Guidebook

Society of Economic Geologists Foundation, Inc. Student-Dedicated Field Trip Course – Ore Deposits of Northern Nevada

May 10-18, 2007

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Inaugural Year

SEGF Student-dedicated Field Trip Course

Ore Deposits of Northern Nevada

Welcome to the northern hemisphere inaugural SEGF Field Trip Course - Ore Deposits of Northern Nevada running May 10 to 18, 2007. The first field trip course in this series visited the ore deposits of Northern Chile and was a response to a student petition at the at the recent SEG Conference held in Keystone, Colorado, to provide more support for field trips to important mining districts.

The course starts at the Reno airport at 2:00 pm on Thursday the 10th at the Reno airport baggage claim area. We will depart from the airport at 2:15. We will drive to Winnemucca where we will stay the first night at the Gold Country Inn in two vans. An orientation meeting will be held following dinner. The next day we will visit the Phoenix deposit south of Battle Mountain and travel to Elko, NV, where we will be based for several nights. Other deposits and districts that will be visited include, Cortez District, Carlin District, Chukar deposit, Leeville operations, Twin Creeks mine and deposits in the Turquoise Ridge /Getchell district. The field trip course ends in Reno on the evening of Thursday the17th with participants departing Reno on Friday the 18th.

Entrance to the mine sites usually follows a specific protocol; please be patient. At the mines we will receive safety training and a geological/engineering presentation. Do not take any pictures of the presentations unless and until we clear this point with company personnel. We will ask, but in general, participants can take pictures and collect samples on company property. Participants are responsible for their own samples (be aware of weight limits if you plan to take samples back with you). See itinerary for hosted meals, but be aware that last-minute changes are possible.

We will have VERY LIMITED . . . REPEAT: VERY LIMITED . . . . space for luggage, so you should bring clothing and field gear ONLY IN DUFFLE BAGS - NO HARD-SIDED LUGGAGE.

See you in Reno

Erich U. Petersen

William X. Chavez

Acknowledgements

*This field trip is generously supported through the Society of Economic Geologist Foundation through the **SEGF Student Field Trip Fund**. We wish to also thank the companies that provided access to their operations in Nevada and the many company representatives that gave generously of their time to make this trip a success. Special thanks are due to Rachel Burgess, Robert Leonardson, Fred Breit, Karl Marlow, Jon Carlson, Jamie Cockrell, Carole Smith, Susan Abbott, Steve Garwin, Sue Courtney and John Thoms.*

The Society of Economic Geologists Foundation

Newmont Gold Co.

Newmont Mining Corporation

Barrick- Tourquoise Ridge Mine

Barrick- Cortez Gold Mines

Kennecott Minerals

SEG Foundation Student-Dedicated Field Trip
May 10 – 18, 2007

Thursday, May 10, 2007

Hotel- Gold Country Inn, Winnemucca

2:00 PM	**Arrive in Reno, Nevada.** Meet at Airport Baggage Claim area.
	Travel by vans to Winnemucca Confirmation #s255520, 255521, 255522, 255523, 255524
~5:00 PM	Dinner at 6:00 p.m. at the Flying Pig with Newmont Mining Company Geology staff

Friday, May 11, 2007

Hotel- Hilton Garden Inn, Elko

7:00 AM	Continental Breakfast at Gold Country Inn (lobby area)
7:30 AM	Travel to **Phoenix Project** south of Battle Mountain
9:15 AM	Meet Fred Breit for tour
1:00 PM.	Lunch in Battle Mountain on your own
1:45 PM.	Travel to Elko
3:00 PM.	Check in - Hilton Garden Inn, Elko: Conf # 3263995981 (for all rooms)
6:00 PM	• Dinner at La Fiesta hosted by Newmont Carlin Geology Group

Saturday, May 12, 2007

Hotel – Hilton Garden Inn, Elko

8:00 AM	Breakfast on your own. Bring snacks and water.
9:00 AM	Travel to Carlin Site for core review at the **Core Shed review of regional rock and alteration types** with Rachel Burgess. Meet Rachel at Security at 9:30 AM
12:00 noon	Return to Elko
1:00 PM	Lunch on your own.
2:00 PM	Drive to Lamoille Canyon (weather permitting) hike/ enjoy.
~5:00 PM	Dinner on your own either at O'Carroll's Bar and Grill in the little town of Lamoille, or after retrun to Elko.
evening	Return to hotel.

Sunday, May 13, 2007

Hotel – Hilton Garden Inn, Elko

7:00AM	Breakfast on your own; prepare pack lunch for field visit.
8:00AM	Depart for visit at **Cortez District**, afternoon return to Elko.
1:00PM	Lunch in the field; more local geology and return to Elko
~5:00 PM	Dinner in Elko on your own.

Monday, May 14, 2007

Hotel – Hilton Garden Inn, Elko

6:00 AM 7:00 AM	Breakfast on your own; prepare lunches for field Depart for Carlin District
8:00 AM	Meet Rachel Burgess at Carlin Security for Surface Tour of **Carlin District**
12:00 PM	Lunch in the field
1:00 PM.	Return to finish tour.
2:30 PM.	Return to Elko.
~5:00 PM	Hosted Dinner at Star with Barrick.

Tuesday, May 15, 2007

Hotel – Hilton Garden Inn, Elko

6:30 AM	Breakfast on your own
8:00 AM	Meet Rick Streiff at Carlin Security for **underground mine tour at Chukkar Mine**
11:00 AM	Travel to North Area for tour of **Leeville operations**.
1:00 PM.	Lunch in Carlin or Elko.
2:00 PM.	Return to Elko.
5:00 PM	• Hosted dinner at The Star with Newmont Human Resources staff (traditional Basque food!)

Wednesday, May 16, 2007

Hotel – Gold Country Inn, Winnemucca

6:30 AM	Breakfast on your own; prepare sack lunches.
7:30 AM	Travel to **Twin Creeks Mine**.
9:30 AM	Meet Sue Abbott at Twin Creeks for tour.
12:00 PM	Lunch – bring sack lunches.
3:00 PM	Travel to Winnemucca.
4:00 PM.	Check in to the Gold Country Inn, Winnemucca. Confirmation # 255228, 255229, 255230, 255231, 255232
~5:00 PM	Dinner: Barbecue at Susan Abbott's (Newmont).

Thursday, May 17, 2007

Hotel – Reno

6:00 AM	Breakfast at the Gold Country Inn (Lobby area)
7:00 AM	Travel to **Turquoise Ridge/Getchell District**
1:00 PM	Lunch in the field..
2:00 PM	Return to Reno for overnight
~5:00 PM	Dinner
	Course concludes

Friday, May 18, 2007

	Course participants depart Reno

Directions to Hilton Garden Inn:
Turn left on Mountain City Highway when exiting the airport
Turn right on the I-80 East on-ramp
Exit on next Elko exit, Exit #303, turn right off of freeway exit.
Turn left on Idaho Street – travel approximately 1.5 miles
Turn right into Hilton

Directions to Minesite:
West on I-80 for approximately 20 miles
Take the Central Carlin Exit
Turn right on Newmont Road – travel approximately 5 miles
Turn left at Newmont Eastern Nevada Operations entrance
Check in at the Security Gate

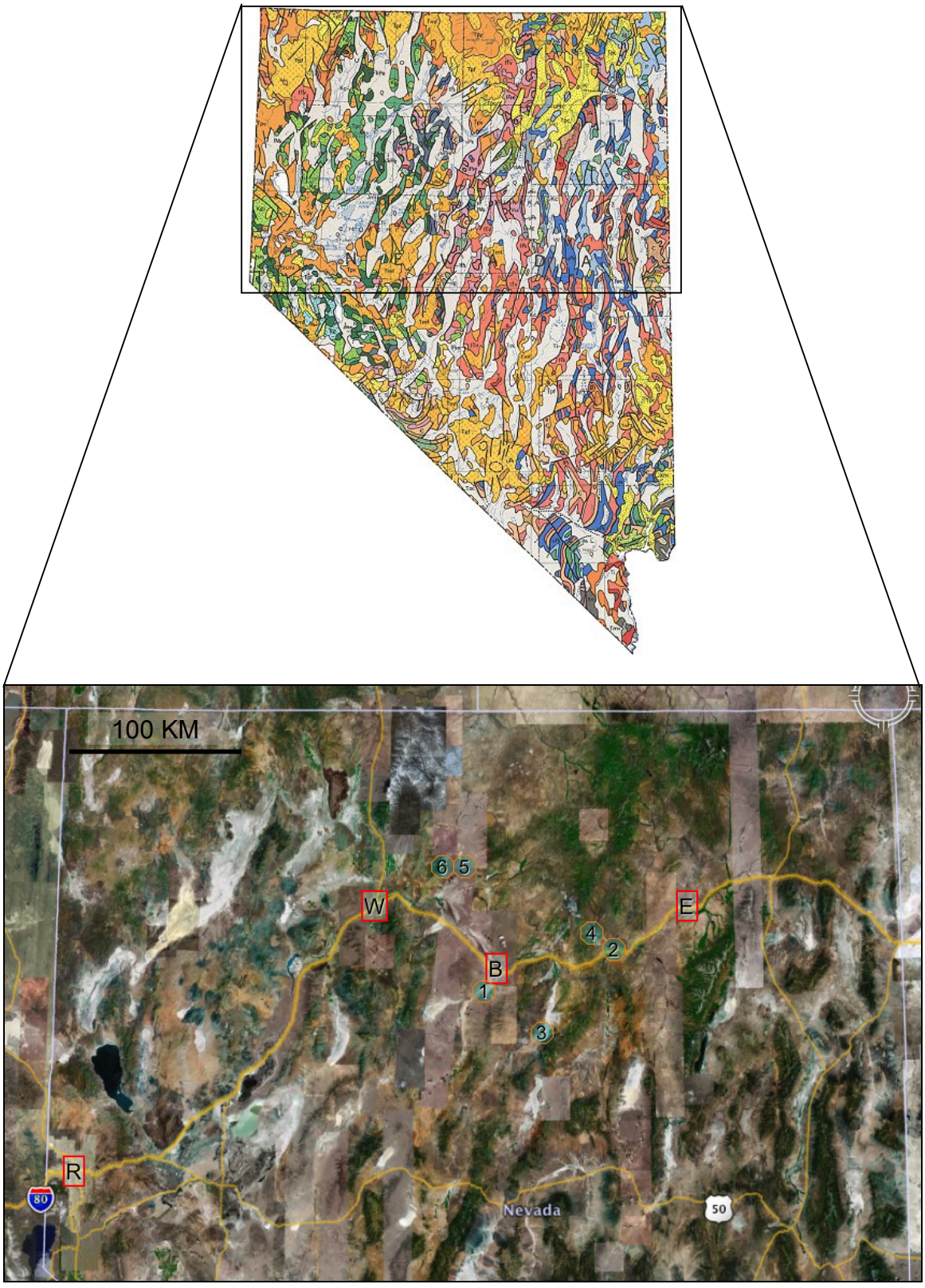
Directions to Gold Country Inn Winn. from I-80
Head West on I-80
Take Exit 178 at Winnemucca
Turn left on West Winnemucca Blvd.
Hotel is approximately 1 Mile on Left handside
921 West Winnemucca Blvd

Logistics and Field Gear Checklist

- Please bring (**REQUIRED**) **hardhat**, **reflective red or orange vest, and steel toe boots.**
- Weather in northern Nevada in May is quite variable, so please bring:
  - Long pants (required; several pair)
  - Long-sleeve shirts (required)
  - Jacket/windbreaker; rain/snow possible, as are very sunny days
  - Cap or hat for sun protection
  - One nice set of clothing for company-sponsored dinners
  - Field/hiking boots for our field days
  - Sunscreen and lip balm
  - Sunglasses
  - Field gloves

- For our field work:
  - rock hammer
  - hand lense
  - hardness tester (scratcher)

- We will be traveling in two vans, with limited space; please use a duffle bag or soft-sided luggage for your clothing and personal effects.
- Remember to bring any prescription medicines and your insurance card/proof of insurance.
- Cameras are permitted, although we ask permission to take photographs at each minesite. Be sure to bring extra film/cards.
- For underground mine tours - coveralls, hard hat, safety boots will be provided – bring cool comfortable clothes to wear under coveralls and bottle of water to take underground.
- SEGF will provide lodging and transport for students; students should bring money for snacks/meals, incidental expenses, phone calls, and the like.



R = Reno, W = Winnemucca, B = Battle Mountain, E= Elko
1, Phoenix Project; 2, Carlin; 3, Cortez Joint Venture; 4, Leeville, Chukar; Twin Creeks; 6, Tourquoise Ridge100 KM

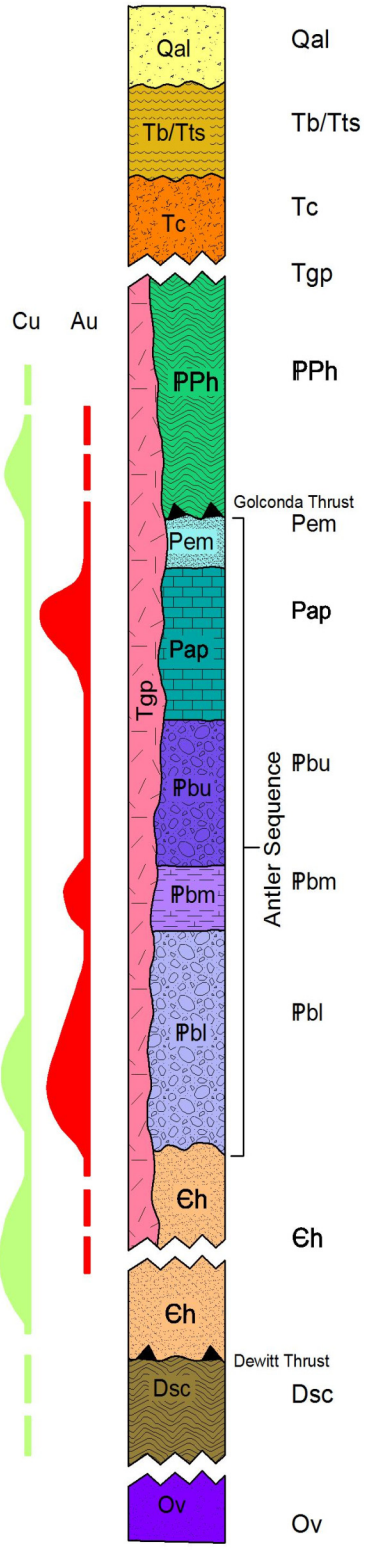
Participants

Participant	Country	Institution
John Porter	USA	University of Utah
Thomas Dittrich	Germany	Freiberg
Molor Erdenebat	Mongolia	Mongolian Science University
Jeremy Fairbanks	USA	New Mexico Tech
Constanza Jara B.	Chile	Universidad de Concepcion
Melanie Mercier	Canada	University Ottawa
John Morkeh	Gahna	New Mexico Tech
Aristo Nunez Othon	Mexico	Universidad Nacional de Mexico
Angela Page	Canada	University New Brunswick
Francisco Quintanar	USA	University Arizona
Remigio Ruiz	Argentina	Univ. Nacional de la Plata
Gerd Sielfeld Corvalan	Chile	Universidad de Concepcion
Derick Unger	USA	Auburn University
Christopher Wyatt	USA	Colorado Schole of Mines
ErdemYetkin	Turkey	Middle East Tech University
Diego M. Guido	Argentina	
Steve Garwin		
Erich Petersen	U.S.A.	University of Utah
William Chávez, Jr.	U.S.A.	New Mexico Tech

COPPER CANYON (PHOENIX)
TECTONOSTRATIGRAPHIC COLUMN

May 2005

0 200 FT



Qal	Alluvium/colluvium
Tb/Tts	Pliocene basalt and interbedded tuffaceous siltstone + sandstone 0-400 ft thick.
Tc	Caetano tuff Oligocene 33 Ma crystal-rich lithic tuff 0-200 ft thick.
Tgp	Eocene 38 Ma granodiorite porphyry of Copper Canyon and Wilson-Independence laccolithic stocks up to 1,500 ft thick. Variable argillic, sericitic, secondary biotite and propylitic alteration.
PPh	Pumpernickel sequence >5,000 ft thick allochthonous argillite + chert with minor sandstone, siltstone, limestone and metavolcanic units. Lower LU-1 and upper LU-2 units (Murchey 1990). LU-1 formerly Pumpernickel Fm of Roberts (1964). Altered to biotite and siliceous hornfels. Golconda thrust = basal contact.
Pem	Edna Mountain Fm 60-120 ft thick lower siliceous pebble conglomerate and upper coarse-grained sandstone and calcareous siltstone. Altered to diopside+siliceous hornfels.
Pap	Antler Peak Limestone 140-220 ft thick medium-bedded micritic and bioclastic limestone with minor shale and conglomerate near lower contact. Altered to marble+actinolite-pyroxene skarn.
Pbu	upper unit of Battle Fm 120-220 ft thick siliceous pebble conglomerate with interbedded shale, siltstone and silty limestone. 0.5-2-inch diameter clasts of of angular to subrounded quartzite and chert in sandy matrix. Altered to biotite+siliceous hornfels.
Pbm	middle unit of Battle Fm 40-125 ft thick thin-bedded calcareous siltstone and shale with minor sandstone. Altered to actinolite+diopside skarn.
Pbl	lower unit of Battle Fm 220-300 ft thick massive siliceous pebble conglomerate with minor sandstone + siltstone. 1-6-inch diameter clasts of angular to subrounded quartzite and chert in sandy hematitic matrix. Altered to actinolite+diopside+epidote skarn + siliceous hornfels.
Ch	Harmony Fm >1,200 ft thick allochthonous micaceous sandstone and arkose with minor shale, siltstone and conglomerate. Altered to biotite hornfels + sericite in matrix. Dewitt thrust = basal contact with Scott Canyon Fm.
Dsc	Scott Canyon Fm > 2,000 ft thick allochthonous chert+argillite (Dsc) with basalt/greenstone (Dsg), limestone (Dsl), and olistostrome (Dso) with olistoliths of limestone, sandstone and chert (Doebrich, 1994).
Ov	Valmy Fm lower quartzite and upper cherty argillite 300-1,000 ft thick.

Glossary

Brief definitions of terms as used in Nevada (and other places)

Decalcification—A type of alteration in typically occuring in silty limestone in which the carbonate is removed by dissolution. Generally this leads to increased prosity in the rock.

Pyritization—A type of alteration in which sulfur and possibly iron has been added to the rock mass and lead to the conversion of Fe-bearing minerals to pyrite and/or addition of pyrite.

Carbonaceous matter—A type of alteration consisting of addition of organic matter to the rock mass. This process may complicate gold recovery as gold may adsorb on the organic matter making it difficult to separate later (see preg-robbinb).

Restite—A rock that has been decalcified generally consists of clays and quartz.

Jasperoid—A rock mass, formerly limestone, which has been completely silicified. Some have applied this term to any silicified rock.

Preg-robbing—Characteristic of a rock mass that contains organic matter that strongly adsorbs gold.

Carbon-in-pulp— Granular coconut shell activated carbon, is widely used for recovery of gold from cyanide solutions. Gold cyanide is adsorbed into the pores of activated carbon, resulting in a process solution that is devoid of gold. The loaded carbon is heated by a strong solution of hot caustic and cyanide to reverse the adsorption process and strip the carbon of gold. Gold is then removed from the solution by electrowinning. Stripped carbon is returned to adsorption for reuse. Carbon-in-pulp operation is a variation of the conventional cyanidation process. Ore is crushed, finely ground, and cyanide leached in a series of agitated tanks to solubilize the gold values. Granular activated carbon is added to the leached slurry. The carbon adsorbs the gold from the slurry solution and is removed from the slurry by coarse screening. In practice, this is accomplished by a series of five or six agitated tanks where carbon and ore slurry are contacted in a staged countercurrent manner. The opening size of the CIP tank screens is such that the finely ground ore particles will pass through the screens, but the coarse carbon will not.

Roasting—A metallurgical process by which carbonaceous ores (see carbonaceous matter) are heated in air to 1000°F to oxidize the carbon. SO_2 is produced from pyrite, which is a common constituent of the ore and

captured to make sulfuric acid.

Autoclave (pressure oxidation)—A metallurgical process by which sulfides (pyrite) is converted to an oxide at high temperature and pressure. It involves a reaction between gas (O_2) and solid. SO_2 is produced and captured to make sulfuric acid. Sulfide refractory ore without carbonaceous matter is treated by pressure oxidation in an autoclave.

Minerals

Mineral	Chemical Formula
Orpiment	As_2S_3
Realgar	AsS
Galkhaite	$(Cs,Tl)(Hg,Cu,Zn)_6(As,Sb)4S_{12}$
Arsenopyite	FeAsS
Pyrite	FeS_2
Dolomite	$CaMg(CO_3)_2$

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