

Mining District File Summary Sheet

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|---|---|
| DISTRICT | Rosebud |
| DIST_NO | 4010 |
| COUNTY | Pershing |
| If different from written on document | |
| TITLE | Wild Rose Exploration Report, December 19, 1999 |
| If not obvious | |
| AUTHOR | Mitchell, P.; Westervelt, T.; Ballou, C.; Vance R. |
| DATE OF DOC(S) | 1999 |
| MULTI_DIST | <input checked="" type="checkbox"/> N? |
| Additional Dist_Nos: | |
| QUAD_NAME | Sulphur 7½' |
| P_M_C_NAME (mine, claim & company names) | Rosebud Mine; Wildrose; Newmont Mining Corp. Chemex Labs, Inc.; Newmont Exploration, Ltd |
| COMMODITY | gold, silver |
| If not obvious | |
| NOTES | Property report; geology; geochemistry; handwritten notes; cross-sections; geologic map; sample location maps |
| | NOTE: p 9, 10 have overlays - scan pages twice - with and w/o overlay |
| | 87p 5 oversized plates |

Keep docs at about 250 pages if no oversized maps attached
(for every 1 oversized page (>11x17) with text reduce
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Hecia 4010

WILD ROSE

Exploration Report



by

Peter A. Mitchell and Thomas N. Westervelt

A handwritten signature in blue ink, appearing to read "Peter A. Mitchell".

NEWMONT MINING CORPORATION
Winnemucca Exploration Office

December 19, 1999

NEWMONT MINING CORPORATION

Winnemucca Exploration Office

WILD ROSE
Final Exploration Report

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WILD ROSE

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NEWMONT MINING CORPORATION

Winnemucca Exploration Office

WILD ROSE
Final Exploration Report

December 19, 1999

Peter A. Mitchell and Thomas N. Westervelt

SUMMARY

Wild Rose is a volcanic-hosted epithermal gold prospect located ~3,000 feet southwest of the Brimstone open pit gold-silver mine in the northern Kamma Mountains of Nevada. This report summarizes the results of exploration conducted at Wild Rose between August 1st and October 15th, 1999. A geologic map (1:2,400) with overlays showing the type and distribution of hydrothermal alteration, sample locations and the results of geochemical sampling for Au, Ag, As, Hg, Sb, Se and Zn accompany the report. Reconnaissance-style mapping and sampling of the property was completed by Peter Butterfield. This work was augmented by a detailed evaluation of the southern part of the Wild Rose fault zone by Peter Mitchell and Tom Westervelt. Our work focused on the Wild Rose fault duplex and neighboring areas because it is the largest expanse of intense hydrothermal alteration and harbors the highest gold values within the prospect.

CONCLUSIONS

The primary and secondary exploration targets are the Wild Rose and Juniper Canyon faults, respectively. Hydrothermal alteration and gold mineralization occur along the mapped length of both fault systems, but intense rock alteration is much more extensive and gold values are higher in the vicinity of the Wild Rose fault. Alteration mineral assemblages and their zoning patterns at Wild Rose are similar to those features at the Rosebud gold mine which is located ~3.3 miles south-southeast of the prospect. Additional similarities between Wild Rose and Rosebud include lithology and structural style. The main rock types exposed in the Wild Rose area are the auto-brecciated and planar-laminated "members" of the Wild Rose formation. These units are the compositional and textural equivalents of the primary ore hosts (pink matrix breccia and planar-laminated "members" of the LBT formation) at Rosebud (K. Allen, personal communication). Hydrothermal alteration and precious metal mineralization in the Wild Rose and Rosebud areas are primarily controlled by the Wild Rose and South Ridge faults. Both of these faults strike northeasterly, dip to the northwest at moderate angles (~50°) and are relatively wide zones consisting of multiple, anastomosing fault planes, well-developed mullions, and extensive inter-plane fracturing. The main differences between the two mineral systems include less dickite, and sericite, more mercury and antimony, and a higher Au/Ag ratio at Wild Rose than at Rosebud.

The lateral extent of gold mineralization along the Wild Rose fault combined with similarities in lithology, structural style and hydrothermal alteration between Wild Rose and Rosebud amplify the economic potential of the prospect.

RECOMMENDATIONS

- Negotiate an exploration/development agreement with Hycroft (Vista Gold).
- Complete the 1:2400 scale geology and hydrothermal alteration maps of the prospect area.
- Collect soil and rock chip samples in the northern and eastern parts of the prospect.
- Conduct induced polarization and in-fill gravity surveys.
- Evaluate the northern and southwestern (covered) segments of the Wild Rose fault zone.
- Drill test the Wild Rose fault zone
 - ⇒ Initial drilling program should concentrate on the Wild Rose fault duplex, and include a minimum of 10 holes, .
 - ⇒ Test both the northern and southern (alluvium covered) extensions of the fault zone.
- Complete follow-up evaluation of the Juniper Canyon fault and other auriferous structures which are exposed south of Juniper Canyon.

GEOLOGY

The Wild Rose prospect coincides with the western margin of an extensive rhyolite flow-dome complex which covers most of the northern Kamma mountains in north-central Nevada. Along the upper flanks and crest of the mountains, the rhyolite lavas are concealed by volcaniclastic and pyroclastic debris and a thin sequence of andesitic lavas. Several major detachment faults, such as the South Ridge, Cave, Gator and Wild Rose, segment the northern Kamma mountains into several allochthonous blocks. These faults strike northeast, dip 40 and 60° to the northwest, and probably sole into high-angle, normal faults along the range front. This structure network tapped deep geothermal fluids and provided conduits along which the rising auriferous fluids migrated. Some of the hydrothermal fluid saturated near-surface permeable units and formed large disseminated gold deposits proximal to the high-angle faults, and others continued along the detachment faults to produced satellite deposits of lower tonnage but much higher grade. Hycroft, which contains more than 2.5 million ounces of gold averaging 0.019 opt Au and 0.057 opt Ag (Ebert and Rye, 1997), and Rosebud with approximately 0.5 million ounces of gold at an average grade of 0.49 opt Au and 3.54 opt Ag are type examples of these deposits.

Stratigraphy

The relationships between the stratigraphic units exposed in the northern and central portions of the Wild Rose prospect are depicted in Figure 1. The oldest rocks correlate with the rhyolite lavas of the Wild Rose and LBT formations in the vicinity of the Rosebud mine (Appendix 1). Fine-grained aphyric alkali rhyolite lavas resembling those of the Dozer formation are absent at Wild Rose, and it is likely that lava flows from the Dozer flow-dome complex either dispersed before reaching this far north, or their northward progression was blocked by the early flows from the Wild Rose dome. The relationship between the North Andesite and planar-laminated lavas of the Wild Rose formation shown in Figure 1 is conjectural. The succession of andesitic lavas to planar-laminated rhyolite lavas as shown is difficult to reconcile with regional stratigraphic relationships. More feasible interpretations are that this stratigraphic arrangement repre-

sents an unrecognized erosional nonconformity, or that the units were juxtaposed along a splay of the Wild Rose or Juniper Canyon fault systems.

STRATIGRAPHY

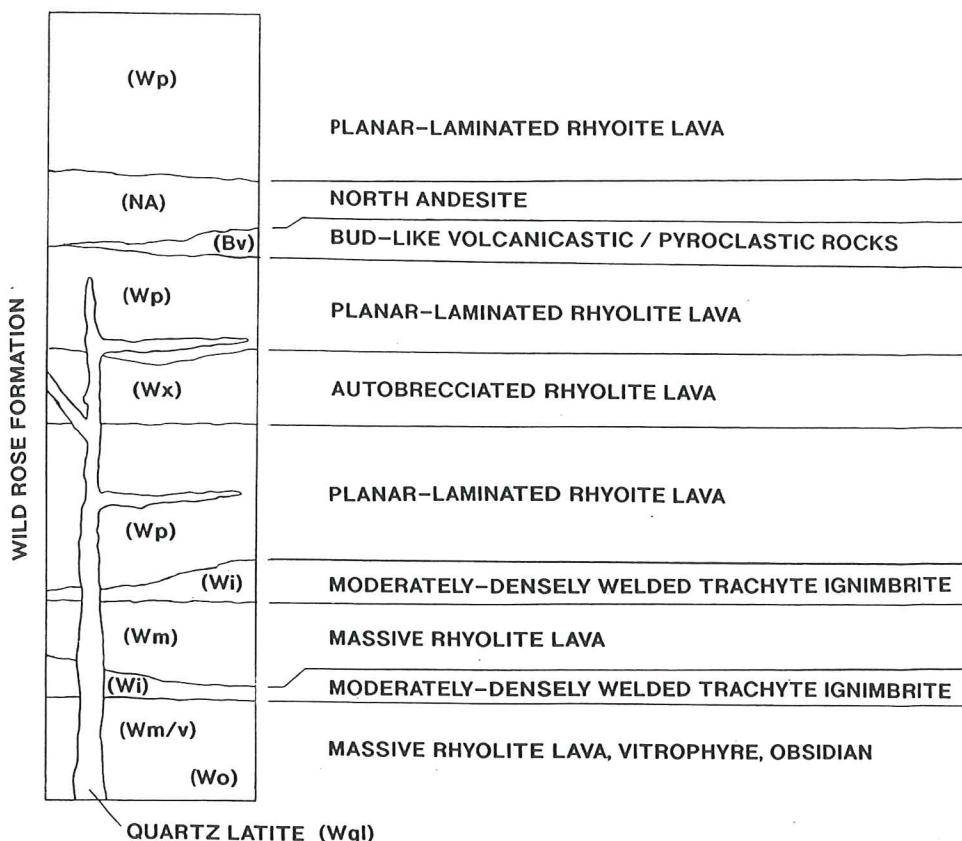


Figure 1. Stratigraphic column for the northern and central portion of the Wild Rose prospect. Quartz latite (wql) is the former field designation for the Wild Rose porphyritic rhyolite intrusion.

Autobrecciated and planar-laminated Wild Rose lavas cover most of the southern one-third of the prospect area (Plate 2). Other units exposed south of Wild Rose ridge include andesitic lavas of the North Andesite which occur along the eastern margin of the prospect, and a small elliptical plug of Wild Rose porphyritic rhyolite which is exposed in western quarter of Wild Rose canyon. A sequence of weakly altered trachytic(?) ignimbrites are exposed along the western terminus of the mountains immediately north of Wild Rose canyon. These ignimbrite flows probably belong to the Bud formation, but they may be the late valley-filling residue of a major pyroclastic flow erupted during "Chocolate" time. This assumption is based on the observation that trachytic ignimbrites do not occur in rocks younger than the middle part of the Chocolate formation.

Strong to intense hydrolytic alteration and gold mineralization is primarily confined to the Wild Rose formation and Wild Rose porphyritic rhyolite, although thin alteration halos are present in

other units along splays of the major faults. Of these areas, argillization is best developed east of the saddle between Juniper and Brimstone canyons in pyroclastic beds of the Bud formation.

Wild Rose Formation

Planar-laminate rhyolite lavas of an extensive flow-dome complex cover most of the prospect area. Flow-banding is typically on the millimeter scale, variably contorted and strikes and dips at various angles reflecting both flowage folding and different "lobes" of the dome complex. Autobrecciated and massive lavas form less than 45% of the exposed dome in the northern and central parts of the prospect. In the vicinity of the intersection of Juniper and Gargoyle canyons, the contact between planar-laminated and autobrecciated lava flows strikes northwest ($\sim 315^\circ$) and dips steeply northeastward. This attitude is nearly orthogonal to the strike of formation contacts in the northern Kamma Mountains, and in part reflects northwest translation induced by the Wild Rose fault system.

There are four textural varieties of the Wild Rose lavas: massive, planar-laminated, vesicular and autobrecciated. These textural variations occur as "mappable" units throughout the northern Kamma mountains, and are the compositional and textural equivalents of the massive, planar-laminated, LST-LST wantabe, and pink matrix breccia members of the LBT formation at the Rosebud mine (Kurt Allen and Brian Morris, personal communication). Identification of the vesicular units in the Wild Rose area is difficult, because both the Wild Rose planar-laminated lavas and the Wild Rose porphyritic rhyolite intrusion(s) are compositionally similar, have vesicular phases, and where the Wild Rose intrusion is vesicular, it is commonly planar-laminated. Intense hydrolytic alteration and incipient leaching are characteristic of the vesicular phases of both units and, in most instances, this alteration precludes positive identification of the rock type. Field relationships indicate that most of the vesicular rhyolite exposed in the central portion of the prospect area is a border phase of the Wild Rose porphyritic rhyolite.

Wild Rose Porphyritic Rhyolite

Intrusive rocks exposed in the Wild Rose area are texturally similar to the Rosebud quartz latite, but typically contain substantially more quartz and plagioclase. Flow-banding is more common in the Wild Rose intrusion(s) than in the Rosebud quartz latite, which probably reflects both compositional and volumetric differences between the two intrusions. Border phases of both intrusions tend to be flow-laminated, aphyric, glassy, and similar in appearance to the planar-laminated lavas of the Wild Rose formation. One subtle difference is that the flow laminations in the Wild Rose porphyritic rhyolite are typically more closely spaced (millimeter-scale) and much more convoluted than in the Rosebud quartz latite. Outcrops exposing the Wild Rose porphyritic rhyolite intruding either the Bud formation or the North Andesite were not seen. It is possible that the Wild Rose porphyritic rhyolite is a feeder dike to the Wild Rose dome complex, but the compositional difference(s) between the units seems excessive for them to be genetically linked. The age of the Wild Rose porphyritic rhyolite and that of the Rosebud quartz latite are probably similar, and most likely both intrusions were sourced from the same magma chamber.

Detailed mapping indicates that the apparent northwest elongation ($\sim 200\%$ extension) of the intrusion is the result of its dismemberment and northwest translation along several splays of the Wild Rose fault. Initial palinspastic reconstruction reveals that the Wild Rose porphyritic

rhyolite was emplaced as a north-northeasterly elongated, sill-like plug ~500 feet wide and ~1500 feet long.

Bud Formation

A relatively thin horizon of rhyolitic volcaniclastic and possibly trachytic(?) pyroclastic debris is exposed intermittently along the lower slopes of the northerly-trending ridge line separating the Wild Rose and Gator prospects. The clastic unit(s) are comprised of coarse-grained volcanic sandstone and pebbly conglomerate, which is compositionally and texturally identical to the basal beds of the Bud formation at Short Shot. The contact between the Bud and Wild Rose formations (~010, 45E) approximates the regional strike of stratigraphic units in the northern Kamma mountains. One or more trachytic(?) ignimbrite(s) and intervening ash and fine- to medium-grained volcaniclastic beds with an aggregate thickness of ≤ 200 feet appears to overly the basal clastic horizon. This succession is similar to that of the lower Bud formation at Short Shot, Degerstrom and on South Ridge, but the correlation between these units and the weakly altered ignimbrite(s) exposed at the western end of Wild Rose ridge is tenuous at best. The stratigraphic position of the exposures on Wild Rose ridge is permissive for their correlation with the Bud formation, but definitive contact relationships between the ignimbrite(s) and the underlying(?) planar-laminated Wild Rose lavas are concealed by talus.

North Andesite

A thickness of more than 300 feet of andesite lavas cap the ridge separating the Wild Rose and Gator prospects. The unit strikes $\sim 027^\circ$, dips 45° to the east, is very weakly altered (chlorite-epidote \pm albite) to unaltered, and may postdate gold mineralization. Contacts between the Bud formation and the North Andesite are not exposed, but outcrop patterns indicate that the relationship is a nonconformity. Because of similarities in modal composition and the occurrence of weak deuterian(?) alteration in both units, the North Andesite is tentatively correlated with the Kamma Andesite exposed in the Mother Lode and South Kamma areas, north and southwest of the Rosebud mine respectively.

Structural Geology

Several major fault systems occur within the Wild Rose area, the largest of which are the Wild Rose and Juniper Canyon faults. All of the major faults identified strike northeasterly (015 to 075°), dip at moderate angles (30 to 60°) to the northwest and exhibit well-developed mullions, sillicenelines and cataclastic textures. Cataclasite zones grade from several millimeters of ultra-cataclasite surrounding the fault planes into protocataclasite which pervades much of the rock mass within the fault zones. Crush breccias are uncommon in both the Wild Rose and Juniper Canyon fault zones. Argillization, silicification and pyritization are common features of all of the major faults. The occurrence of alunite appears to be restricted to either major splays of the fault, or to where closely spaced, anastomosing fault planes resulted in extensive zones of cataclasite or intense interplane fracturing.

Most of the smaller (linking) faults strike northerly (005 to 020°), dip steeply ($>80^\circ$) west or east, and, unless they occur within a major fault zone, are associated with very weak hypogene hydrothermal alteration or juxtapose unaltered wall-rocks.

Detachment-style Faulting

Detachment faults are regional structures which form in both compressional (*décollements*) and extensional (rift) settings. They are most commonly associated with the formation of metamorphic core complexes, but may be a fundamental, albeit unrecognized, component of Basin and Range extension. In extensional environments, detachment faults are induced by gravity as lateral confining pressure is reduced or removed. This happens along the margins of rapidly uplifted or down-dropped crustal blocks. In the Kamma Mountains, lateral confining pressure was drastically reduced (removed?) during Basin and Range extension as the Black Rock basin subsided along high-angle normal faults. This reduction in confining pressure resulted in the development of several regional gravity slide (detachment) faults which segmated the northern end of the mountain range with a periodicity of ~4,000 feet, i.e., the Wild Rose, Juniper Canyon, Gator, Chance, White Alps(?), Cave and South Ridge faults. Each of these faults is characterized by multiple, anastomosing fault planes, wide fault zones and extensive interplane fracturing.

A similar style of faulting was proposed by Benson and Jones (1990) for the structural control of gold mineralization at the San Luis deposit along the Rio Grande Rift in Colorado (Figs. 2 and 3). Gravity-induced detachment faulting was envisioned by Anderson (1978) for the Black Canyon region of Nevada and Arizona (Fig. 4) and by Davis and Hardy (1981) for the Eagle Pass detachment in southeastern Arizona, and was documented by Page (1998) for the western flank of the Arrow Canyon Range northeast of Las Vegas (Fig. 5). It is suggested that a review of other published geologic maps throughout the Great Basin will produce relationships at least permissive, if not diagnostic of this structural style. Detachment-style faulting has been long known to geomorphologists and geological engineers concerned with slope stability and the potential impact of large-scale rotational slumps. The large torevia blocks of Redwall and Mauv limestone that slid along listric normal faults into the void created by down-cutting of the Colorado river in the eastern Grand Canyon are examples of this mode of extensional failure. That extensional detachment faulting is not widely recognized in the Basin and Range province is most likely due to the prevailing belief that gently- to moderately-dipping normal faults necessarily represent thrust faults, high-angle faults rotated to lower angles during progressive crustal extension, or major detachments on metamorphic core complexes. We anticipate that detachment-style extensional faulting may indeed become an important exploration model for range-front precious metal exploration.

Wild Rose Fault

The Wild Rose (Sulfur Duke) fault is a complex system of anastomosing planes with intervening cataclasite which is exposed for more than 1.5 miles along the western margin of the prospect. Regionally, the Wild Rose fault trends ~035° and dips ~50° to the northwest, but in detail individual fault planes have widely varied strikes and dips (Figs. 6, 7; Plate 1). The fault zone is orthogonally warped to the extent that the maximum amplitude and wavelength of first order flexures (mullions) are approximately 100 and 300 feet, respectively. Multiple order slickenlines document variable directed, repetitive movement, but regardless of orientation, slip directions (~300°) are relatively constant (240 to 340°) in accordance with detachment fault kinematics (Appendices 2 and 3). Motion indicators (mullions, slickenlines, conjugate fractures) consistently document dip-slip displacement along the length of the fault system. It is estimated that collective movement along the Wild Rose fault system resulted in greater than 200% northwest extension.

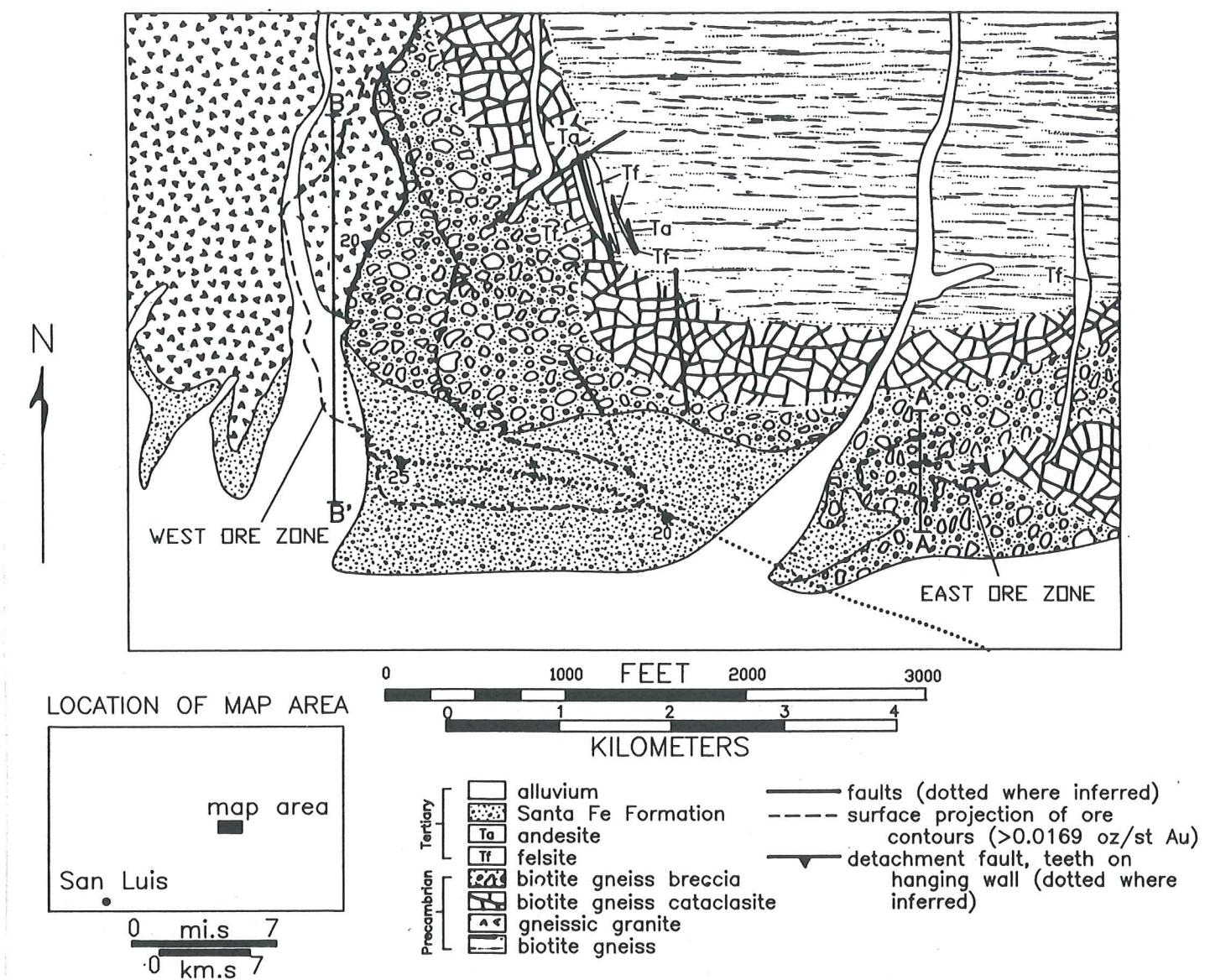


Figure 2. Generalized geologic map of the San Luis deposit, Costilla County, Colorado, from Benson and Jones (1990), Figure 2, page 84.

Geometrically, the Wild Rose fault consists of three unique segments which correspond to the northern half and to the central and southern quarters (Plate 1). In the north, the fault consists of upper and lower strands less than 10 feet thick and separated by 400 to 800 feet of tectonically undeformed planar-laminated rhyolite lava. This portion of the fault strikes northerly ($\sim 015^\circ$), dips approximately 40° to the west, and is subparallel to and approximately 2,500 feet southeast of the East fault which controls gold mineralization at the Brimstone mine (Ebert and Rye, 1997). It is possible that on the north side of the saddle between Juniper and Brimstone canyons, an east-striking fault offsets the Wild Rose fault, but this can not be determined easily because the intersection of

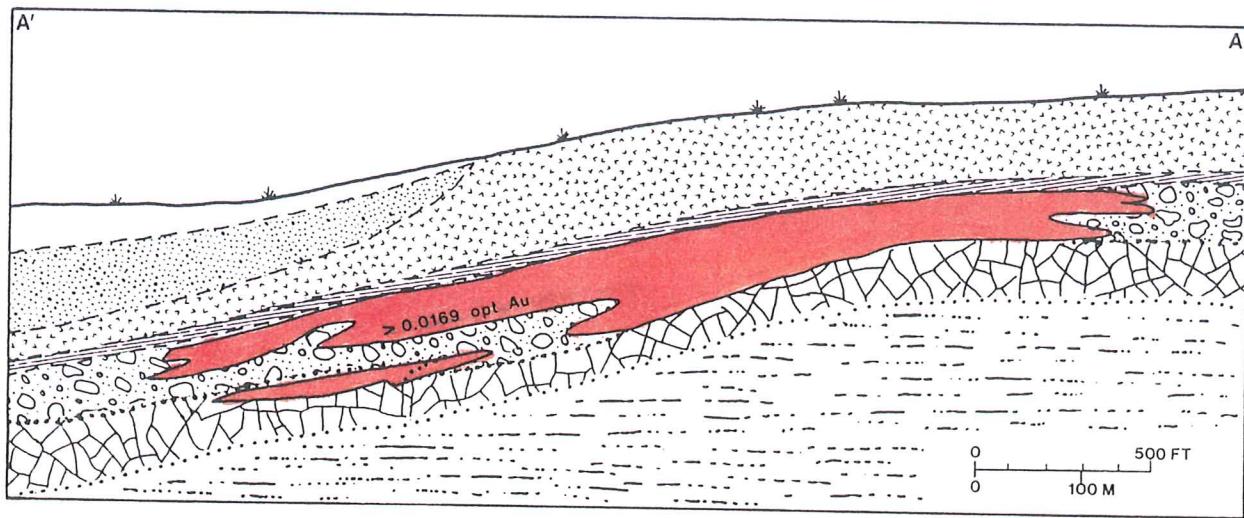


Figure 3. Representative north-south cross section through the west ore zone of the San Luis deposit, see figure 2 for a description of the symbols. Red outlines gold values greater than 0.017 ounce per ton, from Benson and Jones (1990), figure 4, page 86. The San Luis deposit is located along the eastern margin of the San Luis basin. The deposit contains approximately 12.2 million tons of ore at an average grade of 0.041 opt Au (0.449 million ounces), and has a gold silver ratio of approximately 1 (Benson and Jones (1990)).

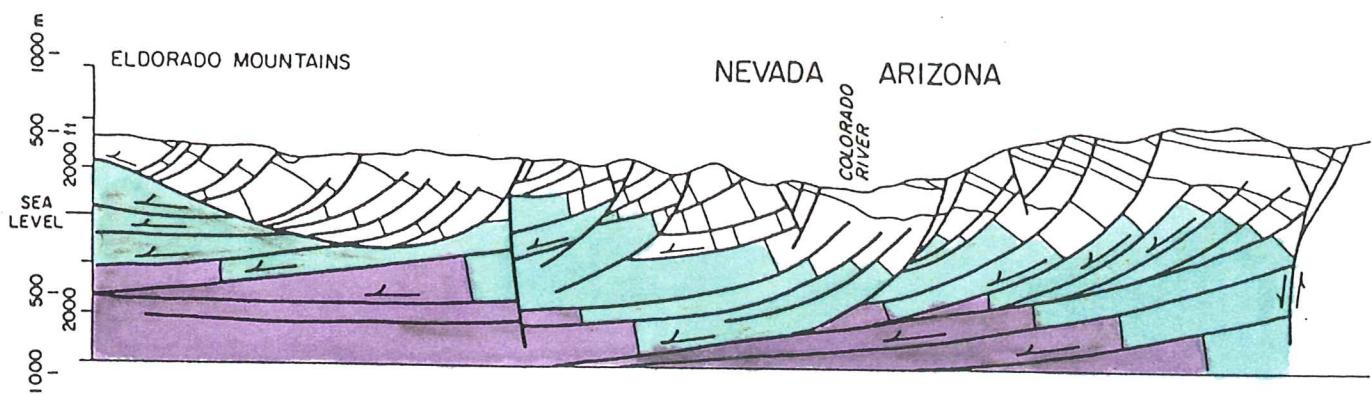


Figure 4. Representative cross section showing the relationships between listric normal (detachment) faults in the Black Canyon region, from Davis and Hardy (1981), Figure 1, page 749. The diagram is after Anderson (1978). Tertiary sedimentary and volcanic rocks rest directly on Precambrian basement.

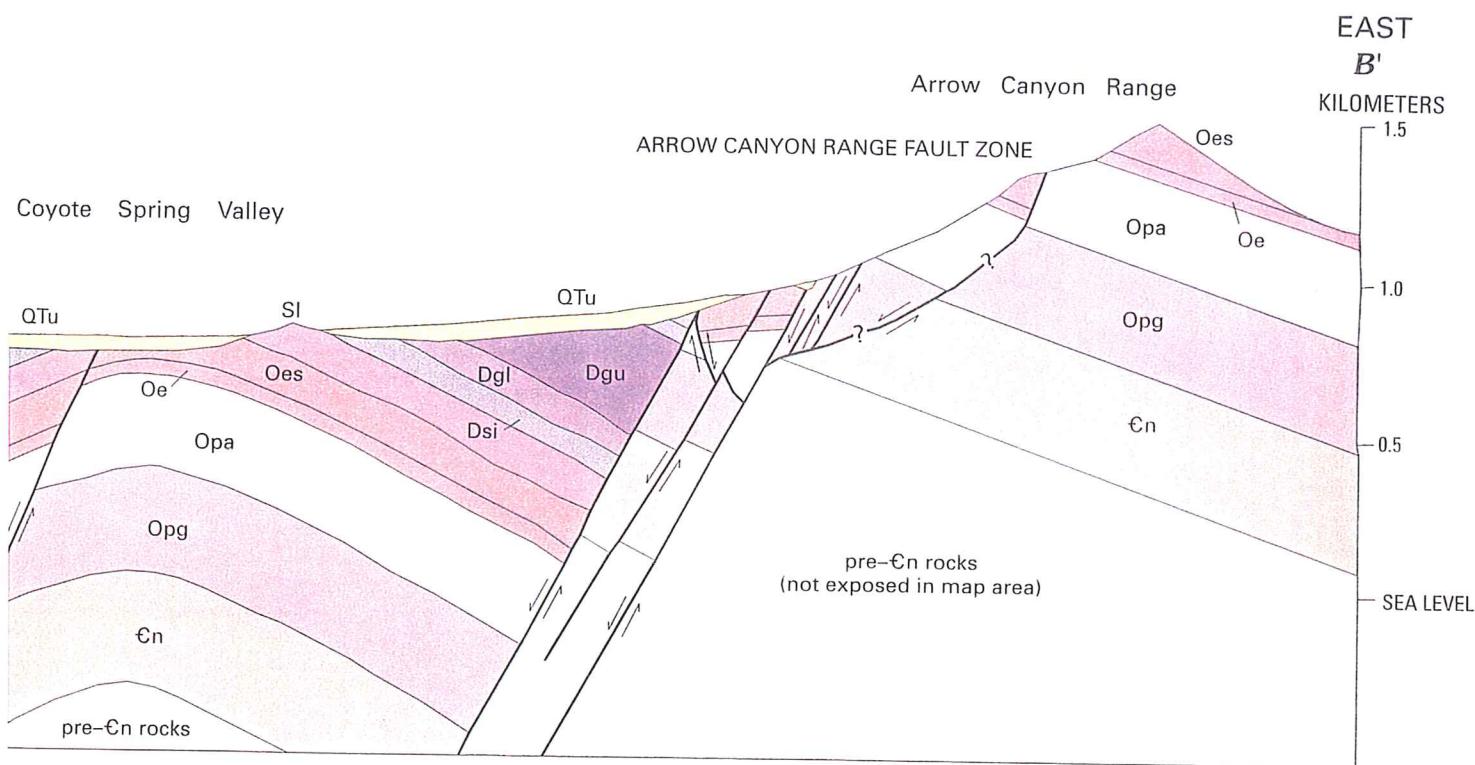
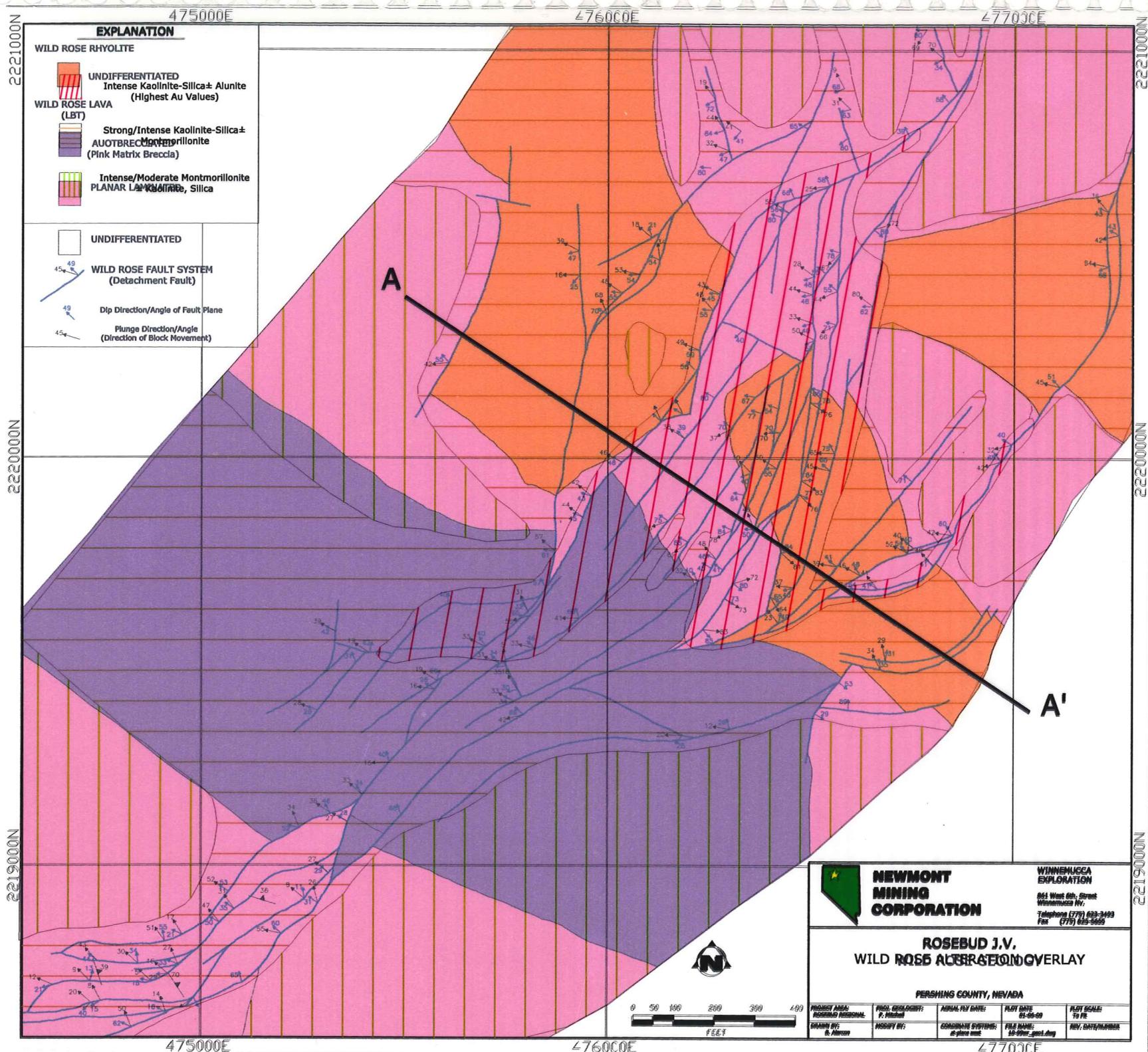


Figure 5. Generalized northwest-southeast cross section through the Arrow Canyon fault zone along the west flank of the Arrow Canyon Range, from Page (1998). The diagram shows the relationship between high-angle normal faults and smaller-scale, arcuate-shaped, moderate-angle normal (detachment) faults. Note that the faults that dip at moderate angles flatten with depth and merge or intersect the major high-angle faults.

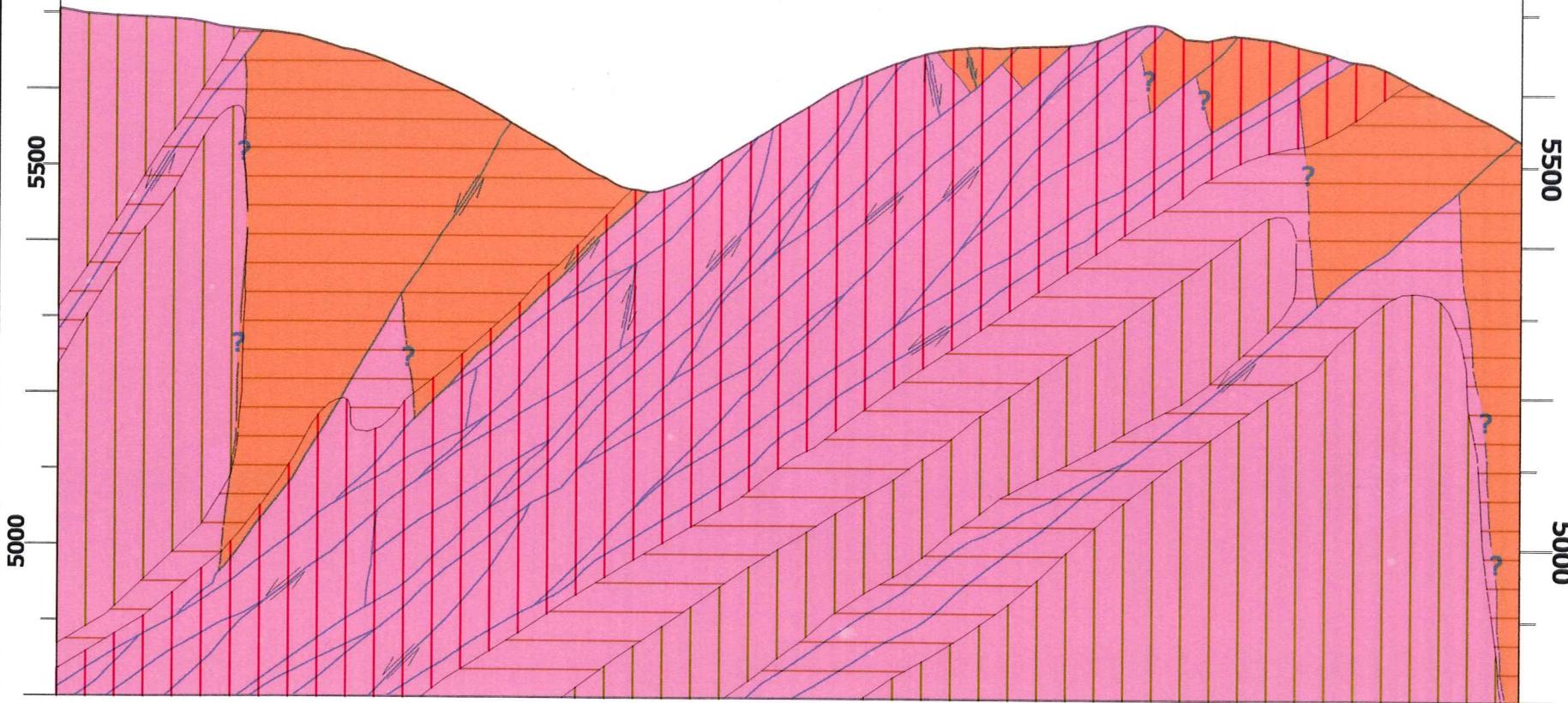
the two faults is obscured by talus. If the east-west fault does offset the Wild Rose fault, this is the only locality along the exposed length of the fault where it may be offset by post-detachment tectonism. Alternatively, the east-west fault may be a regional-scale linking fault between the Wild Rose and Gator fault systems.

The southwestern portion of the Wild Rose fault is comprised of multiple anastamosing fault planes dispersed in a zone of cataclasite more than 200 feet thick (Fig. 6, Plate 1). The reason(s) for the increased intensity of fracturing is not obvious. One possibility is that this portion of the fault is much closer to the margin of the Black Rock basin, and proximity to the high-angle normal faults along which the Kamma Mountains were elevated may foster increased shearing. At one location in this section of the fault, a silicified fault plane with well developed mullions dips steeply (84°) to the east. The steep southeast dip is unusual for faults with pronounced mullions in the Wild Rose area. If the fault is rotated back (stereographically) to a position consistent with the overall attitude of the Wild Rose structure, the rotated slip vectors (plunges) coincide with the regional slip vectors (compare Appendix 4 with plots in Appendix 3). This relationship is at least permissive evidence that the fault plane initially dipped to the west and was rotated into its present position during detachment faulting.



NW
A

SE
A'



EXPLANATION

| |
|---|
| WILD ROSE PHYOLITE |
| Intense Kaolinite-Silica± Alunite (Highest Au Values) |
| UNDIFFERENTIATED |
| Strong/Intense Kaolinite-Silica± Montmorillonite |
| WILD ROSE LAVA |
| (LB) Intense/Moderate Montmorillonite ± Kaolinite, Silica |
| PLANAR LAMINATED |



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ROSEBUD J.V.
WILD ROSE ALTERATION OVERLAY

PERSHING COUNTY, NEVADA

| | | | |
|-----------------------------------|---------------------------------|-------------------------------------|-------------------------------|
| PROJECT AREA: ROSEBUD REGIONAL | PROJ. GEOLOGIST: P. Mitchell | AERIAL FLY DATE: 04-05-00 | FLAT SCALE: 1:250,000 |
| DRAWN BY: S. Hansen | HOODY BY: | COORDINATE SYSTEM: st-plane west | FILE NAME: WR-roseburn.dwg |

The third segment of the structure is a major duplex that developed south of the mid point (as mapped) of the Wild Rose fault. It is in this area that the strike of the fault changes from approximately 015° to 050° . The duplex is a structurally complex zone approximately 2,000 feet long, 1,000 feet wide and 350 feet thick (Figs. 6, 7; Plate 1), within which major fault planes are spaced ~30 feet apart. The Wild Rose fault duplex is spatially coincident with the porphyritic rhyolite intrusion and may be due in part to refraction of the fault within the intrusion. Where marginal splays of the fault intersect thick sections of porphyritic rhyolite, the style of faulting changes from discrete planes to distributive shearing (Figs. 8 and 9).



Figure 8. Photograph of the western splay of the Wild Rose fault (station 1056) north of the saddle between Wild Rose and Brimstone canyons. Here the fault is a single “plane” less than three feet thick with a well developed slickenside surface. Such surfaces are typical of detachment faults in the northern Kamma Mountains.

Juniper Canyon Fault

The Juniper Canyon fault is exposed for more than 3,600 feet along the crest and northern flank of Wild Rose ridge. Because of the limited time allocated for the Wild Rose exploration program, and the fact that surface alteration associated with the Juniper Canyon fault is less intense than that associated with the Wild Rose fault, little time was devoted to evaluating the economic potential of this structure.

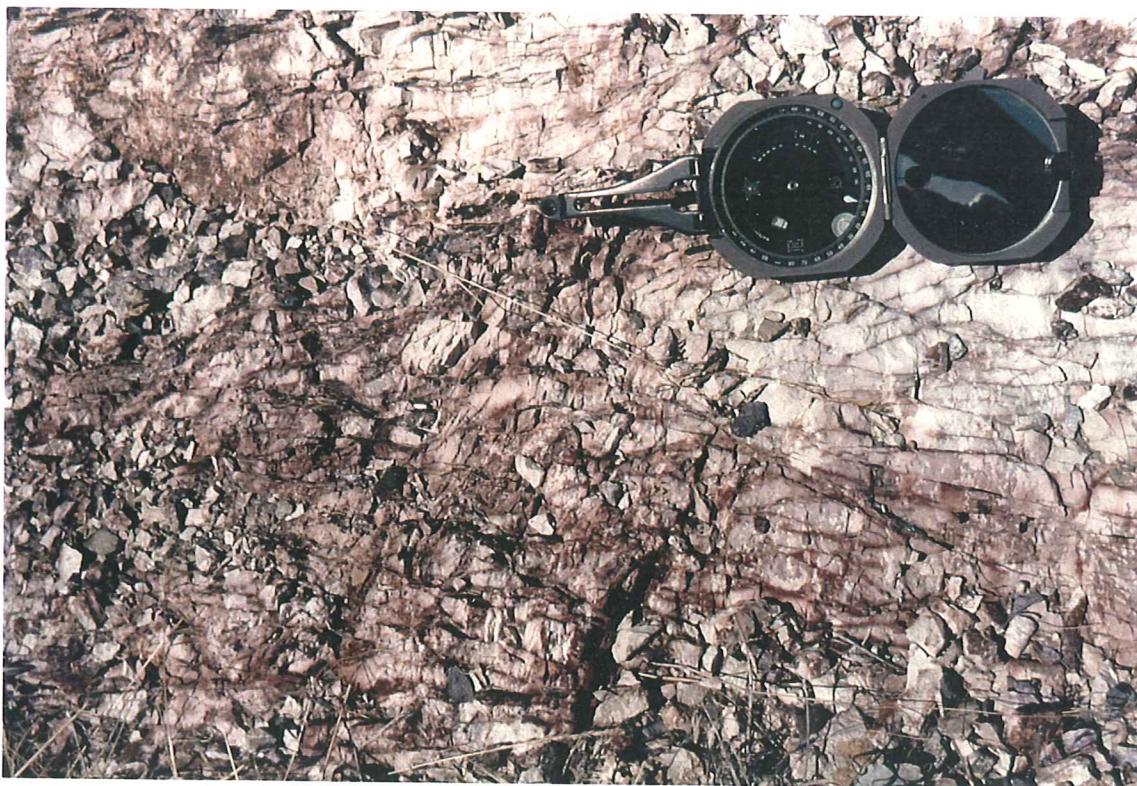


Figure 9. Photograph showing distributive shearing in the Wild Rose porphyritic rhyolite intrusion (station 1004). When the fault exits the intrusion and enters either planar-laminate or autobrecciated Wild Rose lava it again becomes a discrete fault zone.

The Juniper Canyon fault strikes approximately east-west and dips at a moderate angles (35 to 70°) to the north. The attitude and projection of the Juniper Canyon fault is such that it may be either a linking or tear fault between the Wild Rose and Gator structures. Depending on the projection of the western portion of the fault, it may either merge with, or continue subparallel to and ~300 feet beneath the western extension of the Wild Rose fault. In either case, this area is of particular economic interest. The projected point of intersection of the two faults is concealed by pediment, but considering its proximity to the range front, the alluvium should be relatively shallow. Assays of cataclasite samples collected along the mapped length of the Juniper Canyon fault were all auriferous, and it is recommended that the Juniper Canyon fault be explored in greater detail.

HYDROTHERMAL ALTERATION

Intermediate argillic alteration overprints nearly all of the rocks that are exposed north of Wild Rose ridge, and intense silicification, argillization and pyritization (pyrite ± marcasite) are associated with all of the major faults in the Wild Rose area. The greatest surface exposure of intense hydrothermal alteration is centered on the Wild Rose fault duplex and porphyritic rhyolite intrusion. Here, and around most major faults, hydrolytic alteration is systematically zoned. Intense silicification, kaolin-

ization and locally advanced argillic alteration (kaolinite-alunite \pm dickite, sulfide) occur along and proximal to the fault planes (Fig. 10). Only rarely does alunite occur more than twenty-five feet away from the fault plane. Argillization grades outward from advanced argillic assemblages through a wide zone of intermediate argillic alteration into weakly porphyritized rock. With distance from the fault the abundance of kaolinite increases as that of silica (opal, lussatite, quartz) decreases until kaolinite becomes the dominant alteration phase. This usually happens within a few feet of the fault and, depending on the lithology and extent of fracture permeability, kaolinite remains the dominant secondary mineral for distances of a few tens to several hundred feet from the fault. Kaolinite is a major component of both advanced argillic and proximal intermediate argillic alteration, and location of the contact between them is subjective. To circumvent the problem of distinguishing between these two alterations, the spatial distribution of specific minerals instead of mineral assemblages were recorded on the alteration map.

Intermediate argillic alteration (kaolinite-montmorillonite-silica \pm illite) is the most common and most extensive type of hydrothermal alteration associated with gold mineralization. The alteration assemblage itself is gradational, varying from kaolinite-dominant assemblages proximal to the fault to a distal assemblage dominated by montmorillonite. As the abundance of chlorite increases and that of montmorillonite decreases, intermediate argillic alteration grades into a pyropylitic assemblage (chlorite \pm epidote, albite, calcite, hematite, montmorillonite). Locating the contact between these two alteration types also is very difficult, and the mapping of individual alteration minerals again proved beneficial. Rock compositions appear to be the controlling factor in the formation of secondary minerals under the physiochemical conditions favoring distal intermediate argillic and propylitic alteration.

The Wild Rose and Rosebud hydrothermal systems are atypical of Nevada epithermal precious metal deposits in that gold was deposited under acidic conditions rather than the near neutral to weakly alkaline environment of the "adularia-sericite" deposits, e.g., Round Mountain and Midas. Both types of deposits form at low to moderate temperatures ($<250^\circ$), and at relatively shallow crustal levels. Although gold precipitated under conditions that were favorable for the formation of high-alumina clays and alunite at Wild Rose and Rosebud, their sulfide assemblages (pyrite-marcasite \pm chalcopyrite) clearly indicate that they are intermediate-sulfidation state systems. The closest analogies to the hypogene alteration assemblages and zoning patterns identified at Wild Rose and Rosebud are found associated with the main-stage veins at Butte, Montana (e.g., Meyer and Hemley, 1967), and with the silicified fissure veins at Goldfield, Nevada (e.g., Vikre, 1989).

The relationships between hypogene mineralogy and gold solubility for "argillic" and "adularia-sericite" systems are illustrated in figure 11. Figure 11A represents the general physiochemical environment for the formation of "adularia-sericite"-type epithermal gold-silver deposits, e.g., Round Mountain (Sander and Einaudi, 1990) and Sleeper (Nash et al., 1990). The stability field for these deposits coincides with the zone of maximum solubility for gold (Fig. 11C). Because of this, an external force must disrupt the chemical equilibrium of the system for gold to precipitate. The most effective mechanisms for this are fluid mixing or catastrophic depressurization (throttling). Contrary to popular belief, the gentle boiling characteristic of active high-temperature ($>250^\circ\text{C}$) geothermal reservoirs actually increases the solubility of gold by driving the system to more alkaline conditions



Figure 10. Photographs of one of the many composite splays of the Wild Rose fault zone near its western terminus with the pediment at the mouth of Juniper Canyon. The photographs show that the major fault splays consist of numerous anastomosing planes which are separated by thick zones of cataclasite. The bold outcrops are silicified (\pm alunite) and argillized (kaolinite \pm dickite) ultracataclasite to protocataclasite. Cataclasite and less common crush breccias extend outward in both directions from the silicified “core” of the fault for a few to several tens of feet. In this area the Wild Rose fault zone is >200 feet thick with a major splay similar to the ones shown here occurring every 30 to 50 feet throughout the fault zone.

(e.g., see Krupp and Seward, 1987). Figure 11B illustrates the physiochemical environment for the formation of “argillic”-type precious metal deposits like Rosebud. By comparing Figures 11B and 11D it is apparent that very little gold can be carried as a bisulfide complex in the dilute aqueous fluids that favor the formation of advanced argillic alteration, i.e., the assemblage alunite-kaolinite-barite. The conditions illustrated in Figures 11B and 11D efficiently partition gold (silver) from the solution into the altered rock. Under acidic near-surface conditions all but a very minor amount of gold carried by a rising hydrothermal fluid will precipitate. It is for this reason that the higher gold assays in the Wild Rose area came from rocks containing strong alunite-kaolinite alteration, and the highest gold values (0.5 to 3.0 ppm) were reported for samples taken from alunite-silica veins.

Controls on Hydrothermal Alteration

The primary control on the spatial distribution and intensity of hydrothermal alteration and gold mineralization at Wild Rose is fracture permeability. Primary (cooling) fracturing in the planar-laminated rhyolite lavas and secondary fracturing which developed in all of the units during detachment faulting were the major controls on fluid migration. Additional minor controls on fluid movement include the contacts between the porphyritic rhyolite intrusion and the autobrecciated and planar-laminated lavas, primary porosity in the autobrecciated lavas, and secondary permeability due to feldspar leaching in the porphyritic rhyolite.

Wild Rose Fault Zone

The most intense and wide-spread hydrothermal alteration in the Wild Rose area occurs within the Wild Rose fault duplex. With the exception of a small septa of porphyritic rhyolite overprinted by intermediate argillic alteration in which the abundance of montmorillonite greatly exceeds that of kaolinite, all of the rocks within the fault duplex are intensely replaced by advanced argillic (alunite-kaolinite-silica) or kaolinite-dominant intermediate argillic alteration. Alunite-silica (opal CT or

Figure 11. (Following page) Isothermal log fO_2 -pH diagrams constructed for temperatures of 225° and 150°C. Stippled areas in Figures 11A and 11B indicate the stability fields constrained by the potassic equilibrium assemblage quartz-adularia-illite-sericite (anhydrite-pyrite-stibnite), and by the advanced argillic equilibrium assemblage alunite-kaolinite-silica (lussatite-pyrite-barite), respectively. The diagrams in figures 11C and 11D are simplified versions of figures 11A and 11B, respectively, showing gold solubility contours for the stated conditions. Stippled areas in Figs. 11C and 11D correspond to the stability fields defined for potassic and advanced argillic alteration in Figs. 11A and 11B, respectively. The diagrams were calculated from published thermodynamic data for: sulfur species (Robie and Waldbaum, 1968), K-feldspar (adularia)-muscovite (illite-sericite), muscovite-kaolinite, iron and sulfur species, barite and anhydrite solubility (Helgeson, 1969), kaolinite-alunite (Hemley et al., 1969), sulfur species (Ellis and Giggenbach, 1971), kaolinite-alunite (Helgeson et al., 1978), and pyrite-stibnite-berthierite (Barton and Skinner, 1979). Additional thermodynamic data was taken from Bowers et al. (1984). See Appendix 5 for mineral reactions and calculated log K values.

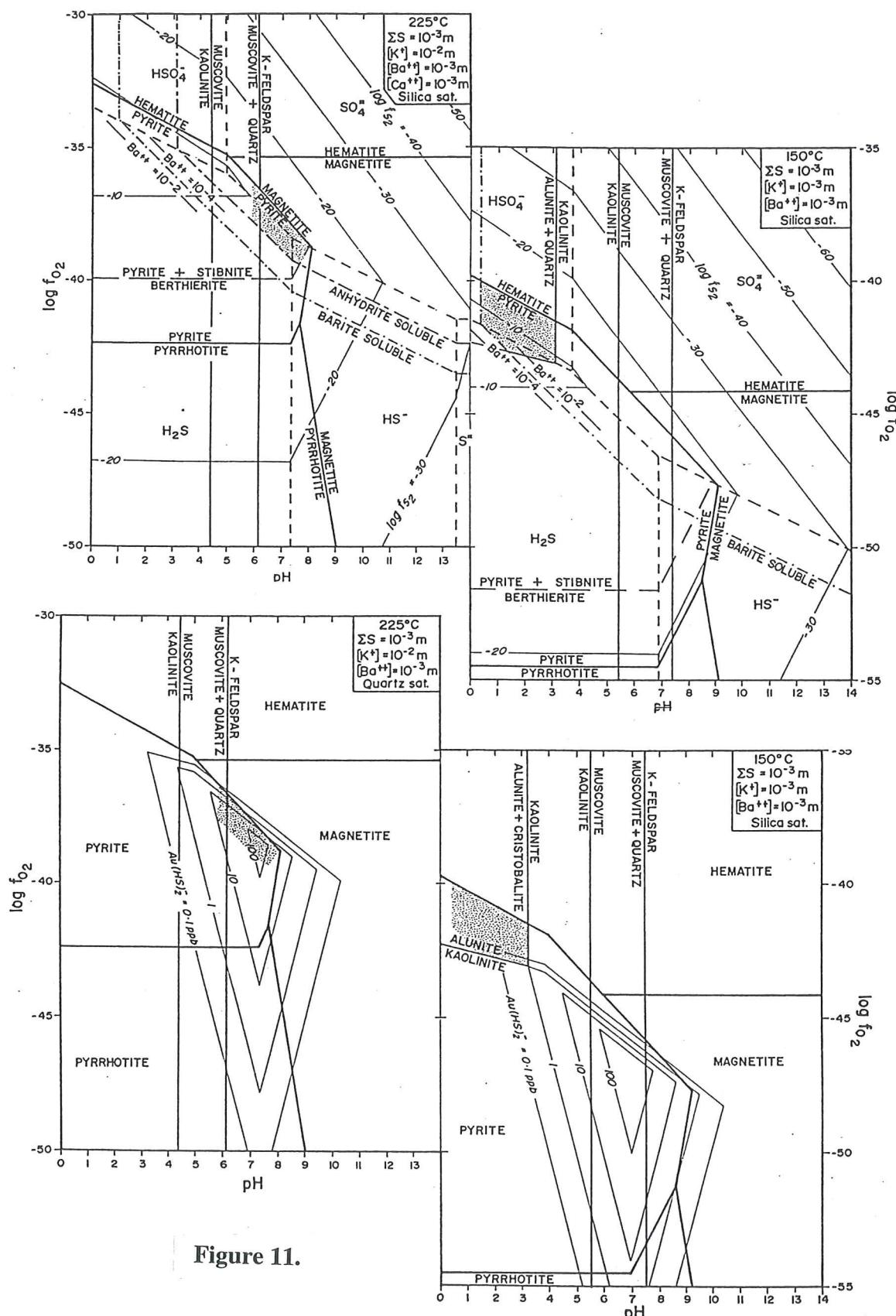


Figure 11.

lussatite) \pm kaolinite, sericite and dickite veins a few inches to more than two feet thick are common within and adjacent to the upper and lower bounding structures of the Wild Rose fault zone and duplex. Outboard of the cataclasites surrounding major fault planes, the fault duplex and porphyritic rhyolite intrusion, the abundance of montmorillonite increases rapidly. Montmorillonite becomes the dominant secondary mineral within moderate distances (25 to <300 feet) of most faults and remains so for a few hundred to more than 1,000 feet from the bounding structures of major fault zones like Wild Rose. The only area where intermediate argillic alteration grades into (or overprints) propylitic alteration is east of the saddle between Wild Rose and Brimstone canyons. In this area, the distribution of propylitic alteration (chlorite-epidote-albite \pm montmorillonite, calcite) is confined to the andesitic lavas of the North Andesite and a narrow volcaniclastic bed at the base of the Bud formation. Because of its limited occurrence, it is not clear whether propylitization is distal hypogene or regional deuterian alteration.

Sulfide minerals (principally pyrite) occur as disseminated and less commonly fracture-controlled mineralization in halos to the major faults. Minor fracture-controlled pyrite also occurs along small faults and strong joint sets which developed away from the major fault zones. Intense silicification \pm alunite and kaolinite is commonly accompanied by one to a five percent pyrite, and thin bands of pyritized ultracataclasite commonly contain $>10\%$ sulfide. These ultracataclasite intervals occur along most of the major fault planes and commonly have slickensided surfaces. Wide-spread disseminated pyrite was not identified during geologic mapping or geochemical sampling, and it is considered unlikely that moderate to intense pyritization occurred at significant distances from the major structures. The absence of abundant limonite and pyrite casts except in proximity to the faults is permissive evidence that the distribution of sulfide phases was restricted to relatively narrow structural zones, but owing to the nearly ubiquitous presence of at least weak intermediate argillic alteration it is difficult to conclude this with certainty. It is possible that disseminate pyrite was relatively widespread initially and was oxidized during near-surface weathering.

Marcasite and chalcopyrite were tentatively identified in strongly pyritized and silicified ultracataclasite at a few localities along the Wild Rose fault and within the fault duplex, but virtually all of the sulfide identified at the surface was pyrite.

Supergene Alteration

There is disagreement among geologists who have visited the Wild Rose area as to whether or not alunite and much of the kaolinite are the result of hypogene or supergene processes? The answer to this question is not easily discernable. Both of these minerals represent the aluminum-rich residue of intense cation leaching of feldspar and mafic minerals by low pH fluids (Fig. 11). In addition to aluminum, the formation of alunite requires modest amounts of sulfur and potassium. The rhyolite lavas and intrusion(s) contain sufficient potassium to form large amounts of alunite, but was there enough sulfur in the altered rocks to generate large amounts of sulfuric acid? So the question is, how did the late fluid acquire its sulfur? Did sulfur come from the upwelling hydrothermal fluid (hypogene), or was it derived from pyrite during near-surface weathering (supergene)?

Ebert and Rye (1997) proposed a supergene origin for acid-sulfate alteration (alunite-kaolinite-opal) at Hycroft. In their model, near surface advanced argillic alteration formed as low-temperature

acidic fluids percolated downward during the waning stages of hydrothermal activity. The acidic fluids were generated as steam condensed at the top of the geothermal reservoir, or in shallow lakes overlying the reservoir. There is sufficient evidence indicate that steam condensation was the process responsible for advanced argillic alteration and precious metal enrichment at Hycroft, but this is not *supergene* alteration. Advanced argillic alteration at Hycroft may have occurred late in the evolutionary history of the hydrothermal system, but it is still the result of hypogene processes.

The occurrence of advanced argillic and kaolinite-dominant intermediate argillic alteration at Wild Rose is much different than it is at Hycroft where advanced argillic alteration (alunite-kaolinite-opal) is widespread in the upper part of the paleogeothermal reservoir. Pervasive advanced argillic alteration similar to that at Hycroft was not recognized at Wild Rose, and alunite was rarely detectable by PIMA analysis at distances exceeding 25 feet from the major faults. The most common occurrence of advanced argillic alteration in the Wild Rose area is as discrete veins subparallel to major faults planes. This occurrence is at least permissive for the formation of alunite and kaolinite by relatively late hypogene processes.

There is little evidence to suggest that rocks in the Wild Rose area contained sufficient pyrite or marcasite to generate the acid needed to leach the large volume of rock containing greater than 50 volume percent kaolinite and alunite-kaolinite alteration. The supergene origin of advanced argillic alteration if further maimed by the observation that in areas where abundant ($\geq 5\%$) pyrite \pm marcasite were deposited, most of the sulfide phases are still present in the rock. It seems very unlikely that kaolinite and alunite alteration are the result of near-surface weathering at Wild Rose.

GEOCHEMISTRY AND GOLD MINERALIZATION

Of the 219 representative rock-chip samples collected from the Wild Rose prospect more than 75% are from the northern area, and nearly all of the samples are from silicified fault zones or intensely argillized cataclasite outboard of the silicification. Rock-chip samples collected away from the major faults were taken from strongly altered outcrops. The distribution of assay data for Au, Ag, As, Hg, Se, Sb and Zn are shown on a series of overlays to Plates 1 and 3.

The sample data should represent a relatively homogeneous population, and it is for this reason that the analytical results are surprising. *Stones* linear correlation (matrix) was used to test for interrelationships between elements in the assay data (Table 1). The maximum correlation coefficient between gold which was determined by a 1 assay ton fire assay with an atomic absorption finish and the other 27 elements assayed by ICP-MS methods is 0.288 (As), indicating that there is no statistical linear relationship between gold and any other element in the Wild Rose area. Correlation coefficients between gold and As, Sb, Se and P varied between 0.218 and 0.288, and those between Au and Cu, Fe, Mg, Ni, Sr and V ranged from 0.096 to 0.189. Linear correlation coefficients for gold and Ag, Al, Ba, Be, Cd, Co, Cr, Hg, K, Mn, Mo, Na, Pb, Sb, Ti, Zn, W were less than 0.100. Correlation coefficients between silver and the other elements were all less than or equal 0.070.

Several elements had correlation coefficients in the range of 0.5 to 0.8 (Table 1). With the exception of weak to moderate correlations displayed by a few metals, i.e., As, Cu, Sb, Fe and Zn, nearly all

Table 1. Correlation coefficients for the Wild Rose geochemical database. The 28 elements were analyzed by ICP-MS methods except for gold which was determined by 1 assay ton fire assay with an atomic absorption finish. The correlation matrix was calculated using the old Stones software.

| | Ag | Al | As | Ba | Be | Ca | Cd | Co | Cr | Cu | Fe | Hg | K | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Sr | Ti | V | W | Zn |
|----|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Ag | 0.010 | -0.023 | 0.288 | -0.045 | 0.088 | 0.043 | 0.033 | -0.069 | -0.034 | 0.166 | 0.189 | 0.059 | 0.035 | 0.109 | -0.050 | 0.032 | -0.084 | 0.108 | 0.256 | -0.025 | 0.218 | 0.218 | 0.130 | -0.070 | 0.096 | 0.053 | 0.043 |
| Ag | 1.000 | -0.047 | -0.012 | 0.054 | -0.009 | -0.037 | -0.007 | -0.024 | 0.034 | 0.070 | -0.028 | -0.026 | -0.049 | -0.065 | -0.025 | -0.009 | -0.036 | 0.019 | -0.030 | -0.011 | 0.050 | 0.050 | -0.029 | -0.013 | 0.015 | -0.011 | -0.028 |
| Al | 1.000 | -0.203 | 0.313 | -0.188 | 0.085 | -0.056 | 0.148 | -0.541 | -0.237 | -0.260 | -0.192 | 0.778 | -0.071 | -0.014 | -0.133 | 0.362 | -0.383 | -0.173 | 0.072 | -0.174 | -0.155 | 0.145 | 0.151 | -0.083 | -0.077 | -0.201 | |
| As | | 1.000 | -0.114 | 0.372 | -0.010 | -0.017 | 0.042 | -0.151 | 0.387 | 0.632 | 0.208 | -0.079 | 0.134 | 0.260 | 0.356 | -0.191 | 0.279 | 0.508 | 0.019 | 0.365 | 0.182 | 0.174 | -0.211 | 0.350 | 0.123 | 0.372 | |
| Ba | | | 1.000 | 0.105 | 0.426 | 0.117 | 0.538 | -0.288 | -0.032 | 0.030 | -0.013 | 0.473 | 0.349 | 0.355 | -0.102 | 0.575 | -0.077 | 0.013 | 0.146 | -0.020 | -0.076 | 0.125 | 0.398 | 0.075 | 0.117 | 0.153 | |
| Be | 1.000 | 0.119 | -0.008 | 0.227 | -0.161 | 0.023 | 0.532 | 0.489 | -0.044 | 0.245 | 0.303 | 0.099 | 0.032 | 0.200 | 0.636 | 0.035 | 0.560 | 0.039 | 0.218 | -0.103 | 0.131 | 0.718 | 0.571 | | | | |
| Ca | | | 1.000 | -0.062 | 0.336 | -0.158 | 0.113 | 0.160 | -0.056 | 0.169 | 0.674 | 0.123 | -0.014 | 0.627 | 0.095 | 0.186 | 0.007 | 0.023 | -0.099 | 0.087 | 0.340 | 0.264 | 0.113 | 0.183 | | | |
| Cd | | | | 1.000 | 0.068 | 0.090 | 0.013 | -0.030 | -0.025 | -0.060 | -0.034 | 0.021 | -0.020 | -0.026 | 0.027 | 0.018 | -0.038 | -0.010 | 0.147 | 0.150 | -0.034 | 0.006 | -0.010 | 0.149 | | | |
| Co | | | | | 1.000 | -0.203 | 0.041 | 0.280 | -0.029 | 0.223 | 0.300 | 0.584 | -0.022 | 0.290 | 0.091 | 0.168 | 0.103 | 0.069 | -0.033 | 0.161 | 0.280 | 0.159 | 0.124 | 0.423 | | | |
| Cr | | | | | | 1.000 | 0.031 | -0.285 | 0.081 | -0.434 | -0.214 | -0.171 | -0.041 | -0.275 | 0.234 | -0.178 | -0.086 | -0.109 | 0.141 | 0.023 | -0.065 | -0.152 | -0.046 | -0.236 | | | |
| Cu | | | | | | | 1.000 | 0.432 | 0.026 | -0.171 | 0.252 | 0.066 | 0.143 | -0.095 | 0.766 | 0.384 | 0.013 | 0.121 | 0.101 | 0.049 | -0.064 | 0.738 | -0.009 | 0.161 | | | |
| Fe | | | | | | | | 1.000 | 0.104 | -0.072 | 0.421 | 0.341 | 0.343 | -0.069 | 0.453 | 0.801 | 0.131 | 0.378 | 0.144 | 0.253 | -0.139 | 0.501 | 0.134 | 0.807 | | | |
| Hg | | | | | | | | | 1.000 | -0.213 | 0.010 | -0.028 | -0.035 | -0.176 | 0.022 | 0.247 | -0.059 | 0.402 | 0.127 | 0.087 | -0.046 | -0.023 | 0.340 | 0.044 | | | |
| K | | | | | | | | | | 1.000 | 0.058 | 0.163 | -0.114 | 0.582 | -0.224 | -0.041 | 0.134 | -0.127 | -0.186 | 0.154 | 0.055 | -0.010 | -0.052 | 0.006 | | | |
| Mg | | | | | | | | | | | 1.000 | 0.247 | 0.136 | 0.361 | 0.214 | 0.330 | 0.098 | 0.114 | -0.053 | 0.056 | 0.261 | 0.329 | 0.056 | 0.385 | | | |
| Mn | | | | | | | | | | | | 1.000 | -0.013 | 0.142 | 0.121 | 0.136 | 0.077 | 0.007 | -0.107 | 0.001 | 0.075 | 0.140 | 0.022 | 0.536 | | | |
| Mo | | | | | | | | | | | | | 1.000 | -0.094 | 0.096 | 0.194 | 0.279 | 0.110 | 0.057 | 0.047 | -0.157 | 0.150 | 0.021 | 0.168 | | | |
| Na | | | | | | | | | | | | | | 1.000 | -0.099 | -0.066 | 0.080 | -0.102 | -0.230 | 0.052 | 0.226 | 0.051 | 0.164 | 0.076 | | | |
| Ni | | | | | | | | | | | | | | | 1.000 | 0.467 | -0.061 | 0.128 | 0.099 | 0.200 | -0.103 | 0.663 | 0.161 | 0.337 | | | |
| P | | | | | | | | | | | | | | | | 1.000 | 0.016 | 0.563 | 0.195 | 0.527 | -0.084 | 0.543 | 0.339 | 0.633 | | | |
| Pb | | | | | | | | | | | | | | | | | 1.000 | -0.023 | 0.064 | 0.017 | -0.045 | 0.008 | -0.096 | 0.195 | | | |
| Sb | | | | | | | | | | | | | | | | | | 1.000 | 0.387 | 0.192 | -0.029 | 0.250 | 0.427 | 0.294 | | | |
| Se | | | | | | | | | | | | | | | | | | | 1.000 | 0.300 | 0.038 | 0.164 | -0.034 | 0.069 | | | |
| Sr | | | | | | | | | | | | | | | | | | | | 1.000 | -0.100 | 0.219 | 0.245 | 0.182 | | | |
| Ti | | | | | | | | | | | | | | | | | | | | | 1.000 | 0.157 | 0.065 | -0.066 | | | |
| V | | | | | | | | | | | | | | | | | | | | | | 1.000 | 0.040 | 0.331 | | | |
| W | | | | | | | | | | | | | | | | | | | | | | | 1.000 | 0.140 | | | |
| Zn | | | | | | | | | | | | | | | | | | | | | | | | | 1.000 | | |

of the higher correlation coefficients appear to reflect silicate mineralogy. A few correlations, such as those for K-Al, K-Na and Na-Ca (feldspar) and Ba-Al and K-Al (advanced argillic alteration), are relatively obvious, but most of the elements with weak to moderate correlation coefficients are not readily linked to the observed alteration mineralogy. One interesting weak correlation (0.330) that of Mg and P, may indicate the presence of wagnerite [$Mg_2(PO_4)$] which is a rarely recognized, but possibly common alteration phase associated with advanced argillic alteration. The reason(s) for weak to moderate correlation between Be and As, Fe, Hg, Mn, P, Sb, Zn and W, between P and Sr, Sb, V and Zn, or between Sb and W are not clear. There are several beryllium minerals that may form in relatively low pH environments, e.g., beryl, bertrandite and phenakite, and minor amounts of one or more of these minerals may be present in strongly kaolinitized rock. But these minerals are Be silicates and it is unlikely that their occurrence would account for the statistical correlations between beryllium and the other elements.

Gold

Assay results indicate that there is widespread low-level (80 to 200 ppb) gold north of Wild Rose ridge and west of the northern branch of Juniper canyon, and that outside this area, gold values are generally below the assay detection limit of 5 ppb. The highest gold values were determined for samples of silicified cataclasite and alunite-silica ± kaolinite veins and veinlets taken from the major fault zones. Low-level gold is associated with the Wild Rose fault zone along the ~1.5 miles that were mapped. Rocks within the Wild Rose fault zone generally contain between 25 and 100 ppb gold, but values from 200 to 500 ppb are not uncommon. Three samples of alunite-silica-kaolinite altered cataclasite from the fault duplex, and two samples of silicified cataclasite from the northern splay of the Wild Rose fault where it crosses the saddle between Juniper and Brimstone canyons contained between 2 and 6.8 ppm gold.

Gold values in samples collected from the Juniper Canyon fault range from 90 to 900 ppb. On the southern side of Wild Rose ridge, gold values ranging between 1,200 and 3,300 ppb appear to be related to an unmapped, high-angle normal fault. If real, this linking(?) fault trends approximately north from the Wild Rose canyon road to the Juniper Canyon fault on Wild Rose ridge (Plate 1, Au Overlay). Another concentration of elevated gold values (190 to 2,600 ppb) occurs along the low-to moderate-angle (17 to 62°) detachment-style fault which crosses the low ridge south of Wild Rose canyon.

Silver

Silver values determined from Wild Rose rock-chip samples are consistently low. Very few altered wall-rock and cataclasite samples contained more than 2 and 6 ppm Ag, respectively. The highest values (10 to 798 ppm) were determined for samples of the Wild Rose fault and fault duplex (Plate 1, Ag Overlay). The low silver content of altered rocks in the Wild Rose area sets it apart from the remainder of the Rosebud district where high silver values are much more common. There is virtually no correlation between silver and gold or arsenic (-0.012). Weak to modest correlations occur for silver and Cu (0.387), Fe (0.632), Ni (0.279), Sb (0.365), and Zn (0.372), possibly indicating the presence of tetrahedrite. Specific minerals which may responsible for the weak to moderate correlations between Ag and Be (0.372), Mn (0.260), Mo (0.356), P (0.508), and V (0.350) are unresolved.

Antimony

Rock-chip antimony values are generally higher in the Wild Rose area than elsewhere in the Rosebud district. Most data determined for both cataclasite and wall-rock samples range from 12 to 125 ppm, but a few silicified cataclasite samples contained between 125 and 5600 ppm Sb. The greatest density of elevated antimony values occurs south of Juniper Canyon (Plate 1, Sb Overlay). There is a very weak correlation between antimony and gold (0.218), weak correlations between Sb and Fe (0.378), Hg (0.402), Se (0.387), V (0.250), W (0.427) and Zn (0.294), and modest correlations between antimony and Be (0.560) and P (0.563), none of which are easily explained by the observed alteration mineralogy. The correlation between antimony and silver (0.050) is negligible.

Mercury

The mercury content of the fault zones and altered rhyolite lavas in the Wild Rose area is very high, commonly exceeding 1 ppm. The highest values (1 to 30 ppm) correlate with samples collected from the fault zones and adjacent to lithologic contacts. The most extensive concentration of elevated Hg values occurs on Wild Rose ridge between Juniper and Wild Rose canyons (Plate 1, Hg Overlay). Within this area there is a general eastward increase in rock-chip mercury assays. Mercury is much higher at Wild Rose than in the southern part of the Rosebud district, and this probably reflects overprinting of the area by low-temperature hydrothermal fluids related to the auriferous geothermal system at Hycroft. There is a weak correlation between mercury and Be (0.489), P (0.247) and W (0.340), and almost no correlation between Hg and gold (0.059) or silver (-0.026).

Selenium

Rock-chip selenium values greater than or equal to 4 ppm occur in both the fault zones and strongly altered rocks away from the faults. The highest selenium levels (6 to 40 ppm) occur on the western half of Wild Rose ridge, and ~1,500 feet west of the center of the Wild Rose fault duplex (Plate 1, Se Overlay). The correlation between selenium and gold (0.218) is similar to that of Au-Sb and Au-As. There is a weak correlation between selenium and antimony (0.389), and an insignificant positive correlation between Se and Ag (0.050).

Zinc

Zinc values determined for rock-chip samples throughout the Wild Rose area are generally low (\leq 60 ppm). No consistent relationship exists between the abundance of zinc in rock-chip samples and lithology or structure, but there is an apparent decrease in zinc values north and west of the Juniper Canyon fault (Plate 1, Zn Overlay). The correlation between zinc and gold (0.043) or Ag (-0.028) is virtually nonexistent, but there are weak to modest correlations between zinc and As (0.372), Be (0.571), Co (0.423), Mg (0.385), Mn (0.536), Ni (0.337), P (0.633), Sb (0.294) and V (0.331), and a relatively strong correlation (for Wild Rose) between zinc and iron (0.807).

Comment

The geochemical overlays to Plate 1 do not indicate a strong relationship between gold and Ag, As, Hg, Sb, Se or Zn, and in fact there is very little statistical correlation between gold and any of the 27

elements for which sample assays were reported (Table 1). As is often the case in gold exploration, the so-called "pathfinder" elements provide a wealth of general information about the hydrothermal system, but do not specifically highlight areas containing the highest gold values. Statistical and graphical evaluation of the Wild Rose assay database support the conclusion that multielement assays are not a cost effective tool for gold exploration in the area. Detailed geology and alteration maps supported with gold assay data are all that are needed to define drilling targets at Wild Rose.

GEOPHYSICS

Geophysical modeling and the following discussion of the airborne magnetic and ground gravity data was provided by Bruce Ferneyhough. Geological comments on magnetic and gravity modeling, and brief comments on the radiometric, resistivity and thermatic mapper data were taken from Mitchell et al. (1999) and discussions with Nigil Phillips and Bruce Ferneyhough.

Airborne Magnetic and Ground Gravity

Apart from a dominant set of 050°-trending and less prominent east-trending magnetic lineaments, and a general correlation between areas of low magnetic relief and exposures of strong agrillization and silicification, modeling of the airborne magnetic and ground gravity data indicates the presence of a high-level felsic intrusion which is located south of the Wild Rose area (Mitchell et al., 1999). In addition, two cross sections through the Wild Rose fault zone were modeled by Bruce Ferneyhough. Section 1 extends from 2,222,040N, 472,000E to 2,219,040N, 478,5000E (Fig. 12), and section 2 extends from 2,219,700N, 472,000E to 2,216,700N, 478,500E (Fig. 13) on the State Plane West grid; see Plate 1 for location of the sections, and Plate 2 for the interpreted geology upon which the geophysical model is founded.

GM-SYS, an interactive 2.5 D magnetic and gravity modeling program, was used to model the data. The physical properties of each unit are annotated on the sections. Rock densities (D) are relative to 2.3 g/cc, with D = 0.30 equivalent to a density of 2.60. An average density of 2.60 g/cc was assigned to the Auld Lange Syne Formation (geological basement), 2.40 g/cc to all Tertiary(?) volcanic units, i.e., Wild Rose and Bud formations, and 2.0 to alluvium. Magnetic susceptibilities (S) were measured and modeled in cgs units. The most prominent magnetic unit is annotated Tv2, and has magnetic susceptibilities ranging from 0.001 to 0.003 cgs units. Unit Tv1 is weakly magnetic with susceptibilities ranging from 0.0004 to 0.001 cgs units, and unit Tv3 is essentially nonmagnetic. Reduced to the pole magnetic data were used for modeling.

The more magnetic unit Tv1 in section 2 appears to correspond to the Wild Rose autobrecciated rhyolite lavas. The east dipping contact between Tv1 and Tv2, the planar-laminated rhyolite lavas of the Wild Rose formation, is consistent with measured attitudes. Unit Tv3 represents intense magnetite destruction and correlates with the Wild Rose fault zone. The east dip of Tv3 in section 1 differs from the geological section, but is a better geophysical fit to the data. The contact between the Wild Rose porphyritic rhyolite intrusion (not assigned a geophysical unit number) and the planar-laminated lavas is inferred from mapping to be near vertical ($\pm 80^\circ$ east and west), but it may dip to the east. It is also possible that the modeled eastward dip reflects the ~200% slab-like, northwest extension of the porphyritic rhyolite intrusion by the Wild Rose fault. Nearly all of the outcrops of

Wild Rose, Rosebud

Section 1 (looking NNE) Figure 12

Mon Jan 10 13:50:15 2000

-3000
0
3000

Distance

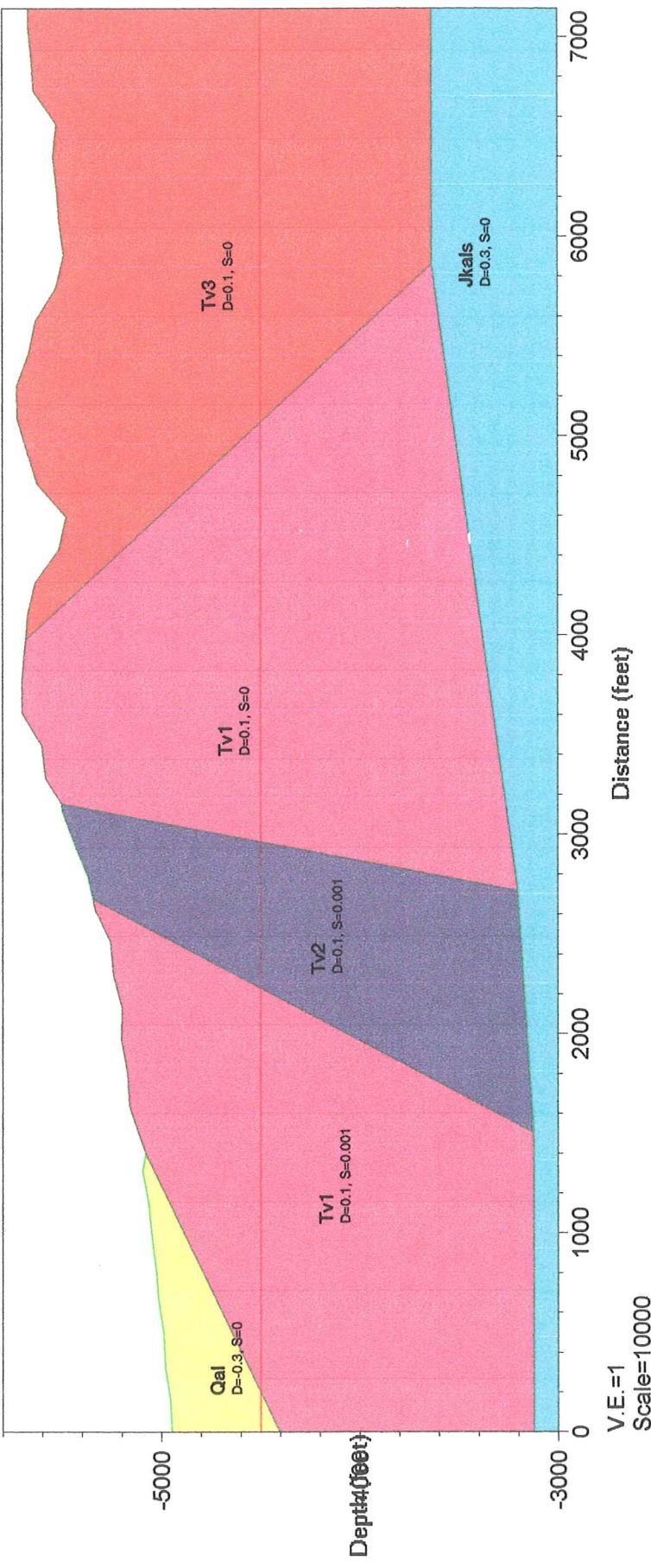
150
-115

Mag (mGal)

=Observed, - =Calculated

-120
-125

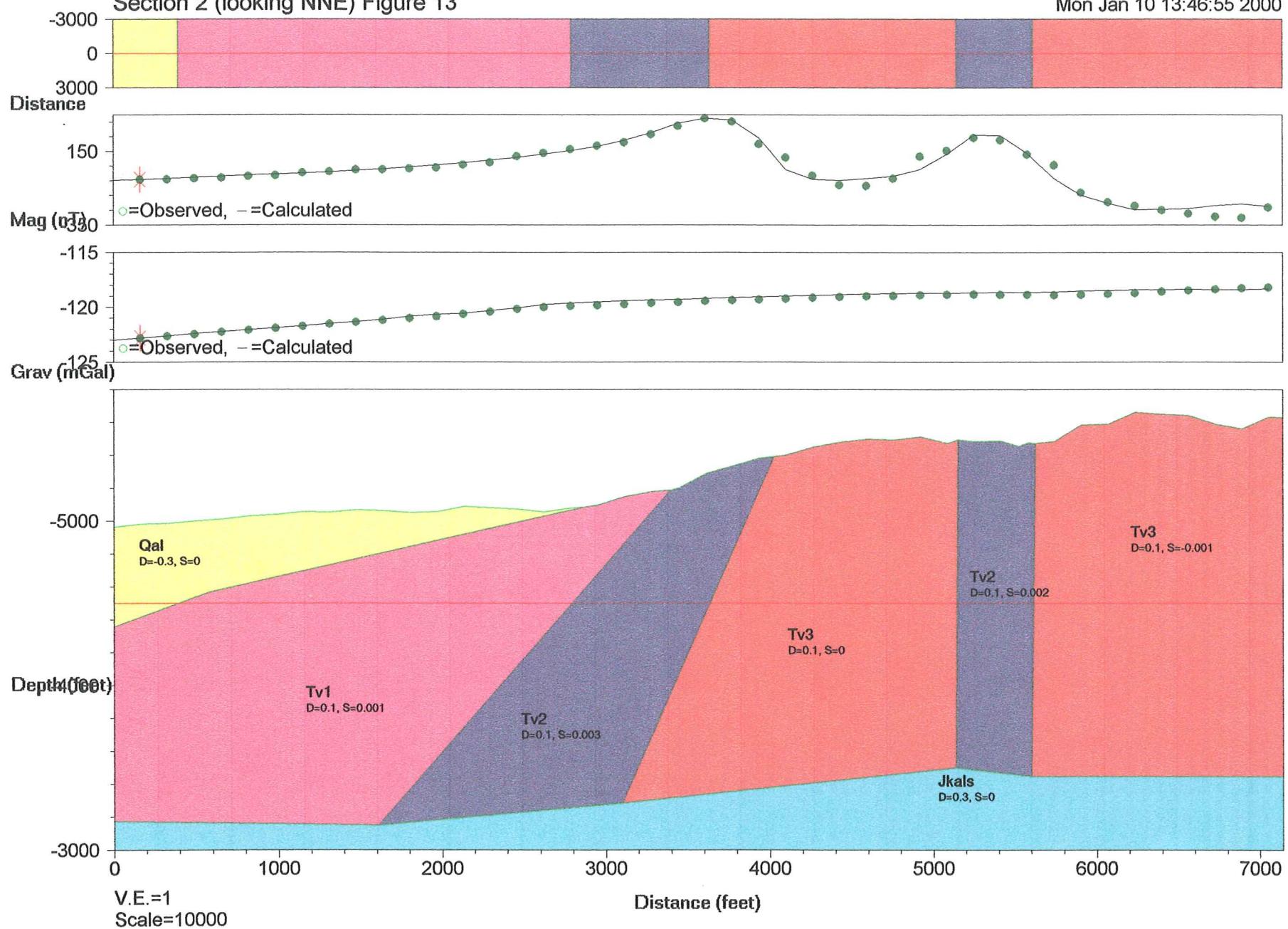
Grav (mGal)



Wild Rose, Rosebud

Section 2 (looking NNE) Figure 13

Mon Jan 10 13:46:55 2000



the intrusion are intensely altered to kaolinite-dominant intermediate argillic alteration in which all primary magnetite is destroyed. The porphyritic rhyolite intrusion corresponds best with unit Tv3.

Airborne Radiometric Data

The radiometric signature of the Wild Rose area is similar to hydrothermal alteration-related K-Th-U anomalies in other parts of the Rosebud district. Positive anomalies for all three elements are well developed (high relief) and correlate with widespread hydrothermal alteration north of Wild Rose canyon. The fact that this area has a positive radiometric anomaly is surprising because significant amounts of illite (sericite) were not identified in any of the rocks analyzed with the PIMA. Of the dominant alteration minerals, only montmorillonite ($R_{0.33}Al_2Si_4O_{10}(OH)_2 \bullet nH_2O$; R = Na⁺, K⁺, Mg²⁺, Ca²⁺) may contain potassium. The amplitude of the potassium anomalies corresponds to 2 to 4 wt. %, which is in part related to the initial rhyolite composition of altered rocks. Although small positive potassium anomalies may reflect the presence of alunite, but the larger anomalies are difficult to explain through alteration mineralogy.

Resistivity Data

Lac Minerals (?) conducted a small resistivity survey in the Wild Rose area, but the data cannot be located. Hand contoured maps of the resistivity data show a strong correlation between low resistivity values, positive gold anomalies and exposed or inferred faults. If the results of the initial drilling program warrant continuing exploration at Wild Rose, it is recommended that additional resistivity data be collected.

Thematic Mapper

End member analysis of thematic mapper data by Marc Goosens identified extensive clay alteration and 070° to 090°-trending hydrothermal alteration lineaments.

PREVIOUS DRILLING RESULTS

Lac Minerals and Santa Fe Pacific Gold Company completed eight(?) reverse circulation rotary drill holes in the Wild Rose area. None of these drill holes were successful in identifying high-grade ($\geq 0.X$ opt) gold mineralization (Tables 2 and 3). Considering these results, is possible that gold grades will not exceed 0.0X ounces per ton over extended intervals. However, seldom does one encounter a more prospective target than the Wild Rose fault duplex. The area is on of extreme extension (~200%) with exceedingly high fracture permeability, and both the Wild Rose fault and the fault duplex dip at a moderate angle toward the heart of Vista Gold's multimillion ounce gold-silver deposits at Hycroft. Yet the previous drilling did not target the most prospective areas of the auriferous Wild Rose fault zone. Only one drill hole (RL-118) intercepted the fault duplex, and this hole was collared on the northwestern margin of the duplex and drilled approximately parallel to the structure. Clearly, further drilling is warranted at Wild Rose.

Table 2. Drill hole statistics for the Wild Rose area.

| Drill Hole | Company | Azmuth (°) | Angle (°) | TD (ft.) |
|------------|----------|------------|-----------|----------|
| RL - 118 | Lac | 035 | -45 | 640 |
| RL - 119 | Lac | 180 | -45 | 500 |
| RL - 120A | Lac | 020 | -60 | 495 |
| RL - 120B | Lac | 157 | ? | ? |
| RL 157 | Lac | 020 | -60 | 405 |
| 97 - 388 | Santa Fe | 155 | -70 | 920 |
| 97 - 391 | Santa Fe | 180 | -60 | 1400 |
| 97 - 392 | Santa Fe | 180 | -60 | 1200 |

Data for drill hole RL-120B are in the drilling database, but neither the drill log nor the assays could not be located.

Table 3. Significant drill hole intercepts in the Wild Rose area.

| Drill Hole | Interval (ft.) | Depth (ft.) | Au (opt) | Ag (opt) |
|------------|-------------------|-------------|--------------|----------|
| RL-119 | 5 | 465 - 470 | 0.010 | -- |
| RL-120A | 5 | 40 - 45 | 0.035 | 0.10 |
| | 15 | 110 - 125 | 0.015 | 0.09 |
| | 20 | 155 - 175 | 0.015 | 0.06 |
| | 5 | 265 - 270 | 0.042 | 0.27 |
| RL-120B | 10 | 125 - 135 | 0.010 | -- |
| | 10 | 195 - 205 | 0.010 | -- |
| RL-157 | 10 | 225 - 235 | 0.010 | -- |
| | 15 | 275 - 290 | 0.010 | -- |
| | 10 | 295 - 305 | 0.010 | -- |
| | 40 | 320 - 360 | 0.011 | -- |
| 97-392 | 10 | 215 - 225 | 0.100 | -- |

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APPENDIX 1

Stratigraphic column for the northern Kamma Mountains (Rosebud stratigraphy) and tentative unit correlations between the Rosebud mine stratigraphy and district stratigraphic units (Stratigraphic Correlations).

ROSEBUD STRATIGRAPHY

| AGE | GROUP | FORMATION | MEMBER | COMPOSITION | THICKNESS (Feet) |
|----------------------|--------------------------------|---------------------|----------------------------|------------------------|---------------------|
| Pleistocene | LOWER SULFUR GROUP | | ALLUVIUM, COLLUVIUM, TALUS | | |
| Pliocene (<6 Ma) | | | CAMEL CONGLOMERATE | | 40 to >250 |
| Pliocene | | | LACUSTRINE DEPOSITS | ? | |
| | KAMMA MOUNTAINS VOLCANIC GROUP | CHOCOLATE FORMATION | INTRUSIONS | KAMMA "ANDESITE" | ? |
| | | | | RELAY PORPHYRY | ? |
| | | | | ROSEBUD QUARTZ LATITE | Trachydacite |
| | | | | SPOTTED VITROPHYRE | ? |
| | | | | WHITE ALPS PORPHYRY | ? |
| | | | CHOCOLATE MEMBER | BAGER MEMBER | ? |
| | | | | CHOCOLATE LAPILLI TUFF | ? |
| | | | CHOCOLATE MEMBER | SOUTH RIDGE LAVA | |
| | | | | ROSEBUD MEMBER | Trachydacite |
| | | | | CHOCOLATE LAVA | |
| | | | BUD MEMBER | BUD MEMBER | Rhyolite |
| | | | | WILD ROSE MEMBER | Alkali Rhyolite |
| | | | | LBT LAVAS | Trachydacite |
| | | | | MINE TOS | ? |
| | | DOZER FORMATION | | | 2 to >250 |
| | | | | | |
| | OSCAR FORMATION | | TCS | | |
| | | | OSCAR "ANDESITE" | ? | |
| | | | OSCAR MEMBER | ? | |
| | BARREL SPRINGS FORMATION | | BARREL SPRINGS MEMBER | Rhyolite | >2000 |
| | | | RABBITHOLE RIDGE MEMBER | Rhyodacite | |
| Triassic to Jurassic | AULD LANG SYNE GROUP | UNDIFFERENTIATED | | | |

STRATIGRAPHIC CORRELATIONS

| MINE STRATIGRAPHY | | DISTRICT STRATIGRAPHY | | |
|---|--|---|-----------|--|
| SOUTH ZONE | NORTH AND EAST ZONES | MEMBER | FORMATION | |
| SULFUR GROUP UNDIFFERENTIATED | | SULFUR GROUP UNDIFFERENTIATED | | |
| <i>Not Present</i> | | KAMMA ANDESITE | | |
| MARKER PORPHYRIES Includes the Fine-grained Pink Porphyry and Vitrophyre | | GORILLA PORPHYRY | CHOCOLATE | |
| | | RELAY PORPHYRY | | |
| | | ROSEBUD QUARTZ LATITE | | |
| | | <i>Not Present</i> | | |
| CHOCOLATE Undifferentiated | CHOCOLATE LAVA Undifferentiated | CHOCOLATE LAVA Amphibole-dominant | CHOCOLATE | |
| | LITHIC LAPILLI TUFF | CHOCOLATE LAVA AUTOBRECCIA | | |
| | CHOCOLATE LAVA Undifferentiated | CHOCOLATE LAVAS Biotite-dominant | | |
| | FINE CRYSTALLINE TCS | ROSEBUD VOLCANIC MEMBER | | |
| | CHOCOLATE LAVA Undifferentiated | SOUTH RIDGE LAVAS Amphibole-dominant | | |
| BUD Undifferentiated | UPPER BUD | UPPER BUD | CHOCOLATE | |
| | PORPHYRITIC AUTOBRECCIA | WHITE ALPS PORPHYRY | | |
| | MIDDLE BUD | LOWER BUD Undifferentiated | | |
| | LOWER BUD | | | |
| FINE-GRAINED MASSIVE, PLANAR LAMINATED | | LBT / WILD ROSE LAVAS | CHOCOLATE | |
| LST "WANNA BE" | VITROPHYRE | | | |
| | FINE-GRAINED, SLIGHT PLANAR LAMINATED | | | |
| LST | FINE-GRAINED MASSIVE | | | |
| | VITROPHYRE | SLIGHT PLANAR LAMINATED | | |
| UPPER PINK MATRIX BRECCIA | LOWER PINK MATRIX BRECCIA | | | |
| PLANAR LAMINATED | FINE-GRAINED MASSIVE | | | |
| OSCAR SEDIMENTS | MINE TOS | | | |
| DOZER | PORPHYRITIC DOZER | | DOZER | |
| | APHYRIC DOZER | | | |
| TCS | OSCAR MEMBER | OSCAR | | |
| AULD LANG SYNE GROUP Undifferentiated | AULD LANG SYNE GROUP Undifferentiated | | | |

APPENDIX 2

Fault classification scheme (Fig. 14) and structural data for the Wild Rose and Juniper Canyon fault zones. The data are summarized graphically on rose diagrams (Figs. 15 and 16).

| | Random-fabric | Foliated | |
|--|---|--|----------------------|
| Glass/devitrified glass | Fault breccia (visible fragments > 30 % of rock mass) | ? | |
| | Fault gouge (visible fragments < 30 % of rock mass) | ? | |
| | Pseudotachylite | ? | |
| Nature of matrix | Crush breccia Fine crush breccia Crush microbreccia | (fragments > 0.5 cm) (0.1 cm < frags. < 0.5 cm) (fragments < 0.1 cm) | 0-10% |
| Tectonic reduction in grain size dominates grain growth by recrystallization and neomineralization | Protocataclasite | Protomylonite | 10-50% |
| | Cataclasite | Mylonite | 50-90% |
| | Ultracataclasite | Ultramylonite | 90-100% |
| Grain growth pronounced | ? | Blastomylonite | Proportion of matrix |

Figure 14. Classification scheme used to identify fault breccias at Wild Rose. The figure is from Sibson (1977).

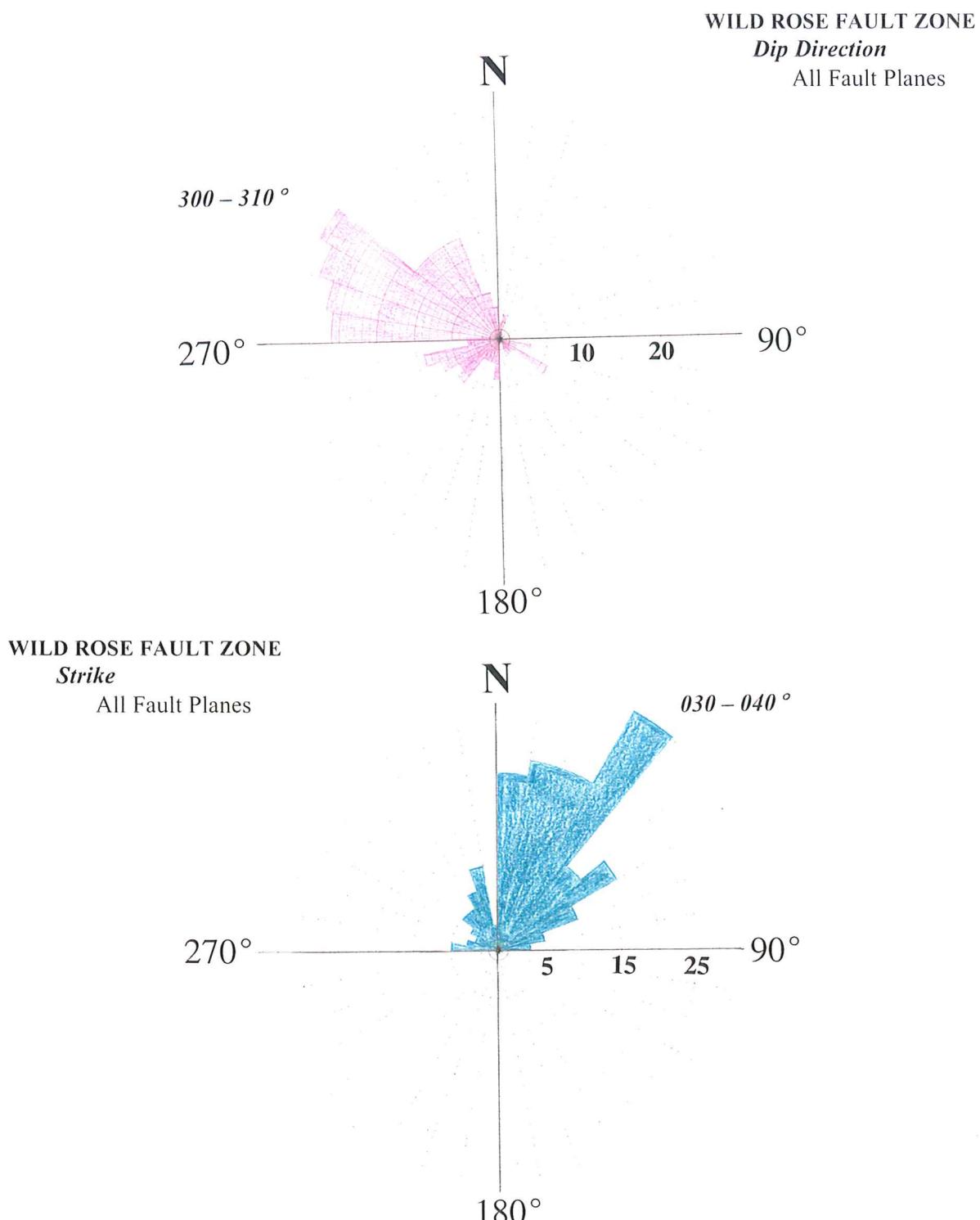


Figure 15. Rose diagrams showing the strike and dip direction of all (208) measurements taken along the 1.5 mile exposed strike length of the Wild Rose fault zone, see Appendix 2 for numerical data.

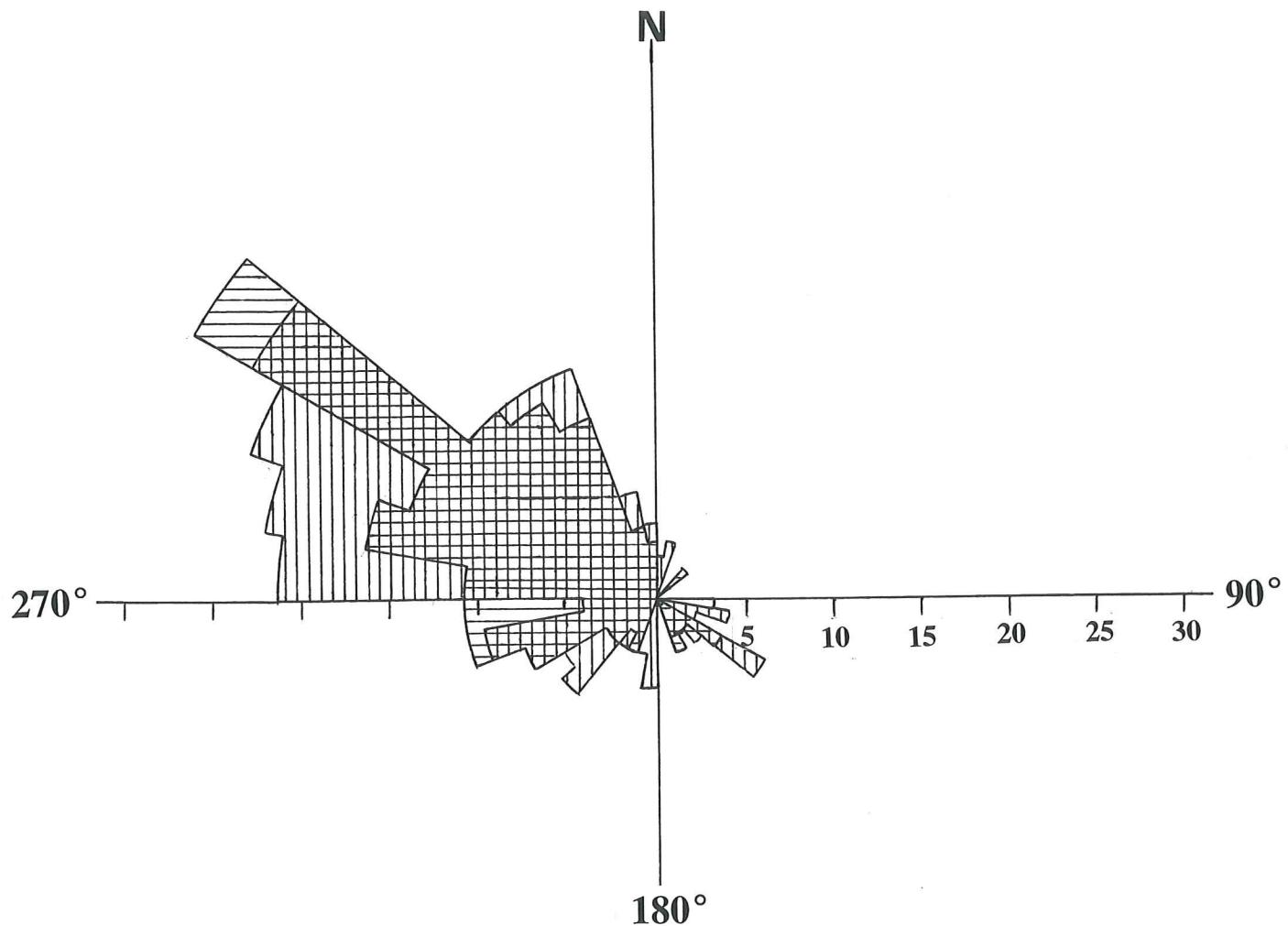


Figure 16. Rose diagram showing the relationship between the dip direction (vertical ruling) and the plunge of mullions and slickenlines (horizontal ruling) for all (208) measurements taken along the 1.5 mile exposed length of the Wild Rose fault zone, see Appendix 2 for numerical data.

| WILD ROSE | | | | | | | | | | | |
|---------------------------------|------|-------------|-------|------------------------------|-------|---------|---------|-------|-------------|-------|---------|
| STRUCTURAL DATA | | | | | | | | | | | |
| | | Fault Plane | | Mullions and/or Slickensides | | | | | | | |
| | | Strike | Dip | Plunge | | Rake | | Fault | | | |
| Station | Zone | | Angle | Azimuth | Angle | Azimuth | Azimuth | Angle | Description | Width | Segment |
| | | | | | | | | | | | |
| Juniper Canyon Fault Zone | | | | | | | | | | | |
| 506 | 5 | 274 | 38W | 184 | 38 | 191 | 274 | 85 | | | Ridge |
| 507 | 5 | 082 | 70W | 352 | 54 | 292 | 262 | 60 | | | Ridge |
| 508 | 5 | 285 | 57E | 015 | | | | | | | Ridge |
| | | | | | | | | | | | |
| Wild Rose Detachment Fault Zone | | | | | | | | | | | |
| 514 | 4 | 305 | 40W | 215 | | | | | | | |
| " | " | 320 | 55W | 230 | | | | | | | |
| " | " | 305 | 52W | 215 | 22 | 286 | 305 | 28 | | | |
| 515 | 4 | 048 | 43W | 318 | 20 | 252 | 228 | 32 | | | Alunite |
| 518 | 2 | 056 | 72W | 326 | 35 | 250 | 236 | 38 | | | Alunite |
| 519 | 2 | 060 | 41W | 330 | | | | | | | Alunite |
| 521 | 3 | 020 | 45W | 290 | 44 | 304 | 020 | 80 | | | |
| 522 | 3 | 033 | 48W | 303 | | | | | | | |
| " | " | 018 | 45W | 288 | 43 | 267 | 200 | 75 | | | |
| 523 | 3 | 018 | 62W | 288 | | | | | | | Alunite |
| 527 | 3 | 015 | 77E | 105 | 76 | 127 | 195 | 85 | | | |
| " | " | 010 | 84E | 100 | 83 | 136 | 190 | 85 | | | |
| 528 | 3 | 040 | 65E | 130 | 64 | 152 | 220 | 80 | | | |
| " | 3 | 011 | 84E | 101 | 81 | 141 | 191 | 85 | | | |
| 529 | 3 | 022 | 50W | 292 | 44 | 335 | 022 | 65 | | | |
| 530 | 3 | 005 | 55W | 275 | 50 | 308 | 005 | 70 | | | |
| 531 | 3 | 030 | 53W | 300 | 52 | 308 | 030 | 85 | | | |
| 532 | 3 | 035 | 39W | 305 | 38 | 302 | 215 | 88 | | | |
| 533 | 3b | 345 | 45E | 015 | | | | | | | |
| " | " | 037 | 82E | 127 | 49 | 046 | 037 | 50 | | | |
| " | " | 007 | 52E | 97 | 34 | 155 | 007 | 45 | | | |
| 535 | 3 | 310 | 28W | 220 | 20 | 268 | 310 | 45 | | | |
| " | " | 067 | 26W | 337 | 12 | 274 | 247 | 30 | | | |
| 536 | 3 | 068 | 26W | 338 | 12 | 275 | 248 | 30 | | | |
| 537 | 3b | 035 | 29E | 125 | | | | | | | |
| 538 | 3b | 039 | 53E | 129 | | | | | | | |
| 539 | 3b | 275 | 89E | 185 | | | | | | | |
| 540 | 3b | 275 | 89E | 185 | 75 | 092 | 095 | 75 | | | |
| 541 | 3 | 065 | 60W | 335 | | | | | | | |
| 543 | 3 | 047 | 85E | 137 | 83 | 095 | 047 | 85 | | | |
| 548 | 3 | 040 | 45W | 310 | | | | | | | |
| " | " | 032 | 48W | 302 | 48 | 310 | 032 | 85 | | | |
| " | " | 063 | 40W | 333 | 36 | 302 | 243 | 65 | | | |
| 563 | 3 | 053 | 39W | 323 | | | | | | | Alunite |
| 565 | 3 | 050 | 51W | 320 | 45 | 284 | 230 | 65 | | | |
| 567 | 3 | 018 | 54W | 288 | 34 | 348 | 018 | 44 | | | |
| 568 | 3 | 047 | 65W | 317 | 42 | 252 | 227 | 48 | | | |
| " | " | 030 | 40W | 300 | 32 | 257 | 210 | 55 | | | |
| 572 | 3b | 083 | 21W | 353 | 20 | 330 | 263 | 70 | | | |
| " | " | 070 | 43W | 340 | 20 | 273 | 250 | 25 | | | |
| 573 | 3b | 075 | 79W | 345 | 29 | 261 | 259 | 30 | | | |
| 574 | 3b | 020 | 43W | 290 | | | | | | | |

| WILD ROSE | | | | | | | | | | | | |
|-----------------|------|-------------|-----|-----|------------------------------|------|-----|---------|-------|-------------|---------|---------|
| STRUCTURAL DATA | | | | | | | | | | | | |
| Station | Zone | Fault Plane | | | Mullions and/or Slickensides | | | | Fault | | | |
| | | Strike | Dip | | Plunge | Rake | | Azimuth | Angle | Description | Width | Segment |
| 577 | 3b | 021 | 45W | 291 | | | | | | | | |
| 580 | 3 | 024 | 24W | 294 | 12 | 234 | 204 | 21 | | | | |
| 581 | 3 | 033 | 43W | 303 | 36 | 265 | 213 | 60 | | | | |
| " | " | 033 | 43W | 303 | 42 | 322 | 033 | 75 | | | | |
| 582 | 3 | 342 | 68W | 252 | 64 | 287 | 342 | 75 | | | | |
| 585 | 3 | 062 | 60W | 332 | 42 | 273 | 242 | 50 | | | | |
| 586 | 3 | 040 | 41W | 310 | 41 | 317 | 040 | 85 | | | White | |
| " | " | 054 | 41W | 324 | 40 | 325 | 234 | 75 | | | White | |
| " | " | 054 | 40W | 324 | 40 | 310 | | | | | White | |
| 587 | 3 | 053 | 54W | 323 | 52 | 299 | 233 | 70 | | | White | |
| 588 | 3 | 338 | 58W | 248 | 39 | 308 | 338 | 48 | | | | |
| " | " | 002 | 80W | 272 | 69 | 208 | 182 | 72 | | | | |
| " | " | 330 | 70W | 240 | 34 | 316 | 330 | 36 | | | | |
| 589 | 3 | 317 | 89E | 227 | 35 | 135 | 137 | 35 | | | | |
| | | | | | | | | | | | | |
| 915 | 3 | 315 | 25W | 225 | 16 | 276 | 315 | 40 | | | | |
| 916 | 3 | 343 | 47W | 253 | 39 | 294 | 343 | 60 | | | | |
| 918 | 3 | 056 | 55W | 326 | 24 | 254 | 246 | 30 | | | Alunite | |
| 919 | 3 | 008 | 65E | 098 | | | | | | | | |
| 920 | 2 | 330 | 57W | 240 | 50 | 304 | 150 | 55 | | | | |
| " | " | 336 | 40W | 246 | 33 | 286 | 336 | 58 | | | | |
| " | " | 348 | 48W | 258 | 44 | 287 | 348 | 70 | | | | |
| " | " | 338 | 48W | 248 | 28 | 308 | 338 | 40 | | | | |
| 921 | 3 | 315 | 40W | 225 | | | | | | | | |
| 923 | 3 | 045 | 56W | 315 | | | | | | | Alunite | |
| 924 | 3 | 008 | 50W | 278 | 49 | 292 | 008 | 80 | | | Alunite | |
| 929 | 2 | 327 | 84W | 237 | | | | | | | | |
| 930 | 2 | 010 | 71W | 280 | 66 | 240 | 190 | 75 | | | | |
| " | " | 012 | 78W | 282 | 67 | 220 | 192 | 70 | | | | |
| " | " | 040 | 55W | 310 | 32 | 245 | 220 | 44 | | | | |
| 931 | 3 | 020 | 67W | 290 | | | | | | | Alunite | |
| 933 | 3 | 023 | 70W | 293 | | | | | | | Alunite | |
| " | " | 020 | 55W | 290 | | | | | | | Alunite | |
| 941 | 3 | 065 | 60W | 335 | | | | | | | Alunite | |
| 942 | 3 | 005 | 80W | 275 | | | | | | | | |
| 949 | 3 | 040 | 55W | 310 | 42 | 259 | 210 | 55 | | | | |
| 952 | 3 | 350 | 28W | 260 | 24 | 294 | 350 | 60 | | | | |
| 959 | 3 | 344 | 43W | 254 | 34 | 297 | 344 | 56 | | | | |
| " | " | 282 | 55E | 192 | 39 | 316 | 282 | 50 | | | | |
| 962 | 2 | 018 | 62W | 288 | 60 | 308 | 018 | 80 | | | | |
| 963 | 3 | 010 | 55W | 280 | 48 | 318 | 010 | 65 | | | Alunite | |
| " | " | 008 | 45W | 278 | 43 | 298 | 008 | 75 | | | | |
| 965 | 3 | 332 | 66E | 242 | 09 | 336 | 332 | 10 | | | | |
| " | " | 337 | 63W | 247 | 31 | 320 | 337 | 35 | | | | |
| 966 | 3 | 334 | 72W | 244 | 19 | 328 | 334 | 20 | | | | |
| " | " | 334 | 84W | 244 | 44 | 328 | 334 | 45 | | | | |
| " | " | 325 | 47W | 235 | 32 | 290 | 325 | 47 | | | | |
| 967 | 3 | 018 | 54W | 288 | 34 | 227 | 208 | 44 | | | | |
| " | " | 075 | 21W | 345 | 18 | 313 | 225 | 60 | | | | |

| WILD ROSE | | | | | | | | | | | |
|-----------------|---------|-------------|---------|---------|------------------------------|-------------|-------|---------|--------------------------|----|---------|
| STRUCTURAL DATA | | | | | | | | | | | |
| Station | Zone | Fault Plane | | | Mullions and/or Slickensides | | | | Fault | | |
| | | Strike | Dip | | Plunge | | Rake | | | | |
| Angle | Azimuth | Angle | Azimuth | Azimuth | Angle | Description | Width | Segment | | | |
| 968 | 3 | 008 | 55W | 278 | 48 | 300 | 008 | 75 | 2mm uc, 1cm fcbx, cbx | | |
| " | " | 002 | 54W | 272 | 53 | 282 | | | | | |
| 969 | 3 | 040 | 70W | 310 | 68 | 335 | 040 | 80 | | | |
| 972 | 3 | 027 | 67W | 297 | | | | | | | |
| " | " | 022 | 70W | 292 | 31 | 268 | 182 | 40 | | | |
| 973 | 1 | 020 | 77W | 290 | | | | | | | |
| 974 | 3 | 020 | 54W | 290 | | | | | | | |
| 975 | 3 | 001 | 70W | 271 | 70 | 270 | 001 | 90 | | | |
| 977 | 3 | 010 | 64W | 280 | | | | | | | |
| " | " | 328 | 40W | 238 | 06 | 320 | 328 | 10 | | | |
| 979 | 3 | 043 | 84W | 313 | 78 | 254 | 223 | 80 | | | |
| 980 | 3 | 013 | 49W | 283 | 44 | 312 | 013 | 70 | | | |
| " | " | 035 | 47W | 305 | 44 | 324 | 215 | 75 | | | |
| 982 | 2 | 040 | 66W | 310 | 45 | 245 | 220 | 50 | | | |
| " | " | 062 | 75W | 332 | 65 | 275 | 245 | 70 | | | |
| 983 | 2 | 010 | 30W | 280 | 18 | 334 | 010 | 40 | | | |
| 984 | 2 | 053 | 46W | 323 | 35 | 248 | 233 | 60 | | | |
| " | 2 | 005 | 35W | 275 | 05 | 356 | 010 | 10 | | | |
| 985 | 2 | 055 | 60W | 325 | 41 | 266 | 235 | 50 | | | |
| 986 | 3 | 030 | 75W | 300 | 65 | 245 | 210 | 70 | | | |
| 987 | 3 | 030 | 80W | 300 | | | | | | | |
| " | " | 035 | 85W | 305 | 69 | 230 | 215 | 70 | | | |
| 988 | 3 | 038 | 80E | 128 | 72 | 70 | 038 | 75 | | | |
| " | " | 036 | 73E | 126 | 73 | 127 | 036 | 90 | | | |
| 989 | 3 | 039 | 41W | 309 | 41 | 309 | 039 | 90 | | | |
| 991 | 3 | 035 | 80W | 305 | | | | | | | |
| 992 | 3 | 042 | 54W | 312 | 54 | 319 | 042 | 85 | | | Alunite |
| " | " | 054 | 58W | 324 | 58 | 334 | 054 | 75 | | | Alunite |
| 993 | 3 | 030 | 46W | 300 | 46 | 306 | 030 | 85 | | | Alunite |
| 994 | 3 | 026 | 43W | 296 | 42 | 309 | 026 | 80 | | | Alunite |
| 995 | 3 | 035 | 54W | 305 | | | | | | | |
| " | " | 002 | 61W | 272 | 57 | 307 | 002 | 72 | | | |
| 996 | 2 | 037 | 57W | 307 | | | | | | | Alunite |
| 997 | 2 | 025 | 65W | 295 | 55 | 248 | 205 | 65 | | | Alunite |
| " | " | 034 | 32W | 304 | 31 | 324 | 043 | 80 | | | Alunite |
| 998 | 3 | 046 | 53W | 316 | 52 | 342 | 046 | 80 | | | |
| 999 | 3 | 030 | 80W | 300 | | | | | | | |
| | | | | | | | | | | | |
| 1001 | 1 | 089 | 11W | 359 | 08 | 307 | | | 36 cm uc, 15cm fcbx, cbx | 9m | |
| 1002 | 1 | 049 | 29W | 319 | 27 | 310 | | | 9cm uc, 1-13m fcbx, cbx | 9m | |
| 1003 | 1 | 025 | 28W | 295 | 27 | 294 | | | 16cm uc, fcbx | | |
| 1004 | 1 | 038 | 52W | 308 | 52 | 308 | | | | | |
| 1005 | 1 | 010 | 52W | 280 | 34 | 337 | | | | | |
| 1006 | 1 | 043 | 46W | 313 | 46 | 297 | | | | | |
| 1007 | 2 | 012 | 29W | 282 | 28 | 286 | | | 28cm uc, fcbx | | |
| 1008 | 2 | 025 | 42W | 295 | 39 | 282 | | | cbx only | | |
| 1009 | 2 | 065 | 37W | 335 | | | | | cbx only | | |
| 1010 | 2 | 288 | 62E | 018 | 19 | 299 | 288 | 22 | | | |
| 1011 | 2 | 275 | 40E | 005 | | | | | | | |

| WILD ROSE | | | | | | | | | | | |
|-----------------|------|-------------|-------|---------|------------------------------|---------|-------|-------------------------|-------|---------|--|
| STRUCTURAL DATA | | | | | | | | | | | |
| | | Fault Plane | | | Mullions and/or Slickensides | | | | | | |
| | | Strike | Dip | | Plunge | Rake | | Fault | | | |
| Station | Zone | | Angle | Azimuth | Angle | Azimuth | Angle | Description | Width | Segment | |
| 1012 | 3 | 358 | 30W | 268 | 29 | 260 | | | | | |
| 1013 | 1 | 088 | 13W | 358 | 09 | 307 | | 12cm uc, 40cm cbx | | | |
| 1014 | 1 | 015 | 18W | 285 | 15 | 315 | | 5cm uc, 1m cbx | | | |
| 1015 | 1 | 343 | 39W | 253 | 25 | 310 | | | | | |
| 1016 | 1 | 012 | 33W | 282 | 21 | 335 | | | | | |
| " | " | 351 | 29W | 261 | 16 | 310 | | | | | |
| 1017 | 1 | 027 | 50W | 297 | 47 | 318 | | | | | |
| 1018 | 1 | 033 | 35W | 303 | 31 | 317 | | uc, cbx | 10m | | |
| 1019 | 1 | 032 | 21W | 302 | 17 | 330 | | | | | |
| 1020 | 1 | 075 | 55W | 345 | 51 | 325 | | 2cm uc, cbx | | | |
| 1021 | 1 | 075 | 34W | 345 | 30 | 310 | | cbx | | | |
| 1022 | 1 | 044 | 44W | 314 | 43 | 316 | | cbx | | | |
| 1023 | 1 | 341 | 21W | 251 | 12 | 297 | | 90cm uc | | | |
| 1024 | 1 | 315 | 40W | 225 | 06 | 308 | | 90 cm uc | | | |
| 1025 | 1 | 342 | 15W | 252 | 08 | 322 | | uc | | | |
| 1026 | 1 | 017 | 18W | 287 | 12 | 338 | | cbx | | | |
| 1027 | 1 | 064 | 84E | 154 | 75 | 232 | | | | | |
| 1028 | 1 | 041 | 60W | 311 | 55 | 282 | | 3cm uc, cbx | | | |
| 1029 | 1 | 036 | 31W | 306 | 26 | 344 | | uc, cbx | | | |
| 1030 | 1 | 080 | 65W | 350 | | | | | | | |
| 1031 | 1 | 021 | 62W | 291 | 50 | 333 | | 4cm fcbx, cbx | | | |
| 1032 | 2 | 062 | 66W | 332 | | | | no brecciation | | | |
| 1033 | 2 | 039 | 34W | 309 | 33 | 306 | | 5cm uc, cbx | | | |
| 1034 | 2 | 063 | 40W | 333 | 16 | 263 | | | | | |
| 1035 | 2 | 030 | 30W | 300 | 28 | 296 | | 2mm uc, 1cm fcbx, cbx | | | |
| 1036 | 2 | 029 | 26W | 299 | 26 | 280 | | cbx | | | |
| " | " | 285 | 60E | 195 | 19 | 304 | | | | | |
| 1037 | 2 | 060 | 40W | 330 | 33 | 301 | | <1cm uc, cbx | | | |
| 1038 | 2 | 034 | 34W | 304 | 31 | 289 | | 2cm uc, cbx | | | |
| 1039 | 2 | 023 | 34W | 293 | 33 | 299 | | 2mm uc | | | |
| 1040 | 2 | 061 | 69W | 331 | 13 | 254 | | 15cm uc, fcbx | | | |
| 1041 | 3 | 064 | 66W | 334 | | | | cbx | 3m | | |
| " | " | 015 | 80W | 285 | | | | 5cm fcbx, cbx | | | |
| " | " | 025 | 56W | 295 | 55 | 302 | | | | | |
| 1042 | 3 | 042 | 71W | 312 | | | | | | | |
| 1043 | 3 | 016 | 40W | 286 | 38 | 260 | | 10cm cbx | | | |
| 1044 | 3 | 349 | 40W | 259 | 37 | 274 | | distributive shear zone | 9m | | |
| 1045 | 3 | 295 | 40E | 205 | 23 | 326 | 295 | 3mm uc, cbx | | | |
| 1046 | 3 | 027 | 41W | 297 | 25 | 273 | | | | | |
| 1047 | 3 | 051 | 48W | 321 | 46 | 302 | | 2mm uc, 1cm fcbx, cbx | | | |
| " | " | 040 | 40W | 310 | 40 | 310 | | | | | |
| 1048 | 3 | 036 | 54W | 306 | 52 | 290 | | cbx, 15cm fcbx | | | |
| 1049 | 3 | 272 | 31E | 182 | 29 | 353 | | cbx | | | |
| 1050 | 3 | 272 | 35E | 182 | 34 | 330 | | | | | |
| 1051 | 4 | 040 | 45W | 310 | 28 | 265 | | cbx | | Alunite | |
| 1052 | 4 | 030 | 37W | 300 | 35 | 285 | | cbx | | Alunite | |
| 1053 | 4 | 004 | 38W | 274 | 37 | 285 | | | | Alunite | |
| 1054 | 4 | 030 | 54W | 300 | 50 | 280 | | | | Alunite | |
| 1055 | 4 | 005 | 41W | 275 | 39 | 291 | | | | Alunite | |

| WILD ROSE | | | | | | | | | | | |
|-----------------|------|-------------|-------|---------|------------------------------|---------|---------|-------|-------------|-------|---------|
| STRUCTURAL DATA | | | | | | | | | | | |
| | | Fault Plane | | | Mullions and/or Slickensides | | | | | | |
| | | Strike | Dip | | Plunge | | Rake | | Fault | | |
| Station | Zone | | Angle | Azimuth | Angle | Azimuth | Azimuth | Angle | Description | Width | Segment |
| 1056 | 4 | 027 | 36W | 297 | 35 | 282 | | | | | Alunite |
| 1057 | 4 | 299 | 62W | 209 | 46 | 265 | | | | | Alunite |
| 1058 | 4 | 032 | 49W | 302 | 45 | 285 | | | | | Alunite |
| | | | | | | | | | | | |
| 1059 | 3 | 060 | 36W | 330 | 35 | 312 | 240 | 75 | | | |
| 1060 | 3 | 055 | 8W | 335 | 03 | 258 | 235 | 23 | | | |
| | 3 | 057 | 46W | 327 | 44 | 306 | 333 | 75 | | | |
| 1061 | 3 | 028 | 43W | 208 | 41 | 277 | 332 | 75 | | | |
| 1062 | 3 | 030 | 63W | 300 | 42 | 239 | 300 | 50 | | | |
| | 3 | 030 | 78W | 300 | 48 | 224 | 300 | 50 | | | |
| 1063 | 3 | 036 | 84W | 306 | 60 | 226 | 336 | 60 | | | |
| 1064 | 3 | 040 | 62 | 310 | | | | | | | |
| | 3 | 045 | 50W | 315 | 48 | 292 | 315 | 75 | | | |
| 1065 | 3 | 060 | 37W | 330 | 25 | 278 | 330 | 45 | | | |
| | 3 | 66 | 47W | 336 | 39 | 296 | 336 | 60 | | | |
| 1066 | 3 | 45 | 33W | 315 | 24 | 005 | 045 | 50 | | | |
| 1067 | 3 | 22 | 48W | | | | | | | | |
| | | | | | | | | | | | |
| 6909 | 3 | 057 | 58W | 327 | 25 | 255 | | | fcbx | | |
| 6918 | 3 | 005 | 42W | 275 | 37 | 243 | 185 | 65 | | | |
| 6923 | 3 | 052 | 86E | 142 | 81 | 203 | 232 | 82 | | | |
| 6942 | 3 | 007 | 72W | 277 | 69 | 307 | 007 | 80 | | | |
| 6943 | 3 | 020 | 62W | 290 | | | | | | | |

APPENDIX 3

Lower hemisphere stereographic (Wolff net) projections showing the relationships between fault planes and motion indicators (mullions and slickenlines, Fig. 17) for the Wild Rose detachment fault. If the various splays of the Wild Rose fault are parts of a unified system, then the different fault planes (represented as great circles on the Wolff net) should intersect at a common point, and this point should coincide with the plunge of the mullions and slickenlines. It can be seen from the stereograph plots in this appendix, that the slip vectors for the Wild Rose fault system coincide with concentrations of great circle intersections, indicating that the fault planes are part of a single system. This relationship further indicates that the bends in the fault (as mapped) are actual flexures of the fault planes and not simply an artifact of topography.



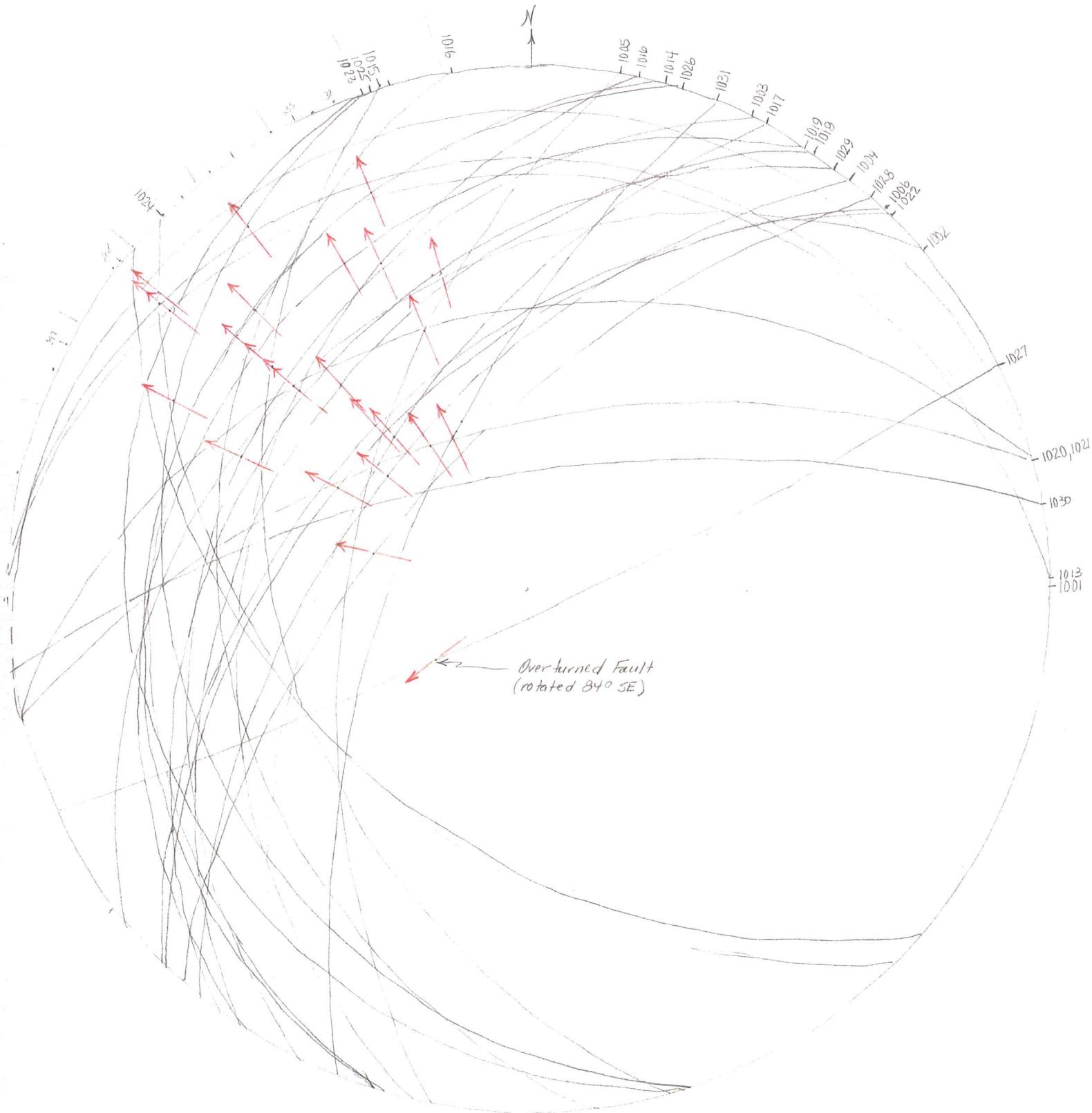
Figure 17. Photograph of a typical second order mullion in one of the major splays of the Wild Rose fault near the mouth of Juniper Canyon. The bold outcrop is due to silicification of cataclasite within closely spaced fault planes. Cataclasite extends outward from the silicified zone in both directions. Note the anastomosing nature of individual fault planes within the silicified portion of the fault zone. In this area the Wild Rose fault zone is greater than 200 feet thick. Major splays of the fault, like the one shown in the photograph, are spaced between 30 and 50 feet apart through the fault zone.

WILD ROSE FAULT ZONE

Segment 1

South W.S.E.

n=25



SEGMENT 1

Southwest

WILD ROSE FAULT ZONE SOUTH (WRFZS)

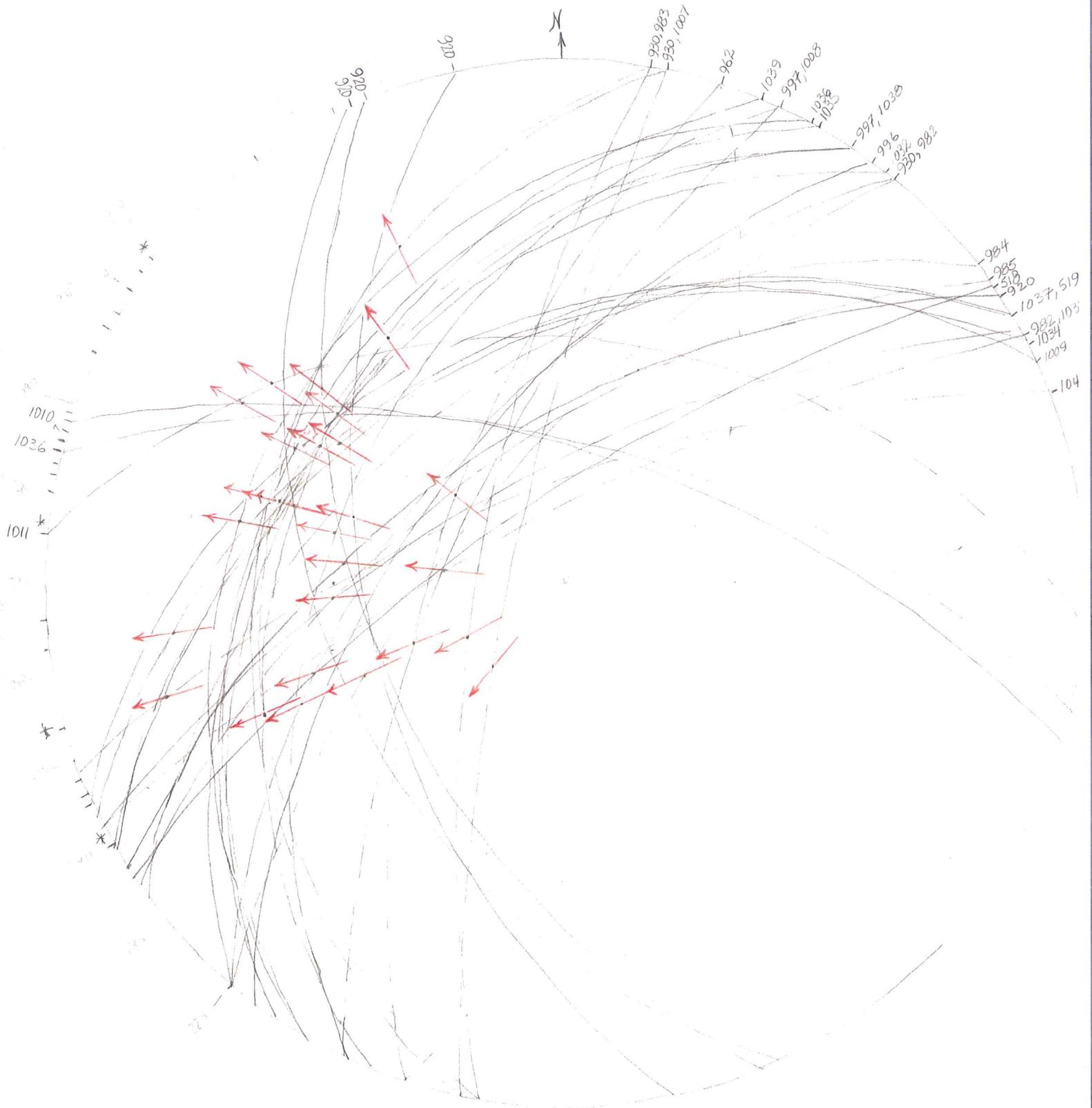
WILD ROSE FAULT ZONE

Segment 2

Fault Depth

n = 25

1085

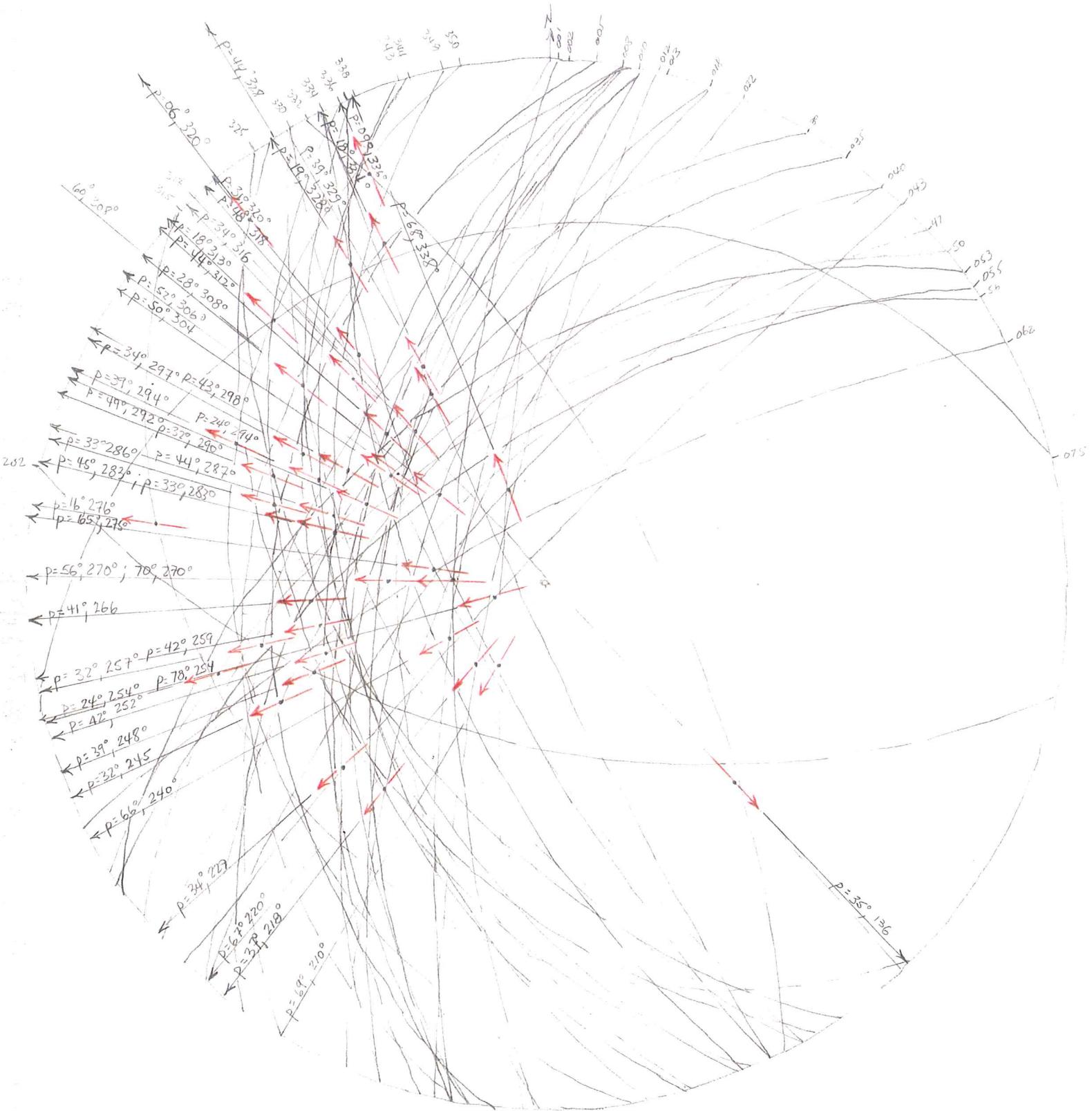


Segment 2

WILD ROSE FAULT ZONE

FAULT DUPLEX

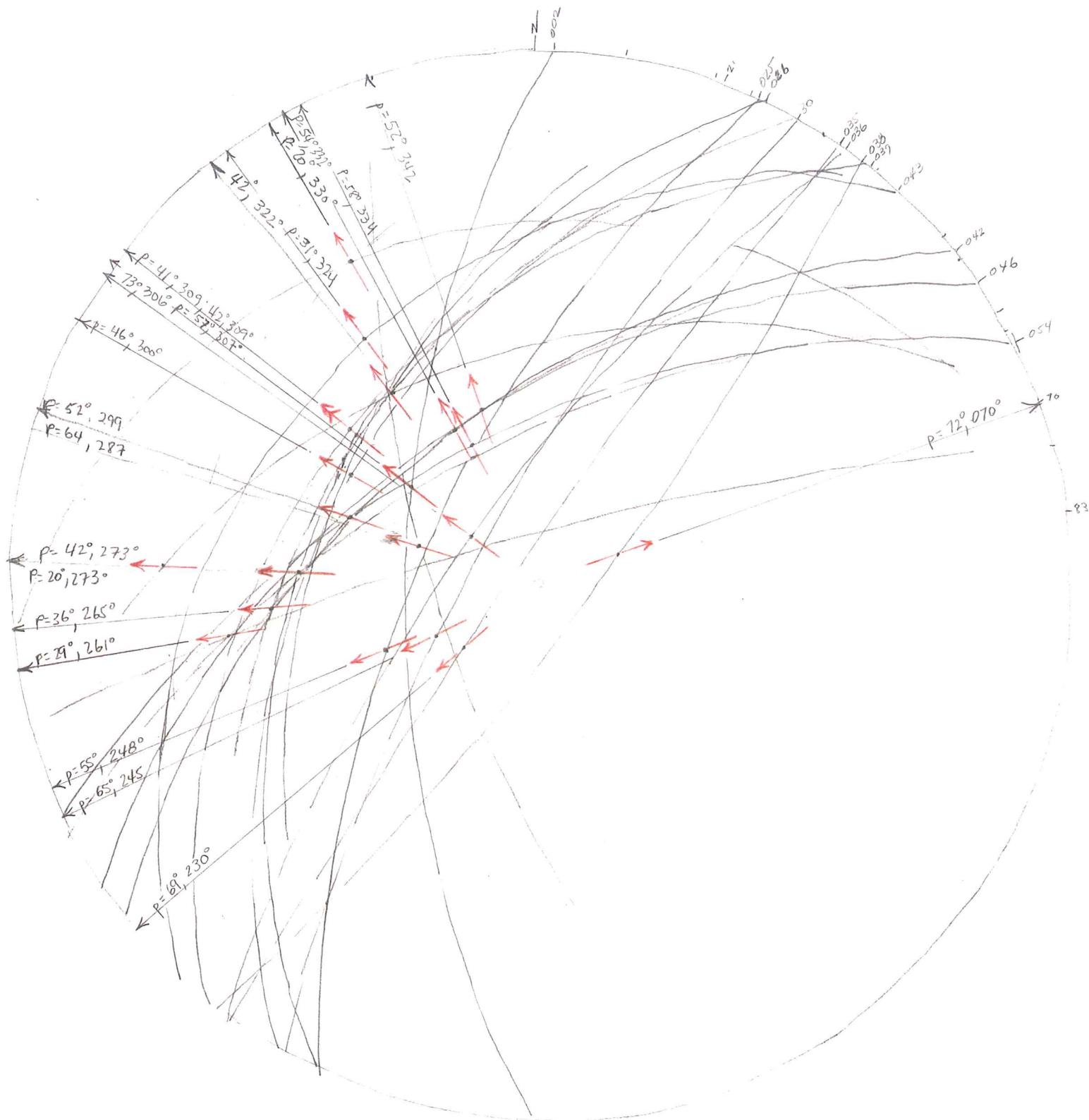
205



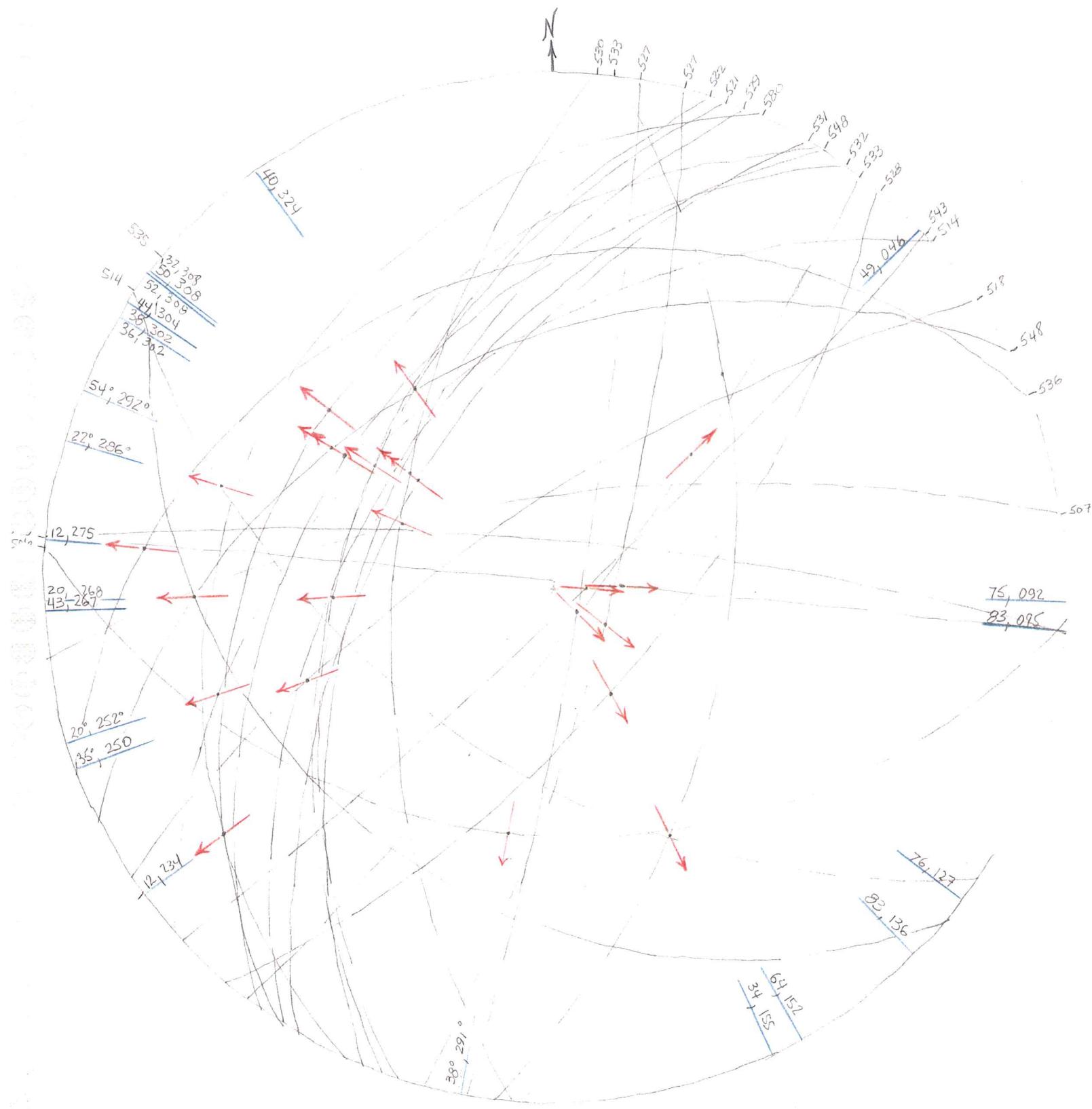
WILD ROSE FRUIT ZONE Segment 2

Full Duplex

395



WILD ROSE FAULT ZONE
 Segment 2
 Fault Duplex
 475

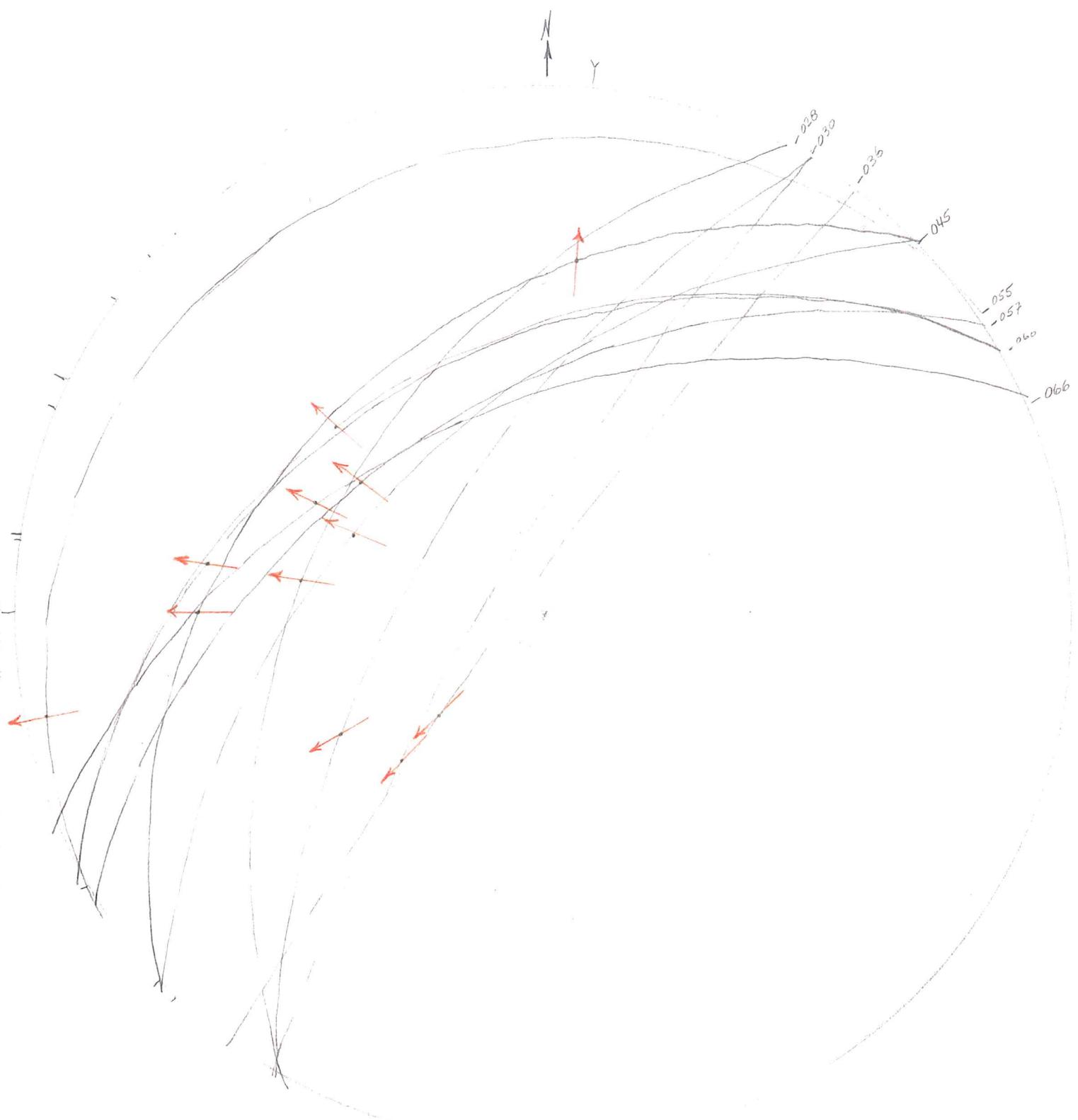


WILD ROSE FAULT ZONE

SEGMENT 2

FAULT DRAWS

5 of 5



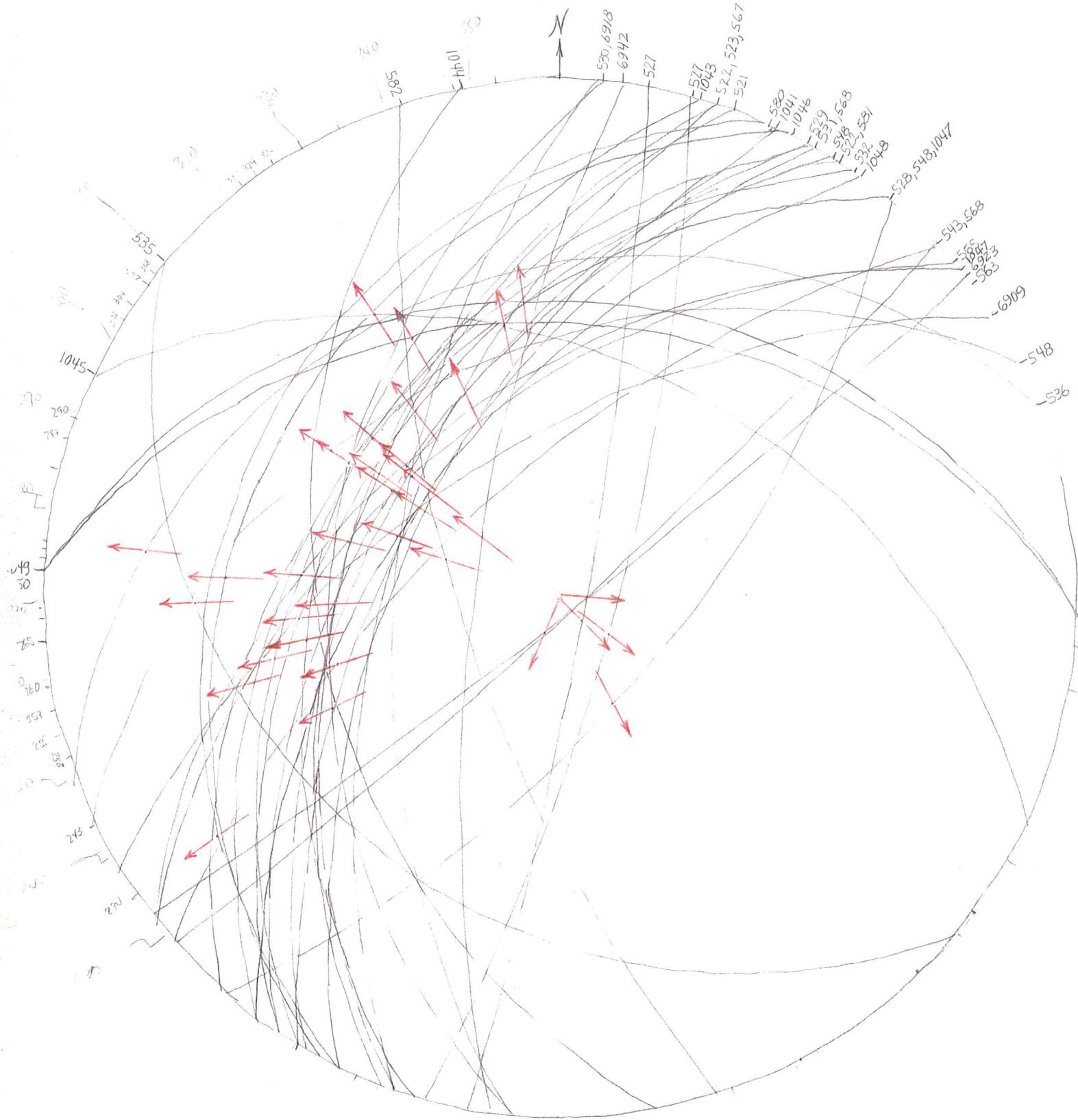
WILD ROSE FAULT ZONE

Segment 3

Fault Duplex

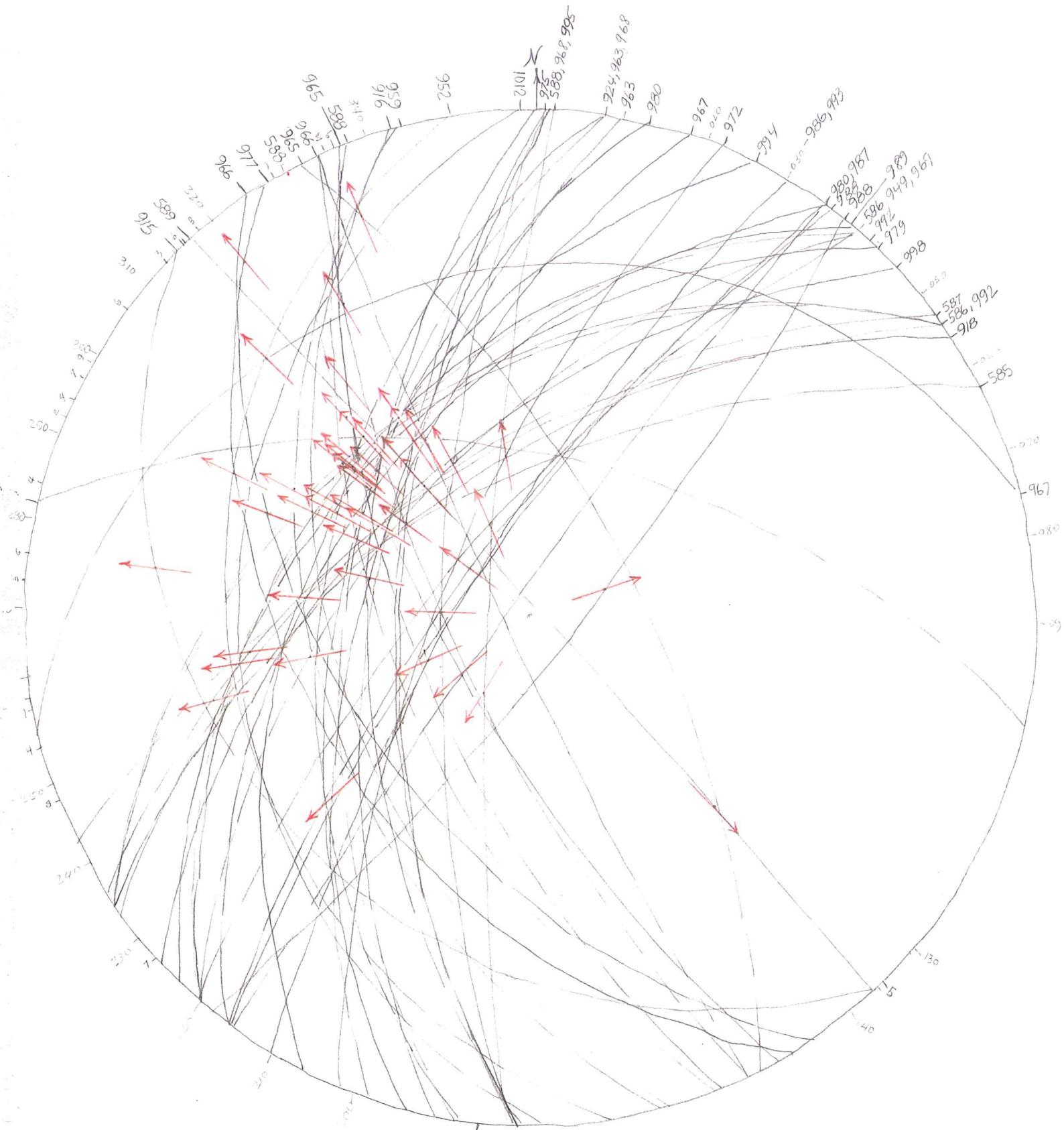
SHEET 1 OF 2

$$n=36$$



WILD ROSE FAULT ZONE
Segment 3
Fault Duplex
SHEET 2 of 2

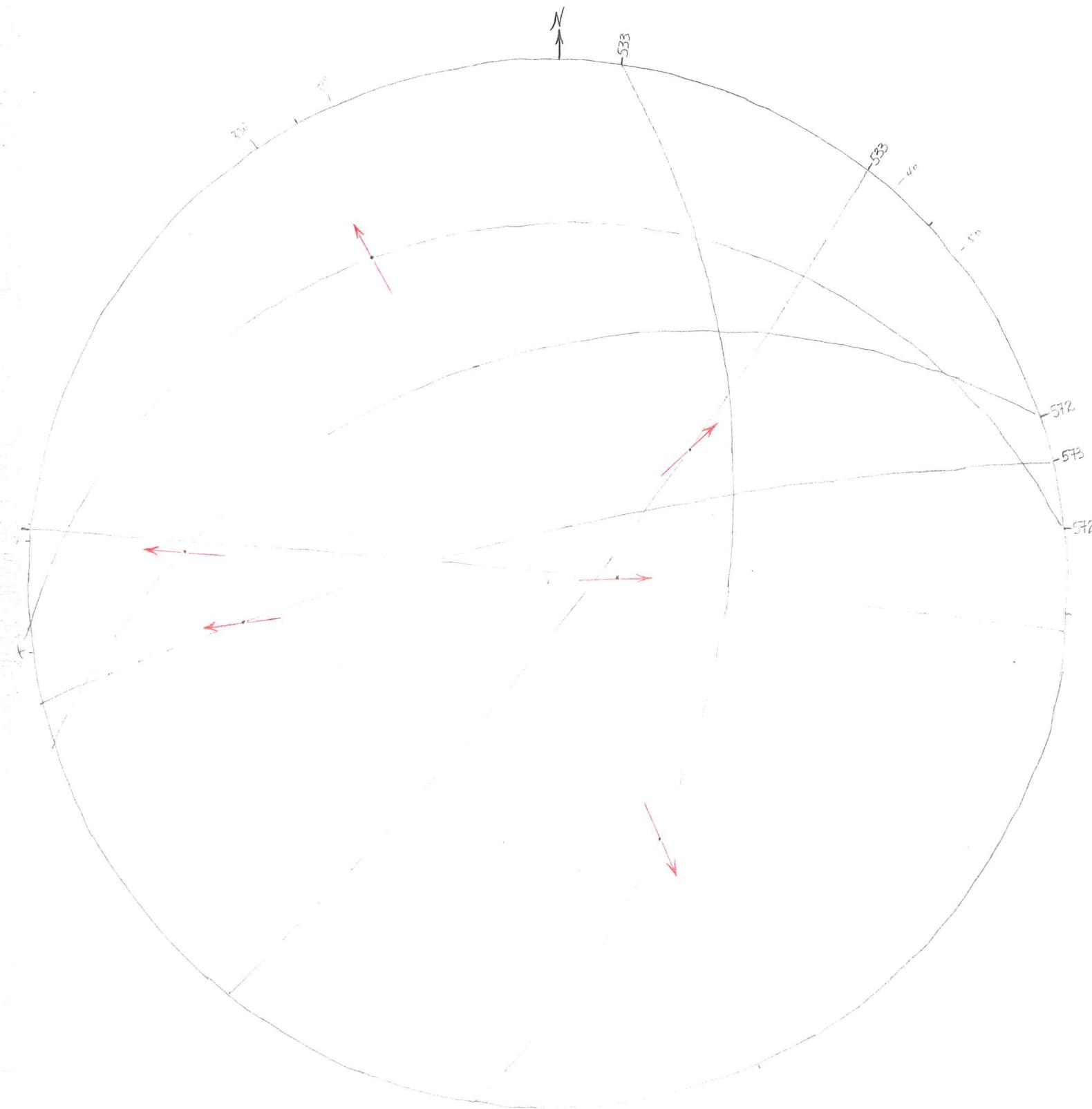
$$\pi = \frac{\pi}{4}$$



Wild Rose Fault Zone
Segment 3b

FAULT DUPLEX

$n=6$

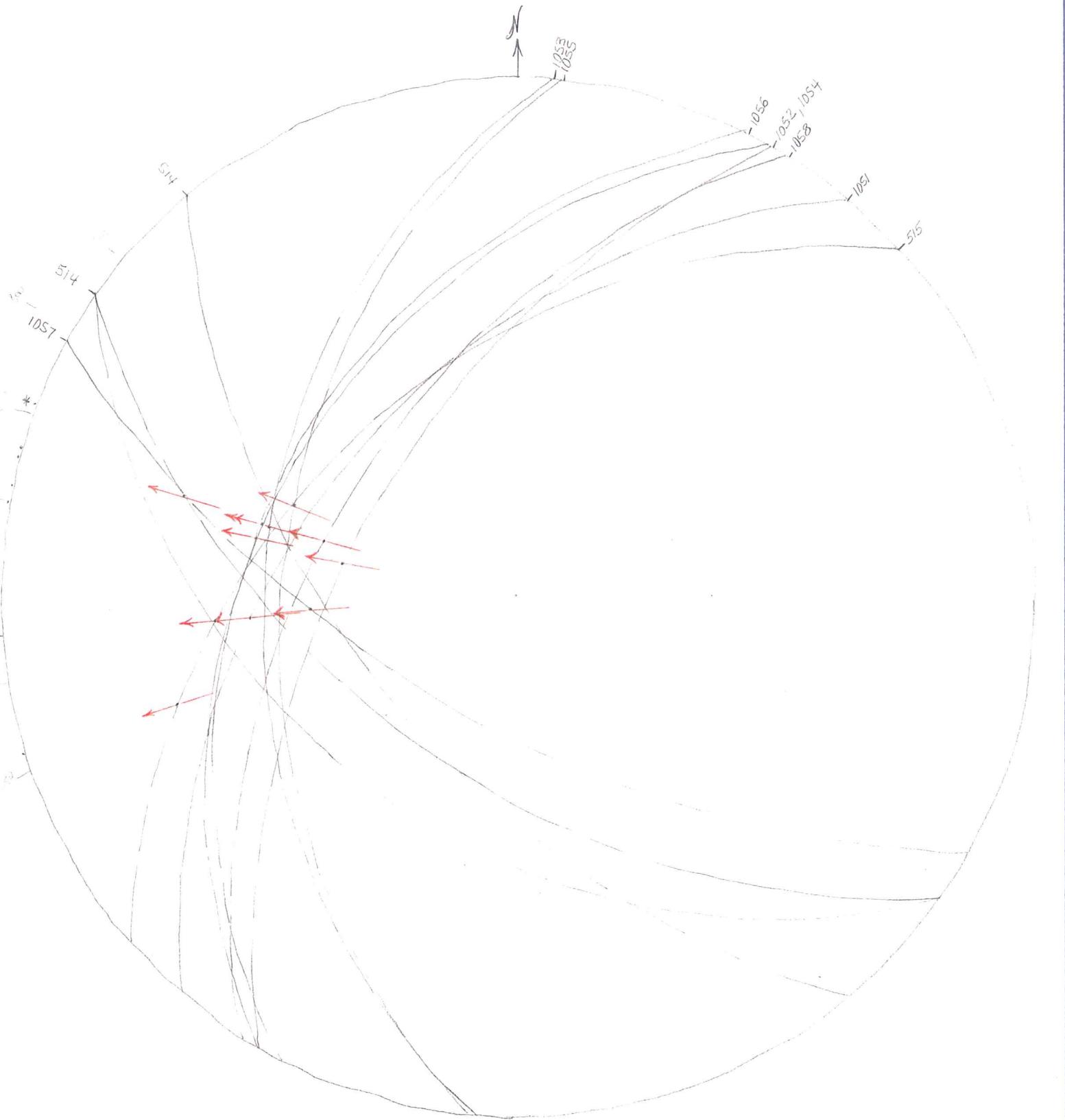


WILD ROSE FAULT ZONE

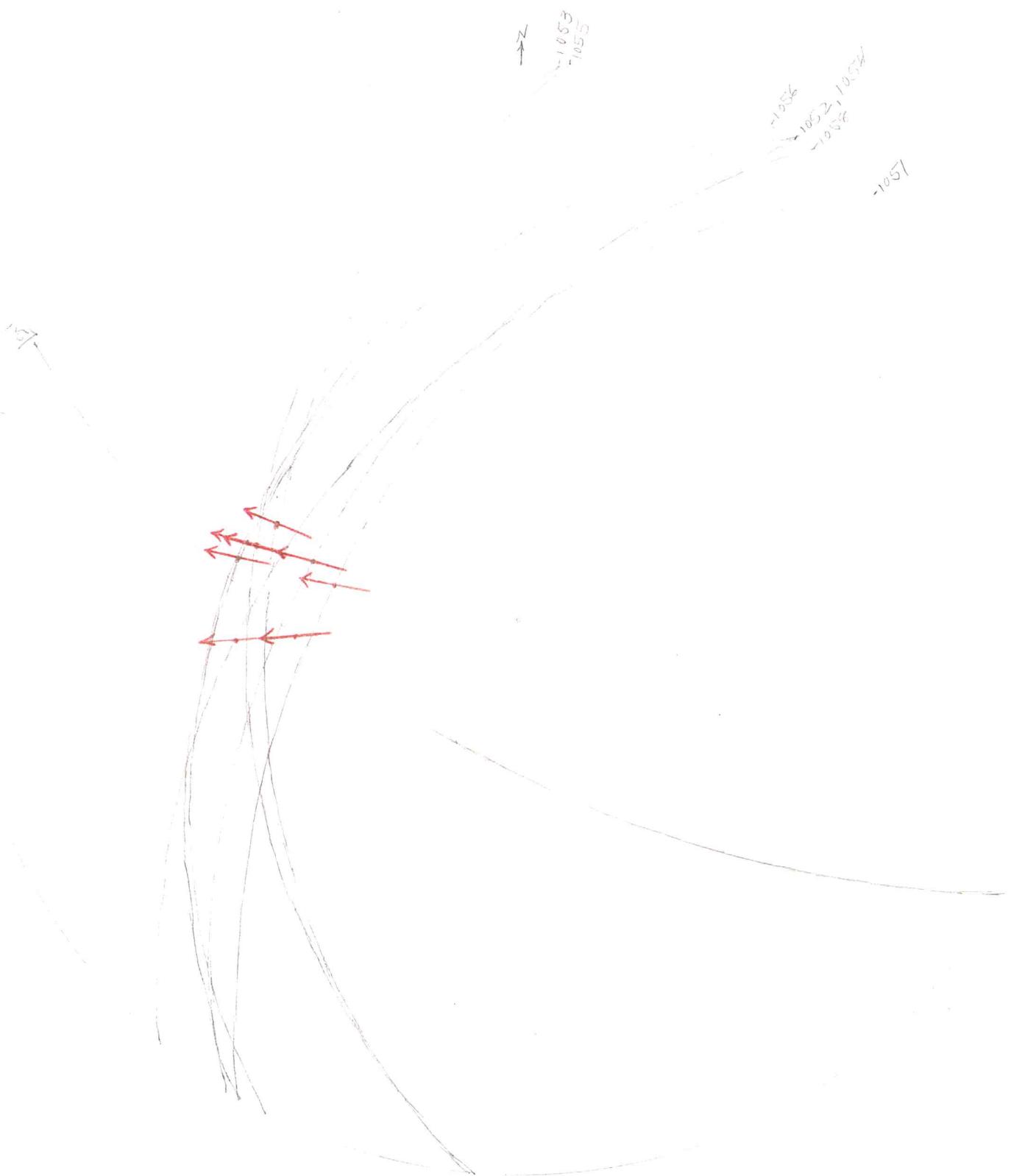
Segment 4

Northern area

N=11



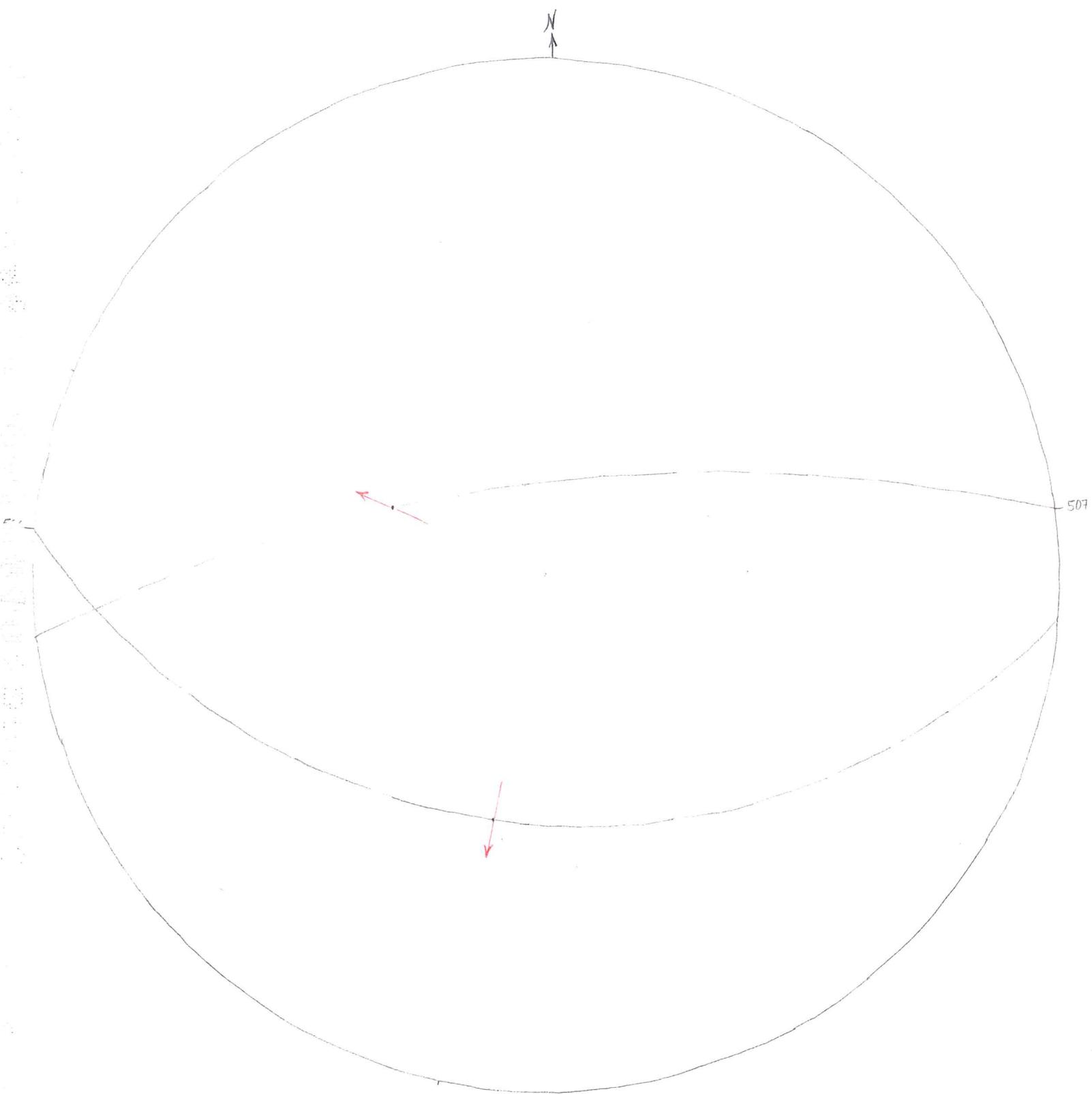
SULFUR DUKE FAULT ZONE
REGION 4 (NORTHERN AREA)



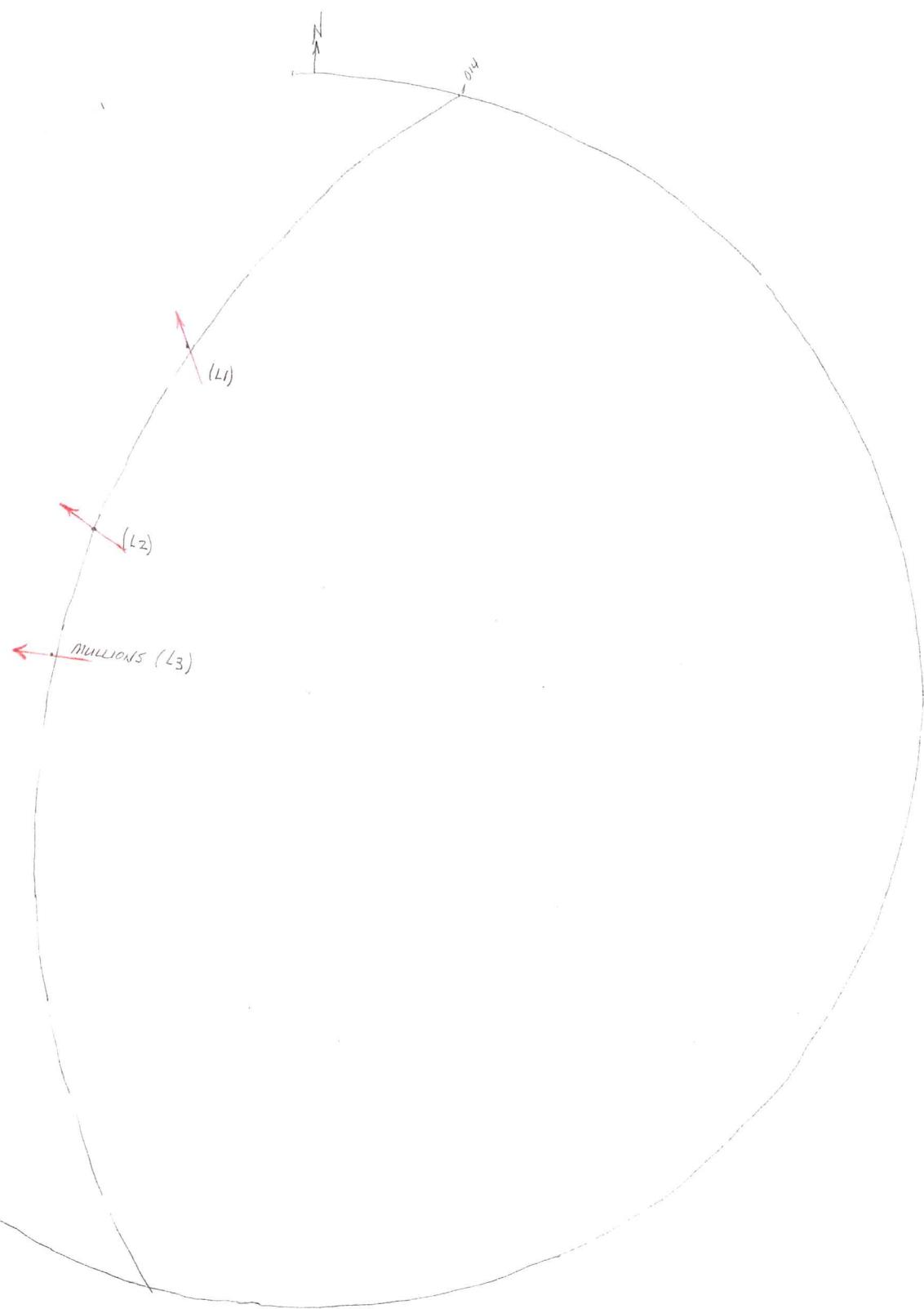
WILD ROSE FAULT ZONE NORTH (WRFZN)

WINTER CANYON FAULT ZONE
Ridge Fault

N=2

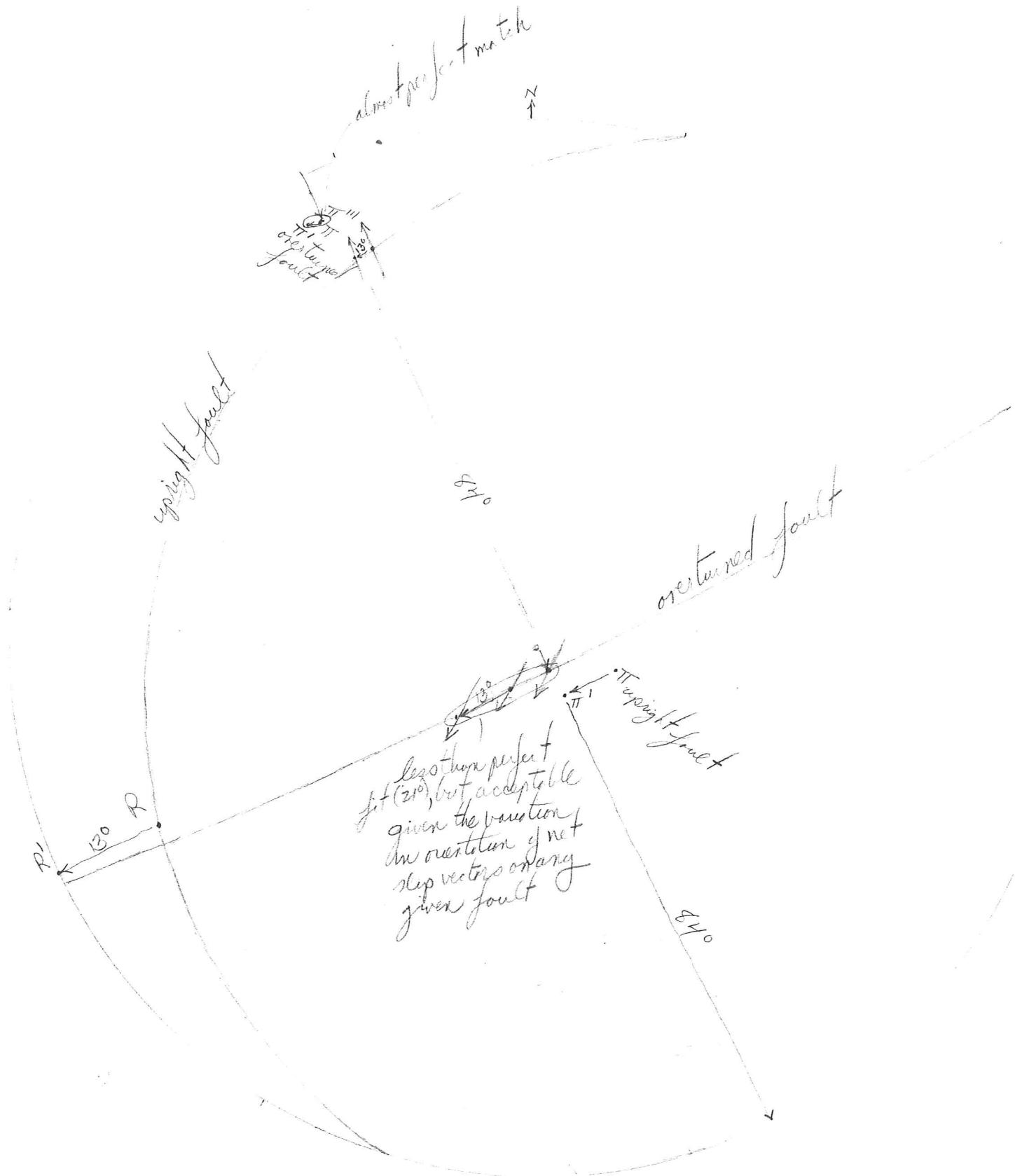


GATOR Filter Zone



APPENDIX 4

Stereographic rotation of an overturned(?) segment of the Wild Rose fault.



APPENDIX 5

Thermodynamic data used to calculate pH- $f\text{O}_2$ diagrams. These data were used initially to construct phase diagrams showing the relationship(s) between alteration mineralogy and gold solubility in the high-temperature (deeper) parts of geothermal reservoirs where gold remains in solution, and in the cooler (near-surface or peripheral) areas where ore-grade gold commonly occurs in the altered rocks (e.g., Sander and Mitchell, 1988; Mitchell, 1989). At that time there were no examples of extinct geothermal reservoirs that contained sufficient gold at ore grades to be economic. The Hycroft deposits are extremely rare examples of economic gold-silver mineralization in what was clearly a paleogeothermal reservoir (White, 1981; Mitchell, 1989). It is recommended that anyone exploring for gold in the northern Kamma Mountains read the articles by Ebert et al. (1996) and Ebert and Rye (1997) and White (1981).

Hydrolysis reactions and log K values for minerals used in constructing Figure 11.

| Mineral | Abbreviation | Reaction | 100°C | Log K (P = P _{SAT}) | 200°C | 250°C | 300°C |
|--------------------|--------------|--|-------|-------------------------------|-------|-------|-------|
| Albite | ALB | $\text{NaAlSi}_3\text{O}_8 + 4\text{H}^+ = \text{Na}^+ + \text{Al}^{3+} + 3\text{SiO}_2(\text{qtz}) + 2\text{H}_2\text{O}$ | 10.25 | 6.47 | 5.04 | 3.51 | |
| Calcite | CALC | $\text{CaCO}_3 + 2\text{H}^+ = \text{Ca}^{2+} + \text{CO}_2(\text{aq}) + \text{H}_2\text{O}$ | 9.09 | 8.77 | 8.67 | 8.39 | |
| Clinochlore (14Å) | CHL(14Å) | $\text{Mg}_5\text{Al}(\text{AlSi}_3\text{O}_{10})(\text{OH})_8 + 16\text{H}^+ = 5\text{Mg}^{2+} + 2\text{Al}^{3+} + 3\text{SiO}_2(\text{qtz}) + 12\text{H}_2\text{O}$ | 56.62 | 37.69 | 31.88 | 26.07 | |
| Clinzozoisite | CLNZ | $\text{Ca}_2\text{Al}_3\text{Si}_3\text{O}_{12}(\text{OH}) + 13\text{H}^+ = 2\text{Ca}^{2+} + 3\text{Al}^{3+} + 3\text{SiO}_2(\text{qtz}) + 7\text{H}_2\text{O}$ | 37.63 | 22.97 | 17.33 | 11.34 | |
| Grossular | GROSS | $\text{Ca}_3\text{Al}_2\text{Si}_3\text{O}_{12} + 12\text{H}^+ = 3\text{Ca}^{2+} + 2\text{Al}^{3+} + 3\text{SiO}_2(\text{qtz}) + 6\text{H}_2\text{O}$ | 46.44 | 32.21 | 26.80 | 21.21 | |
| Kaolinite | KAOL | $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4 + 6\text{H}^+ = 2\text{Al}^{3+} + 2\text{SiO}_2(\text{qtz}) + 5\text{H}_2\text{O}$ | 8.61 | 3.31 | 1.22 | -1.20 | |
| K-Feldspar | K-SPAR | $\text{KAlSi}_3\text{O}_8 + 4\text{H}^+ = \text{K}^+ + \text{Al}^{3+} + 3\text{SiO}_2(\text{qtz}) + 2\text{H}_2\text{O}$ | 8.19 | 5.13 | 3.92 | 2.57 | |
| Laumontite | LAUM | $\text{Ca}(\text{Al}_2\text{Si}_4\text{O}_{12})\cdot 4\text{H}_2\text{O} + 8\text{H}^+ = \text{Ca}^{2+} + 2\text{Al}^{3+} + 4\text{SiO}_2(\text{qtz}) + 8\text{H}_2\text{O}$ | 19.98 | 12.10 | 9.11 | 5.88 | |
| Muscovite | MUSC | $\text{KAl}_2(\text{AlSi}_3\text{O}_{10})(\text{OH})_2 + 10\text{H}^+ = \text{K}^+ + 3\text{Al}^{3+} + 3\text{SiO}_2(\text{qtz}) + 6\text{H}_2\text{O}$ | 15.72 | 7.19 | 3.83 | 0.00 | |
| Na-montmorillonite | Na-MONT | $3\text{Na}_{0.33}\text{Al}_{2.33}\text{Si}_{3.67}\text{O}_{10}(\text{OH})_2 + 22\text{H}^+ = \text{Na}^+ + 7\text{Al}^{3+} + 11\text{SiO}_2(\text{qtz}) + 14\text{H}_2\text{O}$ | 35.06 | -- | -- | -- | |
| Phlogopite | PHLOG | $\text{KMg}_3(\text{AlSi}_3\text{O}_{10})(\text{OH})_2 + 10\text{H}^+ = \text{K}^+ + 3\text{Mg}^{2+} + \text{Al}^{3+} + 3\text{SiO}_2(\text{qtz}) + 6\text{H}_2\text{O}$ | 36.38 | 25.44 | 21.32 | 17.04 | |
| Prehnite | PREHN | $\text{Ca}_2\text{Al}(\text{AlSi}_3\text{O}_{10})(\text{OH})_2 + 10\text{H}^+ = 2\text{Ca}^{2+} + 2\text{Al}^{3+} + 3\text{SiO}_2(\text{qtz}) + 6\text{H}_2\text{O}$ | 31.77 | 21.00 | 16.88 | 12.51 | |
| Pyrophyllite | PYROPH | $\text{Al}_2\text{Si}_4\text{O}_{10}(\text{OH})_2 + 6\text{H}^+ = 2\text{Al}^{3+} + 4\text{SiO}_2(\text{qtz}) + 4\text{H}_2\text{O}$ | 9.62 | 3.72 | 1.39 | -1.22 | |
| Quartz | QTZ | $3\text{SiO}_2(\text{qtz}) = 3\text{SiO}_2(\text{aq})$ | 9.30 | 7.29 | 6.57 | 6.03 | |
| Wairakite | WAIR | $\text{Ca}(\text{Al}_2\text{Si}_4\text{O}_{12})\cdot 2\text{H}_2\text{O} + 8\text{H}^+ = \text{Ca}^{2+} + 2\text{Al}^{3+} + 4\text{SiO}_2(\text{qtz}) + 6\text{H}_2\text{O}$ | 22.45 | 12.80 | 9.13 | 5.31 | |

All thermodynamic data except for Na-montmorillonite are from Bowers et al. (1984). Na-montmorillonite data are from Helgeson (1969).

| Reaction | | 100°C | Log K 200°C | (P = P _{SAT}) 250°C | 300°C |
|--|--|--------|----------------|----------------------------------|-------|
| Albite | | | | | |
| 2ALB + 2H ⁺ + H ₂ O = KAOL + 2Na ⁺ + 4QTZ | | 11.89 | 9.63 | 8.86 | 8.22 |
| ALB + K ⁺ = K-SPAR + Na ⁺ | | 2.06 | 1.34 | 1.12 | 0.94 |
| 3ALB + 2H ⁺ + K ⁺ = MUSC + 3Na ⁺ + 6QTZ | | 15.03 | 12.22 | 11.29 | 10.53 |
| 7ALB + 6H ⁺ = 3Na-MONT + 6Na ⁺ + 10QTZ | | 36.69 | -- | -- | -- |
| Clinochlore (14Å) | | | | | |
| CHL(14Å) + 8H ⁺ + 2Na ⁺ + 3QTZ = 2ALB + 5Mg ²⁺ + 8H ₂ O | | 36.12 | 24.75 | 21.80 | 19.05 |
| CHL(14Å) + 4H ⁺ + 3Ca ²⁺ = GROSS + 5Mg ²⁺ = 6H ₂ O | | 10.18 | 5.48 | 5.08 | 4.68 |
| CHL(14Å) + 10H ⁺ = KAOL + 5Mg ²⁺ + QTZ + 7H ₂ O | | 48.01 | 34.38 | 30.66 | 27.27 |
| CHL(14Å) + 8H ⁺ + 2K ⁺ + 3QTZ = 2K-SPAR + 5Mg ²⁺ + 8H ₂ O | | 40.24 | 27.43 | 24.04 | 20.93 |
| CHL(14Å) + 8H ⁺ + Ca ²⁺ + QTZ = LAUM + 5Mg ²⁺ + 4H ₂ O | | 36.64 | 25.59 | 22.77 | 20.19 |
| 3CHL(14Å) + 28H ⁺ + 2K ⁺ = 2MUSC + 15Mg ²⁺ + 3QTZ + 2H ₂ O | | 138.42 | 98.69 | 87.98 | 78.21 |
| 7CHL(14Å) + 68H ⁺ + 2Na ⁺ + QTZ = 6Na-MONT + 35Mg ²⁺ + 56H ₂ O | | 326.22 | -- | -- | -- |
| CHL(14Å) + 6H ⁺ + 2Ca ²⁺ = PREHN + 5Mg ²⁺ + 6H ₂ O | | 24.85 | 16.69 | 15.00 | 13.56 |
| CHL(14Å) + 8H ⁺ + Ca ²⁺ + QTZ = WAIR + 5Mg ²⁺ + 4H ₂ O | | 34.17 | 24.89 | 22.75 | 20.76 |
| Clinozoisite | | | | | |
| CLNZ + H ⁺ + 3Na ⁺ = 3ALB + 2Ca ²⁺ + H ₂ O | | 6.88 | 3.56 | 2.21 | 0.81 |
| 2CLNZ + 2H ⁺ + 6QTZ + 10H ₂ O = 3WAIR + Ca ²⁺ | | 7.91 | 7.54 | 7.27 | 6.75 |
| Grossular | | | | | |
| GROSS + 4H ⁺ + 2Na ⁺ + 3QTZ = 2ALB + 3Ca ²⁺ + 2H ₂ O | | 25.94 | 19.27 | 16.72 | 14.19 |
| GROSS + 4H ⁺ + 2K ⁺ = 2K-SPAR + 3Ca ²⁺ + 2H ₂ O | | 30.06 | 21.95 | 18.96 | 16.07 |
| GROSS + 2H ⁺ = PREHN + Ca ²⁺ | | 14.67 | 11.21 | 9.92 | 8.70 |
| K-Feldspar | | | | | |
| 3K-SPAR + 2H ⁺ = MUSC + 2K ⁺ + 6QTZ | | 8.85 | 8.20 | 7.93 | 7.71 |
| Laumontite | | | | | |
| LAUM + 2H ⁺ = KAOL + Ca ²⁺ + 2QTZ + 3H ₂ O | | 11.37 | 8.79 | 7.89 | 7.08 |
| 3LAUM + 4H ⁺ + 2K ⁺ = 2MUSC + 3Ca ²⁺ + 6QTZ + 12H ₂ O | | 28.50 | 22.00 | 19.67 | 17.64 |
| LAUM + 2H ⁺ = PYROPH + Ca ²⁺ + 4H ₂ O | | 10.36 | 8.38 | 7.72 | 4.66 |
| Muscovite | | | | | |
| 2MUSC + 2H ⁺ + 3H ₂ O = 3KAOL + 2K ⁺ | | 5.61 | 4.45 | 4.00 | 3.60 |
| 7MUSC + 4H ⁺ + 3Na ⁺ + 12QTZ = 9Na-MONT + 7K ⁺ | | 4.86 | -- | -- | -- |
| Na-montmorillonite | | | | | |
| 6Na-MONT + 2H ⁺ + 7H ₂ O = 7KAOL + 2Na ⁺ + 8QTZ | | 9.85 | -- | -- | -- |
| Phlogopite | | | | | |
| 2PHLOG + 4H ⁺ = CHL(14Å) + 2K ⁺ + Mg ²⁺ + 3QTZ | | 16.14 | 13.19 | 10.76 | 8.01 |
| 3PHLOG + 20H ⁺ = MUSC + 2K ⁺ + 9Mg ²⁺ + 6QTZ + 12H ₂ O | | 93.42 | 69.13 | 60.13 | 51.12 |
| Prehnite | | | | | |
| PREHN + 2H ⁺ + 2Na ⁺ + 3QTZ = 2ALB + 2Ca ²⁺ + 2H ₂ O | | 11.27 | 8.06 | 6.80 | 5.49 |
| 3PREHN + 4H ⁺ = 2CLNZ + 2Ca ²⁺ + 3QTZ + 4H ₂ O | | 20.05 | 17.06 | 15.98 | 14.85 |
| PREHN + 2H ⁺ + 2K ⁺ + 3QTZ = 2K-SPAR + 2Ca ²⁺ + 2H ₂ O | | 15.39 | 10.74 | 9.04 | 7.37 |
| PREHN + 2H ⁺ + QTZ + 2H ₂ O = LAUM + Ca ²⁺ | | 11.79 | 8.90 | 7.77 | 6.63 |
| 3PREHN + 10H ⁺ + 2K ⁺ = 2MUSC + 6Ca ²⁺ + 3QTZ + 6H ₂ O | | 63.87 | 48.62 | 42.98 | 37.53 |
| PREHN + 2H ⁺ + QTZ + 2H ₂ O = WAIR + Ca ²⁺ | | 9.32 | 8.20 | 7.75 | 7.20 |
| Wairakite | | | | | |
| WAIR + 2H ⁺ = KAOL + Ca ²⁺ + 4H ₂ | | 13.84 | 9.49 | 7.91 | 6.51 |
| WAIR + 2H ⁺ = PYROPH + Ca ²⁺ + 4H ₂ O | | 12.83 | 9.08 | 7.74 | 6.53 |

Reactions and log K values calculated from the data presented in Table 3.10.

Reactions and log K values used to construct phase boundaries in Figure 11.

APPENDIX 6

Geochemical results for samples collected in the Wild Rose area.



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| SAMPLE | PREP CODE | | Au ppb | Ag ppm | Al % | As ppm | B ppm | Ba ppm | Be ppm | Bi ppm | Ca % | Cd ppm | Co ppm | Cr ppm | Cu ppm | Fe % | Ga ppm | Hg ppb | K % | La ppm | Mg % |
|--------|-----------|-------|--------|--------|------|--------|-------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------------|--------|------|--------|--------|
| | | FA+AA | | | | | | | | | | | | | | | | | | | |
| 699201 | 205 | 226 | < 5 | < 0.2 | 1.32 | < 2 | 10 | 90 | 0.5 | < 2 | 0.46 | < 0.5 | 3 | 37 | 4 | 3.05 | < 10 | 40 | 0.17 | 10 | 0.28 |
| 699202 | 205 | 226 | 130 | < 0.2 | 0.81 | 64 | < 10 | 90 | 0.5 | < 2 | 0.16 | < 0.5 | 3 | 129 | 2 | 4.63 | < 10>100000 | 0.16 | 10 | 0.03 | |
| 699203 | 205 | 226 | 10 | < 0.2 | 1.18 | 64 | 10 | 110 | 4.0 | < 2 | 0.37 | < 0.5 | 8 | 53 | 1 | 13.95 | < 10 | 2390 | 0.17 | 10 | 0.04 |
| 699204 | 205 | 226 | 50 | < 0.2 | 1.24 | 42 | < 10 | 20 | < 0.5 | < 2 | 0.23 | < 0.5 | < 1 | 96 | 3 | 2.35 | < 10 | 1030 | 0.07 | < 10 | 0.04 |
| 699205 | 205 | 226 | 90 | < 0.2 | 1.14 | 74 | < 10 | 100 | < 0.5 | < 2 | 0.10 | < 0.5 | < 1 | 89 | 1 | 4.93 | < 10 | 15250 | 0.54 | 10 | 0.03 |
| 699206 | 205 | 226 | 20 | < 0.2 | 0.74 | 16 | < 10 | 280 | < 0.5 | < 2 | 0.10 | < 0.5 | < 1 | 138 | 3 | 0.66 | < 10 | 28100 | 0.11 | 10 | 0.01 |
| 699207 | 205 | 226 | 60 | < 0.2 | 1.22 | 94 | < 10 | 140 | 0.5 | < 2 | 0.25 | < 0.5 | < 1 | 15 | 3 | 7.05 | < 10 | 670 | 0.70 | 10 | 0.06 |
| 699208 | 205 | 226 | 40 | < 0.2 | 1.17 | 90 | 10 | 30 | < 0.5 | < 2 | 0.21 | < 0.5 | < 1 | 90 | 4 | 2.22 | < 10 | 16010 | 0.05 | 10 | 0.05 |
| 699209 | 205 | 226 | 210 | 0.6 | 1.39 | 90 | < 10 | < 0.5 | < 2 | 0.19 | < 0.5 | < 1 | 95 | 1 | 3.57 | < 10 | 2820 | 0.68 | < 10 | 0.01 | |
| 699210 | 205 | 226 | 55 | < 0.2 | 1.18 | 102 | < 10 | 40 | < 0.5 | < 2 | 0.15 | < 0.5 | < 1 | 106 | 1 | 3.66 | < 10 | 11360 | 0.21 | < 10 | 0.02 |
| 699211 | 205 | 226 | 225 | 1.2 | 0.92 | 26 | 10 | 100 | < 0.5 | < 2 | 0.20 | < 0.5 | < 1 | 143 | 2 | 1.31 | < 10 | 2410 | 0.22 | 10 | 0.04 |
| 699212 | 205 | 226 | 100 | 3.4 | 1.26 | 40 | < 10 | 200 | < 0.5 | < 2 | 0.19 | < 0.5 | < 1 | 65 | 3 | 3.68 | < 10 | 2700 | 0.53 | 10 | 0.05 |
| 699213 | 205 | 226 | 305 | 19.4 | 1.61 | 42 | < 10 | 150 | 1.0 | < 2 | 0.13 | < 0.5 | < 1 | 81 | 3 | 3.12 | < 10 | 2620 | 1.01 | 10 | 0.04 |
| 699214 | 205 | 226 | 245 | 30.6 | 1.59 | 70 | < 10 | 420 | < 0.5 | < 2 | 0.10 | < 0.5 | 1 | 76 | 11 | 5.33 | < 10 | 3320 | 0.35 | 10 | 0.01 |
| 699215 | 205 | 226 | 310 | < 0.2 | 0.89 | 196 | < 10 | 130 | < 0.5 | < 2 | 0.13 | < 0.5 | 1 | 93 | 2 | 4.14 | < 10>100000 | 0.31 | 20 | 0.02 | |
| 699216 | 205 | 226 | 205 | 15.4 | 1.02 | 58 | < 10 | 150 | < 0.5 | < 2 | 0.39 | < 0.5 | 1 | 106 | 4 | 2.59 | < 10 | 3240 | 0.19 | 10 | 0.04 |
| 699217 | 205 | 226 | 95 | 4.2 | 1.11 | 48 | < 10 | 1130 | < 0.5 | < 2 | 0.19 | < 0.5 | < 1 | 122 | 5 | 1.16 | < 10 | 2460 | 0.07 | 10 | 0.03 |
| 699218 | 205 | 226 | 40 | 4.6 | 1.32 | 24 | < 10 | 70 | < 0.5 | < 2 | 0.17 | < 0.5 | < 1 | 160 | 3 | 0.60 | < 10 | 1920 | 0.04 | 10 | 0.01 |
| 699219 | 205 | 226 | 60 | 1.2 | 0.78 | 56 | < 10 | 30 | < 0.5 | < 2 | 0.19 | < 0.5 | < 1 | 150 | 3 | 0.98 | < 10 | 8170 | 0.05 | 10 | 0.03 |
| 699220 | 205 | 226 | 75 | 0.6 | 1.05 | 58 | < 10 | 660 | < 0.5 | < 2 | 0.12 | < 0.5 | < 1 | 95 | 3 | 1.37 | < 10 | 4930 | 0.15 | 10 | 0.04 |
| 699221 | 205 | 226 | 5 | < 0.2 | 1.12 | 12 | 10 | 240 | < 0.5 | < 2 | 0.23 | < 0.5 | 1 | 69 | 4 | 5.04 | < 10 | 2150 | 0.07 | 10 | 0.11 |
| 699222 | 205 | 226 | 85 | < 0.2 | 0.73 | 58 | 10 | 40 | < 0.5 | < 2 | 0.22 | < 0.5 | < 1 | 165 | 3 | 1.42 | < 10 | 6610 | 0.09 | 10 | 0.05 |
| 699223 | 205 | 226 | 50 | < 0.2 | 0.66 | 22 | 10 | 60 | < 0.5 | < 2 | 0.45 | < 0.5 | < 1 | 82 | 3 | 1.86 | < 10 | 770 | 0.06 | 10 | 0.08 |
| 699224 | 205 | 226 | 90 | 1.4 | 0.60 | 44 | < 10 | 100 | < 0.5 | < 2 | 0.17 | < 0.5 | < 1 | 84 | 1 | 1.76 | < 10 | 4300 | 0.28 | 10 | 0.05 |
| 699225 | 205 | 226 | 200 | < 0.2 | 0.89 | 74 | 10 | 30 | < 0.5 | < 2 | 0.20 | < 0.5 | < 1 | 74 | 3 | 2.89 | < 10 | 4410 | 0.04 | 10 | 0.06 |
| 699226 | 205 | 226 | 60 | < 0.2 | 1.08 | 38 | 10 | 70 | < 0.5 | < 2 | 0.29 | < 0.5 | 1 | 166 | 5 | 1.43 | < 10 | 2090 | 0.09 | < 10 | 0.04 |
| 699227 | 205 | 226 | 150 | 0.2 | 0.80 | 270 | < 10 | 10 | < 0.5 | < 2 | 0.19 | < 0.5 | 3 | 156 | 3 | 2.98 | < 10 | 3170 | 0.27 | < 10 | 0.03 |
| 699228 | 205 | 226 | 250 | < 0.2 | 1.22 | 208 | < 10 | < 10 | < 0.5 | < 2 | 0.09 | < 0.5 | 1 | 119 | 7 | 2.36 | < 10 | 7930 | 0.45 | < 10 | 0.02 |
| 699229 | 205 | 226 | 6760 | 4.6 | 1.48 | 96 | < 10 | 60 | < 0.5 | < 2 | 0.28 | < 0.5 | < 1 | 56 | 2 | 1.98 | 10 | 960 | 0.71 | < 10 | 0.05 |
| 699230 | 205 | 226 | 135 | 0.2 | 0.66 | 126 | < 10 | 80 | < 0.5 | < 2 | 0.22 | < 0.5 | < 1 | 225 | 3 | 2.03 | < 10 | 4870 | 0.23 | < 10 | 0.01 |
| 699231 | 205 | 226 | 45 | < 0.2 | 0.92 | 196 | < 10 | 50 | < 0.5 | < 2 | 0.12 | < 0.5 | < 1 | 216 | 5 | 8.12 | 10 | 2100 | 0.21 | 10 | 0.03 |
| 699232 | 205 | 226 | 75 | 0.2 | 0.79 | 30 | < 10 | 50 | < 0.5 | < 2 | 0.25 | < 0.5 | < 1 | 113 | 4 | 0.88 | < 10 | 1380 | 0.08 | 30 | 0.05 |
| 699233 | 205 | 226 | 75 | 0.2 | 1.12 | 28 | < 10 | 30 | < 0.5 | < 2 | 0.27 | < 0.5 | < 1 | 135 | 2 | 1.15 | < 10 | 1100 | 0.05 | 30 | 0.06 |
| 699234 | 205 | 226 | 25 | 4.4 | 2.05 | 98 | < 10 | 100 | < 0.5 | < 2 | < 0.01 | < 0.5 | < 1 | 59 | 2 | 6.65 | < 10 | 570 | 0.33 | < 10 | < 0.01 |
| 699235 | 205 | 226 | 15 | < 0.2 | 1.07 | 40 | 10 | 40 | < 0.5 | < 2 | 0.18 | < 0.5 | < 1 | 148 | 3 | 1.55 | < 10 | 4170 | 0.11 | 10 | 0.05 |
| 699236 | 205 | 226 | < 5 | < 0.2 | 0.91 | 2 | 10 | 40 | < 0.5 | < 2 | 0.38 | < 0.5 | < 1 | 172 | 2 | 0.82 | < 10 | 200 | 0.06 | 30 | 0.04 |
| 699237 | 205 | 226 | 75 | 0.4 | 0.66 | 34 | 10 | 40 | < 0.5 | 2 | 0.07 | < 0.5 | < 1 | 84 | 1 | 1.79 | < 10 | 2870 | 0.18 | 20 | 0.02 |



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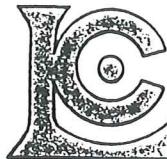
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| SAMPLE | PREP CODE | | Mn ppm | Mo ppm | Na % | Ni ppm | P ppm | Pb ppm | S % | Sb ppm | Sc ppm | Sr ppm | Ti % | Tl ppm | U ppm | V ppm | W ppm | Zn ppm | Se ppm |
|--------|-----------|-----|--------|--------|--------|--------|-------|--------|------|--------|--------|--------|--------|--------|-------|-------|-------|--------|--------|
| 699201 | 205 | 226 | 430 | 1 | 0.12 | 2 | 450 | < 2 | 0.03 | < 2 | 2 | 44 | < 0.01 | < 10 | < 10 | 4 | < 10 | 86 | < 0.2 |
| 699202 | 205 | 226 | 85 | 9 | 0.04 | 4 | 980 | 20 | 0.40 | 56 | 1 | 199 | < 0.01 | < 10 | < 10 | 8 | < 10 | 174 | 50.0 |
| 699203 | 205 | 226 | 515 | 3 | 0.04 | 6 | 1080 | 18 | 0.36 | 14 | 2 | 139 | < 0.01 | < 10 | 20 | 10 | < 10 | 400 | < 0.2 |
| 699204 | 205 | 226 | 35 | < 1 | 0.07 | 2 | 430 | 10 | 0.30 | 20 | < 1 | 227 | < 0.01 | < 10 | < 10 | 4 | < 10 | 8 | 4.0 |
| 699205 | 205 | 226 | 25 | < 1 | 0.06 | 3 | 660 | 18 | 1.04 | 30 | 1 | 253 | < 0.01 | < 10 | < 10 | 4 | < 10 | 8 | 6.8 |
| 699206 | 205 | 226 | 45 | 1 | 0.01 | 2 | 180 | 20 | 0.20 | 16 | < 1 | 42 | < 0.01 | < 10 | < 10 | 3 | < 10 | 8 | 1.4 |
| 699207 | 205 | 226 | 40 | < 1 | 0.07 | 3 | 2150 | 8 | 1.18 | 36 | 1 | 177 | < 0.01 | < 10 | < 10 | 6 | < 10 | 12 | 1.8 |
| 699208 | 205 | 226 | 20 | < 1 | 0.01 | 1 | 310 | 12 | 0.09 | 14 | < 1 | 40 | < 0.01 | < 10 | < 10 | 3 | < 10 | 6 | 2.0 |
| 699209 | 205 | 226 | 20 | 3 | 0.12 | 2 | 190 | 4 | 1.59 | 66 | < 1 | 89 | < 0.01 | < 10 | < 10 | 6 | < 10 | 6 | 17.0 |
| 699210 | 205 | 226 | 25 | < 1 | 0.04 | 2 | 160 | 8 | 0.51 | 26 | < 1 | 49 | < 0.01 | < 10 | < 10 | 4 | < 10 | 8 | 4.2 |
| 699211 | 205 | 226 | 30 | 1 | 0.07 | 3 | 210 | 8 | 0.42 | 8 | < 1 | 34 | < 0.01 | < 10 | < 10 | 3 | < 10 | 6 | 4.2 |
| 699212 | 205 | 226 | 25 | < 1 | 0.11 | 2 | 620 | 8 | 0.99 | 10 | 1 | 343 | < 0.01 | < 10 | < 10 | 4 | < 10 | 8 | 3.6 |
| 699213 | 205 | 226 | 25 | < 1 | 0.09 | 2 | 840 | 6 | 1.63 | 18 | < 1 | 555 | < 0.01 | < 10 | < 10 | 5 | < 10 | 14 | 13.8 |
| 699214 | 205 | 226 | 10 | < 1 | 0.14 | 3 | 720 | 10 | 0.87 | 54 | < 1 | 203 | < 0.01 | < 10 | < 10 | 9 | < 10 | 20 | 17.2 |
| 699215 | 205 | 226 | 140 | 15 | 0.08 | 3 | 560 | 20 | 0.73 | 56 | < 1 | 252 | < 0.01 | < 10 | < 10 | 9 | < 10 | 34 | 21.0 |
| 699216 | 205 | 226 | 55 | 1 | 0.04 | 3 | 340 | 10 | 0.31 | 20 | < 1 | 72 | < 0.01 | < 10 | < 10 | 7 | < 10 | 34 | 13.8 |
| 699217 | 205 | 226 | 30 | 1 | 0.01 | 2 | 170 | 8 | 0.19 | 10 | < 1 | 92 | < 0.01 | < 10 | < 10 | 5 | < 10 | 18 | 1.6 |
| 699218 | 205 | 226 | 20 | < 1 | 0.01 | 3 | 190 | 2 | 0.02 | 2 | < 1 | 99 | < 0.01 | < 10 | < 10 | 3 | < 10 | 14 | 0.6 |
| 699219 | 205 | 226 | 50 | 4 | 0.01 | 2 | 210 | 10 | 0.12 | 12 | < 1 | 45 | < 0.01 | < 10 | < 10 | 2 | < 10 | 6 | 1.8 |
| 699220 | 205 | 226 | 40 | 11 | 0.01 | 2 | 150 | 10 | 0.16 | 8 | < 1 | 72 | < 0.01 | < 10 | < 10 | 3 | < 10 | 10 | 2.2 |
| 699221 | 205 | 226 | 55 | 1 | 0.02 | 3 | 450 | 34 | 0.12 | 10 | < 1 | 184 | < 0.01 | < 10 | < 10 | 11 | < 10 | 118 | 2.8 |
| 699222 | 205 | 226 | 35 | 1 | 0.02 | 3 | 170 | 10 | 0.22 | 14 | < 1 | 62 | < 0.01 | < 10 | < 10 | 5 | < 10 | 18 | 5.2 |
| 699223 | 205 | 226 | 20 | 1 | 0.01 | 2 | 160 | 12 | 0.11 | 6 | < 1 | 55 | < 0.01 | < 10 | < 10 | 3 | < 10 | 10 | 4.6 |
| 699224 | 205 | 226 | 40 | 4 | 0.02 | 1 | 350 | 6 | 0.47 | 12 | < 1 | 79 | < 0.01 | < 10 | < 10 | 1 | < 10 | 6 | 5.2 |
| 699225 | 205 | 226 | 35 | 4 | 0.01 | 2 | 130 | 16 | 0.09 | 20 | < 1 | 26 | < 0.01 | < 10 | < 10 | 3 | < 10 | 8 | 5.0 |
| 699226 | 205 | 226 | 100 | 3 | 0.03 | 3 | 230 | 2 | 0.30 | 12 | < 1 | 52 | < 0.01 | < 10 | < 10 | 4 | < 10 | 14 | 1.2 |
| 699227 | 205 | 226 | 20 | 9 | 0.17 | 3 | 60 | 8 | 1.44 | 24 | < 1 | 31 | < 0.01 | < 10 | < 10 | 1 | < 10 | 20 | 20.0 |
| 699228 | 205 | 226 | 5 | 12 | 0.23 | 2 | 140 | < 2 | 0.99 | 32 | < 1 | 21 | < 0.01 | < 10 | < 10 | 1 | < 10 | 18 | 21.0 |
| 699229 | 205 | 226 | 25 | 15 | 0.06 | 2 | 160 | 2 | 1.36 | 6 | < 1 | 125 | < 0.01 | < 10 | < 10 | 5 | < 10 | 4 | 2.2 |
| 699230 | 205 | 226 | 45 | 8 | 0.02 | 3 | 190 | 6 | 0.48 | 10 | < 1 | 101 | < 0.01 | < 10 | < 10 | 4 | < 10 | 6 | 7.2 |
| 699231 | 205 | 226 | 25 | 63 | 0.02 | 5 | 320 | 18 | 0.41 | 36 | < 1 | 133 | < 0.01 | < 10 | < 10 | 13 | < 10 | 22 | 7.8 |
| 699232 | 205 | 226 | 40 | 2 | 0.01 | 2 | 110 | 8 | 0.08 | 8 | < 1 | 23 | < 0.01 | < 10 | < 10 | 4 | < 10 | 14 | 1.8 |
| 699233 | 205 | 226 | 60 | < 1 | < 0.01 | 2 | 60 | 8 | 0.06 | 6 | < 1 | 20 | < 0.01 | < 10 | < 10 | 5 | < 10 | 20 | 1.6 |
| 699234 | 205 | 226 | < 5 | 9 | 0.03 | 1 | 150 | < 2 | 0.66 | 20 | < 1 | 126 | < 0.01 | < 10 | < 10 | 12 | < 10 | 4 | 6.0 |
| 699235 | 205 | 226 | 30 | 1 | 0.07 | 2 | 110 | 34 | 0.23 | 8 | < 1 | 38 | < 0.01 | < 10 | < 10 | 3 | < 10 | 12 | 3.0 |
| 699236 | 205 | 226 | 25 | 5 | 0.02 | 2 | 50 | 14 | 0.16 | 2 | < 1 | 27 | < 0.01 | < 10 | < 10 | 1 | < 10 | 10 | < 0.2 |
| 699237 | 205 | 226 | 20 | 1 | 0.02 | 1 | 60 | 10 | 0.20 | 12 | < 1 | 16 | < 0.01 | < 10 | < 10 | 4 | < 10 | 22 | 5.0 |



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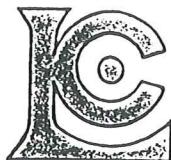
Comments: ATTN: C. BALLEW/R. VANCE PO#3637-477 (WILD ROSE)

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A9925991

| SAMPLE | PREP CODE | Au ppm FA+AA | Au oz/T calc. | As ppm | Sb ppm | Hg ppb | Ag AAS | ppm (ICP) | Al % (ICP) | Ba ppm (ICP) | Be ppm (ICP) | Bi ppm (ICP) | Ca % (ICP) | Cd ppm (ICP) | Co ppm (ICP) | Cr ppm (ICP) | Cu ppm (ICP) | Fe % (ICP) | K % (ICP) | Mg % (ICP) | Mn ppm (ICP) |
|----------|-----------|-----------------|------------------|----------|--------|--------|--------|-----------|------------|--------------|--------------|--------------|------------|--------------|--------------|--------------|--------------|------------|-----------|------------|--------------|
| NWRA5656 | 205 226 | 0.020 | 0.0006 | 2 | 0.6 | 10 | 0.2 | 1.93 | 90 | 2.5 | < 2 | 0.17 | 0.5 | 1 | 203 | 1 | 1.28 | 0.29 | 0.03 | 180 | |
| NWRA5657 | 205 226 | 0.240 | 0.0070 | 14 | 36 | 4070 | 1.0 | 6.30 | 710 | 2.0 | < 2 | 0.19 | < 0.5 | 3 | 120 | 2 | 3.58 | 2.12 | 0.04 | 25 | |
| NWRA5658 | 205 226 | 0.030 | 0.0009 | 7 | 57 | 480 | 0.2 | 6.38 | 920 | 6.5 | < 2 | 0.52 | < 0.5 | 10 | 24 | 1 | 14.30 | 2.97 | 0.11 | 920 | |
| NWRA5659 | 205 226 | 0.290 | 0.0085 | 93 | 710 | 5230 | 4.6 | 5.54 | 430 | 2.0 | < 2 | 0.21 | < 0.5 | 4 | 101 | 4 | 3.66 | 0.97 | 0.04 | 90 | |
| NWRA5660 | 205 226 | 0.140 | 0.0041 | 2 | 2.0 | 40 | 3.2 | 7.85 | 1170 | 2.5 | < 2 | 2.13 | 0.5 | 9 | 118 | 2 | 1.39 | 2.98 | 0.15 | 335 | |
| NWRA5661 | 205 226 | 0.260 | 0.0076 | 14 | 18.0 | 3760 | 1.4 | 4.48 | 140 | 2.5 | < 2 | 0.32 | < 0.5 | 3 | 95 | 2 | 1.44 | 0.24 | 0.02 | 35 | |
| NWRA5662 | 205 226 | 0.205 | 0.0060 | 130 | 600 | 1740 | 0.6 | 2.46 | 60 | 12.0 | < 2 | 0.56 | < 0.5 | 1 | 21 | 7 | >25.0 | 1.55 | 0.08 | 850 | |
| NWRA5663 | 205 226 | 0.090 | 0.0026 | 11 | 540 | 1290 | < 0.2 | 4.45 | 310 | 7.0 | < 2 | 0.41 | < 0.5 | 6 | 72 | 5 | 6.50 | 0.43 | 0.09 | 90 | |
| NWRA5664 | 205 226 | 0.045 | 0.0013 | 5 | 2.2 | 60 | 0.6 | 6.92 | 1340 | 2.5 | < 2 | 1.49 | 0.5 | 5 | 93 | 1 | 1.46 | 2.86 | 0.16 | 990 | |
| NWRA5665 | 205 226 | 0.225 | 0.0066 | 109 | 22 | 520 | 0.8 | 4.77 | 170 | 3.5 | < 2 | 0.26 | < 0.5 | 4 | 106 | 4 | 6.58 | 0.32 | 0.06 | 165 | |
| NWRA5666 | 205 226 | 0.015<0.0005 | | 67 | 24 | 480 | 0.2 | 5.93 | 980 | 5.0 | < 2 | 0.29 | < 0.5 | 6 | 31 | < 1 | 9.88 | 1.29 | 0.06 | 4390 | |
| NWRA5667 | 205 226 | 0.065 | 0.0019 | 139 | 58 | 1900 | 0.2 | 5.95 | 660 | 3.0 | < 2 | 0.18 | < 0.5 | 7 | 52 | 4 | 7.87 | 1.90 | 0.04 | 1625 | |
| NWRA5668 | 205 226 | 0.020 | 0.0006 | 19 | 12.0 | 1440 | < 0.2 | 7.70 | 640 | 1.5 | < 2 | 0.13 | < 0.5 | 2 | 122 | < 1 | 0.91 | 2.31 | 0.02 | 60 | |
| NWRA5669 | 205 226 | 0.015<0.0005 | | 91 | 32 | 25400 | < 0.2 | 4.75 | 1030 | 2.5 | < 2 | 0.78 | < 0.5 | 2 | 103 | 1 | 2.51 | 0.30 | 0.05 | 55 | |
| NWRA5670 | 205 226 | 0.030 | 0.0009 | 16 | 18.0 | 11320 | 0.2 | 5.57 | 580 | 2.5 | < 2 | 0.25 | < 0.5 | 2 | 65 | 1 | 2.24 | 0.55 | 0.04 | 80 | |
| NWRA5671 | 205 226 | 0.050 | 0.0015 | 139 | 175 | 2640 | < 0.2 | 4.61 | 590 | 6.0 | < 2 | 0.44 | < 0.5 | 4 | 60 | 8 | >25.0 | 0.44 | 0.10 | 455 | |
| NWRA5672 | 205 226 | 0.030 | 0.0009 | 92 | 89 | 1150 | < 0.2 | 4.68 | 110 | 3.0 | < 2 | 0.38 | < 0.5 | 3 | 6 | 3 | >25.0 | 0.09 | 0.12 | 1340 | |
| NWRA5673 | 205 226 | 0.095 | 0.0028 | 47 | 44 | 3800 | 0.2 | 6.84 | 740 | 2.5 | < 2 | 0.28 | < 0.5 | 4 | 49 | 2 | 3.45 | 1.87 | 0.03 | 55 | |
| NWRA5674 | 205 226 | 0.445 | 0.0130 | 231 | 480 | 48100 | 0.2 | 3.71 | 670 | 4.0 | < 2 | 0.30 | < 0.5 | 7 | 106 | 3 | 6.06 | 0.99 | 0.07 | 170 | |
| NWRA3556 | 205 226 | 0.070 | 0.0020 | 36 | 43 | 6560 | < 0.2 | 3.62 | 260 | 3.0 | < 2 | 0.25 | < 0.5 | 3 | 131 | < 1 | 2.60 | 0.50 | 0.03 | 40 | |
| NWRA3557 | 205 226 | 0.030 | 0.0009 | 7 | 17.0 | 9740 | < 0.2 | 3.88 | 190 | 2.5 | < 2 | 0.20 | < 0.5 | 2 | 108 | < 1 | 0.65 | 0.32 | 0.01 | 20 | |
| NWRA3558 | 205 226 | 0.010<0.0005 | | < 1 | 10.0 | 570 | < 0.2 | 5.94 | 1680 | 8.0 | < 2 | 0.78 | 0.5 | 18 | 17 | < 1 | 10.65 | 2.57 | 0.09 | 5140 | |
| NWRA3559 | 205 226 | 0.510 | 0.0149 | 620>1000 | 87000 | < 0.2 | 1.98 | 520 | 62.5 | < 2 | 0.53 | < 0.5 | 3 | 6 | < 1 | >25.0 | 0.07 | 0.12 | 890 | | |
| NWRA3560 | 205 226 | 0.040 | 0.0012 | 14 | 9.8 | 1150 | 0.2 | 4.78 | 110 | 2.0 | < 2 | 0.33 | < 0.5 | 2 | 75 | 1 | 0.72 | 0.14 | 0.06 | 35 | |
| NWRA3561 | 205 226 | 0.050 | 0.0015 | 22 | 24 | 750 | 0.2 | 6.63 | 850 | 2.0 | < 2 | 0.31 | < 0.5 | 3 | 49 | 4 | 3.58 | 3.10 | 0.08 | 30 | |
| NWRA3562 | 205 226 | 0.015<0.0005 | | 3 | 0.6 | 40 | < 0.2 | 6.85 | 260 | 3.5 | < 2 | 0.29 | < 0.5 | 1 | 75 | < 1 | 1.34 | 3.94 | 0.04 | 310 | |
| NWRA3563 | 205 226 | 0.135 | 0.0039 | 33 | 45 | 4520 | < 0.2 | 7.48 | 1090 | 2.5 | < 2 | 0.27 | < 0.5 | 4 | 49 | 1 | 1.68 | 2.85 | 0.06 | 145 | |
| NWRA3564 | 205 226 | 0.030 | 0.0009 | 14 | 16.0 | 1570 | < 0.2 | 7.04 | 300 | 2.0 | < 2 | 0.21 | < 0.5 | 2 | 58 | < 1 | 1.46 | 0.99 | 0.04 | 35 | |
| NWRA3565 | 205 226 | 0.080 | 0.0023 | 27 | 19.5 | 1820 | 0.8 | 6.37 | 130 | 1.5 | < 2 | 0.36 | < 0.5 | 3 | 110 | 8 | 4.89 | 0.14 | 0.05 | 30 | |
| NWRA3566 | 205 226 | 0.030 | 0.0009 | 423 | 54 | 5870 | 0.2 | 5.20 | 420 | 2.0 | < 2 | 0.34 | < 0.5 | 7 | 127 | 5 | 6.99 | 1.07 | 0.05 | 45 | |
| NWRA3567 | 205 226 | 0.055 | 0.0016 | 344 | 29 | 5310 | 0.8 | 5.39 | 390 | 3.0 | < 2 | 0.18 | < 0.5 | 4 | 55 | 1 | 2.13 | 0.38 | 0.03 | 15 | |
| NWRA3568 | 205 226 | 0.025 | 0.0007 | 29 | 34 | 11760 | < 0.2 | 2.90 | 140 | 1.5 | < 2 | 0.33 | < 0.5 | 4 | 187 | 3 | 1.22 | 0.34 | 0.05 | 55 | |
| NWRA3569 | 205 226 | 0.020 | 0.0006 | 25 | 22 | 2770 | < 0.2 | 5.08 | 200 | 2.5 | < 2 | 0.85 | < 0.5 | 3 | 108 | 3 | 2.36 | 0.60 | 0.09 | 45 | |
| NWRA4420 | 205 226 | 0.015<0.0005 | | 12 | 3.8 | 1130 | 7.0 | 6.82 | 460 | 2.0 | < 2 | 0.19 | < 0.5 | 1 | 57 | < 1 | 0.61 | 3.32 | 0.05 | 20 | |
| NWRA4421 | 205 226 | 0.100 | 0.0029 | 177 | 27 | 8530 | 36.6 | 4.90 | 250 | 2.0 | < 2 | 0.15 | < 0.5 | 1 | 119 | 3 | 3.06 | 1.04 | 0.03 | 30 | |
| NWRA4422 | 205 226 | 0.075 | 0.0022 | 59 | 30 | 2800 | 2.2 | 8.05 | 650 | 2.0 | < 2 | 0.09 | < 0.5 | 3 | 61 | < 1 | 1.87 | 3.32 | 0.01 | 20 | |
| 4424 R | 205 226 | < 0.005<0.0005 | | 5 | 0.6 | 260 | 0.2 | 6.88 | 660 | 4.0 | < 2 | 0.61 | < 0.5 | 2 | 78 | 1 | 1.42 | 3.81 | 0.07 | 765 | |
| LM4425 V | 205 226 | 0.005<0.0005 | | 21 | 8.0 | 210 | 0.2 | 5.99 | 700 | 10.5 | < 2 | 0.40 | 0.5 | 6 | 60 | 3 | 0.47 | 3.23 | 0.12 | 2870 | |
| 4426 WR | 205 226 | < 0.005<0.0005 | | 2 | 6.0 | 90 | < 0.2 | 7.19 | 730 | 2.5 | < 2 | 0.31 | < 0.5 | 3 | 32 | < 1 | 2.35 | 4.42 | 0.09 | 135 | |
| 4427 R | 205 226 | < 0.005<0.0005 | | 4 | 3.0 | 10 | 0.2 | 7.77 | 830 | 2.0 | < 2 | 0.42 | < 0.5 | 2 | 28 | < 1 | 1.34 | 4.90 | 0.12 | 115 | |

CERTIFICATION:



Chemex Labs, Inc.

Analytical Chemists * Geochemists * Registered Assayers
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To: NEWMONT EXPLORATION LTD.

861 W. 6TH ST.
 WINNEMUCCA, NEVADA
 89445

Page Number :1-B
 Total Pages :2
 Certificate Date: 31-AUG-1999
 Invoice No. :19925991
 P.O. Number :3637-477
 Account :TNI

Project : ROSEBUD

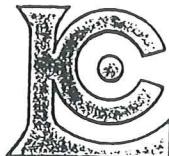
Comments: ATTN: C. BALLEW/R. VANCE PO#3637-477 (WILD ROSE)

CERTIFICATE OF ANALYSIS

A9925991

| SAMPLE | PREP CODE | Mo ppm (ICP) | Na % (ICP) | Ni ppm (ICP) | P ppm (ICP) | Pb ppm AAS | Sr ppm (ICP) | Ti % (ICP) | V ppm (ICP) | W ppm (ICP) | Zn ppm (ICP) | Se ppm |
|----------|-----------|-----------------|---------------|-----------------|----------------|---------------|-----------------|---------------|----------------|----------------|-----------------|--------|
| NWRA5656 | 205 226 | 2 | 0.12 | 2 | 50 | 14 | 33 | 0.01 | 4 | < 10 | 60 | < 0.2 |
| NWRA5657 | 205 226 | < 1 | 0.29 | < 1 | 600 | 16 | 126 | 0.14 | 9 | < 10 | 36 | 8.2 |
| NWRA5658 | 205 226 | 9 | 0.55 | < 1 | 1810 | 18 | 148 | 0.14 | 4 | < 10 | 322 | 2.2 |
| NWRA5659 | 205 226 | 1 | 0.21 | < 1 | 1030 | 18 | 125 | 0.23 | 27 | < 10 | 54 | 26.0 |
| NWRA5660 | 205 226 | < 1 | 2.56 | < 1 | 1040 | 30 | 310 | 0.35 | 33 | < 10 | 108 | < 0.2 |
| NWRA5661 | 205 226 | 1 | 0.13 | < 1 | 1180 | 16 | 120 | 0.15 | 26 | < 10 | 102 | 13.8 |
| NWRA5662 | 205 226 | 15 | 0.58 | 3 | 8260 | 8 | 254 | 0.10 | 98 | < 10 | 564 | 8.0 |
| NWRA5663 | 205 226 | 4 | 0.18 | 2 | 3900 | 6 | 664 | 0.12 | 42 | 40 | 82 | 0.8 |
| NWRA5664 | 205 226 | 1 | 2.28 | < 1 | 600 | 22 | 246 | 0.16 | 7 | < 10 | 74 | 0.4 |
| NWRA5665 | 205 226 | 3 | 0.15 | 1 | 940 | 26 | 60 | 0.07 | 5 | < 10 | 160 | 1.0 |
| NWRA5666 | 205 226 | 6 | 0.27 | 1 | 790 | 24 | 104 | 0.09 | 12 | < 10 | 252 | < 0.2 |
| NWRA5667 | 205 226 | 5 | 0.36 | < 1 | 520 | 38 | 87 | 0.09 | 6 | < 10 | 178 | 3.0 |
| NWRA5668 | 205 226 | 5 | 0.25 | < 1 | 770 | 16 | 221 | 0.07 | 19 | < 10 | 58 | 1.0 |
| NWRA5669 | 205 226 | 1 | 0.15 | 1 | 610 | 30 | 105 | 0.11 | 19 | < 10 | 68 | 1.0 |
| NWRA5670 | 205 226 | 1 | 0.20 | < 1 | 400 | 18 | 76 | 0.09 | 12 | < 10 | 10 | 1.4 |
| NWRA5671 | 205 226 | 50 | 0.23 | 4 | 5860 | 52 | 2170 | 0.04 | 39 | < 10 | 184 | 6.4 |
| NWRA5672 | 205 226 | 152 | 0.15 | 4 | 3830 | 2 | 66 | 0.01 | 19 | < 10 | 588 | < 0.2 |
| NWRA5673 | 205 226 | 1 | 0.34 | < 1 | 1210 | 16 | 262 | 0.16 | 14 | < 10 | 38 | 7.4 |
| NWRA5674 | 205 226 | 29 | 0.17 | 1 | 960 | 12 | 191 | 0.07 | 10 | < 10 | 86 | 11.2 |
| NWRA3556 | 205 226 | 10 | 0.30 | 1 | 1040 | 14 | 247 | 0.10 | 10 | < 10 | 46 | 1.8 |
| NWRA3557 | 205 226 | < 1 | 0.16 | < 1 | 700 | 6 | 187 | 0.10 | 8 | < 10 | 14 | 1.0 |
| NWRA3558 | 205 226 | 1 | 1.07 | 1 | 1260 | 22 | 167 | 0.16 | 20 | < 10 | 260 | < 0.2 |
| NWRA3559 | 205 226 | 46 | 0.15 | 5 | 9030 | 8 | 880 | 0.01 | 16 | 60 | 426 | 7.8 |
| NWRA3560 | 205 226 | < 1 | 0.10 | < 1 | 380 | 6 | 53 | 0.12 | 17 | < 10 | 8 | 1.8 |
| NWRA3561 | 205 226 | 1 | 0.36 | < 1 | 780 | 18 | 152 | 0.21 | 25 | < 10 | 30 | 2.2 |
| NWRA3562 | 205 226 | < 1 | 2.60 | < 1 | 100 | 32 | 25 | 0.04 | 1 | < 10 | 64 | < 0.2 |
| NWRA3563 | 205 226 | 2 | 0.53 | < 1 | 500 | 22 | 228 | 0.23 | 20 | < 10 | 104 | 4.0 |
| NWRA3564 | 205 226 | < 1 | 0.29 | < 1 | 400 | 14 | 73 | 0.16 | 7 | < 10 | 18 | 2.0 |
| NWRA3565 | 205 226 | 1 | 0.14 | 1 | 470 | 12 | 40 | 0.18 | 25 | < 10 | 56 | 3.2 |
| NWRA3566 | 205 226 | 8 | 0.26 | 2 | 860 | 22 | 93 | 0.17 | 35 | < 10 | 80 | 9.4 |
| NWRA3567 | 205 226 | 3 | 0.16 | 1 | 880 | 6 | 493 | 0.04 | 29 | < 10 | 10 | 2.6 |
| NWRA3568 | 205 226 | 3 | 0.10 | 3 | 660 | 8 | 47 | 0.24 | 14 | < 10 | 120 | 3.0 |
| NWRA3569 | 205 226 | 3 | 0.13 | 1 | 370 | 8 | 55 | 0.11 | 12 | < 10 | 20 | 0.6 |
| NWRA4420 | 205 226 | < 1 | 0.50 | < 1 | 70 | 20 | 30 | 0.03 | 1 | < 10 | 16 | 0.8 |
| NWRA4421 | 205 226 | 1 | 0.22 | 1 | 120 | 32 | 33 | 0.02 | 2 | < 10 | 42 | 10.8 |
| NWRA4422 | 205 226 | 3 | 0.44 | < 1 | 330 | 20 | 151 | 0.09 | 1 | < 10 | 46 | 4.4 |
| 4424 R | 205 226 | < 1 | 2.38 | < 1 | 90 | 28 | 75 | 0.04 | 2 | < 10 | 132 | < 0.2 |
| LM4425 V | 205 226 | 3 | 0.98 | 1 | 310 | 36 | 65 | 0.03 | 10 | < 10 | 264 | < 0.2 |
| 4426 WR | 205 226 | < 1 | 1.13 | < 1 | 110 | 30 | 47 | 0.04 | 2 | < 10 | 50 | < 0.2 |
| 4427 R | 205 226 | < 1 | 1.20 | < 1 | 100 | 26 | 61 | 0.04 | 1 | < 10 | 54 | < 0.2 |

CERTIFICATION:



Chemex Labs, Inc.

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To: NEWMONT EXPLORATION LTD.

861 W. 6TH ST.
 WINNEMUCCA, NEVADA
 89445

Page Number :2-A
 Total Pages :2
 Certificate Date: 31-AUG-1999
 Invoice No. :19925991
 P.O. Number :3637-477
 Account :TNI

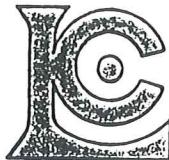
Project: ROSEBUD

Comments: ATTN: C. BALLEW/R. VANCE PO#3637-477 (WILD ROSE)

CERTIFICATE OF ANALYSIS A9925991

| SAMPLE | PREP CODE | Au ppm FA+AA calc. | Au oz/T | As ppm | Sb ppm | Hg ppb | Ag AAS | Al % (ICP) | Ba ppm (ICP) | Be ppm (ICP) | Bi ppm (ICP) | Ca % (ICP) | Cd ppm (ICP) | Co ppm (ICP) | Cr ppm (ICP) | Cu ppm (ICP) | Fe % (ICP) | K % (ICP) | Mg % (ICP) | Mn ppm (ICP) |
|------------|-----------|-----------------------|---------|--------|--------|--------|--------|------------|--------------|--------------|--------------|------------|--------------|--------------|--------------|--------------|------------|-----------|------------|--------------|
| 4428 V | 205 226 | < 0.005<0.0005 | | 1 | 1.0 | 90 | < 0.2 | 6.12 | 620 | 3.5 | < 2 | 0.49 | < 0.5 | 3 | 92 | < 1 | 2.08 | 3.58 | 0.04 | 240 |
| 4429 R | 205 226 | 0.085 0.0025 | | 95 | 46 | 840 | < 0.2 | 7.22 | 960 | 1.0 | < 2 | 0.48 | < 0.5 | 4 | 30 | 8 | 3.83 | 3.18 | 0.11 | 25 |
| 4430 R | 205 226 | < 0.005<0.0005 | | 1 | 1.2 | 40 | < 0.2 | 7.70 | 1170 | 3.0 | < 2 | 1.03 | < 0.5 | 4 | 63 | 3 | 2.62 | 3.78 | 0.05 | 300 |
| CHEM4431 V | 205 226 | 0.020 0.0006 | | 47 | 15.0 | 11830 | < 0.2 | 3.38 | 200 | 2.0 | < 2 | 0.32 | < 0.5 | 1 | 204 | 3 | 0.96 | 0.31 | 0.04 | 65 |
| CHEM4432 R | 205 226 | < 0.005<0.0005 | | 21 | 6.8 | 670 | < 0.2 | 5.72 | 270 | 1.5 | < 2 | 0.54 | < 0.5 | 1 | 134 | 2 | 0.88 | 0.63 | 0.07 | 55 |
| CHEM4433 R | 205 226 | 0.030 0.0009 | | 21 | 12.0 | 3410 | < 0.2 | 6.19 | 300 | 2.0 | < 2 | 0.16 | < 0.5 | 1 | 100 | 2 | 0.76 | 1.26 | 0.03 | 40 |
| LM 533 V | 205 226 | 0.010<0.0005 | | 11 | 1.0 | 170 | < 0.2 | 6.11 | 780 | 11.5 | < 2 | 0.62 | 0.5 | 12 | 122 | 4 | 7.09 | 3.29 | 0.07 | >10000 |

CERTIFICATION: _____



Chemex Labs, Inc.

Analytical Chemists * Geochemists * Registered Assayers
 994 Glendale Ave., Unit 3, Sparks
 Nevada, U.S.A.
 PHONE: 775-356-5395 FAX: 775-355-0179

To: NEWMONT EXPLORATION LTD.

861 W. 6TH ST.
 WINNEMUCCA, NEVADA
 89445

Page Number :2-B
 Total Pages :2
 Certificate Date: 31-AUG-1999
 Invoice No. :19925991
 P.O. Number :3637-477
 Account :TNI

Project : ROSEBUD

Comments: ATTN: C. BALLEW/R. VANCE PO#3637-477 (WILD ROSE)

CERTIFICATE OF ANALYSIS

A9925991

| SAMPLE | PREP CODE | Mo ppm (ICP) | Na % (ICP) | Ni ppm (ICP) | P ppm (ICP) | Pb ppm AAS | Sr ppm (ICP) | Ti % (ICP) | V ppm (ICP) | W ppm (ICP) | Zn ppm (ICP) | Se ppm |
|------------|-----------|-----------------|---------------|-----------------|----------------|---------------|-----------------|---------------|----------------|----------------|-----------------|-----------|
| 4428 V | 205 | 226 | < 1 | 2.06 | < 1 | 100 | 32 | 72 | 0.04 | 7 | < 10 | 72 < 0.2 |
| 4429 R | 205 | 226 | < 1 | 1.40 | < 1 | 400 | 20 | 236 | 0.25 | 33 | < 10 | 40 4.6 |
| 4430 R | 205 | 226 | 3 | 2.77 | < 1 | 340 | 26 | 176 | 0.09 | 4 | < 10 | 86 < 0.2 |
| CHEM4431 V | 205 | 226 | 1 | 0.15 | 2 | 220 | 12 | 81 | 0.06 | 5 | < 10 | 20 1.8 |
| CHEM4432 R | 205 | 226 | 1 | 0.25 | 1 | 210 | 28 | 54 | 0.06 | 10 | < 10 | 42 < 0.2 |
| CHEM4433 R | 205 | 226 | 4 | 0.34 | < 1 | 90 | 20 | 40 | 0.06 | 6 | < 10 | 44 1.8 |
| LM 533 V | 205 | 226 | 3 | 2.04 | 3 | 130 | 38 | 143 | 0.03 | 14 | < 10 | 748 < 0.2 |

CERTIFICATION:



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To: NEWMONT EXPLORATION LTD.

881 W. 6TH ST.
 WINNEMUCCA, NEVADA
 89445

Page Number : 1-A
 Total Pages : 1
 Certificate Date: 21-SEP-99
 Invoice No. : I9928474
 P.O. Number : 3637-477
 Account : TNI

Project : ROSEBUD

Comments: ATTN: CHARLOTTE BALLEW/RANDY VANCE PO# 3637-477

CERTIFICATE OF ANALYSIS A9928474

| SAMPLE | PREP CODE | Au ppm | Au oz/T | As ppm | Sb ppm | Hg ppb | Ag ppm | Al % | Ba ppm | Be ppm | Bi ppm | Ca % | Cd ppm | Co ppm | Cr ppm | Cu ppm | Fe % | K % | Mg % | Mn ppm |
|--------|------------|---------|----------|--------|--------|--------|--------|-------|--------|--------|--------|-------|--------|--------|--------|--------|-------|-------|-------|--------|
| | RUSH calc. | | | | | | AAS | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | |
| 2840 | 255 295 | 0.040 | 0.0012 | 16 | 9.2 | 1160 | 0.8 | 4.07 | 140 | 2.5 | < 2 | 0.24 | < 0.5 | 1 | 87 | 1 | 1.12 | 0.19 | 0.02 | 65 |
| 2841 | 255 295 | 0.010 | < 0.0005 | 13 | 7.4 | 1880 | < 0.2 | 3.63 | 1030 | 2.5 | < 2 | 0.23 | < 0.5 | 1 | 165 | 3 | 1.34 | 0.42 | 0.05 | 65 |
| 2842 | 255 295 | 0.030 | 0.0009 | 37 | 33 | 3950 | 0.2 | 5.09 | 460 | 2.0 | < 2 | 1.03 | < 0.5 | 4 | 94 | 6 | 2.54 | 0.79 | 0.04 | 35 |
| 2843 | 255 295 | 0.010 | < 0.0005 | 67 | 22 | 6800 | < 0.2 | 5.93 | 510 | 3.5 | < 2 | 0.37 | < 0.5 | 3 | 60 | 6 | 2.28 | 1.77 | 0.07 | 100 |
| 2844 | 255 295 | 0.020 | 0.0006 | 72 | 22 | 8950 | < 0.2 | 5.66 | 1390 | 2.0 | < 2 | 0.20 | < 0.5 | 4 | 134 | 4 | 1.30 | 3.96 | 0.03 | 65 |
| 2845 | 255 295 | 0.035 | 0.0010 | 505 | 68 | 1130 | < 0.2 | 3.36 | 570 | 4.0 | < 2 | 0.35 | < 0.5 | 4 | 78 | 4 | 10.70 | 0.75 | 0.05 | 55 |
| 2846 | 255 295 | < 0.005 | < 0.0005 | 563 | 190 | 1140 | < 0.2 | 4.43 | 500 | 1.5 | < 2 | 0.19 | < 0.5 | 4 | 92 | 6 | 10.05 | 1.05 | 0.05 | 80 |
| 2847 | 255 295 | 0.060 | 0.0018 | 345 | 42 | 710 | < 0.2 | 5.91 | 330 | 7.0 | < 2 | 0.51 | < 0.5 | 6 | 108 | 24 | 13.95 | 0.94 | 0.12 | 345 |
| 2848 | 255 -- | 0.085 | 0.0025 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | |
| 2849 | 255 -- | 0.025 | 0.0007 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | |
| 2850 | 255 -- | 0.065 | 0.0019 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | |
| 2851 | 255 -- | 0.040 | 0.0012 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | |
| 2852 | 255 295 | 0.530 | 0.0155 | 384 | 160 | 9930 | 3.2 | 3.99 | 340 | 2.0 | < 2 | 0.27 | < 0.5 | 1 | 136 | 6 | 1.65 | 0.79 | 0.07 | 70 |
| 2852B | 3299 -- | 6.56 | 0.1913 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | |
| 2853 | 255 -- | 0.070 | 0.0020 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | |
| 2854 | 255 295 | 0.025 | 0.0007 | 62 | 16.0 | 4680 | < 0.2 | 5.34 | 140 | 2.0 | < 2 | 0.09 | < 0.5 | 1 | 113 | 2 | 1.65 | 0.36 | 0.02 | 40 |
| 2855 | 255 -- | 0.300 | 0.0088 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | |
| 2856 | 255 295 | 0.185 | 0.0054 | 49 | 16.0 | 5940 | 6.8 | 4.37 | 150 | 1.5 | < 2 | 0.15 | < 0.5 | 1 | 182 | 4 | 1.39 | 0.26 | 0.06 | 65 |
| 2857 | 255 295 | 0.350 | 0.0102 | 57 | 44 | 1970 | 0.6 | 1.51 | 170 | 2.0 | < 2 | 0.08 | < 0.5 | 2 | 659 | 7 | 1.30 | 0.78 | 0.01 | 45 |
| 2858 | 255 295 | 0.110 | 0.0032 | 33 | 30 | 5220 | 0.8 | 3.84 | 510 | 2.0 | < 2 | 0.09 | 0.5 | 2 | 176 | 3 | 0.85 | 0.17 | 0.01 | 35 |
| 2859 | 255 295 | 0.690 | 0.0201 | 202 | 50 | 21600 | 2.0 | 1.79 | 640 | 2.0 | < 2 | 0.15 | < 0.5 | 2 | 257 | 8 | 3.18 | 0.22 | 0.03 | 45 |
| 2860 | 255 295 | 0.410 | 0.0120 | 1270 | 220 | 340 | 0.8 | 2.61 | 220 | 1.5 | < 2 | 0.72 | < 0.5 | 4 | 8 | 10 | >25.0 | 1.86 | 0.18 | 190 |
| 2861 | 255 295 | 0.190 | 0.0055 | 1020 | 240 | 910 | 1.2 | 1.71 | 190 | 2.0 | < 2 | 0.60 | < 0.5 | 5 | 167 | 7 | 20.5 | 1.91 | 0.14 | 140 |
| 2862 | 255 295 | 0.220 | 0.0064 | 714 | 170 | 1200 | 0.6 | 4.39 | 250 | 1.5 | < 2 | 0.48 | < 0.5 | 5 | 51 | 5 | 15.15 | 2.04 | 0.33 | 445 |
| 2863 | 255 295 | 0.080 | 0.0023 | 51 | 17.0 | 9320 | < 0.2 | 6.17 | 570 | 2.0 | < 2 | 0.48 | < 0.5 | 1 | 80 | 7 | 1.20 | 2.49 | 0.07 | 40 |
| 2864 | 255 295 | 0.265 | 0.0077 | 894 | 340 | 2220 | 1.0 | 3.12 | 150 | 1.5 | < 2 | 0.56 | < 0.5 | 4 | 37 | 14 | 20.9 | 1.75 | 0.17 | 190 |
| 2864B | 3299 -- | 1.095 | 0.0319 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | |
| 2865 | 255 295 | 0.035 | 0.0010 | 105 | 150 | 1370 | < 0.2 | 4.67 | 170 | 2.0 | < 2 | 0.30 | < 0.5 | 1 | 163 | 8 | 2.55 | 0.30 | 0.08 | 85 |
| 2866 | 255 295 | 0.065 | 0.0019 | 28 | 30 | 680 | 0.2 | 15.35 | 850 | 1.5 | < 2 | 0.12 | < 0.5 | 3 | 11 | 2 | 0.98 | 6.06 | 0.02 | 5 |
| 2867 | 255 295 | 0.055 | 0.0016 | 175 | 70 | 5780 | < 0.2 | 5.79 | 450 | 2.0 | < 2 | 0.15 | < 0.5 | 1 | 80 | 6 | 2.10 | 1.38 | 0.04 | 25 |
| 2868 | 255 295 | 0.180 | 0.0053 | 608 | 120 | 3970 | 3.0 | 2.68 | 420 | 3.0 | < 2 | 0.27 | < 0.5 | 4 | 167 | 8 | 11.25 | 0.60 | 0.09 | 75 |



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To: NEWMONT EXPLORATION LTD.

881 W. 6TH ST.
 WINNEMUCCA, NEVADA
 89445

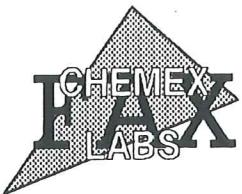
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 Total Pages : 1
 Certificate Date: 21-SEP-99
 Invoice No. : 19928474
 P.O. Number : 3637-477
 Account : TNI

Project : ROSEBUD

Comments: ATTN: CHARLOTTE BALLEW/RANDY VANCE PO# 3637-477

CERTIFICATE OF ANALYSIS A9928474

| SAMPLE | PREP CODE | Mo ppm (ICP) | Na & Ni ppm (ICP) | P ppm (ICP) | Pb ppm AAS | Sr ppm (ICP) | Ti & V ppm (ICP) | W ppm (ICP) | Zn ppm (ICP) | Se ppm |
|--------|-----------|-----------------|----------------------|----------------|---------------|-----------------|---------------------|----------------|-----------------|---------|
| 2840 | 255 295 | < 1 | 0.13 | < 1 | 1440 | 8 | 151 | 6.11 | 6 < 10 | 16 1.6 |
| 2841 | 255 295 | 4 | 0.14 | 3 | 120 | 18 | 108 | 0.05 | 17 < 10 | 20 2.0 |
| 2842 | 255 295 | 3 | 0.33 | < 1 | 580 | 14 | 330 | 0.20 | 28 < 10 | 42 4.4 |
| 2843 | 255 295 | 5 | 0.42 | < 1 | 600 | 16 | 121 | 0.12 | 14 < 10 | 42 1.6 |
| 2844 | 255 295 | < 1 | 0.46 | 1 | 360 | 16 | 225 | 0.11 | 7 < 10 | 22 2.4 |
| 2845 | 255 295 | 4 | 0.14 | 1 | 3740 | 18 | 1765 | 0.09 | 39 < 10 | 38 1.8 |
| 2846 | 255 295 | 26 | 0.27 | 3 | 620 | 16 | 160 | 0.08 | 50 < 10 | 60 10.0 |
| 2847 | 255 295 | 8 | 0.25 | 4 | 5640 | 44 | 3230 | 0.11 | 42 < 10 | 108 7.2 |
| 2849 | 255 -- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 2850 | 255 -- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 2851 | 255 -- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 2852 | 255 295 | 6 | 0.14 | 2 | 300 | 14 | 148 | 0.07 | 11 < 10 | 12 6.0 |
| 2852B | 3299 -- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 2853 | 255 -- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 2854 | 255 295 | 1 | 0.19 | 1 | 150 | 62 | 35 | 0.08 | 5 < 10 | 26 2.6 |
| 2855 | 255 -- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 2856 | 255 295 | 6 | 0.13 | 2 | 120 | 12 | 62 | 0.07 | 3 < 10 | 8 5.2 |
| 2857 | 255 295 | 3 | 0.51 | 7 | 80 | 4 | 58 | 0.01 | 2 < 10 | 16 7.4 |
| 2858 | 255 295 | 9 | 0.11 | 1 | 140 | 14 | 89 | 0.06 | 3 < 10 | 80 8.0 |
| 2859 | 255 295 | 24 | 0.07 | 9 | 990 | 8 | 452 | 0.01 | 1 < 10 | 12 34.0 |
| 2860 | 255 295 | 77 | 0.16 | 4 >10000 | 12 | 1480 | 0.04 | 6 < 10 | 48 5.2 | |
| 2861 | 255 295 | 70 | 0.08 | 6 >10000 | 14 | 1935 | 0.03 | 13 < 10 | 48 5.0 | |
| 2862 | 255 295 | 101 | 0.16 | 4 | 4810 | 20 | 806 | 0.08 | 12 < 10 | 22 7.2 |
| 2863 | 255 295 | 1 | 0.41 | 1 | 150 | 14 | 73 | 0.12 | 1 < 10 | 12 2.8 |
| 2864 | 255 295 | 118 | 0.17 | 5 | 8360 | 18 | 1735 | 0.07 | 13 < 10 | 40 5.4 |
| 2864B | 3299 -- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 2865 | 255 295 | 12 | 0.12 | 3 | 680 | 22 | 49 | 0.08 | 6 < 10 | 14 2.8 |
| 2866 | 255 295 | 4 | 0.57 | < 1 | 1470 | 16 | 956 | 0.01 | 5 < 10 | 26 1.8 |
| 2867 | 255 295 | 36 | 0.23 | 1 | 360 | 18 | 132 | 0.11 | 21 < 10 | 20 2.8 |
| 2868 | 255 295 | 7 | 0.08 | 3 | 3460 | 10 | 387 | 0.05 | 19 < 10 | 30 7.6 |



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861 W. 6TH ST.
 WINNEMUCCA, NEVADA
 89445

Page Number :1-A
 Total Pages :1
 Certificate Date: 01-OCT-99
 Invoice No. :I9929526
 P.O. Number :
 Account :TNI

Project : ROSEBUD
 Comments: ATTN: C. BALLEW/P. MITCHELL/R. VANCE

CERTIFICATE OF ANALYSIS A9929526

| SAMPLE | PREP CODE | Au ppm | Au oz/T | As FA+AA | Sb calc. | Hg ppm | Ag ppb | Al % | Ba (ICP) | Be (ICP) | Bi (ICP) | Ca % | Cd (ICP) | Co (ICP) | Cr (ICP) | Cu (ICP) | Fe % | K % | Mg % | Mn ppm |
|----------|-----------|--------|---------|----------|----------|--------|--------|-------|----------|----------|----------|------|----------|----------|----------|----------|------|-------|------|--------|
| NWRA4437 | 205 | 226 | 0.110 | 0.0032 | 215 | 66 | 5920 | 11.4 | 8.95 | 480 | 1.0 | < 2 | 0.26 | < 0.5 | 3 | 104 | 6 | 3.90 | 3.32 | 0.05 |
| NWRA4438 | 205 | 226 | 0.025 | 0.0007 | 58 | 18.0 | 2670 | < 0.2 | 5.63 | 120 | 1.5 | < 2 | 0.16 | < 0.5 | 2 | 202 | 4 | 1.07 | 1.64 | 0.01 |
| NWRA4439 | 205 | 226 | 0.010 | < 0.0005 | 79 | 13.0 | 420 | 1.8 | 16.45 | 180 | < 0.5 | < 2 | 0.02 | < 0.5 | 3 | 12 | < 1 | 2.58 | 6.95 | < 0.01 |
| NWRA4440 | 205 | 226 | 0.025 | 0.0007 | 745 | 80 | 1750 | < 0.2 | 1.76 | 90 | < 0.5 | < 2 | 0.30 | < 0.5 | < 1 | 56 | 19 | >25.0 | 0.18 | 0.08 |
| NWRA4441 | 205 | 226 | 0.040 | 0.0012 | 34 | 11.5 | 7110 | 2.4 | 4.42 | 670 | 2.5 | < 2 | 0.06 | < 0.5 | 2 | 136 | 1 | 1.17 | 0.26 | < 0.01 |
| NWRA4442 | 205 | 226 | 0.040 | 0.0012 | 127 | 20 | 7440 | 3.4 | 6.16 | 310 | 2.0 | < 2 | 0.09 | < 0.5 | 2 | 77 | < 1 | 2.12 | 0.86 | 0.02 |
| NWRA4443 | 205 | 226 | 0.020 | 0.0006 | 64 | 8.0 | 1320 | 0.8 | 13.60 | 410 | 1.0 | < 2 | 0.09 | < 0.5 | 3 | 24 | < 1 | 0.91 | 5.20 | < 0.01 |



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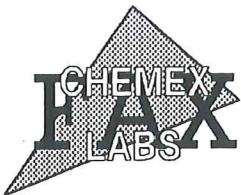
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Page Number :1-B
 Total Pages :1
 Certificate Date: 01-OCT-99
 Invoice No. :I9929526
 P.O. Number :
 Account :TNI

Project : ROSEBUD
 Comments: ATTN: C. BALLEW/P. MITCHELL/R. VANCE

CERTIFICATE OF ANALYSIS A9929526

| SAMPLE | PREP CODE | Mo ppm (ICP) | Na % ppm (ICP) | Ni ppm (ICP) | P ppm (ICP) | Pb ppm AAS | Sr ppm (ICP) | Ti % V ppm (ICP) | W ppm (ICP) | Zn ppm (ICP) | Se ppm |
|----------|-----------|-----------------|-------------------|-----------------|----------------|---------------|-----------------|---------------------|----------------|-----------------|--------|
| NWRA4437 | 205 226 | 17 | 0.31 | < 1 | 1030 | 14 | 129 | 0.06 | 20 | < 10 | 30 |
| NWRA4438 | 205 226 | 8 | 0.11 | 1 | 1040 | 16 | 155 | 0.06 | 11 | < 10 | 2 |
| NWRA4439 | 205 226 | 29 | 0.31 | < 1 | 1660 | 48 | 907 | < 0.01 | 32 | < 10 | 6 |
| NWRA4440 | 205 226 | 281 | 0.14 | 4 | 1090 | 16 | 118 | 0.02 | 74 | < 10 | 116 |
| NWRA4441 | 205 226 | 13 | 0.09 | 1 | 320 | 4 | 310 | 0.04 | 3 | < 10 | 8 |
| NWRA4442 | 205 226 | 3 | 0.11 | < 1 | 530 | 8 | 371 | 0.07 | 2 | < 10 | 24 |
| NWRA4443 | 205 226 | < 1 | 0.19 | < 1 | 2020 | 8 | 1300 | 0.01 | 4 | < 10 | 18 |



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Page Number : 1-A
 Total Pages : 1
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 Invoice No. : I9929983
 P.O. Number :
 Account : TNI

Project : ROSEBUD
 Comments: ATTN: C. BALLEW/P. MITCHELL/R. VANCE

CERTIFICATE OF ANALYSIS A9929983

| SAMPLE | PREP CODE | | Au ppm | Au oz/T | As ppm | Sb ppm | Hg ppb | Ag AAS | Al % | Ba (ICP) | Be (ICP) | Bi (ICP) | Ca % | Cd ppm | Co ppm | Cr ppm | Cu ppm | Fe % | K % | Mg % | Mn ppm |
|----------|-----------|-----|----------------|---------|--------|--------|--------|--------|-------|----------|----------|----------|-------|--------|--------|--------|--------|-------|-------|-------|--------|
| | | | FA+AA calc. | | | | | | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | |
| NWRA6914 | 205 | 226 | 0.005<0.0005 | | 32 | 8.0 | 6310 | < 0.2 | 10.00 | 770 | 0.5 | < 2 | 0.25 | < 0.5 | 3 | 39 | 1 | 0.62 | 3.20 | 0.03 | 50 |
| NWRA6915 | 205 | 226 | < 0.005<0.0005 | | 75 | 15.0 | 3510 | < 0.2 | 6.45 | 1000 | 5.5 | < 2 | 0.23 | < 0.5 | 6 | 46 | 2 | 7.31 | 2.82 | 0.06 | 695 |
| NWRA6916 | 205 | 226 | < 0.005<0.0005 | | 5 | 0.8 | 40 | 3.0 | 8.02 | 1220 | 3.0 | < 2 | 1.00 | < 0.5 | 3 | 50 | < 1 | 2.10 | 3.83 | 0.15 | 680 |
| NWRA6917 | 205 | 226 | 0.020 0.0006 | | 243 | 38 | 4980 | < 0.2 | 2.41 | 300 | 13.5 | < 2 | 0.22 | < 0.5 | 10 | 62 | 1 | 18.45 | 1.34 | 0.06 | 1840 |
| NWRA6918 | 205 | 226 | 0.010<0.0005 | | 81 | 16.5 | 1420 | 0.8 | 6.54 | 270 | 2.0 | < 2 | 0.29 | < 0.5 | 1 | 49 | 1 | 2.20 | 0.43 | 0.04 | 35 |
| NWRA6919 | 205 | 226 | 0.045 0.0013 | | 124 | 62 | 5040 | < 0.2 | 4.55 | 350 | 2.0 | < 2 | 0.29 | < 0.5 | 3 | 146 | 4 | 1.85 | 0.77 | 0.04 | 45 |
| NWRA6920 | 205 | 226 | 0.015<0.0005 | | 160 | 38 | 2790 | 0.4 | 4.91 | 300 | 2.5 | < 2 | 0.28 | < 0.5 | 3 | 145 | 1 | 1.59 | 0.84 | 0.03 | 35 |
| NWRA6921 | 205 | 226 | 0.040 0.0012 | | 80 | 36 | 7260 | 0.2 | 7.89 | 170 | 2.0 | < 2 | 0.26 | < 0.5 | 2 | 70 | 3 | 1.30 | 1.94 | 0.02 | 30 |
| NWRA6922 | 205 | 226 | 0.015<0.0005 | | 51 | 11.0 | 3890 | < 0.2 | 4.77 | 290 | 1.5 | < 2 | 0.19 | < 0.5 | 1 | 216 | 2 | 0.86 | 1.11 | 0.02 | 40 |
| NWRA6923 | 205 | 226 | 0.050 0.0015 | | 188 | 100 | 14670 | 0.2 | 5.91 | 280 | 1.5 | < 2 | 0.42 | < 0.5 | 3 | 102 | 4 | 4.20 | 1.09 | 0.06 | 40 |
| NWRA6924 | 205 | 226 | 0.060 0.0018 | | 246 | 80 | 7170 | 0.2 | 5.15 | 280 | 2.0 | < 2 | 0.16 | < 0.5 | 3 | 142 | < 1 | 2.67 | 0.75 | 0.01 | 25 |
| NWRA6925 | 205 | 226 | 0.080 0.0023 | | 159 | 59 | 21900 | 0.4 | 4.34 | 380 | 2.0 | < 2 | 0.19 | < 0.5 | 2 | 187 | 5 | 2.97 | 0.73 | 0.03 | 30 |
| NWRA6926 | 205 | 226 | 0.070 0.0020 | | 208 | 270 | 9530 | 0.2 | 4.78 | 460 | 1.5 | < 2 | 0.23 | < 0.5 | 3 | 158 | 12 | 2.48 | 0.56 | 0.02 | 30 |
| NWRA6927 | 205 | 226 | 0.050 0.0015 | | 108 | 30 | 8120 | 0.2 | 6.56 | 340 | 1.5 | < 2 | 0.22 | < 0.5 | 2 | 160 | 3 | 1.29 | 1.15 | 0.02 | 25 |
| NWRA6928 | 205 | 226 | 0.030 0.0009 | | 108 | 36 | 11520 | 0.2 | 9.27 | 340 | 0.5 | < 2 | 0.50 | < 0.5 | 3 | 86 | 4 | 2.54 | 2.59 | 0.08 | 75 |
| NWRA6929 | 205 | 226 | 0.045 0.0013 | | 150 | 74 | 18420 | < 0.2 | 5.07 | 190 | 1.5 | < 2 | 0.32 | < 0.5 | 6 | 190 | 25 | 2.52 | 0.90 | 0.03 | 35 |
| NWRA6930 | 205 | 226 | 0.040 0.0012 | | 121 | 61 | 11870 | 0.2 | 5.35 | 250 | 2.0 | < 2 | 0.23 | < 0.5 | 3 | 145 | 12 | 2.66 | 1.30 | 0.03 | 40 |
| NWRA6931 | 205 | 226 | 0.040 0.0012 | | 63 | 17.5 | 2400 | 4.0 | 4.22 | 170 | 2.0 | < 2 | 0.27 | < 0.5 | 1 | 124 | 1 | 1.74 | 0.95 | 0.03 | 40 |
| NWRA6932 | 205 | 226 | 0.025 0.0007 | | 51 | 11.5 | 3180 | 0.4 | 4.95 | 380 | 1.5 | < 2 | 0.12 | < 0.5 | 1 | 118 | 2 | 0.97 | 0.69 | 0.01 | 30 |
| NWRA6933 | 205 | 226 | 0.015<0.0005 | | 75 | 13.0 | 5010 | 0.2 | 6.33 | 340 | 1.5 | < 2 | 0.22 | < 0.5 | 2 | 77 | < 1 | 1.57 | 1.19 | 0.03 | 25 |
| NWRA6934 | 205 | 226 | 0.140 0.0041 | | 182 | 39 | 5460 | 1.0 | 14.90 | 260 | 1.5 | < 2 | 0.36 | < 0.5 | 3 | 14 | < 1 | 2.70 | 6.28 | 0.03 | 5 |
| NWRA6935 | 205 | 226 | 0.345 0.0101 | | 239 | 60 | 6350 | 7.4 | 5.95 | 430 | 1.5 | < 2 | 0.19 | < 0.5 | 1 | 65 | < 1 | 3.73 | 2.07 | 0.03 | 30 |
| NWRA6936 | 205 | 226 | 0.070 0.0020 | | 113 | 17.0 | 8640 | 1.2 | 4.73 | 190 | 2.0 | < 2 | 0.20 | < 0.5 | 1 | 157 | 4 | 1.84 | 0.38 | 0.03 | 35 |
| NWRA6937 | 205 | 226 | 0.020 0.0006 | | 55 | 13.5 | 2770 | < 0.2 | 7.43 | 170 | 1.5 | < 2 | 0.14 | < 0.5 | 1 | 109 | 1 | 1.31 | 1.88 | 0.01 | 20 |
| NWRA6938 | 205 | 226 | 0.045 0.0013 | | 49 | 19.0 | 400 | < 0.2 | 5.50 | 360 | 2.0 | < 2 | 0.37 | < 0.5 | 1 | 103 | 1 | 2.38 | 0.78 | 0.05 | 25 |
| NWRA6939 | 205 | 226 | 0.045 0.0013 | | 60 | 30 | 1180 | 0.6 | 8.36 | 530 | 0.5 | < 2 | 0.19 | < 0.5 | 3 | 142 | < 1 | 1.12 | 2.89 | 0.01 | 65 |
| NWRA6940 | 205 | 226 | 0.055 0.0016 | | 142 | 33 | 9340 | 0.2 | 7.24 | 610 | 2.0 | < 2 | 0.21 | < 0.5 | 3 | 68 | 1 | 2.86 | 1.48 | 0.04 | 35 |

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10/07/99 9:57AM

P.02 R-783 Job-626

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 WINNEMUCCA, NEVADA
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Page Number : 1-B
 Total Pages : 1
 Certificate Date: 06-OCT-99
 Invoice No. : 19929983
 P.O. Number :
 Account : TNI

Project : ROSEBUD
 Comments: ATTN: C. BALLEW/P. MITCHELL/R. VANCE

CERTIFICATE OF ANALYSIS

A9929983

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| NWRA6914 | 205 226 | < 1 | 0.28 | < 1 | 710 | 20 | 284 | 0.10 | 21 | < 10 | 14 | 3.6 |
| NWRA6915 | 205 226 | < 1 | 0.49 | < 1 | 860 | 20 | 256 | 0.09 | 5 | < 10 | 128 | 1.4 |
| NWRA6916 | 205 226 | < 1 | 2.07 | < 1 | 380 | 26 | 190 | 0.11 | 1 | < 10 | 92 | < 0.2 |
| NWRA6917 | 205 226 | 3 | 0.16 | 3 | 2330 | 16 | 602 | 0.02 | 10 | < 10 | 310 | 4.8 |
| NWRA6918 | 205 226 | < 1 | 0.14 | < 1 | 410 | 20 | 92 | 0.10 | 3 | < 10 | 14 | 3.6 |
| NWRA6919 | 205 226 | 8 | 0.16 | 1 | 480 | 16 | 199 | 0.06 | 10 | < 10 | 6 | 5.8 |
| NWRA6920 | 205 226 | 8 | 0.13 | 1 | 320 | 14 | 114 | 0.07 | 4 | < 10 | 40 | 2.0 |
| NWRA6921 | 205 226 | 1 | 0.21 | < 1 | 350 | 20 | 68 | 0.07 | 3 | < 10 | 42 | 3.4 |
| NWRA6922 | 205 226 | 7 | 0.23 | 2 | 380 | 20 | 116 | 0.08 | 5 | < 10 | 6 | 1.8 |
| NWRA6923 | 205 226 | 5 | 0.24 | < 1 | 690 | 22 | 177 | 0.06 | 12 | < 10 | 16 | 5.6 |
| NWRA6924 | 205 226 | 93 | 0.16 | 2 | 260 | 18 | 152 | 0.07 | 4 | < 10 | 22 | 5.2 |
| NWRA6925 | 205 226 | 8 | 0.16 | 1 | 310 | 18 | 92 | 0.05 | 6 | < 10 | 10 | 9.8 |
| NWRA6926 | 205 226 | 14 | 0.20 | 1 | 280 | 18 | 81 | 0.06 | 7 | < 10 | 4 | 5.4 |
| NWRA6927 | 205 226 | 5 | 0.27 | < 1 | 390 | 20 | 135 | 0.08 | 5 | < 10 | 10 | 4.4 |
| NWRA6928 | 205 226 | 7 | 0.52 | < 1 | 540 | 18 | 191 | 0.09 | 13 | < 10 | 10 | 6.2 |
| NWRA6929 | 205 226 | 17 | 0.14 | 3 | 520 | 28 | 175 | 0.07 | 36 | < 10 | 6 | 9.4 |
| NWRA6930 | 205 226 | 12 | 0.15 | 1 | 390 | 14 | 225 | 0.07 | 17 | < 10 | 10 | 9.4 |
| NWRA6931 | 205 226 | 8 | 0.14 | 1 | 420 | 14 | 123 | 0.06 | 4 | < 10 | 16 | 3.6 |
| NWRA6932 | 205 226 | 1 | 0.13 | 1 | 240 | 10 | 104 | 0.06 | 3 | < 10 | 12 | 1.6 |
| NWRA6933 | 205 226 | 1 | 0.23 | < 1 | 250 | 16 | 64 | 0.09 | 2 | < 10 | 12 | 2.0 |
| NWRA6934 | 205 226 | 8 | 0.49 | < 1 | 1140 | 8 | 805 | < 0.01 | 3 | < 10 | 28 | 3.8 |
| NWRA6935 | 205 226 | 13 | 0.20 | < 1 | 780 | 18 | 268 | 0.03 | 4 | < 10 | 22 | 15.4 |
| NWRA6936 | 205 226 | 2 | 0.14 | 3 | 110 | 18 | 44 | 0.06 | 5 | < 10 | 32 | 3.8 |
| NWRA6937 | 205 226 | < 1 | 0.29 | < 1 | 200 | 18 | 140 | 0.03 | 3 | < 10 | 14 | 2.6 |
| NWRA6938 | 205 226 | 2 | 0.18 | 1 | 120 | 20 | 63 | 0.04 | 4 | < 10 | 18 | 5.6 |
| NWRA6939 | 205 226 | 23 | 0.41 | < 1 | 520 | 12 | 495 | 0.07 | 6 | < 10 | 8 | 11.6 |
| NWRA6940 | 205 226 | 6 | 0.26 | < 1 | 520 | 14 | 156 | 0.08 | 7 | < 10 | 24 | 3.0 |

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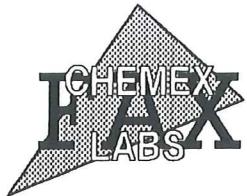
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PAGE 003



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861 W. 6TH ST.
 WINNEMUCCA, NEVADA
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Page Number : 1-A
 Total Pages : 1
 Certificate Date: 05-OCT-99
 Invoice No. : I9929687
 P.O. Number : 3837-477
 Account : TNI

Project : ROSEBUD

Comments: ATTN: CHARLOTTE BALLEW/RANDY VANCE PO# 3837-477

CERTIFICATE OF ANALYSIS A9929687

| SAMPLE | PREP CODE | Au ppm | Au oz/T | As ppm | Sb ppm | Hg ppb | Ag AAS | Al % | Ba ppm | Be ppm | Bi ppm | Ca % | Cd ppm | Co ppm | Cr ppm | Cu ppm | Fe % | K % | Mg % | Mn ppm |
|-----------|-----------|--------|---------|--------|--------|--------|--------|-------|--------|--------|--------|-------|--------|--------|--------|--------|-------|-------|-------|--------|
| | | FA+AA | calc. | | | | | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | |
| NWRA2890 | 205 | 226 | 0.060 | 0.0018 | 40 | 12.0 | 8450 | 0.6 | 4.92 | 610 | 2.0 | < 2 | 0.35 | < 0.5 | 2 | 123 | 4 | 0.72 | 0.92 | 0.08 |
| NWRA2891 | 205 | 226 | 0.065 | 0.0019 | 47 | 11.5 | 3790 | < 0.2 | 3.48 | 150 | 2.0 | < 2 | 0.60 | < 0.5 | 1 | 231 | 4 | 1.36 | 0.35 | 0.04 |
| NWRA2891B | 3299 | -- | 0.150 | 0.0044 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| NWRA2892 | 205 | 226 | 0.035 | 0.0010 | 67 | 16.0 | 9790 | < 0.2 | 6.65 | 490 | 2.0 | < 2 | 0.09 | < 0.5 | 2 | 65 | 2 | 1.21 | 1.05 | 0.01 |
| NWRA2896 | 205 | 226 | 0.190 | 0.0055 | 76 | 18.5 | 710 | 1.8 | 3.38 | 260 | 2.0 | < 2 | 0.10 | < 0.5 | 1 | 202 | 3 | 0.68 | 0.84 | 0.03 |
| | | | | | | | | | | | | | | | | | | | 50 | |

CERTIFICATION: _____



Chemex Labs, Inc.

Analytical Chemists * Geochemists * Registered Assayers
994 Glendale Ave., Unit 3, Sparks
Nevada, U.S.A. 89431
PHONE: 775-356-5395 FAX: 775-355-0179

To: NEWMONT EXPLORATION LTD.

861 W. 6TH ST.
WINNEMUCCA, NEVADA
89445

Page Number :1-B
Total Pages :1
Certificate Date: 05-OCT-99
Invoice No. :I9929687
P.O. Number :3637-477
Account :TNI

Project : ROSEBUD

Comments: ATTN: CHARLOTTE BALLEW/RANDY VANCE PO# 3637-477

CERTIFICATE OF ANALYSIS

A9929687

| SAMPLE | PREP CODE | Mo ppm (ICP) | Na % (ICP) | Ni ppm (ICP) | P ppm (ICP) | Pb ppm (ICP) | Sr ppm AAS | Ti % (ICP) | V ppm (ICP) | W ppm (ICP) | Zn ppm (ICP) | Se ppm |
|-----------|-----------|-----------------|---------------|-----------------|----------------|-----------------|---------------|---------------|----------------|----------------|-----------------|-----------|
| NWRA2890 | 205 226 | 1 | 0.17 | 1 | 150 | 16 | 103 | 0.06 | 6 | < 10 | 28 | 1.4 |
| NWRA2891 | 205 226 | 2 | 0.15 | 2 | 150 | 14 | 99 | 0.06 | 6 | < 10 | 10 | 4.0 |
| NWRA2891B | 3299 -- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| NWRA2892 | 205 226 | 14 | 0.18 | < 1 | 240 | 18 | 65 | 0.10 | 7 | < 10 | 12 | 3.0 |
| NWRA2896 | 205 226 | 8 | 0.08 | 3 | 60 | 48 | 59 | 0.01 | 9 | < 10 | 10 | 2.6 |

OCT-05-99 15:02

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P.03 R-774

Job-610

PAGE 003

CERTIFICATION:



Chemex Labs, Inc.

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861 W. 6TH ST.
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 89445

Page Number :1-A
 Total Pages :1
 Certificate Date: 06-OCT-99
 Invoice No. :I9929688
 P.O. Number :3637-477
 Account :TNI

Project : ROSEBUD

Comments: ATTN: CHARLOTTE BALLEW/RANDY VANCE PO# 3637-477

CERTIFICATE OF ANALYSIS A9929688

| SAMPLE | PREP CODE | Au ppm | Au oz/T | As | Sb | Hg | Ag ppm | Al % | Ba ppm | Be ppm | Bi ppm | Ca % | Cd ppm | Co ppm | Cr ppm | Cu ppm | Fe % | K % | Mg % | Mn ppm |
|-----------|-----------|------------------|---------|------|------|-------|--------|-------|--------|--------|--------|-------|--------|--------|--------|--------|-------|-------|-------|--------|
| | | FA+AA calc. | | ppm | ppm | ppb | AAS | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | |
| NWRA2869 | 205 226 | 0.040 < 0.0012 | 175 | 51 | 1180 | < 0.2 | 5.38 | 220 | 2.5 | < 2 | 0.46 | < 0.5 | 3 | 89 | 6 | 3.80 | 0.13 | 0.11 | 75 | |
| NWRA2870 | 205 226 | 0.020 0.0006 | 1075 | 35 | 1610 | < 0.2 | 2.37 | 140 | 12.0 | < 2 | 0.33 | < 0.5 | 3 | 37 | 5 | >25.0 | 2.52 | 0.07 | 6590 | |
| NWRA2871 | 205 226 | 0.015 < 0.0005 | 8 | 1.0 | 680 | < 0.2 | 4.86 | 320 | 3.5 | < 2 | 0.47 | 0.5 | 7 | 74 | 5 | 14.20 | 0.62 | 0.10 | 3590 | |
| NWRA2872 | 205 226 | 0.010 < 0.0005 | 86 | 28 | 4110 | 0.2 | 5.58 | 150 | 1.5 | < 2 | 0.26 | < 0.5 | 2 | 125 | 5 | 1.46 | 0.19 | 0.07 | 65 | |
| NWRA2873 | 205 226 | 0.140 0.0041 | 42 | 26 | 3360 | 1.4 | 3.60 | 800 | 1.5 | < 2 | 0.08 | 6.5 | 4 | 145 | 4 | 1.00 | 0.20 | 0.03 | 55 | |
| NWRA2874 | 205 226 | 0.465 0.0136 | 178 | 100 | 660 | 0.8 | 2.65 | 480 | 5.0 | < 2 | 0.36 | 2.0 | 3 | 444 | 7 | 5.38 | 0.21 | 0.06 | 85 | |
| NWRA2875 | 205 226 | 0.100 0.0029 | 47 | 34 | 1840 | 0.2 | 5.74 | 250 | 1.5 | < 2 | 0.13 | 0.5 | 3 | 113 | 5 | 1.09 | 0.14 | 0.05 | 65 | |
| NWRA2875B | 3299 -- | 0.150 0.0044 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| NWRA2876 | 205 226 | 0.020 0.0006 | 150 | 15.5 | 7810 | < 0.2 | 5.23 | 220 | 3.0 | < 2 | 0.28 | < 0.5 | 3 | 125 | 7 | 4.88 | 0.52 | 0.03 | 235 | |
| NWRA2877 | 205 226 | 0.010 < 0.0005 | 28 | 11.0 | 3390 | < 0.2 | 4.85 | 190 | 2.0 | < 2 | 0.22 | < 0.5 | 2 | 153 | 6 | 1.16 | 0.18 | 0.08 | 115 | |
| NWRA2878 | 205 226 | 0.005 < 0.0005 | 99 | 12.0 | 5910 | < 0.2 | 5.17 | 490 | 2.5 | < 2 | 0.12 | < 0.5 | 1 | 96 | 4 | 2.32 | 1.38 | 0.04 | 110 | |
| NWRA2879 | 205 226 | 0.065 0.0019 | 271 | 62 | 6680 | 0.6 | 3.37 | 360 | 4.0 | < 2 | 0.24 | < 0.5 | 2 | 105 | 5 | 8.33 | 0.40 | 0.10 | 130 | |
| NWRA2880 | 205 226 | 0.020 0.0006 | 128 | 17.0 | 930 | < 0.2 | 5.38 | 290 | 2.0 | < 2 | 0.87 | < 0.5 | 3 | 118 | 8 | 5.46 | 0.30 | 0.10 | 280 | |
| NWRA2881 | 205 226 | 0.010 < 0.0005 | 128 | 24 | 3590 | < 0.2 | 4.95 | 370 | 4.0 | < 2 | 0.23 | < 0.5 | 3 | 103 | 5 | 8.91 | 1.26 | 0.04 | 110 | |
| NWRA2882 | 205 226 | 0.015 < 0.0005 | 27 | 16.0 | 3360 | < 0.2 | 5.48 | 250 | 2.5 | < 2 | 0.34 | < 0.5 | 1 | 117 | 5 | 1.30 | 0.23 | 0.05 | 40 | |
| NWRA2883 | 205 226 | 0.015 < 0.0005 | 72 | 9.4 | 6690 | < 0.2 | 6.57 | 290 | 1.5 | < 2 | 0.19 | < 0.5 | 1 | 124 | 3 | 0.86 | 0.61 | 0.04 | 30 | |
| NWRA2884 | 205 226 | 0.040 0.0012 | 12 | 1.6 | 4020 | < 0.2 | 4.99 | 130 | 2.0 | < 2 | 0.08 | < 0.5 | < 1 | 60 | 3 | 0.22 | 0.14 | 0.02 | 30 | |
| NWRA2885 | 205 226 | 0.010 < 0.0005 | 110 | 9.6 | 3990 | < 0.2 | 5.65 | 110 | 1.5 | < 2 | 0.15 | < 0.5 | 1 | 119 | 4 | 1.94 | 0.21 | 0.03 | 40 | |
| NWRA2885B | 3299 -- | 7.00 0.2042 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | |
| NWRA2886 | 205 226 | < 0.005 < 0.0005 | 8 | 4.2 | 120 | < 0.2 | 0.56 | 60 | 0.5 | < 2 | 0.32 | < 0.5 | 1 | 395 | 5 | 0.51 | 0.26 | 0.02 | 40 | |
| NWRA2887 | 205 226 | 0.005 < 0.0005 | 48 | 10.5 | 6980 | < 0.2 | 4.47 | 130 | 2.0 | < 2 | 0.27 | < 0.5 | 1 | 146 | 4 | 0.85 | 0.31 | 0.04 | 45 | |
| NWRA2888 | 205 226 | 0.050 0.0015 | 53 | 34 | 7170 | 0.6 | 4.57 | 170 | 1.5 | < 2 | 0.41 | < 0.5 | 2 | 174 | 4 | 0.89 | 0.40 | 0.07 | 55 | |
| NWRA2889 | 205 226 | 0.020 0.0006 | 41 | 9.2 | 3790 | < 0.2 | 5.36 | 170 | 1.5 | < 2 | 0.37 | < 0.5 | 2 | 114 | 3 | 1.38 | 0.46 | 0.16 | 75 | |
| NWRA2893 | 205 226 | 0.015 < 0.0005 | 64 | 49 | 3640 | < 0.2 | 4.61 | 140 | 1.5 | < 2 | 0.60 | < 0.5 | 1 | 158 | 6 | 1.97 | 0.21 | 0.06 | 65 | |
| NWRA2894 | 205 226 | 0.030 0.0009 | 99 | 40 | 3370 | < 0.2 | 4.97 | 370 | 2.0 | < 2 | 0.31 | < 0.5 | 1 | 97 | 1 | 1.21 | 0.31 | 0.04 | 90 | |
| NWRA2895 | 205 226 | 0.120 0.0035 | 141 | 30 | 8830 | < 0.2 | 4.30 | 150 | 1.5 | < 2 | 0.17 | < 0.5 | 1 | 99 | 2 | 2.58 | 0.46 | 0.03 | 35 | |

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OCT-06-99 14:30

10/06/99 2:32PM CHEMEX LABS VAX-FAX

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Chemex Labs, Inc.

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To: NEWMONT EXPLORATION LTD.

881 W. 6TH ST.
 WINNEMUCCA, NEVADA
 89445

Page Number : 1-B
 Total Pages : 1
 Certificate Date: 06-OCT-99
 Invoice No. : I9929688
 P.O. Number : 3637-477
 Account : TNI

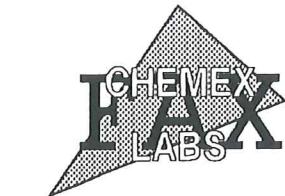
Project : ROSEBUD

Comments: ATTN: CHARLOTTE BALLEW/RANDY VANCE PO# 3637-477

CERTIFICATE OF ANALYSIS A9929688

| SAMPLE | PREP CODE | Mo ppm (ICP) | Na % ppm (ICP) | Ni % ppm (ICP) | P ppm (ICP) | Pb ppm (ICP) | Sr ppm AAS | Ti % V ppm (ICP) | W ppm (ICP) | Zn ppm (ICP) | Se ppm |
|-----------|-----------|-----------------|-------------------|-------------------|----------------|-----------------|---------------|---------------------|----------------|-----------------|--------|
| NWRA2869 | 205 226 | 10 | 0.09 | 1 | 270 | 10 | 88 | 0.12 | 15 | < 10 | 16 |
| NWRA2870 | 205 226 | 8 | 0.11 | 4 | 2980 | 12 | 239 | 0.04 | 39 | < 10 | 594 |
| NWRA2871 | 205 226 | 10 | 0.10 | 8 | 1080 | 22 | 72 | 0.12 | 18 | < 10 | 324 |
| NWRA2872 | 205 226 | 6 | 0.12 | 1 | 340 | 14 | 70 | 0.08 | 3 | < 10 | 22 |
| NWRA2873 | 205 226 | 1 | 0.13 | 1 | 220 | 12 | 154 | 0.06 | 4 | < 10 | 272 |
| NWRA2874 | 205 226 | 13 | 0.10 | 8 | 4450 | 12 | 3150 | 0.01 | 48 | < 10 | 252 |
| NWRA2875 | 205 226 | 5 | 0.10 | 2 | 230 | 20 | 74 | 0.08 | 6 | < 10 | 70 |
| NWRA2875B | 3299 -- | ----- | | | | | | | | | |
| NWRA2876 | 205 226 | 7 | 0.11 | 1 | 240 | 16 | 41 | 0.05 | 4 | < 10 | 220 |
| NWRA2877 | 205 226 | < 1 | 0.08 | 1 | 280 | 12 | 140 | 0.05 | 4 | < 10 | 18 |
| NWRA2878 | 205 226 | 4 | 0.21 | < 1 | 170 | 20 | 56 | 0.04 | 2 | < 10 | 22 |
| NWRA2879 | 205 226 | 385 | 0.09 | < 1 | 790 | 82 | 105 | 0.03 | 6 | < 10 | 66 |
| NWRA2880 | 205 226 | 5 | 0.08 | 1 | 270 | 26 | 76 | 0.04 | 7 | < 10 | 44 |
| NWRA2881 | 205 226 | 4 | 0.18 | < 1 | 230 | 26 | 45 | 0.03 | 4 | < 10 | 178 |
| NWRA2882 | 205 226 | 2 | 0.09 | < 1 | 380 | 36 | 144 | 0.06 | 5 | < 10 | 22 |
| NWRA2883 | 205 226 | 5 | 0.17 | < 1 | 60 | 16 | 38 | 0.05 | 1 | < 10 | 16 |
| NWRA2884 | 205 226 | 1 | 0.08 | < 1 | 30 | 6 | 32 | 0.01 | 1 | < 10 | 6 |
| NWRA2885 | 205 226 | 1 | 0.09 | < 1 | 160 | 24 | 61 | 0.04 | 3 | < 10 | 14 |
| NWRA2885B | 3299 -- | ----- | | | | | | | | | |
| NWRA2886 | 205 226 | 12 | 0.07 | 4 | 100 | 2 | 47 | < 0.01 | 2 | < 10 | 12 |
| NWRA2887 | 205 226 | 41 | 0.12 | 1 | 220 | 18 | 49 | 0.06 | 4 | < 10 | 8 |
| NWRA2888 | 205 226 | 145 | 0.14 | 1 | 410 | 62 | 95 | 0.07 | 6 | < 10 | 12 |
| NWRA2889 | 205 226 | 2 | 0.18 | 1 | 260 | 10 | 56 | 0.08 | 5 | < 10 | 16 |
| NWRA2893 | 205 226 | 3 | 0.09 | 1 | 380 | 18 | 53 | 0.09 | 4 | < 10 | 16 |
| NWRA2894 | 205 226 | 2 | 0.09 | < 1 | 270 | 14 | 141 | 0.07 | 26 | < 10 | 20 |
| NWRA2895 | 205 226 | 4 | 0.08 | < 1 | 400 | 16 | 155 | 0.07 | 6 | < 10 | 8 |
| | | | | | | | | | | | 4.0 |

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 WINNEMUCCA, NEVADA
 89445

Page Number : 1-A
 Total Pages : 1
 Certificate Date: 08-OCT-99
 Invoice No. : 19929689
 P.O. Number :
 Account : TNI

Project : ROSEBUD

Comments: ATTN: CHARLOTTE BALLEW/R. VANCE/P. MITCHELL

CERTIFICATE OF ANALYSIS A9929689

| SAMPLE | PREP CODE | Au ppm | Au oz/T | As ppm | Sb ppm | Hg ppb | Ag AAS | Al % | Ba ppm | Be ppm | Bi ppm | Ca % | Cd ppm | Co ppm | Cr ppm | Cu ppm | Fe % | K % | Mg % | Mn ppm |
|----------|-----------|-------------|----------|----------|--------|--------|--------|-------|--------|--------|--------|-------|--------|--------|--------|--------|-------|-------|--------|--------|
| | | FA+AA calc. | | | | | | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | (ICP) | |
| NWRA4436 | 217 285 | not/ss | not/ss | 491 | 105 | 1110 | < 0.2 | 3.20 | 420 | 2.0 | < 2 | 0.26 | < 0.5 | < 1 | 46 | 12 | >25.0 | 1.05 | 0.05 | 150 |
| NWRA4444 | 205 226 | 0.020 | 0.0006 | 48 | 30 | 3870 | < 0.2 | 5.16 | 190 | 2.0 | < 2 | 0.27 | < 0.5 | 1 | 82 | 2 | 1.02 | 0.33 | 0.04 | 55 |
| NWRA4445 | 205 226 | 0.045 | 0.0013 | 48 | 15.0 | 10480 | < 0.2 | 4.76 | 110 | 2.5 | < 2 | 0.27 | < 0.5 | 1 | 107 | 4 | 1.13 | 0.22 | 0.04 | 65 |
| NWRA4446 | 205 226 | 0.550 | 0.0160 | 319>1000 | | 6560 | 10.6 | 4.38 | 250 | 1.5 | < 2 | 0.12 | < 0.5 | 1 | 88 | 4 | 1.62 | 0.51 | 0.03 | 50 |
| NWRA4447 | 205 226 | 0.045 | 0.0013 | 54 | 22 | 4440 | 0.2 | 4.13 | 380 | 2.0 | < 2 | 0.21 | < 0.5 | 1 | 103 | 1 | 1.11 | 0.60 | 0.05 | 50 |
| NWRA4448 | 205 226 | 0.040 | 0.0012 | 132 | 34 | 4850 | 0.2 | 3.98 | 190 | 2.5 | < 2 | 0.14 | < 0.5 | 1 | 116 | 4 | 2.27 | 0.37 | 0.03 | 55 |
| NWRA4449 | 205 226 | 0.025 | 0.0007 | 56 | 22 | 6950 | 0.4 | 3.53 | 450 | 2.5 | < 2 | 0.30 | < 0.5 | 1 | 120 | 4 | 1.06 | 0.49 | 0.03 | 160 |
| NWRA4450 | 205 226 | 0.020 | 0.0006 | 51 | 8.8 | 1630 | < 0.2 | 5.33 | 350 | 1.5 | < 2 | 0.13 | < 0.5 | 1 | 74 | 2 | 0.98 | 0.29 | 0.03 | 45 |
| NWRA4451 | 205 226 | 0.005 | < 0.0005 | 65 | 10.0 | 3030 | < 0.2 | 5.58 | 280 | 2.0 | < 2 | 0.28 | < 0.5 | < 1 | 72 | 2 | 0.83 | 1.18 | 0.03 | 30 |
| NWRA4452 | 205 226 | < 0.005 | < 0.0005 | 128 | 30 | 1790 | < 0.2 | 4.33 | 340 | 3.0 | < 2 | 0.16 | < 0.5 | 3 | 102 | 2 | 2.85 | 0.30 | 0.04 | 70 |
| NWRA4453 | 205 226 | < 0.005 | < 0.0005 | 56 | 10.5 | 8190 | < 0.2 | 4.80 | 250 | 2.0 | < 2 | 0.21 | < 0.5 | 1 | 78 | 1 | 1.08 | 0.41 | 0.06 | 60 |
| NWRA4454 | 205 226 | 0.015 | < 0.0005 | 79 | 16.0 | 4850 | < 0.2 | 4.31 | 300 | 2.5 | < 2 | 0.33 | < 0.5 | 2 | 116 | 2 | 1.69 | 0.55 | 0.04 | 65 |
| NWRA4455 | 205 226 | 0.010 | < 0.0005 | 157 | 28 | 10240 | < 0.2 | 6.31 | 190 | 1.5 | < 2 | 0.26 | < 0.5 | 1 | 101 | 1 | 1.88 | 0.91 | 0.04 | 40 |
| NWRA4456 | 205 226 | 0.030 | 0.0009 | 125 | 26 | 3040 | < 0.2 | 5.71 | 210 | 2.0 | < 2 | 0.38 | < 0.5 | 1 | 63 | 1 | 2.38 | 0.53 | 0.04 | 60 |
| NWRA6900 | 205 226 | 0.020 | 0.0006 | 103 | 22 | 2400 | < 0.2 | 8.21 | 450 | 1.0 | < 2 | 0.07 | < 0.5 | 1 | 63 | 2 | 3.48 | 2.49 | 0.01 | 10 |
| NWRA6901 | 205 226 | 0.155 | 0.0045 | 114 | 17.0 | 4700 | 0.8 | 5.94 | 260 | 2.0 | < 2 | 0.13 | < 0.5 | 1 | 130 | < 1 | 1.85 | 1.24 | 0.01 | 30 |
| NWRA6902 | 205 226 | 0.010 | < 0.0005 | 32 | 11.5 | 860 | < 0.2 | 6.70 | 960 | 3.5 | < 2 | 0.36 | < 0.5 | 1 | 82 | < 1 | 0.90 | 4.70 | 0.05 | 75 |
| NWRA6903 | 205 226 | 0.035 | 0.0010 | 87 | 16.0 | 3980 | < 0.2 | 9.36 | 400 | 0.5 | < 2 | 0.25 | < 0.5 | 3 | 78 | < 1 | 2.03 | 3.65 | 0.03 | 40 |
| NWRA6904 | 205 226 | 0.045 | 0.0013 | 121 | 31 | 2150 | < 0.2 | 7.28 | 550 | 0.5 | < 2 | 0.62 | < 0.5 | 2 | 87 | < 1 | 1.88 | 2.85 | 0.05 | 45 |
| NWRA6905 | 205 226 | 0.030 | 0.0009 | 58 | 17.0 | 4020 | < 0.2 | 9.16 | 250 | 0.5 | < 2 | 0.20 | < 0.5 | 1 | 106 | < 1 | 1.19 | 3.54 | 0.02 | 45 |
| NWRA6906 | 205 226 | 0.010 | < 0.0005 | 194 | 21 | 6390 | < 0.2 | 3.52 | 190 | 1.0 | < 2 | 0.28 | < 0.5 | 1 | 204 | 1 | 1.25 | 0.65 | 0.03 | 30 |
| NWRA6907 | 205 226 | 0.060 | 0.0018 | 184 | 50 | 2580 | < 0.2 | 3.82 | 320 | 2.5 | < 2 | 0.09 | < 0.5 | 3 | 120 | 4 | 3.18 | 0.62 | 0.05 | 490 |
| NWRA6908 | 205 226 | 0.055 | 0.0016 | 97 | 22 | 3370 | 0.2 | 4.45 | 380 | 2.0 | < 2 | 0.26 | < 0.5 | 1 | 117 | 1 | 1.65 | 0.73 | 0.05 | 45 |
| NWRA6909 | 205 226 | 0.045 | 0.0013 | 157 | 13.5 | 7410 | < 0.2 | 4.06 | 170 | 2.0 | < 2 | 0.46 | < 0.5 | 2 | 147 | 4 | 2.56 | 0.50 | 0.06 | 35 |
| NWRA6910 | 205 226 | 0.160 | 0.0047 | 95 | 27 | 4580 | 1.6 | 8.21 | 200 | 1.0 | < 2 | 0.08 | < 0.5 | 1 | 97 | < 1 | 2.56 | 2.71 | < 0.01 | 20 |
| NWRA6911 | 205 226 | 0.120 | 0.0035 | 56 | 15.5 | 1810 | 2.2 | 6.20 | 290 | 1.0 | < 2 | 0.07 | < 0.5 | 1 | 81 | < 1 | 0.76 | 1.76 | < 0.01 | 15 |
| NWRA6912 | 205 226 | 0.045 | 0.0013 | 43 | 15.0 | 5430 | 1.4 | 4.42 | 250 | 2.5 | < 2 | 0.36 | < 0.5 | 1 | 109 | 3 | 1.27 | 0.63 | 0.08 | 65 |
| NWRA6913 | 205 226 | 0.010 | < 0.0005 | 19 | 1.4 | 280 | < 0.2 | 7.91 | 1120 | 2.5 | < 2 | 0.20 | < 0.5 | 3 | 16 | < 1 | 2.83 | 3.62 | 0.06 | 725 |
| NWRA6299 | 205 226 | 0.110 | 0.0032 | 25 | 2.6 | 50 | 30.0 | 6.20 | 670 | 2.5 | < 2 | 1.05 | 0.5 | 3 | 132 | 16 | 1.87 | 3.12 | 0.07 | 115 |

CERTIFICATION:

OCT-06-99 14:35

10/06/99 2:38PM CHEMEX LABS VAX-FAX

P.02 R-779 Job-617

PAGE 002



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To: NEWMONT EXPLORATION LTD.

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Page Number : 1-B
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 Invoice No. : 19929689
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WILD ROSE
 P.A. Mitchell and T.N. Westervelt

CERTIFICATE OF ANALYSIS A9929689

| SAMPLE | PREP CODE | Mo ppm (ICP) | Na & Ni ppm (ICP) | P ppm (ICP) | Pb ppm AAS | Sr ppm (ICP) | Ti & V ppm (ICP) | W ppm (ICP) | Zn ppm (ICP) | Se ppm |
|----------|-----------|-----------------|----------------------|----------------|---------------|-----------------|---------------------|----------------|-----------------|-----------|
| NWRA4436 | 217 285 | 24 | 0.07 | 1 | 2960 | 26 | 412 | 0.02 | 11 < 10 | 198 6.2 |
| NWRA4444 | 205 226 | 1 | 0.08 | < 1 | 270 | 24 | 76 | 0.07 | 10 < 10 | 12 3.4 |
| NWRA4445 | 205 226 | < 1 | 0.07 | < 1 | 140 | 38 | 43 | 0.07 | 4 < 10 | 14 4.8 |
| NWRA4446 | 205 226 | 4 | 0.08 | 1 | 190 | 16 | 100 | 0.04 | 12 < 10 | 20 17.6 |
| NWRA4447 | 205 226 | 1 | 0.17 | < 1 | 190 | 14 | 88 | 0.06 | 8 < 10 | 24 1.2 |
| NWRA4448 | 205 226 | 5 | 0.08 | < 1 | 450 | 18 | 78 | 0.10 | 13 < 10 | 24 1.8 |
| NWRA4449 | 205 226 | 3 | 0.20 | 1 | 480 | 16 | 110 | 0.06 | 5 < 10 | 16 2.0 |
| NWRA4450 | 205 226 | < 1 | 0.09 | < 1 | 130 | 20 | 70 | 0.05 | 9 < 10 | 12 0.4 |
| NWRA4451 | 205 226 | < 1 | 0.22 | < 1 | 120 | 16 | 56 | 0.06 | 10 < 10 | 10 0.4 |
| NWRA4452 | 205 226 | 9 | 0.09 | < 1 | 360 | 24 | 90 | 0.05 | 16 < 10 | 42 1.0 |
| NWRA4453 | 205 226 | < 1 | 0.09 | < 1 | 200 | 16 | 95 | 0.06 | 3 < 10 | 12 0.6 |
| NWRA4454 | 205 226 | 10 | 0.22 | 1 | 320 | 40 | 179 | 0.06 | 9 < 10 | 16 2.4 |
| NWRA4455 | 205 226 | 3 | 0.52 | < 1 | 410 | 20 | 176 | 0.08 | 13 < 10 | 14 3.0 |
| NWRA4456 | 205 226 | 13 | 0.13 | < 1 | 360 | 20 | 173 | 0.07 | 6 < 10 | 10 3.2 |
| NWRA6900 | 205 226 | 32 | 0.24 | < 1 | 700 | 52 | 224 | 0.07 | 27 < 10 | 2 3.4 |
| NWRA6901 | 205 226 | 7 | 0.15 | < 1 | 460 | 20 | 336 | 0.06 | 8 < 10 | 12 3.2 |
| NWRA6902 | 205 226 | < 1 | 2.27 | < 1 | 200 | 16 | 98 | 0.10 | 6 < 10 | 26 1.0 |
| NWRA6903 | 205 226 | 4 | 0.20 | < 1 | 390 | 14 | 486 | 0.05 | 8 < 10 | 2 1.2 |
| NWRA6904 | 205 226 | 9 | 0.23 | < 1 | 260 | 16 | 273 | 0.06 | 8 < 10 | 2 1.0 |
| NWRA6905 | 205 226 | 17 | 0.16 | < 1 | 650 | 28 | 449 | 0.06 | 11 < 10 | 2 1.4 |
| NWRA6906 | 205 226 | 10 | 0.15 | 1 | 370 | 18 | 253 | 0.07 | 5 < 10 | 6 5.2 |
| NWRA6907 | 205 226 | 8 | 0.08 | 1 | 160 | 14 | 80 | 0.09 | 8 < 10 | 66 5.2 |
| NWRA6908 | 205 226 | 1 | 0.12 | < 1 | 310 | 14 | 138 | 0.07 | 4 < 10 | 16 2.6 |
| NWRA6909 | 205 226 | 2 | 0.10 | 1 | 360 | 18 | 89 | 0.08 | 5 < 10 | 12 3.6 |
| NWRA6910 | 205 226 | 4 | 0.30 | < 1 | 320 | 16 | 172 | 0.07 | 6 < 10 | 4 7.6 |
| NWRA6911 | 205 226 | 4 | 0.32 | < 1 | 410 | 14 | 484 | 0.06 | 3 < 10 | 2 1.4 |
| NWRA6912 | 205 226 | 3 | 0.15 | < 1 | 190 | 8 | 82 | 0.07 | 4 < 10 | 8 2.8 |
| NWRA6913 | 205 226 | < 1 | 0.47 | < 1 | 500 | 26 | 324 | 0.11 | 5 < 10 | 48 0.2 |
| NWRA6299 | 205 226 | < 1 | 2.55 | 9 | 80 | 136 | 72 | 0.05 | 17 < 10 | 182 < 0.2 |