MACTEC

April 5, 2004

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Submitted by E-mail: comments@msha.gov / Nichols-Marvin@msha.gov

Marvin Nichols
Office of Standards, Regulations and Variances
US Department of Labor
Mine Safety & Health Administration
1100 Wilson Blvd
Arlington, VA 22209-3939

Reference: RIN 1219-AB29
DPM Comments

Dear Mr. Nichols:

My name is H. John Head. I am a mining engineer with considerable experience in underground mining operations and regulatory compliance. My resume is attached.

I have been retained in an on-going capacity by the MARG Diesel Coalition (MARG) to work on DPM regulations. I have been involved with the Metal/Nonmetal Diesel Partnership since its inception. The Partnership was formed to research DPM control methods in underground metal/nonmetal mines. It comprises the National Institute for Occupational Safety and Health (NIOSH), the National Mining Association (NMA), MARG, the National Stone, Sand and Gravel Association (NSSGA), and the United Steel Workers of America (USWA), with the Mine Safety and Health Administration (MSHA) as an observer.

Considerable work in the research of DPM control methods has been carried out at the Stillwater Mine in Nye, Montana. I assisted drafting the protocols for this work, and in helping to finalize the reports that were developed by the engineers and scientists conducting the research.

One portion of this research was the Isolated Zone Study which is one of the three studies that MSHA has entered in the recently-reopened rulemaking record. This study was the first phase in a two-phase study. Phase I was an Isolated Zone study to determine the efficiency of DPM control technology in an environment where the mobile equipment fitted with the controls performed simulated mining activities. Phase II was a Case Study which attempted to simulate a real mine production setting, with some vehicles fitted with control devices and some without.

MACTEC Engineering and Consulting
1200 Jorie Boulevard, Suite 230 • Oak Brook, IL 60523
630-571-2162 • Fax: 630-571-0439

I have attached comments on the Stillwater studies.

I appreciate the opportunity to submit these comments for the record.

Please call me if you have any questions. You can reach me at my office number - 630-571-2162, extension 21 - or on my cell phone - 630-750-0652. My E-mail address is hjhead@mactec.com.

Regards,

MACTEC Engineering & Consulting, Inc.

H. John Head, P.E.
Senior Principal Engineer

HJH/hjh/KJS

cc Henry Chajet, Esq., Counsel to MARG Diesel Coalition

dpm comments april 2004 cover letter.doc

Comments on the Research at Stillwater Mine on DPM Control Methods

INTRODUCTION

The Metal/Nonmetal Diesel Partnership, a coalition whose membership includes, the National Institute for Occupational Safety and Health (NIOSH), the National Mining Association (NMA), MARG Diesel Coalition, the National Stone, Sand and Gravel Association (NSSGA), the United Steel Workers of America (USWA), and the Mine Safety and Health Administration (MSHA), was formed to examine, enhance, and facilitate implementation of emissions control technology that will reduce the exposure of underground miners to diesel particulate matter (DPM) and toxic gases. The first step toward fulfilling this objective was to identify potentially technically and economically feasible controls to curtail diesel particulate matter emissions from existing and new diesel powered vehicles in underground metal and nonmetal mines. The study of diesel particulate filters (DPFs) at the Stillwater Mine was organized under the auspices of the Metal/Nonmetal Diesel Partnership to continue the effort of identifying potentially practical DPM control technologies.

The work at the mine was planned in two phases. Phase I was an Isolated Zone study to determine the efficiency of DPM control technology in an environment where the mobile equipment fitted with the controls performed simulated mining activities. Phase II was a Case Study which attempted to simulate a real mine production setting, with some vehicles fitted with control devices and some without.

One result of both studies was clear: in these tightly controlled, limited duration trials, DPFs reduced DPM concentrations in the mine atmosphere. In this regard the studies confirmed similar short-duration trials at other mines and in laboratory settings.

What was not proven in the trials is whether DPFs are widely applicable to on-going mining operations, where the regeneration of filters is a dominant concern. Other concerns include: the considerable cost of this control technology, whether DPFs will physically fit (1) on certain types and models of diesel-powered equipment or (2) within some tightly constrained mine openings, and the reliability of both the DPF units

themselves and the control devices needed to keep them operating safely and efficiently on mobile equipment.

APPLICABILITY OF DPFs AT STILLWATER

Stillwater Mine has undertaken extensive research in the use of DPFs to control DPM in the mine. Numerous types of DPFs have been evaluated for use with the fleet of diesel-powered equipment at the mine. The mine have reviewed engine and exhaust system characteristics, duty cycles, exhaust temperatures, and DPM generation potential.

The filter elements of DPFs become clogged, as they filter out particulates. It is this removal of these clogged particulates that is the primary concern. They can only be removed by burning them out of the filter matrix. This is done by high temperatures, either applied externally by heating elements (either on-board by plugging the filter into a power source or in off-board ovens) or internally through high exhaust temperatures. Filters that are regenerated using separately applied heat are "active" filters; those that regenerate through high exhaust temperatures only are "passive" filters. The active filters require periodic operator intervention; the passive filters are independent of operator involvement.

Of the 285 pieces of diesel-powered mobile equipment used at Stillwater Mine, only 47 units (or 17 percent) are deemed practical for use with passive DPFs. The remaining 238 (or 83 percent) cannot be used with passive DPFs. However, actively regenerated filters - with off-board regeneration - are not capable of being used at the mine because of the considerable difficulties that would be encountered in providing regeneration capabilities. These difficulties include (1) ground control concerns with over-size mine excavations for the regeneration stations and their related parking areas and (2) the administrative problems of managing the regeneration cycles of the large fleet of diesel-powered equipment, spread over hundreds of miles of underground workings.

The DPF technology tested in both phases of the work at Stillwater used filters that regenerated passively, when they achieved high exhaust temperatures. All five DPF systems used in the Case Study had a Corning cordierite wall-flow monolith filter

element washcoated with a proprietary platinum-based catalyst. This platinum catalyst reduces the combustion temperature of the soot trapped within the filter matrix. While it improves the operational characteristics of the filter's regeneration process, it also promotes the production of gases within the exhaust stream, the most common being nitrogen dioxide (NO2). The large quantity of ventilation in the mine and test area was expected to dilute the NO2 and prevent any hazards.

In the Case Study, the new filters produced so much NO2 - 6 to 7 ppm at the operator's station - that the tests had to be terminated 20 minutes after the start of the trial. Even 30 ft or so downstream from the vehicle readings were in excess of 5 ppm NO2, the present TLV-C(r) ceiling limit in (30 CFR § 57.5001). The ventilation quantity in the section was measured at 80,000 cfm.

Stillwater operates on a 12-hr shift, further reducing the time weighted average exposure to 2.4 ppm NO2. Thus Stillwater operates on an action level of 2.0 ppm NO2 to withdraw miners from affected areas to allow dilution of the atmosphere before the concentration requires the mine to remove the miners from the mine.

The problems observed in this Phase II of the Stillwater study, under ideal conditions with extra precautions, conducted in the presence of and in cooperation with MSHA, NIOSH, equipment manufacturers, and others, regarding installation and use of the DPF systems, and getting them to perform correctly, are indicative of the difficulties inherent in applying this emerging technology and expected to be encountered at all mines that attempt to retrofit the technology to existing fleets.

FEASIBILITY ISSUES

This Phase II of the Stillwater tests demonstrates that even when experienced and dedicated engineers are responsible for the application of emerging DPF technology, the DPF systems do not yet provide reliable, feasible methods to meet the current MSHA DPM limit of 308 micro-gram EC per cubic meter, and the 2006 limit of 160 TC (to be converted to an EC equivalent, assumed to be 123 micro-gram EC per cubic meter).

Both phases of the Stillwater study prove that further testing is warranted and must be performed to insure both the functionality and feasibility of DPF systems and to assure that the use of such systems will not produce other more significant hazards to miners.

While this exercise was a scientific study, the issue of costs cannot be ignored. Stillwater Mine incurred costs of about $750,000 in DPF research to date, without being able to achieve compliance with the MSHA 308 micro-gram EC per cubic meter standard. Stillwater anticipates that it will spend least $1.9 million to fit DPFs to those units where size constraints permits their installation (without regard to the anticipated significant operational costs demonstrated by the Phase II Case Study), and that after this considerable expenditure, it is uncertain that the mine will be able to comply with MSHA's 308 micro-gram EC per cubic meter standard. Stillwater is certain, however, that even these actions will not permit it be in compliance with MSHA's 160 micro-gram TC per cubic meter standard (assumed to be 123 micro-gram EC per cubic meter).

Possible solutions to enable DPFs to be used at Stillwater are as follows:

- continue to use "passive" filter regeneration technology (i.e. the soot is burnt off from within the filter matrix by high exhaust temperatures) for the limited number of mine vehicles for which the engine and duty cycle are suitable *:

Option	Issues
"degreen" the filters off line; i.e. remove the excess platinum catalyst by "running them in" for several hundred hours	- requires separate facilities; - also there is an absurdity to "degreening" a new filter, essentially "wearing it out" before putting it to work.
"degreen" the filters in a carefully controlled manner in the underground operations by limiting the numbers of new filters in any one section	- administrative controls to insure that no more than one or two new filters are operating in a section at any one time are likely to be difficult to implement; - especially when the ventilation circuit is in series and the exhaust from one

	section is used as the intake to the next
operate tight administrative controls to limit the numbers of new filters in any one section	- see above
- use fuel additives	- administrative controls to insure that the right fuel is available to each diesel-powered unit are likely to be difficult to implement

- revert to "active" filter regeneration technology (i.e. the soot is burnt off from within the filter matrix by applying heat from external sources, either on board the unit or in separate ovens):

Option	Issues
install ovens in regeneration stations throughout the mine	- expensive, even for the limited numbers of high emission producing engines - the excavations for the stations are likely to present ground control problems in the Stillwater orebody
insure that every diesel-powered unit returns to have the filter regenerated when needed	- essentially impossible to achieve, given the nature of the operation and the miners

Stillwater Mine has undertaken considerable research in the field of DPF applications, as can be seen from the estimates above. Yet the efforts of this intensive program have not been able to demonstrate that DPFs are a practical mine-worthy technology.

Even under the highly controlled conditions of this Stillwater test, using expert engineering personnel and careful planning, installation, and monitoring of equipment, the DPF technology did not provide a feasible means of successfully meeting either the MSHA 308 EC standard or the pending MSHA 2006 reduction to a 160 TC standard, based on achieving compliance for all single sample personal exposure results as required by the rule. The results indicate that significant additional development, testing and experimentation is needed to develop feasible DPF controls to meet the mandates of the MSHA rule, particularly the 160 TC standard.

CONCLUSION

The concluding paragraph of the Introduction to the Case Study report reads as follows:

> "Due to the nature of the study, Phase II did not address other and no less important matters related to implementation of DPM control technologies in underground mines. These matters include selection of DPF regeneration strategies, economic, logistical, and technical feasibility of implementation of various DPF systems on mining vehicles, and the reliability and durability of the systems in mine settings. Addressing those matters would require a different and more comprehensive type of feasibility study yet to be performed."

We concur that the issues of economic and technical feasibility, and long term reliability and durability of DPFs as DPM control devices are still unproven.

H. John Head, P.E.
Senior Principal Engineer

Biosketch

Mr. Head has over 30 years of experience in the mining industry with specific expertise in underground and surface mine planning, ore reserves analysis, mine and tunnel ventilation, mine safety and health issues, including compliance audits.

He has experience in all aspects of mining including mine management and engineering, corporate and financial issues, mine safety and health, regulatory affairs, and consulting research services. Mr. Head has worked in mines in Zimbabwe, Australia, Canada, England, Ireland, the United States, Mexico, Indonesia, and South Africa. His extensive experience allows him to provide solution-oriented approaches to a broad range of mining projects.

Mr. Head's general fields of competence include mine operations, mining engineering, and underground mine feasibility studies.

Recently, Mr. Head has managed general engineering projects, such as the modification to a storm water reservoir, a landfill investigation and subsequent restoration, and a waste water treatment plant. He acts as a senior engineer in developing new leads within Mactec Engineering and Consulting, Inc.'s site restoration group.

Mr. Head is a nationally and internationally recognized expert in mine safety and health. He has been instrumental in drafting and implementing corporate safety policies and managing mine safety programs; he has been consulted on safety and health reviews and mine health and safety regulations and has provided expert testimony on mining safety and health issues.

Education

MBA, Management, Cranfield Institute of Technology, Bedford, England, 1975
B.Sc., Mining Engineering, Royal School of Mines, Imperial College, London, England, 1970

Licenses/Registrations/Certifications

Chartered Engineer, England
Registered Professional Engineer, Illinois, Kentucky, Missouri, Ohio, Pennsylvania
Mine Manager's Certificate of Competency, Tasmania, Australia

Project Experience

Mining Operations/Engineering

Underground Salt Mine, United States –Managed a 1.8 million ton per year underground salt mine and implemented a $4 million capital investment program over an 18-month period. During this period, production went up, while the frequency of accidents and injuries went down. Relations with MSHA were also significantly improved, and safety and health violations dropped dramatically. This reflected a

major shift in the mine's safety and health philosophy, from one of reacting to observed hazards and violations to one where potentially unsafe conditions were actively prevented.

Aggregate and Lime/Cement Production Facilities, United States – Directed mine planning projects for aggregate and lime/cement producers in Connecticut, Iowa, Illinois, Indiana, Kentucky, Maryland, Missouri, Pennsylvania, South Carolina, Virginia, and Wisconsin. Several of these included feasibility plans for underground mining.

Salt Mine, United States – Assisted in the reopening of a century-old salt mine that had been on care and maintenance for 15 years. Comprehensive involvement included:

- Refining capital and operating cost estimates
- Developing and updating a detailed project schedule by activity and cost flow
- Designing mine layouts
- Preparing necessary operating plans for approval by the Mine Safety and Health Administration
- Assisting in compliance with mining safety and health regulations
- Recommending, selecting, and helping to buy equipment and facilities, and helping to get them into the mine through 4'-6" by 5'-6" shaft openings
- Working with experts in various other fields, such as rock mechanics, mine hoists, and building demolition, to ensure that the work is done cost effectively and to the tight time constraints of the project
- Assisting in the design, procurement, and installation of the new production shaft headframe and shaft conveyances
- Presenting mining plans to owners of mineral rights and to local government officials, in both private and public meetings
- Undertaking complete processing plant implementation, including plant design to meet ASTM specifications for the product, equipment selection, construction layout in the mine, and erection supervision
- Developing labor requirements, including number and skills of necessary personnel, and appropriate wage and salary levels
- Assisting in blasting patterns for optimum rock breakage and minimum neighborhood complaints
- Setting up mine surveying and layout controls
- Analyzing various ventilation options for the mine, to ensure that blasting fumes and the exhaust from the diesel-powered equipment is adequately cleared from the mine
- Reviewing permit applications, prepared by local contractors, for the site's air and water controls

Primary ongoing involvement is in project management and control, both time and cost, following the intensive start-up operations and as the mine moves toward consistent operating productivity.

Salt Mine, United States – Undertook an operations review of a large underground salt mine. The primary goal of the work was to review the management structure and its effectiveness in consistently achieving production targets. To determine whether any possible problems were due to organizational, rather than technical, issues, undertook a mine operations review, including:

- A brief review of underground and surface operations - both production and maintenance
- A review of reports and reporting functions - shift handovers, reporting and priority setting between production and maintenance, department head/staff meetings and progress reports
- Interviews/discussions with key staff
- A brief review of mining engineering activities as they relate to the management issues - mainly mine planning and related operational scheduling

Trap Rock Quarry, Pennsylvania – Prepared detailed plans for a quarry in eastern Pennsylvania that included in-pit crushing with a steep conveyor (40 degrees) hauling rock up the high wall, and the

extension of reserves by going underground in the dipping (15 degrees) deposit. The underground mine layout used "diamond-shaped" pillars to limit roadway grades to less than 15 percent. Directed the development of an experimental portal that was driven into the highwall to evaluate the stability of the blocky ground.

Underground Limestone Mine, Kansas City – Developed a conceptual plan for all aspects of opening an 1,100 ft deep limestone mine. Feasibility plans included detailed analyses of ramp verses shaft access, stability and sizing of a multi-legged decline for mine access, all estimated capital and operating costs for mine development and operation at various levels of production, preliminary design of the underground crushing and screening system, manning and equipment requirements, and preliminary ventilation design.

Underground Limestone Mines, Pennsylvania – Developed the plans for two underground high calcium limestone mines. The first involved an open stopping/draw point system in a 70-foot-thick vertical seam, while the second utilized a diamond pattern room and pillar system in the same seam, but dipping at 14 degrees.

Underground Limestone Mine, Cincinnati, Ohio – Prepared the preliminary design and feasibility of an underground room and pillar mine located in a high-purity limestone beneath the City of Cincinnati. The city was interested in offsetting costs associated with developing the reservoir by selling aggregate.

Underground Limestone Mine, Illinois – Prepared an underground mine feasibility study, including estimated capital and operating costs. Excessive overburden, desire for a higher quality aggregate, and depleting reserves made an underground mine a feasible alternative to moving vast quantities of overburden while attempting to expand the quarry laterally.

Sand and Gravel Production Facility, Midwestern United States – Used geophysical methods (seismic and electro-magnetic) and reverse circulation drilling to develop reserves estimate across the site of a major sand and gravel producer in the Midwest. Data generated were used to develop a mining sequence that would optimize the life of the deposit by blending material from different areas into a more consistent product.

Potash Mine, England – Developed mining plans and operational procedures for a deep potash mine in England in very difficult conditions, gas, high temperature, and weak mudstone.

Litigation Support

Various Sites, United States – Provided specific expertise including expert witness testimony on numerous projects involving aspects of mine operations and mining safety and regulatory issues on such subjects as:

- Methane gas occurrences and mitigation, including ignitions and explosions
- Equipment selection, operation, and maintenance
- Blasting practices, including explosive use and storage
- Escapeway procedures
- Airborne contaminants, including diesel particulate matter (DPM)
- Confined spaces
- Shaft and hoist operations, both conventional service and production shafts and hoists, as well as emergency access raises
- Mine planning, including new mine design and feasibility
- Ground control of quarry/open pit highwalls and underground mine portals and roadways

- Stockpile operations, including rock salt stockpile health issues, and slope stability
- Plant and crusher operations
- Railroad operations and training
- Rock storage silo failure
- Mine contractor issues, including training and overlapping workplace responsibilities
- New mine development contract issues
- Conveyor design, construction, and operation
- Noise and hearing conservation, including noise controls
- Mine planning and exploitation of reserves

Safety Audits/Reviews

Mining Facilities, United States – Conducted in-depth safety audits for several mining operations. These audits have been in coal, salt, trona, industrial minerals, sand and gravel, and aggregate in underground mines and surface quarries. Conducted audits on behalf of outside parties who wanted an independent review as part of due diligence studies, internal self-regulatory reviews and as parts of general reviews of diverse conglomerates, and on behalf of insurance companies.

Nationwide Mining Company, United States – Responsible for the safety and health compliance in multidisciplinary audits of a nationwide stone, industrial sand, and specialty minerals corporation. Developed procedures to allow "pilot site" audits at several representative mines to be performed uniformly throughout the remaining United States facilities.

Gold and Platinum Mines, South Africa – Provided the mining expertise for a multidisciplinary team involved in reviewing the operations of several deep, underground gold and platinum mines. Evaluated the safety practices and operating procedures related to mining methods and related roof support; ventilation systems; travel-way conditions, mobile equipment procedures; use and storage of explosives; and emergency planning and response procedures.

Copper/Gold Mine, Indonesia – Part of a multidisciplinary safety audit team at a massive copper/gold mine. Responsible for reviewing the safety and health issues at the open-pit/underground block cave complex, producing in excess of 90,000 tons per day with a work force of more than 5,000. The review included: the ventilation system; production and development mining methods and related roof support practices; access roadway stability both above and below ground, mobile equipment operation procedures; maintenance and warehouse operations; use and storage of explosives; and operator training procedures.

Coal Mines, Mexico – Part of a multidisciplinary team reviewing the operations of four underground coal mines and two open pits as part of the acquisition of a northern Mexico coal mining complex. The review included: longwall production and road-header development mining methods and related roof support practices; ventilation systems; maintenance operations; conveyor haulage systems; and operator training and safety reporting procedures.

Safety and Health and Safety and Health Training

Aggregate Quarries, United States – Undertook industrial hygiene surveys of 18 quarries in the eastern United States for a large aggregate producer. These determined background exposures of quarry workers to respirable dust and noise. Presented results of the surveys to company management with recommendations for mitigation of overexposures.

Underground Limestone Mines, United States – Provided advice to an eastern United States lime producer on MSHA compliance issues at two large underground limestone mines.

Underground Limestone Mines, United States – Conducted diesel exhaust particulate matter (DPM) surveys and ventilation reviews at six underground limestone mines in the Midwestern United States. The results of the diesel survey were used to formulate a response to MSHA's proposed rule on DPM in all U.S. underground metal and nonmetal mines. The ventilation reviews were used to recommend improvements in underground air quality for miners.

Various Small Mines, United States – Developed a training program for instructors to enable small mines and independent mining contractors to give their own MSHA Part 46 safety and health training. Gave course in several states where MSHA does not provide grants to assist in miner training.

Regulatory Issues

As one of the founding members of the Methane Awareness Resource Group and presently retained as Mining Engineering Consultant to the group. The plans to revise the metal/nonmetal gassy mine standards have apparently been put on hold, if not abandoned by MSHA, largely as a result of the work of this group.

Various Mines, United States – Involved in the review of several substantial new mining regulations proposed by MSHA, OSHA, and EPA, resulting in a thorough understanding of the workings of federal agencies. Worked with clients to assist in commenting on proposed mining ordinances at both the state and local levels.

Various Mines, United States – Took the lead among the U.S. mining industry in commenting on several significant health and safety regulations proposed by the Federal Mine Safety and Health Administration. These included standards for air quality, gassy mines, explosives, personnel hoisting, haulage and equipment, pattern of violations, and electrical power.

Metal and Nonmetal Mines, United States – Undertook a review of MSHA's regulatory flexibility analysis of the proposed rule on diesel exhaust particulate matter on behalf of the National Mining Association, in conjunction with the National Stone Association, The Salt Institute, and the MARG Diesel Coalition. This was done by conducting a survey of diesel equipment usage at all U.S. underground metal and nonmetal mines. This data was then used to evaluate the likely cost of compliance with the proposed rule. Another aspect of this review was to determine the technical feasibility of compliance including: clean-burning, electronic-controlled engines, particulate traps and catalytic converters on exhaust streams, and alternative diesel fuel and fuel additives.

Permitting and Zoning

Limestone Quarry, Illinois – Assisted in the rezoning application for a quarry in Northern Illinois. Work included life-of-mine plans, including reclamation options; detailed presentations in zoning meetings and expert testimony in court; and assisting the county in writing a mining ordinance.

Limestone Deposit, United States – Assisted in the zoning and permitting of a steeply dipping, high-grade limestone deposit to be mined from underground. Developed plans to have the crushing and

screening processing operations and all related run-of-mine and finished product stockpiles underground to reduce surface impacts.

Hydrogeology

Limestone Quarry, Kentucky – Reviewed the hydrogeologic conditions in a large, deep limestone quarry in western Kentucky. Evaluated the geotechnical conditions with respect to likely maximum depth of the quarry, without excessive pumping. Established the "sill pillar" thickness between a water-bearing zone and the quarry floor necessary to retain an adequate seal beneath the quarry.

Limestone Quarry, Illinois – Reviewed the conflicting conclusions of two hydrological consultants at a quarry in northern Illinois. Clarified the issue and made recommendations for the reestablishing of water flow in a dried up well close to the quarry. Evaluated the potential impact of underground mining at the site on nearby deep wells.

Limestone Quarry, United States – Assisted in the analysis of hydrological data from a drilling program. Estimated ground water flows into the proposed quarry. Incorporated in mine plan methods to reduce uncontrolled surface water run-off.

Granite Quarry, South Carolina – Prepared mine plans for a quarry in South Carolina that included the extensive relocation of a surface stream. The plan included the protection of adjacent wetlands that could not to be affected by the mining operation.

Geotechnical

Miller Brewing Facility, Milwaukee – Analyzed the structural stability of, and the potential for a soil slope failure above, a series of 150-year old masonry lined tunnels at the Miller Brewing facility in Milwaukee. The tunnels were used primarily as a tourist attraction during brewery tours, and had experienced several small failures. Results led to the design of a reinforced shotcrete lining with a system of radial drains to completely rehabilitate the tunnels.

Lead Zinc Mine, Ireland – Developed pillar extraction blasting designs in a large underground lead-zinc mine to reduce vibration damage to exposed, vertical faces of hydraulic backfill in adjacent slopes. Developed blasting designs to reduce surface vibration and noise in overlying urban areas above underground blasts.

Geotechnical Laboratory, Australia – Managed a field office and provided onsite liaison between laboratory scientists and mine staff at an underground mine in Australia that was being used as a "full-scale model" for rock mechanics experiments. Work included stability evaluations of the hanging wall and footwall of high (600 ft plus) stopes, backfilled with sand tailings.

Landfill

Illinois Environmental Protection Agency, Anna Municipal Landfill, Anna, Illinois – Managed this project from the initial investigation stage, through remediation design, to construction oversight of the restoration activities.

The Anna Municipal Landfill is an 80-acre municipal waste disposal site located approximately one mile north of the City of Anna in Union County, Southern Illinois. The facility accepted general municipal

refuse from 1975 until operations ceased in 1992. The site was added to the abandoned landfills program in 1999.

MACTEC E&C undertook a detailed site investigation that resulted in a summary Investigation Report in June 2002. This documented numerous erosion gullies, lack of vegetative cover, inadequate gas venting, and leachate seeps. The western half of the landfill, approximately 10 acres, had only temporary "day cover" over the trash and was the primary target for remedial activities. The erosion gullies were threatening to cut back into the waste areas, compromising the site.

MACTEC E&C prepared a detailed design for remediation of the landfill. Construction, under the supervision of MACTEC E&C started in July 2003. Activities included grading the western half of the landfill to provide suitable drainage contours, placing a geosynthetic gas collection fabric on top of the subgrade, and then capping the site with two feet of low permeability soils and one foot of topsoil, and seeding the cap with a proven grass mix to ensure long lasting stability of the cap. The drainage profile of the regraded area was such that a detention basin was needed to collect storm water run off and control its discharge to adjacent streams. Gas flares and other landfill gas control systems have being installed. The erosion gullies have been regraded and reinforced with rip rap and gabions to limit future damage.

Construction Management

County of DuPage, Eldridge Park Reservoir, Elmhurst, Illinois – Managed the construction oversight of a project to provide additional storage volume in a reservoir adjacent to the Salt Creek in Elmhurst. This involved liaison with the client, the County of DuPage, who provided the funding, the user and manager of the reservoir, the City of Elmurst, and the design engineers and the construction contractor.

Mactec E&C acted as the owner's representative in the successful modifications to increase the storm surge capacity of this over-flow reservoir in DuPage County.

Waste Water Treatment

Amber Plating Works, Chicago, Illinois – Managed the project to upgrade the waste water treatment stream from an old metals plating facility. This involved coordinating plant activities and permits with the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) and the Illinois Environmental Protection Agency (IEPA). The plant obtained a waste water treatment permit from the IEPA and a response from the MWRDGC indicating that the treatment process met the facility's Special Conditions to its discharge authorization.

Like most of those in the plating/surface finishing industry, Amber is subject to the current categorical limitations of 40 CFR Part 433. These limits are enforced locally by the Metropolitan Water Reclamation District of Greater Chicago. Amber's 30+ year-old clarifier was not consistently capable of removing sufficient floc to meet the District's standards. Additionally, the massive settling tank did not allow room around its space for the necessary secondary containment of some 68,000 gallons of wastewater.

MACTEC E&C was retained to design the new clarification/containment capabilities at Amber. Of necessity, our design first went considerably upstream to process water volume issues. After working with Amber for water reduction and water beneficial reuse, MACTEC was able to size Amber's system for optimal performance.

Publications

1990. Head, H. John, "Enforcement - a pattern of violations." Eastern Mineral Law Foundation, Mine Safety Institute, Washington D.C. June.
1991. Head, H. John, "Real-world mine planning." American Mining Congress Mining Convention, Salt Lake City Utah. September 29 – October.
1996. Head, H. John, Kip Smith, Karl Everet. "Quarry Zoning & Permitting Issues in Urban Areas." NSA Environmental Committee Seminar, Chicago Illinois. September 22 - 23,
1996. Head, H. John, "Underground limestone mines - a safe future." Roof and Rib Seminar, (USBM) Pittsburgh Research Center, Paducah, Kentucky. December 11.
1997. Head, H. John, Jack Raimondi, Mike Dunn. "Safety - beyond compliance." National Stone Association Environment, Safety and Health Forum, St. Louis, Missouri. October 19-21.
1999. Head, H. John, "Diesel equipment in U/G metal/nonmetal mines and the potential impact of MSHA's proposed DPM rule." 8th U.S. Mine Ventilation Symposium, Diesel Workshop, Rolla, Missouri. June 13.
1999. Head, H. John, "Review of economic and technical feasibility of compliance issues related to: Department of Labor - MSHA 30 CFR Part 57 - proposed rule for diesel particulate matter exposure of underground metal and nonmetal miners." Report prepared for National Mining Association, Washington D.C. July 21.
1999. Head, H. John, "Diesel equipment in U/G stone mines: MSHA's proposed diesel particulate rule and mine ventilation." National Stone Association Environment, Safety and Health Forum, Houston, Texas. October 24-26.
2000. Head, H. John, Emanuel Z. Manos, "Detroit Salt Mine - Past & Future." 8th World Salt Symposium, Rob. M. Geertman, Editor, The Hague, The Netherlands. May 8-11.
2001. Head, H. John, "Proper Ventilation for Underground Stone Mines." Aggregates Manager, January.
2001. Head, H. John, "Calculating UG Mine Ventilation Fan Requirements." Aggregates Manager, April.
2001. Head, H. John, "Diesel Emissions in Stone Mines." Aggregates Manager, June.
2001. Head, H. John, "Compliance Strategies for DPM Exposure Limits in U.S. Mines." Mine Diesel Emissions Conference. Markham Ontario Canada. 7-8 November.
2002. Manos, Emanuel Z., H. John Head, "Diesel Emissions at the Detroit Mine." North American/Ninth U.S. Mine Ventilation Symposium, Euler de Souza, Editor, Kingston, Ontario, Canada. June 8-12. (Abstract accepted, paper submitted for publication)

Memberships

Institution of Mining and Metallurgy, London, England
Society of Mining, Metallurgy and Exploration, Inc., Chairman Safety and Health Committee
International Society of Explosives Engineers
National Stone Association, Member Safety and Health Committee
Illinois Association of Aggregate Producers, Member Safety and Health Committee