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March 1, 2010

HAND DELIVERED

John Baza, Director
Utah Division of Oil, Gas & Mining
1594 West North Temple
Salt Lake City, UT 84114-5801

RE: Abatement Plan – Division Order DO-09A, Genwal Resources, Inc. Crandall Canyon Mine, C-015/0032

Dear Director Baza:

On behalf of Genwal Resources, Inc. ("**Genwal**"), we appreciated the opportunity to meet with the Division to discuss the treatment of mine water discharge at the Crandall Canyon Mine and Genwal's proposed plan to address Division Order DO-09A. As discussed, at this time, Genwal views the mine water discharge and exceedence of the UPDES standard for iron as an operational issue which will not require long-term treatment. Erik Petersen, consulting hydrologist for Genwal, has studied conditions at Crandall Canyon and other mines in the area and believes that the likely source of iron discharge is pyrite in the exposed coal and surrounding rock strata. He used the example of the Skyline Mine to show that iron discharge spiked initially when the mine was unexpectedly flooded but returned to normal after a two to three year period. See attached Report of Petersen Hydrologic. Genwal has constructed a mine water treatment facility to address discharge during operation of the Crandall Canyon. In addition, by May 1, 2010, Genwal has agreed to design and submit to the Division plans for a long-term treatment facility in the event it is proven a long-term treatment will be necessary at the time of Final Reclamation. Prior to permit renewal in 2013, Genwal is proposing to monitor the mine water discharge to determine whether the iron exceedence will continue and may require long-term treatment. The long-term treatment facility would not be required until Final Reclamation if the water quality has not come into compliance without treatment.

Genwal's abatement plan, through 2013, will depend on the following three (3) alternative scenarios:

1. Iron Discharge Dissipates and Returns to UPDES Standards.

For the next two years, mine water discharge will be monitored and treated by the operational facility which Genwal recently constructed at the approximate cost of $350,000. If iron discharge dissipates, mine water discharge will remain an operational matter and long-term treatment will not be necessary. Monitoring will continue in accordance with Division rules, the requirements of the Utah Division of Water Quality and Genwal's UPDES water quality permit.

2. Iron Discharge Continues After Two Years of Monitoring.

Under this scenario, iron discharge would continue to be monitored and treated by the operational facility. Monitoring will continue until final reclamation and at that time, if water quality has not improved, the long-term treatment plan will be implemented.

3. Permit Renewal in 2013.

At the time the Crandall Canyon permit is renewed in 2013, if iron discharge continues to exceed UPDES standards and shows no downward trend, the discharge will be addressed as an operational issue.

Please let us know if you would like to further discuss this abatement plan.

Very truly yours,

Denise A. Dragoo

DD:pdm

cc: David W. Hibbs
David Shaver

PETERSEN HYDROLOGIC

25 February 2009

Mr. Dave Shaver
Genwal Resources, Inc.
P.O. Box 1077
Price, Utah 84501

Dave,

At your request we have performed an investigation of iron concentrations in mine discharge waters from the Genwal Resources, Inc. Crandall Canyon Mine. Specifically, the purpose of this investigation is to evaluate historical iron concentrations in the mine discharge waters and to provide projections of likely future iron concentrations in discharge waters from the now sealed Crandall Canyon Mine.

Overview

The Genwal Resources Inc. Crandall Canyon Mine is located in the Wasatch Plateau coal field approximately 15 miles northwest of the town of Huntington, Utah (Figure 1). On August 6, 2007, a major mine bump/bounce event occurred in the Main West pillar section of the Crandall Canyon Mine. Mine entries in portions of the mine were filled with coal and debris emplaced by the tragic mine collapse event. Subsequent to the initial bump/bounce event and continued instability in the mine area, the mine was permanently sealed. Because of the obvious unplanned nature of this event, the routing of mine waters in some portions of the mine could no longer be controlled as these areas were rendered inaccessible. During September 2007, the mine pumps were shut-off and discharge of mine water to the surface ceased. During October, November, and December 2007, no mine water discharged from the Crandall Canyon Mine. Commencing in early 2008, mine water began to spill from the mine portals as portions of the sealed mine workings became filled to a topographic level that allowed gravity discharge of the mine water to the surface through the mine portals.

Presentation of Data

A map of the Crandall Canyon Mine underground workings is presented in Figure 2. Information presented in Figure 2 was obtained from Mr. Dave Shaver of Genwal Resources, Inc. Also shown on Figure 2 are regions that were flooded underground sump areas during operational conditions (shown in green), and additional areas that are now believed to be flooded under the current closure conditions (shown in red). The projections of the newly flooded areas are based on an analysis of the geometry (topography) of the mine workings. Also shown on Figure 2 are red arrows indicating the likely routing of current underground mine water from likely source areas to the mine portals. It is believed that the most significant underground water source in the mine continues to be that area situated in the northwest corner of the mine adjacent to the Joes Valley Fault system. During the operational phase of the mine, this area was observed to be overlain by fractured water-bearing sandstone channels in the mine roof that were actively discharging into the mine openings. The directions of groundwater routing through the mine shown on Figure 2 are based on knowledge of the nature of the underground mine workings, surveyed mine topography information, and visual observations made during the operational phases of the Crandall Canyon Mine (personal communication, Dave Shaver, 2010).

A graph of the TDS concentration of Crandall Canyon Mine discharge water for the period 1996 – 2010 is presented in Figure 3. A graph of the total iron concentrations of mine discharge water for the period of record 1996 – 2010 is presented in Figure 4. A graph of recent (2006-2010) total iron concentrations in the mine discharge water is presented in Figure 5. Additionally, for comparative purposes, a graph of total iron concentrations in mine discharge water from a large area of flooded mine workings in the Canyon Fuel Company, LLC Skyline Mine (monitoring site CS-14) is presented in Figure 6.

Solute Geochemistry

In the period subsequent to the first gravity drainage of mine water from the Crandall Canyon Mine in early 2008, a spike in TDS concentrations and an increase in total iron concentrations in mine water discharge were observed (Figures 3 and 5). Geochemical reactions commonly resulting in elevated TDS or iron concentrations in underground mine waters in the Wasatch Plateau coal district of Utah are briefly described below.

Groundwater migrating through underground mine workings may acquire elevated TDS concentrations through interactions with soluble minerals (such as gypsum or halite) where these are present according to:

$$CaSO_4 \cdot 2H_2O = Ca^{2+} + SO_4^{2-} + 2H_2O \quad \text{(gypsum dissolution)}$$
$$NaCl = Na^+ + Cl^- \quad \text{(halite dissolution)}$$

These minerals may be naturally present in the rock strata adjacent to the coal seams, or as impurities in materials used in mining (such as limestone, dolomite, or gypsum rock dust). (It should be noted that solute chemical data necessary to fully evaluate the sources of elevated TDS concentrations in the initial spike in TDS during early 2008 are not available).

Of primary importance to this investigation is the geochemistry of iron. The sulfide mineral pyrite, which is commonly present in underground coal mines in Utah, is oxidized when it comes into contact with oxygenated water. This reaction is represented in a simplified form as:

$$FeS_{2\,(S)} + 7/2\ O_2 + H_2O = Fe^{2+} + 2SO_4^{2-} + 2H^+ \quad \text{(pyrite oxidation)}$$

This reaction, which may be facilitated and enhanced by the presence of certain bacteria, yields free, reduced iron (Fe^{2+}), sulfate, and H^+ (acid), and removes oxygen from the water. The liberation of H^+ in this reaction results in a temporary lowering of the pH and facilitates the dissolution of carbonate minerals according to:

$H^+ + CaCO_3 = Ca^{2+} + HCO_3^-$ (calcite dissolution)

$2H^+ + CaMg(CO_3)_2 = Ca^{2+} + Mg^{2+} + 2HCO_3$ (dolomite dissolution)

These two reactions result in an increase in the calcium, magnesium, and bicarbonate concentrations of the water and consume H^+, resulting in a rising of the pH. Because of the abundance of carbonate minerals in the coal fields of the western United States, the acid produced from pyrite oxidation is readily consumed in the reactions described above and acid-mine-drainage does not occur.

Water flowing in a surface stream that is fully aerated with near neutral pH generally will generally not contain more than a few micrograms per liter of dissolved iron (Hem, 1985). This is because oxygen is continuously present in an actively flowing stream and the Fe^{2+} is rapidly oxidized to Fe^{3+} according to:

$Fe^{2+} + 1/4\ O_2 + H^+ = Fe^{3+} + 1/2\ H_2O$ (iron oxidation)

The oxidized iron is subsequently precipitated as a solid (commonly as an amorphous iron hydroxide) which eventually settles to the bottom of the water body. This simplified reaction may be expressed as:

$Fe^{3+} + 3H_2O = Fe(OH)_{3\ (s)} + 3H^+$ (iron hydroxide precipitation)

The H^+ produced in this reaction is consumed in the carbonate mineral dissolution reactions described above.

Analysis of Data

It is apparent in Figure 3 that the TDS concentrations of mine discharge water rapidly spiked relative to previous levels as the first groundwater spilled from the sealed Crandall

Canyon Mine in early 2008. The TDS concentrations of mine discharge waters sampled after this initial occurrence steadily declined. By late 2009, the TDS concentrations of the mine discharge waters were gradually approaching those observed during the operational phase of the mine. This TDS spike likely resulted from the effects of the flushing of soluble minerals or other materials present in the old mine workings as these areas were flooded for the first time (see Figure 2). After these materials were flushed and gradually removed from the recently flooded mine workings, elevated TDS concentrations declined accordingly.

Beginning in late 2008 and early 2009, total iron concentrations in the mine discharge water began to increase, with concentrations rising to approximately 3 mg/L, and temporarily spiking to about 8 mg/L in late 2009. The most recent two samples from the mine discharge water were slightly above 3 mg/L total iron. The observed increased total iron concentrations are likely attributable to the oxidation of pyrite or other sulfide minerals as described above.

Total iron concentrations in Crandall Canyon Mine discharge waters were typically low prior to the mine bump/bounce event (Figure 4). This conclusion is of particular importance to this investigation. The previous lack of appreciable iron in mine discharge water is likely attributable to the removal of pyrite from the mine environment that was in contact with mine waters through oxidation reactions (i.e., the available pyrite was likely consumed). Accordingly, elevated iron concentrations did not occur in mine waters that flowed over the pyrite-depleted materials during operational conditions.

Additionally, although the physical conditions of flooded mine areas have likely been changed somewhat relative to the operational condition, it is important to note that the mineralogical compositions of the rocks and coals of the Crandall Canyon Mine underground mine environment have not changed. As described previously, this same system of minerals, coal and rocks present in the Crandall Canyon Mine did <u>not</u> support any long-term elevated iron concentrations during the approximately 12 years of mine discharge prior to the 2007 mine collapse event.

As indicated on Figure 2, subsequent to the cessation of mine-water pumping, portions of the mine workings that were previously not flooded (under operational conditions) became flooded as rising mine waters inundated these areas. Accordingly, un-oxidized pyrite minerals in the newly flooded areas likely came into contact with oxygenated mine waters, resulting in pyrite oxidation and the resultant liberation of iron into the mine waters. Additionally, as a result of the mine bump/bounce event, freshly broken coal debris was likely emplaced in mine entries, which may have resulted in increased potential for interactions between mine waters and freshly exposed pyrite minerals. It is my professional opinion that the observed increases in iron concentrations in mine discharge water subsequent to the gravity discharge of mine waters to the surface likely occurred under these geochemical conditions.

Projections of future total iron concentrations

As described above, the iron present in Crandall Canyon Mine discharge water is likely derived from the oxidation of pyrite or other sulfide minerals present in the coal seam. It is considered likely that the pyrite currently in contact with mine waters will eventually be consumed by oxidation reactions (i.e., there is not an unlimited supply of pyrite in the inundated mine environment). The amount of time that will be required for the oxidation of the available pyrite in inundated areas will likely be a function of the amount of pyrite available for reacting, water flushing rates, and the availability of dissolved oxygen in the reacting mine waters. Because the mine workings are now inaccessible, an evaluation of these conditions cannot be accomplished.

It is instructive to examine a similar situation that has occurred at a nearby coal mine in the Wasatch Plateau coal field. Commencing in approximately 2003, Mined-out areas of the Canyon Fuel Company, LLC Skyline Mine were allowed to fill with groundwater as mining in these areas was completed. The southwest portion of the Skyline mine workings dip away from the mine portals. Consequently, an area of appreciable extent was filled as mine water was allowed to inundate these areas. Mine water pumped to the surface from this flooded area is monitored at monitoring site CS-14 (UDOGM, 2010).

While not all characteristics of the physical or chemical regimes of these two mines are the same, the overall hydrogeochemical environment is believed to be generally similar. As shown on Figure 6, after some initial variability in iron concentrations in 2004 and 2005, the total iron concentrations in the mine discharge water began a fairly uniform decline in 2006 that continued until there was eventually an essentially complete absence of total iron present in the mine water discharge. It seems likely that, in a similar manner, the concentrations of iron in the Crandall Canyon Mine discharge water should gradually moderate over time as the chemical reactants are removed from the system. The time required for the iron concentrations to decline to levels less than 1 mg/L cannot be determined with certainty, as the physical mine environment is not accessible for inspection. However, based on the declines observed at the Skyline Mine CS-14 location, it seems likely that declines in iron concentrations to levels less than 1 mg/L will likely occur within a few years.

Conclusions

- The initial spike in TDS concentrations observed in the gravity discharge from the Crandall Canyon Mine in early 2008 is likely attributable to the dissolution of soluble minerals or other matter in inundated portions of the mine. Upon flushing of these materials from the flooded mine areas over time, the TDS concentrations of mine discharge water are gradually returning to near-previous levels.

- The elevated iron concentrations observed in Crandall Canyon Mine discharge waters subsequent to the commencement of gravity drainage from the mine are likely attributable to the oxidation of pyrite or other sulfide minerals in newly inundated mining areas.

- It is my professional opinion that it is unlikely that substantially elevated concentrations of total iron will persist over long periods of time in mine discharge waters from the Crandall Canyon Mine. Iron concentrations in mine discharge waters will likely return to moderate levels as pyrite minerals are consumed through oxidation processes. A perpetual discharge of mine discharge waters with total iron concentrations exceeding about 1 mg/L is not considered likely.

References Cited

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water, U.S. Geological Survey Water Supply Paper 2254.

UDOGM, 2010, DOGM on-line water quality database, http://ogm.utah.gov/coal/edi/wqdb.htm

Please feel free to contact me should you have any questions in this regard.

Sincerely,

LICENSED PROFESSIONAL GEOLOGIST
ERIK CARL PETERSEN
No. 5373615-2250
STATE OF UTAH

Erik C. Petersen, P.G.
Principal Hydrogeologist
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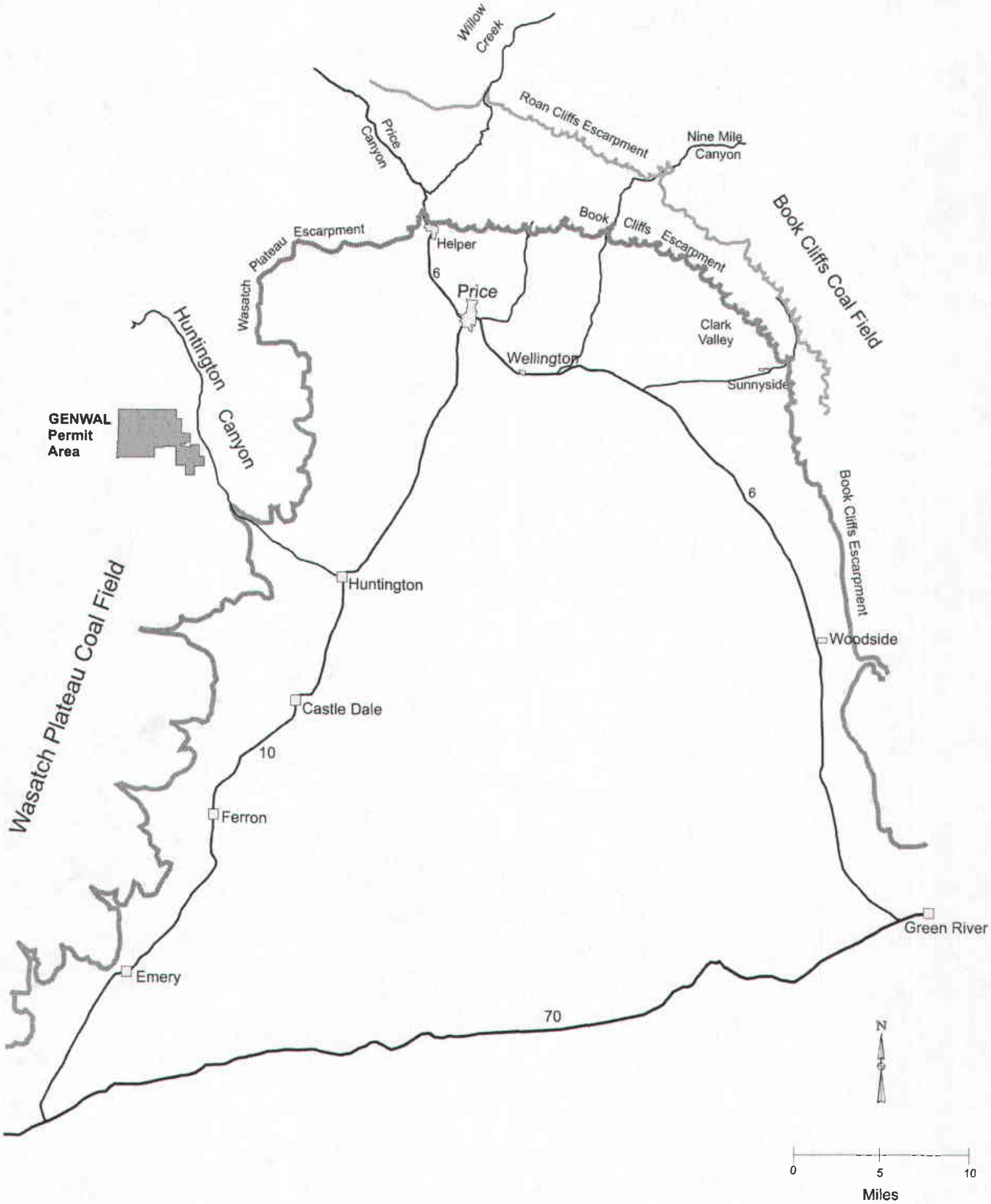

Figure 1 Location of the Genwal Resources, Inc. Crandall Canyon Mine.

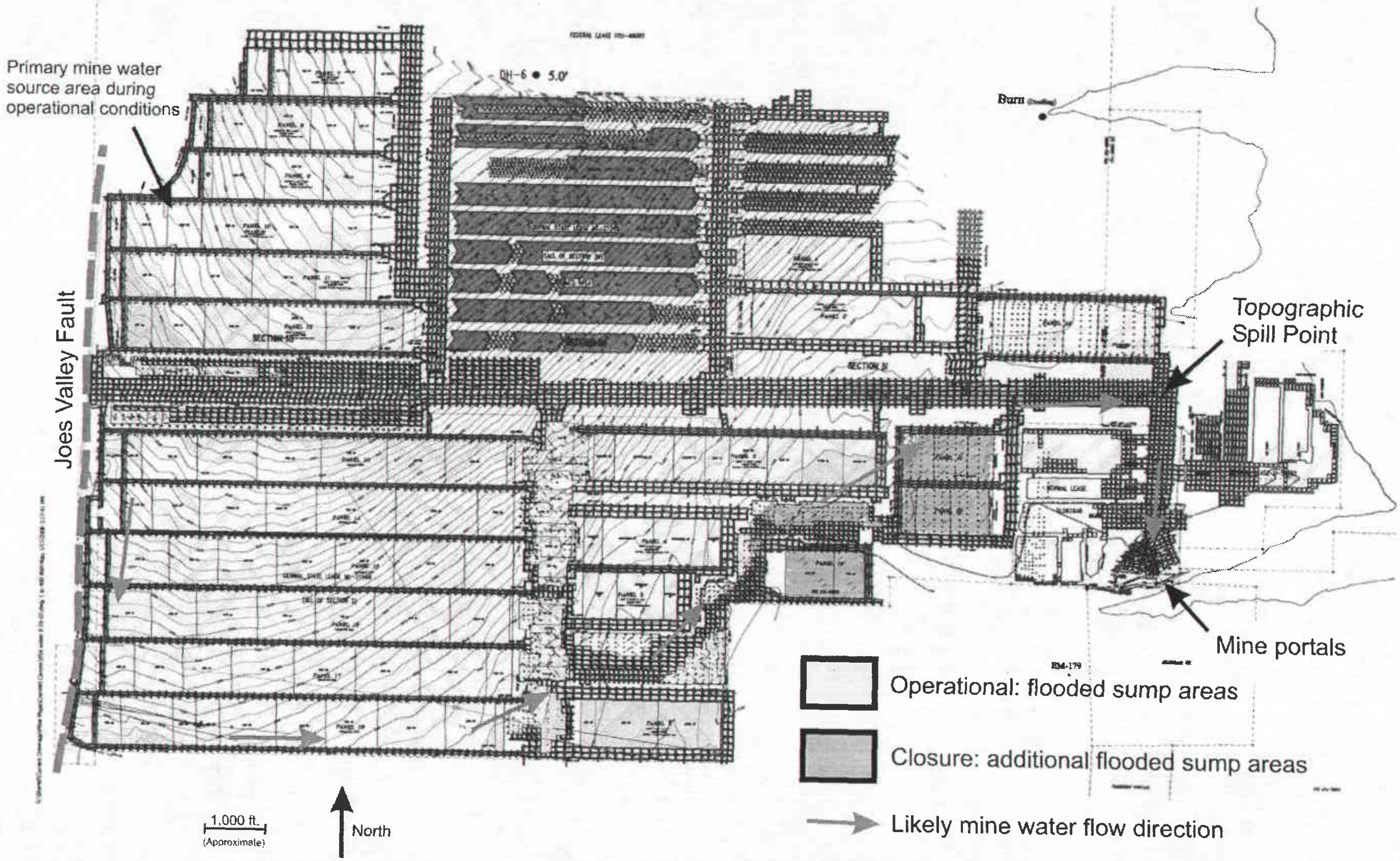

Figure 2 Map of the Crandall Canyon Mine workings with the likely routing of mine water to the surface indicated by red arrows. Areas shown in green are mined areas flooded with water during operational conditions. Areas in red indicate recently flooded areas of the mine. The red areas together with those in green indicate likely flooded mine areas in the current closure condition.

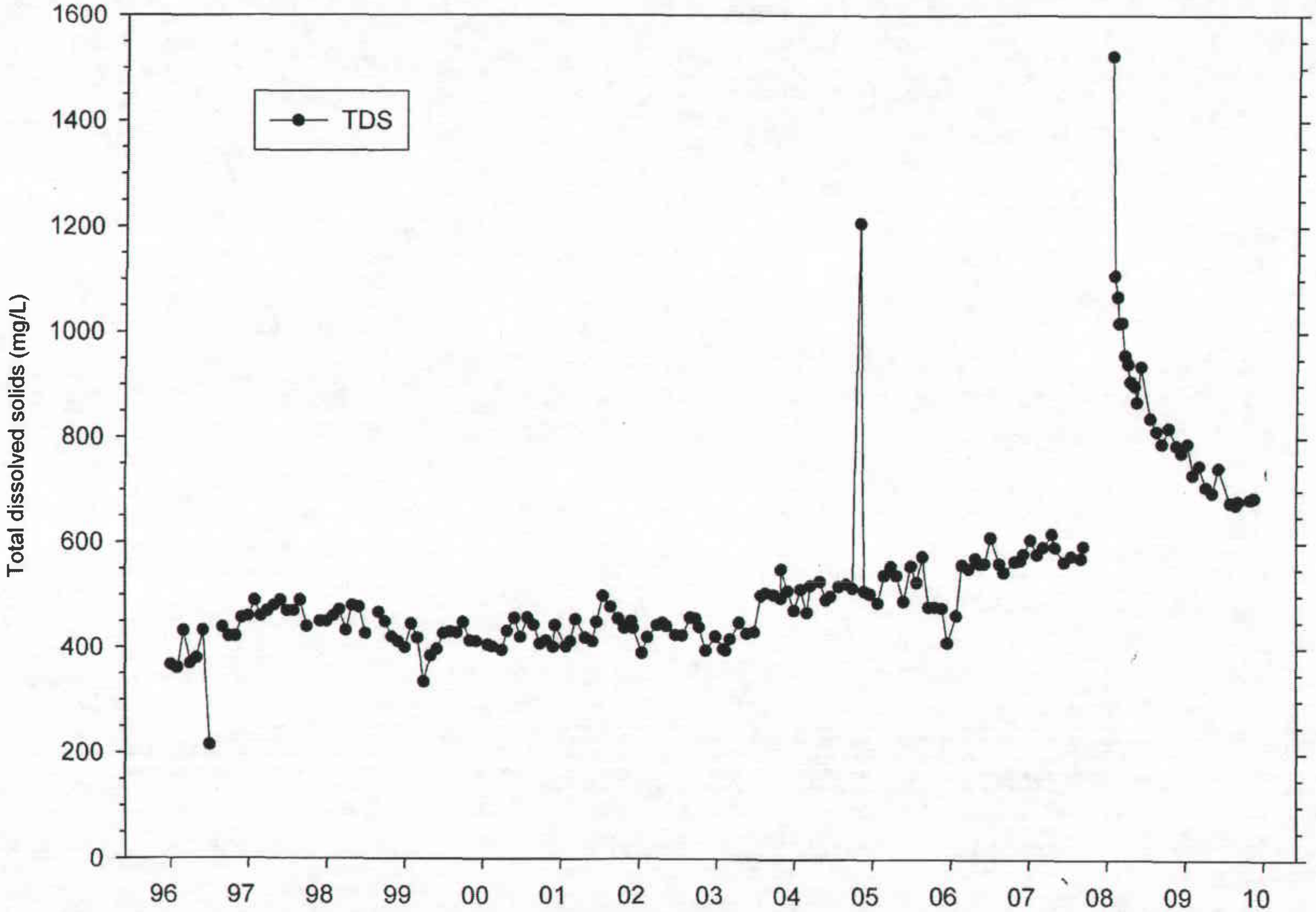

Figure 3 Total dissolved solids (TDS) concentrations of Crandall Canyon Mine discharge waters.

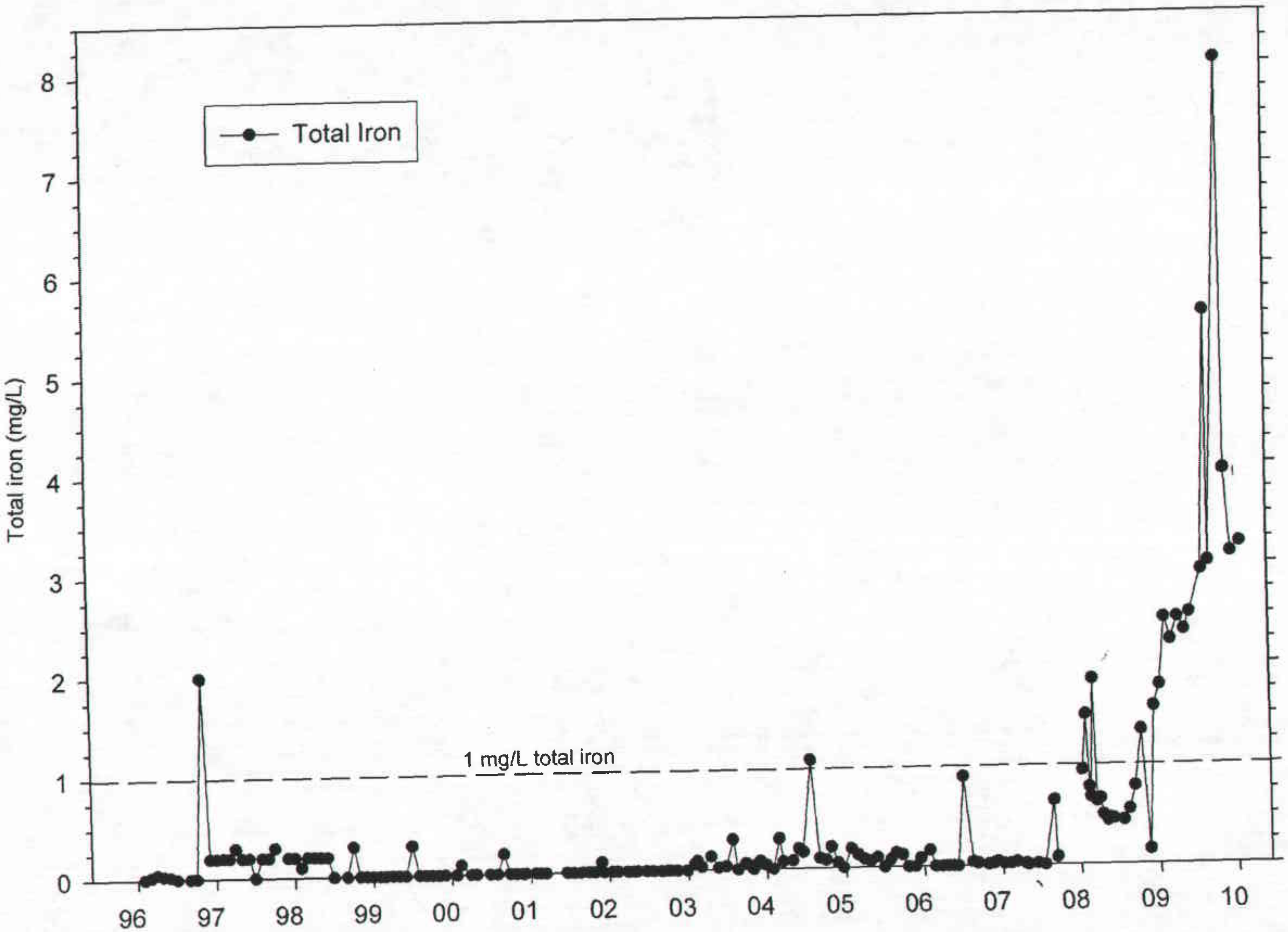

Figure 4 Total iron concentrations of Crandall Canyon Mine discharge waters

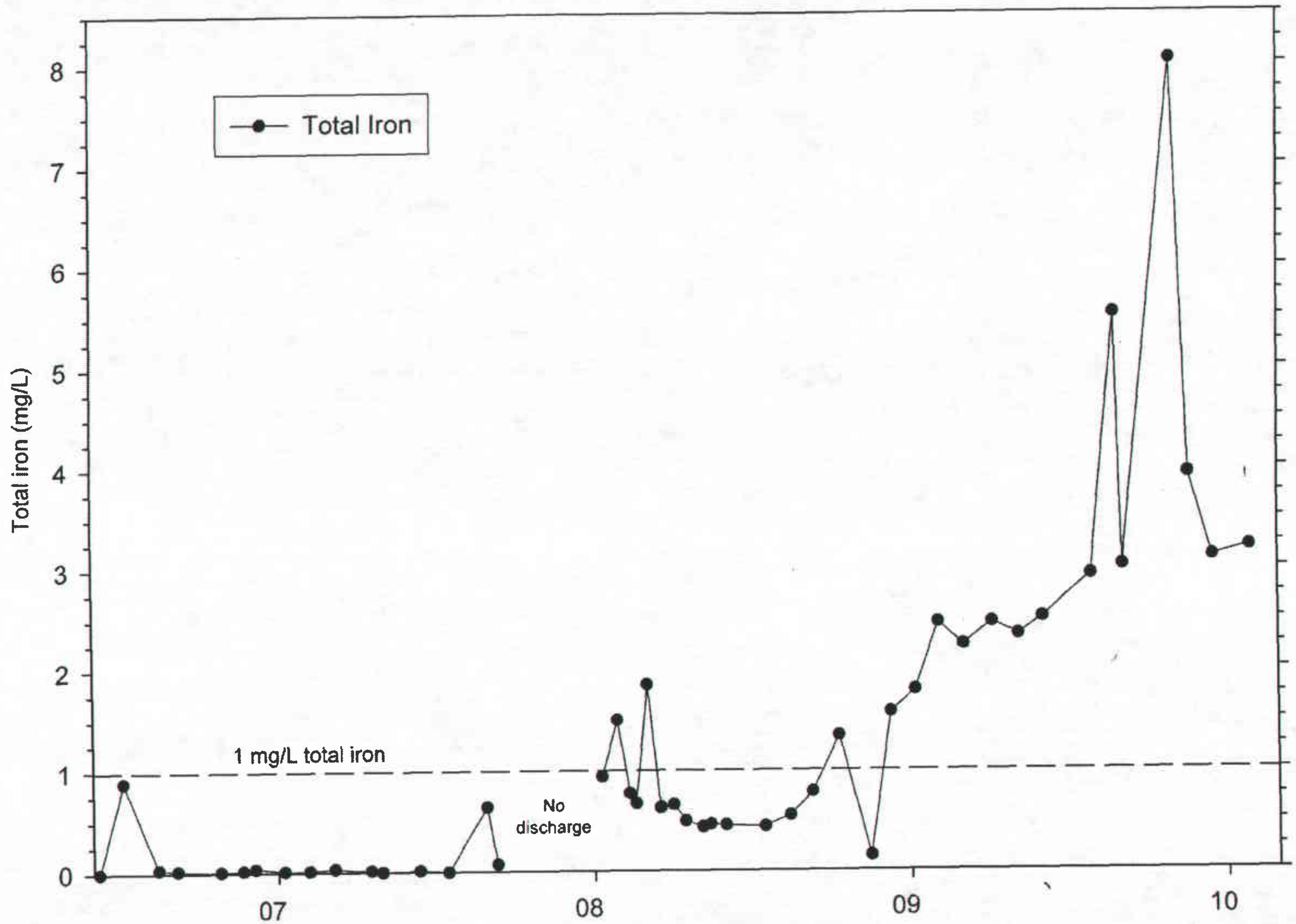

Figure 5 Total iron concentrations of Crandall Canyon Mine discharge waters

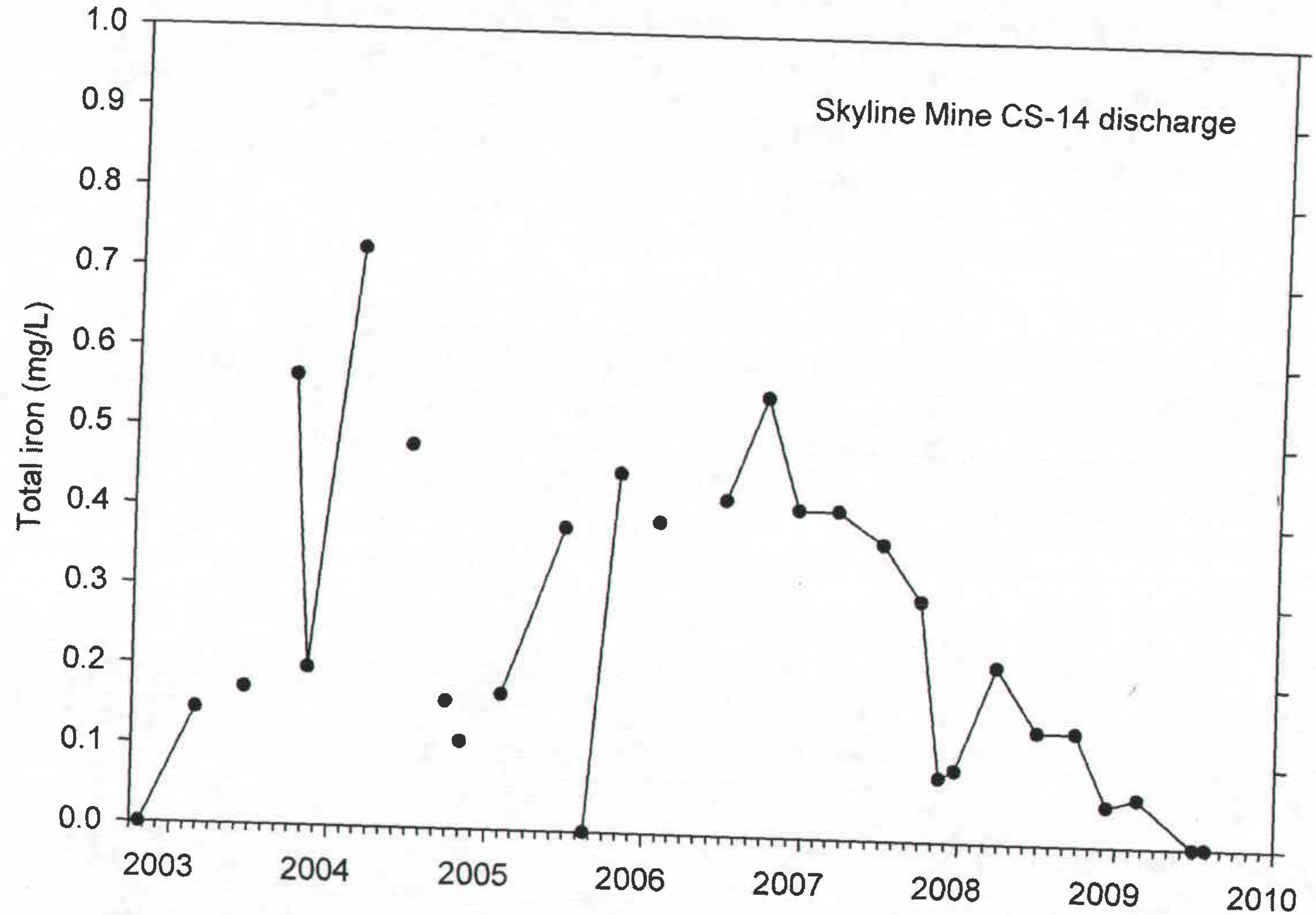

Figure 6 Total iron concentrations in mine discharge waters pumped from the down-dip flooded mine workings in the southwest portion of the Skyline Mine at monitoring point CS-14 (DOGM, 2010).