

## **SUMMARY OF GROUNDWATER QUALITY MONITORING AT JACKPINE FLATS IN 2002-03**

A safe and dependable supply of drinking water is critical to the health of all British Columbians, and we all want to have confidence in the quality of the water we consume. Drinking water quality is influenced by a number of factors including local geology, climate, and water flow patterns. Human land use activities in watersheds (such as urbanization/development, agriculture and forestry) can cause pollution, and are important influences on water quality.

The Regional District of Kitimat-Stikine (RDKS) is concerned about groundwater quality at Jackpine Flats, and has voluntarily begun creation of a Liquid Waste Management Plan to protect drinking water supplies. The provincial government recently created a Drinking Water Action Plan to prevent contamination of drinking water, identify potential risks and improve water quality. Although the Northern Health Authority (NHA) plays the primary role in implementing the action plan, providing safe drinking water requires an integrated approach. The B.C. Ministry of Water, Land and Air Protection (MoWLAP) manages and regulates activities in watersheds that have a potential to affect water quality, and plays the lead role in protecting and monitoring drinking water quality at its source. The RDKS, NHA, and MoWLAP are all committed to improved protection of drinking water sources, and they have recently formed a partnership to assess source water quality at Jackpine Flats.

### **JACKPINE FLATS**

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Jackpine Flats is a rural subdivision between Thornhill and Lakelse Lake. It consists of approximately 100 parcels of land zoned as high and low-density rural lots. Most contain single family residences, and there are a few “hobby farms” in the area. Sewage disposal is on-site using septic tanks and tile fields. Much of the subdivision has been logged and what little topsoil existed has been lost in many areas. The underlying substrate is largely coarse gravel, stones and cobbles, and percolation rates are very high.

Drinking water supplies in the subdivision are from groundwater with individual wells on each property. The groundwater table is reported to be only 6 – 7 meters from the surface, and most drinking water wells are quite shallow with reported depths in the 5 – 20 m range. Groundwater quality in the subdivision has not been formally monitored and most water users said that they did not know the current quality of their drinking water. There is a general concern that sewage disposal systems may contaminate groundwater. The importing of “hog fuel” (chipped wood waste) for lawns, and agricultural activities including hobby farms, are other potential sources of groundwater contamination. The risks associated with these activities are amplified by the high percolation rates and shallow depths of the wells.

## 2002-03 GROUNDWATER QUALITY MONITORING PROGRAM

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Jackpine Flats groundwater was sampled at a number of residential wells in the subdivision. Sampling began in August 2002 at three sites. In subsequent sampling sessions conducted in October 2002, and April and August 2003, the program was expanded to include nine sites at a range of locations in the subdivision. Although groundwater flow patterns have not been established, this study assumes the general direction of groundwater flow is from the northeast to the southwest, and sampling sites were located in the upstream, middle and downstream parts of the aquifer. Water samples were analyzed for three indicators of bacteriological water quality (fecal coliforms, *E. coli*, and *Enterococci*), as well as a range of physical and chemical parameters that have health and aesthetic implications in drinking water. Test results were compared to B.C. MoWLAP approved and working guidelines for drinking water quality.

### TEST RESULTS FROM JACKPINE FLATS

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Both fecal coliform and *Enterococci* organisms were detected in Jackpine Flats groundwater wells, mostly in low concentrations. Eighty-eight samples had no bacteriological indicators, but five samples contained *Enterococci* and one sample contained fecal coliforms. The MoWLAP drinking water (*No Treatment*) guideline for groundwater is zero bacteriological indicators detected, so six samples did not meet MoWLAP drinking water guidelines. See *Data Summary for Jackpine Flats* (attached) for additional information.

Turbidity in Jackpine Flats wells occasionally exceeded the recommended level of 1 NTU for water entering distribution systems, indicating that effectiveness of treatment systems may be compromised by suspended materials in the water. There were two sites where turbidity was measured at levels higher than the 5 NTU (maximum) aesthetic guideline. Colour exceeded the aesthetic drinking water guideline in one sample, and iron and manganese occasionally exceeded aesthetic guidelines. The observed concentrations do not pose a health risk. Other physical and chemical parameters were below (MoWLAP) guideline levels.

Water in Jackpine Flats wells had a low concentration of dissolved solids (specific conductance values were low), which is more characteristic of surface water rather than groundwater. This suggests that surface water is being transmitted into the groundwater, which is possible given the permeability of the substrate. The effect is a higher risk of groundwater contamination, as infiltration of surface waters is a known source of groundwater contamination.

There does not appear to be a significant difference in water quality from one site to another, or one area of the subdivision to another. No site had consistently poor water quality results, but occasional low-level detection of nitrate, chloride and ammonia

suggest possible localized influences on groundwater quality. There was no correlation between detections of bacteria, nitrate, chloride and ammonia, which are common indicators of sewage or agricultural influence on groundwater, and bacteriological indicator concentrations were much lower than would be expected if widespread contamination from domestic sewage or hobby farms was occurring.

Slight differences in observed water quality may possibly be accounted for by different well depths, or by varying qualities of well construction and well-head protection. Although results show only low levels of contamination at the present time, the permeable ground and shallow depth to groundwater is cause for concern. The situation in Jackpine Flats warrants ongoing consideration about how to ensure the safety of drinking water supplies.

## DATA SUMMARY OF JACKPINE FLATS MONITORING (2002-03)

The table below summarizes bacteriological indicator results from Jackpine Flats sampling sites (JF1 – JF9). *Because the No Treatment guideline (zero organisms detected) applies to bacteriological indicators in groundwater samples, every detection represents a guideline exceedence.*

### Summary of Bacteriological Indicator Guideline Exceedences in Jackpine Flats Groundwater

Site	# Samples	# Guideline Exceedences (blank square = 0)		
		Fecal Coliforms	<i>E. coli</i>	<i>Enterococci</i>
JF1	19	1		1
JF2	20			2
JF3	10			
JF4	15			
JF5	5			
JF6	10			1
JF7	1			
JF8	10			1
JF9	4			
ALL SITES	94	1		5

The table below summarizes other water quality results from Jackpine Flats sampling sites (**JF1 – JF9**). Results are reported in mg/L unless otherwise noted.

	# Values	Minimum	Maximum	Mean	Drinking Water Guideline	
<b>PYHSICAL</b>						
pH (pH units)	19	6.9	8.2	7.3	≤ 8.5	ao (>6.5)
Specific Conductance (uS/cm)	22	41	109	69	≤ 700	mac
Residue Filterable - TDS	9	34	68	53	≤ 500	ao
Hardness Total - T	22	15.9	49.0	30.8	≤ 500	mac
Alkalinity (mg/L CaCO <sub>3</sub> )	9	21.5	46.5	34.4		
<b>ANIONS</b>						
Chloride Dissolved	22	0.5	3.0	1.4	≤ 250	ao
Fluoride Dissolved	9	0.01	0.03	0.02	≤ 1.5	mac
<b>CARBON</b>						
Organic Carbon - Total	8	0.5	0.7	0.5	≤ 2	mac (THM)
<b>NITROGEN</b>						
Total Kjeldahl N	13	0.02	0.05	0.02		
Total N	13	0.02	1.26	0.22		
Total Organic N	13	0.1	0.1	0.1		
Ammonia N	22	0.005	0.029	0.006		
Nitrate Nitrogen Dissolved	22	0.02	1.21	0.20	≤ 10	mac
Nitrate+Nitrite	22	0.002	1.210	0.196		
Nitrite Nitrogen	22	0.002	0.005	0.002	≤ 1	mac
<b>PHOSPHORUS</b>						
Ortho-Phosphorus	0					
Phosphorus Total Dissolved	0					
Phosphorus Total	0				≤ 0.01	mac (lakes)
<b>SULFATE</b>						
Sulfate	9	1.3	3.8	2.3	≤ 500	ao
<b>METALS TOTAL</b>						
Aluminum	22	0.0003	0.0269	0.0048	≤ 0.2	mac
Antimony	22	0.00001	0.00026	0.00003	≤ 0.006	imac
Arsenic	22	0.0001	0.0002	0.0001	≤ 0.025	imac
Barium	22	0.00289	0.01490	0.00905	≤ 1	mac
Beryllium	22	0.00002	0.00002	0.00002		
Bismuth	22	0.00002	0.00002	0.00002		
Cadmium	22	0.00001	0.00001	0.00001	≤ 0.005	mac
Calcium	22	5.54	16.70	10.86		
Chromium	22	0.0002	0.0012	0.0003	≤ 0.05	mac
Cobalt	22	0.000005	0.000015	0.0000065		
Copper	22	0.00129	0.17300	0.02545	≤ 1	ao
Iron	19	0.007	26.200	1.565	≤ 0.3	ao
Lead	22	0.00007	0.00246	0.00047	≤ 0.01	mac
Lithium	22	0.00005	0.00070	0.00011		
Magnesium	22	0.47	1.77	0.88	≤ 100	ao
Manganese	22	0.000258	1.380000	0.083225	≤ 0.05	ao
Molybdenum	22	0.00005	0.00105	0.00037	≤ 0.25	mac
Nickel	22	0.00005	0.00122	0.00012		
Selenium	22	0.0002	0.0004	0.0002	≤ 0.01	mac
Silver	22	0.00002	0.00002	0.00002		
Strontium	22	0.029000	0.059000	0.044755		
Thallium	22	0.000002	0.000004	0.000002		
Tin	22	0.00001	0.00251	0.00018		
Uranium	22	0.000002	0.000145	0.000046	≤ 0.02	imac
Vanadium	22	0.00010	0.01440	0.00106	≤ 0.1	mac
Zinc	22	0.0010	0.0421	0.0094	≤ 5	ao

Note: ao = aesthetic objective; mac = max acceptable concentration; imac = interim max acceptable concentration