

BEFORE THE  
MINE SAFETY AND HEALTH ADMINISTRATION  
ARLINGTON, VA

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In the Matter of:	)	
	)	
<b>30 CFR Part 57</b>	)	
<b>DIESEL PARTICULATE MATTER</b>	)	68 Fed. Reg. 48668
<b>EXPOSURE OF UNDERGROUND</b>	)	(August 14, 2003)
<b>METAL AND NONMETAL MINERS;</b>	)	
<b>PROPOSED RULE</b>	)	
_____	)	

COMMENTS OF KENNECOTT MINERALS HOLDING COMPANY &  
KENNECOTT GREENS CREEK MINING COMPANY

SUBMITTED VIA E-MAIL  
OCTOBER 14, 2003

**Introduction**

These comments are submitted with respect to the Greens Creek Mine near Juneau, Alaska, owned in joint venture by Kennecott Greens Creek Mining Company ("KGCMC," 57.75 percent), Kennecott Juneau Mining Company (12.51 percent) and Hecla Mining Company (29.74 percent). Kennecott Greens Creek Mining Company is the operator of the property and is 100 percent owned by Kennecott Minerals Holdings Company with head office in Salt Lake City, Utah. The Greens Creek Mine extracts ore containing lead, zinc, silver and gold and was the recipient of the 1997 Sentinels of Safety Award for underground metal mines.

Kennecott Minerals Holding Company (KMC) is a member of the National Mining Association (NMA), which has been party to the challenge of the January 19, 2001 final rule and the July 15, 2002 settlement agreement, as is Kennecott Greens Creek Mining Company, and endorses all past and current comments from both entities, including testimonies at the public hearings in Salt Lake City on September 16, 2003 and in Pittsburgh on September 23, 2003, hereby requesting that these comments be made part

**MSHA Docket  
No. AB29-COMM-38**

of the record for this rulemaking.

The purpose of these comments is to provide the Agency with a history of the Greens Creek Mine's involvement in previous diesel particulate matter (DPM) rulemaking efforts, and to clearly demonstrate the potential impacts of the proposed rule on the Greens Creek Mine. While much progress has been made to address the concerns of Greens Creek since the proposed rule was first published in the Federal Register on Thursday, October 29, 1998, there still remain issues of great concern to the mine's ability to economically and technically achieve compliance to the standards being proposed. The Greens Creek Mine requires additional time to determine the economic and technical feasibility of the proposed rule governing exposure to DPM by miners in underground metal-nonmetal mines. Our comments on the proposed rule are as follows:

### **Kennecott Greens Creek Mine's Involvement in the DPM Rulemaking.**

On January 19, 2001 MSHA published a final rule to control exposure of underground metal and nonmetal miners to DPM. The rule set an interim limit of 400 ug/m<sup>3</sup> total carbon (TC) and 160 ug/m<sup>3</sup> TC that became effective July 19, 2002 and January 19, 2006, respectively. Early DPM sampling at the Greens Creek Mine indicated compliance with the limits of 400 ug/m<sup>3</sup> and 160 ug/m<sup>3</sup> TC limits might not be feasible. On January 29, 2001 Greens Creek and Anglo Gold legally challenged the rule. This was followed by legal challenges from NMA and other companies. A partial settlement was reached on July 5, 2001 that allowed certain provisions of the new rule to go into effect and required a sampling study be conducted beginning August 2001 to determine the appropriateness of the compliance limits. The interim DPM concentration limit of 400 ug/m<sup>3</sup> TC became effective July 20, 2002.

The Greens Creek Mine initiated testing of diesel particulate filters (dpfs) on March 3, 2000. The mine continues to install and test the feasibility of on-board self-regenerating catalyzed dpfs, along with active regenerating filters. Sampling for DPM at Greens Creek was conducted by outside parties e.g. NIOSH and MSHA since July 2000. Greens Creek continues to sample DPM as part of its implementation of a diesel exhaust control plan. Greens Creek participated in the joint MSHA/ industry sampling program and study (the 31-Mine Study) that was completed at the end of March 2002. The study showed the Greens Creek Mine was at the high end of non-compliance with the interim standard compared to the other 30 participating mines. A settlement agreement was accepted by all parties on July 15, 2002 and published in the Federal Register on July 18, 2002. The settlement allowed for a one-year compliance extension to the July 19, 2002 effective date for the interim 400 ug/m<sup>3</sup> TC standard. For a one-year period after July 20, 2002 and until July 20, 2003, MSHA stated it would not issue citations if operators were cooperating in good faith to reduce dpm emissions. Since July 20, 2002, Greens Creek has operated under a diesel control plan to limit exposures of miners to DPM and cooperated in good faith with MSHA. Since July 20, 2003, MSHA has conducted one inspection at the Greens Creek Mine during which it did not conduct personal exposure limit (PEL) sampling.

The Greens Creek Mine and MSHA also participated in an additional mine-specific study to assess the performance of catalyzed ceramic filters being applied at Greens Creek for reducing diesel particulates and to determine practical mine-worthy diesel particulate filter technology. The study protocol was developed with input from MSHA and NIOSH and originally scheduled for early November 2002 but later rescheduled for January 20, 2003 due to sampling equipment and weather-related problems experienced by MSHA.

The results of the DPM study at Greens Creek indicated the use of ceramic filters reduced personal DPM exposure by 60 to 80 percent and CO levels up to 50 percent. Use of the filters reduced average engine DPM emissions by 96 percent. However, because of the cascading ventilation system at Greens Creek and with ambient dpm concentrations being measured in the intake air to some of the stopes at concentrations around 300 ug/m<sup>3</sup> elemental carbon (EC), the proposed DPM surrogate, it became clear that being able to achieve personal DPM concentrations below the proposed 308 ug/m<sup>3</sup> (EC) for every underground miner on every shift is most likely not feasible. We believe the DPM study at Greens Creek also brought into question the practical application and worthiness of the dpfs being utilized.

Even with the uncertainty of being able to comply with the proposed interim limit, Greens Creek has ordered additional ceramic filters to retrofit all large hp diesel engines and, as stated earlier, is currently researching active re-generating filters for medium and small hp engines. It is very likely Greens Creek will not be in compliance during certain mining cycles, therefore, Greens Creek will continue to demonstrate to MSHA that it is doing everything technically and economically feasible to comply with the standard, allowing MSHA the opportunity to grant an extension(s) of time for compliance and not issue citations. The most desirable and expected outcome of the proposed rules for the Greens Creek Mine is the expected overall decrease in DPM exposures from dpf installations and the granting of time extensions to further develop feasible DPM controls.

### **The Proposed Rule is not Feasible.**

MSHA has not identified dpm control technology capable of meeting the proposed standards at the Greens Creek Mine for every underground miner on every shift. Greens Creek is unaware of any technology that has been demonstrated that would be capable of attaining the proposed standards at our underground operations. This deficiency in MSHA's analysis of technological feasibility renders its predictions of economic feasibility inaccurate and flawed as well. Given our expanded knowledge of the questionable feasibility of the mine being able to meet the proposed interim elemental carbon limit of 308 micrograms per cubic meter of air, Greens Creek does not believe that the proposed final limit of 160 micrograms per cubic meter is feasible and urges that this limit, or any limit below the interim limit, be deleted from this rulemaking. MSHA should also include a definition of "practical mine-worthy filter technology" in the new rule that identifies dpfs as those proven to be capable of achieving the PELs for DPM in

the underground mine environment for every miner on every shift.

### **Agreement Reached on Some Issues.**

To the degree that the proposed rule follows the settlement agreement, KMC and Greens Creek support finalizing the proposed rule as soon as possible. The proposed rule is expected to be published sometime in the third quarter of 2003 after it has cleared the DOL Policy Review Board and Office of Management and Budget reviews. MSHA is strongly encouraged to expedite finalization of the new rule, as it now leaves the Greens Creek Mine, and all other metal and nonmetal mines, out on a limb without a safety net, relative to compliance.

Total Carbon vs. Elemental Carbon. More specifically, we support the current proposal § 57.5060(a) that defines an interim limit on the concentration of diesel particulate matter as an average eight-hour equivalent full shift airborne concentration of 308 micrograms of elemental carbon per cubic meter of air. MSHA intends to sample miner's exposures to DPM by using a respirable dust sampler equipped with a submicrometer impactor and analyze samples for the amount of elemental carbon using the NIOSH Analytical Method 5040, or equivalent. There is agreement that MSHA has established available sampling technology that can within certain precision, accurately and reliably measure miner's exposures to DPM in all types of underground metal and nonmetal mines.

Personal Exposure Limit. There is also agreement that compliance determinations will be based solely upon personal exposures, rather than on area or occupational exposures, although there still exist issues with the proposed compliance sampling process related to the use of single samples for compliance determinations. We believe that the single sample policy of MSHA carried forth as part of the overall settlement will not accurately reflect the environment to which miners are exposed, especially at the Greens Creek Mine where considerable variability has been measured during the 31-Mine study and subsequent MSHA study.

The 31-Mine study in 2001 indicated that the Greens Creek Mine had DPM levels at the higher end of the spectrum of the mines sampled. The sampling was conducted over a two-day period to determine the DPM exposures over a cross section of the labor force. The second day of sampling, however, was interrupted by a ventilation fan failure and the results were biased higher than normal. The first day of sampling consisting of five personal samples and two area samples showed four of the seven samples obtained were over 308 ug/m<sup>3</sup> EC. These values were 328, 432, 538, and 1141 ug/m<sup>3</sup> EC. Interestingly, all three of the drillers sampled were over the limit even though they were operating electrically powered drills.

The baseline survey conducted by MSHA in January of 2003, however, showed encroachment on the proposed 308 ug/m<sup>3</sup> EC limit on seven occupations sampled, but no excursions over the proposed limit. Of the seven personal samples taken, the highest three samples registered 281, 289, and 292 ug/m<sup>3</sup> (91%, 94%, and 95% of the interim

limit). These values were uncomfortably close to the enforcement level. Given the values obtained from the 31-Mine study, Greens Creek is left in a position of uncertainty based on the data spread. Greens Creek has clearly demonstrated that significant variability exists when sampling underground thereby rendering a single-sample compliance determination of questionable validity. Sample averaging is the preferred method for MSHA to conduct compliance samples.

MSHA Position on Technological Feasibility. As stated in the preamble (pg. 48671), MSHA has limited in-mine documentation on DPM control technology because sampling results were obtained at a time that few mine operators had implemented controls to reduce DPM concentrations. As a result, MSHA's position on feasibility does not reflect consideration of current complications with respect to implementation of controls, such as retrofitting and regeneration of filters. There is strong agreement with MSHA's acknowledgement that these issues (re: retrofitting and regeneration of DPM filters) may influence the extent to which controls are feasible, along with the ability to increase ventilation airflows. The Greens Creek Mine first installed ceramic dpm filters on a haul truck in March 2000 and has since been retrofitting DPM filters on its diesel units, with variable successes. Please refer to the *Greens Creek Mine – Ceramic Filter Testing Experience*, Attachment 1, which clearly demonstrates the variable success of dpf technology and the unlikelihood of meeting the proposed interim and final standard.

The Green Creek Mine uses trucks to haul ore out of the mine up its ramp system. The primary haulage units are six Toro 40D 40-ton haul trucks, fitted with Detroit Series 60 engines, rated at 475 hp. These units the primary focus for the initial DPM exposure level reductions. The mine worked with Englehart to come up with workable dpfs to reduce exhaust emissions from the units. After initial problems, mainly caused by installation and sizing of the filters, the mine successfully equipped its fleet of six Toro trucks with dpfs.

The dpfs utilized have a platinum wash coat, to allow the filters to regenerate passively. There have been 1 – 2 ppm increases in NO<sub>2</sub> levels, but these have been manageable. The dpfs are considered hands off from an operator's stand point. One of the problems with the Englehart filters is that they vibrate loose in the binding "can" holding the four quadrants of the filter elements together; this can lead to the ceramic filter elements progressively degenerating, allowing the exhaust to bypass the filter entirely.

Two identical Toro 1250 LHDs, fitted with Detroit Series 60 engines rated at 350 hp, were fitted with passive dpfs. The one that was consistently worked harder had exhaust temperatures in the 390 degree C range, while the other lower-duty unit had exhaust temperatures of only 340 – 350 degrees C. The dpf on the first LHD regenerated without any problems, but the other one did not. This demonstrates the extreme sensitivity of duty cycle and exhaust temperature to the ability to use dpfs.

A similar problem with the application of dpfs, despite the best engineering available, was experienced with a new Wagner 436 haul truck, fitted with an OEM aftertreatment dpf package. This was designed by Wagner, Detroit Diesel, and Englehart engineers, but

did not work in practice. The failure was because the unit was used on a waste rock backhaul route, with loads being carried down the ramp or on relatively flat hauls. Had the unit been used for ore haulage on uphill routes, it would have achieved the high exhaust temperatures for the designed passive regeneration. This reflects the application-specific use of equipment fitted with dpfs, thereby adding another level of uncertainty to the practicality of having a mine-worthy filter technology.

The Greens Creek Mine has also tried a DCL Blue Sky "active" filter on an Elphinstone R1300 3-1/2 yd LHD, fitted with a Cat engine. This unit is used as a clean up loader with relatively light duties, so would not be a candidate for a passive dpf as the exhaust temperatures do not get high enough to regenerate the filter element. It has sufficient down time during the day to allow it to be parked for 3 hrs or so to clean out the filter.

Active filters are not an option with high-use production equipment, which frequently operate with a "hot change," e.g. the on-coming operator takes over from the operator going off shift from the unit at the working face.

Because the mine is experiencing DPM exposure levels of just below 400 micrograms per cubic meter TC, with occasional excursions above the interim exposure limit, it does not consider the final DPM exposure limit feasible, given its cascading series ventilation system, and with only limited increases in air flow capable of being achieved. Please refer to the *Site Specific Effects of Mine and Ventilation Design in Meeting DPM Limits*, Attachment 2, which clearly demonstrates that there are feasibility constraints to increase ventilation air-flow volumes based on site-specific design criteria for the mine and ventilation systems.

Alternative DPM Control Options. MSHA believes that enhancing ventilation and enclosing miners in cabs or other filtered areas are also effective engineering controls. There is mutual agreement that enclosing a miner in a well-maintained cab is an effective engineering control and Greens Creek will implement these types of controls wherever practical. However, the Greens Creek Mine has limited opportunities to enhance its ventilation, and even if it did, the required ventilation to reduce DPM concentrations without the use of filters would not be feasible (see discussion above).

There is agreement with MSHA that administrative controls can be effective in reducing miner's exposure to DPM, such as: reducing diesel engine idling time, reducing lugging of engines, designating certain areas "off limits" for operating certain diesel equipment, and establishing one-way travel whenever these controls are practical. However, we have to caution MSHA that in many situations, these types of controls are not practical and not possible to implement.

Compliance Assistance. There is acknowledgement by MSHA that some mine operators, such as Greens Creek, may face feasibility challenges implementing current DPM control

methods. That is why Greens Creek solicited MSHA's compliance assistance in early 2002 to conduct a study for the "identification of site-specific, practical mine-worthy filter technology." While the study indicated "significant reductions both in personal exposures and engine emissions", there was no evidence that the mine can consistently comply with the interim limit for every underground miner on every shift. Practical mine-worthy filter technology has not been completely defined at Greens Creek and additional time is required to do so.

Formal Procedure Required for Granting of Extensions. MSHA proposes to adapt the special extension provision of existing § 57.5060(c) and remove the limit on the number of extensions that may be granted to each mine. There is strong agreement with this provision, including allowing approval of the extension by the District Manager, rather than the Secretary. However, we believe there should be a formal process in place to appeal a District's decision on an extension request to the Secretary, if necessary.

We do not believe that granting a special extension would duplicate the regulatory objectives addressed under new § 57.5060(d) and the intended hierarchy of controls for the DPM rule. By granting a special extension under the proposed rule that is limited to one year, subject to yearly renewals, MSHA would be allowing each operator to define site-specific controls, including engineering, administrative and respiratory controls allowed for by the proposed rules. Such controls would be evaluated yearly to warrant an additional extension of time. The proposed special extension provision and the ability granted to use administrative controls and respirators is a good start and will most likely be required to enable compliance at the Greens Creek Mine, specifically with the proposed interim limit. However, KMC also believes there should be provisions to require that MSHA act on a special request and do so within specified time frames.

### **Concerns Remain on Other Issues.**

MSHA's Discretion to Issue Citations: If MSHA finds that a miner is overexposed to the DPM standard, and an inspector determines that some form of engineering and administrative controls are feasible, and the operator didn't install or maintain such controls, MSHA can issue a citation to the mine operator. This is a concern because of the current guidance from the Federal Mine Safety and Health Review Commission (Commission) being is quoted in the preamble that engineering controls may be feasible even though they fail to reduce exposures to PELs, as long as there is a significant reduction in exposure re: capable of reducing miner's exposure by 25%. Notwithstanding, an operator could be subject to citations after implementing engineering and administrative controls deemed feasible by an MSHA inspector. The very reason for MSHA to grant special extensions allowing the operator to avoid citations may be moot, leaving the operator totally at an MSHA inspector's discretion unless the provisions are changed to be transparent and MSHA is required to act on a special extension request agreeing on what controls are, or are not feasible, and do so within specified time frames (see above). This is why we believe it is very important for

MSHA to place in the new rule a definition of “practical mine-worthy filter technology”, meaning those dpfs that have been proven in the mine environment to achieve the PELs for DPM.

Technological Feasibility: We disagree with MSHA’s conclusion that a PEL of 308 ug/m<sup>3</sup> of EC is technologically feasible for the metal and nonmetal mining industry, including the Greens Creek Mine, and that control mechanisms exist that are capable of reducing DPM exposures to this level in all types of underground metal and nonmetal mines. As stated above and in the preamble, MSHA’s position on feasibility does not reflect consideration of current complications with respect to implementation of controls, such as retrofitting and regeneration of filters as discussed above. MSHA acknowledges that these issues may influence the extent to which controls are feasible and that it is continuing to consult with NIOSH, industry and labor representatives on the availability of practical mine-worthy filter technology. In addition, as described above, complications with obtaining adequate ventilation, especially at the face of a stope located in a dead-end drift, like many situations at Greens Creek, would most likely prohibit meeting the PEL of 308 ug/m<sup>3</sup> EC. Many EC samples taken at Greens Creek were very close to the 308 ug/m<sup>3</sup> EC standard, e.g. 281 ug/m<sup>3</sup>, 292 ug/m<sup>3</sup>, demonstrating that being able to achieve personal DPM concentrations near or below 308 ug/m<sup>3</sup> (EC) for every underground miner on every shift in all types of underground mines may not be feasible.

#### **Compliance Assistance Should Continue.**

MSHA has stated that during the 31-Mine Study, the Agency did not find mine operators were using filtration devices. Moreover, few mine operators actually contacted MSHA to ask for compliance assistance, in spite of the Agency’s repeated offers to help. Kennecott Greens Creek Mining Company must, for the record, state that it retrofitted its first diesel engine with a catalyzed ceramic filter on the newest truck (HT37) on March 3, 2000, and installed additional filters on different large horse power diesel engines during 2000, well before the 31-Mine Study took place. In addition, Greens Creek believes it was the first underground metal mine to solicit compliance assistance from MSHA and NIOSH.

MSHA states in the preamble (pg. 48698) that it has found that suitable dpfs for engines for the horsepower used in underground metal and nonmetal mining equipment are commercially available. We disagree that there exist “suitable” dpfs for the two-cycle engines of mid-range horsepower used at Greens Creek. Also, the results of tests at Greens Creek showed that filter rotation was an issue with a particular type of filter due to a manufacturing problem. This issue was discussed with the filter manufacturer and vendor without obtaining closure on the issue, thus, questioning the mine-worthiness of this particular filter and necessitating future compliance assistance from MSHA and the dpf manufacturers to assure compliance is feasible.

At this juncture, we question the ability for all types of underground metal and nonmetal mines to meet the revised interim permissible exposure limit of 308 ug/m<sup>3</sup> EC without further compliance assistance, let alone the proposed final limit of 160 ug/m<sup>3</sup>. Therefore, we would like MSHA to delete the final limit now. If MSHA doesn't delete the final limit in the proposed rulemaking, KMC would support MSHA in amending a final DPM limit in separate rulemaking, allowing enough time to justify the 160 ug/m<sup>3</sup> limit and for all types of underground metal and nonmetal mines to demonstrate feasibility for compliance with the interim limit before addressing a final limit. KMC openly requests MSHA's compliance assistance in meeting a final DPM limit, as it did in its continuing efforts to meet the interim limit.

### **Potential Risks From DPM Exposure Not Quantified.**

The Greens Creek Mine desires to continue to work together with MSHA and other interested parties to develop standards that are both feasible for operators and would prevent a significant health risk to underground miners. However, the available DPM health data fall far short of demonstrating that the standards MSHA has proposed are necessary to protect against a significant risk to underground miners' health. MSHA should not rush to judgment in prematurely proposing DPM standards that are not feasible to meet at the Greens Creek Mine. MSHA should wait for the outcome of additional ongoing studies to establish a dose-response relationship for exposure to DPM before imposing standards that cannot feasibly be achieved. The current scientific database is insufficient to sustain a meaningful quantitative risk assessment for DPM; therefore, we believe there is no sufficient scientific basis upon which to establish the proposed DPM limits. Unfortunately, the regulations are far in advance of the science. This is why we urge MSHA to delete the final limit from these regulations and concentrate on the feasibility of meeting the proposed interim limit.

### **More Time Needed.**

Continued compliance assistance is necessary at the Greens Creek Mine to establish controls for all diesel equipment underground. In the case of the fleet of two cycle engines, no technology exists for the mitigation of DPM by means of an exhaust after-treatment. These engines serve a low duty cycle and as such will potentially be in the fleet inventory for years to come. Engines with a higher duty cycle will require changing at more frequent intervals. These engines are targeted with cleaner replacement engines as the opportunities present themselves. Continued dialog with compliance assistance is important to disseminate information as newer, or additional, technologies develop until there are solutions for all engines currently inventoried at all metal/non-metal underground mines.

Additional time is necessary to evaluate more durable filters. Filter durability is one of the pivotal points in determining a feasible solution. The technology has been shown to be effective in a certain range of applications, but to be economically viable, extended service is necessary. Failures of dpfs at 2,500 hours is common at Greens Creek. On-

going dialog with the filter manufacturers have been unfruitful. Testing is continuing but there are no guarantees apart from a “trust me ... it should work better.” Costs for ceramic soot trap installations are approaching 10% of the fleet operational costs. This is excessive for a consumable product with a finite life span. “Mine-worthy filter technology” is far more demanding than a typical over-the-road application and the ability of the filter to survive these conditions goes to the very heart of the feasibility issue.

In summary, KMC and the Greens Creek Mine are willing to continue to work with MSHA to develop performance-based controls to reduce diesel exhaust exposures to miners that are feasible and flexible enough to accommodate the real-world conditions that exist at the Greens Creek Mine and look forward to doing so.

Respectfully submitted,

A handwritten signature in black ink that reads "Fred Fox". The signature is written in a cursive, slightly slanted style.

Fred Fox

## **Greens Creek Mine Ceramic Filter Testing Experience**

Greens Creek has been testing ceramic filters for 3 ½ years and has approximately 26,000 hours of filter operation experience.

- 03/00 The first Ceramic filter was installed on the newest truck (HT37) on March 3, 2000. The filter size recommended by Englehard was a 20" x 15" unit matched to the 12.7 liter Series 60 DDEC engine in the Toro 40 D haul truck. The filter was mounted on the truck and was run for approximately two months. Within 500 hours of engine operation the engine performance decreased and ultimately the operator complained of a "lack of power" and the truck was withdrawn from service. Troubleshooting indicated that excessive backpressure was the cause of the problems and a value of 70" Water Gauge was measured.
- 05/00 The 20" x 15" filter was returned to Englehard to be exchanged for two smaller 15" x 15" filters. The expectation was that a smaller filter would retain the exhaust heat more effectively and provide sufficient heat to allow the trapped soot to burn off and self-regenerate as per design.
- 07/00 Temperature profiles were run on the haul truck (HT37) to determine the operating temperature and duty cycle of the engine under normal conditions without a soot filter installed but running a normal PTX scrubber. The temperatures achieved were 431 degrees C for 29% of the operating cycle. This range was deemed satisfactory by Englehard, the filter manufacturer, to allow self-regeneration of the filter without the need for external kilning.
- 09/00 The replacement ceramic filters arrived and a 15" x 15" unit was re-installed on HT37. The truck operated for roughly 200 hours and again the filter clogged up. This time the backpressure was recorded as being close to 80" W.G. The filter was once again removed from service.
- 12/00 A new 15" x 15" filter was re-mounted on HT37 after making the proper physical mounting modifications. The exhaust system was wrapped with a heat retaining insulation. Trials began anew.
- 04/01 After successful operation of 1131 hours, an additional 5 ceramic filters were committed to purchase to outfit the remainder of the large truck fleet.
- 09/01 Another 40 D haul truck, HT 21, was outfitted with a 15" x 15" ceramic filter on September 18<sup>th</sup>. Engine meter hours were 565 hours at installation.
- 10/01 Commitments were made for 3 additional ceramic filters to mount on the 3 large LHD units. The fleet of loaders is comprised of 2 Toro 450 loaders with 11.1 liter Series 60 DDEC engines and on Toro 1250 loader with the same powerplant. The filters purchased were 12" x 15" models.

- 11/01 An MTT420 backfill truck HT 33 was retrofitted with a smaller 11" x 14" model of ceramic filter on November 4. The engine meter was reading 2087 hours at installation. A third 40 D haul truck, HT 23 was retrofitted with a 15" x 15" ceramic filter on November 23rd. The engine hour meter was reading 2810 hours at installation.
- 08/02 Wagner MT436B - 30 Ton teletram was outfitted with an Engelhard 12x15 OEM soot filter at the factory prior to delivery based on specifications provided to them by Englehard. The truck has a Detroit 60 Series engine model 6063TK32 rated at 375 HP. Wagner reported that backpressure was too high but suspicions were that the Detroit engine was not set up correctly to accept the filter. One of our spare 12x15 filters was sent down to the Wagner plant to allow them to fit the filter at the factory prior to shipment to us for commissioning. Subsequent field trials at Greens Creek indicated similar problems and the filter was removed from service.
- 09/02 Following a PM inspection, the filter on HT37 was removed from service due to a cracked ceramic. The filter had been run for 21 months and logged 5649 hours. A replacement 15x15 was installed and is functioning normally.
- 10/02 A 12x15 filter was installed on LR46 following specifications provided by Englehard. The engine is a Detroit 60 Series engine model 6063WK32 with 11.1 liter displacement rated at 300 HP. After installation, backpressures were excessive. Pressures registered 43" water gauge full throttle, no load and over 55 inches under torque stall conditions. The filter was removed and replaced with a 15x15 model. Backpressures dropped to 15 inches at high idle no load and 22" under full torque stall conditions.
- 12/02 The soot trap was removed from HT and discarded. A maintenance review on HT21 resulted in the soot trap on HT21 being removed from service December 23, 2002. The ceramic had rotated inside the shell and was "loose".
- 1/03 The soot trap was removed from HT37 (idled truck) and stored in the shop January 15, 2003. The mounting cones for the filter pulled from HT21 were located in the shop. Two additional 15 x 15 filters were ordered from Englehard and one set of transition cones and clamps. The clamps were air freighted Jan 15/03. Confirmed HT23 and HT24 had filters mounted. Work order for installing the filter from HT37 on HT21 MU4959 initiated 1/16/03. MSHA slated to conduct in-mine sampling for filter efficiency as well as gas co-generation Jan 22-30.
- 1/03 MSHA conducted an in-mine DPM sampling program to determine filtration efficiencies of the Engelhard soot traps. 3 days of sampling the mucking cycle with filters in place were followed by 3 days of sampling the same equipment with the traps removed. Roughly 120 samples were taken by MSHA and 20 by

- Greens Creek. Engine gas emissions were also conducted on two separate occasions for determination of the gas byproducts of filter regeneration. Sampling was completed Jan 30.
- 1/03 MSHA conducted baseline DPM sampling on 7 miners Jan 27<sup>th</sup>. Miners sampled were backfill jammer, backfill truck, powder truck, grader, open cab mucker, truck driver, driller, and two area samples at the bottom of the mine where backfilling was taking place.
  - 05/03 Repowered grader GR17 with a Mercedes engine to replace the old Caterpillar unit before placing into service.
  - 05/03 Ordered one 15x15 filter and one 11 ¼ x14 ceramic filters from DCL 05/28/03
  - 06/03 Received two 15 x 15 ceramic filters from Engelhard on Warranty from the failed units discovered in January. Received one 15 x 15 filter and one 11 ¼ x 14 filter from DCL (06/19/03). Installed one Engelhard 15 x 15 filter on HT22 (06/25/03) – New installation. Received two 15 x 15 filters from Engelhard (06/26/03) that had been on order since January 10<sup>th</sup> 2003
  - 07/03 Installed new Engelhard 15 x 15 filter on LR 46 after a PM noticed the old filter had cracked up internally (06/30/03). Old filter had logged 2302 hours.. Installed the DCL 11 ¼ x 14 filter on HT29 as a test bed for the DCL filter Model 5C-5211 S/N 38125 (07/11/03) . Install new backpressure monitor and new 15 x 15 ceramic filter from DCL on HT38 (07/17/03) during PM cycle
  - 09/03 Sampled Dozer operation in backfill cycle in 254 stope (09/03/03). Took both personal and area samples. Sampled Dozer operation in backfill cycle in M46 Stope laying tailings floor down (09/06/03). Took both personal and area samples. Connors removed stope drill mounted on the John Deere dozer from the mine. Preparations are being made to re-power the dozer-drill with an engine approved from Part 36. We now have 10 filters mounted on equipment. There are two trial DCL passive filters, one DCL active filter, and seven passive Engelhard filters.

## ATTACHMENT 2

### Site Specific Effects of Mine and Ventilation Design in Meeting DPM Limits

Greens Creek operates with the Admiralty Island National Monument. As such, severe restrictions have been imposed pertaining to disturbances to surface lands. Opportunities for establishing alternative ventilation accesses into the mine are very restrictive not only in establishing the ventilation breakthrough locations but also in providing access to the openings for maintenance purposes. The permitting processes for land disturbances are lengthy.

The mine has portal accesses driven into the mountainside at 920 and 1350 feet elevations. Mine development has progressively found additional ore at locations deeper and more distal to the portal. As mining development has followed the orebody deeper, the overlying mountain has also risen higher above the active workings. Existing development activity has reached a depth of roughly 200 feet below sea level at the current face, and the mountain is roughly 3000 feet above the lowest workings. The terrain is very rugged as can be expected from a mountainous setting befitting a national monument. Additional breakthroughs to surface have been prohibitively costly in terms of both time and expense.

As such, the mine ventilation plan has evolved into a cascading ventilation system where the air is coursed through the mine and progressively ventilates lower workings in turn until ultimately the air is captured in raises and routed to the original ventilation returns established with the original General Plan of Operations approved for the mine construction.

The cascading nature of the mine ventilation system has some important consequences regarding maintaining the DPM concentration levels within proposed limits. In a cascading, or series system, the ambient levels of contaminant slowly increase as each time the air ventilates a heading, additional contaminant is introduced into the same air stream. There comes a point where the ambient contaminant levels encroach close enough to the compliance limit that no volume of dilutant air could realistically dilute the heading concentrations to compliance levels. In the case of Greens Creek, ambient levels of DPM in the intake air near the lower levels of the mine were already at 77% of the interim limit.

The 31 mine study indicated that the DPM concentration levels in the Gold mines were generally higher than those found in the Limestone and Trona operations. This is felt to be a partial function of mining geometry. The gold mines typically have smaller stopes and headings than the larger tonnage open room geometries utilized by other mining methods. The exhaust has to come out the same entry it entered and has no opportunity to convect into the upper reaches of a stope where sampling would not be able to collect it.

The typical response to lowering DPM concentration within work headings without resorting to exhaust filtration or re-powering equipment is to improve stope ventilation through either maintaining existing ventilation ducting or increasing the size of either the auxiliary fan and/or ducting to the face. While this would seem like a plausible approach, it assumes such equipment can be mounted in the areas of concern. Large headings can accommodate larger ventilation fans and ducting while small headings such as those required at Greens Creek can only accommodate smaller diameter ducting without interfering with the operation of the equipment. Ventilation volumes are limited by fan and ducting diameter and there is an upper limit as to the realistically feasible ventilation volumes that can be delivered. Conditions such as these precludes the fall back position of increasing ventilation volumes to a stope as a means of reducing DPM concentrations, although limited enhancements can be made with routine vent ducting maintenance.

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**From:** Sexauer, Edward J - MSHA  
**Sent:** Wednesday, October 15, 2003 8:10 AM  
**To:**  
**Subject:** FW: Comments of Kennecott Minerals Holding Company & Kennecott Greens Creek Mining Company 68 Fed. Reg. 48668, Aug. 14, 2003 Diesel Particulate Matter Exposure of Underground Metal and Nonmetal Miners; Proposed Rule



DPM comments FF  
10.14.03.doc ...

-----Original Message-----

From: Fox, Fred (KMC) [mailto:Fred.Fox@riotinto.com]  
Sent: Tuesday, October 14, 2003 5:54 PM  
To: comments@msha.gov  
Cc: Webster, Peter L (KEX); Heig, Rich (KMC-GC); Jackman, Adrian (KMC)  
Subject: Comments of Kennecott Minerals Holding Company & Kennecott Greens Creek Mining Company 68 Fed. Reg. 48668, Aug. 14, 2003 Diesel Particulate Matter Exposure of Underground Metal and Nonmetal Miners; Proposed Rule

Mr. Marvin Nichols  
Director  
Office of Standards, Variances & Regulations  
MSHA  
1100 Wilson Blvd., Room 2313  
Arlington, VA 2209-3939

Dear Mr. Nichols:

Please see the attachment for comments on the Notice of Proposed Rulemaking published on August 14, 2003 (68 FR 48668) submitted by Kennecott Minerals Holding Company and Kennecott Greens Creek Mining Company in the matter of: 30 CFR Part 57, Diesel Particulate Matter Exposure of Underground Metal and Nonmetal Miners; Proposed Rule.

I appreciate the opportunity to comment on these proposed rules and to work with MSHA in the past and to continue in the future to reduce DPM exposures to our miners.

Sincerely,

Fred Fox  
Kennecott Minerals Company  
224 N 2200 W  
Salt Lake City, Utah 84116

801-238-2492  
e-mail: foxf@kennecott.com

<<DPM comments FF 10.14.03.doc>>