MINUTES

MINE SAFETY AND HEALTH RESEARCH ADVISORY COMMITTEE (MSHRAC) MEETING
NOVEMBER 14, 2016, 8:00 AM – 12:30 PT
SPOKANE MINING RESEARCH DIVISION
315 E. MONTGOMERY
SPOKANE, WA 99207

COMMITTEE MEMBERS & ATTENDEES PRESENT

Dr. Priscilla Nelson, Department Head and Professor, Department of Mining Engineering, Colorado School of Mines, Chair of MSHRAC, called the meeting to order at 8:00 a.m.

The following members were present in person:

Mr. Jeffrey Welsh, NIOSH, Designated Federal Officer
Dr. Sukumar Bandopadhyay, Professor of Mining Engineering, University of Alaska Fairbanks
Dr. Kramer Luxbacher, Associate Professor, Assistant Department Head, Mining and Minerals Engineering, Virginia Polytechnic Institute and State University
Dr. Richard Fragaszy, Program Director, Division of Civil, Mechanical and Manufacturing Innovation, National Science Foundation
Dr. Jeffery Kravitz, Chief, Scientific Development, Mine Emergency Operations, Mine Safety and Health Administration

The following members were present via webinar:

Dr. Jefferey Burgess, Director, Division of Community, Environmental and Policy, University of Arizona
Mr. Dale Drysdale, Vice President of Occupational & Environmental Health, National Stone, Sand & Gravel Association (Mr. Drysdale departed the meeting at 12:30 p.m.)
Mr. Bruce Watzman, Senior Vice President, National Mining Association
Mr. Michael Wright, Director of Health, Safety and Environment, United Steelworkers of America
Dr. Aubrey Miller, Senior Medical Advisor, National Institute of Environmental Health Sciences (Joined the meeting at 8:35 a.m.)

The following attendees were present in person:

Jessica Kogel, NIOSH, Atlanta, GA
RJ Matetic, NIOSH-PMRD, Pittsburgh, PA
Eric Lutz, NIOSH-SMRD, Spokane, WA
F. Michael Jenkins, Spokane, WA
Robert Randolph, NIOSH-PMRD, Pittsburgh, PA
Linda Burrow, NIOSH-SMRD, Spokane, WA
George Luxbacher, Dallas, Texas
Pamela Drake, NIOSH-SMRD, Spokane, WA
Michael Wegleitner, Hecla Mining, Coeur d'Alene, ID
Todd Ruff, NIOSH-SMRD, Spokane, WA
Carl Sunderman, NIOSH-SMRD, Spokane, WA
Mary Poulton, University of Arizona, Tucson, AZ
David Hanson, NIOSH-SMRD, Spokane, WA

The following attendees were present via webinar:

John Howard, NIOSH, Washington, DC
Gerald Finfinger, Pittsburgh, PA
Marie Chovanec, NIOSH, Pittsburgh, PA
Ron Bowersox, UMWA
Stacy Kramer, Freeport McMoRan, Phoenix, AZ
Erica Poff, Board of Certified Safety Professionals

Mark Thomson, Crowell & Moring, Washington, DC
Patrick Dempsey, NIOSH-PMRD, Pittsburgh, PA
John Burr, NIOSH, Pittsburgh, PA
Dana Willmer, NIOSH-PMRD, Pittsburgh, PA
David Weissman, NIOSH-RHD, Morgantown, WV
Drew Potts, NIOSH-PMRD, Pittsburgh, PA
Carl Brackpool, Denver, Colorado
Martin Harper, NIOSH-HELD, Morgantown, WV
Ryan Hill, NIOSH, Morgantown, WV
Gerrit Goodman, NIOSH-PMRD, Pittsburgh, PA
Lisa Steiner, NIOSH-PMRD, Pittsburgh, PA
Berni Metzger, NIOSH, Pittsburgh, PA
3 guests were in attendance via webinar that could not be identified

Mr. Welsh explained that MSHRAC members participating in the meeting must be free from conflicts of interest. He asked members to declare conflicts of interest before the morning session and after a short health break. There were no conflicts from members reported.

Dr. Nelson introduced the minutes from the last meeting and S. Bandopadhyay moved to approve the minutes as written. R. Fragaszy seconded the motion and it was passed unanimously. P. Nelson thanked the NIOSH staff for the timely production of the minutes.

DR. JOHN HOWARD, TELEPHONIC REPORT FROM THE DIRECTOR, NIOSH

Dr. Howard welcomed the committee members and thanked them for traveling to Spokane for the meeting. He stated that NIOSH is fortunate to have Dr. Jessica Kogel as the Associate Director for Mining and Dr. Eric Lutz as the Spokane Mining Research Division (SMRD) Director. Dr. Howard is delighted with the progress that SMRD has made toward scientific excellence under Dr. Lutz's direction. He asked the committee for recommendations about the future direction of SMRD.

DR. JESSICA KOGEL, REPORT FROM THE ASSOCIATE DIRECTOR FOR MINING, NIOSH

Dr. Kogel presented an overview of the NIOSH mining program's initiatives with a focus on providing a status update of progress since the last MSHRAC meeting. Over the past 6 months the mining program has filled key leadership positions including Director (PMRD), Deputy Director (SMRD), multiple Branch Chiefs (PMRD), and Associate Director for Science (SMRD). This has given the program stability in the leadership ranks as well as permanency both of which have been a positive step for the program. Additional leadership positions that are in the process of being filled include Associate Director for Science (PMRD), Deputy Director (PMRD), Senior Advisor (OMSHR) and several team leads at SMRD. It is anticipated that these positions will be filled by the end of the calendar year. Also during this time period a comprehensive review and gap analysis of the program was undertaken. Based on this exercise several new teams have been chartered to address the following areas: smart mines and mining of the future, oil and gas occupational health and safety, mine worker health and safety training, mineralogy and characterization of mine dust (eg. elongate mineral particles, crystalline silica, erionite, coal dust) as well as long term health. The Minerals and Materials Research team will be staffed and functional at the beginning of 2017. The focus of this team will be the mineralogical and geological properties of earth materials as they apply to mine worker health and safety. Areas such as dust exposure and toxicity along with ground control will be addressed by this team. A mine worker health and safety training research team that will serve both PMRD and SMRD is being formed to research effective training methods to improve mine worker health and safety outcomes. The Mining Program will also increase focus on health research and has built capacity in this area including standing up a Miner Exposure and Health Surveillance Team as well as a new IH lab in Spokane. The program is also making strategic investments in experimental mines and includes 3 approaches 1) upgrading the Bruceton Experimental Mine, 2) replacing Lake Lynn Laboratory Mine and 3) exploring the possibility of forming relationships with existing experimental mines or recently retired operating mines. NIOSH hopes to have the replacement site for the Lake Lynn Laboratory Mine selected within a year. Another priority area for the program is building partnerships with a range of stakeholders to identify and implement solutions to mine worker health and safety challenges. To that end a new partnership that will be co-chaired with MSHA has been formed. The first meeting of the NIOSH/MSHA Diesel Health Effects Partnership is December 8th in Meadowlands, PA. NIOSH is also reaching out to work with global organizations. NIOSH has

met with the Pan American Health Organization (PAHO) and members of the Cundinamarca Government in Colombia to discuss collaboration. The International Commission on Occupational Health (ICOH) has reached out to NIOSH Mining. Academic partnerships are also important in the multi-sector approach.

Question from P. Nelson: Who are the members of the Breathing Air Supply Partnership? Response: NIOSH, MSHA, UMWA, BCOA, NMA, and BHP Billiton.

Question from P. Nelson: What did you mean by the separation of OMSHR, PMRD, and SMRD as independent research entities? Response: Each Division has their own independent leadership and budget. But the mining program otherwise functions as a team, working together through weekly senior leadership meetings and quarterly harmonization meetings that bring the leadership team together to focus on identifying and discussing priorities, program strategies and opportunities for coordinating across the two divisions.

Comment from P. Nelson: Some elements of industry do their own cross-sector management. All 3 industries (mining, construction, oil and gas) are doing more outsourcing of tasks. There may be best practices that are already there. Getting information to small mines is important.

Question from J. Kravitz: Has collaboration with the defense sector been discussed? Response: We are putting together an agenda for a meeting of the Interagency Working Group (IAWG). We would like the committee's feedback on possible topic areas, or needs that the IAWG could address.

Comment from B. Watzman: I would like to educate the committee about the NAS respirable dust study. In FY16, funds were provided to NIOSH to work with NAS on coal related respirable dust. The coal industry is concerned that the NAS committee does not have representation from anyone with experience managing the total aspects of a respirable coal dust program. No current or past industry representatives are members of the NAS committee. This could undermine any recommendations that the committee would make. Is there anything that the MSHRAC committee can do to expand the makeup of the NAS committee to include a coal mine operators' representative. Response by P. Nelson: The MSHRAC committee would like to review the charge and provisional member list for the NAS committee.

The charge and provisional member list were shared with the committee later in the meeting. M. Wright stated that the NAS takes a different approach to the study committees. B. Watzman stated that this study will not have creditability without a coal industry representative. P. Nelson asked the MSHRAC committee members to send their comments about the provisional members list to her by COB on Friday, November 18, 2016 and she will forward the comments from MSHRAC to the NAS.

Question from M. Wright: Could you talk about collaboration on oil and gas extraction, which is a pretty dangerous industry, with far less regulatory attention than mining? For example, we've lost a number of workers from acute hydrocarbon exposure caused by climbing on top of a tanker truck and dropping a line in to gauge the level – pretty primitive. Response from Ryan Hill: Your example of tank-related deaths is a great example of where the O&G industry may benefit from mining technologies, in this case the Evade software and use of FLIR and personal monitoring to identify hazards and prevent additional fatalities.

ELONGATE MINERAL PARTICLE WORKSHOP – DR. MARTIN HARPER

Dr. Harper noted that NIOSH research activities regarding elongate mineral particles (EMP's), which include asbestos and minerals crystallizing or occurring in elongate particles, have been guided by the Current Intelligence Bulletin 62: Asbestos Fibers and Other Elongate Mineral Particles: State of the Science and Roadmap for Research (2011). One of the major recommendations of the "Roadmap" was for a better harmonized terminology for EMP's. NIOSH therefore was engaged in developing a workshop to discuss terminology issues, but, more importantly, to develop a common descriptive language and reasonable protocol for characterization, allowing effective comparisons of studies that can later inform policy development. The organizers wanted to bring together mineralogists, analysts, and health scientists, and the workshop was planned to be divided into matrix areas (bulk/soil, air and water, tissue) with presentations on each matrix by world-renowned expert speakers focusing on each specialty (mineralogy, analysis, toxicology) as it relates to the matrix. These presentations were to be interspersed with panel discussions and case studies. Two of the case studies under consideration were to be briefly described. The format was to be a 1.5 day workshop to be held together

with a 1.5 day health effects workshop (the latter through a conference grant to a university) in September, 2016, at the Lister Hill Conference Center, Bethesda, MD. The workshop was constituted to include various government agencies, including NIOSH, OSHA, EPA, NIEHS, USGS, HSL (UK) and the private sector (academia, consultants and industry representatives), and it was not intended to produce immediate recommendations for government policies. However, it was noted that the organizational process could be construed as possibly contravening regulations regarding the Federal Advisory Committee Act, and thus the workshop was canceled. However, the effort is still considered important, and NIOSH is seeking to find a path forward that ensures a proper constitution for the workshop, hopefully in 2017.

Question from M. Wright: What are your views on the excess of mesothelioma on the northern Minnesota iron range, and the extent to which there is a collaboration between NIOSH and U. of Minn. researchers? Response: M. Harper will call M. Wright to discuss.

Question from A. Miller: You indicated that you would be moving the Elongate Mineral Particle Workshop to the NAS in the spring. Have you identified what that process might look like and do you know if there will be an opportunity for us and other agencies to comment on how the NAS process and content might unfold? Response: We will give them an outline but they will be independent. I am sure that agencies will have opportunities to comment, but control of the agenda is an important element in determining if a meeting falls under FACA.

Question from A. Miller to J. Kogel or P. Nelson: I was thinking about comments regarding lack of participation of workers in lung screening and lack of understanding about how and who is using various technologies etc. Is it possible for NIOSH to do more consistent work with focus groups or fund extramural efforts to form ongoing worker-academic collaboration to assess why they do/don't participate in efforts or employ certain technologies etc.? Response: P. Nelson asked A. Miller to send his question to her or J. Kogel.

Question from B. Watzman: Explain the organizational flaws in the planning process that lead to cancellation? Response from J. Kogel: Because of FACA requirements, a decision was made to cancel the workshop that was scheduled for September 2016. The NAS will conduct a 1-1/2 day workshop in spring 2017 with a similar agenda.

Question from S. Bandopadhyay: How do the particles become airborne? Response: Activities which result in dust will also aerosolize elongate mineral particle components of rocks and soils. This includes crushing or grinding rocks during mining or construction, but it is even possible for activities such as mowing lawns in dry environments, as was noted in our assessments of Forest Service worker exposures to Libby amphibole asbestos and zeolite mineral erionite.

SMART MINE/INNOVATIONS TEAM – MR. JEFF WELSH

Mr. Welsh presented an overview of a new NIOSH mining team, Innovations/Smart Mine of the Future Team. The purposes of this team are to envision what the mining industry of the future will look like and what occupational health and safety risks future mine workers will be exposed to, and to determine what role NIOSH should have to protect mine workers from those risks. He went on to describe industry trends that some mining sectors are moving toward, including autonomous operation of mining vehicles, which has become a reality at some mines. Several companies in Western Australia operate entire fleets of excavators, haul trucks and trains from a control center miles away from the mines. Other mining operations are not that advanced, but use various levels of machine control, including remote control and non-line-of-sight teleoperation. Each type of operation has the potential of introducing new emerging worker health and safety issues that will need addressed. Mining operations are also moving toward more advanced mine monitoring systems, collecting real time information from the mine atmosphere, equipment, worker location, and worker health sensors, for example. As large amounts of real-time data is collected, the question of how the data will be managed, sorted and presented to the mine worker will be important. In concluding, Mr. Welsh then asked the committee what their thoughts are of the role the NIOSH mine worker health and safety research program should be in preparing for the future of mining.

Comment from K. Luxbacher: Systems Engineers are important when thinking about the future of mining and need to be incorporated in mining. Also, copper mines in Central America might be a source of information related to robotics in mining. Response: The team will follow up on this.

Comment from J. Burgess: Look at DOT work on connected vehicles, they have a comprehensive portfolio and should be open to collaboration. Response: The team will follow up on this.

Comment from S. Bandopadhyay: Sensors, - sensing the right data is an important consideration. Response: Yes, agreed.

Comment from P. Nelson: Normal operations and emergency operations are two scenarios that should be considered. Response: Yes, agreed.

Comment from M. Wright: There is a body of expertise in Process Safety Management to prevent chemical accidents that you could consider collaborating with. Response: The team will follow up on this.

Comment from J. Kravitz: Thinking about mine rescue teams, contact Robin Murphy, Texas A&M professor, about robot-operator interaction. Response: The team will follow up on this.

EXTRACTIVES INDUSTRY WORK GROUP – MR. JEFF WELSH

Mr. Welsh presented an overview of a new NIOSH mining initiative, an Extractive Industries Working Group, introduced by Dr. Kogel in her Mining Program Highlights presentation. Based on feedback at the May 2016 MSHRAC meeting that NIOSH mining should consider collaborating with the Oil & Gas sector for worker health and safety, a meeting was held between NIOSH mining and oil & gas leadership in June 2016. An output of that meeting was establishment of the Extractive Industries Working Group. The working group objectives are: 1) Identify, prioritize, & implement opportunities for deploying mining technologies into O&G applications and vice versa; 2) Identify new opportunities for developing novel technologies that address H&S challenges common to both the O&G and Mining sectors; 3) Share relevant technical knowledge and best practices across both programs; 4) Share relevant non-technical knowledge and best practice across both programs (ex. stakeholder engagement, working with small companies, communications, information dissemination); and 5) Facilitate communication across all O&G and Mining stakeholders. An example where NIOSH researchers in the two programs have already successfully collaborated is in evaluating the effectiveness of a mini baghouse retrofit assembly to control respirable crystalline silica dust generated by a sand mover at a gas well drill site. NIOSH O&G researchers needed instrumentation and assistance in the mini baghouse evaluation, and NIOSH mining researchers needed a field site to test a portable instrument being considered for mining for the near real time analysis of silica exposures. Mr. Welsh next discussed some examples of mining health and safety solutions that have potential for application to oil and gas workers. They include: Intelligent lockout-tagout; Thermal stress fact sheets; Continuous personal dust monitor; Diesel particulate matter monitor; Helmet-Cam and Evade 2.0 software; Cab filtration; Hearing loss simulator and noise training items; and Ergonomics awareness training. Mr. Welsh concluded by asking the MSHRAC committee members for feedback on the proposed mining and oil & gas collaboration.

Question from S. Bandopadhyay: What are the mining resources that will be put forth for this collaboration? Response from J. Kogel: The Mining Program's first priority is the health and safety of workers in mining. The idea behind this collaboration is to pursue health and safety solutions that are beneficial for both mining and oil & gas, not to just support other sector areas with solutions that don't benefit mining as well. Because the mining program has limited resources it is imperative that we remain clear about priorities and objectives. The goal is to create a win-win proposition and the initial focus will be on technology transfer. This will require limited staff resources.

Question from P. Nelson: Does the Oil & Gas sector have a FACA advisory committee, and could we get their input? At universities, oil & gas and mining departments may not be working together. Are research partnerships with academia possible? Response: Yes, the NIOSH Board of Scientific Counselors (BSC) is the FACA advisory committee for the Oil & Gas sector. The NIOSH Oil & Gas program manager gave a presentation at the last BSC meeting in September 2016 and discussed partnerships to improve safety and health. The BSC is supportive of this work. The oil & gas sector is looking at the possibility of partnerships with academia, and the mining sector does when appropriate.

Comment from M. Wright: In 2014, there were 46 deaths in mining and 135 deaths in the Oil & Gas industry. The Oil & Gas industry is very far behind mining in occupational safety and health. A leading cause of death in Oil & Gas is climbing on equipment to manually gauge depths. Meanwhile mining has solutions. In Oil & Gas there are

very small companies. The Oil & Gas industry desperately needs safety and health help. Response: Agreed. Those are examples of why it makes sense for a mining and Oil & Gas collaboration.

Comment from R. Fragaszy: This collaboration is a very good idea.

Comment from K. Luxbacher: Will you track novel ideas of what comes out of the mining and oil and gas collaboration. Response: Yes, we will track the progress of this collaboration.

TWH/SURVEILLANCE – DR. ERIC LUTZ

Dr. Lutz presented a Mining Program update on the Miner Health Program. The implications of chronic diseases in the U.S. population is significant, with over half or 177 million people suffering from one or more chronic health conditions. Further, chronic diseases account for approximately 86% of U.S. healthcare spending and accounts for seven out of the top 10 causes of death. The current burden of chronic diseases in mining is largely unknown, especially outside of coal mining. However, limited research projects have identified that: exposure to vapors, gas, dust, or fumes among miners is significantly higher than for all U.S. workers; some populations of miners have elevated risk of lung cancer and non-malignant respiratory disease; the top five causes of death among MNM miners are similar to U.S. population: heart disease, cancer, chronic lower respiratory disease, cerebrovascular disease, and unintentional injuries; and that in a sample of miners evaluated at state miners' clinic, prevalence of respiratory disease, cancer, and arthritis varied by mining sector, with Metal miners with higher risk of cancer and arthritis compared with coal miners, coal and uranium miners with higher risk of respiratory disease compared with metal and nonmetal miners, and the need for health and exposure data by sector to systematically analyze health of miners.

To understand the burden of chronic diseases across the mining workforce, and develop interventions and controls to mitigate occupationally-related chronic disease risks, the Mining Program is initiating the Miner Health Research Program (MHP). The objective of the MHP is to understand the relationship between occupation and chronic disease status for the US mining workforce and to elucidate the burden of disease in surface and underground mines, across commodity sectors, and by job tasks. Identify the needs of the mining industry, specifically as it relates to economic implications and exposure/risk management and mitigating risks, disease incidence and knowledge gaps through research that considers evolving mining methods; and conducting high impact research that increases the efficacy of interventions, controls, and technologies. Dr. Lutz underscored that this program will be built with stakeholder participation and partnerships at the earliest stages of formulation and include mining operators, professional associations, labor organizations, and academic institutions. The MHP will be housed out of SMRD under the new Miner Exposure and Health Surveillance Team and will be implemented using a methodical staged and phased approach that will: identify the burden of occupational diseases amongst US miners, elucidate risk of occupational diseases amongst US miners, mitigate risk and burden of occupational diseases across the US mining population, and measure efficacy of mitigation efforts. Currently the MHP roadmap is being developed and a National Academies of Science (NAS)-facilitated workshop on chronic diseases in mining is being scheduled for the fall of 2017.

Question from P. Nelson: Why is the incidences of arthritis more prevalent in metal than coal? Response: We are not sure why the incidence of arthritis is more prevalent in metal mining than in coal mining. There is a broad lack of understanding associated with chronic diseases amongst the mining workforce, hence the need for the MHP.

Question from P. Nelson: With the rise in the number of contractors, tracking is only going to become more difficult. How are you going to engage contractors? Response: Contractors will be engaged by having a seat at the table in meetings from the beginning.

Question from B. Watzman: On the surface this makes sense to improve mine worker health and safety, but there are significant concerns that need to be addressed – how is this going to be carried out and how will sector bias be handled. This needs to be well thought out to answer questions that will be raised. Response: We will look at data gathering and have stakeholders at the table at the project development stage.

Comment from K. Luxbacher: Shift work, fatigue, long shifts, mental health, and stressful environment should also be addressed in addition to respiratory disease. Do you have plans to look at these issues? Response: Heat stress and cognitive function are part of a pilot project with Eastern Washington University.

PMRD DIVISION UPDATE – DR. RJ MATETIC

Dr. Matetic discussed: 1) Organizational Updates, 2) Research Portfolio Overview, and 3) Program Highlights in the presentation.

The Program Strategic Direction has a mission "to eliminate mining fatalities, injuries, and illnesses though research and prevention." The following three strategic goals, along with specific program areas are as follows: 1) Reduce mine workers' risk of occupational illness – Diesel assessment & control, Respirable dust assessment & control, Hearing loss prevention, 2) Reduce mine workers' risk of injuries and fatalities – Health & safety management systems, Musculoskeletal disorder prevention, Training research & development, Illumination, Ground control, Electrical & machine safety, Safety culture, Surveillance, and 3) Reduce the risk of mine disasters and improve survivability of mine workers – Atmospheric monitoring & control, Refuge alternatives, Breathing air supplies, Communications & tracking, Emergency response & rescue, Explosion prevention, Fire prevention & control, and Ventilation.

PMRD (Pittsburgh Mining Research Division) is comprised of seven (7) branches 1) Workplace Health, 2) Ground Control, 3) Human Factors, 4) Health Communications, Surveillance and Research Support, 5) Dust, Ventilation and Toxic Substances, 6) Electrical and Mechanical Systems Safety, and 7) Fires and Explosions. Dr. Matetic pointed out the new team added to the Health Communications, Surveillance and Research Support Branch referred to as the Mine Safety and Health Training Research and Development Team, will recommend training practices and model training products for use by training providers, provide translational training outputs to support NIOSH projects that need a training component, and provide research outputs developed from the latest training science in evaluating for feasibility and impact. He also pointed out the new team in the Dust, Ventilation and Toxic Substances Branch referred to as the Minerals and Materials Research team which will address the fundamental understanding of mine worker exposure to mineral dusts. The team will also develop field based analytical methods for real-time measurement of mine worker exposure to mineral dusts and investigate heavy metals exposure, lead exposure and DPM exposure in the mine environment.

Dr. Matetic explained that the PMRD FY2017 program has 20 projects in seven branches distributed across mining subsectors. Overall, 21% of PMRD projects address Stone, Sand & Gravel H&S issues, 21 % Metal & Nonmetal, and 58 % Coal. Three new projects started since the last meeting are: 1) Design methodology for Rib Control in Coal Mines (100% UG Coal), 2) Underground Stone Mine Pillar Design in Challenging Conditions (100% UG Stone), and 3) Stability Evaluation of Active Gas Well in Longwall Abutment Pillars (100% UG coal with implications for Oil & Gas Extraction safe practices).

Next Dr. Matetic discussed PMRD staffing goals, retirement and succession. There are currently 168 employees at PMRD and 53 current vacancies for the new organizational structure which has a total of 221 positions. Fifty-five (55) employees can retire within 3 years. Dr. Matetic then discussed four (4) Sustainability Workgroups (Workforce Development, Leadership Development, Succession Management, and Employee Outreach) to describe the strategy addressing the staffing needs. He went on to describe the recent successful hiring and recruitment activities that resulted in hiring 21 new employees through various recruitment methods. Three (3) critical Branch Chief positions were filled, and there were also 10 departures in the calendar year at PMRD.

He also presented the PMRD program (by Branch and overall) breakdown by commodity to show the efforts that are represented in Stone, Sand and Gravel, Metal and Nonmetal, and Coal sectors. Dr. Matetic introduced how PMRDs strategic planning links the project activities to the program goals in reaching relevance and impact for the mining industry. An overview of the relationship between the research project's intermediate outcomes (IO), the research plan that contributes to the IO and the dissemination efforts (both scientific and translational) in bringing the knowledge gap and applications to the sectors was presented. In 2016, PMRD produced 147 outputs to support science (54%) and research translation (46%) and PMRD is gearing up to provide translational outputs to the appropriate audiences in a meaningful way. Most outputs were related to coal (53%) and all mining (28%), then metal, then stone, sand and gravel, then industrial minerals, and then finally oil and gas extraction at 7%, 6%, 5%, and 1% respectively. Another avenue of getting science and application to the industry is through stakeholder interaction and engagement. PMRD responded to the committee's advice by providing seven partnership activities since the May meeting, and has three upcoming events in the next couple of months to show the priority and value for stakeholder engagement.

Dr. Matetic wrapped up the PMRD overview by highlighting three areas of success including 1) the ErgoMine mobile auditing app, originally geared towards auditing ergonomics issues in stone, sand and gravel mines, showed that phone downloads (630 downloads) were preferred over tablet downloads (77) which will help shape our approach for future apps, 2) CPDM (Continuous Personal Dust Monitor) was mandated on 2/1/16 for underground coal and anecdotal evidence has shown that miners are using the data to find lower-dust areas to stand while performing their jobs, there was reported healthy competition by co-workers to have the lowest CPDM exposure readings and one company reported a 20% reduction in average dust concentrations. Dr. Matetic also noted that 2000 units have been purchased by the industry. The number of dust samples exceeding the 2 mg/m^3 limit measured until Jan 2016 was 3.1%. In Sept 2016, with the help of the CPDM mandate, just 0.3% of the dust samples exceeded the new lower limit of 1.5 mg/m^3 and 3) PMRDs efforts in Metal and Nonmetal mining for reducing silica and other respirable dust exposures including the filtration and pressurization of cabs by JH Fletcher, 1000 hard copies of the Dust Control Handbook, and 34 Clothes Cleaning Systems have been sold to date. All these product successes come from NIOSH PMRD research efforts.

Question from P. Nelson: Does the 147 output count include extramurally funded outputs? Response: No.

Question from P. Nelson: Where are you planning on going with the ErgoMine app? Are explosions a possibility? Response: The app is modular so we have flexibility to add new functions and content. Explosions are a possibility.

Question from B. Watzman: When looking at MSHA data samples over the allowable level, was there any particular occupation or groupings that stood out? Response: No, that analysis has not been done. It will be the next step.

Question from J. Kravitz: Are there plans to make the CPDM smaller and lighter: Response: Yes, we have heard about that interest, and there are plans for that on the horizon.

Question from M. Wright: Does the ErgoMine app work on iPhones now? Response: It is being corrected but we aren't sure when it will be released.

J. Welsh confirmed that there was quorum when the meeting reconvened after a short health break.

SMRD DIVISION UPDATE – DR. ERIC LUTZ

Dr. Lutz presented a summary of the Spokane Mining Research Division (SMRD). In response to changing miner health and safety injury and health burden and need, SMRD is expanding the research portfolio, adjusting organizational structure, and redirecting research to support the needs of the western industry sectors. To support this work, SMRD utilizes two primary facilities, the 50,000 ft^2 Spokane Research Laboratory and the 20-acre Reardan Field Research Facility. Additionally, infrastructure expansion includes establishing the industrial hygiene research lab (shared with Western States Division), addition of a 200 ft^2 environmental chamber, a scanning electron microscope (SEM), and initiation of the OSHA VPP process. Within the past 12 months, the number of FTEs has increased from 28 to 42, the leadership team for the Division has been put in place, and a fourth team, the Miner Exposure and Health Surveillance Team, has been added. For 2017, SMRD plans to reorganize the four teams into 2 branches of two teams each, namely the Miner Health Branch and the Miner Safety Branch; and add a senior scientific panel made up of a leading scientist from each team to provide scientific support and review of research outcomes and outputs, and ensure effective translation and dissemination of SMRD work. The Divisions significant growth supports the burden and needs of our mining stakeholders and mitigates the risks associated with SMRD workforce attrition, as 21% of current staff are eligible to retire now and 38% within five years. Current research activities include four projects, including: Smart Ventilation to Control Airborne Pollutants and Physical Stressors in Underground Metal/Nonmetal Mines, Detecting and Managing Dynamic Failure of Near-Seam Features in Coal and Nonmetal Mines, Durable Roof Support for Western U.S. Underground Mines, and Alternative Mining Methods in Challenging Environments. Concurrently, SMRD researchers are working on five pilot projects: CFD Modeling in Processing Facilities, Feasibility Study for a Novel Field-Portable DPM Monitor, Predicting Heat Strain in Underground Metal and Nonmetal Miners, Advanced Mining Seismicity Processing, and Blast Damage Control to Reduce Injuries from Ground Falls in Underground Western Hard Rock Mines. To gauge impact, the 2016 SMRD research output includes: 10 proceedings, six peer-reviewed journal articles, two trade articles, 10 presentations, 1 Web-based

Mining Product (Heat Stress – A series of fact sheets for promoting safe work in hot mining settings), and 1 NIOSH numbered document (Report of Investigation - Seismic Monitoring Strategies for Deep Longwall Coal Mines).

Question from K. Luxbacher: What is VPP? Response: Voluntary Protection Program. This is an OSHA program that provides top performing organizations with the opportunity to be recognized as meeting the highest levels of occupational safety and health management for their employees. SMRD is in the early stages of pursuing this program with the goal of achieving VPP status.

Question from P. Nelson: Did SMRD use the same recruitment incentives as PMRD? Response: Yes. SMRD utilizes the full range of available personnel recruitment incentives, including: Title 5, Title 42, student internships, and employee transfers.

MINER ACT CONTRACTS & GRANTS PROGRAM – DR. GEORGE LUXBACHER

Dr. Luxbacher presented a summary of the ten years of awards under the MINER Act Contracts and Grants Program since its inception in 2007. Contracts have been issued under the Broad Agency Announcements (BAA), Requests for Proposals (RFP) and Inter-Agency Agreements (IAA) and have totaled $76 million. With regard to the BAA contracts, 434 proposals were received over the 10-year period and 90 contracts were issued, translating into a 21% proposal to contract rate. Contracts expenditures were broken down into focus areas related to the MINER Act as follows:

Communications and Tracking	35%
Emergency Response	30%
Equipment Safety	4%
Fires and Explosions	15%
Ground Control	5%
Mine Environmental Systems	8%
Workplace Health and Safety	3%

Spending by focus area has changed considerably on an annual basis over the 10-year period as critical topics were addressed.

Grants handled by the NIOSH Office of External Programs (OEP) were then briefly reviewed; mining-related expenditures over the ten-year period have totaled $32 million.

The Capacity Build BAA contracts were then covered; there have been four rounds: ventilation in 2009 and 2014 and ground control in 2011 and 2016. The 2014 ventilation and 2016 ground control BAA contracts are currently in progress and final reports are being completed on the 2011 ground control contracts. Statistics were presented for each contract round; overall there have been 62 proposals received and 27 contracts issued for a 44% proposal to contracts rate. It was noted that significantly more proposals are received for the ground control solicitations as compared to ventilation. Contracts have been issued to 11 of the 14 ABET-accredited programs in the United States, 9 universities in ventilation and 8 in ground control (6 universities have been awarded contracts in both fields and the remainder in each category are unique to that particular category).

The BAA 2016 focus areas and the resulting contracts were reviewed. Of the five BAA focus areas, contracts were issued for three and, while proposals were received, no contracts were issued for the remaining two. Three contracts were issued under the general solicitation provisions of the BAA, not related to the BAA focus areas; one was a follow-up to an OEP Small Business Innovation Research (SBIR) grant and two were extensions of work concepts funded under prior BAA solicitations.

The process for developing the 2017 BAA focus areas was reviewed. The 2017 focus areas are currently in preparation for the 2017 BAA solicitation which should be issued in December.

Issues with adoption and implementation of results from prior BAA contracts was discussed, highlighting the need for research dissemination and diffusion. BAA topics for 2018 forward will be built around enhanced synergy with the intermural program, a review of prior work and outstanding issues and stakeholder input. Capacity build BAA solicitations will require a review of the attainment of the program goals based on the four prior solicitations.

Question from P. Nelson: In thinking about experimental mine partnerships, is it possible to deploy some of the BAA technologies in the experimental mines? With regard to the Capacity Build contracts, has any consideration been given to a process similar to GOALI for follow-on grants with an industry partner? Have needs been tracked with industry, including industry input and participation?

Response: Under the typical BAA contract, the contractor is responsible for collaboration with industry for product demonstration, often with the assistance of NIOSH staff. Field trials and product demonstrations for a number of technologies have been conducted at the NIOSH Bruceton Experimental Mine; while not as common, several contracts included demonstrations at university experimental mines.

A program similar to the NSF GOALI Program (Grant Opportunities for Academic Liaison with Industry) had not been considered previously but it is an interesting concept to extend the Capacity Build BAA contracts and will be considered.

The Capacity Build program was developed based on industry input. Consideration will be given as to methods to enhance their input and participation.

Question from R. Fragaszy: Can you provide a brief summary of how proposals are evaluated.

Response from J. Welsh: NIOSH study teams with expertise in the subject matter of the proposal are put together who meet and evaluate the proposals against the evaluation criteria. One individual sits on all of the study teams to ensure consistency in the evaluation process. The study teams reach a consensus ranking on each of the proposals.

Question: Could an industry person participate on the study teams to evaluate the proposals?

Response from G. Finfinger: That is a possibility and it has been done in the past, depending on the proposal topic.

Comment from K. Luxbacher: On Capacity Build proposals, no feedback is provided on proposals that do not advance to the contract stage. The National Science Foundation (NSF) gives excellent feedback on proposals that do not advance to the grant stage, providing invaluable input to a young developing faculty member.

MINING RESEARCH PROGRAM STRATEGIC VISION – DRS. JESSICA KOGEL, ERIC LUTZ, RJ MATETIC

Drs. Jessica Kogel, Eric Lutz and RJ Matetic presented the NIOSH Mining Program Strategic Planning process. NIOSH's Mining Program uses a systematic process to determine gaps and focus areas for new research areas and/or technology development. Worker health data, mining injury/illness/fatality data, stakeholder input from mining associations, labor, and MSHRAC along with current and trending regulatory mandates are compared to the current research efforts and our strategic plan to identify gaps for future research and funding commitments. These gaps are then identified and reviewed by stakeholders for feedback as to the importance and practicality for mine worker health and safety. The final focus area list is used to establish guidance for both internal and external project concepts. Once a concept is submitted, it is critically scored as to its identification of and alignment with burden, need and impact by the mining division lead team (and possibly MSHRAC going forward) and is reviewed for full proposal potential. The full proposals are written and submitted for external review by subject matter experts using specific review questions. The concept to full proposal process occurs from November through early September with a new project start date of October 1. Dr. Kogel shared with the committee a list of emerging areas and trends that she has identified as potential future research drivers and priorities via email prior to the meeting and solicited feedback. The committee was in agreement with the focus areas and those were going to be submitted to the PMRD and SMRD staff for development of concepts. Reasoning behind going from the seven goal strategic plan to three goal strategic plan was given. The benefits included 1) a simple and clear communication of strategic direction and vision, 2) differentiating between overarching goals (general intentions) and objectives (narrow task specific actions), and 3) better alignment and consistency between MSHRAC-approved research goals and NORA Mining Sector Council Research objectives. It also provides for a multidisciplinary approach to mining gaps/needs. The structure at both the Program Level (strategic planning) and the Project Level (project planning) were shown as well and the relationships or links between the program and the research. Examples of Strategic Goals (SGs) and

Intermediate Goals (IGs) for each of the three SGs was shown. A reiteration of the research project development process from concepts selection to project proposal acceptance was given (previously given in May) again to provide the basis for discussing the new project concept and proposal writing processes. This streamlined revision of the process has the following benefits: best features combined from SMRD and PMRD, simplified forms for both concepts and proposals and the instructions for each, improved burden need and impact guidance and expectations, and a simplified process for researchers to follow.

Finally, the strategic planning that links project activities to program goals and impact was presented, again to show the importance of both the research/project plan to achieve the intermediate outcome (IO) (and ultimately the IG and SG contributions) and the scientific and the translational dissemination plan to provide best opportunities for impact. An example of PMRD's "slips trips and falls" currently funded projects plans and approach was provided to show the relationships between program and project planning. This approach will give confidence to the significance and impact of the Mining Program's research portfolio.

Question from P. Nelson: Chronic illness isn't mentioned? Response from R. Matetic: It will need to be included. This is the first snapshot. Response from E. Lutz: That will be an initiative that cuts across all 3 goals.

Question from S. Bandopadhyay: Does heat stress also include cold stress? Response from R. Matetic: Yes.

Question from P. Nelson: How many webinars or web casts have been done so far? Response from R. Matetic: In 2016 we delivered 3 webinars, and for the period 2012 – 2016 we delivered 13 webinars. We have tried to conduct webinars in the past year if a topic was not covered in a partnership meeting.

Comment from P. Nelson: It might be interesting to reach out to unions or SME about conducting webinars in conjunction with them.

Question from P. Nelson: Is it possible and would it be legal to have a partnership between intramural and extramural researchers outside of NIOSH? Response: This is done through outside partnerships.

Comment from P. Nelson: In remembering the technical presentations from the May 2016 MSHRAC meeting, there were areas where academia could contribute to the intramural research.

Comment from S. Bandopadhyay: Academia can do well on some projects but there are others that NIOSH does very well on. There are other projects that academia and NIOSH can work together on.

Comment from G. Finfinger: NIOSH has used outside people on the NIOSH review panels. A percentage of people have to be federal employees with Contracting Officer Representative (COR) certification

Comment from B. Watzman: Industry has been involved in extramural peer review in the past and would continue to be involved.

Comment from D. Drysdale: In the past, NSSGA people were willing to be involved and would continue to be involved.

Comment from J. Kogel: We wanted to present the strategic planning process so that MSHRAC members would understand how they can be involved.

Question from B. Watzman: How can this process assure better alignment with MSHA's regulatory agenda and better alignment so that fundamental research is done to provide information to MSHA? Response from J. Kogel: We are working on this with MSHA. We are discussing with MSHA how to best coordinate research and rulemaking.

J. Kogel then talked about the FY18 call for research concepts document, and the process for research ideas. It is important that MSHRAC has an opportunity to provide input.

Question from P. Nelson: In category 2, who owns the data? Response from J. Kogel: It is MSHA's data.

Comment from P. Nelson: Extramural access to data resources should be allowed. Build a database for research on mineworker health and safety.

Comment from K. Luxbacher: We have never had an issue getting data from NIOSH.

PUBLIC COMMENTS AND QUESTIONS

There were no comments or questions from the public.

J. Kravitz mentioned a mine rescue exercise in Canada and asked how does NIOSH know what other countries are doing in regards to mine safety and health? Response from J. Kogel: NIOSH closely follows the mine worker health and safety activities in other countries and particularly in countries where mining is a major industry. This includes South Africa, Canada, Australia, Peru, Chile and China.

Question from J. Kravitz: How does NIOSH know what others have done already? Response: Evaluation of health and safety research and looking at MSHA reports and partnerships and Alpha Foundation.

Question from J. Burgess: Is NIOSH looking for international sources of data? Response: NIOSH knows some of the sources, but we are not sure that we know all of the sources. Dr. Kogel asked the committee to provide any information that they might have about reliable sources for international health and safety statistics.

Question from P. Nelson: What is the thinking on experimental mine partnerships? Response from J. Kogel: Opportunities would be available to all, not just universities. Dr. Kogel requests feedback from MSHRAC. NIOSH wants to look at costs and benefits of moving in that direction. NIOSH has the Bruceton Experimental Mine and will have the Lake Lynn Laboratory replacement and will consider moving in the direction of experimental mine partnerships.

Comment from P. Nelson: NIOSH could convene a group of organizations to develop a distributed facility of experimental facilities but what are the rules pertaining to such a possibility? There is $14 million sitting there. This would help universities to manage their resources.

Comment from S. Bandopadhyay: There is a possibility that we might be able to get a mine as a gift but to maintain and operate that mine for experimental research is very expensive.

Comment from M. Wright: Consider collaborating with Canadian mines. P. Nelson said that she has looked into this with the NSF and it is hard to do if the mine is still operational. A. Bugarski from PMRD had a diesel project with Stillwater mine and SMRD also had a hydrogen vehicle project with Stillwater.

Comment from K. Luxbacher: NIOSH priorities for underground research need to be determined to see what type of mine is needed.

FINDINGS AND RECOMMENDATIONS BY MSHRAC MEMBERS

There was general discussion of the issues among the members following each of the presentations. There were no specific recommendation or requests made by the committee.

MSHRAC ACTION ITEMS:

Send comments on the provisional membership of the NAS Respirable Dust committee to P. Nelson by November 18, 2016.

It was decided that the committee will have a face-to-face meeting each year in May in the eastern United States (Pittsburgh, Morgantown, or Washington DC) and a webinar, with face-to-face option, in the western United States in November. The May meeting will include research reports and the November meeting will include higher-level reports.

Topics for future meetings include:

More reporting on research and research activities
Update on experimental mines
Updates on new initiatives

Additional topics for future agenda items or comments on today's presentations should be sent to J. Welsh, who will then send them out to the MSHRAC committee for comment.

The meeting was adjourned at 12:50 pm.

I hereby confirm these Summary Minutes are accurate to the best of my knowledge.

_____
Priscilla P. Nelson, Chair

_____
Date