2.0 STATUS AND ACTIVITIES OF ATHABASCA OIL SANDS DEVELOPMENTS IN 2004

This section provides a synthesis of information related to development pressures that may be influencing aquatic environmental resources within the RAMP focus and regional study areas, and specifically describes the activities of:

- each of the oil sands projects financed by RAMP member companies that occurred in 2004;
- oil sands projects financed by companies that are not members of RAMP; and
- other developments in the RMWB.

2.1 BACKGROUND

Each year, mining activities in the Athabasca oil sands region continue to increase and change in response to expansion of existing oil sands operations and the start-up of new projects. From a monitoring perspective, it is important to have a complete record and understanding of oil sands development activities that have occurred in a given monitoring year. This information is needed to accurately interpret monitoring results within the context of actual mining operations and the potential influence of these operations on the surrounding environment.

For RAMP, mining activities that may alter or influence local aquatic environments are of specific importance. Activities such as land clearing and construction, muskeg dewatering, alteration of drainage patterns, air emissions (i.e., potential acid deposition), water discharges and water withdrawals all have the potential to affect water quality and/or quantity in nearby receiving waters.

As RAMP continues to be evaluated and refined following the Scientific Peer Review presented in 2004 (Ayles *et al*. 2004), background documentation is being developed to more clearly outline RAMP's monitoring objectives, rationale and sampling design. As part of this initiative, it was also recognized that a more formal process was required for obtaining detailed and, if possible, quantitative information on annual oil sands activities relevant to aquatic monitoring. To date, this process is still ongoing, but should be completed in 2005.

The following sections provide a summary of activities known to have occurred during the 2004 monitoring year. Much of the information has been obtained from an Alberta Economic Development (AEC) oil sands update report (AEC 2004, www.alberta-canada.com), field observations during RAMP monitoring surveys and from information provided by industry representatives of RAMP.

2.2 RAMP OIL SANDS PROJECTS

RAMP has been designed largely in response to the monitoring needs of the various industry members. In 2004, ten companies representing 18 oil sands projects participated in RAMP. Table 2.2-1 summarizes the current status of each development within the RAMP study area (as of the end of 2004). The date of initial environmental disturbance

from each project has also been included because it represents the first activity that has the potential to effect local aquatic systems (i.e., conservative approach). In addition, Figure 2.2-1 shows the extent of development for projects in operation[1].

2.2.1 Suncor Energy Inc.

Suncor Energy currently operates the Lease 86/17, Steepbank/Millenium surface mines, associated upgrading facilities as well as the Firebag SAGD operation. Although mining at Lease 86/17 ceased in 2002, the upgrading facility, much of the extraction process, and various storage pond facilities remain operational in support of ongoing mining operations (Shell 2002).

The following are the main oil sands production activities realized by Suncor Energy Inc. in regards to its Athabasca Oil Sands projects in 2004:

- The Steepbank and Millenium surface mines, and existing associated upgrader facilities continued operation;
- Activities at Lease 86/17 included operation of Tailings Pond 6 (with subsequent overboarding of water and infilling of sediment [sand]), infrastructure demolition, including dismantling of the conveyor system (which began in 2004 and will be completed by 2005), and removal of mine head stations in preparation for dismantling/demolition;
- Planning continued for the Steepbank Mine Extension (North Steepbank Mine) with formal application for regulatory approval expected for sometime in 2005;
- Construction of the 1st phase (35,000 bpd) of the Firebag *in situ* Project, located in the vicinity of the headwaters of the Firebag River, Muskeg River and the North Steepbank Rivers, was completed and operation of 1st phase commenced in January 2004. Production from this phase averaged approximately 11,000 bpd throughout 2004. Construction started on the 2nd phase (35,000 bpd) of the Firebag Project and was approximately 50% complete by end of the year;
- EUB approval was given for the South Tailings Pond (Alberta Environment approval was pending as of the end of 2004);
- While formal applications had not yet been submitted as of the end of 2004, planning continued for the Voyageur Upgrader, Phases 1 and 2; and
- Combined production from all Suncor operations amounted to about 86 million barrels or 236,000 bpd.

[1] The detailed development information contained in Figure 2.2-1 was extracted from various images and maps provided by oil sands developers. Where possible, 2004 development information was included in Figure 2.2-1. When 2004 development information was not available, development information as of the end of 2003 was included in Figure 2.2-1.

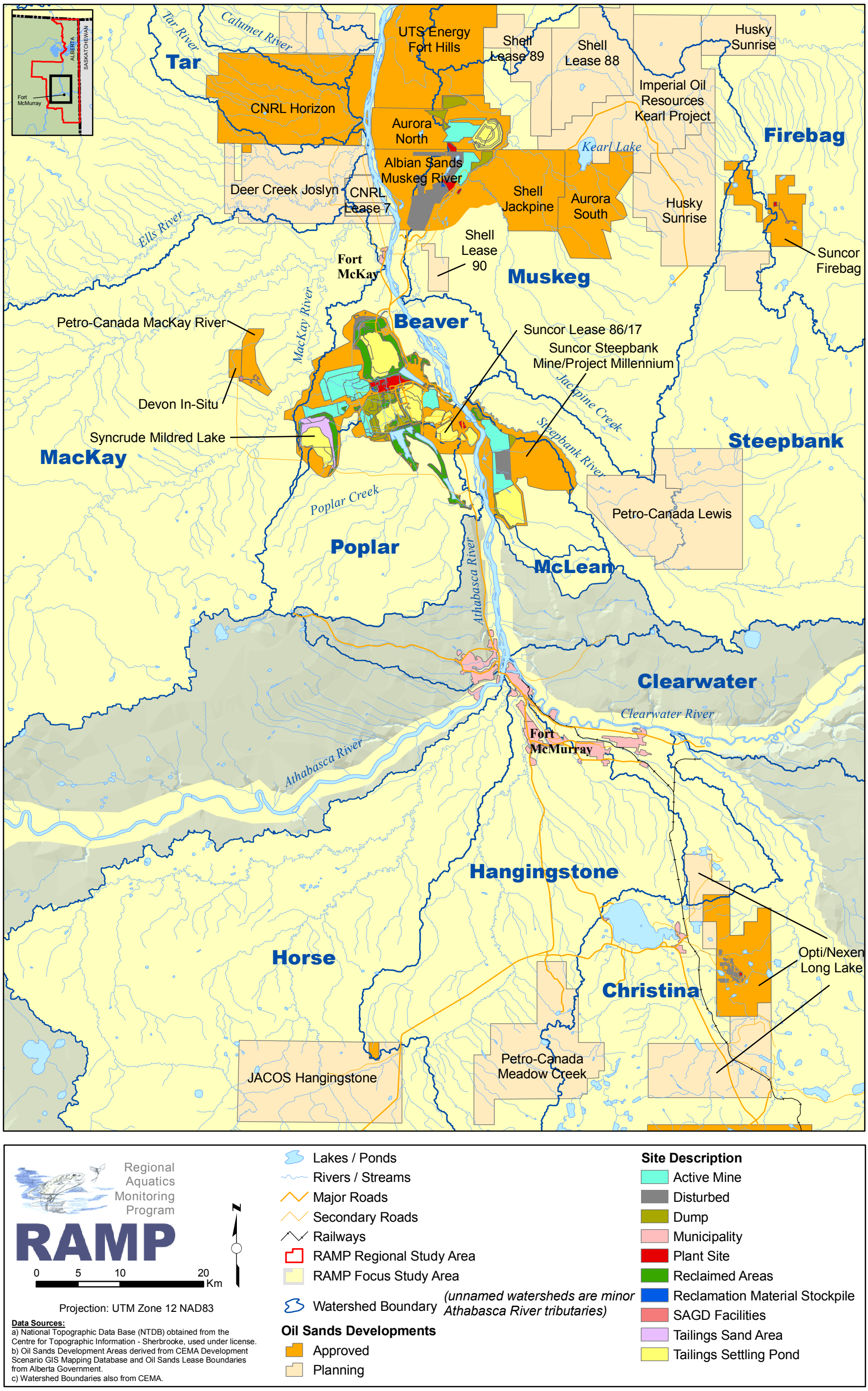
Table 2.2-1 Summary of oil sands projects in the Athabasca oil sands region as of 2004.

Oil Sands Development	Location	Type of Operation	Capacity Bitumen	Capacity Synthetic	Date of Application	Date of First Disturbance	2004 Status	Clearwater-Christina	Hangingstone	Steepbank	Muskeg	MacKay	Ells	Tar	Calumet	Firebag	Misc. Athabasca R. Tributaries[a]	Misc. Lakes and Wetlands[b]	Athabasca River and Delta
Suncor Energy Inc.																			
Lease 86/17	30 km N of Fort McMurray	open-pit			1964	1967	**Upgrading, Storage Ponds**										■		■
Steepbank Mine	30 km N of Fort McMurray	open-pit	280,000		1996	1997	**Operational**			■							■	■	■
Steepbank Mine Extension	30 km N of Fort McMurray	open-pit			2005	2007	**Planning**			■							■	■	■
Millennium Mine and Upgrader	30 km N of Fort McMurray	open-pit, processing		110,000	1998	2000	**Operational**			■							■	■	■
Fixed Plant Expansion	30 km N of Fort McMurray	processing		220,000	1996	existing area	**Operational**			■							■	■	■
Firebag Pilot Project	40 km NE of Mildred Lake	in-situ	1,200		2000	2000	**Discontinued**			■	■					■			■
Firebag Project	40 km NE of Mildred Lake	in-situ	140,000		2000	2002	**Operational -** construction of 1st phase (35,000 bpd) completed, operation of 1st phase commenced in January 2004, construction started on 2nd phase (35,000 bpd) and was approximately 50% complete by end of 2004			■	■					■			■
South Tailings Pond	25 km N of Fort McMurray	tailings pond	n/a	n/a	2003	2005	**Planning** - EUB approval given, Alberta Environment			■							■	■	■
Voyageur Upgrader, Phase 1	30 km N of Fort McMurray	processing		200,000		2008	**Planning**			■							■	■	■
Voyageur Upgrader, Phase 2	30 km N of Fort McMurray	processing		100,000		2010	**Planning**			■							■	■	■
Syncrude Canada Ltd.																			
Mildred Lake (Base Mine)	45 km N of Fort McMurray	open-pit	90,000		1973	1973	**Operational**					■					■		■
Mildred Lake Upgrader	45 km N of Fort McMurray	processing		250,000	1998	existing area	**Operational**					■					■		■
North Mine	60 km N of Fort McMurray	open-pit	160,000		1995	1996	**Operational**					■					■		■
Aurora North	east side of Athabasca River	open-pit	200,000		1996	1996	**Operational** - production from two mine trains				■								■
Aurora South	east side of Athabasca River	open-pit	200,000				**Planning** - approval received from EUB but application to AENV not yet submitted				■							■	■
Mildred Lake Upgrader Expansion	45 km N of Fort McMurray	processing		300,000	1995	2003	**Construction** - first of three phases more than 75% built				■							■	■
Albian Sands Energy Inc.																			
Muskeg River Mine	75 km N of Fort McMurray	open-pit	155,000		1997	2000	**Operational**				■						■	■	■
Muskeg River Mine Expansion	North of Jackpine Mine	open-pit	70,000		2004	2006	**Planning**				■						■	■	■
Shell Canada Limited																			
Jackpine Mine (Phase 1)	East portion of lease 13	open-pit	200,000		2002	2008	**Approved** - approval in early 2004				■							■	■
Jackpine Mine (Phase 2) (Lease 88/89)	65 km NNE of Fort McMurray	open-pit	100,000		not yet	2010-2015	**Planning**				■							■	■
CNRL																			
Horizon Project	80 km N of Fort McMurray	open-pit	270,000		2002	2004	**Construction** - clearing, dewatering						■	■	■				■
Kirby Thermal Pilot	85 km NE of Lac la Biche	in situ	1,600		1999	2000	**Suspended**												■
Kirby Project	85 km NE of Lac la Biche	in situ	30,000		2002	unknown	**Currently Suspended**												■
Imperial Oil Resources																			
Kearl Oil Sands Project	70 km NE of Fort McMurray	open-pit	300,000		2005 (expected)	2007	**Planning** - EIAs, preparation of application, etc.				■							■	■
Petro-Canada Oil and Gas																			
MacKay River	60 km NW of Fort McMurray	in-situ	30,000		1998	2002	**Operational**					■							■
Meadow Creek	45 km S of Fort McMurray	in-situ	80,000		2005	unknown	**Planning**		■										■
Lewis Project	30 km NE of Fort McMurray	in-situ	50,000		unknown	unknown	**Planning**			■									■
Opti Canada Ltd. /Nexen Inc.																			
Long Lake Pilot	40 km SE of Fort McMurray	in-situ	3,000		unknown	2003	**Operational** - production of 1,500 bpd reached by end of 2004	■											■
Long Lake Project (Phase 1 and 2 SAGD, upgrader)	40 km SE of Fort McMurray	in-situ	70,000	60,000	2003	2004	**Construction** - Site clearing completed and rough grading of facilities site started	■											■
Devon Canada Corporation																			
Dover Vapex Pilot	55 km NW of Fort McMurray	in-situ	9,000		unknown	unknown	**Operational**					■							■
Jackfish Project	15 km SE of Conklin	in situ	35,000		2003	2005	**Planning** - approval granted in late 2004	■											■
Deer Creek Energy Ltd.																			
Pilot	60 km SE of Fort McMurray	in-situ	2,000		unknown	1998	**Suspended**						■						■
Joslyn, SAGD Phase 1	60 km SE of Fort McMurray	in-situ	600		unknown	2003	**Operational** - steaming started in early 2004 with production commencing in September 2004						■						■
Joslyn, SAGD Phase 2	60 km SE of Fort McMurray	in-situ	10,000		2004	2005	**Construction** - approval granted in 2004						■						■
Joslyn, SAGD Phase 3A	60 km SE of Fort McMurray	in situ	15,000		2005	2007	**Planning**						■						■
Joslyn, SAGD Phase 3B	60 km SE of Fort McMurray	in situ	15,000		2005	2009	**Planning**						■						■
Joslyn, Mine Phases 1 to 4	60 km SE of Fort McMurray	open-pit	200,000		2005/2006	2008	**Planning**						■						■
Husky Energy																			
Sunrise	70 km NE of Fort McMurray	in situ	200,000		2004	2006	**Planning**				■							■	■
Non-RAMP Members:																			
EnCana Energy																			
Christina Lake, Phase 1	170 km S of Fort McMurray	in-situ	10,000		1998	2000	**Operational**	■											■
Christina Lake, Phase 2,3	170 km S of Fort McMurray	in-situ	70,000		1998		**Planning**	■											■
UTS Energy Corporation																			
Fort Hills	90 km N of Fort McMurray	open-pit	190,000		2001	2005	**Approved**				■								■
ConocoPhillips																			
Surmont Pilot	60 km SE of Fort McMurray	in-situ	2,000		1996	1996	**Operational**	■											■
Surmont	60 km SE of Fort McMurray	in-situ	100,000		2001	2004	**Construction** - Site clearing, infrastructure	■											■
JACOS																			
Hangingstone Pilot	50 km SE of Fort McMurray	in-situ	10,000		1997	1998	**Operational**		■										■
Hangingstone	50 km SE of Fort McMurray	in-situ	45,000		unknown	unknown	**Planning**		■										■
SynEnCo Energy																			
Northern Lights	100 km NE of Fort McMurray	open-pit	100,000		unknown	unknown	**Planning**									■			■
Petrobank Energy and Resources Ltd.																			
Whitesands Pilot	10 km northwest of Conklin	in-situ			2003	2004	**Construction**	■											■

[a] any one or more of Mills Creek, Poplar Creek, McLean Creek, and Beaver Creek

[b] any one or more of Isadore's Lake, Shipyard Lake, McCelland Lake, or Kearl Lake

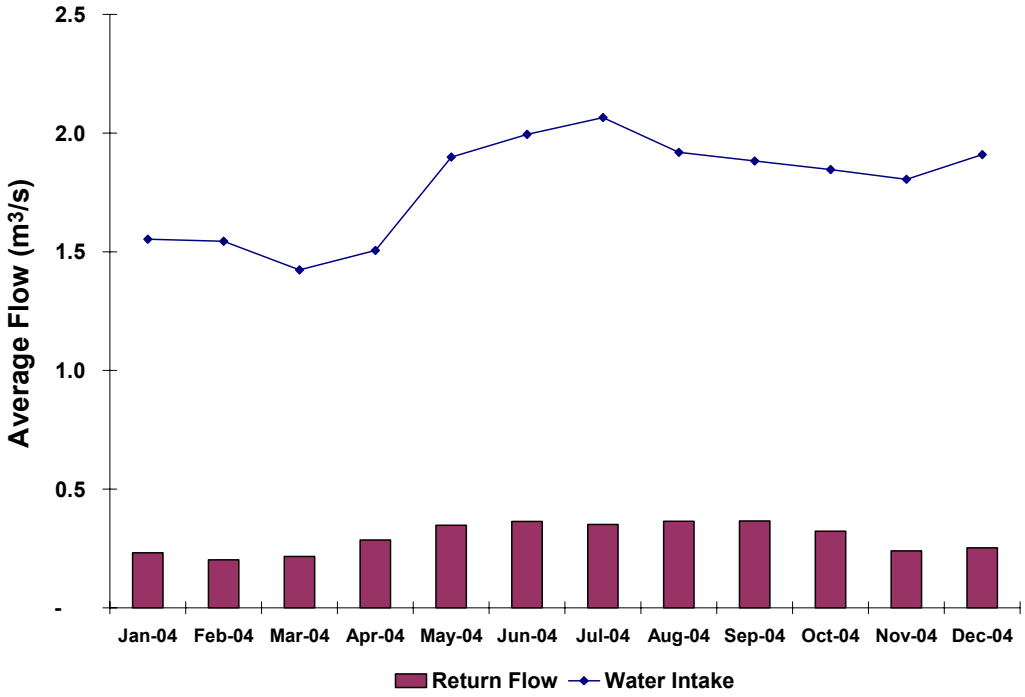
Figure 2.2-1 Extent of mine development for oil sands projects in operation as of 2004.



RAMP1110\GIS\2004_DEVELOP.MXD

Suncor's intake from the Athabasca River in 2004 averaged 1.77 m^3/s (Figure 2.2-2). The only direct discharge from Suncor's surface mining operations originates from the Lease 86/17 operation where wastewater enters the Athabasca River downstream of the Suncor Bridge; discharge in 2004 averaged 0.3 m^3/s (Figure 2.2-2). Other potential influences include the water intake operation on the Athabasca River, Tar Island Dyke seepage to the Athabasca River, the Steepbank Mine (and related ponds) adjacent to the Steepbank River and Athabasca River, Project Millennium (and related ponds) adjacent to the Athabasca River and Shipyard Lake, including an emergency spillway via McLean Creek to the Athabasca River.

Figure 2.2-2 Suncor water intake from and return flow to the Athabasca River, 2004.



Key features of the operations of Suncor Energy Inc. in 2004 for its Lease 86/17, Steepbank and Millenium surface mines and existing associated upgrader facilities are as follows:

- Exploratory drilling was conducted;
- Land clearing/project construction occurred in McLean Creek, "Unnamed Creek" (drains into Shipyard Lake) and the Athabasca River;
- In-stream work occurred in September in the Athabasca River (forebay dredging only) and during the autumn in the McLean Creek wetlands;
- Muskeg dewatering occurred throughout the year, with water being discharged to "Unnamed Creek";

- Site drainage, wastewater treatment plant treated effluent, and once-through cooling water was also discharged (total of 9.4 million m^3) from six discharge points into the Athabasca River, "Unnamed Creek", and McLean Creek;

- A total of 56 million m^3 of water was withdrawn from the Athabasca River; and

- 24,558 t and 15,600 t of SO_2 and NO_x, respectively, were released.

2.2.2 Syncrude Canada Ltd.

Syncrude Canada Ltd. operates mining and upgrader operations at Mildred Lake on the western side of the Athabasca River and the Aurora Mine on the eastern side of the Athabasca River. The following are the main oil sands production activities realized by Syncrude Canada Ltd. in regards to its Athabasca Oil Sands projects in 2004:

- With respect to the Mildred Lake on the western side of the Athabasca River, both the North and East Mines, as well as the Mildred Lake Upgrader facilities, continued operation;

- With respect to the Aurora Mine on the eastern side of the Athabasca River, increased production was achieved from the Aurora North Mine by the addition of a second mine train in 2004. All upgrading of bitumen mined at Aurora is conducted at the Mildred Lake upgrading facility. Formal application for approval of the Aurora South Mine located south of Kearl Lake has not yet been made and this mine is considered to still be in the planning phase;

- Construction of the Mildred Lake Upgrader expansion was almost 75% complete by the end of 2004; and

- Combined production from all Syncrude operations amounted to more than 87 million barrels or almost 240,000 bpd.

The Mildred Lake operation includes an open-pit oil sands mine, extraction and upgrading facilities. The mine obtains water via a water intake facility on the Athabasca River; however, there are no point source discharges to local waterbodies. Other potential influences include the Mildred Lake Settling Basin on smaller watercourses such as Beaver River, or the influence of the Poplar Creek Reservoir (temporary reclamation) on lower Poplar Creek. In addition, developments along the western portion of the mine are immediately adjacent to the MacKay River.

Syncrude's intake from the Athabasca River in 2004 averaged 0.97 m^3/s (Figure 2.2-3).

The Aurora North Mine is located north of the Albian Muskeg River Mine and is within the Muskeg River watershed. The mine, which began production in 2000, consists of an open-pit mine and extraction operations. Potential influences on local waterbodies include the Clean Water Discharge that enters Stanley Creek and the Aurora North Settling Basin adjacent to the Muskeg River. In 2003, water discharge into Stanley Creek ranged from 92,130 m^3 in November to 481,000 m^3 in July; the average daily discharge was approximately 10,500 m^3/day or 122 L/s (RAMP 2003). Clean Water Discharge flows for 2004 are provided in Figure 2.2-4.

Figure 2.2-3 Syncrude water intake from the Athabasca River, 2004.

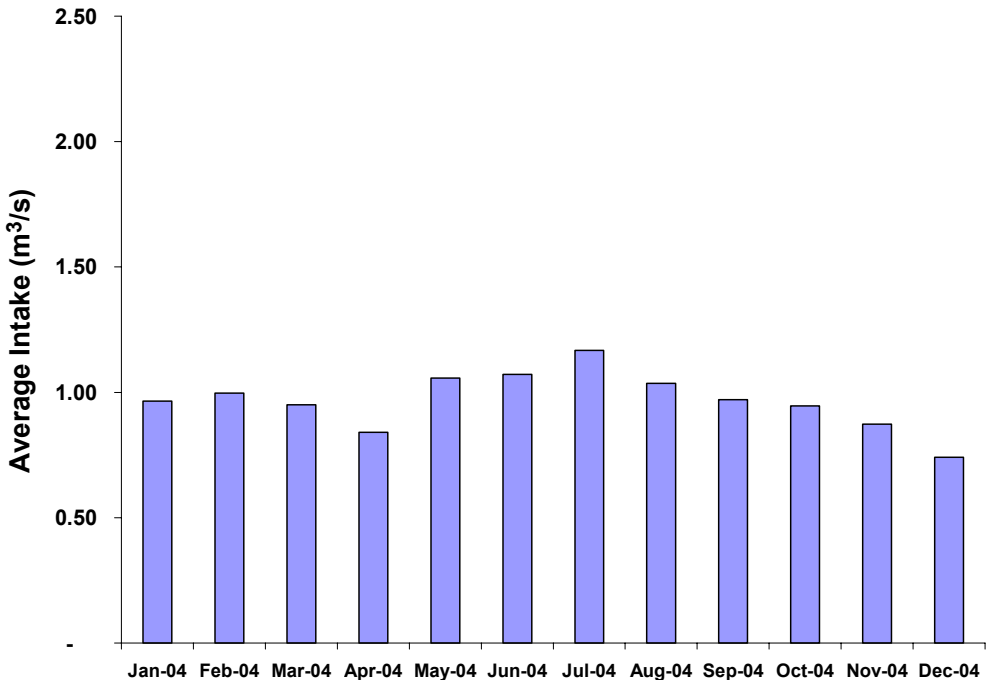
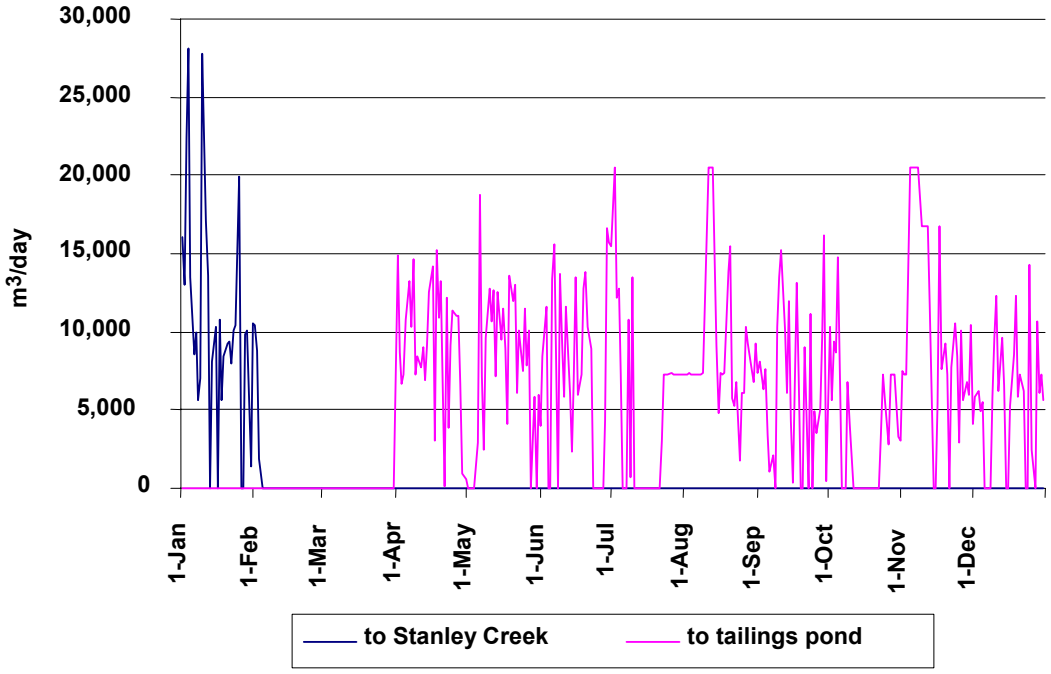


Figure 2.2-4 Daily CWD flows from Aurora North Mine, 2004.



2.2.3 Albian Sands Energy Inc.

Albian Sands Energy Inc. operates the Muskeg River Mine on the eastern side of the Athabasca River immediately to the northeast of Fort McKay. The Muskeg River Mine is located adjacent to the Muskeg River, south of the Aurora North Mine, and consists of an open-pit mine and extraction plant. Diluted bitumen from the mine is transported via pipeline to the Scotford Upgrader located in Fort Saskatchewan, Alberta. Production from the Muskeg River Mine started in late December 2002.

The following are the main oil sands production activities realized by Albian Sands Energy Inc. in regards to its Athabasca Oil Sands projects in 2004:

- Production from the Muskeg River Mine amounted to approximately 49 million barrels in 2004 or about 135,500 bpd; and
- Formal application was made to the EUB and AENV for the Muskeg River Mine.

In 2004, Albian Sands' Muskeg River facility was a zero-discharge operation, with tailings water and local drainage being recycled. Potential mine-related influences included water withdrawal from the Athabasca River, as well as tailings disposal areas and active mining areas in the vicinity of local waterbodies such as Muskeg River, Mills Creek and Isadore's Lake.

Key features of the operations of Albian Sands Energy Inc. in 2004 (Muskeg River Mine and Shell Jackpine Mine Project, Phase 1 [see below]) are as follows:

- Exploratory drilling was conducted;
- Land clearing/project construction occurred in the Muskeg River drainage (Lease 13);
- No in-stream work occurred;
- No muskeg dewatering occurred;
- There were no water discharges whatsoever;
- A total of 20.46 million m^3 of water was withdrawn from the Athabasca River in 2004; and
- 490 t of NO_x and 150 t of SO_x were released in 2004.

2.2.4 Shell Canada Ltd.

The following are the main oil sands production activities realized by Shell Canada Ltd. in regards to its Athabasca Oil Sands projects in 2004:

- Involvement in Albian Sands Energy Inc. and the Muskeg River Mine and planned expansion (see above);

- Approval was granted in early 2004 for the Jackpine Mine Project, Phase 1. Little or no development activity occurred in 2004 for the Jackpine Mine; and

- Formal application for approval of the Jackpine Mine Project, Phase 2, located on Leases 88 and 89 has not yet been made and this mine is considered to still be in the planning phase.

2.2.5 Canadian Natural Resources Ltd.

The following are the main oil sands production activities realized by Canadian Natural Resources Ltd. (CNRL) in regards to its Athabasca Oil Sands projects in 2004:

- CNRL obtained regulatory approval in early 2004 for the Horizon Oil Sands Project located on the western side of the Athabasca River near the Tar River. Land clearing, muskeg dewatering and grading commenced in 2004. In-stream work in 2004 occurred during the months of May, June, and September in the Tar River and three of its tributaries (tributaries designated by CNRL as TRT 7.5, 6, and 7) with drainage entering the lower Tar River. Muskeg dewatering to the Tar River took place during the September to approximately December period. Watershed drainage patterns (i.e., activities such as and similar to rerouting surface flows or removal of small tributaries) occurred in the Tar River watershed, as well as tributaries of the Tar River designated by CNRL as TRT 4, 5, 6, 7, and 7.5). Site drainage took place from June to December and discharges to the Tar River occurred via CNRL-designated drainages D6 and D7. No detailed information is currently available on the exact timing and volume of water diverted to the Tar River. In 2004, 5,220 m^3 of water was withdrawn from the Tar River for drilling purposes.

- CNRL also owns the Kirby *in situ* Project and the Kirby Thermal Pilot Project, both located near the southern boundary of the Regional Municipality of Wood Buffalo and immediately north of the Cold Lake Air Weapons Range. Both projects are situated in the Lac la Biche drainage whose waters eventually flow into the Athabasca River and possibly also the Sand River drainage whose waters eventually flow into the North Saskatchewan River. The Kirby Projects are on hold and CNRL has no plans to proceed with the projects at this time.

2.2.6 Imperial Oil Resources

Imperial Oil Resources is planning to develop an open-pit mining operation near Kearl Lake (Kearl Oil Sands Project—Mine Development), located 70 km northeast of Fort McMurray on Leases 6, 87, the eastern portion of Leases 36 and 31A, and the northeast portion of Lease 88. Imperial is currently undertaking an EIA of this project; exploratory drilling was the only on-site activity that occurred in 2004.

2.2.7 Petro-Canada

The following are the main oil sands production activities realized by Petro-Canada in regards to its Athabasca Oil Sands projects in 2004:

- Ongoing involvement in Syncrude Canada Inc., whose activities are discussed in Section 2.2.2;
- Production from the MacKay River Project amounted to approximately 5.8 million barrels in 2004 or about 16,000 bpd; and
- While EUB approval for the Meadow Creek SAGD Project, located approximately 45 km south of Fort McMurray, was granted in 2003, this project is considered to still be in the planning phase. It is likely the only activity during 2004 at this site was exploratory drilling.

Petro-Canada's MacKay River SAGD Project in the MacKay River drainage is the only active project wholly currently under operation by Petro-Canada in the Athabasca oil sands region. The initial phase of the project includes a development area of 30 km^2 out of a total lease area of approximately 200 km^2. In addition to ongoing production, exploratory drilling and associated planning continued during 2004 for the expansion of the MacKay River project. Potential influences of MacKay River SAGD Project on local waterbodies are limited and restricted to a few small, unnamed waterbodies not monitored by RAMP. No current development is located immediately adjacent to the MacKay River and water for the project is obtained from groundwater sources.

2.2.8 OPTI Canada Ltd./Nexen Inc.

OPTI Canada Ltd. and Nexen Inc. are jointly developing the Long Lake SAGD Project located near Anzac and the Gregoire River. The following are the main oil sands production activities realized by OPTI Canada Ltd./Nexen Inc. in regards to its Long Lake Project in 2004:

- Production of 1,500 bpd reached by end of 2004 for the Long Lake Project; and
- Commencement of construction in the 3rd quarter of 2004 for the Long Lake SAGD Project, consisting of completion of site clearing and initiation of rough grading of facilities site.

In addition to the site clearing areas, Alberta-Pacific Forest Industries Inc. (ALPAC) also has conducted significant logging within the lease area.

2.2.9 Devon Canada Corporation

Devon operates the SAGD Dover Vapex Pilot Project adjacent to and immediately to the west of the Petro-Canada MacKay River Project. Vapex technology uses vaporized solvents instead of steam to extract oil. Devon received regulatory approval for the Jackfish SAGD Project located 15 km southeast of Conklin in late 2004 and construction for this project is expected to begin in 2005.

2.2.10 Deer Creek Energy Ltd.

Deer Creek operates the Joslyn SAGD Project within the Ells River and Joslyn Creek drainages. The following are the main oil sands production activities realized by Deer Creek Energy Ltd. in regards to its SAGD Joslyn Project in 2004:

- Steam injection and field production commenced for Joslyn Phase 1, with production beginning in September 2004 and increasing throughout the final quarter of the year towards its full production target of 600 bpd. Shallow groundwater is currently used for this phase of the Joslyn Project, and a total of 70,497 m^3 of groundwater was withdrawn in 2004 for Joslyn Phase 1 operations;

- EUB and AENV approved Joslyn Phase 2, and land clearing and construction started on this phase of the project;

- A Public Disclosure Document was released for Joslyn Phase 3;

- Exploratory drilling continued;

- Emissions of NO_x totaled 5,866 t in 2004 (comparable figures for SO_x were not available); and

- Planning continued for the Joslyn Mine Project.

2.2.11 Husky Energy

Husky is planning the SAGD Sunrise Thermal Project located 5 km east of Kearl Lake and within the Muskeg River Basin. Husky filed for regulatory approval in 2004. Consequently, exploratory drilling was likely the only on-site activity that occurred in 2004.

2.2.12 Summary of Major Athabasca River Intakes

Total water intake from the Athabasca River by the significant oil sands users of Athabasca River water (Suncor, Syncrude and Albian Sands) has averaged slightly more than 3.1 m^3/s in the past five years (Figure 2.2-5). This represents:

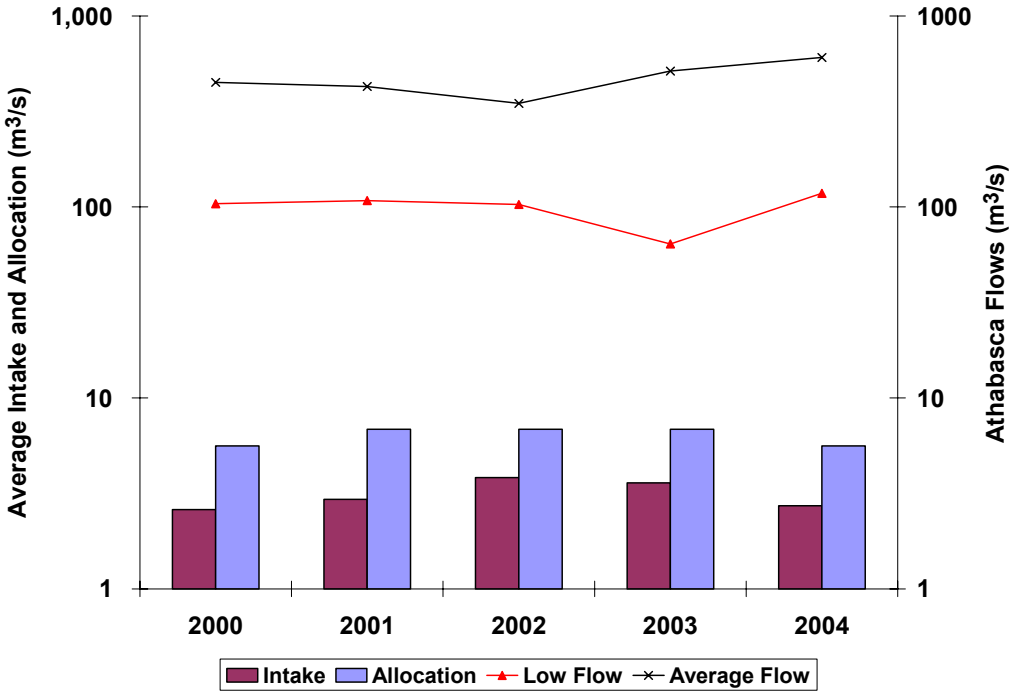
- approximately 50% of approved and allocated water intake for these developers over this period;

- from 0.45% to 1.1% of the total annual flow of the Athabasca River in the 2000 to 2004 period, depending on the year (average about 0.7%) (as measured at Station S24, downstream from the leases of these three developers—the percentage of total annual flow above the leases of Suncor, Syncrude and Albian Sands would be somewhat less); and

- from 2.3% to 5.6% of the lowest recorded flow of the Athabasca River in the 2000 to 2004 period, again depending on the year (average about 3.1%).

Figure 2.2-5 Major Athabasca River intakes, allocations, and flows from 2000 to 2004.

Intake and allocation data is for Suncor, Syncrude, and Albian Sands combined.
Note the logarithmic scale of the Y-axes.



2.3 NON-RAMP OIL SANDS PROJECTS

Several oil sands projects located within the RAMP FSA, particularly SAGD operations south of Fort McMurray, are being developed by companies which were not members of RAMP in 2004. Many are in the planning stages of development, and there are some that are operating pilot studies.

2.3.1 EnCana Energy

EnCana operates Phase 1 the Christina Lake Thermal Project near Conklin, about 170 km south-southeast of Fort McMurray; this facility produced about 5,000 bpd in 2004. No specific information regarding 2004 activities was available.

2.3.2 UTS Energy Corporation

In mid-2004, UTS Energy completed the acquisition of TrueNorth Energy L.P. and TrueNorth Energy Corp. resulting in 100% ownership of the Fort Hills Oil Sands Project. The Fort Hills open-pit mining project is located adjacent to McClelland Lake and immediately north of Syncrude's Aurora North Project. No known activity has occurred on-site that would influence local waterbodies.

2.3.3 ConocoPhillips

In 2004, ConocoPhillips began construction of their Surmont SAGD Project immediately south of OPTI/Nexen's Long Lake Project. Although no details have been provided, site clearing and infrastructure development likely were the only activities that occurred in 2004 that are of relevance to RAMP.

2.3.4 Japan Canada Oil Sands (JACOS)

JACOS continues to operate a SAGD Pilot Project 50 km south of Fort McMurray (vicinity of the upper Hangingstone River). No further information regarding this project was obtainable.

2.3.5 SynEnCo Energy

Synenco's planned Northern Lights Project is an integrated mine, extraction and upgrading facility located northeast of McClelland Lake and within the Firebag River drainage. To date, regulatory approval has not been obtained. Accordingly, exploratory drilling was likely the only on-site activity that occurred in 2004.

2.3.6 Petrobank Energy and Resources Ltd.

Whitesands In situ Ltd., a subsidiary of Petrobank, has received regulatory approval to construct the Whitesands Pilot Project (Toe-to-Heel Air Injection *in situ* operation) located 10 km west of Conklin. Initial construction of the pilot started in late 2004.

2.4 OTHER DEVELOPMENTS IN THE REGIONAL MUNICIPALITY OF WOOD BUFFALO

In addition to the oil sands operations, other developments which utilize the Athabasca River and its basin are present within and beyond the RMWB. Developments such as conventional oil and gas exploration, pipeline construction, forestry operations (pulp and paper, logging), drilling activities, mining (aggregate, coal), and municipal growth/infrastructure development are especially evident within the RMWB.

2.4.1 Forestry

Forestry is one of the most dominant non-oil-sands-related industries in the RMWB. Alberta-Pacific Forest Industries Inc. (ALPAC) operates a Forest Management Agreement (FMA) area of approximately 5.8 million ha; 290,408 ha of which are within the RMWB (V. Toutant, ALPAC, *pers.comm.*). The RMA stretches from the Saskatchewan border west to Lesser Slave Lake, with its southern border starting just north of the town of Athabasca and its northern border in the Birch Mountains north of Fort McMurray. Approximately 36% of the FMA will be harvested, and forest companies operating within the FMA area (ALPAC and quota holders) harvest approximately 14,000 ha each year (ALPAC 2004).

Upstream of the RMWB there are other developments such as pulp and paper operations. There are six mills within the Athabasca River Basin. One of these mills, Northlands Forest Products (1981), is located within the RMWB, approximately 20 km north of Fort McMurray on the Athabasca River.

2.4.2 Other Mining Operations

Other mining activities in the area include extraction of coal, sand, gravel, vanadium, peat and uranium. Deposits of salt, limestone, granite, gypsum and silica also have mining potential.

In 2004, the RMWB Planning and Development Department received applications for six new gravel operations within the municipality (A. deKlerk, Regional Municipality of Wood Buffalo, *pers. comm.*)

One such development is the introduction of the Birch Mountain Resources Ltd. (Birch Mountain) Hammerstone Project. Birch Mountain initiated regulatory approval of a dual-purpose limestone quarry near Fort McKay in October 2002. In March of 2004 Birch Mountain submitted their Application and Environmental Impact Assessment to the Natural Resources Conservation Board and Alberta Environment. The quarry contains limestone suitable for producing construction and concrete aggregate. The company also plans to produce quicklime from the high-quality limestone. Birch Mountain plans to discharge non-industrial waste water into the Muskeg River (Birch Mountain, 2004).

Coal is also very prominent south of the RMWB; there are approximately twelve coal mines operating in the Athabasca River basin.

Oil and Gas

Alberta's petroleum industry includes conventional oil and gas fields, heavy oil, oil sands deposits and numerous oil and gas processing plants with extensive pipeline infrastructure made up of 332,464 km of pipeline. At Fort McMurray, the Athabasca River is joined by the Clearwater River that flows across the border from Saskatchewan. The Clearwater River's major tributary, the Christina River, drains an area with extensive oil and gas development (NRBS 1997).

2.4.2.1 Municipal Growth

The RMWB is undergoing rapid population growth accompanying the growth of the Athabasca Oil Sands developments. Within the RMWB there are twenty-six native Reservations and ten communities with Fort Smith being the most northerly community and Conklin the most southerly. Servicing these communities are eight water treatment plants and eight subsequent sewage lagoons and one secondary sewage treatment plant.

The southern communities of Conklin, Janvier, and Anzac depend on the Christina River and Gregoire Lake to supply them with water, and the surrounding wetlands are used to polish the once per year release of the sewage lagoons. Fort McMurray acquires water from the Athabasca River. Fort McMurray also is home to the only secondary treatment facility in the RMWB with a continuous release into the Athabasca River. Fort McKay also releases into the Athabasca River, but like smaller southern communities only one release per year into a drainage ditch is permitted. Water from the Ells River is utilized in the community's water treatment plant. The area of Fort Chipewyan is serviced by two water treatment plants supplied from Lake Athabasca and two sewage lagoons. These lagoons are also released once per year to be polished by wetlands before arriving in smaller tributaries of Lake Athabasca (A. Fefebvre, RMWB, 2005, *pers.comm.*).

2.5 DESIGNATION OF REFERENCE AND EXPOSED AREAS

The information presented above on the status and activities of Athabasca oil sands developments in 2004 was used to designate particular parts of watersheds in the RAMP FSA, including all RAMP aquatic resources and sampling locations contained in those areas, as either "reference" or "exposed". As indicated in Section 1, the use of these terms does not imply or presume that effects of oil sands developments are occurring or have occurred in exposed areas. For the purposes of this report, the term "exposed" means that data collected from locations so designated are considered as "operational" for the purposes of data analysis. Similarly, the term "reference" means that data collected from locations so designated are considered as "baseline". Table 2.5-1 contains the watershed designations used in the remainder of this 2004 report. In addition, Mills Creek, Poplar Creek, McLean Creek, Beaver River, Isadore's Lake, Shipyard Lake, and Winefred Lake are designated as exposed aquatic systems for 2004, while McClelland Lake, Kearl Lake, and the Horse and Dunkirk Rivers are designated as reference aquatic systems.

Table 2.5-1 Watershed designations (reference vs. exposed) for 2004.

Watershed	Designation and Rationale
Athabasca River mainstem	Confluence of Steepbank River designated as division between reference (upstream) and exposed (downstream).
Athabasca River Delta	Entire Athabasca River Delta designated as exposed. Athabasca River Delta is downstream of all oil sands development activities.
Muskeg River	Area downstream of active oil sands operations designated as exposed. Remainder of watershed designated as reference.
Steepbank River	Area downstream of active oil sands operations designated as exposed. Remainder of watershed designated as reference.
Tar River	Area downstream of activities described in Section 2.2.5 designated as exposed for latter half of 2004. Remainder of watershed designated as reference.
MacKay River	Area downstream of activities described in Sections 2.2.7 and 2.2.9, above designated as exposed from 2002 onward. Remainder of watershed designated as reference.
Firebag River	Entire watershed designated as reference; extent of the Suncor Firebag Project in 2004 assessed to be sufficiently limited in magnitude and extent that RAMP aquatic resources would not be affected.
Ells River	Entire watershed designated as reference; oil sands development to date in this watershed have largely been restricted to Joslyn Creek Phase I.
Calumet River	Entire watershed designated as reference; absence to date of CNRL Horizon Project activities that would have potentially affected aquatic resources in watershed.
Clearwater-Christina Rivers	Entire watershed designated as reference; although a number of *in situ* oil sands projects are planned or undergoing initial development within the Christina River watershed, stations on the Christina River and lower Clearwater River were designated as reference until operations intensify. Clearwater River upstream of Christina River confluence is a long-term reference area.
Hangingstone River	Entire watershed designated as reference; oil sands development to date is limited to the JACOS Hangingstone SAGD Pilot Project in the upper watershed.