noise mitigation was not known. PCA felt that the review of equipment enclosures for crushing equipment indicated potential health concerns for workers pertaining to dust exposure, and it was not considering enclosures. PCA provided one mitigation option that included moving the crushing equipment to a point no closer than 1,800 m from the residences and then using haul trucks to transport material from the southern portions of the Site to the location of the crushing equipment further north. PCA ensured that the exact equipment locations, noise levels, and mitigation methods would be reviewed and determined over the course of the first 30 years of the Project.

PCA committed, to the satisfaction of Environment and Sustainable Resource Development (ESRD), to adopt and adhere to the requirements of the current AER Noise Directive, to implement a variety of operational noise, dust, and vibration reduction measures such as mufflers, silencers and shielding, road maintenance, and traffic routing, to implement a routine noise, dust and vibration monitoring program, and to apply further mitigative measures, if exceedances of permissible noise, dust, and/or vibration levels are detected by the monitoring in a residential area. PCA committed to operate within AER maximum noise requirements that require an average ambient sound level of no more than 48 dBA daytime and 38 dBA night-time as measured at the closest future urban development area (see Figure 1). PCA also committed to implement a Complaint Response Protocol and a Community Awareness Program

(respecting noise and vibration), to be finalized in consultation with the Regional Municipality of Wood Buffalo at the Municipal Development Permit stage.

4.2.2: Views of the Panel

The Panel is satisfied that PCA conducted an adequate noise impact assessment and that potential noise impacts as a result of the Project have been identified. The Panel recognizes that noise is a relatively significant project related issue, particularly for the Regional Municipality of Wood Buffalo.

The Panel notes that the noise impact assessment was intended to compare modeled noise levels at residential receptors to the Alberta Energy Regulator (AER) Directive 038: Noise Control, as opposed to necessarily conducting a noise impact assessment that meets all requirements of the Directive (e.g., including all real and theoretical receptors, all noise sources, providing commitments for mitigation of any exceedances so that the levels in the directive are met at all receptor locations, etc.). The Panel accepts that the Project is technically not required to meet all objectives of the AER Directive 038; therefore the Panel finds that the methodology and processes used by PCA to assess noise are adequate. The Panel accepts that an agreement is in place with the current trapline Leaseholder and associated Trapper's Cabin, though encourages PCA to maintain a positive working relationship with the current and future Leaseholder(s), as the cabin would be required to be considered under the AER Noise Directive.

The Panel acknowledges that traffic noise along Highway 63 is the dominant noise source in the area and that noise contributions from the highway have likely increased since the baseline monitoring survey was conducted. The Panel accepts the modeled noise scenarios and predictions submitted by PCA, both with and without mitigation measures (e.g., equipment enclosures and berms), recognizing that not all potential noise sources were included in the modeling (e.g., back-up beepers, all equipment, blasting). While the Panel believes that it may be ideal that all noise mitigation measures be employed that were included in the initial noise modeling, it may not be practical or necessary to include all of them during operation. Some relatively easy and practical measures, such as the location or positioning of equipment and the use of equipment mufflers and shielding, are expected to be employed by PCA to meet permissible sound levels at residential receptors.

The Panel expects PCA to implement operational noise, dust, and vibration reduction measures, road maintenance, and traffic routing, and to apply further mitigation measures if monitoring identifies potential issues, as committed to by PCA. The Panel further expects PCA to work collaboratively with the Regional Municipality of Wood Buffalo in dealing with noise issues, particularly in implementing a Complaint Response Protocol and Community Awareness Program. The Panel accepts the commitment made by PCA to operate within AER maximum noise requirements of an average ambient sound level of no more than 48 dBA daytime and 38 dBA night-time, as measured at the closest urban development area.

In response to concerns regarding noise, the Panel requires as a condition of approval that PCA adhere to the requirements of the current AER Noise Directive for noise levels measured at existing and future urban development area(s) and must include a noise monitoring program to the satisfaction of ESRD. The Panel also requires the

establishment of a noise complaint protocol, that PCA report noise level exceedances at identified residential area(s) and that PCA develop and implement any noise mitigation that may be required, to the satisfaction of ESRD.

SECTION 5: LAND USE AND TRANSPORTATION

5.1: Land Use and Transportation

5.1.1: Views of the Applicant

Parsons Creek Aggregate (PCA) contended that it had undertaken significant consultations with interested and potentially affected parties since preliminary Project work began in 2004. It was the view of PCA that it had addressed all land use and transportation concerns raised by the Regional Municipality of Wood Buffalo (RMWB) and stakeholders, and that it was committed to ongoing consultations to further mitigate and accommodate issues which might arise in the future. Discussions between PCA and the RMWB culminated in an MOU between the two parties on August 13, 2013. The MOU was intended to allow the Parties to work together to ensure that operations and reclamation objectives at the Site are compatible with land use and quality of life objectives of the RMWB and with the future urban growth in the region, having regard to noise, vibration, traffic, and geotechnical impacts.

According to PCA, the land in the vicinity of Fort McMurray is typically designated as Urban Expansion District under the RMWB Land Use Bylaw. The Site is located immediately north of the District which according to PCA continues to be pressured by urban land use encroachments. A major interchange is under construction south of the PCA lease. According to PCA the area in the vicinity of the interchange is also under pressure for northward expansion of industrial subdivisions and recreational complexes.

PCA stated that the Site is located adjacent to the Urban Service Area of Fort McMurray and is located entirely within the Parks and Recreation District under RMWB's Land Use Bylaw No. 99/059. According to PCA, the RMWB recognized that parks and recreation uses could be realized in the long term through end use reclamation of filled and replanted areas along with quarry ponds and undisturbed riverbank natural areas. PCA stated that Bylaw No. 06/037 was amended in 2006 following a public advertising and consultation program to provide a site-specific amendment to the Parks and Recreation District to allow for "*sand and gravel extraction and associated processing and shipping activities within the West half of Section 31, Township 90, Range 9, W4M.*" PCA indicated that there was a further amendment of the Bylaw in 2010 to allow "*[s]and and gravel extraction and associated processing and shipping activities within part of Section 30, Township 90, Range 9, W4M.*" According to PCA the RMWB did not intend to process a Land Use Bylaw amendment application for the limestone Project quarry until there was a completed EIA.

PCA maintained that the proposed recreational end-use of the subject lands was consistently supported by the RMWB since 2006. PCA contended that recreational end-use supports municipal land use policies approved by the RMWB and the *Lower Athabasca Regional Plan (LARP)*. Further, PCA contended that it had accommodated all land use proposals in the new Municipal Development Plan for a big-box retail location suggested by the RMWB to be located south of the Project area. PCA stated that the reclamation plan in the EIA would be refined in consultation with the RMWB and other stakeholders at the Land Use Amendment and Development Permit stages of the quarry regulatory review and approval processes. According to the MOU, RMWB and PCA would cooperatively work with regulators and stakeholders to ensure that Mineral

Surface Lease permit plans and municipal Development Permit plans for the quarry are consistent and integrated.

PCA indicated that it would maintain a minimum 150 m buffer between the quarry operations and the top of the west bank of the Athabasca River to help reduce flood event impact, provide erosion protection from flood water as well as reduce potential for scour and channelization during flooding events. PCA indicated that the sand and gravel license allowed extraction of sand and gravel to within 60 m of the Athabasca River and contended that this extraction within the proposed 150 m buffer is not related to the proposed quarry Project. PCA stated that it would reclaim all disturbances associated with sand and gravel extraction and re-establish the minimum undisturbed buffer zone between the Athabasca River and the proposed quarry operations using spoil materials from the quarry operation. PCA indicated that the buffer associated with the quarry operation would be wider than 150 m in some areas. For example, in Mine Block 3D (see Figure 2), the undisturbed buffer zone would vary in width between 200 and 275 m due to required setback distances for the Athabasca River and Pond No. 1 combined.

PCA indicated that the reclamation plan for the quarry, if approved, would supersede the reclamation plan for the sand and gravel operation. PCA concluded that since the Project is designed to minimize impacts on the Athabasca River, Parsons Creek, UC6, and Pond 1 through the use of buffers of undisturbed land, hydrologic impacts to local aquatic ecosystem and the Athabasca River would not be significant. PCA also indicated that it had allowed for a 30 m right of way for a possible service road on the west side of the lease. The right of way would allow for a 15 m buffer between the quarry operation and the service road. PCA stated that the buffer would have the potential to accommodate future pipeline projects.

PCA indicated that some Aboriginal groups have indicated that they have little interest in exploring the details of the Project because the area, even without the proposed Project, would be impacted by the growing urban area of Fort McMurray (in addition to the Site being located between an existing lumber yard to the north and a proposed major interchange to the south, and adjacent to a busy highway). Other Aboriginal groups indicated a preference for recreation uses in the southern part of the Project area and more natural vegetation and restricted uses at the north end of the Site. PCA stated that this preference was the basis for its proposed reclamation plan for the Project. PCA committed that physical access would be allowed to any non-operations part of its lease for First Nation people.

According to PCA the proposed quarry is compliant with the *LARP* since the Project is consistent with Outcome 2 of *LARP* (“*The region’s economy is diversified*”). PCA also stated that the Project is consistent with the objectives and policies for the Athabasca River Public Lands Areas for Recreation and Tourism land use zone.

PCA stated that concerns regarding traffic and highway access were addressed in the Traffic Impact Assessment component of the EIA, through SIRs, and through ongoing work with Alberta Transportation (AT). PCA stated that a copy the Parsons Creek Aggregates Limestone Quarry Traffic Impact Assessment was prepared in 2010 and provided to AT for review. According to PCA, AT indicated that “Overall the report is good and provides justification to the intersection improvements that are now in place at this [northern] access.” PCA indicated that AT requested additional information that will

be prepared by PCA's consultant and forwarded to AT in support of a future Roadside Development Permit for the quarry. PCA stated that every effort would be made to extend the life of the north entrance because it has expended significant funds to ensure the access is reliable and safe. PCA's traffic assessment indicated that the number of truck trips at the north entrance would drop by at least 50 percent when the south entrance is completed as part of the proposed North Parsons Creek interchange.

According to the August 2013 MOU, both PCA and the RMWB will encourage the Government of Alberta to disallow aggregate extraction from Area "A" (Figure 1) in perpetuity. However, PCA indicated that it intends to keep lease rights on Area "A" to facilitate traffic movements between areas "B" and "C" until such time suitable access to Areas "B" and "C" can be secured via the proposed interchange. AT indicated that it would advise PCA when all, or a portion of, quarry traffic should be diverted to a south entrance that will be part of the proposed North Parsons Creek interchange.

PCA stated that initial haul hours are expected to be from 0700 hrs to 1900 hrs, 6 days per week between 260 and 275 days/year with winter shut down. According to PCA when quarry operations reach peak production in about 10 years, haul operations are expected to increase to 24 hours per day, 7 days per week, year-round, with the exception of statutory holidays and seasonal maintenance shutdown (340 to 345 days/year). PCA stated that the final details of the haul hours would be discussed with AT as part of the updated Traffic Impact Analysis it will submit to AT at the Roadside Development Permit stage for the quarry operations.

In March and April 2013 both AT and RMWB submitted Statements of Concern relating to the Project which included concerns about geotechnical aspects of the Project. Specifically, there was a concern that quarrying activities could destabilize the escarpment lands to the west of the Project area, potentially impacting infrastructure associated with Highway 63. To address these concerns, PCA committed to retaining a geotechnical engineering firm to conduct a local study of landslide hazards, and a blasting engineering firm to design a blasting plan for the quarry that would involve strategically locating seismographs near structures to monitor the vibrations and concussions associated with each blast, and the submission of seismographs records to AT. In June 2013 AT withdrew its Statement of Concern in light of commitments by PCA to:

- Identify acceptable levels for blast vibrations and noise.
- Document the geotechnical condition of nearby structures/facilities prior to blasting and conduct post-blasting inspections to determine any impacts from blasting.
- Conduct a geotechnical assessment to determine what seismic conditions are most likely to trigger landslides, and confirm that these triggers would not be exceeded by blasting.

The August 2013 MOU between Graymont Western Canada Inc. and the RMWB also addressed some the technical issues identified by the municipality. In the MOU, PCA indicated it would:

- Only undertake blasting in Area C (Figure 1) and that the blasting would only occur from 9:00 am to 5:00 pm, Monday to Friday.
- Extract limestone from Area B (Figure 1) using only mechanical means.
- Implement a Dust Management plan as well as a Noise and Vibration Management Plan.
- Implement a Complaint Response Protocol and a Community Awareness Program (for noise and vibration), in consultation with the RMWB at the municipal Development Permit stage.

5.1.2: Views of the Panel

The Panel encourages PCA to continue discussions with the RMWB, First Nations and environmental stakeholders about reclamation/end land use goals prior to and at early stages of the planning process. The Panel expects PCA to fulfil the commitments made in the MOU to work with the RMWB and other environmental stakeholders to prepare an end land use land reclamation plan that incorporates the objectives of the RMWB along with the requirements of the Crown, regulatory authorities and First Nation stakeholders.

According to PCA a minimum 150 m undisturbed buffer will be maintained between the proposed quarry and the Athabasca River. However, the Panel notes that the only true “undisturbed” buffer will be a 60 m zone between the top of the west bank of the Athabasca River and the edge of the sand and gravel operation. The Panel understands that to maintain a minimum 150 m buffer between the Athabasca River and the limestone quarry operations, the 60 m buffer will be extended by a minimum 90 m buffer using spoil material from limestone quarry operations. As PCA has committed to restore the 90 m of disturbed land to create a 150 m buffer zone as part of its quarry operation plan, the Panel requires that PCA reclaim the minimum 90 m buffer extension to the satisfaction of ESRD to ensure that appropriate vegetation is established and maintained within an appropriate timeframe.

According to the August 2013 MOU, both PCA and the RMWB agreed that aggregate extraction from Area “A” (Figure 1) is not compatible with quality of life and land use objectives of the RMWB. Both parties agreed to encourage the Government of Alberta to not allow aggregate extraction from Area “A” in perpetuity. Given this exclusion, the Board’s approval of this Project does not include Area “A.”

Potential impacts of the proposed Project on Highway 63 safety are an important issue for the Panel. The Project has the potential to impact Highway 63 safety in a variety of ways, including geotechnical and dust issues associated with blasting, and increased traffic due to the Project. It is the Panel’s view that traffic issues associated with the Project need to be managed effectively due to the already high traffic flow in the vicinity of the Project area. The Panel requires as a condition that PCA develop an updated Traffic Impact Analysis to address issues associated with future quarry traffic such as acceptable levels of service, hours of operation, signage, and lighting to the satisfaction of AT. The updated Traffic Impact Analysis will be required for the municipal land use redesignation stage and for AT’s Roadside Development Permit process. AT indicated to PCA that the monitoring of traffic conditions at the existing north intersection is

expected to be a condition of the approval associated with the future Roadside Development Permit.

The Panel requires as a condition that PCA meet the following commitments to the satisfaction of AT to address Highway 63 safety issues associated with the proposed quarry:

- Develop and follow a blasting program to ensure operations do not pose a risk to the infrastructure of Highway 63 and safety of its users.
- Retain a geotechnical firm to conduct a local study of landslide hazards and conduct a risk assessment for blasting to comply with the United States Bureau of Mines Structure Response and Damage Produced by Ground Vibrations from Surface Blasting (USBM RI-8507).
- Use strategically placed seismographs to monitor blast impacts on nearby structures.
- Retain blasting and geotechnical engineer(s) who are familiar with local conditions to sign off on an agreed blasting and monitoring plan.

The Panel acknowledges PCA's contention that the proposed quarry is fully compliant with the *LARP*. A key aspect of this compliance will be adherence to the surface water quality, air, and groundwater management frameworks which became law in August 2012.

SECTION 6: SOILS AND TERRAIN, CONSERVATION, RECLAMATION AND CLOSURE PLAN

6.1: Soils and Terrain

6.1.1: Views of the Applicant

6.1.1.1: Assessment of Soils and Terrain

Parsons Creek Aggregates (PCA) completed and provided a baseline survey and assessment of soils and terrain resources that encompassed both the local study area (LSA; 568 ha) and the regional study area (RSA; 2649 ha). PCA noted that the Project development area (PDA) comprised 69 percent (391 ha) of the local study area.

PCA reported that data, obtained by conducting a detailed field survey (Survey Intensity Level 1) within the LSA and PDA, were used to assess and classify existing soil resources to the level of soil series or variants. PCA said that an inventory and classification of baseline LSA and PDA landforms was also completed by evaluating surface and topography factors such as slope gradient and slope length. To complete the baseline assessment of the soil and terrain resources, PCA explained that the 19 soil taxonomic entities and the 7 distinct landscape patterns were integrated and organized into 17 soil-landscape-model (SLM) map units which were subsequently synthesized to produce a consolidated baseline soil map of the LSA. PCA concluded that the most common landforms in the LSA were floodplains (~75 percent of the terrain) and the most significant, dominant or co-dominant soils in the LSA were Regosols and Gleysols.

PCA noted that, based on the baseline soil map of the LSA, soil-related interpretations were completed and reported regarding: soil profile thickness (litter/surface peat, topsoil, upper subsoil, lower subsoil), forested land capability, suitability of soil materials for reclamation, erosion risk of soil materials and sensitivity to potential acid inputs. With regard to reclamation suitability, PCA said that the topsoil horizons as a reclamation medium were rated as Fair to Poor, limited by elevated saturation percentages and fine textures. PCA determined that upper and lower subsoil media were rated as Fair as a reclamation medium, restricted by elevated saturation percentages, fine or coarse textures and in some cases slightly alkaline pH.

PCA indicated that overburden (geologic material >1.2 m in depth from ground surface), occurring above, between and below the limestone formations to be mined, were also assessed for suitability as reclamation media. It concluded that the surficial overburden materials (glacial fluvial deposits) were rated as Fair to Poor, limited primarily by coarse textures. Based on the results of chemical analyses, PCA believed that there were no limitations on use of this material for mine reclamation. PCA evaluated the calcareous shale waste rock overburden (M3-NSL) occurring between the two limestone zones of interest and reported that the suitability of this material for reclamation was Poor to Unsuitable due to limiting properties (e.g. extremely firm to hard consistency, high sodium adsorption ratio, elevated electrical conductivity).

6.1.1.2: Project Effects

PCA concluded that the potential effects of the Project on the soil resources were similar for the Baseline, Application and Cumulative Effects Assessment (CEA) cases. It indicated that the Baseline Case considered the potential effects resulting from the construction and operation of the sand and gravel lease and development of the Alberta Transportation borrow location.

In summarizing the potential effects of the Project on soils resources, PCA acknowledged that the following results were possible:

- Soil quantity: change due to under and over-salvaging of topsoil and subsoil resources; loss during handling, storage, and replacement during reclamation; loss due to erosion.
- Soil quality: loss due to erosion; change due to soil handling, storage, and replacement during reclamation; impacts due to accidental releases and operational incidents; impacts due to the use and placement of Poor to Unsuitable rated overburden materials as reclamation media.
- Soil biodiversity: change resulting from the removal of the existing soil profiles; topsoil handling, storage and replacement; creation of more homogenous reclaimed soil profiles.

PCA concluded that Project impacts on soils resources within the LSA could be mitigated and managed with appropriate monitoring to allow for proactive planning and action.

PCA believed that the potential residual impacts of the Project, which involve only areas of soil disturbance, would not be significant by implementing mitigative measures and monitoring activities. PCA concluded that potential residual effects on soils within the RSA would not be significant.

6.1.1.3: PCA Commitments Regarding the Soil Resource

PCA stated that the following detailed mitigative measures and monitoring activities would be undertaken to ensure that soils resources are conserved and reclaimed in order to achieve equivalent land capability.

A) Mitigative Measures to Reduce Project Impacts:

- Prescribed salvage information for topsoil and subsoil will be followed to ensure replacement of suitable rooting medium.
- Terrain will be re-created as per desired end land use.
- Salvage and handling will be avoided during wet weather conditions to reduce the chances of erosion, compaction and admixing.
- Where required, topsoil will be stored in areas accessible for reclamation but detached from any salvaged subsoil.

- Subsoil materials placed into long-term stockpiles or utilized for berms will either be stabilized with erosion prevention materials (e.g. coconut mats) or overlain by a topsoil layer that will be seeded. All topsoil material used to cover and aid in the establishment of vegetation on soil berms, will be salvaged separately during initial handling to facilitate final placement.
- De-compaction of the replaced soil profiles will be undertaken to reduce potential compaction as a result of soil replacement.
- In mined areas known to contain significant shale waste rock (M3-NSL), M3-NSL will be capped with surficial overburden materials or placement of additional subsoil material to minimize the potential impacts of sodic material comprising a portion of the rooting zone in the soil profile.
- All reclaimed lands will be vegetated after soil replacement to minimize soil loss via wind and water erosion.

B) Monitoring Activities to Minimize Potential Residual Impacts on the Soil Resource:

- Assess mitigative measures (e.g. deep tillage to reduce compaction) to determine effectiveness of activity.
- Inspect landscape characteristics and features (e.g. identify subsidence or drainage issues).
- Identify potential soil erosion issues of stockpiled or recently replaced soil material.
- Inspect reclaimed areas for topsoil quality (i.e. admixing) and quantity (depths).
- Inspect for appropriate vegetation composition and weed densities.
- Assess established vegetation for plant vigour, health, cover, density, height, and yield.

C) Measures to Ensure the Quality of Salvaged Topsoil and Subsoil Materials:

- Topsoil and suitable subsoil material will be salvaged utilizing soil information from the baseline soil assessment applicable to the PDA.
- Supervision of soil salvage operations and direct placement of soil materials during reclamation will be by a qualified individual.
- Salvage and replacement information for various soil, overburden, and end land use situations will be used for appropriate soil handling throughout the PDA.
- Where required, conditioning of the replaced soil profiles will be completed to reduce potential compaction as a result of soil handling during direct replacement activities.
- Topsoil will be stored in areas accessible for reclamation but detached from salvaged subsoil material.

- All reclaimed lands will be vegetated as per end land use objectives upon completion of soil placement.
- All topsoil and suitable subsoil material to be stockpiled will be placed in areas that minimize exposure to wind or water and will be vegetated in a timely manner.
- All stockpiles and berms will be constructed with slopes less than or equal to 3V:1H and constructed with ridges perpendicular to the main slope gradient.
- Topsoil stockpiles and berms will be seeded immediately after placement with a tackifier containing a quick establishing cover crop.
- Subsoil material placed into long-term stockpiles or utilized for berms will be either stabilized with erosion prevention materials (e.g. coconut mats) or overlain by a topsoil layer that is to be seeded. All topsoil material used to cover and to aid in the establishment of vegetation on soil berms will be salvaged separately during initial handling to facilitate final placement.
- All direct replacement locations will be seeded immediately upon completion of soil placement using a quick establishing cover crop.
- Monitoring will include:
 - Effectiveness of salvage activities in disturbance areas
 - Potential soil erosion issues of stockpiled or recently replaced soil material
 - Potential compaction issues in high traffic areas
 - Reclaimed areas to ensure that required topsoil replacement depths are achieved

6.1.2: Views of the Panel

The Panel concurs with PCA's view that soils and reclamation materials from the LSA are valuable resources that require planned salvage, conservation and future use. PCA has provided a comprehensive list of activities and practices that it will implement to ensure that satisfactory outcomes and performance are achieved with regard to the future reclamation operations involving salvaged and stored LSA soils. The Panel considers the activities and practices that PCA has listed as necessary and important commitments for the responsible and satisfactory recovery, conservation and use of the soil resources. Having regard for the commitments as set out in Section 6.1.1.3, the Panel is satisfied that PCA has adequate measures in place to preserve the quality of salvaged topsoil and subsoil materials. The Panel is confident that ESRD will oversee the fulfillment of these commitments in a manner that will achieve reasonable outcomes.

6.2: Conservation and Reclamation Activities and Quarry Closure Plan

6.2.1: Views of the Applicant

6.2.1.1: Assessment

PCA acknowledged that, as a shared regional priority with other developers in the oilsands region, the primary goal of reclamation is to return the lands to equivalent land capability. In support of this goal, PCA said that a conservation and reclamation (C&R) plan was prepared for the first 10 years of quarry development and mining operation. It explained that the closure plan was developed to summarize the goals of mine closure and the environmental management practices that would be implemented throughout the life of the quarry. PCA emphasized that it would employ an adaptive management approach for reclamation, responding to relevant changes in technology, reclamation knowledge and practices, reclamation monitoring results, stakeholder input and regulatory policy.

6.2.1.2: End Land Use

PCA reported that the proposed end land use after quarry reclamation would be determined using the best available information and in consideration of consultations with stakeholders (public, environmental groups, First Nations, RMWB and ESRD) regarding rehabilitation goals and end land use options.

PCA reported that all Aboriginal groups recognized that the future use of the reclaimed PCA Site will be impacted by the growing urban land use encroachments of Fort McMurray (e.g. outdoor storage industries, highway realignment and interchange, potential new industrial subdivision, potential recreational complex developments). PCA observed that some First Nation groups, consequently, recommended a transition of reclamation end uses for the reclaimed lands, ranging from more intensive recreational uses at the south end of the mining lease to more natural vegetation and restrictive uses at the north end. PCA said that this recommendation was endorsed and adopted as the basis for its proposed reclamation and end land use concept. By planning a mix of woodlands, wetlands and quarry pond at the north end of the reclaimed Site, PCA reasoned that the reclamation plan would provide for wildlife, a transition to natural areas from the south end of the Site.

PCA maintained that it planned to return the land to a capability that would support the many land use options presented. It acknowledged that significant detail work remains to refine the preliminary reclamation plan so that the vision and goals of all stakeholders are met. PCA concluded that end land uses would have to comply with ESRD land management requirements and the Regional Municipality of Wood Buffalo's land development requirements and land use bylaws in effect at the time.

6.2.1.3: Reclaimed Landscape

PCA stated that reclaimed landforms would be designed using the Reclamation Working Group Landscape Design Checklist (CEMA, 2004) and that the following

goals and principles would be incorporated into the reclamation and closure planning:

- Progressive reclamation will be undertaken when practical.
- Landforms will be geo-technically stable and will be integrated into the surrounding natural landforms.
- End-pit lakes will be ecologically stable.
- Drainage systems will be designed to minimize erosion rates and sediment loading.
- Reclaimed areas will be developed into self-sustaining ecosystems with an acceptable degree of biodiversity.
- Forest capability, including commercial forestry potential, will be equivalent to pre-development conditions.
- Direct placement of reclamation materials will be undertaken, whenever practical, to maximize potential viability of native seed banks and propagules.
- Natural invasion and succession of native vegetation will be encouraged in ecologically receptive areas.
- Local native seed sources will be used when practical to maintain genetic integrity of re-established plant communities.
- Reclaimed areas will reduce hazard potential to protect on-site and public health and safety.
- Reclamation certificates will be applied for and obtained to allow transfer of the lands back to the Crown.

To assist in the improvement of reclamation related to the Project, PCA declared that it would explore avenues to participate in regional or specific reclamation research opportunities and consider programs that build on the successes made in soil replacement, wetland construction and revegetation techniques. PCA said that it would determine the level of such participation.

PCA affirmed that the reclaimed lands would feature regionally acceptable vegetation patterns that would be self-sustaining and maintenance free ecosystems capable of natural succession. It acknowledged that, while providing equivalent land capability, the reclaimed land would exhibit a change in the ratio of uplands to wetlands. PCA indicated that end-pit lakes would be added to the landscape and stated that the reclaimed lands would result in increased open water area (34 percent of reclaimed LSA versus 2 percent of baseline LSA).

6.2.1.4: Progressive Reclamation

PCA stated that scheduled reclamation work would occur in the immediate or short term, during or following ongoing quarry activity and operations as part of progressive reclamation, where practical and appropriate. PCA noted that reclamation work should only start when and where there is very limited

possibility for re-disturbance by operations. It estimated that the progressive reclamation program would commence in approximately year 7-8, when Mine Block 3D is into its final stages. The timeline for both quarry mining operations and scheduling of reclamation would be determined by the nature of the limestone deposit to be quarried and the need to remove the M3-NSL layer throughout the first mining stage (Mine Block 3D). Once quarry operations advance beyond the depleted Mine Block 3D, PCA indicated that progressive reclamation programs would continue sequentially with the opening and construction of Mine Block 3C (see Figure 2) and succeeding mining blocks.

6.2.1.5: Stockpiles

PCA explained that designated M3-NSL material from Mine Block 3D would be stockpiled and remain along the eastern boundary of Mine Blocks 3A and 2B (see Figure 2) for the life of the quarry. It said that this 5.0 M m³ stockpile would become the base for an upland feature after reclamation. PCA stated that M3-NSL materials excavated from succeeding mine blocks would be placed directly in the previous mine block, i.e., M3-NSL excavated from Mine Block 3C would be placed as backfill in Mine Block 3D.

PCA estimated the availability of reclamation materials (topsoil, upper subsoil, lower subsoil, overburden) from mine block designs and soil mapping information and stated that sufficient soil materials would be salvaged to meet the requirements of the reclamation plan, with some additional volume for contingency purposes. It said that excess soil materials would not be salvaged and would be disposed of with the overburden materials. For salvaged reclamation materials from Mine Blocks 3D, 3C and 3B, PCA indicated that the topsoil, subsoil and overburden material would be segregated and conserved in stockpile areas to be located along the east side of the quarry mining operations. PCA noted that stockpiles of reclamation materials would be stabilized by seeding grass cover and that the siting of the stockpiles would be strategically separated to allow for free flow paths during and after any flooding events that occurred, to reduce erosion and loss of soil volume.

PCA believed that stockpiling cover soil and reclamation materials for ten years would minimize loss and admixing due to re-disturbance and that extended storage periods would not affect overall soil quality, provided that the stockpile configurations are wide and shallow, and that vegetated cover is maintained with minimal disturbance during the storage period. PCA acknowledged that, if required, additional storage of salvaged reclamation materials could be accommodated in Mine Blocks 3C, 3B and along the southern limits of the mostly reclaimed Mine Block 3D. When required (e.g. construction of Mine Blocks 3C), PCA said that reclamation and overburden material storage would be relocated. It stated that stockpile placement outside of the active quarry mining area (maximum 83 ha) was accounted for in the surface disturbance projections determined in the quarry mine design.

6.2.1.6: Replacement Depths and Direct Soil Placement

In reviewing the soil and overburden replacement requirements in various ESRD approvals issued to other mining proposals in the oilsands region, PCA reported that the following conditions prevailed:

- All coversoil (topsoil materials) and subsoil material salvaged shall be replaced in reclamation.
- An average combined depth of 50 cm of coversoil and suitable subsoil must be placed on all reclaimed areas.
- A cap of 1.0 m of suitable overburden material must be placed over unsuitable parent material located near surface during mine backfilling.

Consistent with the approvals issued to other mining proponents in the region, PCA agreed that, in situations where unsuitable parent material is located near surface, a 1.0 m cap of suitable overburden or subsoil material would be placed over the unsuitable parent materials prior to the placement of the topsoil material. PCA submitted that the condition for an average combined depth of 50 cm of coversoil and suitable subsoil as a growing medium on all reclaimed areas worked well elsewhere in Alberta but required testing in the oilsands region. Consequently, PCA stated that a 30 cm depth of coversoil and suitable subsoil was proposed in its reclamation plan.

PCA submitted that direct placement of soil materials onto re-contoured areas was the preferred option and would be implemented at every opportunity. It estimated that direct placement of soil materials would occur on over 60 percent of the reclaimed areas in the latter stages of the mine plan. PCA explained that 40 percent of the remaining area to be reclaimed is occupied by pits and working areas that are depleted. For these areas and starting in year 5, PCA indicated that M3-NSL backfill activities would occur, initiating the construction of the first of the end pit lakes. It noted that direct placement would only start after the first 10 year quarrying period.

6.2.1.7: Setback distances

PCA disclosed that the proposed sand and gravel operation (SML070025) is a separate entity from the proposed quarry, involving stand alone applications and plans which have been submitted. It said that the sand and gravel operations would proceed ahead of the quarry, removing aggregate materials in Mine Blocks 3C and 3D from the surficial deposits at depths between 10 m and 15 m, and up to 60 m from the top of west bank of the Athabasca River. PCA reasoned that the 60 m setback distance was warranted given the location of the sand and gravel deposit, the value of the deposit, and the results of a geomorphic study assessing protection of the sand and gravel operation from the Athabasca River. The Applicant further rationalized that this stretch of the Athabasca River is very stable due to the outcropping of limestone along the west bank and that the proposed 60 m undisturbed buffer is much greater than the typical 30 m flood

protection buffers established for projects located along a stable river bank elsewhere in Alberta.

PCA said that the quarry would intersect the existing sand and gravel operation (SML050015) in Stage 3D and the proposed sand and gravel operations (SML070025) in Stages 3C and 3B of quarry operations. It estimated that the proposed limestone quarry pits for Mine Blocks 2C and 3D would remove limestone deposit at depths up to 25 m. As the quarry mine and reclamation plan would supersede the reclamation plan submitted for the sand and gravel operation, PCA stated that it would, during mining Stages 3C and 3B, backfill the completed sand and gravel pit with available overburden materials, replace cover materials and revegetate the area to re-establish a minimum 150 m setback. PCA stipulated that no specific quarry development activities would be conducted within the minimum 150 m buffer zone between the quarry operations and the top-of-bank of the Athabasca River. It noted that, in some areas, the buffer zone would be wider than 150 m, as a result of the mining plan or riparian and terrain conditions. As an example, in Mine Block 3D, PCA noted that the undisturbed buffer zone would vary in width between 200-275 m with the combined prescribed minimum setback distances for the Athabasca River and Pond #1. PCA observed that the proposed quarry setback is wider than existing setbacks for Northlands Lumber to the north or the RMWB's industrial park to the south of its mineral leases.

PCA stated that the following additional setback distances would be established in connection with the quarry reclamation:

- Western, northern and southern edge of Pond #1: 60 m. (Under SML050015, PCA indicated that ESRD has approved a 45 m buffer around Pond #1. PCA stated that any disturbance in the 15 m zone between the current setback and that for the proposed quarry would be reclaimed and revegetated).
- Along Highway 63 right-of-way: 45 m (PCA explained that a 30 m setback would be established for future service road and an additional 15 m setback allocated for a treed buffer strip).
- Parsons Creek: 100 m (PCA stated that a 50 m setback would be established along each bank of the stream).

6.2.1.8: End-Pit Lakes

PCA submitted that it would not be possible to completely backfill the depleted quarry areas to near grade. Consequently, PCA said that three end-pit lakes would be developed and incorporated into the reclaimed landscape during the reclamation program.

PCA explained that, within Mine Block 3, two end-pit lakes would be constructed; the West Lake (elevation ~238 m, 47.2 ha) would be located along the east side of Highway 63 and the East Lake (elevation ~238 m, 31.9 ha) would be constructed along the west side of the Athabasca River bordering the setback. It envisioned another single end-pit lake (elevation ~238 m, 55.6 ha) within Mine

Block 2, situated along the east side of the realigned Highway 63 right-of-way. PCA estimated that the depths of the end-pit lakes would be approximately 4-5 m.

PCA reported that the depleted quarry would be backfilled with M3-NSL material and then capped with overburden material to form the base of the end-pit lake. It said that upland side slopes approaching each end-pit lake would be contoured to provide limited access points to the shoreline areas. PCA anticipated that wetland vegetation would be introduced to the end-pit lakes from the soils used for shoreline reclamation and from water flows entering the lakes from riparian areas. To enhance shoreline revegetation, PCA stated that some shoreline might receive direct planting of wetland vegetation from adjacent wetland and riparian areas where patches of natural vegetation would be retained.

PCA stated that the end-pit lake water releases would not occur until water quality objectives were met. PCA also submitted that all three end pit lakes would be connected to the Athabasca River through the floodplain alluvium and that lake water levels were expected to fluctuate by approximately 1.5-2.5 m. PCA reasoned that the commitment regarding end-pit lake water releases could be met as the construction of check structures were proposed at elevation above the estimated 238 m end-pit lake elevations and backfilling with M3-NSL and overburden materials were expected to reduce the hydraulic connectivity between the end-pit lakes and Athabasca River.

PCA anticipated that water quality of the three end-pit lakes would be suitable for aquatic life and that the end-pit lakes would be ecologically sustainable. Based on geologic setting, PCA believed that any concentrations of dissolved metals in the lake water would be low. PCA reasoned that, as the end-pit lakes are expected to be connected by groundwater flows in the floodplain alluvium to the Athabasca River, overall water quality of the end-pit lakes would be determined by this connection to the Athabasca River. While acknowledging the topographic, hydrologic and geographic differences, PCA reported that studies conducted regarding the reclamation of other surface mines (e.g. coal, oilsands) have demonstrated that end-pit lakes can become ecologically viable with proper planning and management.

PCA emphasized that a sustainable recreational fishery is a primary objective for the end-pit lakes. However, it acknowledged that, if the water quality in the end-pit lakes proves detrimental to fish health, plans to establish a fishery in the lakes would be re-evaluated. PCA stated that it would, as an initial option, reconsider the design parameters of the end-pit lakes to attain the original reclamation objective. PCA said that, as a secondary contingency, it would replace the end-pit lake feature as a reclamation objective and, depending on the balance of remaining reclamation materials, construct additional upland and wetland areas. PCA noted that the end-pit lakes would also provide an enhanced waterfowl habitat. To support this objective, PCA said that end-pit lakes would be constructed with irregular lake perimeters and with random placements of remnant oversized rock or overburden along the shoreline.

Through the EIA submission and responses to the SIRs, PCA contented that it had demonstrated that the planned end-pit lakes would be ecologically

sustainable and conceptually meet the reclamation objective of equivalent capability. In this regard, PCA maintained that additional validation would be necessary for future approvals (e.g. ESRD, *Water Act*, *Public Lands Act*, RMWB permits) which would govern the design, development and end land use of the end-pit lakes.

6.2.2: Views of the Panel

The Panel notes that PCA has committed to consult and cooperate with the RMWB and other stakeholders to “*prepare an end land use and reclamation plan that incorporates the objectives of RMWB along with the requirements of PCA, the Crown, regulatory authorities and First Nation stakeholders holding treaty rights with respect to the land*” (PCA-RMWB Memorandum of Understanding, 2013). While this undertaking is commendable, the Panel expects that any discussion on end land use will consider and build upon previous PCA commitments which support the establishment of a vegetated natural area and wildlife habitat in the north of the lease to accommodate traditional land uses, with a transition to recreational uses in the southern part of the lease. The Panel observes that this concept regarding the planned end land uses for the reclaimed mining lease has already been discussed with stakeholders and endorsed by some First Nations Groups.

PCA has stated that it will employ an adaptive management approach to reclamation, which will respond to relevant changes in technology, reclamation knowledge and practices, reclamation monitoring results, stakeholder input and regulatory policy. The Panel concurs with and accepts this approach to reclamation but requires, as a condition of the approval, that PCA provide a written report once every 5 years to ESRD, describing all the actions which have been taken in pursuit of its adaptive management approach, the current status of disturbed mining lease lands (i.e. areas disturbed, temporary reclaimed, permanent reclaimed, certified reclaimed) and any resulting changes to PCA's reclamation plan.

The Panel acknowledges that PCA has committed to establish a minimum 150 m setback distance for quarry operations from the Athabasca River, an area within which no mining operations are to take place. The Panel understands that, where previous sand and gravel operations have preceded quarry operations, 90 m of the 150 m setback will involve lands that are reclaimed following the surface disturbance and excavation from sand and gravel operations. In this regard, the Panel believes that the reclaimed setback area should be returned to an ecologically functional state as soon as possible, in order for the buffer area to serve its stated purpose. Therefore, the Panel expects the disturbed portion of the quarry setback from the Athabasca River to be restored and re-vegetated in a timely manner, and maintained to the satisfaction of ESRD (the Panel has included a condition to this effect in Section 5.1.2).

PCA has reported that the current ESRD requirement for coversoil replacement for mining operations in the oilsands region is an average combined depth of 50 cm of coversoil (topsoil materials) and suitable subsoil placed on all reclaimed areas. Additionally, PCA indicated that ESRD currently requires a cap of 1.0 m of

suitable overburden material to be placed over suitable parent material located near the surface during mine backfilling. The Panel observes that PCA has committed to a 30 cm coversoil replacement depth on all reclaimed areas. The Panel notes that PCA did not provide an evidence-based rationale for this decision. Given that PCA has rated the salvaged coversoil materials as only Fair-Poor in terms of reclamation suitability, the Panel believes that re-vegetation will benefit particularly from a greater depth in growth medium. Therefore, the Panel requires as a condition of approval, that 50 cm of coversoil is replaced on all reclaimed areas that are intended for revegetation to the satisfaction of ESRD.

SECTION 7: HYDROLOGY AND HYDROGEOLOGY

7.1: Hydrology and Hydrogeology

7.1.1: Views of the Applicant

7.1.1.1: Introduction

Parsons Creek Aggregates (PCA) conducted hydrology (surface water) and hydrogeology (groundwater) assessments to evaluate potential effects of the proposed Parsons Creek Resources Aggregates Project (the Project) on surface water and groundwater. PCA stated that surface water features considered in the assessment included the Athabasca River, the most significant watercourse in the Project vicinity, and several relatively small drainages which flow through the Project Site. The hydrology was characterized based on existing regional information and data, sampling activities, and modeled and computed data. The groundwater regime was characterized through instrumentation of groundwater monitoring and existing information and data. PCA outlined that the surface water local study area comprised of the Project lease Site and that the surface water regional study area included the local study area plus upstream watershed areas which drain into the local study area. The groundwater study area was determined to be the Project Site, with no distinction between local and regional study areas, as measurable impacts beyond the study area were not expected.

7.1.1.2: Water Movement

PCA identified that Parsons Creek and Unnamed Creeks (UC) 1 to 6 drain through the Site, and that five Ponds (Ponds 1 to 5) are present at the Site. UC 1, 2, and 3 and Ponds 1, 2, and 3 are in the northern half of the Site, while the remaining UCs and Ponds are in the southern half. PCA indicated that surface water drainage at the Site is generally west to east, and that the Site is relatively poorly drained, resulting in wetland areas in the middle of the Site. Groundwater flow at the Site is also west to east, based on water level information, with average linear velocities ranging from 1×10^{-8} to 2×10^{-2} m/s. PCA believed that groundwater levels at the Site were not particularly close to the surface and that Ponds 1 through 5 were perched above the water table, with the Ponds not being affected by general fluctuations of groundwater levels.

PCA stated that the Project would not perceptibly alter surface water drainage across the Site, as local drainages that originate west of Highway 63 would continue to flow to the Athabasca River in a manner that avoids active pits during Project activities. UC1 (annual average runoff volume of 0.43 M m^3) was proposed to be diverted from entering Pond 2 to below the outlet from Pond 3 and towards the Athabasca River, UC 2 (average annual runoff volume of 0.27 M m^3) and UC 3 (average annual runoff volume of 1.7 M m^3) would be diverted toward the Athabasca River, while UC 4 and UC 5 would be altered by the Alberta Transportation highway interchange, and might be further influenced by the highway storm water pond.

PCA stated that the Site's fish bearing streams, Parsons Creek and UC 6, would be preserved with the use of buffers (50 m setbacks) and would not be disturbed

by mining activities. A setback of 60 m from Pond 1 was proposed by Parsons Creek during limestone mining, while a setback of 45 m is currently approved for the existing sand and gravel operation. Pond 1 and current diversions to Pond 1, associated with the sand and gravel operation, would be left unaltered and part of Project water management activities. PCA expected that the development approval process for the planned urban development west of the Site would ensure that appropriate flow control would be provided, with post-development peak flow rates controlled to pre-development flow rates coming from off-site. PCA submitted that when the Site is reclaimed, diverted drainages would be directed into the proposed end-pit lakes which would subsequently drain into the Athabasca River.

PCA indicated that surface water diversions may alter the groundwater regime by intercepting surface water that may otherwise infiltrate, thereby lowering groundwater levels. PCA assessed this potential impact as insignificant, though the groundwater regime might further be influenced by other mining activities. PCA summarized that in the northern half of the Site, the alluvial (sand and gravel) deposits and limestone quarry would be below the level of the Athabasca River, which would result in required active management of groundwater entering the pits, and would be directly influenced by the river level. In the southern half of the Site, alluvial deposits and the limestone quarry would be above the normal river level, and contain less permeable material (silts and clays), which would result in groundwater not being directly influenced by the River.

PCA used a two-dimensional model to demonstrate the effect of quarry operations on groundwater drawdown of hydraulic head in the limestone. Modeling results predicted that the maximum hydraulic head drawdown of 0.5 m would occur in 15 years in the limestone at a distance of 330 m from the west edge of the pit. PCA claimed that the predicted drawdown was considered immeasurable at the west area boundary and might be less than predicted because the storage capacity might be greater than that used in the model and that recharge might contribute to groundwater levels. PCA felt that the work already completed to get a water license for the aggregate operation was sufficient for addressing any concerns relating to potential drawdown impacts from the quarry.

7.1.1.3: Water Management

PCA acknowledged that Project activities and operations would occur within riparian areas and the 1:100 year floodplain of the Athabasca River. Sumps, storm water ponds, retention ponds, and settling ponds were proposed to be used for water management at the Site, though no dewatering wells were anticipated to be needed due to the relatively low hydraulic conductivity of the limestone at depth. PCA indicated that water management during mining would involve drawdown and/or removal of pit water that accumulates from precipitation, local runoff, and groundwater (including seepage from overburden and limestone). PCA explained that groundwater entering the pit through the alluvial material (i.e., surficial materials connected to the river) would be intercepted by a ditch constructed within a setback along the toe of the pit. Groundwater would flow out of the toe, into the ditch, and then to a sump where

pumps would transfer water to the appropriate sediment control facility and be released. PCA stated that water removed from pits would be recycled for use in operations, such as dust control, and excess water would be stored in retention ponds prior to release.

PCA estimated that quarry pit dewatering would require the diversion of approximately 46,500 m³/day of water and that discharged water would be dispersed by at least four discharge points from constructed sumps or retention ponds (approximately 11,500 m³/day of water from each). Discharge of excess water would be towards riparian areas surrounding the mining areas using pumps, existing drainage channels that flow towards the Athabasca River and/or collapsible hoses, allowing for the possibility of further dispersion from these discharge points. Peak discharge rates of up to 3,000 m³/day of water might be achieved through the use of collapsible hoses to convey water to multiple other existing channels in the undisturbed buffer zone. PCA also provided an alternative that included positioning the collapsible hoses so that the outlets discharge directly to the Athabasca River (following water quality testing). PCA stated that discharge point releases would be monitored to confirm that appropriate erosion and sediment controls (e.g., armoring and rip-rap of defined channels or rock breakers and check structures) are in place and effective. PCA anticipated that dewatering requirements would decrease as the mine extends to the south, where the limestone is above the river level, and was of the opinion that fractures in the limestone are not significant. PCA stated that pumping from open quarry pits would likely not continue in the winter, though expected enough inflow of water to the pits would continue to adequately dilute relatively higher total dissolved solids limestone groundwater.

PCA believed that any release from quarry operating areas could be limited to ensure peak discharges of 3,000 m³/day of water at any one discharge point with adequate holding capacity of water provided by quarry sumps and detention ponds. PCA concluded that the projected volume and flow of water required to be handled could be managed during active mining activities and that dewatering activities to facilitate quarry mining operations would be based on the ability to manage the estimated flow rates resulting primarily from the exposed overburden-limestone interface and management activities.

PCA outlined intentions to use collected water and to recycle aggregate wash water for aggregate washing by using a settling pond system that provides a minimum 48-hour retention time. Some water losses were expected from the system through washed aggregate moisture content, evaporation, and seepage. PCA stated that the settling ponds would adequately reduce total suspended solids in the water and wash water and did not anticipate the need for flocculants in the settling ponds.

PCA provided an overall water balance, taking into account collected/intercepted surface water and groundwater, consumption, and water returns (Table 4).

Table 4: Overall Water Balance for the Project

	Flow (m³/hr)
Total Demand directly from Athabasca River	0.0
Other Water Sources (Athabasca River watershed)	
Subsurface flows (overburden – limestone contact)	1,850
Groundwater	38
Surface Runoff (storm water)	49
Total Quarry Inflows	1,937
Water Use Consumption and Disposition	
Dust Suppression	8.3
Aggregate Washing (washed aggregate moisture content)	12.5
Aggregate Washing Settling Ponds (evap. and seepage)	2.4
Quarry Ponds and Sumps (evap. and seepage)	8.4
Sub-Total Quarry Outflows	31.6
Net Return of Quarry Inflows to Athabasca River and watershed	1,905

PCA stated that the reclamation plan proposed three end-pit lakes, located in the central and northern portions of the Site. The end-pit lakes are expected to be hydraulically connected with the Athabasca River and water levels within the end-pit lakes would be dictated by the hydraulic connection with the River, as well as being augmented by water from the existing unnamed creeks entering from the west. PCA expected that any individual end-pit lake should fill within one year.

7.1.1.4: Site Flooding

PCA acknowledged that the Athabasca River might inundate portions of the Project during an ice jam or open water flood event. Most of the Site at some time will potentially be below various flood levels and subject to inundation. PCA provided 20-year and 100-year inundation limits for open water and ice jam flood scenarios, with ice jam flooding typically being more severe than open water flooding. The northern half of the Site was expected to be more susceptible to flooding than the southern half.

PCA summarized that in a flood event, water would flow through the vegetated buffer and then potentially into the pits. PCA indicated that prior to or during an expected flood event, equipment, vehicles, and portable stores would be mobilized in two stages. The first stage would include the mobilization of all portable equipment and vehicles from quarrying operating areas to constructed pad(s) at the north side of the Project area, while the second stage would include complete evacuation from the Project area should it be totally inundated. PCA stated that assessments indicated that the 100-year open water and ice jam flood levels were estimated at surface elevations of up to 242 m and 246 m respectively. A pad area of compacted materials has been constructed at the north end of the Site with surface elevations between 247 and 248 m and there are several other locations at elevations above 246 m where similar pads could be constructed.

PCA highlighted that a major dewatering effort would likely be required following flooding. PCA was of the opinion that Alberta Environment and Sustainable Resource Development would consider temporary authorizations to conduct emergency dewatering, subject to specific terms and conditions. Emergency dewatering efforts would likely allow discharge to the Athabasca River with minimal or no treatment, provided the water pumped from the flooded area is confirmed equivalent, or acceptable, to receiving waters.

PCA could not provide any guarantees for erosion control measures during open water or ice jam flood events. PCA expected that flooding events would be of backwater type, with relatively slow inundation of the Site as water levels rise over the floodplain. PCA expected that the proposed 150 m undisturbed buffer might curtail erosion type actions and that an expected vegetative cover on stockpiled overburden and reclamation material would reduce erosion. It was also proposed that the stockpile pad base would have rip-rap or armour rock for protection and that in an ice jam event the ground might be frozen, reducing the amount of potential erosion.

7.1.1.5: Water Quality

PCA provided a summary of surface water quality sampling results and indicated that Alberta Environment and Sustainable Resource Development monitors surface water quality at one location on the Athabasca River downstream of Fort McMurray, at the Old Fort Station. PCA stated that the baseline surface water quality testing indicated that there are and will be some exceedances for surface water quality parameters at the Site, particularly for aluminum, chromium, copper, iron, lead, phenols, and total phosphorus, and were primarily linked to total suspended solids. Results were concluded to be comparable to those expected for the region, with little observed seasonal variation.

PCA stated that baseline groundwater quality sampling indicated that no issues were anticipated with collecting and/or discharging groundwater from the alluvium and top of the limestone. Groundwater chemistry below the top of the limestone had significantly higher total dissolved solids, as compared with the groundwater chemistry above the top of the bedrock, and there might be some issues with directly discharging this type of water. PCA demonstrated through the groundwater sampling program that there is greater groundwater dilution potential in the northern portion of the Site.

PCA predicted, through relatively simple modeling, that if outlined potential mitigation strategies were employed, surface water quality would not be affected by Project activities (including physical loss of habitat, construction, changes to groundwater-surface water interactions, discharge water management, and end-pit lakes). PCA did not feel it necessary to assess potential acidifying emissions on surface water acidification. PCA was of the opinion that groundwater collected in the pits would contain total dissolved solids primarily in the 500 to 1,000 mg/L range throughout the year. It was not anticipated that large amounts of saline water would enter the quarry, and that if significant volumes of highly saline water were encountered, mitigation measures would be employed (e.g., plugging openings to shut-off the flow or collection for transport and disposal off-

site). PCA felt that any potential impacts on surface water and groundwater quality from blasting would be insignificant.

PCA expected that water quality in the three end-pit lakes would be suitable for aquatic life and that the end-pit lakes would be ecologically sustainable. PCA predicted that the end-pit lakes would be hydraulically connected to the Athabasca River, with water quality dictated by the hydraulic connection with the river and would not be impacted by wastewater treatment plant effluent upstream of the Site.

7.1.1.6: Monitoring

PCA acknowledged that the volume and frequency of water discharged from the Site would be required to be monitored, including flow measurements and frequency. Up to three discharge points are expected for each Mine Block. PCA stated that any released water would be tested for a variety of required water quality parameters, with key parameters expected to be temperature, conductivity, total suspended solids, pH, petroleum hydrocarbons, and total dissolved solids.

PCA indicated that surface water quality monitoring would be conducted during construction, active mining, and reclamation stages (with special consideration of total suspended solids). Water quality monitoring would include fish inventories to ensure that Project effects on aquatic habitat are insignificant. PCA also expected that water quality in Pond 1, Parsons Creek (upstream and downstream from the Site), and constructed unnamed channel diversions around quarry working areas would be monitored. PCA stated that surface water quality monitoring would likely occur from once each season to once a year. PCA anticipated that a detailed groundwater monitoring program would also be required, with likely requirements consisting of sampling for major ion chemistry, and potentially hydrocarbons, once a year.

PCA indicated that reclamation and closure monitoring would be conducted at annual intervals at selected reclaimed sites and end-pit lakes during the reclamation and closure process. PCA stated that it is not a member of the Regional Aquatics Monitoring Program.

PCA stated that all objectives of the *Lower Athabasca Regional Plan* would be met with respect to surface water quality and groundwater, as required.

7.1.1.7: Conclusions

PCA predicted that the Project would have no discernible impacts to the hydrology or hydrogeology. PCA stated that the Project would not alter or disrupt the hydrology of the local water features with ecosystem value, including the Athabasca River, and that hydrologic impacts would be of negligible magnitude and not significant. PCA concluded that following any mitigation, effects of the Project on surface water resources, through physical loss of habitat, from construction activities, resulting from changes in groundwater-surface water interactions, from discharge of quarry water, and in the end-pit lakes were

assessed as insignificant in the local and regional study areas and also for the Cumulative Effects Assessment case.

PCA stated that the quarry would intercept relatively small volumes of groundwater in the limestone that would have discharged into the Athabasca River, which would subsequently be pumped/released towards the River, and that this impact would have no geographical extent and is insignificant. PCA believed that any saline water from the limestone would be of relatively small volume and adequately diluted by other sources of water in the pit(s), resulting in an insignificant impact. PCA felt that as the reclamation of the quarry and end-pit lakes would result in groundwater being discharged into the wetlands or end-pit lakes and subsequently the Athabasca River, there would be no impact. PCA concluded that the impact to the quality and quantity of groundwater resources was insignificant as a result of the Project and in the cumulative case.

7.1.2: Views of the Panel

The Panel accepts the general methodology and assessments employed by PCA to evaluate potential effects of the proposed Project on hydrology and hydrogeology. The Panel expects PCA to meet all commitments outlined in all submitted material as part of the record, as appropriate. The Panel understands the study areas for the surface water and groundwater assessments and appreciates the influence of the Athabasca River in the area.

The Panel agrees that it is appropriate to re-route surface water drainages across the Site, west to east, to avoid active pit areas during operation. While flow paths will be altered, the resulting and ultimate destination of the water will remain unchanged. The Panel finds that while relatively shallow groundwater (particularly in the alluvial deposits) and limestone groundwater will be intercepted and accumulate in the pits, the general groundwater regime (i.e., volume and flow) will not likely be impacted by the Project.

The Panel recognizes that the entire Project will be located within the Athabasca River floodplain and that a significant amount of surface water and groundwater will accumulate in the pits. This will require considerable active water management at the Site. The Panel is confident that PCA will appropriately and effectively manage water at the Site. This will require discharging a considerable volume of water from various pits, sumps, and ponds to drainage channels and riparian areas in the undisturbed buffer zone between the Project and the Athabasca River. Although the Panel recognizes that the entire 150 m buffer zone will not be undisturbed (i.e., 60 m true undisturbed buffer in the north portion of the Site), the Panel believes it most appropriate that any discharge water be released to the existing, undisturbed, and reclaimed riparian area and/or ponds and channels as opposed to directly into the Athabasca River. The Panel understands that this would also require the authorization of Alberta Environment and Sustainable Resource Development (ESRD) following proper water quality testing.

The Panel encourages PCA to use as much recycled process water as possible, through implementation of the proposed settling pond system, reducing the amount of water collected and used. The Panel accepts the timelines and proposed conceptual ideas of end-pit lake filling. Further discussion on the end-pit lakes can be found in Section 5 (Soils and Terrain, Conservation, Reclamation, and Closure Plan).

The Panel acknowledges the difficulty in predicting and mitigating flood events. Given that the Site is located within the floodplain of the Athabasca River, it is expected that the Project will be affected by flooding at some point during operation. The Panel encourages PCA to formalize a flood response plan, as outlined, and locate as much equipment and materials as possible on constructed pad(s) at higher elevations. The Panel is confident that ESRD and PCA will work closely during and following any flood event to minimize effects and aid in required dewatering activities. The Panel requires as a condition that any stockpiled material, disturbed areas within the buffer zone, and progressively reclaimed areas be vegetated/re-vegetated as soon as possible to reduce the likelihood of significant erosion during flooding, to the satisfaction of ESRD.

The Panel notes that the baseline water quality sampling (for surface water and groundwater) was adequate and that results are comparable to that in the region. The Project is not anticipated to have a significant effect on water quality. However, this assumption will require adequate monitoring and testing to verify and validate during all years of operation and reclamation. Discharge water volume, frequency, and locations should be recorded and reported as part of the monitoring program. The Panel is of the opinion that it is in the public interest that the Project not release any water into the Athabasca River, or into water discharging directly or indirectly to the Athabasca River or the riparian area adjacent to the Project, that does not meet provincial water quality standards. The Panel requires PCA to implement a water quality monitoring program for both surface water and groundwater, for various parameters, as determined appropriate by ESRD. Should monitoring indicate any exceedances, PCA must develop a mitigation plan and implement that plan to the satisfaction of ESRD. Monitoring should include a number of water quality parameters, which should include nutrients (nitrogen and phosphorus), suspended sediment, salinity (i.e., total dissolved solids), hydrocarbons, pH, conductivity, temperature, major ions, and others, particularly those listed in the *Lower Athabasca Regional Plan* Management Frameworks. The number of collected samples, sampling locations, and sampling frequency will be determined by ESRD. The Panel encourages PCA to share monitoring data with regional monitoring programs (e.g., RAMP) and to participate in regional water quality monitoring initiatives.

The Panel notes that PCA must comply with all provisions of the *Lower Athabasca Regional Plan (LARP)*. The LARP Surface Water Quality Management Framework (SWQMF) focuses on managing surface water quality within a specific reach of the Athabasca River, from downstream of the Grand Rapids to the Athabasca River Delta. The LARP Groundwater Management Framework (GMF) applies to groundwater that has total dissolved solids concentrations of less than 4,000 mg/L.

As part of the SWQMF, new activities and pressures will be monitored and evaluated relative to a benchmark (i.e., historical conditions, and/or triggers and limits). This does not mean that departures from historical water quality conditions will not be allowed, but that the cumulative risks of future departures need to be comprehensively assessed and mitigated before they will be allowed. Pollution prevention and continuous improvement remain key management principles. The SWQMF sets surface water quality triggers and limits, measured at the Alberta Environment and Sustainable Resource Department Old Fort monitoring station (triggers and limits may also be developed for an ESRD monitoring station on the Athabasca River upstream of the Firebag River). The GMF is proposed to have three groundwater management areas to better address concerns about potential cumulative effects to groundwater quality and quantity.

The SWQMF considers water uses for the protection of aquatic life, drinking water, recreation and aesthetics, agricultural, and industrial, with water quality trigger and limit values being set, or considered, for 11 general indicator and 27 metal indicator parameters. Water Quality Triggers are considered part of an early warning system that signals a change in ambient conditions, which may or may not require real or meaningful changes, but require that they are closely monitored and managed. Water Quality Limits represent conditions where the risk to adverse effects is heightened. In 10 instances the historical conditions were higher than guideline values (i.e., limits), and therefore water quality limits have not been set for these parameters. For the GMF, both regional and site-specific groundwater triggers and limits will be established for the area. Regional triggers serve as early warnings of a negative change from natural variability in defined aquifer management units. The interim regional triggers will be compared to measurements taken at monitoring wells identified as representative of regional quality. Interim regional triggers for groundwater quality indicators include total dissolved solids, sodium, chloride, sulphate, total ammonia nitrogen, arsenic, silica, and naphthenic acids. There are currently no interim regional quantity triggers in the GMF.

The SWQMF identifies that the roles and responsibilities for regulated parties and proponents, such as PCA, include participating in regional water quality and ecosystems monitoring, providing wastewater characterization, storage, and release information, modeling and assessing how current and planned operations influence local and regional ambient water quality, and participating in ambient water quality management actions, if identified, and reporting on progress of implementation of management actions. The GMF will require that site-specific triggers and limits be developed through the preparation and submission of groundwater management plans by regulated operators. PCA will be required to develop site-specific indicators, triggers and limits and a suitable monitoring network to satisfy the requirements of the *Water Act*, *Environmental Protection and Enhancement Act*, and the groundwater management framework.

The Panel recognizes that the Project is located within an area of Alberta which will receive increasing scrutiny and oversight by environmental regulators over time and, as such, could face new or changing requirements during the period of operation.

SECTION 8: WILDLIFE, VEGETATION AND AQUATIC RESOURCES

8.1: Wildlife

8.1.1: Views of the Applicant

Parsons Creek Aggregates (PCA) assessed wildlife distribution and abundance and wildlife habitat within the proposed Project area (the local study area or the Site) to predict potential Project effects on wildlife. PCA stated that the assessment included the use of collected data, logical analysis, and the application of best available information (e.g., reviews of relevant literature, local traditional knowledge, and a variety of scientific based field studies). PCA acknowledged that the Site is located within a Key Wildlife and Biodiversity Zone [as identified by Alberta Environment and Sustainable Resource Development (ESRD)].

PCA created an initial list of species for consideration as valued ecosystem components based on species known to occur in the area of the Project. This list included moose, fisher/marten, beaver, sharp-tailed grouse, ruffed grouse, spruce grouse, common snipe, old growth forest birds, mixed wood bird species, green-winged teal, and Canadian toad. PCA indicated that baseline studies were conducted to determine habitat use and distribution of wildlife at the Site, in the regional study area (delineated by the local study area plus adjacent uplands to the west and the Athabasca River floodplain to the north), and to identify important habitats and wildlife features that might be affected by the Project. PCA assessed how, or if, the Project would affect wildlife through alteration of habitat, through changes in animal movement, and through human induced mortality.

PCA believed that vegetation and habitat clearing might be the main effect of the Project on wildlife, though other impacts might exist due to the effects of dust, potential contaminants, predator attraction, and sensory disturbances (e.g., noise). PCA stated that the magnitude of impacts in the Application Case would be non-significant for impacts assessed and that the Cumulative Effects Assessment case resulted in a significant effect for moose, insignificant to non-significant effects for yellow rail and Canadian toad (both of which were qualitatively assessed due to relatively limited regional information), and in non-significant effects for all other selected valued ecosystem components.

PCA felt reasonably confident that there were no Canadian toads or yellow rail in the local study area, but did not know all the specifics within the regional study area on these species. PCA indicated that the Project was expected to have a positive impact on white-tailed and mule deer species as a result of changes in habitat, and a non-significant additional impact on woodland caribou, as they have already been heavily disturbed in the regional study area. PCA stated that they believed there has been no meaningful evidence that data collected from owl and bat surveys have been used effectively in an impact assessment or for follow-up programs. PCA believed that Project impacts to owl species could be mitigated through timing restrictions (March through August) and maintaining watercourse buffers, and that these mitigation measures could be applied without the need for a detailed owl specific baseline field survey. Avoidance of old growth forests was suggested as a potential key mitigation measure to minimize the effects of the Project on the resident bat population. PCA stated that the most effective mitigation measure might be to conduct a detailed pre-disturbance assessment to identify bat hibernacula and the installation of bat houses,

though mitigation measures could be applied to the Project without the need for a bat specific baseline field survey. PCA explained that no consideration of offsite compensation measures for songbirds was being applied and that this was consistent with other projects in the area.

PCA stated that the Site had the highest overall average moose pellet group density as compared with other studies in the area, was effective moose habitat, and also had the highest ungulate browse. The shrub and bog/fen/wetland vegetation groups appeared to be particularly important. PCA indicated that, as the Project is located within lowlands adjacent to the Athabasca River, it was assumed that the Site would function as an overwintering area for moose and that the uplands immediately west of the Site would function as summer habitat for moose. PCA believed it to be unlikely that sufficient moose habitat exists within the city limits to permit any considerable amount of moose movement south of the study area.

PCA stated that both the local study area and regional study area contain a large amount of effective moose habitat. The Application Case would see a 13 percent reduction in effective winter and spring moose habitat, while the Cumulative Effects Assessment case would reduce the amount of effective spring and winter habitat by 45 percent and 41 percent respectively. PCA indicated that the reduction in habitat availability in the Cumulative Effects Assessment case would likely result in a decrease in moose population numbers within the regional study area such that population viability might be a concern and that extinction events for the moose population in the regional study area were possible.

PCA predicted that the potential effects of the Project on moose were local in extent, residual in duration, continuous in frequency, reversible to irreversible in the long term, and of low magnitude. PCA assumed that an effect would be significant if it was predicted to be high in magnitude, residual in duration, and occurs at a regional geographic extent. PCA suggested that the Site might represent a unique mosaic of effective moose habitat that supports a higher abundance of moose than other areas, but that only a number of individuals within the entire moose population in the area were expected to be affected by the Project, as opposed to the entire population, making the Project a non-significant impact. PCA felt that relative to other regional developments, the area of habitat cleared would be relatively small and local. Consequently, the habitat alteration resulting from the Project would have greater influence on those species with relatively small home ranges, such as some bird species, in comparison to species with relatively larger home ranges, such as moose.

PCA suggested that a key mitigation strategy to minimize the potential impact on the local moose population would be to consider sensitive time periods for moose. PCA indicated that according to the Regional Municipality of Wood Buffalo, no industrial activity would be permitted in key areas between February 15 and April 30, and that according to ESRD, no construction would be permitted in Key Wildlife Biodiversity Zones between January 15 and April 30. PCA expected that these sensitive time periods would be avoided for construction activities.

PCA identified the north end of the Site as being appropriate for wildlife habitat in the reclamation plan, but that reclaimed quarry lands in proximity to the future interchange and realigned highway (i.e., the southern portion of the Site) would not be appropriate for wildlife habitat due to traffic noise disturbance, danger to wildlife and humans, and

conflict presented by the urban area, highway, and interchange. PCA stated that intentions are to operate in accordance with approved plans and conditions of authorizations, re-establishing required wildlife habitat, and building on existing buffers to maintain connectivity for wildlife as required.

PCA proposed a number of mitigation measures and commitments for wildlife. PCA suggested that a key mitigation measure to minimize impacts on wildlife would be to ensure the construction phase occurs primarily during a time period that minimizes disturbance to most wildlife. PCA expected that ESRD would make recommendations on appropriate timing for clearing and construction activities and that a potential window for these activities exists from October through January. PCA also indicated that setbacks serve as wildlife mitigation measures, with a 150 m setback from the Athabasca River being consistent with the urban growth context of the Site and the intended parks and recreation end-use of the property. PCA did not believe a larger buffer was warranted for wildlife. A 60 m wide buffer has been proposed for the SML070025, while current operations at the Site are no closer than 190 m to the top of the west bank of the Athabasca River.

PCA stated that at least three levels of monitoring types needed to be recognized with respect to wildlife, monitoring for compliance, for environmental performance, and for Project effects. PCA did not propose to conduct specific wildlife research and monitoring activities for purposes of determining appropriate corridor widths and ensuring wildlife habitat connectivity, but did indicate that some consideration might be given to participating in regional and municipal wildlife research and monitoring activities as part of ongoing community outreach and communication processes. PCA recommended seeking guidance from regulators on participation requirements for any initiatives that require regional coordination and that any data (e.g., buffer zones) and monitoring could be contributed to a regional data set.

PCA concluded that the Project and other projects existing or forecasted for the region could be expected to further degrade the ecological integrity of the wildlife and ungulate biodiversity zone, which the Site is part of, though PCA believed the Project to be a relatively small and minor part of this. PCA committed to follow all Federal, Provincial, and Municipal approvals, authorizations, and guidelines that are applicable to the Project with respect to wildlife.

8.1.2: Views of the Panel

The Panel accepts the general methodology followed by PCA to assess wildlife by predicting potential Project effects on wildlife through assessment of wildlife distribution and abundance and wildlife habitat within the proposed Project area. The valued ecosystem components considered and baseline studies conducted were appropriate given the scale and scope of the Project.

The Panel acknowledges that habitat removal or alteration, primarily through vegetation clearing, may be the main effect of the Project on wildlife. The Panel is comfortable with PCA's assertion that no protected animal species occur within the Site, though encourages PCA to conduct pre-disturbance assessments at the Site and employ mitigation measures (e.g., timing restrictions, avoidance of old growth forests, artificial

habitat creation) for as many sensitive species as possible (e.g., owls, song birds, and bats).

The Panel notes that the Site is relatively highly used by moose and provides effective moose habitat, particularly for overwintering. The Panel is aware that in the Cumulative Effects Assessment case, reduction in habitat availability will likely result in a decrease in the moose population, with total removal of the moose population possible, within the local and regional study areas. While the Panel agrees that Cumulative Effects Assessment case will have a significant effect on moose, the Panel disagrees with the PCA conclusion that the Project will have a non-significant impact on the moose population in the local study area. Although the area cleared by the Project may be relatively small, the evidence that the Site may support a higher abundance of moose and provides effective habitat, makes it a relatively important area for the species.

Nevertheless, the Panel is aware that the moose population in the local and regional study areas is vulnerable as a result of a relatively high amount of activity in the area, such as increasing traffic along Highway 63, the sand and gravel operation in the area, nearby residential developments, expanding urban areas, and other industrial activities. Accordingly, the Panel finds this impact on moose to be relatively unavoidable and acceptable, assuming that proposed mitigation (as committed to by PCA) will reduce the impact as much as possible. The Panel expects PCA to work with ESRD to determine appropriate timing for construction activities and maintenance of buffer widths between the Project and the Athabasca River for moose and other species.

The Panel accepts that the north half of the Site will be more appropriate for wildlife habitat as part of reclamation activities, as compared to south half of the Site given the likely land uses surrounding the Site during and following reclamation activities.

The Panel recommends that PCA work with ESRD in coordinating data and monitoring activities and for participation in any research and monitoring activities in the area. The Panel trusts that specifics of wildlife monitoring requirements will be handled by ESRD appropriately. The Panel expects PCA to follow all regulatory authorities as required and to follow all commitments made with respect to wildlife.

8.2: Vegetation

8.2.1: Views of the Applicant

Parsons Creek Aggregates (PCA) provided a baseline vegetation assessment and described and assessed potential project-specific and cumulative impacts on vegetation and wetland resources. PCA stated that Project and regional issues of concern affecting vegetation included the loss of rare plants and plant communities, the loss of old growth forests, the loss of uncommon or restricted ecosites/vegetation communities, the loss of wetlands/peatlands, the loss or alteration of plant community diversity, the loss or damage of traditional plants, vegetation fragmentation leading to invasive plant establishment, affecting vegetation health through air emissions, effluent releases and contaminant leaching, changes in drainage patterns, changes in soil capacity, loss of productive/economic forest, and reclamation performance and effects on vegetation recovery.

PCA selected ten valued ecosystem components, including old growth forest, wetlands, riparian habitat, plant species richness and diversity, landscape diversity, traditional/medicinal plants, rare plants, rare plant communities, ecosite supply/rarity, and commercial forest, and outlined potential effects on each. PCA deemed surface mining impacts to be inherently long-term and significant within the mining footprint and local study area on most valued ecosystem components. PCA believed a more relevant context for impacts on vegetation might be the subregional study area with impacts assessed on this scale.

PCA stated that old growth forest impacts would be temporary and would be ameliorated by progressive reclamation and natural succession. PCA indicated that wetlands would be affected by the removal of approximately 40 percent of the total supply of wetlands in the local study area, which occupy approximately 7.4 percent of the local study area. The entire local study area was classified as riparian habitat. PCA stated that vegetation species richness and diversity would be affected as the Project footprint would impact a relatively high proportion of land cover units with high and very high plant diversity potential. As a result of Project activities, landscape diversity would also be significantly impacted.

PCA summarized that approximately one-third of high and very high potential lands with traditional/medicinal plants would be directly affected by the Project and that land clearing and quarry excavation have the potential to exert direct impacts on rare plants and rare plant communities. A rare plant survey was conducted as part of the baseline assessment in the local study area, with four rare plant species found. PCA summarized that the potential impact on ecosite supply/rarity in the context of total supply within the local study area would range from 0 percent to 100 percent, and average 35 percent. Approximately 31-36 percent of productive timber classes would be removed from the local study area.

PCA stated that during the baseline assessment, four noxious weeds were recorded and indicated that weedy and invasive plants would need to be controlled during and after reclamation activities, with a greater emphasis on controlling the noxious weeds. PCA further explained that certified native seed would be used for reclamation purposes, that stockpiled soils would be monitored for weedy species and controlled as needed, and that a formal weed control program would be developed and employed at the Site.

PCA predicted that no direct or indirect effects to vegetation from acid deposition would be expected, as none of the air quality parameters (e.g., SO₂ and NO₂) were predicted within the local study area to exceed the levels determined to result in effects to vegetation.

PCA stated that cumulative effects of the Project in the context of the regional study area were rated as significant on land cover supply and landscape diversity, while cumulative effects in the context of the subregional study area were rated as not significant.

PCA believed that Project effects on vegetation valued ecosystem components could be avoided and/or reduced by employing a number of mitigation measures. Outlined mitigation measures included, but were not limited to, a 150 m buffer zone (which may be closer to 200-400 m) between operations and the Athabasca River where vegetation would be unaltered, that rare plants would be collected or transplanted prior to removal of vegetation (and would include soil and understory vegetative material) where

appropriate, and that progressive reclamation using topsoil salvage and placement would reduce the loss of original native land cover from surface disturbance. PCA noted other mitigation measures that included salvaging of merchantable timber in agreement with forest management activities in the area, geotechnically stabilizing and integrating re-constructed landforms into the surrounding natural landforms, and taking into account natural landform variability during reclamation, mimicking natural soil conditions and promoting wetland/riparian conditions.

PCA proposed that vegetation monitoring test or verify impact predictions and measure success of mitigation approaches. PCA believed that efforts should focus on predictions for which confidence levels were low and on mitigation measures for which success is relatively uncertain. PCA suggested that monitoring focus on the degree of success in restoring upland native plant diversity, transplanting rare plants and rare plant communities, restoring wetlands using on-site native plant materials, and restoring stream channels and associated riparian vegetation.

8.2.2: Views of the Panel

The Panel accepts the general methodology and process followed by PCA to assess potential Project related impacts on vegetation and wetlands. The Panel acknowledges that essentially all vegetation will be removed within and around the immediate vicinity of the footprint of the Project and that the entire local study area is riparian habitat along the Athabasca River.

The Panel is not comfortable with PCA's establishment of a sub-regional study area to assess impacts to vegetation as opposed to a local study area. While it is important to evaluate potential impacts on a regional scale and from a cumulative effects perspective, it is also important to assess and evaluate potential impacts at the local scale. In the Panel's view, the proper conclusion based on the evidence in the local study area, is that there will be a significant, negative impact on vegetation for all the selected valued ecosystem components as a result of the Project. Nevertheless, the Panel acknowledges that it is virtually inevitable that a limestone quarry of the proposed nature will have a negative impact on vegetation, as this type of activity requires removal of vegetation, and the Panel finds the impact to be acceptable.

The Panel understands that PCA did not explicitly reassess the potential impact of acidification on vegetation following the acid deposition assessment. Based on the results of that assessment, the Panel requires that as part of PCA's participation in regional processes addressing air quality issues (Section 4: Air Quality, Human Health and Noise), that PCA also cooperate with any studies assessing the impact of acidification on vegetation in the Fort McMurray oilsands area to the satisfaction of ESRD.

The Panel supports and expects PCA to follow proposed mitigation measures to lessen Project impacts, including maintaining buffer zones, rare plant collection and/or transplantation, progressive reclamation, vegetating stock piles and re-constructed landforms, and salvaging merchantable timber. The Panel appreciates the difficulties associated with re-vegetating wetland/riparian areas, but is confident PCA will strive for reclamation success in these areas. The Panel expects PCA to adopt and follow a rigorous weed control program at the Site during operation and reclamation.

The Panel trusts that PCA will work with and receive adequate guidance from ESRD regarding a vegetation monitoring program, and that any additional mitigation measures and monitoring subsequently required and deemed appropriate by ESRD will be followed by PCA.

8.3: Aquatic Resources: Fisheries

8.3.1: Views of the Applicant

PCA stated that the Project would preserve undisturbed riparian corridors for the Site's only two fish-bearing streams, Parsons Creek and Unnamed Creek #6. PCA submitted that smaller drainage courses on the Project Site which are not fish-bearing have no inherent ecosystem value and indicated that these watercourses would be intercepted near the Project's west boundary. Similarly, PCA concluded that other lesser drainages within the Project area do not have inherent ecosystem value other than to convey surface water from offsite watersheds to the Athabasca River. PCA stated that the offsite drainage areas supplying water to Parsons Creek and Unnamed Creek #6 would be entirely unaffected by the Project.

Based on its assessment of the baseline fisheries resource for the Site, PCA concluded that the Project would not result in aquatic impacts that would require "no net loss" fish habitat or productivity compensations plans. PCA stated that, although the federal Department of Fisheries and Oceans (DFO) has not assumed a role in the final review and approval of this project, it will be fully compliant with the existing federal guidelines for the protection of fish habitat. PCA maintained that the fishery resource had been assessed appropriately and that the proposed mitigation measures were suitable.

PCA also stated that it would be fully compliant with the existing federal guidelines regarding the use of explosives. PCA maintained that the blasting program involved in its Project will not impact the fisheries in the LSA because:

- Blasting debris and dust will be contained within the mine footprint
- PCA's blasting program will follow DFO guidelines ("*Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters.*" Wright and Hopky, 1998.)

Concerning the question of planned blasting and the potential effects of Rayleigh waves on fish health and behavior, PCA submitted that the concept of Rayleigh waves was not well established in the scientific literature and, to date, no federal or provincial regulator has developed guidelines in this regard. Therefore, PCA believed that assessing the potential effect of Rayleigh waves on fish was not required for the Project.

8.3.2: Views of the Panel

The Panel acknowledges that PCA completed a satisfactory baseline assessment of the fisheries resource for the LSA and accepts the EIA conclusion that Parsons Creek and Unnamed Creek #6 constitute the primary viable fish-bearing streams that will require protection from the potential impacts of quarrying operations. As a mitigative measure in

this regard, the Panel acknowledges that PCA has committed to establish an undisturbed 50 m setback corridor along each bank of these streams.

The Panel acknowledges that PCA has, despite the absence of DFO direct participation in the final decision for this application, committed to be fully compliant with existing Federal guidelines for the protection of fish habitat and productivity, and with regard to the mine blasting program. The Panel observes that additional significant fisheries-related issues exist which will require discussion and regulatory follow-up (e.g. design of the end-pit lakes, over-wintering and survival of stranded Athabasca River fish in the end-pit lakes). In the absence of DFO involvement, the Panel expects that ESRD will be responsible for the necessary assessment and actions regarding any impacts on the fisheries resulting from the Project.

SECTION 9: PANEL DECISION

9.1: Decision

In undertaking its review of the Parsons Creek Aggregates (PCA or the Applicant) application to the NRCB for an approval to construct, operate and reclaim a limestone quarry project in the Regional Municipality of Wood Buffalo (RMWB), the Panel has carefully reviewed all written material provided by PCA and all interested parties, including the environmental impact assessment (EIA), responses to supplemental information requests and answers to Panel questions. Based on its assessment of the information before it and having regard for the commitments made by PCA and subject to the conditions contained in this decision report, the Panel concludes that the Project is in the public interest.

The Panel acknowledges that the Applicant reduced the area covered by its application for an NRCB approval in its Memorandum of Understanding (MOU) with the RMWB dated August 13, 2013 by removing Area A as illustrated in Map 1 attached to the MOU and reproduced in this Decision Report as Figure 1. While PCA has not formally amended its NRCB application to be consistent with the MOU, for clarification, the Panel hereby determines that this approval does not apply to Area A on the basis that aggregate extraction in Area A is incompatible with the land use and quality of life objectives of the Municipality as agreed to by the parties to the MOU.

9.2: Overview

Section 2 of the *Natural Resources Conservation Board Act* establishes the Panel's mandate which is to decide whether the proposed PCA Project is in the public interest, having regard to its social and economic effects and the effect of the Project on the environment. The Act further provides that with the prior authorization of the Lieutenant Governor in Council (provincial Cabinet), the Board may grant an approval with terms and conditions as appropriate. A decision by the NRCB not to grant an approval does not proceed to the Lieutenant Governor in Council.

The PCA application is the first considered by the NRCB since the enactment of the *Alberta Land Stewardship Act (ALSA)*. By way of a consequential amendment, s. 2.1 of the *Natural Resources Conservation Act* now states that:

In carrying out its mandate under this Act and other enactments, the Board must act in accordance with any applicable ALSA regional plan.

Pursuant to *ALSA*, the Alberta government adopted the *Lower Athabasca Regional Plan (LARP)* on August 22, 2012, effective September 1, 2012. The PCA Site is located within the boundaries of the *LARP* and accordingly, the Board is required to ensure that the PCA Project is in compliance with the *LARP*'s provisions.

The Board does not have a predetermined formula for determining whether a proposed project is in the public interest. Each project is unique and its impacts will vary based on many factors. It is evident that the specific nature of the project is key to the Board's assessment: its objectives and size, economic benefits, impact on natural resources and consequences for the natural environment and any affected human populations. Factors external to the project are also relevant such as the location of the proposed project, other developments in the vicinity, the existing quality of the receiving environment, and community acceptance of the project.

Recognizing the uniqueness of each project, the Panel will typically begin its analysis with a determination of the economic impact of the proposed project. At minimum, there must be some demonstrated economic value from the project whether it is a contribution to economic well-being of the province and municipality, jobs, or the provision of needed products. Arriving at a conclusion on this point is normally straightforward.

The more difficult challenge for any Panel working under the NRCB's legislative mandate is to account for predicted impacts of the proposed project on the environment and the community. The Panel understands that it is unlikely that any proposed project subject to its review process would not have an impact on the environment or community. The challenge for the Panel in doing its assessment is to quantify impacts, both positive and negative, and to determine whether any expected negative impacts are acceptable. In undertaking this analysis, the Panel will carefully review the application to ascertain the scope, quality and reliability of information submitted by the proponent, the risk of a negative effect occurring, preventative measures proposed by the applicant, planned mitigation, compliance with current regulations and standards, and follow-up surveillance and monitoring. Through a consideration of these factors, the Panel will determine whether the proposed project is in the public interest. If warranted, the Panel will attach conditions to its approval to ensure that necessary steps are taken to protect the community and the environment.

9.3: Reasons

With respect to the expected economic impact of the proposed Project, the Panel finds that it is likely that the region will require significant quantities of aggregate to support current and future infrastructure, construction and oilsands projects, based on the information provided by PCA and also confirmed in the MOU with the Regional Municipality of Wood Buffalo which said:

2.1 The parties agree that Fort McMurray is likely to experience a significant shortage of aggregates for local infrastructure and construction projects and that a nearby supply of aggregate material from the proposed PCA quarry could support the sustainable development of Fort McMurray.

The Panel accepts PCA's assertion that the Project's economic impacts on the regional and provincial economies are expected to be small, but positive. While acknowledging the presence of social infrastructure pressures in the study area, the Panel agrees that the Project will have a relatively minor impact on local and regional population growth and demand for social infrastructure and services.

Accordingly, the Panel finds that the Project will be of economic benefit to the region based on its ability to supply limestone aggregates for infrastructure and construction without offsetting economic costs to the community.

In considering the potential impact of the proposed Project on the environment and the community, the Panel developed a conceptual list of factors that would need to be considered in order for the Project to meet Board's public interest test in this case. That list includes, but is not limited to, the following:

- That the proposed Project not compromise road safety on Highway 63,
- That nearby residents in the Municipality of Wood Buffalo are not negatively affected by noise from the Site,

- That air quality standards are met and air emissions do not impact the health of nearby residents
- That any water released from the Site to the Athabasca River meets regulatory standards,
- That the disturbed lands are progressively reclaimed and the objective of equivalent land capability is realized,
- That ecological integrity is supported by mitigating and minimizing impacts on wildlife and vegetation,
- That promises made to the Project's neighbours during the consultation processes are honoured,
- That the Project is compliant with the *Lower Athabasca Regional Plan*, and
- That the community is confident standards are being met based on adequate environmental monitoring and transparent reporting of results.

With respect to each listed factor, the Panel has considered whether actions proposed by PCA to avoid, lessen or mitigate potential damage are adequate. In undertaking this exercise, the Panel has relied on PCA's commitments in its application. Where additional actions were required, or particular commitments required emphasis due to their importance, the Panel has imposed conditions. These conditions are requirements that the Applicant must comply with as it proceeds with its Project.

Because this Project concerns a surface mine, the Panel acknowledges that there will inevitably be damage to some existing natural resources as a result of planned surface disturbance. In particular, there will be significant changes to wildlife habitat, vegetation and soils located within the mine's footprint. That is the nature of a mine. While PCA has committed to undertake mitigation with respect to each of these issues, the Panel is aware that there will be negative outcomes since the landscape will be returned to a different state, with irreversible impacts to vegetation and wildlife. Nevertheless, the Panel accepts that these outcomes are a necessary consequence of this mining project and based on the Applicant's commitments to mitigate and minimize damage, are acceptable.

At several points in its application, PCA has indicated that it will follow an adaptive management approach to address issues such as the reclamation of the disturbed lands. The Panel understands that it is virtually impossible and likely unwise to establish a fixed plan at the initial regulatory approval stage for actions to be undertaken many years into the future. New technical and scientific advances and regulatory changes, for example, will determine what is appropriate. While the Panel appreciates that this approach is acceptable in the circumstances, it cannot take place in the absence of oversight from the appropriate regulator. Accordingly, conditions have been included in this approval which require PCA to report to the regulator on any outcomes of its adaptive management approach and to confirm with the regulator the acceptability of any changes in plans.

Due to its location within the Regional Municipality of Wood Buffalo adjacent to the Urban Services Boundary and within the vicinity of large oilsands operations, the Applicant is in a favourable position to take advantage of markets for its limestone products. The Panel recognizes this as an attractive economic opportunity for PCA. However, the Panel observes that development in this area also attracts the attention of regulators who are mindful of the

potential impact of the area's resource developments on the region. While the Panel acknowledges that the proposed Project is relatively small with limited impacts, due to its location, it could be included in various regional initiatives dealing with planning issues and environmental impacts. Indeed, PCA already finds itself in the first of 7 regional plans to be developed for Alberta under the *Alberta Land Stewardship Act*. Anticipated provincial and regional initiatives that could impact the Applicant within the first years of its operation include requirements respecting wetlands, environmental monitoring, end pit lakes, and management frameworks under the *Lower Athabasca Regional Plan*. In this decision, the Panel has specifically required that PCA participate in regional initiatives concerned with air quality monitoring and the impacts of acidification on vegetation. The Panel recommends that PCA also give consideration to the demands that future regional policies might impose on its operations and that it give consideration to developing its capacity to respond appropriately and constructively.

Based on assurances from PCA and its own review, the Panel confirms that the Project as described in the EIA, SIRs and responses to Panel questions complies with *Lower Athabasca Regional Plan*.

The Panel accepts that PCA conducted adequate public consultations with affected communities.

While the Panel has noted areas where there will be some irreversible impacts to the environment resulting from the PCA limestone mining operation, the Panel concludes that based on the anticipated benefits from the Project, the planning evidenced in the application, the Applicant's commitments regarding prevention and mitigation, when combined with the Panel's conditions, the Project is in the public interest. Appendix A sets out a draft Form of Approval for Cabinet's consideration.

DATED at CALGARY, ALBERTA, this 25th day of February, 2014.

Original signed by:

Vern Hartwell, Chair

Donna Tingley

Jim Turner

APPENDIX A: NRCB FORM OF APPROVAL

THE PROVINCE OF ALBERTA NATURAL RESOURCES CONSERVATION BOARD ACT NATURAL RESOURCES CONSERVATION BOARD

IN THE MATTER of a project of Parsons Creek
Aggregates for approval to construct and
operate a limestone quarry
near Fort McMurray, Alberta

APPROVAL NO. NR 2014-01

WHEREAS the construction and operation of a metallic or industrial mineral project is a reviewable project under s. 4(c) of the Natural Resources Conservation Board Act, and

WHEREAS the Natural Resources Conservation Board is prepared to grant approval to the application by Parsons Creek Aggregates (a joint venture between Graymont Western Canada Inc. and Lehigh Hanson Materials Limited), subject to the conditions herein contained, and the Lieutenant Governor in Council has given authorization, hereto attached.

THEREFORE, the Natural Resources Conservation Board hereby orders as follows:

1. The Project of Parsons Creek Aggregates (hereinafter called "PCA"), for construction and operation of a limestone quarry located near Fort McMurray, as described in Application No. 1001 from PCA to the Board filed on 8 June 2010 and all supplemental materials supporting the application filed with the Natural Resources Conservation Board, is approved, subject to the undertakings and commitments in the application and the terms and conditions herein contained.
2. PCA shall not extract aggregate from lands south of Parsons Creek, described in the PCA Quarry Plan as Mine Blocks 1A, 1B and 1C.
3. PCA undertake PM_{2.5} monitoring and implement a dust management plan consistent with that outlined in its application, to the satisfaction of Environment and Sustainable Resource Development (ESRD). The Panel further requires that should the monitoring indicate exceedances, PCA must develop and implement a mitigation plan to the satisfaction of ESRD.
4. PCA must, to the satisfaction of ESRD, actively contribute to regional processes addressing air quality issues, with the goal of achieving reductions in emissions.
5. PCA adhere to the requirements of the current AER Noise Directive for noise levels measured at existing and future urban development area(s) and must include a noise monitoring program to the satisfaction of ESRD.
6. PCA must establish of a noise complaint protocol, report noise level exceedances at identified residential area(s) and develop and implement any noise mitigation that may be required, to the satisfaction of ESRD.
7. PCA reclaim the minimum 90 m buffer extension with suitable vegetation, within an appropriate timeframe, to create a 150 m buffer zone to the west bank of the Athabasca River to the satisfaction of ESRD.

8. PCA meet the following commitments to the satisfaction of Alberta Transportation to address Highway 63 safety issues associated with the proposed quarry:
 - (a) develop an updated Traffic Impact Analysis to address issues associated with future quarry traffic such as acceptable levels of service, hours of operation, signage, and lighting.
 - (b) Develop and follow a blasting program to ensure operations do not pose a risk to the infrastructure of Highway 63 and safety of its users.
 - (c) Retain a geotechnical firm to conduct a local study of landslide hazards and conduct a risk assessment for blasting to comply with the United States Bureau of Mines Structure Response and Damage Produced by Ground Vibrations from Surface Blasting (USBM RI-8507).
 - (d) Use strategically placed seismographs to monitor blast impacts on nearby structures.
 - (e) Retain blasting and geotechnical engineer(s) who are familiar with local conditions to sign off on an agreed blasting and monitoring plan.
9. PCA provide a written report once every 5 years to ESRD, describing all the actions which have been taken in pursuit of its adaptive management approach to reclamation, the current status of disturbed mining lease lands (i.e. areas disturbed, temporary reclaimed, permanent reclaimed, certified reclaimed) and any resulting changes to PCA's reclamation plan.
10. That PCA ensure that 50 cm of coversoil is replaced on all reclaimed areas that are intended for revegetation to the satisfaction of ESRD.
11. That any stockpiled material, disturbed areas within the buffer zone, and progressively reclaimed areas be vegetated/re-vegetated by PCA as soon as possible to reduce the likelihood of significant erosion during flooding, to the satisfaction of ESRD.
12. PCA implement a water quality monitoring program for both surface water and groundwater, for various parameters, as determined appropriate by ESRD. Should monitoring indicate any exceedances, PCA must develop a mitigation plan and implement that plan to the satisfaction of ESRD.

Made at the City of Edmonton, in the Province of Alberta, this day of , 2014.

NATURAL RESOURCES CONSERVATION BOARD

Vern Hartwell, Panel Chair

Donna Tingley

Jim Turner

APPENDIX B: ACRONYMS AND ABBREVIATIONS

AAAQOs	Alberta Ambient Air Quality Objectives
AER	Alberta Energy Regulator (formerly Energy Resources Conservation Board)
Applicant	Parsons Creek Aggregates
AT	Alberta Transportation
Board	Natural Resources Conservation Board
CALMET	California Meteorological model
CALPUFF	California puff model
CEA	Cumulative Effects Assessment
CEMA	Cumulative Environmental Management Association
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ E	carbon dioxide equivalent
COPC	chemicals of potential concern
C&R	Conservation and Reclamation
DFO	Department of Fisheries and Oceans
DMP	dust management plan
EIA	Environmental Impact Assessment
EPEA	<i>Environmental Protection and Enhancement Act</i>
ESRD	Alberta Environment and Sustainable Resource Development (formerly Alberta Environment)
FMFN	Fort McMurray First Nation
GDP	gross domestic product
GHG	greenhouse gas
GMF	Groundwater Management Framework
ha	hectare
HHRA	human health risk assessment
HRIA	historical resources impact assessment
ILCR	incremental lifetime cancer risk
keq/ha/yr	kiloequivalent per hectare per year
LARP	<i>Lower Athabasca Regional Plan</i>

LSA	local study area
MAIM	metallic and industrial mineral
mg/L	milligrams per litre
MOU	memorandum of understanding
MPOI	maximum points of impingement
Mt	million tonnes
NO ₂	nitrogen dioxide
NO _x	oxides of nitrogen
NRCB	Natural Resources Conservation Board
NRCBA	<i>Natural Resources Conservation Board Act</i>
O ₃	Ozone
PAHs	polycyclic aromatic hydrocarbons
PAI	potential acid input
PCA	Parsons Creek Aggregates
PDA	principal development area
PDC	application plus planned development
PM	particulate matter (e.g. PM _{2.5} depicts particles of 2.5 micrometres or less; fine particulate matter)
Project	project proposed by Parsons Creek Aggregates
RCMP	Royal Canadian Mounted Police
RMWB	Regional Municipality of Wood Buffalo
RQ	risk quotient
RSA	regional study area
SIR	Supplemental Information Request
SO ₂	sulphur dioxide
SWQMF	Surface Water Quality Management Framework
TKR	Traditional Knowledge Report
TRVs	toxicity reference values
UC	Unnamed Creeks
US EPA	United States Environmental Protection Agency
VOCs	volatile organic compounds

Contact the Natural Resources Conservation Board at the following offices:
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Copies of the *NRCB Act, Rules of Practice of the Natural Resources Conservation Board Regulation and Administrative Procedures Act* are available through the Queen's Printer. NRCB Guides are available by contacting the NRCB's Edmonton Office.

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