Water Use in Oil and Gas Activities

Annual Report on Short-Term Water Approvals and Use
BC Oil and Gas Commission – January-December 2011
with Q1 Results for January – March 2012

BC Oil & Gas COMMISSION

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About the

BC Oil and Gas Commission

The BC Oil and Gas Commission is the single-window regulatory agency with responsibilities for regulating oil and gas activities in British Columbia, including exploration, development, pipeline transportation and reclamation.

The Commission's core roles include reviewing and assessing applications for industry activity, consulting with First Nations, ensuring industry complies with provincial legislation and cooperating with partner agencies. The public interest is protected by ensuring public safety, protecting the environment, conserving petroleum resources and ensuring equitable participation in production.

The Commission is a Crown corporation of the Province of British Columbia. The enabling legislation for the Commission's powers and responsibilities is the Oil and Gas Activities Act.

Our Mission, Vision and Values were created and adopted by Commission staff in 2010.

Mission

We regulate oil and gas activities for the benefit of British Columbians.

We achieve this by:

- Protecting public safety,
- Respecting those affected by oil and gas activities,
- Conserving the environment, and
- Supporting resource development.

Through the active engagement of our stakeholders and partners, we provide fair and timely decisions within our regulatory framework.

We support opportunities for employee growth, recognize individual and group contributions, demonstrate accountability at all levels, and instill pride and confidence in our organization.

We serve with a passion for excellence.

Vision

To be the leading oil and gas regulator in Canada.

Values

Respectful	Effective	Responsive
Accountable	Efficient	Transparent

Purpose of Report

Annual Water Report

Regulatory responsibility for short-term water use approvals is delegated to the BC Oil and Gas Commission (Commission) through the Oil and Gas Activities Act, as a specified enactment of the Water Act. Under Section 8, oil and gas operators apply to the Commission for approval to use or divert surface water from rivers, lakes or dugouts for an oil or gas activity for a maximum period of one year. The application specifies the total volume of water that is requested, the maximum withdrawal rate in cubic metres (m^3) per day, and the specific geographic coordinates for all locations from where withdrawal is requested. Natural resource officers in the Commission's Permitting and Authorizations division receive, review and adjudicate the applications.

This report is the fourth quarterly report for 2011, and presents information on short-term water use approvals active during the October to December 2011 period and first quarter results for 2012. It details the Commission's responsibilities and authorities under Section 8 of the Water Act. It does not include the diversion and use of water approved by other agencies (such as the Ministry of Forests, Lands and Natural Resource Operations, which has responsibility for water licensing), nor water used for purposes other than oil and gas activities.

Included in the report is the cumulative volume of water that was approved for use, as well as the volume reported as actually used by the Section 8 approval holders during 2011 (January to December). First quarter results for 2012 are also presented in this report in Appendix B, C and D. Previous quarterly reports are available on the Commission's website at www.bcogc.ca.

Water Used in Oil and Gas Activities

The Oil and Gas Activities Act provides authority to the Commission to issue short-term water use approvals under Section 8 of the Water Act in order to manage short-term water use by the oil and gas industry.

Approvals under Section 8 of the Water Act authorize the diversion and use of water for a term not exceeding 12 months. The oil and gas industry obtains short-term water use approvals for a number of activities, which include:

- Seismic or geophysical exploration
- Drilling
- Machine washing
- Winter ice road freezing
- Dust control
- Water floods (to enhance oil recovery)
- Hydraulic fracturing
- Hydrostatic testing of oil and gas pipelines
- Other purposes

Commission Authority for Water

The Commission has natural resource specialists trained to review and adjudicate applications for water use associated with oil and gas activity. These specialists, including a professional hydrologist, have expertise in northeast B.C.'s water resources and oil and gas operations.

The Commission manages water approvals and use with specific focus on environmental values, and tools include:

- The development of a watershed base map for northeast B.C. (derived from the Ministry of Environment's "Freshwater Atlas" base map).
- The review of water use applications on a watershed basis with an understanding of cumulative effects management, which ensures withdrawals do not exceed environmental limits and environmental flows are maintained.
- The production of publicly available reports on all water approvals and use.
- The management of special or unique situations, and the ability to take action if necessary, such as suspending water use by industry during the 2010 summer drought in the Peace River area.
- The creation of complete hydrologic modelling for northeast B.C., in partnership with the Ministry of Forests, Lands and Natural Resource Operations (FLNRO) and Geoscience BC. The Commission is now developing a decision support tool to provide enhanced ability to manage water withdrawals.
- Cooperation with water stewardship staff from FLNRO to ensure decisions are fully informed.

Total Approvals and Reported Use

During the October to December period of 2011, there were a total of 294 short-term water use approvals in place, held by 51 companies (Table 1). The number of approvals increased throughout the year, which may be attributed to new requirements for water source dugouts and water storage sites. The requirement for approvals for these two sources came into effect in March 2011, and the increase over the last quarter of the year may reflect the fact companies are preparing for the winter well completion season.

The total water volume associated with water approvals for 2011 was 31.6 million m^3. This water volume is approved for use for a 12-month period.

The total volume of active approvals during October to December 2011 is 43 per cent less than the third quarter of 2011 (55.2 million m^3). This reduction results in part from the Commission now requiring companies to apply for a total volume of water, rather than a volume per day. The reduction may also reflect a better understanding of water requirements on the part of applicants, as well as possibly reduced water requirements. The Commission anticipates the approved water volumes required will continue to drop during 2012, until all the early-2011 approvals have expired.

Of the total volume approved for withdrawal, only 11.6 per cent or 3.67 million m^3 was reported by the approval holders as being withdrawn. This figure represents a cumulative total for 2011.

Not all approval holders reported water use as required. For this reporting period, 20 approvals (6.8 per cent of total) held by 10 companies were not reported. As is standard procedure, these companies have been referred to the Commission's Compliance and Enforcement Branch for investigation and follow-up.

Table 1. Summary of short-term water use approvals active during 2011

	Q1 Total Jan - Mar 2011	Q2 Total Apr - Jun 2011	Q3 Total Jul - Sep 2011	Q4 Total Oct - Dec 2011
Number of Approvals	161	181	185	294
Number of Points of Withdrawal	599	553	838	1,786
Number of Companies	45	46	49	51
Total Volume Approved (m^3) Note 1	78,350,264	69,243,134	55,268,101	31,603,299
Total Volume Reported Used (m^3) Note 2	776,978	1,439,730	2,694,005	3,673,378

Notes:
1. The number of approvals, number of points of withdrawal, number of companies and total volume approved are for a 12-month period beginning with each quarter.
2. The total volume reported is for calendar year 2011. The Q1-Q3 values have been adjusted from previous reports.

OGC Water Management Basins, Mean Annual Discharge

Early in 2011 the Commission developed map coverage of river basins in northeast B.C., referred to as the "OGC Water Management Basins" (Figure 1). This coverage was created from the Ministry of Environment's "Freshwater Atlas" mapping.

Appendix A, summarizes the short-term water use within the OGC Water Management Basins. The 294 short term water use approvals and the associated 1,786 points of withdrawal are listed within the specific river basin in which they occur.

For each basin, the mean annual discharge (cubic metres per second, m^3/s) and mean annual runoff (m^3/year) are listed. These values are calculated using two approaches:

1. Where there is a Water Survey of Canada stream flow gauge in the basin, the mean annual discharge is calculated from the historic gauge record, and is converted into a discharge per square kilometer of drainage basin ($m^3/s/km^2$). This value is then used to produce estimates of mean annual discharge for ungauged sub-basins by multiplying it by the drainage basin area of ungauged sub-basins. Table 2 contains a listing of the Water Survey of Canada stream flow gauges used in this report.
2. There is a general lack of Water Survey of Canada stream flow data for the Horn, Liard and Cordova basins in northeast B.C. from which discharge estimates can be made. However, the Commission completed a preliminary hydrological modelling study in the Horn and Liard basins in March 2011, which has been used to provide preliminary estimates of mean annual discharge and runoff for some basins.

The Commission has started a project in partnership with FLNRO and Geoscience BC to complete overview hydrologic modelling for all of northeast B.C., and to produce a GIS-based hydrology decision-support tool. This project recognizes the importance of having enhanced stream flow estimates for river basins in which oil and gas activities occur and is expected to be completed late 2012. When completed it will provide improved estimates of monthly, seasonal and annual runoff and will assist the Commission with regard to Section 8 short-term water use approvals.

The hydrology information is used to provide context for the short-term water approvals and use. In Appendix A, the total volume approved and used in each river basin is presented as a percentage of mean annual runoff.

Figure 1: OGC Water Management Basins

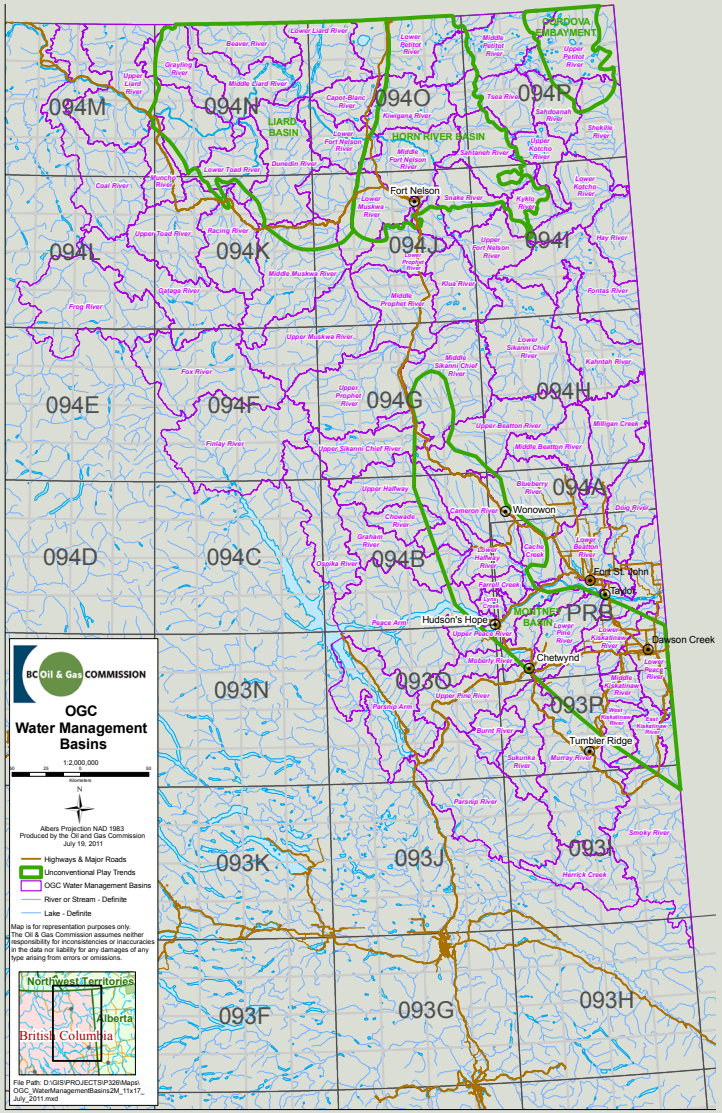

Table 2. Water Survey of Canada Hydrometric Stations utilized in the "mean annual discharge" calculations for 2011.

Gauge No.	Gauge Name	Basin Area (km^2)	Mean Annual Discharge (m^3/s)	Mean Annual Runoff (mm)
07FA003	Halfway River above Graham River	3,780	35.6	421
07FA005	Graham River above Colt Creek	2,200	24.4	496
07FA006	Halfway River near Farrell Creek	9,330	73.5	352
07FB001	Pine River at East Pine	12,100	190	702
07FB002	Murray River near the Mouth	5,550	83.4	672
07FB003	Sukunka River near the Mouth	2,590	54.8	946
07FB004	Dickebusch Creek near the Mouth	82	0.592	323
07FB008	Moberly River near Fort St. John	1,520	11.4	336
07FC001	Beatton River near Fort St. John	15,600	54.1	155
07FC003	Blueberry River below Aitken Creek	1,770	5.35	135
07FD001	Kiskatinaw River near Farmington	3,640	10.4	128
10BE004	Toad River above Nonda Creek	2,570	43.4	755
10BE011	Grayling River near the Mouth	1,780	16.5	414
10BE101	Toad River near the Mouth	6,900	103	667
10CA001	Fontas River near the Mouth	7,400	31.3	189
10CB001	Sikanni Chief River near Fort Nelson	2,160	25.9	535
10CC001	Fort Nelson River at Fort Nelson	43,500	351	361
10CC002	Fort Nelson River above Muskwa River	22,800	138	271
10CD001	Muskwa River near Fort Nelson	20,300	212	467
10CD003	Raspberry Creek near the Mouth	273	1.19	195
10CD004	Bougie Creek at km 368	332	2.67	360
10CD005	Adsett Creek at km 386	109	0.861	353
10CD006	Prophet River above Cheves Creek	7,320	74.6	456

Approvals and Use in Relation to Basin Runoff

In most river basins in northeast B.C., the total approved short-term water use is a small fraction of the mean annual runoff. The basins with the 10 largest total approved volumes as a percentage of mean annual runoff are:

	Percentage
Upper Petitot River	1.10
Kiwigana River	0.81
Tsea River	0.60
East Kiskatinaw River	0.52
Sahdoanah River	0.47
Shekilie River	0.37
Lynx Creek	0.31
Sahtaneh River	0.25
Kyklo River	0.23
Blueberry River	0.22

For all the remaining basins, the approved short-term water use corresponds to less than 0.20 per cent of mean annual runoff.

Actual water use (as reported by the approval holders) in individual basins is a small fraction of the approved water use, and was less than 0.1 per cent of mean annual runoff in individual river basins, except for the Tsea River, where actual use was 0.26 per cent of mean annual runoff (note: the Tsea River is part of the Petitot River watershed, and is located in the Horn River Basin gas play area), and the East Kiskatinaw River, where actual use was 0.20 per cent of mean annual runoff.

Moving Forward

The Commission has authority under the Oil and Gas Activities Act for short-term water use approvals as per Section 8 of the Water Act. Changes in the Commission's water use approvals processes were introduced in March 2011. Included in the changes is the new requirement for the quarterly reporting of actual water withdrawals from all approved points of withdrawal.

This report presents a summary of short-term water approvals for the October to December 2011 period, and a summary of reported cumulative use for 2011. As of March 2011, the Commission required companies to apply for a total volume of water for the duration of an approval, rather than a volume per day, and as such the comparative volumes between water approved and water actually used are more aligned. Total volumes approved for short-term water approvals are declining, and are anticipated to continue declining until mid-2012 as a result of this new requirement.

The Commission's application review and decision-making process for short-term water use approvals addresses the potential for cumulative effects of water withdrawals by ensuring that the volume of water approved for potential withdrawal and use is below thresholds of potential watershed scale impacts. In addition, the Commission is continually enhancing its decision-making processes and information. With support from FLNRO and Geoscience BC, the Commission has completed hydrology modelling of northeast B.C. to provide basic information on natural water supply, and is now converting the model into a "decision-support tool", to provide detail hydrology information. The tool is anticipated to be complete in fall 2012, and will be available to all users via the Commission website at www.bcogc.ca. In addition, detailed information on all short term water use approvals are updated daily on the Commission website at www.bcogc.ca.

More Information

Contact www.bcogc.ca

This report is updated quarterly with new information and statistics. A current copy is available on the Commission website at www.bcogc.ca along with:

- Oil and Gas Activities Act and Water Act
- Short-term Use of Water Application Manual
- Data files of all Active Section 8 Approvals
- 2011 Quarterly Water Reports (Jan-Mar, Apr-Jun, Jul-Sep)

For specific questions or enquiries regarding this report, please contact:

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Appendix A

Table 3. Current Section 8 (short term water use)Approved by the BC Oil and Gas Commission

(Approved volumes for an annual period starting October 2011, actual withdrawals for January-December 2011, and annual discharge).

Major Basin Name	Sub-Basin Name	Section 8 Approvals	Points of Diversion	Total Volume Approved (m^3) (Oct-Dec)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m^3) (2011)	Total Volume Withdrawn as % of Mean Annual Runoff	Mean Annual Discharge (m^3/s)	Mean Annual Runoff (m^3)
Beatton	Upper Beatton River	15	50	315,975	0.082%	32,882	0.009%	12.2	386,248,504
	Middle Beatton River	8	23	82,850	0.014%	5,171	0.001%	18.7	590,127,120
	Milligan Creek	11	89	455,620	0.156%	3,856	0.001%	9.3	292,529,786
	Blueberry River	8	49	728,993	0.217%	12,720	0.004%	10.7	336,659,474
	Doig	1	16	86,945	0.036%	42	0.000%	7.7	243,054,492
	Lower Beatton River	2	12	167,500	0.014%			38.6	1,218,123,360
Beatton Total		45	239	1,837,883	0.108%	54,671	0.003%	54.1	1,708,660,566
Fort Nelson	Fontas River		38	232,381	0.032%	3,121	0.000%	23.3	734,802,107
	Kahntah River	2	38	185,045	0.034%	4,763	0.001%	17.3	544,750,613
	Kiwigana River	9	86	3,153,416	0.808%	118,493	0.030%	12.4	390,226,333
	Klua River	3	12	178,400	0.046%	0	0.000%	12.4	391,372,372
	Upper Prophet River							24.9	786,946,888
	Middle Prophet River							41.7	1,315,951,920
	Lower Prophet River							51.2	1,615,749,120
	Snake River	3	21	294,900	0.091%	1,347	0.000%	10.3	324,902,101
	Upper Fort Nelson River	2	29	323,400	0.006%	5,353	0.000%	165	5,207,004,000
	Middle Fort Nelson River	25	77	3,031,847	0.032%	983,645	0.010%	300	9,467,280,000
	Lower Fort Nelson River	1	16	290,831	0.003%	3,100	0.000%	340	10,729,584,000
Fort Nelson Total		45	317	7,690,220	0.069%	1,119,822	0.010%	350	11,068,673,506

Major Basin Name	Sub-Basin Name	Section 8 Approvals	Points of Diversion	Total Volume Approved (m^3) (Oct-Dec)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m^3) (2011)	Total Volume Withdrawn as % of Mean Annual Runoff	Mean Annual Discharge (m^3/s)	Mean Annual Runoff (m^3)
Halfway	Upper Halfway River	7	24	236,230	0.021%	57,066	0.005%	35.6	1,123,450,560
	Chowade							10.3	325,043,280
	Graham River		8	33,675	0.006%	0		18.3	576,557,352
	Cameron River	16	34	759,303	0.148%	54,823	0.011%	16.2	511,548,540
	Lower Halfway River	8	30	329,054	0.016%	22,427	0.001%	64.2	2,025,051,192
Halfway Total		31	96	1,358,262	0.059%	134,316	0.006%	73.5	2,319,119,474
Hay	Hay River	2	41	320,610	0.123%	3,121	0.001%	8.2	260,100,000
Hay Total		2	41	320,610	0.014%	3,121			2,319,119,474
Kiskatinaw	East Kiskatinaw River	3	56	502,703	0.524%	189,142	0.197%	3.0	95,935,104
	West Kiskatinaw River		11	119,368	0.132%	17,968	0.020%	2.9	90,570,312
	Middle Kiskatinaw	2	17	88,769	0.035%	18,100	0.007%	8.1	255,616,560
	Lower Kiskatinaw River	4	11	270,850	0.086%	33,810	0.011%	10.0	315,576,000
Kiskatinaw Total		9	95	981,690	0.299%	259,020	0.079%	10.4	327,904,045
Kotcho	Kyklo River	2	27	428,790	0.226%	7,170	0.004%	6	189,345,600
	Lower Kotcho River	1	26	123,590	0.035%	3,109	0.001%	11.07	349,342,632
	Shekilie River	1	44	1,476,480	0.371%	532	0.000%	12.6	397,625,760
	Upper Kotcho River	3	23	115,180	0.021%			17.5	552,258,000
Kotcho Total		7	120	2,144,040	0.144%	10,811	0.001%	47.2	1,489,518,720
Liard	Capot-Blanc River	5	25	492,684	0.153%	4,976	0.002%	10.2	321,887,285
	Dunedin River							49.6	1,565,181,051
	Lower Toad River							71.2	2,246,511,740
	Grayling River							18.5	583,947,351

Major Basin Name	Sub-Basin Name	Section 8 Approvals	Points of Diversion	Total Volume Approved (m^3) (Oct-Dec)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m^3) (2011)	Total Volume Withdrawn as % of Mean Annual Runoff	Mean Annual Discharge (m^3/s)	Mean Annual Runoff (m^3)
	Beaver River							16.6	525,243,649
	Upper Liard River							95.5	3,013,750,800
	Middle Liard River							114	3,597,566,400
	Lower Liard River	6	16	218,500	0.005%	3,950	0.000%	136	4,291,833,600
Liard Total		11	41	711,184	0.002%	8,926	0.000%	1420	44,811,792,000
Moberly	Moberly River	3	5	246,000	0.068%	4,080	0.001%		361,134,655
Moberly Total		3	5	246,000	0.068%	4,080	0.001%	11.4	361,134,655
Muskwa	Upper Muskwa River							44.5	1,404,313,200
	Middle Muskwa River							89	2,808,626,400
	Lower Muskwa River	1	1	5,000	0.000%	2,370	0.000%	124	3,913,142,400
Muskwa Total		1	1	5,000	0.000%	2,370	0.000%	213	6,713,724,706
Peace	Cache Creek	1	11	51,000	0.022%	0		7.3	230,370,480
	Farrell Creek	15	20	242,840	0.151%	7,895	0.005%	5.09	160,628,184
	Lower Peace River	6	19	559,000	0.001%	135,549	0.000%	1280	40,393,728,000
	Lynx Creek	2	3	246,000	0.307%			2.54	80,156,304
	Peace Arm					19,779	0.000%	1280	40,393,728,000
	Upper Peace River	4	14	868,050	0.002%	141,332	0.000%	1430	45,127,368,000
Peace Total		28	67	1,966,890		304,555			
Petitot	Lower Petitot River	23	50	1,318,990	0.053%	191,568	0.008%	78.3	2,470,960,080
	Middle Petitot River	8	83	1,059,720	0.054%	18,428	0.001%	62.7	1,978,661,520
	Sahdoanah River	3	79	1,110,576	0.470%	8,065	0.003%	7.5	236,366,424
	Sahtaneh River	9	74	993,780	0.247%	25,339	0.006%	12.8	402,990,552

Major Basin Name	Sub-Basin Name	Section 8 Approvals	Points of Diversion	Total Volume Approved (m^3) (Oct-Dec)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m^3) (2011)	Total Volume Withdrawn as % of Mean Annual Runoff	Mean Annual Discharge (m^3/s)	Mean Annual Runoff (m^3)
	Tsea River	7	95	2,020,030	0.597%	875,732	0.259%	10.7	338,297,472
	Upper Petitot River	19	170	5,642,550	1.104%	471,713	0.092%	16.2	511,233,120
Petitot Total		69	551	12,145,646	0.181%	1,590,845	0.024%	78.3	6,713,724,706
Pine River	Burnt							15.9	501,765,840
	Sukunka							45.4	1,432,715,040
	Upper Pine		1	5,000	0.000%	0		38.9	1,227,590,640
	Murray River	6	34	496,600	0.019%	91,518	0.003%	83.4	2,631,903,840
	Lower Pine River	9	41	225,675	0.004%	37,438	0.001%	189	5,964,386,400
Pine Total		15	76	727,275	0.012%	128,956	0.002%	189	5,980,515,840
Prophet	Upper Prophet River		6	29,200	0.002%	976		42	1,325,419,200
	Middle Prophet		13	167,100	0.008%	3,254	0.000%	70.1	2,212,187,760
	Lower Prophet	4	7	149,450	0.005%	4,343	0.000%	86.2	2,720,265,120
Prophet Total		4	26	345,750	0.013%	8,573	0.000%	86.2	2,720,265,120
Sikanni	Upper Sikanni Chief River	3	8	407,200	0.049%	6,341	0.001%	26.1	823,653,360
	Middle Sikanni Chief River	8	32	217,325	0.009%	2,956	0.000%	76.7	2,420,467,920
	Lower Sikanni Chief River	1	20	77,956	0.002%			132	4,165,603,200
Sikanni Chief Total		12	60	702,481	0.017%	9,297	0.000%	132	4,165,603,200
Smoky	Smoky River	8	51	396,953	0.016%	33,913	0.001%	77.8	2,455,181,280
Smoky Total		8	51	396,953	0.016%	33,913	0.001%	77.8	2,455,181,280
Other		4	14	23,415		102			
Grand Total		294	1,800	31,603,299		3,673,378			

Note: Refer to report for information on how Mean Annual Discharge and Mean Annual Runoff were calculated.

Appendix B

While completing this report, the Commission compiled quarterly data for the period of Jan. 1 to March 31, 2012. Table 4 shows a summary of short-term water use approvals active for this first quarter. Appendix C includes a summary of the volumes of water licensed by the Ministry of Forests, Lands and Natural Resource Operations in each of the watersheds listed. Detail on the various purposes for which water is licensed is detailed in Appendix D.

For the annual period beginning Jan. 2012, a total of 27,162,783 m^3 of water was authorized for use under short-term water use approvals issued by the Commission (Table 5).

For the three-month period of January to March, a total of 1,317,553 m^3 was reported as used by oil and gas operators.In most river basins in northeast B.C., the total approved short-term water use is a small fraction of the mean annual runoff. The basins with the largest total approved volumes as a percentage of mean annual runoff are:

	Percentage
Upper Petitot River	1.10
Tsea River	0.74
Sahdoanah River	0.44
Kiwigana River	0.44
East Kiskatinaw River	0.37
Sahtaneh River	0.26
Upper Kotcho River	0.24
Kyklo River	0.23

For all the remaining basins, the approved short term water use corresponds to less than 0.20 per cent of mean annual runoff.

Actual water use (as reported by the approval holders) in individual basins is a small fraction of the approved water use, and was less than 0.01 per cent of mean annual runoff in all river basins, except for the Blueberry River, where actual use was 0.013 per cent of mean annual runoff.

This report will continue to be updated quarterly with new information and statistics and available on the Commission website at www.bcogc.ca.

Table 4. Summary of short-term water use approvals active during 2012

	Q1 Total Jan - Mar 2011
Number of Active Approvals	285
Number of Companies with Active Approvals	50
Total Volume Available for use for the 12-month period beginning with each Quarter (m^3)	27,162,783
Total Volume Reported Used in each Quarter (m^3)	1,317,533
Cumulative Volume Reported Used in each Quarter (m^3)	1,317,533

Table 5. Water Survey of Canada Hydrometric Stations utilized in the "mean annual discharge" calculations for 2012 Q1

Gauge No.	Gauge Name	Basin Area (km2)	Mean Annual Discharge (m^3/s)	Man Annual Runoff (mm)
07FA003	Halfway River above Graham River	3,780	35.6	421
07FA005	Graham River above Colt Creek	2,200	24.4	496
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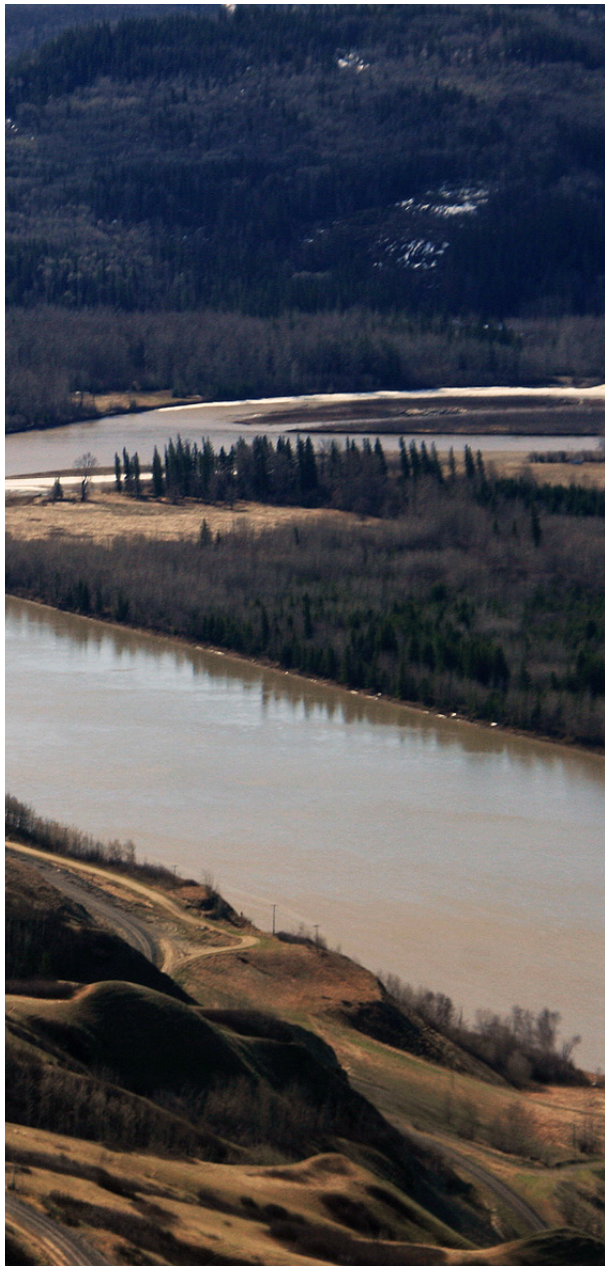
07FC001	Beatton River near Fort St. John	15,600	54.1	155
07FC003	Bluebery River below Aitken Creek	1,770	5.35	135
07FD001	Kiskatinaw River near Farmington	3,640	10.4	128
10BE004	Toad River above Nonda Creek	2,570	43.4	755
10BE011	Grayling River near the Mouth	1,780	16.5	414
10BE101	Toad River near the Mouth	6,900	103	667
10CA001	Fontas River near the Mouth	7,400	31.3	189
10CB001	Sikanni Chief River near Fort Nelson	2,160	25.9	535
10CC001	Fort Nelson River at Fort Nelson	43,500	351	361
10CC002	Fort Nelson River above Muskwa River	22,800	138	271
10CD001	Muskwa River near Fort Nelson	20,300	212	467
10CD003	Raspberry Creek near the Mouth	273	1.19	195
10CD004	Bougie Creek at km 368	332	2.67	360
10CD005	Adsett Creek at km 386	109	0.861	353
10CD006	Prophet River above Cheves Creek	7,320	74.6	456



Appendix C

Table 6. Current Section 8 (short term water use) approved by the Oil and Gas Commission, along with water licensed by the Ministry of Forests, Lands and Natural Resource Operations.

Approved volumes for an annual period starting January, 2012, actual withdrawals for January-March 2012, and are presented as a percentage of average annual river discharge.

	Section 8 Water Use Approvals - Oil and Gas Commission					FLNRO Water Licenses			River Discharge and Runoff	
Major & Sub-Basin Name	Section 8 Approvals (Commission)	Total Volume Approved (m^3)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m^3) (2012)	Total Volume Withdrawn as % of Mean Annual Runoff	# of Water Licenses (FLNRO)	Total Volume Licensed (m^3)	Total Volume Licensed as % of Mean Annual Runoff	Mean Annual Discharge (m^3/s)	Mean Annual Runoff (m^3)
Beatton River										
Upper Beatton River	13	304,371	0.079%	19,125	0.005%				12.2	386,248,504
Middle Beatton River	7	50,350	0.009%	2,030	0.000%				18.7	590,127,120
Milligan Creek	6	372,710	0.127%	264	0.000%				9.3	292,529,786
Blueberry River	12	645,924	0.192%	44,547	0.013%	16	175,436	0.052%	10.7	336,659,474
Doig	3	46,045	0.019%	1,409	0.001%	8	3,375,662	1.389%	7.7	243,054,492
Lower Beatton River	1	81,000	0.007%	0	0.000%	43	8,200,857	0.673%	38.6	1,218,123,360
Beatton Total	42	1,500,400	0.088%	67,375	0.004%	67	11,751,955	0.688%	54.1	1,708,660,566
Halfway River										
Upper Halfway River	5	241,485	0.021%	1,597	0.000%	6	133,304	0.012%	35.6	1,123,450,560
Chowade									10.3	325,043,280
Graham River	1	13,675	0.002%	208	0.000%	1	3,319	0.001%	18.3	576,557,352
Cameron River	17	495,560	0.097%	7,606	0.001%	3	7,467	0.001%	16.2	511,548,540
Lower Halfway River	9	225,859	0.011%	12,395	0.001%	9	1,036,050	0.051%	64.2	2,025,051,192
Halfway Total	32	976,579	0.042%	21,806	0.001%	19	1,180,140	0.051%	73.5	2,319,119,474
Moberly River										
Moberly River	2	212,600	0.059%	0	0.000%	21	85,954	0.024%		361,134,655
Moberly Total	2	212,600	0.059%	0	0.000%	21	85,954	0.024%	11.4	361,134,655
Pine River										
Burnt						2	34,784	0.007%	15.9	501,765,840

	Section 8 Water Use Approvals - Oil and Gas Commission					FLNRO Water Licenses			River Discharge and Runoff	
Major & Sub-Basin Name	Section 8 Approvals (Commission)	Total Volume Approved (m^3)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m^3) (2012)	Total Volume Withdrawn as % of Mean Annual Runoff	# of Water Licenses (FLNRO)	Total Volume Licensed (m^3)	Total Volume Licensed as % of Mean Annual Runoff	Mean Annual Discharge (m^3/s)	Mean Annual Runoff (m^3)
Sukunka						5	121,079	0.008%	45.4	1,432,715,040
Upper Pine						13	2,455,457	0.200%	38.9	1,227,590,640
Murray River	4	399,600	0.015%	0	0.000%	37	28,129,268	1.069%	83.4	2,631,903,840
Lower Pine River	9	288,300	0.005%	0	0.000%	27	5,576,477	0.093%	189	5,964,386,400
Pine Total	13	687,900	0.012%	0	0.000%	84	36,317,065	0.607%	189	5,980,515,840
Kiskatinaw River										
East Kiskatinaw River	6	358,740	0.374%	1,293	0.001%	5	2,871,174	2.993%	3.0	95,935,104
West Kiskatinaw River									2.9	90,570,312
Middle Kiskatinaw						9	3,719,705	1.455%	8.1	255,616,560
Lower Kiskatinaw River	6	331,150	0.105%	5,174	0.002%	20	1,171,180	0.371%	10.0	315,576,000
Kiskatinaw Total	12	689,890	0.210%	6,467	0.002%	34	7,762,059	2.367%	10.4	327,904,045
Peace River										
Peace Arm						8	3,710,644	0.009%	1280	40,393,728,000
Upper Peace River	4	812,350	0.002%	0	0.000%	43	3,655,783	0.008%	1430	45,127,368,000
Lynx Creek						5	259,970	0.324%	2.54	80,156,304
Farrell Creek	15	45,480	0.028%	0	0.000%	2	7,466	0.005%	5.09	160,628,184
Cache Creek	2	11,000	0.005%	0	0.000%				7.3	230,370,480
Pouce Coupe River	1	14,000	0.007%	665	0.000%	64	4,387,417	2.214%	6.3	198,181,728
Lower Peace River	4	480,000	0.001%	0	0.000%	39	122,506,716	0.271%	1280	45,127,368,000
Peace Total	22	550,480	0.000%	665	0.000%	105	134,527,996	0.102%		131,317,800,696
Smoky River										
Smoky River	7	342,774	0.014%	6,144	0.000%	2	528,441	0.022%	77.8	2,455,181,280
Smoky Total	7	342,774	0.014%	6,144	0.000%	2	528,441	0.022%	77.8	2,455,181,280
Fort Nelson River										
Fontas River	2	194,801	0.027%	16,662	0.002%				23.3	734,802,107
Kahntah River	2	209,145	0.038%	32	0.000%				17.3	544,750,613

	Section 8 Water Use Approvals - Oil and Gas Commission					FLNRO Water Licenses			River Discharge and Runoff	
Major & Sub-Basin Name	Section 8 Approvals (Commission)	Total Volume Approved (m^3)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m^3) (2012)	Total Volume Withdrawn as % of Mean Annual Runoff	# of Water Licenses (FLNRO)	Total Volume Licensed (m^3)	Total Volume Licensed as % of Mean Annual Runoff	Mean Annual Discharge (m^3/s)	Mean Annual Runoff (m^3)
Kiwigana River	12	1,713,716	0.439%	9,031	0.002%	3	419,609	0.108%	12.4	390,226,333
Klua River	3	178,400	0.046%	4,333	0.001%				12.4	391,372,372
Snake River	2	262,400	0.081%	0	0.000%				10.3	324,902,101
Upper Fort Nelson River	3	337,400	0.006%	1,286	0.000%				165	5,207,004,000
Middle Fort Nelson River	19	2,471,517	0.026%	892,390	0.009%	4	1,001,848	0.011%	300	9,467,280,000
Lower Fort Nelson River	2	310,831	0.003%	0	0.000%				340	10,729,584,000
Fort Nelson Total	45	5,678,210	0.051%	923,734	0.008%	7	1,421,457	0.013%	350	11,068,673,506
Muskwa River (sub-basin of Fort Nelson R.)										
Upper Muskwa River									44.5	1,404,313,200
Middle Muskwa River						1	830	0.000%	89	2,808,626,400
Lower Muskwa River	1	6,500	0.000%	1,080	0.000%	8	1,839,377	0.047%	124	3,913,142,400
Muskwa Total	1	6,500	0.000%	1,080	0.000%	9	1,840,207	0.027%	213	6,713,724,706
Prophet River (sub-basion of Fort Nelson R.)										
Upper Prophet River	1	9,355	0.001%	0	0.000%				42	1,325,419,200
Middle Prophet	1	116,100	0.005%	0	0.000%				70.1	2,212,187,760
Lower Prophet	4	154,450	0.006%	0	0.000%				86.2	2,720,265,120
Prophet Total	6	279,905	0.010%	0	0.000%	0	0	0.000%	86.2	2,720,265,120
Sikanni Chief River (sub-basin of Fort Nelson R.)										
Upper Sikanni Chief River	2	336,000	0.041%	3,434	0.000%	2	64,488	0.008%	26.1	823,653,360
Middle Sikanni Chief River	11	133,052	0.005%	4,968	0.000%	2	5,808	0.000%	76.7	2,420,467,920
Lower Sikanni Chief River	2	46,229	0.001%	5,538	0.000%				132	4,165,603,200
Sikanni Chief Total	15	515,281	0.012%	13,940	0.000%	4	70,296	0.002%	132	4,165,603,200
Liard River										
Capot-Blanc River	4	432,484	0.134%	854	0.000%				10.2	321,887,285
Dunedin River									49.6	1,565,181,051
Lower Toad River									71.2	2,246,511,740

	Section 8 Water Use Approvals - Oil and Gas Commission					FLNRO Water Licenses			River Discharge and Runoff	
Major & Sub-Basin Name	Section 8 Approvals (Commission)	Total Volume Approved (m^3)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m^3) (2012)	Total Volume Withdrawn as % of Mean Annual Runoff	# of Water Licenses (FLNRO)	Total Volume Licensed (m^3)	Total Volume Licensed as % of Mean Annual Runoff	Mean Annual Discharge (m^3/s)	Mean Annual Runoff (m^3)
Grayling River									18.5	583,947,351
Beaver River	1	6,550	0.001%	1,536	0.000%	1	1,659	0.000%	16.6	525,243,649
Upper Liard River						2	58,906	0.002%	95.5	3,013,750,800
Middle Liard River									114	3,597,566,400
Lower Liard River	3	200,800	0.005%	6,546	0.000%				136	4,291,833,600
Liard Total	8	639,834	0.001%	8,936	0.000%	3	60,565	0.000%	1420	44,811,792,000
Petitot River										
Lower Petitot River	19	1,891,140	0.077%	179,072	0.007%	1	137,026	0.006%	78.3	2,470,960,080
Middle Petitot River	7	944,620	0.048%	4,045	0.000%	1	116,404	0.006%	62.7	1,978,661,520
Sahdoanah River	4	1,045,376	0.442%	20,775	0.009%	1	830	0.000%	7.5	236,366,424
Sahtaneh River	10	1,064,100	0.264%	4,598	0.001%	1	329,865	0.082%	12.8	402,990,552
Tsea River	8	2,495,439	0.738%	126	0.000%	1	292,288	0.086%	10.7	338,297,472
Upper Petitot River	12	5,378,055	1.052%	5,140	0.001%				16.2	511,233,120
Petitot Total	60	12,818,730	0.191%	213,756	0.003%	5	876,413	0.013%	78.3	6,713,724,706
Kotcho River										
Kyklo River	4	431,200	0.228%	1,358	0.001%	1	5,808	0.003%	6	189,345,600
Lower Kotcho River	2	188,400	0.054%	0	0.000%				11.07	349,342,632
Shekilie River									12.6	397,625,760
Upper Kotcho River	6	1,314,360	0.238%	4,681	0.001%				17.5	552,258,000
Kotcho Total	12	1,933,960	0.130%	6,039	0.000%	1	5,808	0.000%	47.2	1,489,518,720
Hay River										
Hay River	5	304,340	0.117%	47,591	0.018%				8.2	260,100,000
Hay Total	5	304,340	0.013%	47,591	0.002%	0	0	0.000%		2,319,119,474
Other	3	25,400		0		1				
Grand Total	285	27,162,783		1,317,533		362	196,428,356			

Appendix D

Table 7. Summary of water use licensed by the Ministry of Forests, Range and Natural Resource Operations, for watersheds in Northeast British Columbia, by "purpose" as defined in the Water Regulation.

For the period of January - March 2012

Major & Sub Basin Name	Bottle Sales	Camps	Conserv.-Stored Water	Cooling	Domestic	Dust Control	Enterprise	Fire Protection	Institutions	Irrigation	Land Improve	Mining Equipment	Mining-Processing Ore	Mining-Washing Coal
Beatton River														
Upper Beatton River														
Middle Beatton River														
Milligan Creek														
Blueberry River					24,890	0				50,157		38,164		
Doig River					8,296									
Lower Beatton River			495,551		21,571	16,593				501,412				
Beatton Total	0	0	495,551	0	54,757	16,593	0	0	0	551,569	0	38,164	0	0
Halfway River														
Upper Halfway					4,148	0			1,659	123,348				
Chowade														
Graham River														
Cameron River					2,489									
Lower Halfway River					17,423	0				997,885				
Halfway Total	0	0	0	0	24,060	0	0	0	1,659	1,121,233	0	0	0	0
Moberly River														
Moberly River					5,808	23,562	830	120		3,084				
Moberly Total	0	0	0	0	5,808	23,562	830	120	0	3,084	0	0	0	0
Pine River														
Burnt River														
Sukunka River					2,489	19,912								

Major & Sub Basin Name	Ponds	Processing	Pulpmills	Road Maintenance	Sediment Control	Snow Making	Stock-watering	Truck Washing	Water Delivery	Watering	Waterworks (Other)	Waterworks Local Auth	Work Camps	Grand Total
Beatton River														
Upper Beatton River														0
Middle Beatton River														0
Milligan Creek														0
Blueberry River							32,357		16,593			13,275		175,436
Doig River							56,085							3,375,662
Lower Beatton River							37,334	1,659		111,013		6,637,291		8,200,857
Beatton Total	0	0	0	0	0	0	125,776	1,659	16,593	111,013	0	6,650,566	0	11,751,954
Halfway River														
Upper Halfway							4,148							133,304
Chowade														0
Graham River							3,319							3,319
Cameron River									4,978					7,467
Lower Halfway River							20,742							1,036,050
Halfway Total	0	0	0	0	0	0	28,209	0	4,978	0	0	0	0	1,180,139
Moberly River														
Moberly River									3,212	49,339				85,954
Moberly Total	0	0	0	0	0	0	0	0	3,212	49,339	0	0	0	85,954
Pine River														
Burnt River					34,784									34,784
Sukunka River										98,678				121,079

Major & Sub Basin Name	Bottle Sales	Camps	Conserv.-Stored Water	Cooling	Domestic	Dust Control	Enterprise	Fire Protection	Institutions	Irrigation	Land Improve	Mining Equipment	Mining-Processing Ore	Mining-Washing Coal
Upper Pine River				306,975	8,296	414,946								473,040
Murray River			344,388	25,003	9,956	208,454		21,571,494		12,335	0	365,051		5,361,120
Lower Pine River			3,660,969		14,934	35,210				30,837	30,837			
Pine Total	0	0	4,005,356	331,977	35,675	678,521	0	21,571,494	0	43,172	30,837	365,051	0	5,834,160
Kiskatinaw River														
East Kiskatinaw River			626,608			36,505					2,193,127			
West Kiskatinaw River														
Middle Kiskatinaw River					3,319	58,076				329,709				
Lower Kiskatinaw River			499,066		6,637	9,956				192,916	6,167			
Kiskatinaw Total	0	0	1,125,674	0	9,956	104,537	0	0	0	522,625	2,199,295	0	0	0
Peace River														
Peace Arm					4,148	16,593	16,593			6,007				
Upper Peace River			2,279,471		26,549	18,253	8,296			77,709	1,233			
Lynx Creek					1,659	4,978				246,696				
Farrell Creek					2,489									
Cache Creek														
Pouce Coupe	17,423		3,646,908		19,911	137,722				258,414	45,640	110,362		
Lower Peace River			2,759,295	86,683,523	15,763	59,736		19,926,808		151,718	0			
Peace Total	17,423	0	8,685,674	86,683,523	70,520	237,281	24,890	19,926,808	0	740,544	46,873	110,362	0	0
Smoky River														
Smoky River						34,845						458,750		
Smoky Total	0	0	0	0	0	34,845	0	0	0	0	0	458,750	0	0
Fort Nelson River														
Fontas River														
Kahntah River														
Kiwigana River				128,480								36,505		

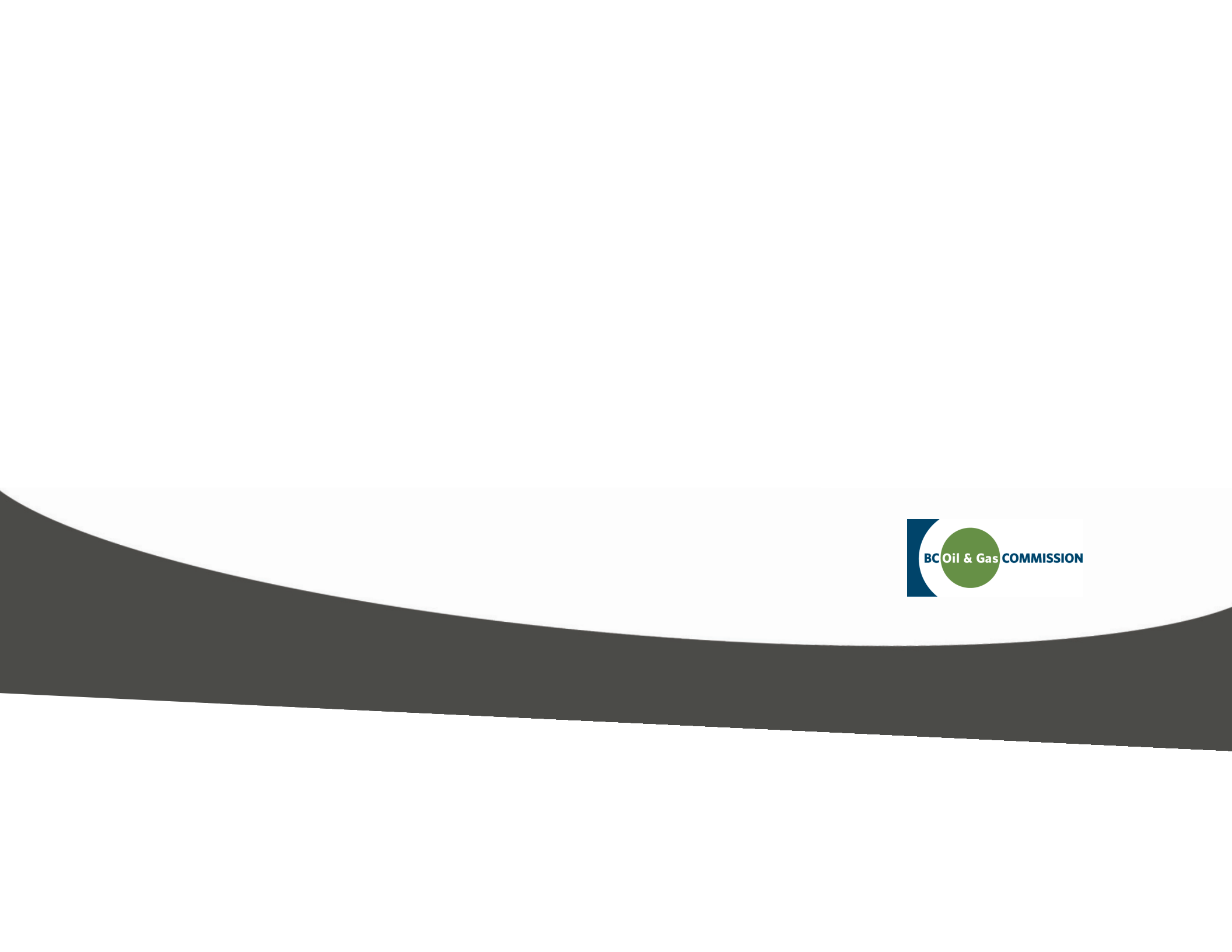
Major & Sub Basin Name	Ponds	Processing	Pulpmills	Road Maintenance	Sediment Control	Snow Making	Stock-watering	Truck Washing	Water Delivery	Watering	Waterworks (Other)	Waterworks Local Auth	Work Camps	Grand Total
Upper Pine River				24,890	10,004						16,593	1,200,713		2,455,457
Murray River		18,250		25,003	140,086		16,593							28,129,268
Lower Pine River			1,797,552				6,139							5,576,477
Pine Total	0	18,250	1,797,552	49,892	184,874	0	22,733	0	0	98,678	16,593	1,200,713	0	36,317,065
Kiskatinaw River														
East Kiskatinaw River				9,956			4,978					0		2,871,174
West Kiskatinaw River														0
Middle Kiskatinaw River							9,956					3,318,646		3,719,705
Lower Kiskatinaw River							14,934							1,171,180
Kiskatinaw Total	0	0	0	9,956	0	0	29,867	0	0	0	0	3,318,646	0	7,762,059
Peace River														
Peace Arm							9,126							3,710,644
Upper Peace River	1,103						58,358				165,932	829,661		3,655,783
Lynx Creek							6,637							259,970
Farrell Creek							4,977							7,466
Cache Creek														0
Pouce Coupe						24,670	101,697			24,670				4,387,417
Lower Peace River		1,037,077	8,041,680				23,230			272,599		791,655		122,506,716
Peace Total	1,103	1,037,077	8,041,680	0	0	24,670	204,026	0	0	297,269	165,932	1,621,317	0	134,527,996
Smoky River														
Smoky River				34,845										528,441
Smoky Total	0	0	0	34,845	0	0	0	0	0	0	0	0	0	528,441
Fort Nelson River														
Fontas River														0
Kahntah River														0
Kiwigana River				128,480										419,609

Major & Sub Basin Name	Bottle Sales	Camps	Conserv.-Stored Water	Cooling	Domestic	Dust Control	Enterprise	Fire Protection	Institutions	Irrigation	Land Improve	Mining Equipment	Mining-Processing Ore	Mining-Washing Coal
Klua River														
Snake River														
Upper Fort Nelson River														
Middle Fort Nelson River					3,319	9,125								
Lower Fort Nelson River														
Fort Nelson Total	0	0	0	128,480	3,319	9,125	0	0	0	0	0	36,505	0	0
Muskwa River (sub-basin of Fort Nelson R.)														
Upper Muskwa River														
Middle Muskwa River					830									
Lower Muskwa River					6,637					43,172				
Muskwa Total	0	0	0	0	7,467	0	0	0	0	43,172	0	0	0	0
Prophet River (sub-basion of Fort Nelson R.)														
Upper Prophet River														
Middle Prophet														
Lower Prophet														
Prophet Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sikanni Chief River (sub-basin of Fort Nelson R.)														
Upper Sikanni Chief River														
Middle Sikanni Chief River					830									
Lower Sikanni Chief River														
Sikanni Chief Total	0	0	0	0	830	0	0	0	0	0	0	0	0	0
Liard River														
Capot-Blanc River														
Dunedin River														
Lower Toad River														
Grayling River														

Major & Sub Basin Name	Ponds	Processing	Pulpmills	Road Maintenance	Sediment Control	Snow Making	Stock-watering	Truck Washing	Water Delivery	Watering	Waterworks (Other)	Waterworks Local Auth	Work Camps	Grand Total
Klua River														0
Snake River														0
Upper Fort Nelson River														0
Middle Fort Nelson River		986,086					3,319							1,001,848
Lower Fort Nelson River														0
Fort Nelson Total	0	986,086	0	128,480	0	0	3,319	0	0	0	0	0	0	1,421,457
Muskwa River (sub-basin of Fort Nelson R.)														
Upper Muskwa River														0
Middle Muskwa River														830
Lower Muskwa River											49,780	1,739,789		1,839,377
Muskwa Total	0	0	0	0	0	0	0	0	0	0	49,780	1,739,789	0	1,840,207
Prophet River (sub-basion of Fort Nelson R.)														
Upper Prophet River														0
Middle Prophet														0
Lower Prophet														0
Prophet Total	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sikanni Chief River (sub-basin of Fort Nelson R.)														
Upper Sikanni Chief River									60,340				4,148	64,488
Middle Sikanni Chief River													4,978	5,808
Lower Sikanni Chief River														0
Sikanni Chief Total	0	0	0	0	0	0	0	0	60,340	0	0	0	9,126	70,295
Liard River														
Capot-Blanc River														0
Dunedin River														0
Lower Toad River														0
Grayling River														0

Major & Sub Basin Name	Bottle Sales	Camps	Conserv.-Stored Water	Cooling	Domestic	Dust Control	Enterprise	Fire Protection	Institutions	Irrigation	Land Improve	Mining Equipment	Mining-Processing Ore	Mining-Washing Coal
Beaver River														
Upper Liard River					830	56,417								
Middle Liard River														
Lower Liard River														
Liard Total	0	0	0	0	830	56,417	0	0	0	0	0	0	0	0
Petitot River														
Lower Petitot River												36,977		
Middle Petitot River												26,666		
Sahdoanah River		830												
Sahtaneh River												101,861		
Tsea River												20,000		
Upper Petitot River														
Petitot Total	0	830	0	0	0	0	0	0	0	0	0	185,504	0	0
Kotcho River														
Kyklo River														
Lower Kotcho River														
Shekilie River														
Upper Kotcho River														
Kotcho Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hay River														
Hay River														
Hay Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other													69,692	
Grand Total	17,423	830	14,312,255	87,143,981	213,219	1,160,882	25,719	41,498,422	1,659	3,025,400	2,277,005	1,194,336	69,692	5,834,160

Major & Sub Basin Name	Ponds	Processing	Pulpmills	Road Maintenance	Sediment Control	Snow Making	Stock-watering	Truck Washing	Water Delivery	Watering	Waterworks (Other)	Waterworks Local Auth	Work Camps	Grand Total
Beaver River														0
Upper Liard River											1,659			58,906
Middle Liard River														0
Lower Liard River														0
Liard Total	0	0	0	0	0	0	0	0	0	0	1,659	0	0	58,906
Petitot River														
Lower Petitot River				36,977										137,026
Middle Petitot River				26,666										116,404
Sahdoanah River														830
Sahtaneh River				101,861										329,865
Tsea River				20,000										292,288
Upper Petitot River														0
Petitot Total	0	0	0	185,504	0	0	0	0	0	0	0	0	0	876,413
Kotcho River														
Kyklo River													5,808	5,808
Lower Kotcho River														0
Shekilie River														0
Upper Kotcho River														0
Kotcho Total	0	0	0	0	0	0	0	0	0	0	0	0	5,808	5,808
Hay River														
Hay River														0
Hay Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other									1,659					71,351
Grand Total	1,103	2,041,413	9,839,232	408,677	184,874	24,670	413,929	1,659	86,782	556,299	233,965	14,531,030	14,934	196,498,046


BC Oil & Gas COMMISSION