

Water Use in Oil and Gas Activities

2012 Annual Report



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About Us

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 services include reviewing and assessing applications for industry activity, consulting with First Nations, cooperating with partner agencies, and ensuring industry complies with provincial legislation and all regulatory requirements. The public interest is protected by ensuring public safety, respecting those affected by oil and gas activities, conserving the environment, and ensuring equitable participation in production.

For general information about the Commission, please visit www.bcogc.ca or phone 250-794-5200.



More Information

Contact www.bcogc.ca

Data on short-term water approvals and usage is updated quarterly on the Commission website at www.bcogc.ca. Resources include:

- [Oil and Gas Activities Act](#) and [Water Act](#)
- [Short-term Use of Water Application Manual](#)
- [Data files of all Active Section 8 Approvals](#)
- [2012 Quarterly Updates](#)
- [Northeast Water Tool](#)

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Annual Report on Short-Term Water Approvals and Use

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 must apply to the Commission for approval, valid for a maximum of one year, to use or divert surface water from rivers, lakes or dugouts for an oil or gas activity. The application specifies the total volume of water requested, the maximum withdrawal rate in cubic metres (m³) per day, and the specific geographic coordinates of all withdrawal locations from the requested area. Natural resource officers in the Commission's Permitting and Authorizations division receive, review and adjudicate the applications.

This report contains short-term water use data from the 2012 calendar year, including the cumulative volume of water approved for use and the volume reported as actually used by permit holders. It also includes data on water licences in northeast British Columbia, which are valid for periods greater than one year and under the issuing authority of the Ministry of Forests, Lands and Natural Resource Operations (FLNRO).

New to this report, in Appendix A, is the inclusion of water volumes used in hydraulic fracturing. Previous annual water reports and quarterly updates 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 permits 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 one year. The oil and gas industry obtains short-term water use permits for a number of activities, which include:

- Seismic or geophysical exploration
- Drilling
- Machine washing
- Ice road freezing
- Dust control
- Water floods (to enhance oil recovery)
- Hydraulic fracturing
- Hydrostatic testing of pipelines

Commission Authority for Water

The Commission has natural resource specialists trained to review and adjudicate applications for water use associated with oil and gas activities. 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. Methods 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 water approvals and use.
- The management of special or unique situations, and the ability to take action if necessary, such as suspending oil and gas water use during the 2010 and 2012 summer droughts in northeast B.C.
- The [Northeast Water Tool](#), a complete hydrologic model for northeast B.C.
- Cooperation with water stewardship staff from FLNRO to ensure decisions are fully informed.



Short-Term Water Approvals and Use

Total Approvals and Reported Use

During 2012, between 233 and 285 short-term water use approvals were active at various times. These were held by 50 companies (Table 1). The number of approvals declined in the third quarter (July-September), likely due to the Commission's suspension of short-term water withdrawals due to drought conditions.

On Aug. 2, 2012 the Commission issued a directive suspending water withdrawals for short-term water use due to low stream flow conditions. Several larger rivers and lakes less affected by the drought were exempted.

On Nov. 14 the suspension was lifted for all rivers in the Peace River drainage area, but maintained for smaller rivers in the Fort Nelson and Liard river drainages. It was lifted completely on Jan. 23, 2013. Approvals increased slightly in the fourth quarter (October-December) following the partial end of the suspension.

The total volume of water approved for withdrawal fell 25 per cent during 2012 to a total of 20.4 million m³ as of the fourth quarter. The total volume of water reported as used was 3,770,019 m³ (18.5 per cent of the approved volume). Water usage in 2012 was comparable to the 2011 volume of 3,673,378 m³.

Table 1: Summary of short-term water use approvals active during 2012

	Q1 Total Jan-Mar 2012	Q2 Total Apr-Jun 2012	Q3 Total Jul-Sept 2012	Q4 Total Oct-Dec 2012
Number of active approvals in each quarter	285	271	233	248
Number of approvals issued in each quarter	127	51	38	73
Number of companies with active approvals	50	50	44	48
Total volume available for use for the 12-month period beginning with each quarter (m ³)	27,162,783	27,301,242	23,190,084	20,384,090
Total volume reported used in each quarter (m ³)	1,332,894	982,376	1,083,899	370,586
Cumulative total volume reported used in 2012 (m ³)	1,332,894	2,315,270	3,399,433	3,770,019

The basins with the largest total approved volumes as a percentage of mean annual runoff during the last quarter of 2012 are represented in Table 2.

For all the remaining basins, the approved short-term water use corresponded to less than 0.20 per cent of mean annual runoff. Refer to [quarterly water reports](#) for the first, second and third quarters of 2012 for details on approvals during those time periods.

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 0.075 per cent of mean annual runoff in all river basins between January and December 2012.

Table 2: Basins with largest total approved percentage of mean annual runoff

	Percentage (Oct-Dec 2012)
Lower Halfway River	1.28
East Kiskatinaw River	0.72
Lower Pine River	0.38
Kyklo River	0.33
Lower Kiskatinaw River	0.27
Cameron River	0.26
Kiwigana River	0.24
Blueberry River	0.24
Middle Petitot River	0.23
Capot-Blanc River	0.23

Northeast Water Tool – Version 2

The [Northeast Water Tool \(NEWT\)](#) is a GIS-based hydrology decision-support tool developed by the Commission. It provides guidance on water availability across northeast B.C., and supports the decision-making process for water use permits and licences.

Version 2 of NEWT was released in February 2013. Key upgrades include:

- An improved tool box.
- An enhancement to the model results for mountainous areas.
- The ability to query individual Section 8 approvals or water licences on the map screen throughout the entire province.
- A detailed compilation of all Section 8 approvals and water licences in the PDF output.
- The addition of major oil and gas roads to the map.



Table 2: Section 8 permits approved by the BC Oil and Gas Commission and water licensed by the Ministry of Forests, Lands and Natural Resource Operations.

Approved volumes for an annual period starting October 2012; actual withdrawals for January-December 2012 presented as percentage of average annual river discharge.

Major & Sub-Basin Name	Section 8 Water Use Approvals – BC Oil and Gas Commission					Water Licenses – FLNRO			River Discharge and Runoff	
	Section 8 Approvals	Total Volume Approved (m³)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m³) (2012)	Total Volume Withdrawn as % of Mean Annual Runoff	# of Water Licenses	Total Volume Licensed (m³)	Total Volume Licensed as % of Mean Annual Runoff	Mean Annual Discharge (m³/s)	Mean Annual Runoff (m³)
Beatton River										
Upper Beatton River	13	412,400	0.083%	52,372	0.010%				15.8	499,408,440
Middle Beatton River	7	32,920	0.013%	1,938	0.001%				7.9	249,152,995
Milligan Creek	4	174,645	0.091%	1,370	0.001%				6.1	191,536,686
Blueberry River	16	694,596	0.237%	57,103	0.019%	15	175,436	0.060%	9.3	293,278,540
Doig River	2	59,920	0.019%	358	0.000%	9	3,375,662	1.045%	10.2	323,069,523
Lower Beatton River						42	7,822,425	5.658%	4.4	138,262,629
Beatton Total	42	1,374,481	0.081%	113,141	0.007%	66	11,373,522	0.671%	53.7	1,694,708,813
Halfway River										
Upper Halfway River	3	216,000	0.027%	10,069	0.001%	6	133,304	0.017%	25.2	795,962,409
Chowade River								0.000%	10.4	327,027,527
Graham River	3	1,280,400	0.149%	804	0.000%	1	3,319	0.000%	27.3	860,627,172
Cameron River	14	587,465	0.263%	44,636	0.020%	3	7,467	0.003%	7.1	223,679,567
Lower Halfway River	19	1,933,965	1.276%	27,652	0.018%	10	1,036,050	0.684%	4.8	151,526,991
Halfway Total	39	4,017,830	0.170%	83,161	0.004%	20	1,180,139	0.050%	74.7	2,358,823,666
Moberly River										
Moberly River						10	85,954	0.022%	12.41	391,714,995
Moberly Total						10	85,954	0.022%	12.41	391,714,995
Pine River										
Burnt River						2	34,784	0.005%	23.38	737,930,022

Section 8 Water Use Approvals – BC Oil and Gas Commission						FLNRO Water Licenses			River Discharge and Runoff	
Major & Sub-Basin Name	Section 8 Approvals	Total Volume Approved (m³)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m³) (2012)	Total Volume Withdrawn as % of Mean Annual Runoff	# of Water Licenses	Total Volume Licensed (m³)	Total Volume Licensed as % of Mean Annual Runoff	Mean Annual Discharge (m³/s)	Mean Annual Runoff (m³)
Sukunka River						5	121,079	0.012%	33.19	1,047,282,572
Upper Pine River						13	2,454,627	0.167%	46.48	1,466,884,035
Murray River River	6	1,134,200	0.043%	1,690	0.000%	34	28,129,268	1.042%	85.5	2,698,285,017
Lower Pine River	9	308,400	0.005%	12,116	0.000%	28	5,576,477	4.052%	4.36	137,619,889
Pine Total	15	1,442,600	0.024%	13,806	0.000%	82	36,316,235	0.597%	192.91	6,088,001,535
Kiskatinaw River										
East Kiskatinaw River	2	763,300	0.724%	28,024	0.027%	4	2,871,174	2.723%	3.3	105,452,962
West Kiskatinaw River									3.7	117,515,115
Middle Kiskatinaw River	1	28,536	0.051%	0	0.000%	11	3,719,705	6.601%	1.8	56,347,972
Lower Kiskatinaw River	4	242,884	0.271%	22,068	0.025%	20	1,644,961	1.835%	2.8	89,659,847
Kiskatinaw Total	7	1,034,720	0.280%	50,092	0.014%	35	8,235,840	2.232%	11.7	368,975,896
Peace River										
Lynx Creek						4	259,970	0.854%	0.96	30,436,635
Farrell Creek	14	175,840	0.193%	5,193	0.006%	2	7,466	0.008%	2.88	91,018,843
Cache Creek	1	1,500	0.002%	273	0.000%	8	1,978,540	2.652%	2.4	74,603,546
Pouce Coupe River						61	3,104,923	1.214%	8.1	255,686,202
Peace River Mainstem	3	550,000	0.002%	622	0.000%	81	129,707,490	0.384%	1070	33,766,632,000
Peace Total	119	8,329,641	0.018%	303,325	0.001%	369	192,250,080	0.426%	1430.0	45,127,368,000
Smoky River										
Smoky River	2	156,000	0.006%	57,567	0.002%	3	528,441	0.020%	84.59	2,669,506,123
Smoky Total	2	156,000	0.006%	57,567	0.002%	3	528,441	0.020%	84.59	2,669,506,123
Fort Nelson River										
Fontas River	5	1,063,627	0.180%	6,360	0.001%				18.7	591,531,903
Kahntah River	1	720	0.000%	11,742	0.003%				12.7	400,582,903

Section 8 Water Use Approvals – BC Oil and Gas Commission						FLNRO Water Licenses			River Discharge and Runoff	
Major & Sub-Basin Name	Section 8 Approvals	Total Volume Approved (m³)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m³) (2012)	Total Volume Withdrawn as % of Mean Annual Runoff	# of Water Licenses	Total Volume Licensed (m³)	Total Volume Licensed as % of Mean Annual Runoff	Mean Annual Discharge (m³/s)	Mean Annual Runoff (m³)
Kiwigana River	4	1,060,195	0.240%	11,984	0.003%	2	419,609	0.095%	14.0	441,657,543
Klua River	2	21,000	0.005%	4,333	0.001%				12.7	402,135,448
Sahtaneh River	12	462,265	0.097%	38,828	0.008%	1	329,865	0.069%	15.1	474,904,729
Snake River	2	47,100	0.015%	1,453	0.000%				9.9	310,763,522
Upper Fort Nelson River	24	1,670,643	0.039%	236,568	0.005%	4	70,295	0.002%	136	4,303,636,908
Middle Fort Nelson River	41	4,154,018	0.036%	1,738,271	0.015%	18	2,912,350	0.025%	365	11,528,703,092
Lower Fort Nelson River	56	4,887,922	0.039%	1,780,223	0.014%	19	3,242,215	0.026%	400	12,627,140,281
Fort Nelson Total	60	5,948,117	0.046%	1,792,207	0.014%	21	3,661,825	0.028%	414	13,068,797,824
Muskwa River (sub-basin of Fort Nelson River)										
Upper Muskwa River									54.67	1,725,201,511
Middle Muskwa River						1	830	0.000%	62.54	1,973,711,816
Lower Muskwa River	0	0	0.000%	1,080	0.000%	9	1,839,377	0.284%	20.5	646,841,560
Muskwa Total	0	0	0.000%	1,080	0.000%	10	1,840,207	0.042%	137.71	4,345,754,887
Prophet River (sub-basin of Fort Nelson River)										
Upper Prophet River	0	0	0.000%	365	0.000%				46.59	1,470,271,289
Middle Prophet River	1	66,615	0.011%	663	0.000%				19.69	621,428,680
Lower Prophet River	4	149,000	0.055%	0	0.000%				8.63	272,262,427
Prophet Total	5	215,615	0.009%	1,028	0.000%	0	0	0.000%	74.91	2,363,962,396
Sikanni Chief River (sub-basin of Fort Nelson River)										
Upper Sikanni Chief River	2	419,100	0.052%	200,394	0.025%	2	64,488	0.008%	25.6	807,771,692
Middle Sikanni Chief River	8	67,197	0.007%	9,237	0.001%	2	5,808	0.001%	30.1	949,755,794
Lower Sikanni Chief River	3	47,564	0.005%	1,900	0.000%				27.75	875,678,142
Sikanni Chief Total	13	533,861	0.020%	211,531	0.008%	4	70,295	0.003%	83.45	2,633,205,628
Liard River										
Capot-Blanc River	4	420,625	0.229%	747	0.000%				5.8	183,879,851
Dunedin River	1	5,000	0.001%	0	0.000%				26.0	820,464,167
Lower Toad River									13.3	419,472,722

Section 8 Water Use Approvals – BC Oil and Gas Commission						FLNRO Water Licenses			River Discharge and Runoff	
Major & Sub-Basin Name	Section 8 Approvals	Total Volume Approved (m³)	Total Volume Approved as % of Mean Annual Runoff	Total Volume Withdrawn (m³) (2012)	Total Volume Withdrawn as % of Mean Annual Runoff	# of Water Licenses	Total Volume Licensed (m³)	Total Volume Licensed as % of Mean Annual Runoff	Mean Annual Discharge (m³/s)	Mean Annual Runoff (m³)
Grayling River									20.0	630,833,914
Beaver River	0	0	0.000%	1,536	0.000%	3	58,906	0.000%	344.2	10,862,659,426
Upper Liard River									1049.69	33,125,817,465
Middle Liard River									14.69	463,652,312
Lower Liard River	4	438,500	0.035%	87,763	0.007%				39.19	1,236,634,664
Liard Total	9	864,125	0.002%	90,046	0.000%	3	58,906	0.000%	1512.9	47,743,414,521
Petitot River										
Lower Petitot River	20	1,250,240	0.138%	667,995	0.074%	1	137,026	0.015%	28.7	904,314,069
Middle Petitot River	5	1,617,500	0.232%	3,349	0.000%	1	116,404	0.017%	22.1	698,562,753
Sahdoanah River	4	392,234	0.155%	7,698	0.003%	1	830	0.000%	8.0	252,625,362
Tsea River	3	211,700	0.049%	147,726	0.034%	2	2,783,632	0.641%	13.8	434,062,484
Upper Petitot River	4	570,900	0.039%	615,527	0.042%				46.8	1,476,579,488
Petitot Total	36	4,042,574	0.107%	1,442,295	0.038%	5	3,037,892	0.081%	119.4	3,766,144,156
Kotcho River										
Kyklo River	5	477,783	0.327%	4,775	0.003%	1	5,808	0.004%	4.62	145,897,691
Lower Kotcho River	1	147,000	0.047%	1,314	0.000%				9.87	311,519,217
Shekilie River	3	13,750	0.003%	9,681	0.002%				14.28	450,747,494
Upper Kotcho River	4	54,800	0.018%	6,819	0.002%				9.87	311,519,217
Kotcho Total	13	693,333	0.047%	22,589	0.002%	1	5,808	0.000%	47.2	1,489,518,720
Hay River										
Hay River	5	199,000	0.037%	57,358	0.011%				17.07	538,672,352
Hay Total	5	199,000	0.037%	57,358	0.011%	0	0	0.000%	17.1	538,672,352
Chinchaga River										
Chinchaga River	3	150,440	0.137%	4,270	0.004%				3.5	109,492,680
Chinchaga River Total	3	150,440	0.137%	4,270	0.004%	0	0	0.000%	3.5	109,492,680
Other	1	860		362						
Total	248	20,384,090		3,770,019		615	199,542,951			

Water Used for Hydraulic Fracturing in 2012

On Jan. 1, 2012 British Columbia implemented the mandatory disclosure of ingredients used in hydraulic fracturing fluids in the province. The website FracFocus.ca was launched, providing public access to information on fluids and ingredients used for the hydraulic fracturing of individual natural gas wells, as well as information on the process of hydraulic fracturing. Submissions also require data on volumes of water used for hydraulic fracturing.

The amount of water used for hydraulic fracturing varies considerably across northeast B.C., with the lowest use per well in the Heritage Basin of the Montney Play (south of the Peace River) and the highest use in the Horn River Basin (Table 3). The varying water requirements are largely dependent on the geology of the formation being fractured.

In 2012, a total of 7,054,704 m³ of water was used for hydraulic fracturing. The average water use was 6,670 m³/well (193 wells) in the Heritage Basin, 9,792 m³/well (138 wells) in the north Montney, and 76,923 m³/well (50 wells) in the Horn River Basin.

The watersheds with the highest total volumes of water used for hydraulic fracturing are in the Horn River Basin (Table 4). The total volume of water used for hydraulic fracturing from the Fort Nelson River (Middle Fort Nelson and Kiwigana rivers) was 2,299,257 m³, and from the Petitot River (Lower Petitot, Sahdoanah, Tsea and Upper Petitot rivers) the total water used was 2,156,636 m³.

The number of wells completed during the year remained fairly constant through the four quarters at 94, 94, 113 and 106, respectively. The highest volumes of water were used in the second and third quarters where most of the Horn River Basin wells were completed.

Of the water used for hydraulic fracturing in 2012, approximately 3.5 million m³ was acquired from short-term water use approvals, 1.5 million m³ was acquired from water licences, 0.5 million m³ was acquired from water source wells, with the remaining water acquired from other sources, including increased use of flowback and produced water recycling (Figure 1).

Table 3: Water used for hydraulic fracturing in 2012

Play	# of Wells	Mean (m ³ /well)	Total Water Use (m ³)
Horn River Basin	50	76,923	3,846,142
Montney – Heritage	193	6,760	1,304,619
Montney – North	138	9,792	1,351,341
Liard Basin	1	139	139
Cordova Embayment	15	36,704	550,563
Other	9	211	1,899
Total	406	17,376	7,054,704

Figure 1: Acquisition of hydraulic fracturing water

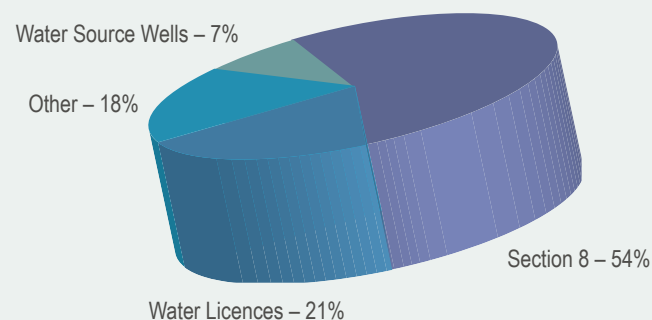


Table 4: Total number of wells completed and total amount of water used for hydraulic fracturing for 2012 in northeast B.C. as reported to the Commission through FracFocus.ca

Major & Sub-Basin Name	Q1		Q2		Q3		Q4		Annual 2012	
	# of Wells	Water Volume	# of Wells	Water Volume	# of Wells	Water Volume	# of wells	Water Volume	# of Wells	Water Volume
Beatton River										
Upper Beatton River	5	31,891	0	0	4	27,510	1	13,829	10	73,230
Middle Beatton River	0	0	0	0	0	0	0	0	0	0
Milligan Creek	3	788	0	0	1	0	0	0	4	788
Blueberry River	5	26,428	2	2,663	2	10,887	2	5,174	11	45,151
Doig River	0	0	0	0	0	0	0	0	0	0
Lower Beatton River	2	121	0	0	0	0	0	0	2	121
Beatton Total	15	59,228	2	2,663	7	38,396	3	19,003	27	119,290
Halfway River										
Upper Halfway River	0	0	0	0	0	0	0	0	0	0
Chowade River	0	0	0	0	0	0	0	0	0	0
Graham River	0	0	0	0	0	0	0	0	0	0
Cameron River	7	54,485	1	13,116	13	127,804	6	101,905	27	297,309
Lower Halfway River	1	10,261	1	2,700	7	61,042	5	65,508	14	139,511
Halfway Total	8	64,746	2	15,816	20	188,846	11	167,413	41	436,821
Moberly River										
Moberly River	0	0	0	0	0	0	0	0	0	0
Moberly Total	0	0	0	0	0	0	0	0	0	0
Pine River										
Burnt	0	0	0	0	0	0	0	0	0	0
Sukunka	0	0	0	0	0	0	0	0	0	0
Upper Pine	0	0	0	0	0	0	0	0	0	0
Murray	1	17,260	0	0	0	0	3	45,824	4	63,084
Lower Pine	10	51,953	18	109,837	4	33,409	2	28,161	34	223,360
Pine Total	11	69,213	18	109,837	4	33,409	5	73,985	38	286,443

Major & Sub-Basin Name	Q1		Q2		Q3		Q4		Annual 2012	
	# of Wells	Water Volume	# of Wells	Water Volume	# of Wells	Water Volume	# of wells	Water Volume	# of Wells	Water Volume
Kiskatinaw River										
East Kiskatinaw River	1	4,236	2	5,557	1	6,682	2	45,556	6	62,031
West Kiskatinaw River	0	0	0	0	1	72	0	0	1	72
Middle Kiskatinaw	4	3,579	0	0	2	1,970	1	7,529	7	13,078
Lower Kiskatinaw River	16	101,180	11	51,889	25	184,834	43	271,236	95	609,139
Kiskatinaw Total	21	108,995	13	57,446	29	193,558	46	324,321	109	684,320
Peace River										
Upper Peace River	0	0	0	0	0	0	4	38,074	4	38,074
Lynx Creek	0	0	5	73,755	0	0	0	0	5	73,755
Farrell Creek	9	149,286	13	175,738	8	101,690	3	50,368	33	477,081
Cache Creek	2	537	2	0	1	6,191	4	0	9	6,728
Pouce Coupe River	6	41,525	5	33,684	7	46,144	14	89,663	32	211,016
Lower Peace River	1	93	7	36,539	2	13,381	1	5,798	11	55,810
Peace Total	18	191,441	32	319,716	18	167,405	26	183,902	94	862,464
Smoky River										
Smoky River	0	0	2	39,188	1	14,876	2	13,669	5	67,732
Smoky Total	0	0	2	39,188	1	14,876	2	13,669	5	67,732
Muskwa River										
Upper Muskwa River	0	0	0	0	0	0	0	0	0	0
Middle Muskwa River	0	0	0	0	0	0	0	0	0	0
Lower Muskwa River	0	0	0	0	0	0	0	0	0	0
Muskwa Total	0	0	0	0	0	0	0	0	0	0
Prophet River										
Upper Prophet River	0	0	0	0	0	0	0	0	0	0
Middle Prophet	0	0	0	0	0	0	0	0	0	0
Lower Prophet	0	0	0	0	0	0	0	0	0	0
Prophet Total	0	0	0	0	0	0	0	0	0	0

Major & Sub-Basin Name	Q1		Q2		Q3		Q4		Annual 2012	
	# of Wells	Water Volume	# of Wells	Water Volume	# of Wells	Water Volume	# of wells	Water Volume	# of Wells	Water Volume
Sikanni Chief River										
Upper Sikanni Chief	1	2,222	4	39,616	0	0	0	0	5	41,838
Middle Sikanni Chief	5	29,827	0	0	0	0	11	128,013	16	157,840
Lower Sikanni Chief	0	0	0	0	0	0	0	0	0	0
Sikanni Chief Total	6	32,048	4	39,616	0	0	11	128,013	21	199,678
Fort Nelson River										
Fontas River	0	0	0	0	0	0	0	0	0	0
Kahntah River	0	0	0	0	0	0	0	0	0	0
Kiwigana River	0	0	7	976,657	0	0	0	0	7	976,657
Klua River	0	0	0	0	0	0	0	0	0	0
Sahtaneh River	0	0	0	0	0	0	0	0	0	0
Snake River	0	0	0	0	0	0	0	0	0	0
Upper Fort Nelson	0	0	0	0	0	0	0	0	0	0
Middle Fort Nelson	9	760,921	0	0	8	561,679	0	0	17	1,322,600
Lower Fort Nelson	0	0	0	0	0	0	0	0	0	0
Fort Nelson Total	9	760,921	7	976,657	8	561,679	0	0	24	2,299,257
Liard River										
Capot-Blanc River	1	139	0	0	0	0	0	0	1	139
Dunedin River	0	0	0	0	0	0	0	0	0	0
Lower Toad River	0	0	0	0	0	0	0	0	0	0
Grayling River	0	0	0	0	0	0	0	0	0	0
Beaver River	0	0	0	0	0	0	0	0	0	0
Upper Liard River	0	0	0	0	0	0	0	0	0	0
Middle Liard River	0	0	0	0	0	0	0	0	0	0
Lower Liard River	0	0	0	0	0	0	0	0	0	0
Liard Total	1	139	0	0	0	0	0	0	1	139

Major & Sub-Basin Name	Q1		Q2		Q3		Q4		Annual 2012	
	# of Wells	Water Volume	# of Wells	Water Volume	# of Wells	Water Volume	# of wells	Water Volume	# of Wells	Water Volume
Petitot River										
Lower Petitot River	0	0	8	676,972	0	0	0	0	8	676,972
Middle Petitot River	0	0	0	0	0	0	0	0	0	0
Sahdoanah River	0	0	0	0	0	0	2	859	2	859
Tsea River	0	0	0	0	18	869,913	0	0	18	869,913
Upper Petitot River	2	2,176	5	214,572	8	333,815	0	0	15	550,563
Petitot Total	2	2,176	13	891,544	26	1,203,728	2	859	43	2,098,307
Kotcho River										
Kyklo River	0	0	0	0	0	0	0	0	0	0
Lower Kotcho River	0	0	0	0	0	0	0	0	0	0
Shekilie River	1	106	0	0	0	0	0	0	1	106
Upper Kotcho River	2	147	0	0	0	0	0	0	2	147
Kotcho Total	3	253	0	0	0	0	0	0	3	253
Hay River										
Hay River	0	0	0	0	0	0	0	0	0	0
Hay Total	0	0	0	0	0	0	0	0	0	0
Chinchaga River										
Chingaga River	0	0	0	0	0	0	0	0	0	0
Chingaga Total	0	0	0	0	0	0	0	0	0	0
Total	94	1,289,159	93	2,452,483	113	2,401,897	106	911,164	406	7,054,704

