

June, 2019

This issue was prepared in May but had to be postponed until after the Supreme Court's decision in June. The next issue will provide a more current update.

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Deliveries to the Bison Ranch

We began limited initial delivery of the biosolids-wood fibre mix to the ranch in April. We remained in contact with neighbours directly adjacent to the project during deliveries who reported they had not noticed any odours or noise. We received one complaint about the speed of a truck and immediately contacted the driver and trucking management to address the issue and rectified the situation. The site was receiving truckloads of biosolids-wood fibre mix until April 29 when a blockade was set up on English Road.

Figure 1 shows an image of the material that was delivered to site. This material was mixed with native soil and will be tested before it is applied to the land.

We encourage anyone who has a concern or complaint with odour or an Arrow truck to contact us immediately, so we can address the issue.



Figure 1. Delivery of biosolids-wood fibre pre-mix to the Bison Ranch.

Organic Matter Recycling Regulation

The Organic Matter Recycling Regulation of B.C. (OMRR) governs the land application of biosolids, as well as composting facilities for biosolids and other organic matter (defined in Schedule 12 of the regulation). The sections of the OMRR that directly relate to the land application are:

- *Part 3 – Land Application and Distribution Requirements:*
 - Division 1 – Land Application Plan, and
 - Division 3 – Class B Biosolids
- *Part 4 – Storage and Land Application Requirements:*
 - Division 1 – Storage at a Land Application Site, and
 - Division 2 – Notification of Land Application of Managed Organic Matter

Land applications do not fall under section 3.1 or *Part 5 – Composting Facility Requirements*. At the Bison Ranch we are not constructing or operating a composting facility, and we are not producing compost, nor have we ever had plans to do so.

The land application process requires a Land Application Plan (LAP), the requirements of which are defined in Schedule 7 of the OMRR. A LAP is submitted to the Ministry of Environment, the health authority, and to the Agricultural Land Commission if the location is within the Agricultural Land Reserve (ALR). We submitted a LAP for the project to the required authorities as required by the OMRR.

Schedule 8 of the OMRR defines the management requirements of a Land Application for class B biosolids, including restrictions around timing of applications, and the required buffers to water and roads. The required buffer to irrigation wells, lakes, rivers, and streams is 30 meters; our Turtle Valley project plan adjusted this buffer to 100 meters to Chum Lake and 60 meters to Chum Creek.

We must also comply with Schedule 10.1 of the regulation, which defines the concentration limits for trace metals in soils under different conditions for different uses. Our fabricated soils must meet the Agricultural Soil Standards.

The Turtle Valley project is in compliance with all applicable sections of the OMRR. For more information about the OMRR and the project in general you can visit the Government of BC website at:

<https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-permitting-compliance/turtle-valley-biosolid-application>

Summary of Water Quality Data

During our initial consultation about the project with individual residents, we were asked several questions about possible leaching and the protection of local water bodies. We shared some of our mitigation strategies in the March newsletter.

To recap, OMRR requires 30-metre buffers from surface water to biosolids applications. Our operation at the Bison Ranch will maintain a buffer of 100 metres from Chum Lake and 60 meters from Chum Creek, with the goal of providing extra assurance the project will not impact either. The buffers start at the farthest edge of the reed-like vegetation found at the site

We shared baseline water sampling data in the April newsletter and have now completed six sampling events of Chum Creek and Chum Lake between March 28 and April 22, 2019. This data is attached at the end of this newsletter and summarized below. The majority of these samples were taken before any biosolids deliveries and show the water quality in Chum Lake and Chum Creek prior to the delivery of any significant amounts of biosolids. No additional samples have been taken since April 22 due to the blockade on English road. Water sampling will continue once operations commence.

The initial water sampling indicates that prior to the delivery of any significant amounts of biosolids to the project site both Chum Creek and Chum Lake had elevated phosphorus (P). The Canadian Council of Ministers of the Environment state that most uncontaminated freshwaters contain between 0.01 and 0.05 mg/L of total P¹. The average total phosphorous in Chum Creek was 0.05 mg/L, an average in the upper range with some samples exceeding this 0.05 mg/L limit. The total phosphorus in Chum Lake was measured at 0.04 mg/L.

Based on these initial samples, Chum Lake can be considered eutrophic¹. Eutrophic lakes have a high amount of nutrients that can promote excessive algal growth, potentially leading to detrimental effects on fish. For context, the main arm of Shuswap Lake was not considered eutrophic until declining water quality suggests some regions may be becoming eutrophic².

Pre-project water sampling also detected fecal coliforms in both Chum Lake and Chum Creek, indicating the water was impacted by either human or other warm-blooded animals' fecal matter prior to the delivery of any significant amounts of biosolids. Canadian drinking water standards are 0 E.coli /100mL, therefore anyone taking water directly from the stream or lake for household water should consider their own testing prior to consuming water from these sources.

As stated in our April update, if you would like access to the original lab data, please contact Michelle Harris at mharris@arrow.ca.

Please feel free to contact any of the individuals listed below by phone or email if you have any questions or concerns about the issues raised in this newsletter or the project in general.

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¹ Canadian Council of Ministers of the Environment. 2004. Canadian water quality guidelines for the protection of aquatic life: Phosphorus: Canadian Guidance Framework for the Management of Freshwater Systems. In: Canadian environmental quality guidelines, 2004, Canadian Council of Ministers of the Environment, Winnipeg.

² Northwest Hydraulics Consultants Ltd. 2010. Integrated Water Quality Monitoring Plan for the Shuswap Lakes, BC. Prepared for Fraser Basin Council

Table 1. Water Quality Data

Many nutrient parameters do not have water quality guidelines. Where there are no guidelines the cell has been left blank. The trace elements that do not have a guideline have been excluded from this summary. Original lab reports are available upon request.

Nutrients and Coliforms	Units	Chum Creek	Chum Creek	Chum Creek	Chum Lake	Chum Creek	Chum Creek	Guidelines	
		Mar. 28	Apr. 3	Apr. 9	Apr. 10	Apr. 16	Apr. 22	CCME (Freshwater, Long Term) ¹	BC WQ Guidelines ²
Chloride	mg/L	5.68	5.64	5.61	5.11	4.27	4.19		150
Nitrate (as N)	mg/L	0.128	0.085	0.029	<0.010	0.28	0.12	13	3
Nitrite (as N)	mg/L	<0.010	<0.010	0.016	<0.010	<0.010	<0.01	60	0.06
Sulfate	mg/L	43.3	41.7	36.6	33.4	32	30		429
Hardness, Total (as CaCO ₃)	mg/L	203	-	183	199	-	187		
Nitrogen, Total	mg/L	0.871	0.335	0.84	0.706	0.66	-		
Ammonia, Total (as N)	mg/L	0.18	0.057	0.023	0.027	0.057	-		~1.26*
Nitrogen, Total Kjeldahl	mg/L	0.743	0.25	0.795	0.706	0.633	-		
Phosphorus, Total (as P)	mg/L	0.0622	0.0549	0.049	0.0382	0.0451	0.0436	0.035	0.005-0.015
Phosphorus, Total Dissolved	mg/L	0.0173	0.0043	0.0128	0.0096	0.0096	0.0087		
pH	pH units	8.06	8.14	8.14	8.15	8.09	8.08		
Coliforms, Total	CFU/100 mL	-	>= 2	>=17	>=13	-	-		
Background Colonies	CFU/100 mL	-	> 200	>200	>200	-	-		
Fecal Coliforms	CFU/100 mL	-	-	2	1	-	23		
E. coli	CFU/100 mL	-	<1	2	1	-	9.1		

Table 1. Water Quality Data continued

Trace elements	Unit	Chum Creek	Chum Creek	Chum Lake	Chum Creek	Guidelines	
		Mar. 28	Apr. 9	Apr. 10	Apr. 22	CCME (Freshwater, Long Term) ¹	BC WQ Guidelines ²
Aluminum, total	mg/L	0.0878	0.0884	0.0729	0.251		0.05 (dissolved)
Arsenic, total	mg/L	0.00077	0.00066	0.00068	0.0007	0.005	0.005
Boron, total	mg/L	0.0081	0.0111	0.0075	0.0051	1.5	1.2
Cadmium, total	mg/L	0.000012	<0.000010	<0.000010	0.000016	0.00009	0.0004
Cobalt, total	mg/L	0.00018	0.00016	0.00014	0.00022		0.004
Copper, total	mg/L	0.00096	0.00105	0.00093	0.00146	4	0.008
Iron, total	mg/L	0.198	0.21	0.163	0.343	0.3	1
Lead, total	mg/L	<0.00020	<0.00020	<0.00020	0.00022	0.007	0.01
Manganese, total	mg/L	0.25	0.0672	0.0676	0.0517		1.50
Mercury, total	mg/L	<0.000010	<0.000010	<0.000010	<0.00001	0.00026	
Molybdenum, total	mg/L	0.00438	0.00504	0.0058	0.00572	0.073	1
Nickel, total	mg/L	0.00095	0.007	0.00065	0.00106	150	
Selenium, total	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.001	0.002
Silver, total	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.00025	0.0015
Thallium, total	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	0.8	
Uranium, total	mg/L	0.00628	0.00479	0.00466	0.00493	0.015	
Zinc, total	mg/L	<0.0040	0.0058	<0.0040	0.0042		0.027

¹Water quality guidelines for the protection of aquatic life, fresh water, long term guidelines. Available at: <http://sts.ccme.ca/en/index.html?chems=4,5,8,9,12,15,16,20,21,61,65,66,67,71,123,124,127,129,131,138,139,140,141,143,167,197,198,200,204,207,211,213,219,225,226,229&chapters=1,2>

²BC Approved Water Quality Guidelines for freshwater aquatic life. Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf

*BC Ammonia water quality guidelines are variable depending on water temperature and pH.