Applied Polymer Systems, Inc.
519 Industrial Drive, Woodstock, GA 30189
www.siltstop.com

Innovations

Water Treatment

Clover Bar Ravine Clean Up, Edmonton, Alberta

The Clover Bar Ravine is located north of Edmonton, Alberta, in a moderate to heavy industrialized area. The ravine flows directly into the North Saskatchewan River and both are lively with fish and aquatic organisms. The City of Edmonton Risk Management Plan required water samples be taken from Clover Bar Ravine between 2004 and 2011 and tested for metal concentrations and hydrocarbons. The samples taken between 2004 and 2007 showed various metal concentrations that exceeded guidelines set by several regulatory agencies and departments to include the CCME (Canadian Council of Ministers of the Environment), AENV (Alberta Environment), and the Sewer Use Bylaw.

The source of the contamination was due to several industrial companies as well as surface runoff discharge. Analysis of samples from 2004 to 2007 indicated a continuous active source of metals located upstream in the ravine. The Clover Bar Ravine and the North Saskatchewan River are fish-bearing water bodies; therefore, an eco-friendly solution needed to be implemented to treat the ongoing metal and sediment contamination. The chosen treatment method was a passive system using environmentally safe, site specific Floc Logs® from Applied Polymer Systems, Inc. of Woodstock, Georgia. The Floc Logs® were installed to capture and reduce metal concentrations and turbidity levels without harming aquatic organisms.

Left: Water before treatment with Floc Logs.

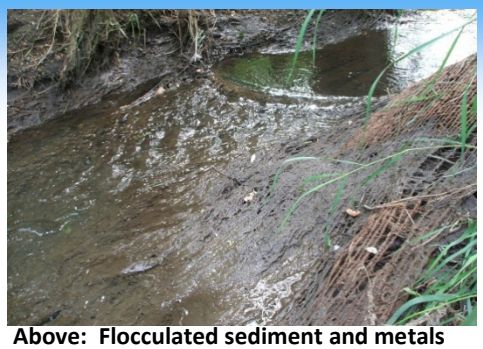
Below: Jute matting was installed along the stream bed and banks.

Flog Logs® are anionic polyacrylamide based water clarification products. Floc Logs® are water soluble and must be placed within the flow of water to achieve adequate mixing and dissolution of the log components. As the logs dissolve they bind with suspended sediment, metals, and nutrients to form larger particulate that can be settled out or captured. Binding of particulate is achieved through flocculation in which large agglomerates are formed through the bridging of the polymer with two or more particles.

Left: Floc Logs were attached to sand bags, which added extra turbulence.

Right: Jute lining the creek bed and banks captured flocculated metals and sediment, preventing them from discharging into the stream and river.

These flocs are heavy and settle quickly out of the water column. Natural fiber matting, such as jute, is used in conjunction with Floc Logs® to provide an area of attachment for the polymer charged particles as well as added erosion control. Floc Logs® are composed of anionic, negatively charged, polyacrylamides. This charge repels against the negatively charged gill mucous of fish and other aquatic organisms, making them nontoxic even at high dosages and safe for use in the open aquatic environment, unlike cationic (positively charged) polyacrylamides or chitosan that can cause detrimental effects to aquatic organisms.



Above: Flocculated sediment and metals attached to jute matting result in clear water discharging from the treatment train.

The passive treatment system was installed in June 2007. The treatment system was designed with 34 Floc Logs® placed along the creek bed beginning at the outfall. Before the logs were installed, the streambed was lined with an open-weave jute matting to prevent further erosion and work as an area of attachment for flocculated particulate. The logs were placed 10 feet apart alternating between APS 703d#3 and 706b Floc Logs®. Sand bags were placed in the channel and the Floc Logs® were tied off to them. The sand bags kept the logs in place as well as increased the turbulence of the water flowing over and around the logs, increasing mixing which in turn improved the reaction and performance of the system. The only maintenance required for this passive treatment system was simple monitoring of the banks to ensure they were not washing out. The biodegradable jute matting was not removed; new layers were simply applied directly on top of existing layers.

Above: Success is evident with clear water exiting.

Once the treatment system was installed, water and sediment samples were taken before and after the Floc Logs®. These samples were analyzed to observe changes in levels of contamination before and after treatment. The metals of concern that were tested include Aluminum, Copper, Iron, Lead, Nickel, and Zinc. This treatment system was in place during the summer months of 2007, 2008, and 2010. In 2009, the system was not used due to beaver activity flooding the area; in 2011, the system was not used due to embankment repairs and the possibility of further work upstream that may have compromised the treatment system. As can be seen in the table below, the passive treatment system consistently reduced the metals of concern as well as turbidity.

	Before Floc Logs (2007)	After Floc Logs (2007)	Before Floc Logs (2008)	After Floc Logs (2008)	Before Floc Logs (2010)	After Floc Logs (2010)
Aluminum	0.218 mg/L	0.114 mg/L	4.08 mg/L	0.322 mg/L	11.6 mg/L	1.19 mg/L
Copper	0.055 mg/L	0.01 mg/L	0.085 mg/L	0.027 mg/L	0.036 mg/L	0.018 mg/L
Iron	2 mg/L	0.6 mg/L	5.19 mg/L	0.49 mg/L	20.6 mg/L	1.98 mg/L
Lead	0.0009 mg/L	0.0003 mg/L	0.0057 mg/L	0.0004 mg/L	0.0155 mg/L	0.0015 mg/L
Nickel	0.013 mg/L	0.0039 mg/L	0.012 mg/L	0.0052 mg/L	0.0373 mg/L	0.0058 mg/L
Zinc	0.12 mg/L	0.014 mg/L	0.259 mg/L	0.066 mg/L	0.248 mg/L	0.037 mg/L
TSS	20 mg/L	4.2 mg/L	95 mg/L	11 mg/L	1060 mg/L	44 mg/L

Analysis of the water samples taken during treatment years showed a clear reduction in metals as well as total suspended solids (TSS) after the Floc Log system was installed. Water collected downstream from the treatment system showed dramatic reductions in TSS levels. Sampling revealed TSS levels as low as 4 mg/L and clear visibility to the bottom of the stream. Large concentrations of collected sediment were observed within the treatment system and sediment samples from the first site showed large concentrations of metals within sediment that had accumulated around the Floc Logs®. There was then a gradual decrease in metal concentrations moving further downstream in the treatment system. The passive treatment system achieved turbidity levels and metal concentrations limits that were established by the regulatory agencies. These results are proof positive that the implementation of the polymer enhanced passive treatment system was highly successful and the eco-friendly solution to reducing turbidity and metal contamination within the Clover Bar Ravine.

For product and distributor information, please contact us at:
Applied Polymer Systems, Inc. • 519 Industrial Drive • Woodstock, GA 30189
Phone: 678•494•5998 Email: info@siltstop.com www.siltstop.com