Turbidity Barriers - Mine Site Reclamation Project

Presented by: Murray Banting, R.E.T.
Turbidity Curtain Details

- PVC coated polyester floatation cover; helps to contain hydrocarbons and floating debris *
- Optional galvanized cable (5/16" typ.) **
- Polycarbonate tow/endpoint ***
- Brass grommets
- Dual stitching on all seams
- Geotextile skirt options:
  - semi-permeable monofilament or woven slit film
  - impermeable reinforced polyethylene
- Galvanized chain ballast (5/16" typ.)
- Heat sealed floatation pocket

* Floatation size (6", 8" or 12") determined by skirt depth and other site variables.
** Optional top tension cable is available for increased strength.
*** Other end types, such as aluminum universal slide or slotted tube are also available.

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Turbidity Curtains - History

First put to use in early 1970’s. Got started in logging industry when nets were suspended from log booms to catch log debris. Later the nets were replaced with fabrics such as canvas to confine mud and finer debris. The term “Log” still is used today to describe the floating PVC and poly-booms used today.
A turbidity curtain or barrier consists of a floating top boom section attached to a skirt constructed of either impermeable or permeable materials. The skirt is equipped with a ballast chain or other weight to anchor and “seal” it to the bottom.
Turbidity Barriers optional anchoring details
Typical Applications of Turbidity Barriers

1.) Minimize migration of fines during in-water construction – i.e.: intake structures, pipeline crossings, lakeshore rehabilitation, etc.

2.) Spill containment – booms and curtains used to confine sludge or floating debris to specific areas.

3.) To create forebays in sedimentation ponds, storm water ponds, tailings ponds to replace conventional earthen-fill dykes.

4.) To trap pollutants suspended in the water column – i.e.: protect water intakes, beaches etc.
Storm Pond - Bridlewood
Advantages over conventional means

- Low cost compared to other permanent structures
- Portable, movable and able to install rapidly
- Minimal disturbance to environment
- Minimal access required – usually deployed from a small boat by hand
- Regulatory authorities (DFO) are familiar with turbidity curtains and recommend use.
Air Photo of Bay
Photo of Galena Bay looking south

17 km
Blue Bell mine

Project: Located on east shore of Kootenay Lake approx. 75 km N. of Creston

Project Engineers: Bel MK - Calgary

Environmental Monitors: Morrow Environmental - Cranbrook

Contractor: McKay Const. - Kimberly

Supplier of Turbidity Curtains: AGES Inc. Calgary
Remedial Design

- Source removal was selected as the remedial approach.
- Necessary to recover process fines to a depth of 0.5 m below low water to prevent ARD/ML.
- Cap process fines to a depth of 5 m below low water.
- Construct an engineered beach that would resist becoming re-contaminated by offshore tailings during peak storm events.
Challenges associated with implementing the remedial design included:

1) Recovering contaminated sediments from Kootenay Lake;
2) Constructing a beach that would cap submerged contaminated sediments;
3) Preventing contamination of the lake by sediment and/or metal-containing water; and
4) Obtaining necessary approvals and permits in a nine-week period.
1) Build a temporary dam across the bay, dewater and work in a “dry” environment.
2) Build a temporary dyke across the bay and work in a saturated environment.
3) Install sheet piling and work in a saturated environment.
4) Install floating silt barriers and work in a saturated environment.
Floating silt barriers were selected as the preferred approach to working in the lake due to:

- Minimal disruption to bottom of bay;
- Quick deployment;
- Bay geometry;
- History of successful use in marine environments in the USA; and
- Cost effectiveness.
Siltation Barrier Material/Construction
Adding oil absorbent skimmer
Recovery of Deep Process Fines
300 NTU vs 3 NTU
Lake Water Quality on May 4th, 2001

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- ug/L (Metals)
- mg/L (TSS)
- NTU (Turbidity)
Can turbidity curtains fail?

Yes - Most turbidity curtain projects are required only in difficult situations. Any marine environment exposes many hazardous and often unpredictable situations. Build in safety factors such as redundancy, extra strength, heavy cables and robust materials are important. Monitoring and inspection on regular basis also important.
Compromised Containment
... and just when you thought it was safe to go in the water....
Mud slide occurred on lake bottom due to earthwork activities and unstable fine deposits. Additional weight of the new fill and constant vibration was determined to be cause of rapid slumping of debris along sloping lake shore below water level.
Repair work being done on shore once curtains pulled from lake. Excavator and tug boat used to extract curtains from under debris.
Damage caused to sides of curtain from mud slide and removal efforts.
Performance of Containment System

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Legend:
- Blue diamonds: Inside Primary
- Orange stars: Inside Secondary
- Pink circles: Outside Secondary
Sediment Transport Control
Exposed Final Upper Foreshore
The floating silt barriers were effective in minimizing the transport of contaminants further into Galena Bay.

Floating silt barriers were an appropriate control method given the environmental setting.

Open communication with regulatory agencies resulted in a positive, cooperative working relationship.
Evaluation of Sediment Control Program

- Intercepting groundwater seepage and diverting Hammil Creek prevented an unnecessary flux of water and sediment into the contained area.
- Working from “top down” minimized the amount of time that the contractor was working below low water.
- Pit-run fill material with a lower percentage of silt would have reduced the sediment loading to the curtain.
Evaluation of Sediment Control Program

- The primary containment barrier was deployed too close to shore.
- The design of the other barrier components could be improved to function better in a lake environment.
- Earlier routine underwater inspections may have resulted in mitigative action being taken sooner in some situations.
Thank You

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Special thanks to Morrow Environmental Consultants for technical data & photos