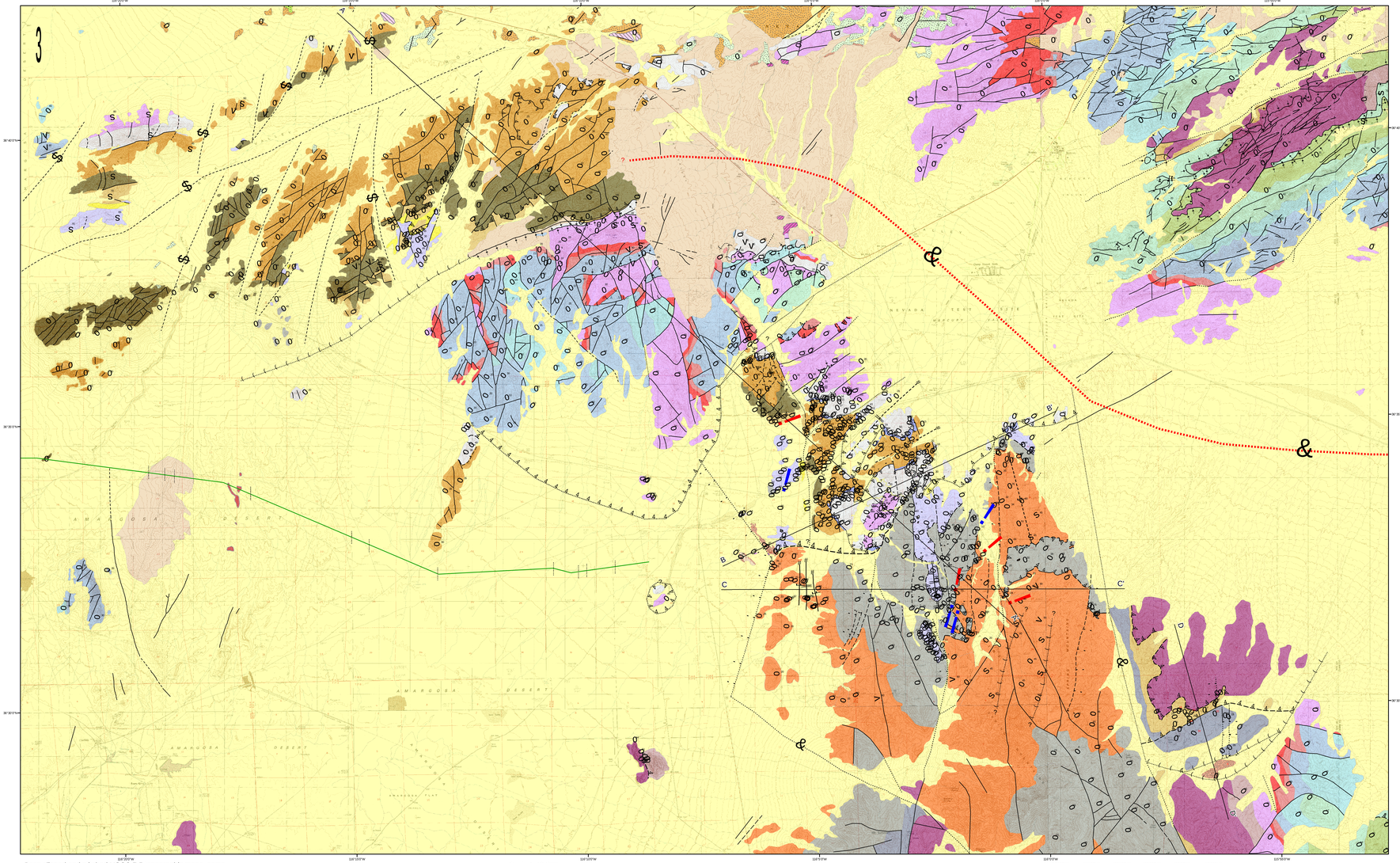
Plate 1



Explanation

- Approximate trace of USGS Seismic Line AV-1
- Inferred trace of the Las Vegas Valley shear zone
- Horizontal bedding
- Bedding
- Overturned Bedding
- Vertical Bedding
- Horizontal Foliation
- Foliation
- High Angle Fault
- Thrust Fault
- Slickenline interpreted to record Mesozoic slip
- Slickenline interpreted to record Cenozoic slip
- Detachment Fault
- Normal Fault
- Anticline
- Syncline
- Strike-Slip motion

List of Map Units

- Qa — Alluvium, colluvium, and playa deposits, undivided
- QTps — Paleospring (Quaternary to Pliocene?)
- Tft — Post-Timber Mountain basaltic rocks (Miocene)
- Tt? — Tertiary tuff (Pliocene to Miocene?)
- Tam — Ammonia Tanks Tuff (Miocene 11 Ma)
- Tbft — Bullfrog Tuff (Miocene 13 Ma)
- Tlr — Lithic Ridge Tuff (Miocene 14 Ma)
- Tb — Tertiary breccias (Miocene)
- Tsu
  - Tpp — Pavits Spring (Miocene)
  - Tl? — Tertiary Limestone (Pliocene to Miocene?)
  - Tgr — Prevolcanic sedimentary rocks (Oligocene-Early Miocene)
- MDe — Eleana Formation (Devonian to Mississippian)
- Dg — Guilmette Formation (Devonian)
- Ds — Simonson Dolomite (Devonian)
- DSsl — Sevy Dolomite (Silurian)
- Oes — Ely Springs Dolomite (Ordovician)
- Oe — Eureka Quartzite (Ordovician)
- Opg — Pogonip Group (Ordovician)
- €nds
  - €n — Nopah Formation (Cambrian)
  - €ds — Dunderberg Shale (Cambrian)
- €bk
  - €bku — Bonanza King Upper Member (Cambrian)
  - €bkl — Bonanza King Lower Member (Cambrian)
- €c — Carrara Formation (Cambrian)
- €z — Zabriskie Quartzite (Cambrian)
- €Zzw
  - €Zw — Wood Canyon Formation (Precambrian to Cambrian)
  - Zs — Stirling Quartzite (Precambrian)
  - Zj — Johnnie Formation (Precambrian)

Description of Map Units

Alluvium, colluvium, and playa deposits, undivided
Poorly sorted unconsolidated sand, gravel, talus, and calcareous silt and sand.

Paleospring (Quaternary to Pliocene?)
White fine grained precipitated calcite associated with ground-water discharge. Contains disturbed layering which is consistent with vertical ground water flow. Microcrystalline quartz with iron staining and barite indicate that this may have been a hydrothermal spring. The age of this unit is poorly constrained.

Post-Timber Mountain basaltic rocks (Miocene)
Lava flows and dikes composed of basalt, basaltic andesite, trachybasalt, and basaltic trachyandesite (Carr et al., 1996). The thickness of these deposit are generally less then 30 meters (Carr et al., 1996).

Tertiary tuff (Pliocene to Miocene?)
White to light gray nonwelded ash fall tuff with clasts of pumice and phenocrysts of plagioclase and biotite. Correlation to tuffs of the Crater Flat sequence is difficult do to sporadic exposures and insufficient thickness. The age of this unit is poorly constrained.

Ammonia Tanks Tuff (Miocene 11 Ma)
Welded ashflow tuff erupted from the Ammonia Tanks and and Timber Mountain calderas (Carr et al., 1996) Contains phenocrysts of biotite, plagioclase, and rare clinopyroxene (Carr et al., 1996). The unit contains a high percentage of quartz compared to other tuffs of the Crater Flat sequence (Carr et al., 1996).

Bullfrog Tuff (Miocene 13 Ma)
Welded rhyolite ash-flow tuff sheet (Carr et al., 1996). Contains phenocrysts of sanidine, plagioclase, biotite, and rare hornblende (Carr et al., 1996).

Lithic Ridge Tuff (Miocene 14 Ma)
A regional welded metaluminous ash-flow tuff (Carr et al., 1996). Contains phenocrysts of plagioclase and sanidine, and minor sphene and biotite (Carr et al., 1996).

Tertiary breccias (Miocene)
Carbonate breccia masses that were deposited into Tertiary basins. The breccias vary from pebble to boulder sized clasts within a matrix of ground calcite and secondary calcite precipitated along open fractures and pore space.

Pavits Spring (Miocene)
Contains bedded fluvial and lacustrine sedimentary deposits with domains of nonwelded ash-fall tuff (Carr et al., 1996). Fluvial deposits contain volcaniclastic conglomeratic sandstone, siltstone, shale, and sandy limestone with minor fish and plant fossils (Carr et al., 1996). Exposures northeast of the Specter Range contain east west fold hinges interpreted to be compressional folds associated Miocene transpression along the Las Vegas Valley Shear zone (Deemer, 2003).

Tertiary Limestone (Pliocene to Miocene?)
Tan to light brown microcrystalline limestone with calcite filled vugs and volcanoclastic fragmenes. Pieces of this unit are in the footwall of a detachment associated with the Point of Rocks detachment. The age of this unit is poorly constrained.

Prevolcanic sedimentary rocks (Oligocene-Early Miocene)
Consists of poorly sorted, poorly rearranged, and poorly bedded conglomerate, siltstone and shale, clasts of quartzite and carbonate are common (Carr et al., 1996). This unit is correlative with the Needles Range Group due to age and lithology, formerly correlated with the Horse Spring Formation (Carr et al., 1996; Barnes et al., 1982; Hinrichs, 1965).

Bird Spring Formation (Permian to Mississippian)
Composed of limestone, silty limestone, dolomite, chert, quartzite, siltstone, and shale (Workman et al., 2002). Clastic domains within the formation commonly contain sedimentary structure associated with submarine debris-flows (Workman et al., 2002). The estimated thickness in the Las Vegas Range is 2500 meters (Workman et al., 2002).

Eleana Formation (Devonian to Mississippian)
Composed of sandstone, conglomerate, siliceous siltstone, and silty limestone (Carr et al., 1996; Workman et al., 2002). The formation contains sedimentary structures indicative of submarine fan deposits and debris-flows indicating deposition is a deep-water trough (Workman et al., 2002). The maximum thickness of the formation is 2048 meters (Workman et al., 2002).

Guilmette Formation (Devonian)
Composed of thick beds of gray limestone (Carr et al., 1996). The upper part of the formation contains sandy limestone and beds of tan quartzite (Carr et al., 1996). The thickest section measured in the Beatty quadrangle is estimated to be 345 meter (Carr et al., 1996).

Simonson Dolomite (Devonian)
Composed of sandy dolomite with yellow cherty dolomite at the base (Carr et al., 1996). The base is defined by a discontinuity on the Sevy Dolomite and the top appears conformable with the Guilmette Formation above. The estimated thickness in the Nevada Test Site area is 300-365 meters (Workman et al., 2002).

Sevy Dolomite (Silurian)
Composed of gray dolomite with silty and sandy interbeds. The base may contain chert nodules. The base and the top of the unit are defined by discomformities between the Ely Springs Dolomite and Simonson Dolomite respectively (Workman et al., 2002). Many of the exposures within the Specter Range show strong brecciation. The thickness of the unit is not well known do to complex structure, but is estimated to be 450-695 meters in the Spotted Range (Carr et al., 1996).

Ely Springs Dolomite (Ordovician)
Composed of black dolomite and minor sandy and silty interbeds. The base and the top of the unit are defined by discomformities between the Eureka Quartzite and Sevy Dolomite respectively (Workman et al., 2002). The bedding throughout the unit is poor and chert lens are common. The Ely Springs Dolomite is 130 meters thick in the Specter Range (Burchfiel, 1964).

Eureka Quartzite (Ordovician)
Composed of orthoquartzite and minor gray dolomite bed 10 meters from the base (Burchfiel, 1964). The unit is dominated by very clean well sorted orthoquartzite with greater then 90 percent quartz. Most of the exposed sections of the Eureka Quartzite within the Specter Range are brecciated and commonly contain a fault surface near the base or top of the formation. The Eureka Quartzite is estimated to be 145 meter thick in the Specter Range (Burchfiel, 1964).

Pogonip Group (Ordovician)
The Pogonip Group includes the Goodwin Limestone, Ninemile formation, and Antelope Valley Limestone. The Pogonip Group is composed of silty limestone, siltstone, and dolomite. The base is defined by thin silty limestone with chert lens, equivalent to the Goodwin Limestone. The middle consists of interbedded siltstone and limestone - equivalent to the Ninemile Formation. The Antelope Valley Limestone at the top is composed of gray limestone with minor silty interbeds. The Pogonip Group is estimated to be 550 meters thick in the Specter Range (Carr et. al, 1996).

Nopah Formation (Cambrian)
Within the mapped domain nearly all of the Nopah formation is brecciated. The breccia retains a ruff stratigraphy of black speckled dolostone with two 20 meter bands of white dolostone near the top of the formation (Smoky Member). The breccia varies from pebbly clast supported breccia to a boulder sized matrix supported breccia. The thickest most undisturbed section of Nopah within the Specter Range is estimated to be 325 meters thick, 220 meters thinner then sections measured in the Nopah Range to the South (Brurchfiel, 1964).

Dunderberg Shale (Cambrian)
Composed of interbedded limestone and brown shale. The base of the formation is defined by a rusty red massive limestone. The middle is composed of thin bedded brown shale, which commonly forms a conspicuous brown slope. The top is interbedded shale and molten limestone with numerous trilobite and brachiopod fossils. The Dunderberg Shale is estimated to be 60-90 meters thick within the Specter Range (Burchfiel, 1964).

Bonanza King Upper Member (Cambrian)
Composed of silty thin bedded limestone to massive gray limestone and dolostone. The base is defined by silty thin bedded limestone with minor dolostone beds. The middle is composed of dolostone and minor limestone with laminated bedding. The top is dark to light-gray limestone with minor dolostone. The Upper Member of the Bonanza King Formation is estimated to be between 560-730 meters thick within the Specter Range (Burchfiel, 1964; Sargent and Stewart, 1971).

Bonanza King Lower Member (Cambrian)
Composed of silty laminated limestone to massive dolostone. The base is defined by silty laminated limestone with the top of the base being a bleached limestone. The middle is silty brown limestone with thin calcareous shale interbeds. The top is composed of thick dark gray limestone and dolostone, which is often cliff forming. The Lower Member of the Bonanza King Formation is estimated to be between 360-490 meters thick within the Specter Range (Burchfiel, 1964; Sargent and Stewart, 1971).

Carrara Formation (Cambrian)
Composed of tan limestone and thin interbeds of yellowish brown siltstone. The shales become calcareous at the top of the formation. The Carrara Formation is 460 meters thick within the Specter Range (Burchfiel, 1964; Sargent and Stewart, 1971).

Zabriskie Quartzite (Cambrian)
Composed of fine to medium-grained cross-laminated pinkish gray quartzite. The upper 10 meter of the formation contains large Scolithus worm burrows. The Zabriske Quartzite is estimated to be 85 meters thick within the Northern Spring Mountains (Stewart, 1970).

Wood Canyon Formation (Precambrian to Cambrian)
Composed of sandstone, quartzite, with interbedded shale, and minor dolostone. The base is defined by two massive dolostone beds that weather a characteristic rusty reddish brown with interbedded quartzite and shale. The middle is composed of thicker sandstone and interbedded shale. The top contains a 1-2 meters bed of dolostone overlain by shale and sandstone. The Wood Canyon Formation is estimated to be 600 meter thick within the Northern Spring Mountains (Stewart, 1970 and Abolins, 1999).

Stirling Quartzite (Precambrian)
Composed of well sorted to conglomeratic quartzite, sandy siltstone, siltstone, and minor limestone. The base is massive conglomeratic pink quartzite. The middle grades from silty sandstone to a greenish shale followed by a thin limestone unit. The top is composed of massive red to pink conglomeratic quartzite. The Stirling Quartzite is estimated to be 1025 meters thick within the Northern Spring Mountains (Burchfiel, 1964; Stewart, 1970 and Abolins, 1999).

Johnnie Formation (Precambrian)
The base of the Johnnie Formation is not exposed within the Northern Spring Mountains. The Johnnie Formation is composed of siltstone, quartzite, sandstone, shale, and minor carbonate. The lowest exposed unit is composed mostly of siltstone with minor sandstone and quartzite. The overlying unit is composed of siltstone, quartzite, and minor dolostone. The base of the upper unit is defined by a 5-8 meter thick orange to tan oolitic limestone marker bed, which is overlain by greenish siltstone. The Johnnie formation is estimated to be 1375 meters thick within the Northern Spring Mountains. (Burchfiel, 1964; Stewart, 1970 and Abolins, 1999).

Base clipped and stitched USGS 7.5 topographic maps, some quadrangles contours in meters others in feet NAD 83 Zone 11N

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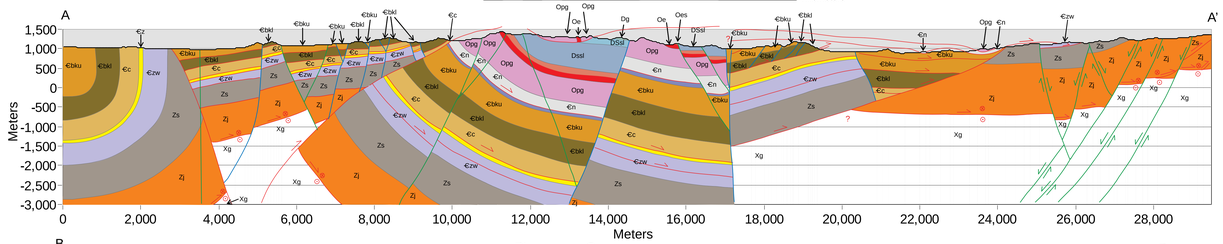
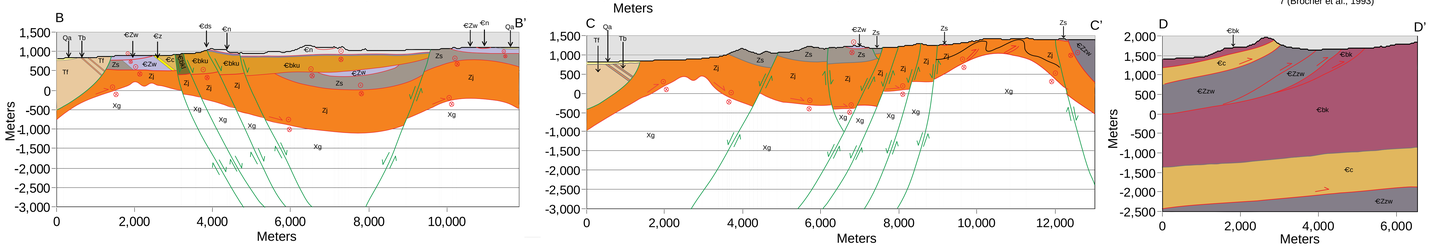
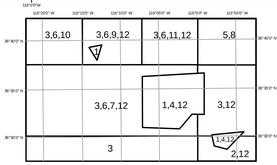
Kilometers



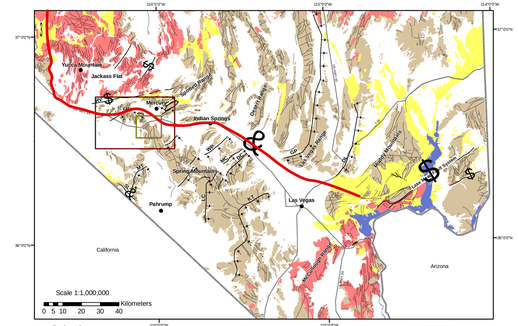




Index of maps and data used to create Geologic map of the Specter Range and northern Spring Mountains.

1 (Damian Piaschyk, M.S. Thesis, University of Pittsburgh)
2 (Page et al., 2005)
3 (Workman et al., 2002)
4 (Abolins, 1999)
5 (Wahl et al., 1997)
6 (Carr et al., 1996)
7 (Brocher et al., 1993)
8 (Barnes et al., 1982)
9 (Sargent et al., 1971)
10 (Sargent et al., 1970)
11 (Hinrich, 1968)
12 (Burchfiel, 1965)
(Burchfiel et al., 1974)

- Fault motion
- Fault motion into page
- Fault motion out of page
- Miocene detachments and thrusts
- Northeast northwest faults
- Miocene north-south normal faults



Generalized regional geologic map of southern Nevada data modified from (Raines et al., 1996) geology from (Stewart and Carlson, 1974). The red box represents the location of the Specter Range and northern Spring Mountains (Plate 1). The yellow box represents the location of the Point of Rocks area (Plate 2).

Geologic Map of the Specter Range and Northern Spring Mountains, Nye and Clark Counties, Nevada

By Damian Piaschyk
2007

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