



U. S. Steel Corporation  
Minnesota Ore Operations  
P.O. Box 217  
Keewatin, MN 55753

April 6, 2011

Brandon Smith  
Minnesota Pollution Control Agency  
520 Lafayette Road North  
St. Paul, MN 55155

RE: United States Steel Corporation, Minnesota Ore Operations – Keetac (Keetac)  
NPDES / SDS Permit Nos. MN0031879 & MN0055948  
Water Management Study & Sulfate Reduction Strategy Study Six-Month Update

Dear Brandon,

Keetac's NPDES / SDS Permit No. MN0031879 was modified on June 17, 2010. Changes to the permit included total sulfate effluent limitations applicable in the final period to all external outfalls as well as a compliance schedule by which to achieve compliance with these limits. Sections 1.4 and 1.8 of the compliance schedule require written progress updates on these studies to the MPCA every six months, at minimum, following MPCA approval. The attached submittal satisfies that requirement for the first six-month period of the Water Management Study (WMS) and the Sulfate Reduction Strategy Study (SRSS).

Please feel free to contact me at (218) 778-8672 or via email at [tmmuck@uss.com](mailto:tmmuck@uss.com) with any questions.

Sincerely,

A handwritten signature in blue ink that reads "Tracy Muck".

Tracy Muck  
Environmental Control Engineer

***Water Management Study and  
Sulfate Reduction Strategy Study  
Six-Month Update  
NPDES / SDS Permits  
MN0031879 & MN0055948***

**April 6, 2011**



**United States Steel Corporation  
Minnesota Ore Operations – Keetac**

## **1.0 Introduction**

United States Steel Corporation (U. S. Steel) owns and operates a taconite mine and processing facility near Keewatin, Minnesota (Keetac). The facility consists of open pit taconite mining, mining waste disposal, and processing plant areas. Surface water discharges from the Plant and Mining Area at the Keetac facility are monitored through the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit No. MN 0031879 enforced by the Minnesota Pollution Control Agency (MPCA). U. S. Steel also maintains and operates a tailings basin system that is regulated under a separate NPDES / SDS permit (No. MN0055948).

## **2.0 Background**

Keetac's NPDES / SDS Permit No. MN0031879 was modified on June 17, 2010. Changes to the permit included total sulfate effluent limitations applicable in the final period to all external outfalls as well as a compliance schedule by which to achieve compliance with these limits. Chapter 1 of this permit details the compliance schedule related to sulfate. Per Section 1.2 of this compliance schedule, a Water Management Study Plan (WMSP) was submitted to MPCA on August 16, 2010. Also, per Section 1.6 of the compliance schedule, a Sulfate Reduction Strategy Study Plan (SRSSP) was submitted on September 15, 2010. MPCA approved both the WMSP and the SRSSP on October 6, 2010. Sections 1.4 and 1.8 of the compliance schedule require written progress updates on these studies to the MPCA every six months, at minimum, following MPCA approval. This submittal satisfies that requirement for the first six-month period of the Water Management Study (WMS) and the Sulfate Reduction Strategy Study (SRSS).

## **3.0 Water Management Study**

### **3.1 Water Balance / Mine Yield Study Enhancement**

U. S. Steel is in the process of enhancing the water balance / mine yield study that was originally performed for the proposed Keetac Expansion Project Environmental Impact Statement (EIS).

- 3.1.1 The original water balance encompassed a 3-month timeframe in 2008. U. S. Steel intends to expand this timeframe and perform the enhanced water balance over approximately a one-year period in order to capture any seasonal variability.
- 3.1.2 Ultrasonic flow meters have been installed at the following locations and data is being collected on a monthly basis:
  - 3.1.2.1 Perry Pit
  - 3.1.2.2 Mesabi Chief Pit
  - 3.1.2.3 Russell Pit

Other piping and discharge locations are currently being reviewed for relocation in the near future. Installation of flow meters has been

postponed due to this impending re-alignment of the piping and eventual discharge of these dewatering sites.

- 3.1.3 Evaluation of the use of other flow measurement methods and feasibility of installing flow meters at additional locations was completed. A spreadsheet showing flow measurement methods and frequencies was developed and resulted in identification of several opportunities for the implementation of more accurate flow measurement techniques.
- 3.1.4 A field study was performed in March 2011 to review potential locations for additional flow data collection. The results of the field study is summarized below:
  - 3.1.4.1 Twenty-one sites have been identified for data collection.
  - 3.1.4.2 Installation of weirs is planned for at least three of these sites.
  - 3.1.4.3 Installation of pump hour meters is planned for at least six of these sites. Dye testing is being considered for verification flows determined by pump hour meters.
- 3.1.5 U. S. Steel has contracted Liesch Associates to assist in development of additional data needs and to process data necessary for enhancing the Water Balance / Mine Yield Study. At a minimum, monthly data will be collected for the purpose of refining the overall mass balance model. Data collection has already commenced for certain locations.
- 3.1.6 Liesch Associates will evaluate the model on a monthly basis to ensure seasonal variability is being captured and data collection methods and frequency are appropriate. The monitoring plan may be adjusted as evaluation of data identifies additional data needs, etc.
- 3.1.7 Precipitation data from Keetac's on-site weather station will be utilized to refine the hydrologic portion of the water balance. U. S. Steel is also investigating installation of additional precipitation gauges elsewhere on Keetac property to ensure the most appropriate data is utilized for the water balance.
- 3.1.8 Liesch Associates will finalize the water balance and a final report will be developed.

### 3.2 Water Discharge Evaluation

U. S. Steel is evaluating the feasibility of re-routing, minimizing, reusing, and/or eliminating discharges to identify alternatives that may lead to compliance.

- 3.2.1 Routing off-site discharges to alternate locations
  - 3.2.1.1 U. S. Steel is evaluating the feasibility of routing off-site discharges to alternate watersheds and water bodies that are not used for the production of wild rice. Investigation of the feasibility of interbasin water transfer is underway. U. S. Steel is also investigating whether any potential non-wild rice

waters exist within close proximity to Keetac for discharge. In addition, U. S. Steel is investigating the feasibility of bypassing wild rice waters.

- 3.2.2 Alternatives to surface water discharge
  - 3.2.2.1 U. S. Steel is in the process evaluating regulatory requirements for deep well injection.
  - 3.2.2.2 U. S. Steel is exploring the possibility of bottling various source waters for retail sale. Sulfate data has been collected for several drinking water sources across the Iron Range. Several of Keetac discharges show the same or lower levels of sulfate as these drinking water sources, which give them good potential for bottling.
- 3.2.3 U. S. Steel is in the process evaluating consolidation and optimization of discharges for any end-of-pipe treatment that may be required. The results of the enhanced water balance will aid in these efforts.
- 3.2.4 Flow equalization / normalization
  - 3.2.4.1 Several locations at Keetac have been identified as potential locations for on-site water storage. The results of the enhanced water balance will aid in determining if these locations have the appropriate capacity for Keetac's discharges.
  - 3.2.4.2 The locations identified in 3.2.4.1 above could be used for temporary storage on-site followed by discharge during non-critical wild rice growth periods. The critical wild rice growth periods will need to be clearly defined by MPCA in order for this option to be feasible.
  - 3.2.4.3 U. S. Steel will also utilize the enhanced water balance to determine if other flow management alternatives exist.
- 3.2.5 U. S. Steel is investigating whether other facilities or municipalities have the capacity or need for additional water.

### 3.3 Water Consumption Evaluation

U. S. Steel is reviewing water consumption throughout the facility to identify potential water management alternatives that may lead to compliance.

- 3.3.1 The plant water recycle system is being reviewed to determine whether optimization is feasible. The enhanced water balance will aid in this determination. Production quality may also need to be considered for any process changes.
- 3.3.2 U. S. Steel is reviewing whether the potential exists for consolidation and/or elimination of emergency overflows at Keetac. The enhanced water balance will aid in this determination.

- 3.3.3 U. S. Steel is also evaluating the plant makeup water to determine whether options for volume reduction or increase exist. The enhanced water balance will aid in this determination.

### **Proposed Sulfate Reduction Strategy Study**

#### 3.1 Water Quantity and Quality Data Review

U. S. Steel has compiled water quantity and quality data that has been collected to date. Additional data will be collected for the enhanced water balance.

3.1.1 The results of the enhanced water balance will be used as a tool for the evaluation and selection of an appropriate sulfate reduction option(s).

3.1.2 The results of the enhanced water balance will be used as a tool for the development and evaluation of scenarios for optimization of water management for potential treatment technologies.

#### 3.2 Source Control Strategies

U. S. Steel is evaluating the feasibility of source control strategies with the aid of U. S. Steel's Research and Technology Facility.

#### 3.3 Sulfate Treatment Technologies

U. S. Steel is evaluating the feasibility of various sulfate treatment technologies with the aid of U. S. Steel's Research and Technology Organization. A professional literature search is being conducted of various case studies and available information regarding existing and emerging sulfate technologies. The literature search will be used to generate a matrix comparing various sulfate reduction technologies capabilities, limitations, environmental impacts, etc. The various technology groups that will be considered in the review include the following:

- Ion Exchange
- Membrane-based filtration
- Chemical Precipitation
- Bioremediation
- Freeze Crystallization
- Other Emerging Technologies