

## PROJECT ACTIVITIES

Thirty-three pharmaceuticals and personal care products (PPCPs) were evaluated in the wastewater, sludge and invertebrates of the primary, secondary and tertiary ponds of the Whitehorse sewage lagoon. All 33 PPCPs were detected in water, sludge or invertebrate samples. Although all PPCPs were detected, many were measured at levels below the limits of quantification. The PPCPs with the highest concentrations in wastewater at the WSL were acetaminophen (150 000 ng/L), caffeine (100 000 ng/L) and ibuprofen (10 000 ng/L). The PPCPs with the highest concentrations in sludge were triclosan (93 000 ng/g), triclocarban (31 000 ng/g), and citalopram (6200 ng/g). Estrogens were the PPCPs with the lowest concentrations in both water and sludge. With the exception of carbamazepine and the estrogens, all PPCP concentrations were significantly reduced between primary cell B and secondary cell 2. Estrogen concentrations in the long-term storage pond were higher than those found in primary cell B. Within secondary cell 2, there was a general tendency for PPCP concentrations of water and sludge to decrease from July to September. The concentrations of PPCPs in water and sludge at the Whitehorse sewage lagoon were generally lower than those found in other studies. Among 21 PPCPs tested for within four invertebrate types, every PPCP was detected, except the synthetic musk, celestolide. However, only triclosan, triclocarban, galaxolide, and musk ketone had concentrations greater than the limits of quantification.

Based on the concentrations and the available toxicological data, the risks of acute toxic effects from these PPCPs at the Whitehorse sewage lagoon are believed to be not likely. However, risks posed by chronic and cumulative effects of PPCPs are largely unknown. Chronic effects are of particular concern at the Whitehorse sewage lagoon due to the long retention time of wastewater within the system. The potential risk of cumulative effects at the WSL is important because of the chronic presence of PPCPs. Recently, priority lists have been created to focus research efforts on particular PPCPs that may pose the greatest environmental risk. PPCPs present at the Whitehorse sewage lagoon, which are consistently found on these priority lists, are sulfamethoxazole, trimethoprim, ibuprofen, estrogens, atenolol, carbamazepine, and gemfibrozil. These chemicals are listed as priority based on their consumption, acute toxicity, degradation and bioaccumulation potential. Currently in Canada, no prioritization lists occur. Furthermore, no guidelines exist for concentrations in the aquatic environment. The state of PPCP research in Canada is still in its infancy. This study is the first of its kind to specifically focus on the occurrence, removal and risk of PPCPs in a northern wastewater treatment plant.

Variances of dates did occur between the work plan and the actual sampling. When the work plan was created it was unknown when the most appropriate time would be to collect invertebrate samples. The work plan said the sampling would occur in May, July and September; however actual sampling occurred in July and August. A third invertebrate sample was not collected because more samples were collected during July and August.

Although point count surveys, waterfowl breeding surveys, and invertebrate surveys were conducted, they were not completely as thoroughly as originally planned. This was because the focus and importance of the project shifted away from the bird use to more of the occurrence of pharmaceuticals. A lot of time was required to complete the bird surveys thoroughly and that time was unfortunately not available this summer. Only a small amount of time was required to collect the water, sludge and invertebrate samples for analysis.

The results of this research contribute to the protection and enhancement of fish, wildlife and their habitat because this data has never been collected before at the Whitehorse sewage lagoon. The preliminary results collected during the summer of 2013 will be used as baseline data to guide further research at the lagoon. This report will also raise awareness among the Whitehorse community of the occurrence of pharmaceuticals and personal care products in domestic wastewater potentially entering the environment, including the Yukon River.

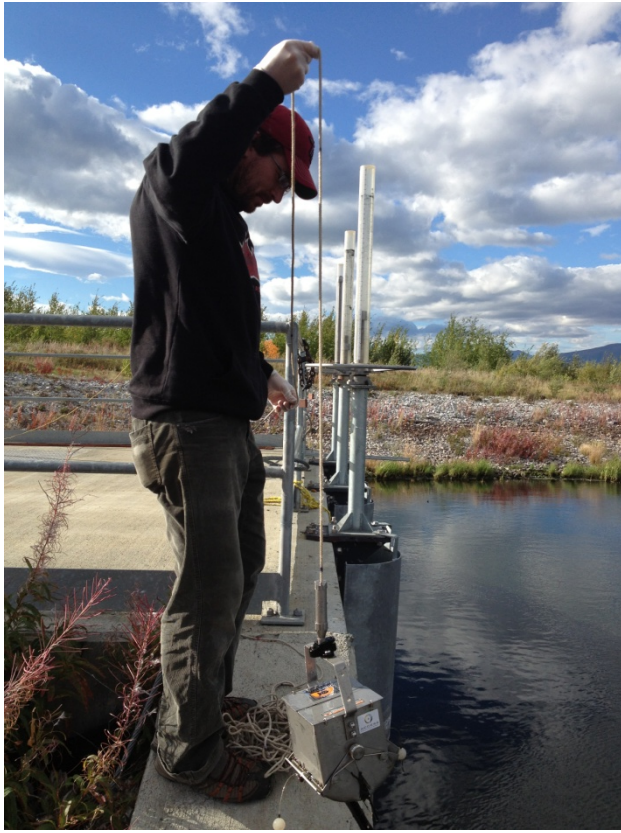
## **COMMUNICATIONS**

Printed hard copies of the final report will be hand delivered to the Fish and Wildlife Enhancement Trust, Northern Research Institute, City of Whitehorse, Environment Canada, Yukon College and Department of Fisheries and Oceans. An electronic copy of the final report will also be sent to the organizations listed above as well as any group, person, or government that is interested.

The financial support of the Yukon Fish and Wildlife Enhancement Trust was thankfully recognized in the “Acknowledgements” of the final report. The YFWET logo was also displayed in the Acknowledgements of the final report. Presentations of the project have also been completed with more likely to occur in the future. An “Acknowledgements” slide in the presentation recognizes the financial support of the YFWET fund.

Although specific communication strategies and techniques were not used to promote the project, verbal communication of this project was passed through the grapevine of the scientific community

because of the uniqueness and timeliness of a project such as this. In addition, the CBC radio broadcast team has taken an interest in this project and has performed one live radio interview and one television interview with me regarding the results of the project. It is anticipated that they will want to perform more interviews once a second summer of field work has been completed and the results are more conclusive.



**Picture 1. Sampling the sludge with an Eckman dredge from the long-term storage pond on September 14, 2013.**



**Picture 2. Transferring the sludge from the Eckman dredge to the sample bottle.**



**Picture 3. Water sampling from the long-term storage pond on September 14, 2013.**