



**Hudson Bay Mining & Smelting Co., Limited**  
**Flin Flon Tailings Impoundment System**  
**Saskatchewan Government Annual Report – 2009**



**Hudson Bay Mining & Smelting Co., Limited**  
**Flin Flon Tailings Impoundment System**  
**Saskatchewan Government Annual Report - 2009**

---

**1. Introduction**

Hudson Bay Mining & Smelting Co., Limited (HBMS) has operated the base metal tailings management area known as the Flin Flon Tailings Impoundment System (FFTIS) for over 70 years. In 1991, the Saskatchewan Department of Environment and Public Safety, Mines Pollution Control Branch, established effluent limits for the tailings pond discharge by issuing Ministerial Approval No. MPCO-36. This license has been replaced several times since then, most recently with IO-198 which was issued by Saskatchewan Environment (SE) in March 2005.

In addition to IO-198, effluent from the FFTIS is also subject to the monitoring and reporting requirements of the federal Metal Mining Effluent Regulations (MMER).

HBMS continues to maintain the ISO-14001 certification that was achieved in 2003 and OHSAS-18001 safety certification that was achieved in 2004.

**2. General Performance**

Operation of the FFTIS over 2009 was in accordance with all conditions of IO-198.

**2.1 Final Discharge**

Compliance with the allowable levels of arsenic, copper, lead, nickel, zinc, total suspended solids, and pH at the North Weir discharge was 100% during 2009. Compliance with the allowable levels was 100% throughout the previous reporting period, 2008.

Compliance with the allowable concentration of un-ionized ammonia at the confluence of the North Weir discharge and Beaverdam Creek was 100% during 2009. Compliance with allowable levels was 100% throughout the previous reporting period, 2008.

**2.2 Tailings Pond Dusting / Ambient Air Quality**

In 2009, HBMS continued to be proactive in handling dusting events by implementing dust control measures as outlined in the corporate dust control plan (FFTIS Dust Control Guidelines, LAI-612). A more detailed list of actions completed in 2009 is outlined in Section 5.4.

Total Suspended Particulate (TSP), PM<sub>10</sub>, and PM<sub>2.5</sub> levels from the Creighton School monitoring station along with details of dusting events that occurred throughout the year were forwarded to SE on a monthly basis.

**3. Monitoring Programs**

**3.1 Effluent and Downstream Water Quality**

During the reporting period, FFTIS water sampling stations were situated at Beaverdam Creek, the North Weir discharge, the confluence of the North Weir Discharge and Beaverdam Creek, Flin Flon Creek at the Perimeter Highway, and Ross Lake at Third Avenue. Analytical results of water samples were forwarded

to SE on a monthly basis. A summary of monthly results is contained in Appendix 1 while the following table summarizes the average annual results at each location.

IO-198 2008	North Weir	Beaverdam Creek	Flin Flon Ck. Confluence	Flin Flon Creek	Third Avenue
pH	8.22	7.68	7.62	6.87	6.50
Zn	0.0621	0.370	0.168	0.246	0.458
Cu	0.0107	0.061	0.030	0.041	0.102
Ni	0.006	0.015	0.015	0.015	0.015
Pb	0.009	0.030	0.031	0.031	0.030
As	0.006	0.005			
TSS	1.2	1.1	1.2	1.3	2.7
NH3-UI	0.07		0.02		

All parameters are in mg/L except pH.

A comparison of the average annual 2009 zinc levels to 2008 indicates that zinc concentrations decreased at most locations except Beaverdam Creek. The North Weir was 48% lower, Beaverdam Creek was 15% higher, the Confluence was 23% lower, Flin Flon Creek was unchanged, and Third Avenue was 13% lower.

### 3.2 Settlement Plates

Settlement plate data and graphs from the North Weir Dam are attached in Appendix 2. New settlement plates and pins were installed in 2005. The coordinate system is UTM Nad83 datum, as opposed to the historical use of a local mine grid.

North Weir Dam settlement plates were surveyed twice in 2009, once on April 27 and again on September 21.

Data collected since 1984 indicates that the subsoil continues to consolidate. Since 1995, surveys have indicated both minor increases and decreases in the settlement plate elevations. The 2009 settlement plate monitoring indicated an average annual increase in elevation of 0.1 cm, as compared to an average annual elevation decrease of 2.1 cm per year since 1985 and a 0.6 cm decrease in 2008.

### 3.3 Air Quality

Air quality monitoring is conducted on a daily basis at the Creighton School. Results are reported to SE on a monthly basis. The following table summarizes the 2009 annual geometric mean concentrations in each particulate size fraction:

Parameter	Total Suspended Particulate	PM <sub>10</sub>	PM <sub>2.5</sub>
PM	18.71	23.25	11.34
Cu	0.0351	0.0269	0.0126
Zn	0.0638	0.0403	0.0188
Cd	0.0010	0.0088	0.0051
Pb	0.0157	0.1716	0.0964
As	0.0030	0.0042	0.0026
Hg	< 0.0001		
SO <sub>4</sub>	0.7700		

All parameters are in µg/m<sup>3</sup>.

## 5.4 Dust Control

There were no significant dusting occurrences during 2009. All incidents were local to the tailings facility and no fugitive dust was noted leaving the FFTIS disposal limits. Minor dusting incidents occurred on the following dates:

February 21 - Minor dusting was observed within the active North borrow pit's westerly cell, and on the secondary pond's Southerly side, local to the tailings pond.

March 6 - Minor dusting was observed in the vicinity of the active North Borrow pit and the South Tailings pipeline area, local to tailings pond.

March 9 – Localized dusting coming from the active North borrow pit, falling out adjacent to the South tailings pipeline.

March 15 – Minor dusting from the ZPL Pond, and secondary pond.

March 24 – Minor dusting noted in North Borrow Pit near active tailings discharge pipeline.

October 13 – Minor dusting noted from traffic on construction haul roads. The water truck was mobilized to dampen the drier haul roads.

November 16 - Minor dusting noted from traffic on construction haul roads.

November 22 – Dusting occurred overnight on ZPL dams and East Perimeter Dam North Section.

Incidents were primarily due to extremely high North Westerly winds in the range of 30 km/hr gusting to near 50 km/hr, coupled with temperatures in the range of -25 to -35 degrees Celsius. A few incidents were related to dry construction haul roads.

Salted sand was placed on March 11, 12, and 18<sup>th</sup>, 2009 in the vicinity of the South Causeway, within the secondary pond, to mitigate local tailings pond dusting. The sand was placed by sand truck and a small Cat 902 loader.

During the 2009 summer construction season, two water trucks maintained dust control in areas of tailings excavation (borrow pits), haul roads, and construction of tailings fill embankments to maintain optimum moisture content during compaction of fill. The water trucks were active from early June to late October and were quite effective in controlling all areas from fugitive tailings dust generated by vehicular traffic.

Following the completion of tailings fill embankment construction, all dams crests and fill slopes within the primary and secondary pond structures were sanded for dust control. This was accomplished by use of a belly dump semi-truck, and in some areas, a sand truck was used.

Soil Sement chemical dust suppressant was initiated in late September by placing the product on the South Perimeter Dam exposed tailings beach (spigoted) within the North borrow pit area of the primary pond, directly South of the South Causeway structure. A few isolated sections of exposed beach (spigoted) along the East Perimeter Dam were also surficially treated. Although the material was placed during normal operating conditions, the weather that followed in mid to late October subjected the soil sement to a few freeze thaw periods, that seemed to rapidly deteriorate the treated surface. These areas were treated again in late November / early December by placement of salted sand, to ensure that there would be no dusting from areas in closer proximity to the town of Creighton.

Tailings Slurry water was retained within the excavated North Borrow pit area to cover as much exposed tailings as possible, and to allow it to freeze to create a more longer term cap cover.

In October, all dam crests and fill slopes on the ZPL facility were covered with screened sand following tailings fill embankment construction.

The West Weir Spillway was reconstructed in early September to retain water within the primary pond. A new 1500mm HDPE culvert was placed, with invert elevations higher than the existing operating pond level. The flows from the lake bottom sump discharge resulted in a higher primary pond water level to allow the water to back flood as far south as possible to create a water cover over exposed tailings and to allow the water to create an ice cap.

On September 15, the process of retaining water within the large secondary pond commenced by placement of one stop log within the new North Perimeter Dam water control spillway structure. One stop log was added on a bi-weekly basis to retain water and maintain an effluent flow through the spillway such that water quality would not be lost within the clarification pond. A total of five stop logs were placed, raising the water level to 334.27. This effectively covered 90% of exposed tailings within the secondary pond. The remaining exposed tailings within the secondary pond was covered with salted sand in late November, after sufficient frost had developed to allow light weight bearing machinery to spread the sand.

### 5.5 North Weir Acid Plant

In May of 2009, the acid plant was shut down to allow technicians from Prominent Fluid Controls to overhaul the acid metering pumps and replace the diaphragms on the pumps. The upstream acid distribution piping network was repaired and upgraded in 2009. Concrete abutments were placed along the shoreline of the North Weir approach channel. A steel pipeline support bridge was mounted on the top of the concrete piers. The acid distribution header pipe was placed into the flowing water, supported by 2 - ½ ton block and chain hoists. The header pipe is now adjustable to accommodate fluctuating water levels, and access for preventive maintenance has been drastically improved. The North weir submersible transfer water pumps were replaced in November 2009, with Toyo submersible pumps.

### 5.6 Miscellaneous

Geotechnical consultants from BGC Engineering Inc. were in Flin Flon between September 22, 2009 to September 25, 2009, to conduct the annual audit of the FFTIS.

The final version of the third party Dam Safety review report was received in August of 2009. North Weir settlement plates were surveyed twice in 2009, once on April 27 and again on September 21.

Meetings of the Flin Flon Environmental Liaison Committee sub-groups were held in conjunction with the Healthy Flin Flon meeting on air quality during October 5, 2009.

A meeting of the Joint Regulatory Group (JRG) was held on January 29, 2009. Representatives from various Manitoba and Saskatchewan government departments met to discuss environmental issues related to the HBMS Metallurgical Complex.

### 5.7 Storage Capacity

As of December 31, 2009 the available storage capacity within the FFTIS with current dyke heights was:

Primary Pond .....	571,545 tonnes of tailings
Secondary Pond.....	4,614,667 tonnes of tailings
Clarification Pond .....	424,000 m <sup>3</sup>

## 6. Site Rehabilitation Activities

The following is a brief summary of rehabilitation projects conducted on the Flin Flon Metallurgical Complex.

### 6.1 Callinan Mine (South Main)

Rehabilitation of the Callinan (South Main) Mine began in mid-2009. Rakowski Cartage and Wrecking was on-site from June through October to conduct demolition and clean-up work.

Work involved the removal of the South Main Headframe (pictured), the Changehouse, Water Tower, fuel storage area and several minor outbuildings.



### 6.2 Miscellaneous

In addition to work at the Callinan Mine site, several smaller projects at the Metallurgical Complex were also completed. These included:

- Demolition of three sections of the Oxide Conveyor.
- Removal of the Smelter Trestle.
- Demolition of the old Drying Plant to make room for the new Copper Concentrate Filter Plant.



### 6.3 Planned Rehabilitation Activities for 2010

Rehabilitation work planned for 2010 includes the following projects:

- Completion of the Callinan Mine rehabilitation. This includes removal of the Hoistroom and Ore Loadout as well as sealing the #33 Upcast and #44 Backfill Raise.
- Demolition of the remaining sections of the Oxide Conveyor Gallery.
- Demolition of the North Main Headframe.

## 7. Quality Assurance

### 7.1 Field Quality Assurance

The quality assurance program followed during environmental field sampling is as follows:

- Clear polyethylene terephthalate bottles are used for all water sampling.
- Prior to use, each bottle is rinsed three times by filling the container approximately one quarter full, shaking, and then emptying.
- The sample container is filled, leaving an air space of approximately 10% of the container volume to allow for thermal expansion.
- Care is taken to insure that samples do not become contaminated during sample collection or subsequent handling.
- All water sample bottles are “dedicated”. That is, they are used only once for sample collection and are then recycled.

- The sample location, date sampled, and the analysis parameters identify all water sample bottles in order to ensure that accurate records can be maintained.
- pH, temperature, and conductivity are measured in the field.
- Water samples that cannot be analyzed within the appropriate time after collection are preserved with high purity reagents.
- pH meter quality assurance is maintained by following the manufacturer's operating procedures.

## 7.2 Laboratory Quality Assurance

Quality assurance programs for the HBMS laboratory (Guideline for Maintaining Sample and Analysis Integrity, LAP-001) and ALS Laboratory Group are included in Appendices 4 and 5 respectively.

## 8. Contingency Plan

A reference to the Emergency Procedures Manual has been included in the Tailings Pond Operational Manual, Section 7. The Emergency Response Manual details what to do in the event of various possible emergency failures within the FFTIS. The procedures specific to the FFTIS are documented in the FFTIS Emergency Preparedness Plan, LAP-500.

A plan to handle tailings pond dusting events (FFTIS Dust Control Guidelines, LAI-612) was developed and implemented in 2003 and was last updated in 2007.

HBMS has tested the emergency response procedures annually to ensure adequacy:

- 2009 – Environment Department personnel conducted a “table-top” response to a catastrophic failure of the North ZPL Dam. The response involved notification / contact with all appropriate contractors and HBMS personnel as well as “desktop” notification of government authorities. No physical implementation of emergency response personnel and equipment was required for the exercise.
- 2008 – Environment Department personnel were presented with a scenario in which vandals had removed the control panels from the final control structure and that there was a considerable flow of turbid effluent through the structure.
- 2007 – Tested response of Environment Department staff and consultants to a geotechnical dam stability concern.
- 2006 – Tested response of Environment Department staff and contractors to a major dusting event.

## 9. Spill Control

Spill control procedures (Environmental Spill Response Plan, PWP-616) have been updated and are included in the Emergency Procedures Manual.