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ALAN R. COYNER
Administrator

MEMORANDUM

March 29, 2012

TO: Nevada Mining Oversight and Accountability Commission

FROM: Alan R. Coyner, Administrator

SUBJECT: Agenda Item #7 c. 2. - Nevada Earth Science Teacher's Workshops

The Nevada Division of Minerals is a co-sponsor of the Nevada Earth Science Teacher's Workshops. Two workshops are held each year, one in southern Nevada and one in northern Nevada. The southern Nevada workshop has been held for annually for 23 years and the northern Nevada workshop for 28 years. Approximately 200 Nevada educators participate in the workshops each year.

The goal of the workshops is educate active K-12 Nevada teachers about the earth sciences, the importance of mined materials, and the role that mining plays in our lives. The workshops provide participants with valuable information concerning earth sciences, mineral resources, and the mining industry in Nevada. The program includes classroom sessions with hands-on activities and field trips to local sites of geologic interest and/or mineral production facilities. The courses are taught by volunteers from the Division of Minerals, Nevada Bureau of Mines and Geology, University faculty, Washoe County School District educators, and the mineral industry. All coursework is correlated to the Nevada Earth Science Standards and teachers can receive University credit and Professional Development credit for attending the workshop.

I have attached the schedule for the upcoming Las Vegas workshop on April 3 to 5, 2012. I have also included a description of the courses being offered and the field trip tour descriptions. Members of the MOAC are very welcome to attend this workshop or the northern Nevada workshop which is scheduled for June 24 to 26, 2012 in Reno.

23rd Annual Southern Nevada Earth Science Education Workshop 2012
April 3rd - April 5th, 2012
Faith Lutheran Jr/Sr High School, 2015 S. Hualapai Way, Las Vegas, NV 89117
Agenda

#1 - Implementation Strategies for suggested classroom activities focusing on a "hands-on/minds-on" approach to teaching and student participation which includes technology, environment, occupations/careers, mineral resource utilization and geologic processes.

#2 - Mineral Industry Overview

#3 - Mining Operation(s) Tour

Tuesday, April 3, 2012			**no.1**	**no.2**	**no.3**	**total**
7:00 AM -	7:45 AM	Registration and Continental Breakfast	-	-	-	**0:00**
7:45 AM -	7:55 AM	Welcome	-	0:10	-	**0:10**
7:55 AM	8:10 AM	Introductions and Opening Remarks	-	0:15	-	**0:15**
8:10 AM -	8:30 AM	General Session - In the Bag	0:20	-	-	**0:20**
8:30 AM -	10:00 AM	CONCURRENT SESSION I	1:30	-	-	**1:30**
10:00 AM -	10:15 AM	Break	-	-	-	**0:00**
10:15 AM -	11:45 AM	CONCURRENT SESSION II	1:30	-	-	**1:30**
11:45 AM -	12:15 PM	Lunch	-	-	-	**0:00**
12:15 PM -	12:30 PM	Cashman DVD	-	0:15	-	**0:15**
12:30 PM -	1:00 PM	Mine Orientation	-	0:30	-	**0:30**
1:00 PM -	2:30 PM	CONCURRENT SESSION III	1:30	-	-	**1:30**
2:30 PM -	2:45 PM	Break	-	-	-	**0:00**
2:45 PM -	3:30 PM	Guest Speaker	0:45	-	-	**0:45**
3:30 PM -	3:45 PM	Break	-	-	-	**0:00**
3:45 PM -	5:15 PM	CONCURRENT SESSION IV	-	1:30	-	**1:30**
Wednesday, April 4, 2012						
7:15 AM -	8:00 AM	Continental Breakfast	-	-	-	**0:00**
8:00 AM -	8:15 AM	Welcome	-	0:15	-	**0:15**
8:15 AM -	9:45 AM	CONCURRENT SESSION V	1:30	-	-	**1:30**
9:45 AM -	10:00 AM	Break	-	-	-	**0:00**
10:00 AM -	12:00 PM	Field Trip(s)	-	-	2:00	**2:00**
12:00 PM -	12:30 PM	Lunch on bus en route to tours	-	-	-	**0:00**
12:30 PM -	3:00 PM	Field Trips (continued)	-	-	2:30	**2:30**
3:00 PM -	3:15 PM	Break	-	-	-	**0:00**
3:15 PM -	5:15 PM	Field Trips (continued)	-	-	2:00	**2:00**
5:15 PM -	5:30 PM	Questions/Answers - Evaluations	-	0:15	-	**0:15**
		TOTAL INSTRUCTION HOURS:MINUTES -	**7:05**	**3:10**	**6:30**	**16:45**

Thursday, April 5, 2012 - Post-Workshop Tour			**no.1**	**no.2**	**no.3**	**total**
FIELD TRIP - TBA						
7:30 AM	**tentative**	Arrive at Fairth Lutheran Jr/Sr High School and load onto buses or vans				
8:00 AM	**tentative**	Depart on Mine Site/Plant Tour to TBA				
		Overview of minerals, rocks and local geology on the bus to the mine				
		Safety orientation: review of equipment and procedures necessary to ensure a safe working environment				
		Mine tour: overview by mine geologists, identification of the minerals that are being targeted for extraction and how the deposit formed				
		Process plant: Investigation of the technology used to recover ores				
		Question and answer session with mine professionals				
		Collection and identification of rock and mineral samples				
		Summary of the activities on bus back to the school with any follow up questions				
10:00 AM -	10:15 AM	Break (approximate time)				
12:00 PM -	12:30 PM	Lunch Break (approximate time)				
3:00 PM -	3:15 PM	Break (approximate time)				
		Downtime on bus or in vans - Drawing for gold splatter (must be present to win)				
5:00 PM	**tentative**	Approximate return time to Faith Lutheran Jr/Sr High School				

23rd Annual Southern Nevada Earth Science Education Workshop 2012

Class/Session Descriptions

Tues., 8:10 AM - 8:30 AM – General Session - In the Bag. All grades. A guided tour through the educational materials provided for you in the workshop tote bag. Classroom instructors and other teachers will share ways in which they have used these materials to enrich their teaching of earth science and mining in the classroom.

Tues., 8:30 AM - 10:00 AM Session 1, Minerals

- **Minerals Level 1 with Rachel Wearne. Grade recommendation K-8. Participants will review some common properties of different minerals (color, streak, hardness, transparency, smell) and explore in detail some other properties (density, crystal structure and form, ductility, malleability) and discuss possible relationships between these properties and the minerals' chemistry and uses. Participants will receive a box of labeled mineral specimens for use in their classrooms.**
- **Minerals Level 1 with Rachel Dolbier. Grade recommendation K-8. Participants will review some common properties of different minerals (color, streak, hardness, transparency, smell) and explore in detail some other properties (density, crystal structure and form, ductility, malleability) and discuss possible relationships between these properties and the minerals' chemistry and uses. Participants will receive a box of labeled mineral specimens for use in their classrooms.**
- **Minerals Level 1 with Bill Durbin. Grade recommendation K-8. Mineral Detective. Definitions, hands-on testing of the physical properties of minerals, and the use of minerals in daily life. (4-5). Participants will receive a box of labeled mineral specimens for use in their classrooms.**
- **Minerals Level 1 with DD LaPointe. Grade recommendation K-8. We will review some common properties of different minerals (color, streak, hardness, transparency, smell) and explore in detail some other properties (density, crystal structure and form, ductility, malleability) and discuss possible relationships between these properties and the minerals' chemistry and uses. Participants will receive a box of labeled mineral specimens for use in their classrooms.**
- **Minerals Level 2 with Jon Price. Grade recommendation 9-12. We will review some common properties of different minerals (color, streak, hardness, transparency, smell) and explore in detail some other properties (density, crystal structure and form, ductility, malleability) and discuss possible relationships between these properties and the minerals' chemistry and uses. Participants will receive a box of labeled mineral specimens for use in their classrooms.**

Tues., 10:15 AM - 11:45 AM Session 2

- **Critical Elements of Energy. Grade recommendation: 6-12. This activity will present and discuss issues concerning the global demand and supply of mineral resources, particularly those that are critical for emerging technologies in energy efficiency and renewable energy, including rare earth elements, lithium, copper, and elements that are likely to be key in the development of alternatives to current mainstream power generation. What is the need for and availability of minerals in the development of a 'green society,' whether it be by use of solar, wind, other types of renewable energy, and critical minerals needed for modern technology. **This is a preliminary session description. Please review the current description listed on the workshop registration site.** (#S201)**
- **Erosion / Reclamation. Grade recommendation 3-12. In this session, teachers learn ways to teach the process of erosion through interactive learning. Students will discuss the different ways erosion occurs. After that discussion, students will build a table top stream using everyday materials. They will then simulate different flows of water and what those flows do to stream beds. Throughout this activity, teachers will have a chance to "mine" for gold. (Actually fake gold). This activity teaches students how to form hypotheses and geology. (#S202)**
- **Just Drill It. Grade recommendation: 9-12. Just Drill It! is an activity which combines coordinate map skills with real life mineral exploration "clues" to guess the location of a hidden gold deposit. The activity utilizes the format of the board game "Battleship" to allow the explorer to drill holes, score their success in finding gold, and calculate the value of their discovery. The ultimate test of any promising mineral property and a geologist's quest for treasure is to Just Drill It! (#S203)**
- **Abandoned Mine Land Safety and Topographic Mapping. Grade recommendation: 4–12. Stay out, stay alive! During this short course participants will learn about the dangers surrounding abandoned mines and living in a state with over 200,000 abandoned mine land features. This session will combine abandoned mine land safety with topographic mapping activities in order to better educate students about the dangers of abandoned mines and how to navigate the terrain while exploring Nevada's public lands. *(#S204)***
- **Minerals/Crystals. Grade recommendation: 6-12. Mineral Crystal Project – *adapted from an activity by Mary Stanley and presented by D.D. LaPointe, Nevada Bureau of Mines and Geology.* Minerals have different physical properties due to different chemistry and crystal structure. This activity introduces you to the crystal structure of minerals as well as to physical properties of minerals. You will compile information about a mineral's physical properties, beneficial uses, and other interesting facts, and build a crystal model of your mineral on which to display your mineral information in the classroom. *Most suited to intermediate grade levels but adaptable to grades from elementary through high school. (#S205)***
- **Nevada's Natural Resources. Grade recommendation K-12. In this presentation, we will discuss the need for various minerals for every American every year. Many of these minerals are mined in Nevada. Attendees will be introduced to**

several books that are age appropriate to help readers understand our use of minerals, metals, and energy to maintain our standard of living. (#S206)

- **Operation Chemistry: Ore Processing. Grade recommendation 5-8. Discover the secrets of mining and processing gold and silver ore and the people who get the job done. This is a hands-on activity that lets participants build models of ore processing steps to discover some of the details of producing metal from the ore rocks. Each step will also introduce the "miners" that it takes to get the job done. Discover the best jobs in Nevada and how to get them. (#S207)**
- **Rock On: Language Arts. Grade recommendation K-6. Use Reading, Language Arts, and hands on projects in a creative workshop showcasing rocks and minerals. Participants will learn many different ways to incorporate reading and language arts while learning creative ways to learn about rocks and minerals. (#S208)**

Tues., 1:00 PM - 2:30 PM Session 3, Rocks

- **Rocks Level 1 with Rachel Wearne. Grade recommendation K-8. Participants will investigate rocks and learn how to classify and identify rocks. We will start with a general discussion of rock types and their origins. You will use a rock key to ask and answer questions on unknown rock specimens (provided) in order to find the correct rock identification. The goal of this session is for you to become comfortable with looking at rocks and making an identification based on those observations.**
- **Rocks Level 1 with Rachel Dolbier. Grade recommendation K-8. Participants will investigate rocks and learn how to classify and identify rocks. We will start with a general discussion of rock types and their origins. You will use a rock key to ask and answer questions on unknown rock specimens (provided) in order to find the correct rock identification. The goal of this session is for you to become comfortable with looking at rocks and making an identification based on those observations.**
- **Rocks Level 1 with Bill Durbin. Grade recommendation K-8. Rocks and Geology. Classification of rocks, the "Rock Cycle", hands-on activities demonstrating the formation of igneous, sedimentary and metamorphic rocks. (4-5). Participants will receive a box of labeled rock specimens for use in their classrooms.**
- **Rocks Level 1 with DD LaPointe. Grade recommendation K-8. Nevada Rocks!! Presented by D. D. LaPointe, Nevada Bureau of Mines and Geology. In this session we will start with a general discussion of rock types and their origins, faulting and folding, and a basic introduction to map-reading skills. Then you will learn to use some of the tools a geologist uses to learn from the rocks in an area to construct a simple geologic history for a county in Nevada. We will use geologic maps, time lines, and other information, rocks, and other information. Like any history or report, it should include information on "when, what, where, and who" and should describe the geologic processes and environments of formation of each kind of rock in that area (volcanoes, faulting/earthquakes). Each group will report on the geologic history of their county. Most suited to intermediate grade levels (6-8) but adaptable to grades from upper elementary through high school. Participants will receive a box of labeled rock specimens for use in their classrooms.**
- **Rocks Level 2 with Jon Price. Grade recommendation 9-12. Participants will learn about minerals and rocks in the context of the geological history of Nevada. Participants will receive a box of labeled rock specimens for use in their classrooms. They will follow the U.S. Geological Survey's "GeoSleuth" murder mystery to see how unraveling geological history is scientific detective work. A practical example will use identification of rocks from a road cut along West Fourth Street in Reno in deciphering the local history of mountain building and earthquakes. Participants will receive a box of labeled rock specimens for use in their classrooms.**

Tues., 3:45 PM - 5:15 PM Session 4

- **Density. Grade recommendation: 3-12. In this session, teachers will explore the metric system through hands-on activities. Teachers will start out learning linear distance measurement in millimeters, centimeters, decimeters, meters, and kilometers. Then teachers will move to cubic volume measurement in millimeters cubed, centimeters cubed, decimeters cubed, and meters cubed. We will then explore liquid measurement in micro-liters, milliliters, liters, and kiloliters. We will finish with the mass weight measurement in milligrams, grams, and kilograms. All activities align with Nevada Science and Math Standards. (#S401)**
- **Geology Sleuth. Grade recommendation: 6-12. This murder mystery introduces both the nature of scientific inquiry and important geologic concepts in a very student-friendly, accessible manner. Geology is a lot like detective work. The power of this exercise is that it exposes students to the main goals of geology and even some of the fundamental principles in a setting that they can understand -- a murder mystery. After the class explores the murder mystery, the teacher then shows a range of geologic photos that relate to features in the mystery. (#S402)**
- **Gold Through the Curriculum.. Grade recommendation K-12. Learn about the history of gold. From the history of the Gold Rush, evolution of the gold pan, learning how to pan your material, valuing your find, and deciding how to spend your "poke". This activity spans the curriculum including: geography, geology, U.S. and Nevada history, marketing, and math. (#S403)**
- **Introduction to Mapping and Geocaching. Grade recommendation K-12. In this session we will have an introduction to various kinds of maps, their uses and basic map-reading skills. We will learn the basic use of GPS devices in an introduction to the sport of geocaching, which is a great way to get students and their families involved in simple outdoor activity. (#S404)**
- **Operation Chemistry: Ore Processing. Grade recommendation 5-8. Discover the secrets of mining and processing gold and**

silver ore and the people who get the job done. This is a hands-on activity that lets participants build models of ore processing steps to discover some of the details of producing metal from the ore rocks. Each step will also introduce the "miners" that it takes to get the job done. Discover the best jobs in Nevada and how to get them. (#S405)

- **Paste with a Taste/Birdseed Mining. Grade recommendation K-12. (PWAT) Minerals play an important role in dental hygiene - make your own toothpaste using mineral materials, customize it with flavorings and colorings then market your product. (BM – time permitting) Students will experience the difficulty in locating valuable mineral deposits, learn a simple economic lesson involving profit and loss, be shown the importance of clean, environmentally conscious mining, and learn about reclamation requirements all mining operations must meet when mining is completed. (#S406)**
- **Rock On: Language Arts. Grade recommendation K-6. Use Reading, Language Arts, and hands on projects in a creative workshop showcasing rocks and minerals. Participants will learn many different ways to incorporate reading and language arts while learning creative ways to learn about rocks and minerals. (#S407)**
- **Soils. Grade recommendation K-6. In this session teachers will explore soils by: separating them into particle sizes (Gravel, Sand, Silt, and Clay), comparing relative amounts of sizes, and separating out the organic matter. Teachers will also learn of the importance of soil in the reclamation phase of mining. Activities are tied to CCSS and the new Science Framework. (#S408)**

Wed., 8:15 AM - 9:45 AM Session 5

- **Economics of Mining. Grade recommendation: 4-12. What does it cost to run a mine? This class will challenge participants to consider all of the economic factors of mining in Nevada, realizing the true costs of starting and operating a mini g operation in Nevada. Course numbers will be based on hard rock, heavy metal operations, yet variables will be applicable and relevant to all types of mining in Nevada. From exploration to reclamation, tally the hundreds of millions of dollars required to mine in Nevada. Participants will have handouts to take back to their classrooms to walk students through the process of allocating resources and operating within regulations to ensure the successful opening of a mining operation. (#S501)**
- **Fossils. Grade recommendation K-8. We will explore how fossils form by "making" our own fossils and discuss how life has evolved through geologic time, and what fossils tell us of ancient times on earth. (#S502)**
- **Gold Through the Curriculum.. Grade recommendation K-12. Learn about the history of gold. From the history of the Gold Rush, evolution of the gold pan, learning how to pan your material, valuing your find, and deciding how to spend your "poke". This activity spans the curriculum including: geography, geology, U.S. and Nevada history, marketing, and math.) (#S503)**
- **Maps and Models Activity: Faulting and Plate Tectonics. Grade recommendation: 7-12. We will build a simple paper block model to illustrate the three different kinds of faults and then use it to illustrate different kinds of tectonic plate boundary interactions. We will talk about the history of plate tectonic theory and do an activity to show how Alfred Wegener first came up with his concept of continental drift. Websites with activities, materials and information we will use are as follows: 1. USGS Model of 3 Faults: http://www.earthsciweek.org/forteachers/faults_cont.html, 2, Plate Tectonics in a Nutshell: http://volcanoes.usgs.gov/about/edu/dynamicplanet/nutshell.php, 3. Simple page map of Earth's tectonic plates, spreading centers, trenches, volcanoes, "Ring of Fire": http://vulcan.wr.usgs.gov/Glossary/PlateTectonics/Maps/map_plate_tectonics_world.html, 4. "Wegener's Puzzling Evidence" activity: http://volcanoes.usgs.gov/about/edu/dynamicplanet/wegener/, 5. This Dynamic Planet Map & teaching companion website: http://mineralsciences.si.edu/tdpmap/ and http://volcanoes.usgs.gov/about/edu/dynamicplanet/, and 6. This Dynamic Earth: online textbook of plate tectonics: http://pubs.usgs.gov/gip/dynamic/dynamic.pdf. (#S504)**
- **Mining in a Nutshell. Grade recommendation 4-7. Participants will re-enact a typical mining cycle from Discovery and Exploration through Processing and Reclamation using peanuts and play money. The company "team" who avoids bankruptcy and completes the mining cycle with the most money wins a prize. (#S505)**
- **Playdoh Fault/Fold Modeling. Grade recommendation: 5-12. The earth's crust is constantly changing! Make scale models of various types of faults and folds using Play-Doh. (#S506)**
- **Soils. Grade recommendation K-6. In this session teachers will explore soils by: separating them into particle sizes (Gravel, Sand, Silt, and Clay), comparing relative amounts of sizes, and separating out the organic matter. Teachers will also learn of the importance of soil in the reclamation phase of mining. Activities are tied to CCSS and the new Science Framework. (#S507)**
- **Under the Earth. Grade recommendation 6-12. The "Under the Earth" activity provides a brief description of mining terminology and mining methods. This activity culminates with a hands-on lesson demonstrating the principles of ground support by having the participants mine their way through a loaf of sliced bread, installing edible ground support as they go. (#S508)**

Tour Descriptions

TOUR 1 – Las Vegas Rock and Red Rock Canyon NCA (RRCNCA) Wednesday, April 4, 2012

Las Vegas Rock - Las Vegas Rock Quarry – The Las Vegas Rock Rainbow Quarry is located 6 miles north of Goodsprings, Nevada. This operation produces attractive red-brown sandstone prized in both architecture and landscaping. Visitors will have the opportunity to view an active rock quarry in operation, and learn about the geology and mineralogy of the spectacular Jurassic Aztec sandstone.
Red Rock Canyon National Conservation Area (RRCNCA) – RRCNCA is located in the Mojave Desert just six miles west of Interstate 215 on Highway 159. The tour will include a 13-mile scenic loop drive which offers opportunities to see desert wildlife, red and cream sandstone formations, waterfalls and petroglyphs. We will take a short easy hike and investigate the geologic processes that have formed these rocks and landscape as it exists today.

TOUR 2 – PABCO and Valley of Fire State Park Wednesday, April 4, 2012

PABCO – PABCO Gypsum has produced gypsum from their Apex Mine near Lake Mead since 1959. The PABCO tour of the open-pit mine and wallboard manufacturing plant shows the entire process of converting a rock (gypsum) into a useable product (wallboard).
Valley of Fire State Park – Valley of Fire State Park is located only six miles from Lake Mead and 55 miles northeast of Las Vegas via Interstate 15 and exit 75. Valley of Fire is Nevada's oldest and largest state park, dedicated in 1935. The valley derives its name from the red sandstone formations and the stark beauty of the Mojave Desert. We will investigate processes of sedimentary rock formation and erosion as well as evidence of early man represented throughout the park by 3,000 year-old Indian petroglyphs. The park offers a full-scale visitor center with extensive interpretive displays. The park is open all year and welcomes school field trips. http://parks.nv.gov/vf.htm

TOUR 3 – Aggregate Industries Sloan;) Cashman Equipment Company; and McCaw School of Mines Wednesday, April 4, 2012

Aggregate Industries Sloan – We will travel to Aggregate Industries Sloan's operation located south of Las Vegas on I-15 at Sloan. We will visit the mine which has operated for many years producing high-quality magnesium dolomite for the construction industry. Visitors will have the opportunity to see an active mine and processing facility in operation and to collect beautiful pink dolomite and enjoy a unique view of Las Vegas from the mine site.
Cashman Equipment Co. – One of the largest equipment manufacturers and distributors for Caterpillar products, Cashman Equipment's new headquarters are located on St. Rose Parkway in Henderson. The tour will take us to the main sales office and we will view up-close and personal, some of the loaders, backhoes, dozers, trucks and cranes used in most of the mines in Nevada today. Cashman Equipment is a major supporter of the "Stay Out and Stay Alive" abandoned mine lands program, having donated a D-6 dozer and other equipment for the last seven years to backfill abandoned mine hazards all across the state. http://www.cashmanequipment.com/
McCaw School of Mines - The McCaw School of Mines is an experience in earth science, mining and history for elementary school students. The one-of-a-kind facility simulates an old underground mine; provides a look at mining past and present and highlights the importance of minerals in everyday life. More than a museum, the McCaw School of Mines is actually a visual and a hands-on adventure. http://www.mccawschoolofmines.org/

POST-WORKSHOP TOUR – Mercator Minerals Ltd. Mineral Park Thursday, April 5, 2012.

Advance registration is required along with a refundable $20.00 deposit. Meals, snacks, and beverages (along with your refund) will be provided on the bus.

Mercator Minerals Ltd. is a diversified natural resource company engaged in the exploration, development and mining of base and precious metal deposits.

Mercator embarked on a two-phase expansion of its Mineral Park operations to a 50,000 ton per day copper and molybdenum milling operation which is expected to increase total Mineral Park average annual production over the first ten years of a 25-year mine life to 56 million pounds of copper, 10 million pounds of molybdenum and .6 million ounces of silver. Mercator's Mineral Park Mine expansion is one of the largest, furthest advanced copper-molybdenum expansion projects in North America.

The first phase of the expansion to a 25,000 ton per day milling operation was completed and achieved commercial production in the second quarter of 2009.

Mercator is currently producing copper, molybdenum and silver in concentrates and copper by SX/EX leach extraction at is wholly-owned Mineral Park Mine located near Kingman, Arizona