2.0 ACTIVITIES IN THE RAMP FOCUS STUDY AREA IN 2006

2.1 BACKGROUND

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

For RAMP, oil sands and related development 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 aquatic resources in receiving waters.

This section provides a synthesis of information related to development pressures that may be influencing aquatic environmental resources within the RAMP Focus Study Area (FSA), and describes relevant activities that occurred in 2006 in the focal projects (i.e., those projects within the RAMP FSA owned by 2006 RAMP funders which were under construction or operational in 2006, described below in Section 2.2). This information is supplemented by:

- Updates of projects within the RAMP FSA owned by 2006 RAMP funders that were approved but not yet under construction as of 2006 (Section 2.3); and
- A list of projects within the RAMP FSA owned by 2006 RAMP funders that were in the Application stage in 2006 (Section 2.4).

Table 2.2-1 summarizes the current status of each of these projects as of the end of 2006. The date of initial environmental disturbance of each project has also been included where possible because this represents the first activity that has the potential to affect local aquatic systems (i.e., conservative approach).

In addition, a list of oil sands projects within the RAMP FSA that were under active development in 2006 by companies that were not funders of RAMP in 2006 is also provided (Section 2.5).

Much of the information pertaining to these projects has been obtained from the Alberta Energy and Utilities Board (EUB) publications on active oil sands schemes (EUB 2006), field observations during RAMP monitoring surveys, information provided by industry representatives of RAMP, an analysis of summer 2006 satellite imagery for estimation of land changes in the RAMP FSA, and information found on RAMP-member and other company websites.

2.2 FOCAL PROJECT ACTIVITIES IN 2006

2.2.1 Suncor Energy Inc.

Suncor's projects in the RAMP FSA in 2006 were Lease 86/17; the Steepbank Mine; the Millennium Mine; the Firebag Project; and associated upgraders, tailings ponds and associated facilities. Bitumen production averaged 260,000 bpd from these operations in 2006.

Table 2.2-1 Status and activities of developments owned by 2006 RAMP-funders in the RAMP Focus Study Area.

2006 RAMP Funder	Development	Location		Type of Operation	Capacity[1]	Year of Application	Year of First Disturbance	2006 Status
		Oil Sands Leases	Township and Range					
Suncor Energy Inc.								
	Lease 86/17	Lease 86, Lease 17	23-92-10-W4M	mine	280,000	1964	1967	**No Mining**
	Steepbank Mine	Leases 97, 19, 25 and Fee Lots 1 and 3	91-9-W4M and 92-9-W4M	mine		1996	1997	**Operational**
	Millennium Mine	Leases 25, 19 and Fee Lots 3 and 4	91,92-9-W4M	mine		1998	2000	**Operational**
	Millennium Upgrader and Expansion	Lease 86, Lease 17, Lease 23	92-10-W4M		300,000	1998	2000	**Operational**
	South Tailings Pond	Lease 25, Lease 19	90,91-8-W4M, 91-9-W4M			2003	2005	**Construction**
	Firebag	Lease 85	19, 20, 29 to 32-94-5-W4M; 22 to 36-94-6-W4M; W25 36-94-7-W4M; 6 to 8, 17 to 20, 29 to 32-95-5-W4M; 95-6-W4M; 4 to 6-96-6-W4M	*in situ*	280,000	2000	2002	**Operational**
	Voyageur: North Steepbank Mine Extension	Lease 25, Lease 97, Fee Lot 1	92,93-9-W4M	mine	180,000	2005	--	**Approved**
	Voyageur: Voyageur Upgrader	Fee Lot 2, Lease 23	91,92-10-W4M		550,000[2]	2005	--	**Approved**
Syncrude Canada Ltd.								
	Mildred Lake	Lease 17, Lease 22	6-93-10-W4M	mine	250,000	1973	1973	**Operational**
	Aurora North	Lease 10, Lease 12, Lease 34	96-9,10,11-W4M	mine	200,000	1996	1996	**Operational**
	Mildred Lake Upgrader and Expansion	Lease 17, Lease 22	6-93-10-W4M		350,000	1998	existing area	**Operational**
Albian Sands Energy Inc.								
	Muskeg River Mine	Lease 13	95-10-W4M	mine	155,000	1997	2000	**Operational**
	Muskeg River Mine Expansion	Lease 13, Lease 90	95-8,9-W4M, 94-10-W4M	mine	115,000	2005	--	**Approved**
Shell Canada Ltd.								
	Jackpine Mine (Phase 1)	Lease 13	95-8-W4, 95-9-W4	mine	200,000	2002	2006	**Construction**
CNRL								
	Horizon	Lease 18	96-11/12-W4M, 96-13-W4M, 97-11-W4M, 97-12-W4M, 97-13-W4M	mine	270,000	2002	2004	**Construction**
Imperial Oil Resources								
	Kearl	Leases 6, 87, 36 31A, 88	95,96,97-R6-W4M, 95,96,97-R7-W4M, 95,96,97-R8-W4M	mine	300,000	2005	--	**Application**
Petro-Canada Oil and Gas								
	Dover	7187060328	93-12-W4M	*in situ*	900	unknown	unknown	**Operational**
	Fort Hills	7598060T05, 7281020T52, 7400120008	96-11-W4M, 97,98-10-W4M	mine	190,000	2001	2005	**Construction**
	MacKay River	7282030T75	92, 93-12-W4M	*in situ*	33,000	1998	2000	**Operational**
	MacKay River Expansion	7282030T75, 728004AT22, 7187060328	92, 93-12-W4M	*in situ*	40,000	2006	--	**Application**
	Meadow Creek	7281010T58, 7283010T81	Townships 84, 85, Ranges 8, 9, 10-W4M	*in situ*	80,000	2001	--	**Approved**
OPTI Canada Ltd. /Nexen Inc.								
	Long Lake Pilot	Lease 27	85-6-W4M	*in situ*	3,000	unknown	2003	**Operational**
	Long Lake Project (Phase 1, Upgrader)	Lease 27	84,85,86-6-W4M, 84,85,86,87-7-W4M	*in situ*	70,000	2003	2004	**Construction**
Total E&P Canada Ltd.								
	Joslyn, SAGD Phase I	7280060T24, 7404110452, 7405070799	94,95,96-11-W4M, 94-12-W4M	*in situ*	600	unknown	2003	**Operational**
	Joslyn, SAGD Phase II			*in situ*	10,000	2004	2005	**Construction**
	Joslyn, SAGD Phase III			*in situ*	15,000	2005	--	**Application**
	Joslyn North Mine Project			mine	100,000	2006	--	**Application**
Husky Energy								
	Sunrise	728704AT87, 728103AT49, 740101A022, 740012A006, 7401100015, 7002080057, 742080006	Townships 94-97, Ranges 6-7, W4M	*in situ*	200,000	2004	--	**Approved**
Synenco Energy Inc.								
	Northern Lights	Lease 15, Lease 16, Lease 789	Townships 98 and 99, Ranges 5 to 7, W4M	mine	100,000	2006	--	**Application**
Birch Mountain Resources Ltd.								
	Muskeg Valley Quarry	MAIM Leases 9494070001, 9494070002, 9403120367, 9499030555, and 9400080004	94,95-10-W4M	quarry	7 million t/yr of limestone product	2004	2005	**Operational**
	Hammerstone Quarry	MAIM Leases 9494070001, 9494070002, 9403120367, 9499030555, and 9400080004	94-10-W4M	quarry	18 million t/yr of limestone product	2006	--	**Application**

Note: Information in this table obtained from EUB (2006), EUB project approvals, project EIA documents, and company websites.

[1] Unless otherwise stated, units are in bpd

[2] Suncor's total planned upgrading capacity once Voyageur begins operations.

Suncor Lease 86/17 and Steepbank Mine/Project Millennium

Suncor continued to operate the Steepbank and Millennium surface mines, existing associated upgrader facilities, and various storage pond facilities in 2006. Specific activities conducted by Suncor in 2006 in regards to Lease 86/17 and Steepbank Mine/Project Millennium included:

- 1,220 ha of muskeg and overburden dewatering in the Shipyard Lake drainage from April to October. The water yield from these dewatering activities was 6.83 million m^3;
- Continued construction of the Suncor South Tailings Pond;
- SO_x emissions totaling 24,115 t and NO_x emissions totaling 1,082 t; and
- Water withdrawal from the Athabasca River totaling 50.9 million m^3. Discharge information was not available at the time this report was prepared.

Suncor Firebag

Production of bitumen from Phases 1 and 2 of the Suncor *in situ* Firebag Project continued throughout 2006. In addition, construction commenced on Phase 3 of this project in 2006.

2.2.2 Syncrude Canada Ltd.

Syncrude's active oil sands projects in the RAMP FSA in 2006 were the Mildred Lake Base Mines (East and North Mines), the associated Mildred Lake Upgrader and Upgrader Expansion, and the Aurora North Mine. Bitumen production averaged slightly more than 258,000 bpd from these operations in 2006.

Syncrude Mildred Lake Mine and Upgrader

The Mildred Lake operation includes an open-pit oil sands mine, and extraction and upgrading facilities. In addition to ongoing oil sands production and upgrading activities, specific activities conducted for the Mildred Lake project in 2006 included:

- Continued exploratory drilling;
- Startup of the Mildred Lake Upgrader Expansion No. 1;
- Withdrawal of 33.9 million m^3 from the Athabasca River; and
- Discharge of 0.314 million m^3 of treated domestic sewage to the Athabasca River.

Syncrude Aurora North Mine

The Aurora North Mine is located north of the Albian Sands 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. In addition to ongoing oil sands production activities, specific activities conducted by Syncrude for the Aurora North Mine in 2006 included:

- Continued exploratory drilling;
- 261 ha of land cleared; and

- As part of the Aurora Clean Water Diversion system, there was a diversion of 2.53 million m^3 of water to Stanley Creek and the Muskeg River from muskeg dewatering activities as well as site drainage.

2.2.3 Albian Sands Energy Inc.

Albian Sands operates the Muskeg River Mine which consists of an open-pit mine and extraction plant. In 2006, Albian Sands' Muskeg River Mine facility was a zero water-discharge operation, with tailings water and local drainage being recycled for project operations. Bitumen production from the Muskeg River Mine averaged approximately 137,500 bpd in 2006. Specific activities conducted by Albian Sands in 2006 in regards to the Muskeg River Mine included:

- Continued exploratory drilling;
- No instream work;
- 124.3 ha of land cleared;
- Dewatering of 81 ha of muskeg in the 3rd and 4th quarter of 2006, with water being collected in the External Tailings Facility;
- Water withdrawal from the Athabasca River totaling 8.37 million m^3; and
- SO_x emissions totaling 57.6 t and NO_x emissions totaling 4596.7 t.

2.2.4 Shell Canada Ltd.

Construction activities commenced in 2006 on Shell's Jackpine Mine Phase 1 project; these activities included:

- Geotechnical drilling;
- Land clearing of approximately 1,200 ha in the Jackpine Creek and Shelley Creek drainages;
- Fish salvage in Shelley Creek in April 2006, followed by re-routing over a 3 km section of watercourse beginning in May 2006;
- Muskeg dewatering in 1,200 ha of the Jackpine Creek, Shelley Creek, and Khahago Creek drainages from August to early December 2006. A total of 26,438 m^3 of water was released from muskeg dewatering activities over this period. Average daily discharge (August to early December 2006) was 0.037 m^3/s into Jackpine Creek, 0.085 m^3/s into Shelley Creek, and 0.006 m^3/s into Khahago Creek; and
- Initial construction of some of the project facilities.

2.2.5 Canadian Natural Resources Ltd.

Construction activities continued in 2006 on the CNRL Horizon mining project on Lease 18; these activities included:

- Continued exploratory drilling and land clearing;
- In-stream work in August and October 2006 in the Tar River drainage;

- Water withdrawal of approximately 0.27 million m^3 from the Athabasca River from mid-July to December 2006; and
- Water discharge from the wastewater treatment plant to the Athabasca River via the Tar River throughout 2006 and totaling approximately 0.149 million m^3.

2.2.6 Petro-Canada Oil and Gas

Petro-Canada's active projects in the RAMP FSA in 2006 were the *in situ* Dover Project, the Fort Hills Project, and the *in situ* MacKay River Project. Bitumen production from these operations averaged approximately 27,000 bpd in 2006.

Petro-Canada Dover

Specific activities conducted by Petro-Canada in 2006 in regards to the Dover Project included:

- Production of bitumen averaging approximately 900 bpd;
- SO_2 emissions totaling 1.94 t; and
- Withdrawal of groundwater from the buried Birch Channel.

Petro-Canada Fort Hills

Construction activities commenced in 2006 on Petro-Canada's Fort Hills Project; these activities included:

- Ongoing exploratory drilling and land clearing;
- Removal in January 2006 from the Athabasca River of the temporary water supply pump for supplying the BITMIN Demonstration Plant;
- Discharge of site drainage to an unnamed creek at 460920E, 6357915N (NAD83, Zone 12);
- Withdrawal of water from the Athabasca River totaling approximately 0.27 million m^3;
- Minimal NO_x/SO_x emissions; and
- Production of bitumen production averaging less than 1,200 bpd.

Petro-Canada MacKay River

Specific activities conducted by Petro-Canada in 2006 in regards to the MacKay River Project included:

- Land clearing;
- Production of bitumen averaging approximately 25,000 bpd;
- Withdrawal of groundwater from the buried Birch Channel; and
- SO_x emissions totaling 12.3 t and NO_x emissions totaling 81.67 t.

2.2.7 OPTI Canada Ltd./Nexen Inc.

OPTI Canada Ltd. and Nexen Inc. are jointly developing the *in situ* Long Lake Project located near Anzac and the Gregoire River. The Long Lake Pilot Project continued operation in 2006, while construction of Phase 1 of the Long Lake Project (SAGD plus upgrader) continued throughout 2006.

2.2.8 Deer Creek Energy Ltd.

Deer Creek Energy Ltd.'s active projects in the RAMP FSA in 2006 were the *in situ* Joslyn Phase I and Phase II Projects on Lease 24. The Joslyn Phase I Project continued operation in 2006, and bitumen production from the Joslyn Phase II project commenced in the final quarter of 2006.

2.2.9 Birch Mountain Resources Ltd.

Birch Mountain Resources Ltd. began operating its Muskeg Valley Quarry in 2006. Activities included:

- Continued land clearing and project construction;
- Muskeg dewatering of approximately 15 ha from April to September 2006;
- Quarry water discharge (466323E, 6338405N, NAD83, Zone 12) from a wetland polishing pond. There were four releases of quarry water during 2006, each lasting three to four days; and
- Quarry start-up, and generation of aggregate product stockpiles on the project site.

2.3 OTHER APPROVED RAMP-FUNDER PROJECTS

The following four projects in the RAMP FSA owned by 2006 RAMP funders had received regulatory approval in 2006; significant implementation on these projects had not commenced as of the end of 2006:

- Suncor's Voyageur Project, comprised of the North Steepbank Mine Extension and the Voyageur Upgrader, was approved in late 2006;
- The Albian Sands Muskeg River Mine Expansion was approved in 2006;
- Petro-Canada has had regulatory approval for 80,000 bpd *in situ* Meadow Creek project since 2001 and is continuing to evaluate the development potential of the oil sands leases within the Meadow Creek area; and
- Front-end engineering design continued through 2006 on Husky's *in situ* Sunrise Thermal Project, which received regulatory approval in 2005. Exploratory drilling was the only significant on-site activity that occurred in 2006.

2.4 RAMP-FUNDER PROJECTS UNDER APPLICATION

Formal application has been made for six projects in the RAMP FSA owned by 2006 RAMP funders, and all were awaiting regulatory approval as of 2006:

- Petro-Canada submitted its application for the MacKay River Expansion project in 2006;

- Imperial Oil has submitted an application to develop an open-pit mining operation near Kearl Lake, located on Oil Sands Leases 6, 87, the eastern portion of Oil Sands Leases 36 and 31A, and the northeast portion of Oil Sands Lease 88. The application was submitted in 2005. Little on-site activity occurred in 2006;
- Deer Creek Energy Ltd. submitted its application for the Joslyn Phase III SAGD project in 2005, and its application for the Joslyn North Mine Project in 2006;
- Synenco Energy Inc. submitted the application for its Northern Lights Project, in 2006. Activities in the Northern Lights project area (Oil Sands Leases 15, 16, and 789, Townships 98 and 99, Ranges 5 to 7, W4M) in 2006 consisted of exploratory drilling and land clearing in support of the drilling operations; and
- Birch Mountain submitted its application for the Hammerstone Quarry in 2006.

2.5 NON-RAMP MEMBER OIL SANDS PROJECTS

There were nine approved oil sands development projects active in the RAMP study area in 2006, and whose operators were not members of RAMP in 2006. A brief summary of those operations is provided in Table 2.5-1.

Table 2.5-1 Approved Athabasca oil sands development projects within the RAMP study area operated by non-RAMP members, as of 2006.

Operator	Effective Date	Field or Area	Location (Township and Range)	Recovery Method
EnCana	3 Apr 2000	Christina Lake	11 to 16,E17,24-76-6W4M, 1, 2-20-76-6W4M, 1 to 4-21-76-6W4M, 1 to 4-22-76-6W4M, 1 to 4-23-76-6W4M	SAGD
Japan Canada	2 Apr 1998	Hangingstone	NW26, N27, N28, 33, 34, W35-84-11W4M	SAGD
ConocoPhillips	15 May 2003	Athabasca	81-6W4M, 1, 2, 11 to 14, 23 to 29, 32 to 36-81-7W4M, NW 82-5W4M, 82-6W4M, 82-7W4M, SW 83-5W4M, 83-6W4M, 83-7W4M	SAGD
ConocoPhillips	4 Jun 2003	Surmont	24-83-7W4M	Steam Stimulation
Devon	18 Nov 2004	Jackfish	19 to 21, 28 to 33-75-6W4M, 4 to 6-76-6W4M	SAGD
MEG Energy	01 Feb 2005	Christina Lake	7 to 9, 16 to 18, N19 to N21-77-5W4, E12, E13, E24-77-6W4	SAGD
EnCana	19 Sep 2003	Christina Lake	03/10-16-76-6W4M, 06/10-16-76-6W4M, 07/10-16-76-6W4M, 08/10-16-76-6W4M	Solvent Addition
Whitesands	20 Feb 2004	Whitesands	12, 13-77-9W4M	Toe to Heel Air Injection
Connacher	31 Jul 2006	Great Divide	NW16, NE17, SE20, 21-82-12W4	SAGD

Information from EUB (2006).

2.6 LAND CHANGE EFFECTS OF DEVELOPMENT ACTIVITIES IN 2006

Land change was estimated with satellite imagery in conjunction with more detailed maps of operations provided by a number of RAMP industry members. These sources of data were used to estimate the amount of land changed for a number of land change classes in each of the main RAMP FSA watersheds in 2006.

A set of twelve 10 m resolution images taken on 4, 14, and 26 June 2006 were obtained. A land change classification protocol was developed and applied to the imagery to identify and delineate the following types of land change in 2006 from the projects listed in Table 2.2-1 and in Table 2.5-1:

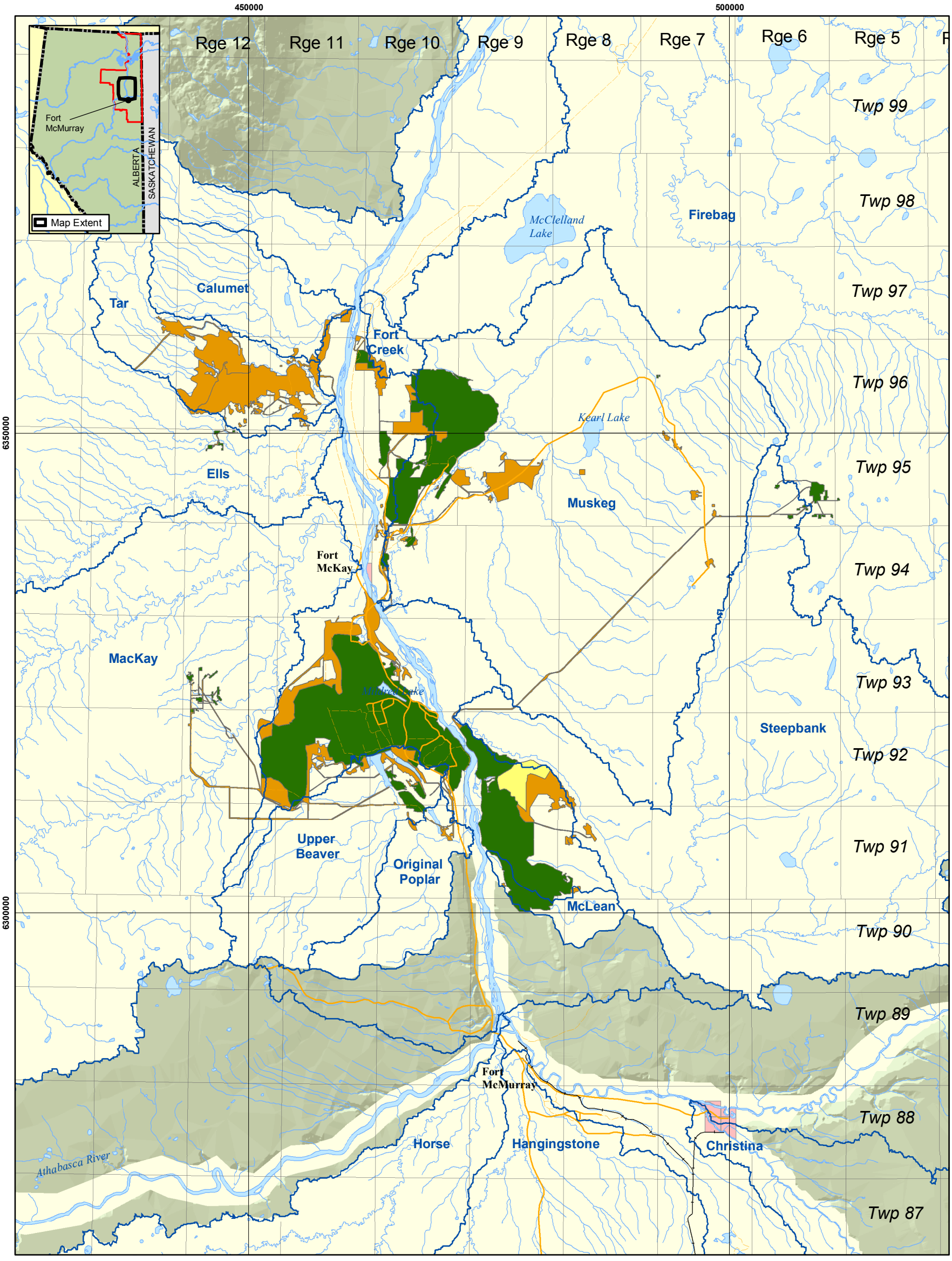
- Land change area that is not closed-circuited;
- Land change area that is closed-circuited; and
- Land change area that is undergoing dewatering.

Because of the resolution of the satellite imagery, it was not possible to efficiently delineate roads and small, localized anthropogenic land changes, such as seismic lines and exploratory wells. SAGD well pads were about the smallest oil sands development entity that was delineated. Details of the land change estimation procedure are provided in Appendix A. Drafts of the land change maps were provided to RAMP members for review, and recommendations for revision of the maps were used to produce the final set of 2006 land change maps.

Land change area as of 2006 is presented in Figure 2.6-1 and Figure 2.6-2 for north and south of Fort McMurray, respectively, while Table 2.6-1 and Table 2.6-2 provide tabular summaries of the land changes in each of the main watersheds by each land change type, for focal projects and for oil sands projects within the RAMP FSA that were under active development in 2006 by companies that were not funders of RAMP in 2006.

Estimated land change as of 2006 within the RAMP FSA is estimated at approximately 58,000 ha for focal projects and slightly more than 2,000 ha for oil sands projects operated by non-RAMP funding companies, for a total of slightly more than 60,000 ha, or approximately 1.7% of the area of the RAMP FSA. The percentage of the area of watersheds with land change as of 2006 varies from less than 1% for many watersheds (Steepbank, MacKay, Ells, Christina, Firebag, Horse, Hangingstone, and Calumet), to 5% to 10% for the Muskeg, and all the smaller Athabasca River tributaries from Fort McMurray to the mouth of the Firebag River, to more than 10% for the Beaver, McLean, and Tar watersheds.

Figure 2.6-1 Land change areas for the RAMP FSA north of Fort McMurray, derived from SPOT5 imagery taken in June 2006.



RAMP Regional Aquatics Monitoring Program

- Lakes / Ponds
- Rivers / Streams
- Major Roads
- Secondary Roads
- Railways
- First Nations Reserve
- RAMP Regional Study Area
- RAMP Focus Study Area
- Watershed Boundary
- Land Change Area, not Closed-Circuited
- Land Change Area, Closed-Circuited
- Land Change Area, Dewatering

0 5 10 20 Km

Projection: UTM Zone 12 NAD83

Scale 1:425,000

Data Sources:
a) National Topographic Data Base (NTDB) obtained from the Centre for Topographic Information - Sherbrooke, used under license.
b) Watershed Boundaries from CEMA.
c) Land change areas delineated from June 2006 10-meter SPOT imagery.

Township and Range designations are relative to W4M.

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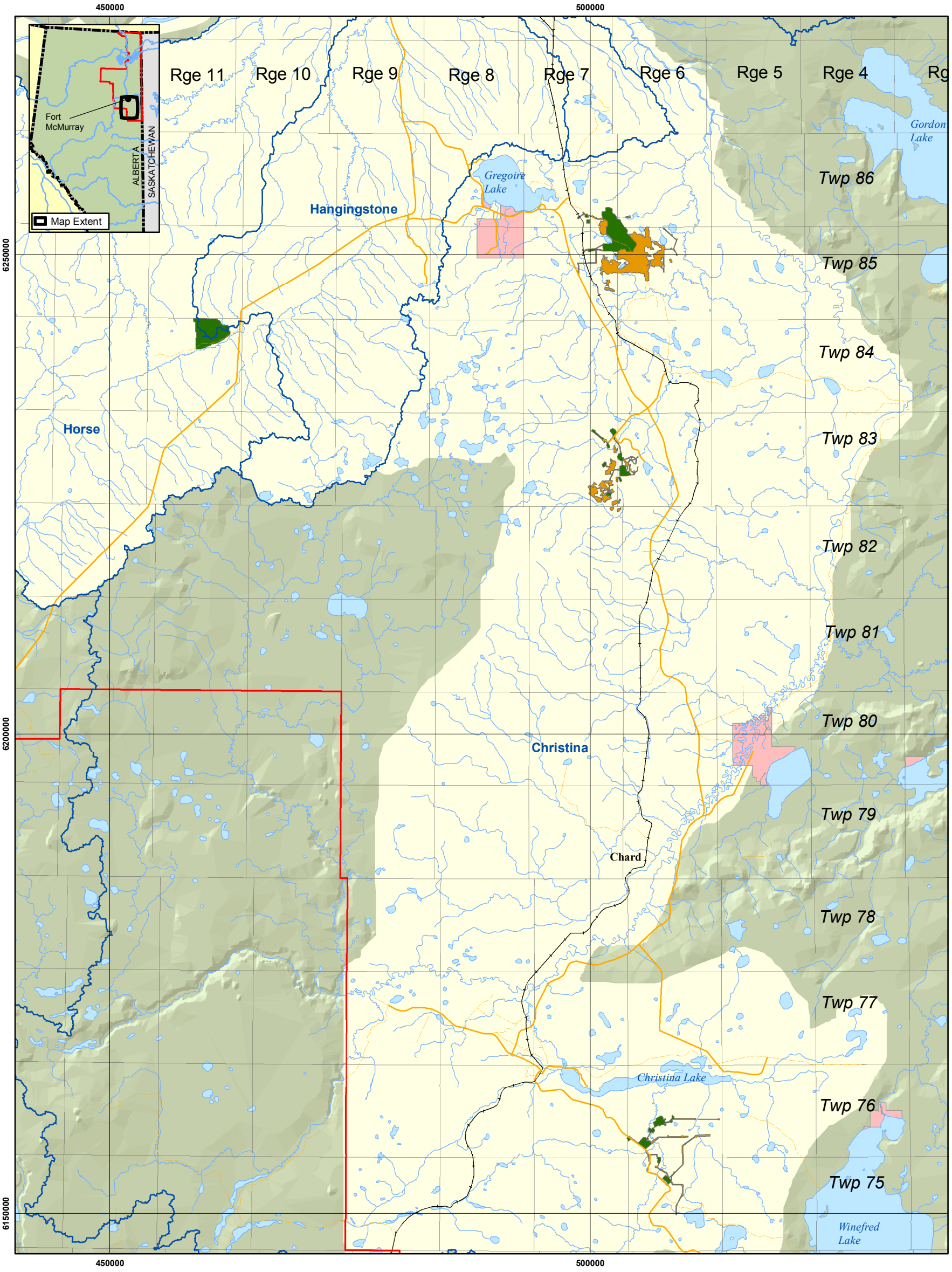
Figure 2.6-2 Land change areas for the RAMP FSA south of Fort McMurray, derived from SPOT5 imagery taken in June 2006.



RAMP
Regional Aquatics Monitoring Program

Data Sources:
a) National Topographic Data Base (NTDB) obtained from the Centre for Topographic Information - Sherbrooke, used under license.
b) Watershed Boundaries from CEMA.
c) Land change areas delineated from June 2006 10-meter SPOT imagery.

Township and Range designations are relative to W4M.

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Table 2.6-1 Area of watersheds with land change in 2006.

Watershed	Total Watershed Area (ha)	Watershed Area with Land Change (ha)									
		Focal Projects			Other Oil Sands Projects in RAMP FSA			Total			Watershed Total
		Not Closed-Circuited	Closed-Circuited	De-watering	Not Closed-Circuited	Closed-Circuited	De-watering	Not Closed-Circuited	Closed-Circuited	De-watering	
Minor Athabasca River Tributaries[1]	165,666	7,224	24,013	1,097				7,224	24,013	1,097	32,333
Calumet	17,354	200						200			200
Christina	1,303,805	1,735	935		811	566		2,546	1,501		4,046
Ells	245,000	60	133					60	133		193
Firebag	568,174	45	307					45	307		352
Fort Creek	3,193	177	24					177	24		202
Hangingstone	106,641					386			386		386
Horse	215,741					467			467		467
MacKay	557,000	627	210					627	210		837
McLean	4,712	40	1,069					40	1,069		1,109
Muskeg	146,000	2,546	7,406					2,546	7,406		9,952
Original Poplar[2]	13,856	178	7					178	7		186
Steepbank	135,491	336	243	127				336	243	127	706
Tar	33,261	6,959						6,959			6,959
Upper Beaver[2]	28,711	1,130	1,027					1,130	1,027		2,157
FSA Total	**3,324,286**	**21,105**	**35,526**	**1,224**	**811**	**1,419**	**0**	**21,916**	**36,945**	**1,224**	**60,085**

Only land changes within the RAMP FSA were delineated.

[1] Refers to Athabasca River tributaries from Fort McMurray to the mouth of the Firebag River excluding the watersheds listed explicitly listed in this table. All land change areas in the minor Athabasca River tributaries in 2006 were above RAMP hydrology station S24.

[2] Original Poplar" refers to the Poplar Creek watershed prior to the Beaver Creek diversion, while "Upper Beaver" refers to that part of the Beaver Creek drainage that now drains into Poplar Creek as a result of the Beaver Creek diversion. Drainage boundaries were estimated from maps provided in Syncrude Canada Ltd. (1977).

Table 2.6-2 Percent of total watershed areas with land change in 2006.

Watershed	Total Watershed Area (ha)	Watershed Area with Land Change (ha)									
		Focal Projects			Other Oil Sands Projects in RAMP FSA			Total			Watershed Total
		Not Closed-Circuited	Closed-Circuited	De-watering	Not Closed-Circuited	Closed-Circuited	De-watering	Not Closed-Circuited	Closed-Circuited	De-watering	
Minor Athabasca River Tributaries[1]	165,666	4.36	14.49					4.36	14.49		19.52
Calumet	17,354	1.14						1.14			1.14
Christina	1,303,805	0.14	0.07		0.06	0.05		0.20	0.12		0.31
Ells	245,000	0.02	0.05					0.02	0.05		0.07
Firebag	568,174	0.01	0.05					0.01	0.05		0.06
Fort Creek	3,193	5.55	0.77					5.55	0.77		6.32
Hangingstone	106,641					0.36			0.36		0.36
Horse	215,741					0.22			0.22		0.22
MacKay	557,000	0.13	0.04					0.13	0.04		0.17
McLean	4,712	0.85	22.69	0.66				0.85	22.69	0.66	23.54
Muskeg	146,000	1.78	5.17					1.78	5.17		6.95
Original Poplar[2]	13,856	1.29	0.05					1.29	0.05		1.34
Steepbank	135,491	0.25	0.18	0.09				0.25	0.18	0.09	0.52
Tar	33,261	20.92						20.92			20.92
Upper Beaver[2]	28,711	3.94	3.58					3.94	3.58		7.51
FSA Total	**3,324,286**	**0.61**	**1.0**	**0.03**	**0.02**	**0.04**	**0**	**0.63**	**1.04**	**0.03**	**1.70**

Only land changes within the RAMP FSA were delineated.

[1] Refers to Athabasca River tributaries from Fort McMurray to the mouth of the Firebag River excluding the watersheds listed explicitly listed in this table. All land change areas in the minor Athabasca River tributaries in 2006 were above RAMP hydrology station S24.

[2] Original Poplar" refers to the Poplar Creek watershed prior to the Beaver Creek diversion, while "Upper Beaver" refers to that part of the Beaver Creek drainage that now drains into Poplar Creek as a result of the Beaver Creek diversion. Drainage boundaries were estimated from maps provided in Syncrude Canada Ltd. (1977).