STATE OF ALASKA

FRANK H. MURKOWSKI,
GOVERNOR

410 WILLOUGHBY AVE., SUITE 303
JUNEAU, ALASKA 99801-1795
PHONE: (907) 465-5353
Fax: (907) 465-5164

DEPARTMENT OF ENVIRONMENATAL CONSERVATION

DIVISION OF ENVIRONMENTAL HEALTH
SOLID WASTE PROGRAM

FIELD INSPECTION REPORT
GREENS CREEK MINE

Inspection Date:	November 30, 2005
Report Date:	January 3, 2006
Weather:	Clear. Temp 21°F., Wind 8mph with gusts to 18mph
Inspection Objectives:	Observe the effects of a large storm event on the various Greens Creek disposal and containment facilities
Operator Contact:	Bill Oelklaus, Kennecott Greens Creek Mining Co. (KGCMC)
State Personnel:	Ed Emswiler, ADEC; Charlie Cobb, ADNR,
Other Personnel:	Tom Zimmer, KGCMC; Eric Sundberg. KGCMC; Steve Hohensee, USDA Forest Service
Documentation:	Photos were taken and are available for inspection at ADEC in Juneau and ADNR in Anchorage

.

Notes

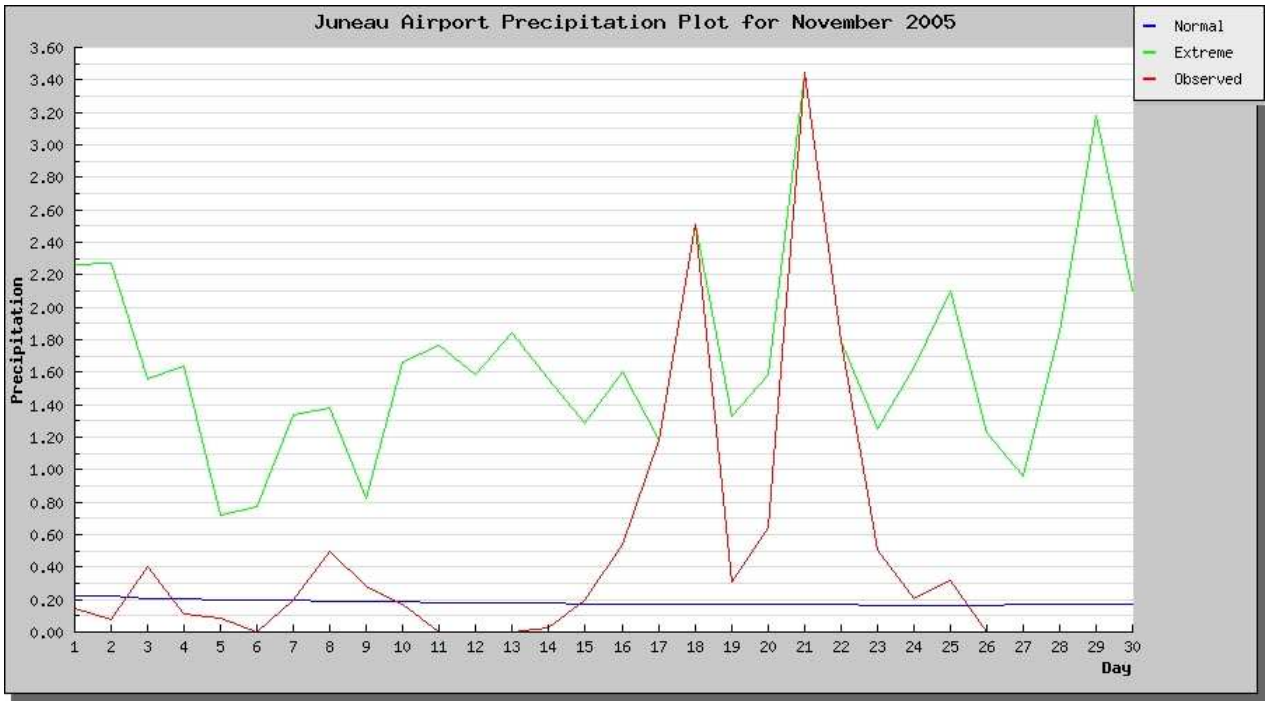
This is a joint inspection report between ADEC and ADNR.

On November 30, 2005, the above listed personnel participated in a site visit at the Kennecott Greens Creek Mining Company (KGCMC) facilities on Admiralty Island. The purpose of the visit was to observe the effects of a large precipitation event that took place between November 14-27, 2005 on the various disposal and containment facilities. Of particular interest was to observe Pond 7, the tailings disposal site and Pond A.

We arrived on a Forest Service provided float plane at approximately 8:45 am where we met at Hawk Inlet to sign a release of liability, discuss the precipitation event and the plan to visit various sites during the day. We decided to focus most of our time on the newly constructed Pond 7 and the tailings facility.

According to the National Weather Service, approximately 10.7 inches of precipitation was measured at the Juneau airport over a seven day period between November 16-23, 2005 (see graph below). KGCMC reported 13.5 inches of precipitation during this period. The mill was

shut down twice during this event, first for a one day period starting on Saturday, November 19th in order to decrease loading on the water storage and treatment system. It was shut down again for a 7 day period between November 21-27 for the same purpose. It was reported that had it not been for the additional water storage capacity brought on by the newly constructed Pond 7, the storm event would have caused flow in the Pond 6 emergency spillway and associated water would have left the contained area into the muskeg below the facility.



Pond 6 and Pond 7

At approximately 09:15 we visited Pond 7. Since the June 27, 2005 site visit conducted by Charles Cobb and myself, Pond 7 construction was substantially completed, including the HDPE geomembrane liner. Pond 7 functioned effectively to contain excess flows from the November 16-23 storm event.

The pond sill elevation is 140-feet above MSL. The elevation of water in Pond 7 reached its highest level of 137.3-feet on November 23rd when inflow to Pond 7 stopped (see photo below). Pumping to Pond 6 started on November 25th at the rate of approximately 700 gallons per minute (gpm) while water delivery was continued from Pond 6 to the Pit 5 plant for treatment and ultimate disposition through the NPDES permitted outfall (Outfall 002) into Hawk Inlet.

Final construction work needed for Pond 7 included:

- completion of the pumping system pumps from the wet well at the southwest aspect of the impoundment to pump water directly to the Pit 5 water treatment plant
- connection of the suction lysimeters that act as leak detection below the pond
- a discharge chute and stilling basin at the end of spillway from Pond 7

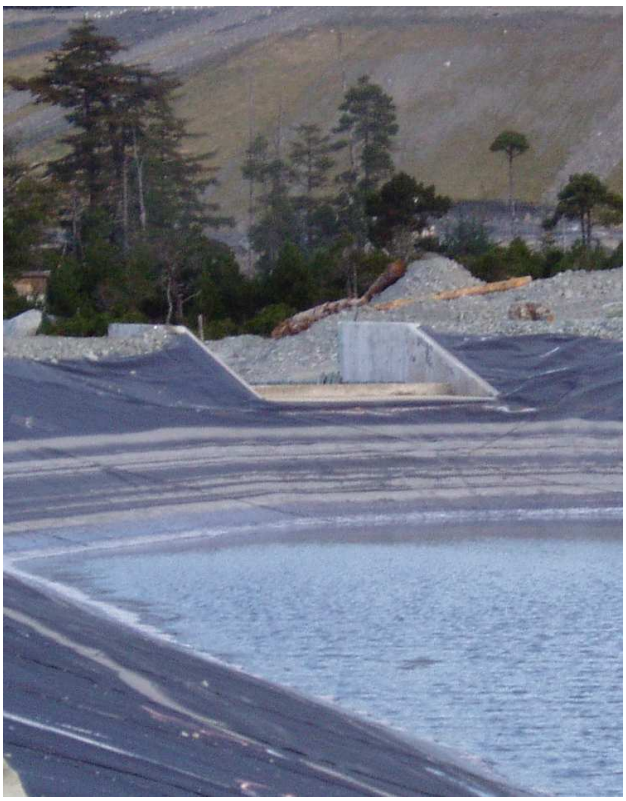
- minor earth fill at crest of dam at spillway
- final improvements to the inlet from Pond 6
- sediment traps at Pond 6 and Pond 7

Panorama: Pond 7 Retention Basin
Panorama Photo taken from the adjacent southwest Soils Pile looking northeast
Note: spillway, tailings facility, Tank 7, and inlet from Pond 6

Pond 6 will continue to operate after Pond 7 is fully completed. Pond 6 will be used for additional operational storage until it is needed for tailings disposal (approximately 2-4 years from now). In order for Pond 7 to effectively contain water generated during the 24 hour / 25 year design storm without the aid of Pond 6, increased discharge from treatment will be needed. According to NPDES permit limitations, the facility is allowed to discharge a daily maximum of 3.6 million gallons, and an average monthly discharge of 2.39 million gallons per day (averages of 2,500 & 1,660gpm respectively) through NPDES Outfall 002. However, the gravity flow volume output through the outfall system is currently limited to approximately 1,800gpm. A new water head tank (Tank 7) is being constructed that will place more head on the system (see photo below). This is designed to add another 500gpm of discharge to the outfall. This should make the system able to sustain volume in the pond up to a 24 hour / 25 year storm event.

Current maximum water treatment capacity from both the mill and Pit 5 is approximately 2,700gpm (mill @ 1,600gpm, Pit 5 @ 1,100gpm). In order to accomplish the permitted discharge volume of 2,500gpm without shutting the mill processing down, approximately 1,400gpm more treatment capacity will likely be needed. It was unclear from this site visit whether or not the Pit 5 water treatment plant will be moved to Pond 7. However, the relative merits of this are being discussed among KGCMC officials.

Tank 7 and Inlet from Pond 6 Into Pond 7 (picture center)



Pond 7 Spillway – Note: Highest Water Level Reached During the Storm Event

Tailings Disposal Facility

At approximately 10:00am we visited the tailings disposal facility. Since the June 27, 2005 site visit conducted by Charles Cobb and myself, the Southeast Expansion Area 2 liner, buttress and drainage system to Pond 6 had been completed. Tailings had been placed into this area to an approximate thickness of 1-2 feet although it was not actively used for disposal at the time of this site visit.

Panorama: Southeast aspect of Tailings Disposal Site Looking West

Tailings disposal occurred in north, northeastern and Southeast Expansion Area 1. Plans are to expand disposal activities into the Southeast Expansion Area 2, flatten out the upper surface, and

build up the northwest area of the existing facility. If the decision is made to move the Pit 5 water treatment plant to Pond 7, then tailings disposal will expand into Pit 5 likely during the 2007 construction season at the earliest.

External (outside) areas of the facility experienced no significant erosion. Some minor rill erosion was observed on internal slopes at the Southeast Expansion Area 1. It was reported this was not the result of the storm event. It was also reported that sheet flow of precipitation at the tailings facility was managed effectively by dozers to minimize rill erosion on external slopes. A lined channel was installed in the area of the west buttress to allow egress of water from the upper surface (see photo below). A diversion ditch fitted with a geosynthetic liner was installed to prevent water from entering the Southeast Expansion Area 2 where tailings were placed (see photo below). There were observed gaps in the lined ditch where the liner overlapped. The lined ditch was likely reasonably effective. However, this ditch is all internal to the system which merely redirects surface waters within the Tailings containment facility, and did not allow the escape of waste or water from the facility.

Tailings Disposal Site – West Buttress Area ***East Area of Tailings Site***
Lined Stormwater Ditch Channels Made During Storm Event

The Southeast Expansion Area 2 where tailings had been placed experienced moderate to severe rill erosion (see photo below) during previous rain events. The active water management conducted by KGCMC on the pile during the November storm prevented further erosion in this area.. The erosion has exposed the sand protective layer and the liner system in some areas, but no damage to the liner system was observed. However, all sediment that resulted from erosion throughout the facility was captured in Pond 6 and Pond 7 and did not leave the facility. Sediment traps are projected to be constructed at both Pond 6 and Pond 7. This should be incorporated into the “Stage 2 Tailings Facility Expansion 2006 Work Summary”.

The upper aspects of the tailings were solid and dry from the freezing conditions. Some tailings material (dust) was observed to be carried by gusts of wind away from the facility. It is not clear whether or not this was significant.

Tailings Disposal Site – Southeast Expansion Area 2
Note: Rill Erosion from previous precipitation events

Details with regard to the work scheduled to be done at the tailings facility during the 2005 construction season can be found in a letter from Klohn Crippen to KGCMC Tom Zimmer dated February 4, 2005 entitled "Stage 2 Tailings Facility Expansion 2005 Work Summary".

Pond A and Mill Area

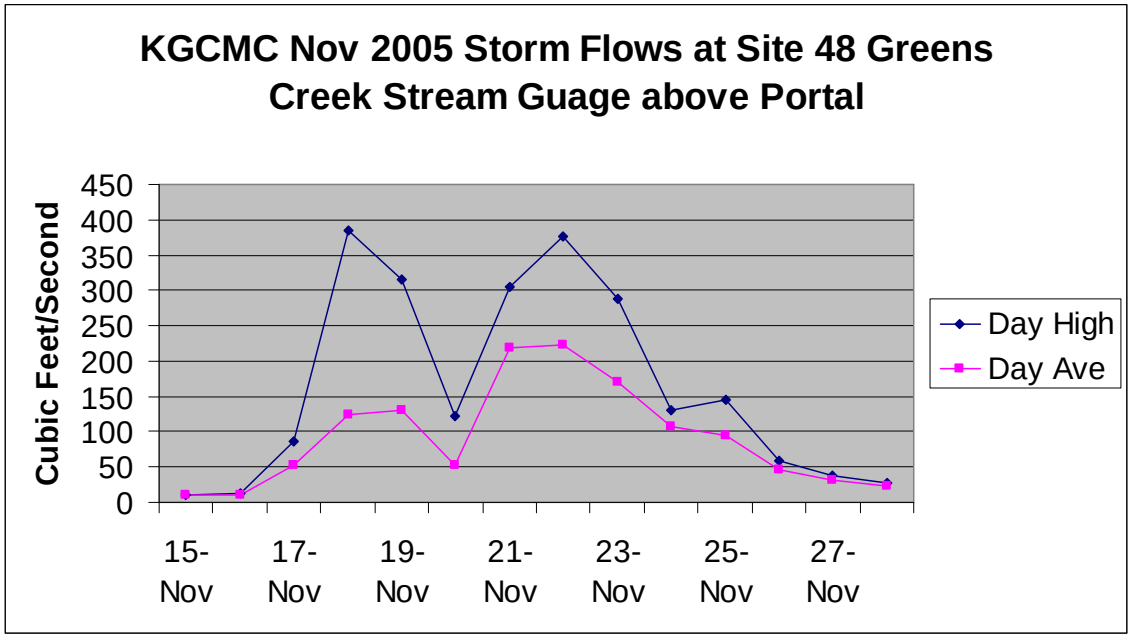
At approximately 11:00am we visited the Mill area and Pond A. Pond A is part of the "closed" system that captures waters which contain sediments from the mill area. Runon into Pond A is limited by diversion ditches above the mill. Water captured in Pond A is normally transmitted to treatment at Pit 5, but can also be routed into the Mill water treatment plants. When sediments build within the pond and other containment structures in this area they are collected and taken back to the mill or taken to the tailings disposal site.

Pond A is formed by an embankment varying from approximately 8 to 17 feet high adjacent to Greens Creek, as seen in Figure 12. Charles Cobb was interested as to whether or not Pond A was considered a jurisdictional dam and needed a permit through ADNR Dam Safety. ADNR requested that KGCMC complete an ADNR Hazard Potential Classification and Jurisdictional Review form for a determination.

While at the mill area we also observed the Greens Creek stream gauging station. The station has continuous recording devices that monitor stream height at the KGCMC weir that uses a USGS stage rating curve that determines stream flow. This monitoring system also measures the amount of water withdrawn from the creek under the KGCMC permit with ADNR. During the site visit the Greens Creek flow rate was approximately 36 cubic feet per second (cfs). Green

Creek experienced maximum flow rate over 375cfs on two occasions during the November storm event (see graph below).

A landslide during the storm event took place in the tributary (Cub Creek) located within 100-feet of the stream gauging station. The landslide threatened but did not damage the gauging station. There were no significant effects observed other than Cub Creek continuing to feed high sediment load into Greens Creek.



Pond D

Site D is located below production rock site 23. At Site D, placement of native glacial till excavated from the mill during site development is overlain by waste rock. Below site D is a retention pond known as Pond D. Pond D is located less than 50-feet from Greens Creek. The retention pond collects stormwater from sites 23/D and landfill associated water from a curtain drain at with toe of site 23. Pond D was reported to overflow into Greens Creek for 7 days during the storm event. Samples of the overflow water were collected, and one sample was collected in the Greens Creek (receiving water) during the storm event below the facility. Results are pending. However, because of dilution during the storm event, it is expected there was no significant pollution of Greens Creek from landfill associated water, from any of the active or inactive production rock sites or quarries.

Site 23

At approximately 11:30am we visited the Site 23 production rock facility. The only significant change with respect to this facility over previous visits was related to the development of a spring located above the back wall to the disposal site (see photo below) that flowed onto the site between two finger drains. The spring developed before the storm event and is reported to react to precipitation events. The spring flowed onto the production rock site at an approximate rate of 20gpm during this site visit. It is reported this flow could be as much as 200gpm during high precipitation events. After flowing onto the site the water channeled its way along the pile access road ditch into the lined ditch at the pile toe that terminates in Pond 23 where it is collected and transmitted ultimately to treatment. The plan is to connect this spring's drainage to one of the finger drains as the pile development progresses further up the hill. The finger drain should be able to handle the flow from the spring as the finger drains are made from a 6-inch HDPE pipe that is capable of handling a flow of approximately 2,000gpm.

Production Rock Site 23 (foreground), and Backwall (background)
Note: Spring Running Onto Site

Conclusion

Although the storm that took place between November 14-27, 2005 was a significant event, the tailings facility, Pond 6 and Pond 7 performed well in preventing escape of waste, landfill or mine associated water.

Because of dilution during the storm event, it is expected there was no significant pollution of Greens Creek from landfill associated water, from any of the active or inactive production rock sites or quarries.

In order to accomplish the permitted discharge volume of 2,500gpm without shutting the mill processing down, approximately 1,400gpm more treatment capacity will likely be needed. It was unclear from this site visit whether or not the Pit 5 water treatment plant will be moved to Pond 7.

At approximately 12:15pm we traveled back to the cannery area where we turned in our protective gear and caught the Forest Service provided transportation back to Juneau.

Action Items

The supplemental geotechnical stability report for the Stage 2 expansion is pending. This information should help to guide operation and design characteristics of the State 2 expansion.

ADEC awaits the production of the Stage 2 Tailings Facility Expansion 2006 Work Summary and as-builts from work done during 2005.

A review should be conducted of Pond A to determine if the embankment meets the statutory definition of a dam under AS 46.17.900(3). If so, it would be under the jurisdiction of the Alaska Dam Safety Program. A Hazard Potential Classification and Jurisdictional Review form (available from the Dam Safety and Construction Unit) should be completed by an engineer qualified under 11 AAC 93.193.

Construction completion reports and the operations and maintenance manual for the Pond 7 Dam should be submitted to Dam Safety when received from Klohn-Crippen so that a *Certificate of Approval to Operate a Dam* may be issued.

Final Note

The Department of Environmental Conservation greatly appreciates the Kennecott Greens Creek Mining Company participation in the Environmental Management System ISO 14001 (EMS/ISO) standardization process. An EMS/ISO certification is a standard of excellence highly regarded by regulators, industry and the public around the world. It shows your commitment to achieving the highest of environmental goals.

The ADNR appreciates the cooperation of KGCMC with the Alaska Dam Safety Program.

* * * *End of Report* * * *

cc S. Hohensee (USFS)

E:\z-dec\Z-FACIL\GREENS\051130 Site Visit\051130 Site Visit.doc