

# MINERAL RESOURCE SERVICES, INC.

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**To: Simon Pollard**  
**From: Paul Klipfel**  
**Date: February 26, 2007**

**Re:**  
**Geo-story Interpretation of the Henty Area Following Recent Visit**

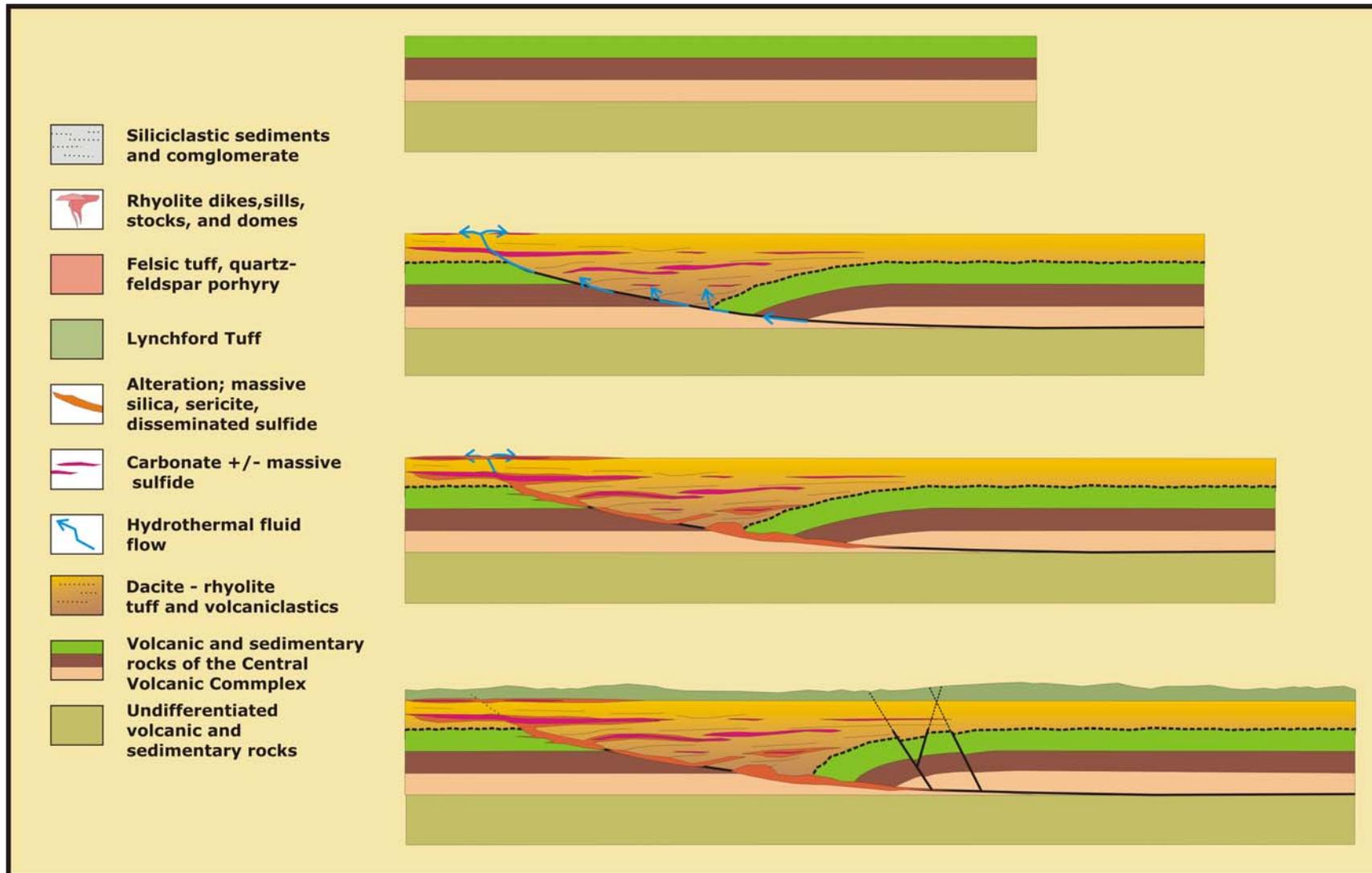
Simon – The following diagrams and descriptions reflect my current interpretation of the Henty area based on observations and my understanding to date. Some points are rather unconventional, but the story explains the range of observations and honors, but elaborates on, the regional interpretations of others. This is a working hypothesis at this stage and provides a 'baseline' interpretation against which the geologic staff at Henty can observe and support or condemn.

Please ask questions and share the points of disagreement and argument. We will all learn.

Thank you for the time working on this.

Paul Klipfel

This sequence of diagrams portrays a plausible sequence of events that explains many of the observed features at Henty and honors regional concepts for the development of Western Tasmania. Some new concepts are proposed here and are speculative.



- 1) In the first diagram, volcanic and sedimentary rocks are deposited to form the Central Volcanic Complex. These rocks are deposited on prior volcanic rocks or Proterozoic sediments thought to be part of a passive margin setting underlying western Tasmania.

- 2) Extensional tectonism apparently occurred contemporaneous with the development and deposition of Mount Read volcanics of which the Central Volcanic Complex is part. These volcanics are reported to have been deposited in an interpreted graben or series of grabens with steep, basin-bounding, normal faults. It is proposed here that the Henty Fault could have started life as a low angle detachment fault within this extensional regime. The direction of transport could have been parallel to the current surface, or up to 45 degrees to that orientation. In other words, these images could be the current plan map or a slice dipping up to 45 degrees north or south parallel to the direction of slippage along the detachment fault.

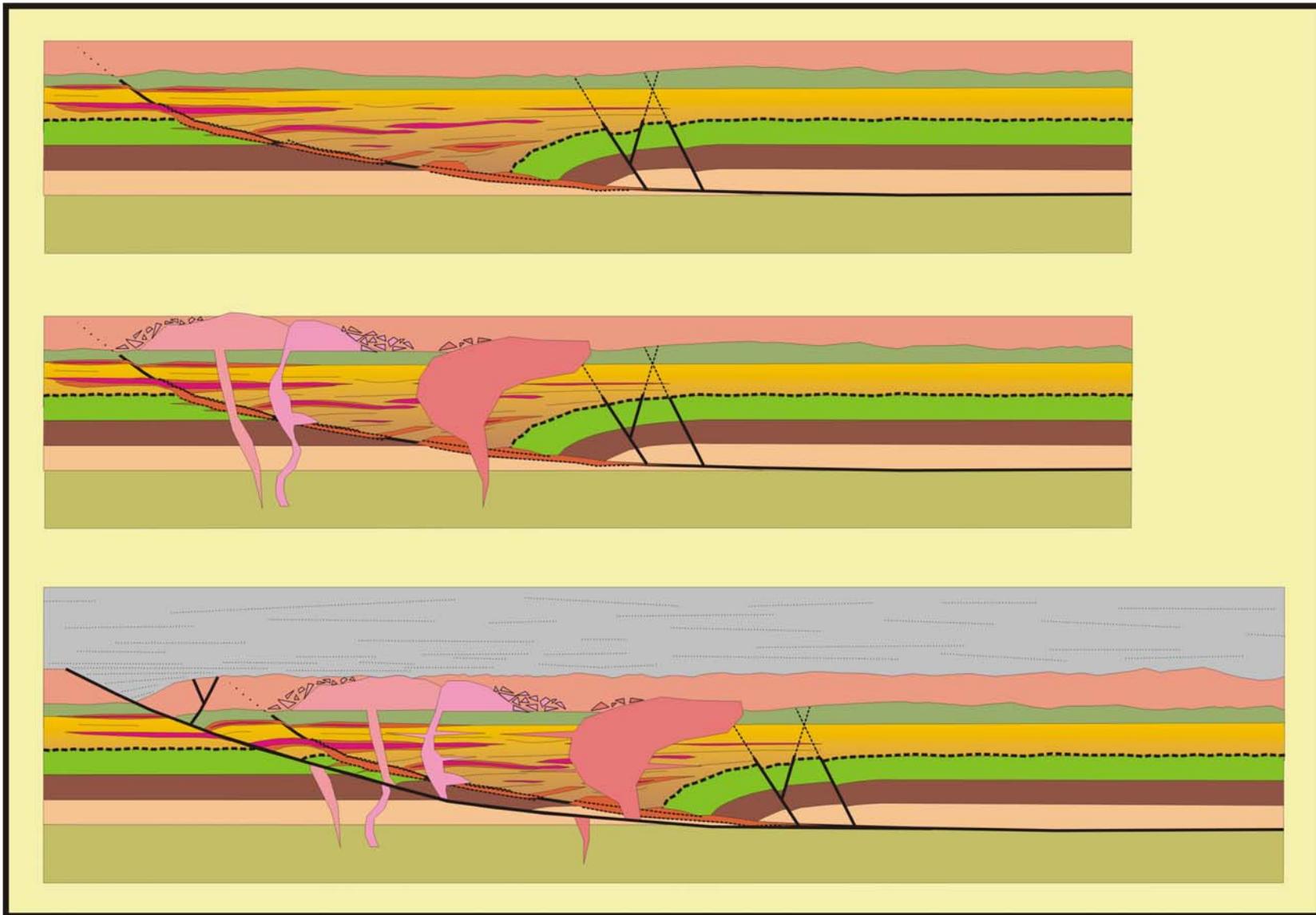
As the hangingwall block slips away from the footwall a rollover anticline forms in the hangingwall. This feature may fracture and develop normal faults with both synthetic and antithetic movement (shown in the bottom diagram). As a topographic low develops above the exposed detachment surface, it fills with sediment – in this case, various felsic tuff units and volcanoclastic sediment.

A detachment fault commonly provides a fluid path for groundwater and/or hydrothermal fluid, or possibly seawater. In this case, it is postulated that magmatic water/vapor from volcanic-related intrusives is at least a partial contributor to fluid that likely moved along this fault.

Fluids migrating upward along the fault could have exited the fault zone vertically and exhaled carbonate and/or sulfide on the sea floor or could have bled laterally along permeable stratigraphy, or continued upward along the fault until it daylights at the surface to exhale metals and/or carbonate there. Regardless of the details, fluid flow along a planar feature and exhalation of metal rich fluids needs to be explained if massive sulfide bodies (pyrite, sphalerite, galena ±gold) are interpreted as syngenetic – the preferred hypothesis of the writer. These fluids or subsequent stages of hydrothermal activity could have leached the rocks surrounding the flow path if they were magmatically –derived acidic fluids. Leaching would have provided a permeable path for continued fluid flow for silicification and alteration.

- 3) In the third diagram, alteration and silicification is depicted as an orange zone along and surrounding the detachment fault. Massive silica that is spatially associated with sulfide lenses could have formed at this time after the sulfide, or may have formed together with the sulfide. Resolution of this matter is dependant upon determining the nature of the relationship between sulfide formation, silicification and alteration. Detachment faulting likely continued through this period and could have fractured, sheared, or otherwise tectonized the silicified-altered rocks as is commonly observed. Alternately, shearing might have taken least resistant paths around brittle, resistant lenses.
- 4) In the fourth diagram, detachment has continued, the roll-over anticline in the hangingwall block is more strongly developed featuring greater curvature and most likely has fractured to form minor normal faults. These faults could have been the proto- Moa Fault and others like the Moa.

At some stage after mineralization (?), the Lynchford Tuff was deposited. It is curious that most massive sulfide deposits are capped by a tuff or other unit which is essential for preservation of the deposit. Without a cap, sulfides and other syngenetic minerals are dissolved back into the sea and are not preserved. In this case, the Lynchford tuff or other tuffaceous units stratigraphically near the Lynchford Tuff may have acted as a partial insulating unit and helped to preserve mineralization. Interestingly, there is a magnetite-rich layer within the Lynchford Tuff. This could be attributed to introduction of anomalous abundances of magnetite detritus, or could have been derived from ferruginous hydrothermal fluids. Had they not been diluted by tuff, a minor iron formation layer might have formed instead.



- 5) In the fifth diagram, the sequence is buried beneath a sequence of dacitic to rhyolitic tuffs and volcaniclastic sediment.
- 6) In the sixth diagram, the entire sequence is intruded by felsic (mostly rhyolite) magma as dikes, sills, stocks, and domes if the magma made it to the surface (Julia Rhyolite). The surrounding felsic sequence may relate closely in time and genetically with this episode of magmatism. Domes could have intruded and extruded onto tuff derived earlier from the same eruption. Similarly, the domes could have been buried by tuff erupting from the dome complexes. In either case, albite-silica alteration which occurs primarily in the hangingwall to mineralization

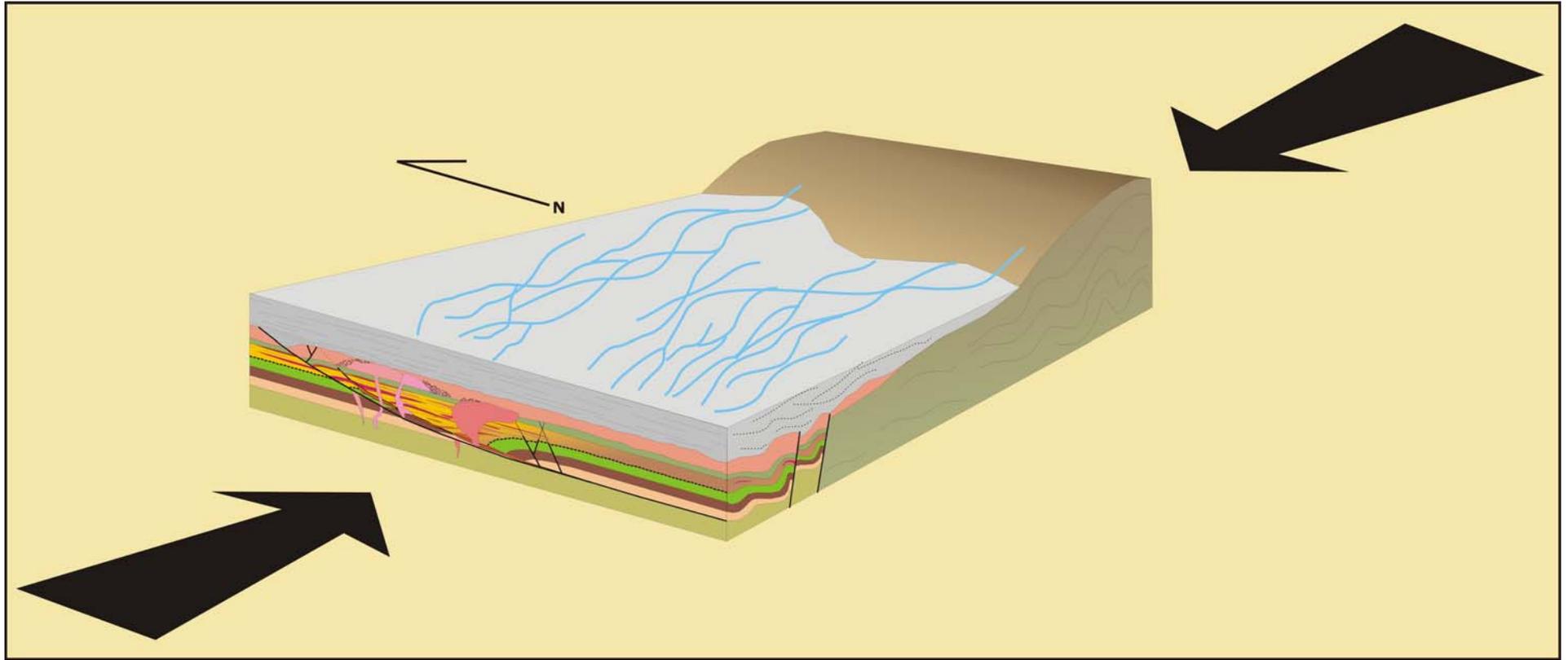
may have formed as part of this magmatic episode. Preliminary evaluation of cross sections reveals apparent spatial association of albite-silica alteration with rhyolite. Perhaps this alteration can be considered as the alteration halo within and surrounding the rhyolite and possibly was derived from the rhyolite. Late quartz-carbonate-K-spar veins are associated with the rhyolite and possibly represent late hydrothermal activity. Some remobilization of mineralization could have happened at this time, but veins samples so far are unmineralized.

At about this time, a second detachment fault may have formed oblique to the earlier one. This one might have cut the first one or merged into it.

- 7) In the seventh diagram, the new detachment fault has formed along with a new roll-over anticline and normal faults. Characteristics of detachment faults include:
- a. Low cut-off angles with stratigraphy (as observed)
  - b. Juxtaposition of younger rocks over older (thrusts juxtapose older over younger)
  - c. Retention of intact stratigraphy and facing directions
  - d. Shearing within a zone parallel to the fault
  - e. Displacement of the hangingwall block by up to several kilometers. Any beheaded intrusive sources or zones of mineralization could be several kilometers away.
  - f. Common meteoric and hydrothermal fluid paths

The volcanic sequence is overlain by volcanoclastic sediment grading (?) upward into a siliciclastic sequence of quartz rich sandstone and conglomerate of which most of the cobbles are quartzite and gneiss allegedly derived from Proterozoic basement to the east (Zigzag Fm and Newton Creek conglomerate). It is very curious that this sedimentary sequence has a paucity of volcanoclastic cobbles and that virtually all of the detritus is derived from somewhere else.

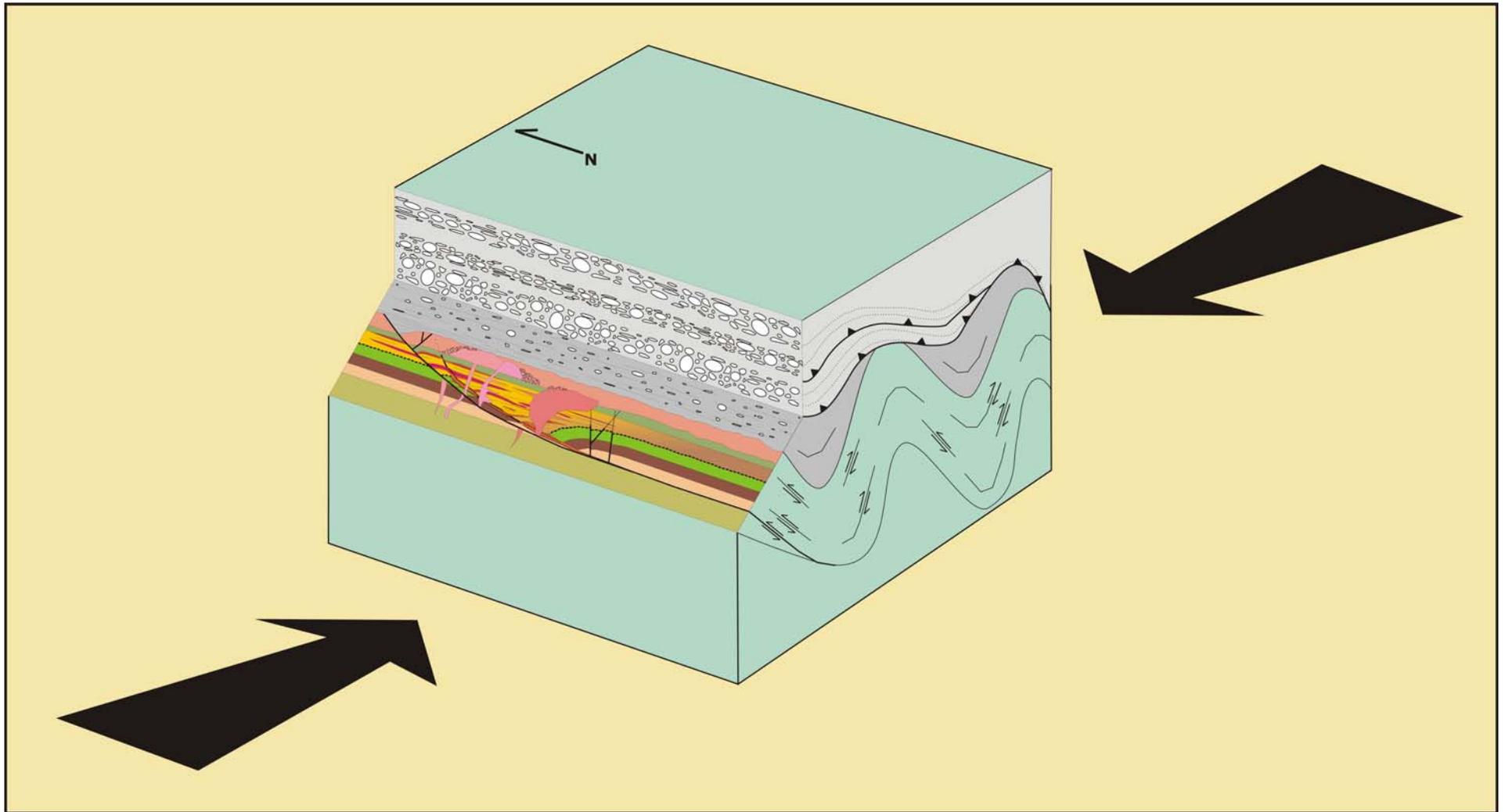
The contact between siliciclastic sediment and underlying volcanics is a conformable shear contact (in the Henty Mine and observed in road cuts) or normal fault (reported at Mt Lyell). This suggests that the contact is either a depositional unconformity with subsequent flexural slip to explain the shearing or is a thrust contact. A thrust contact might be consistent with deposition of these sediments at a location away from the Mt Read Volcanics followed by tectonic juxtaposition via thrust faulting. Thrust faults are observed in the overlying Owen Conglomerate.



- 8) This diagram depicts deposition of the siliciclastic sediments (Zigzag, Newton Creek, and Owens Conglomerate) from a Precambrian source to the east as described in current published interpretations. In order for this to occur, basement must be uplifted relative to the site of deposition. Of course, this could also be accomplished by continued subsidence of the depositional area as a result of continued extensional tectonism. In this diagram, compressional tectonism is depicted. Basin-bounding faults of the Mt Read volcanics are also indicated in the block diagram.

It is envisioned here that the quartz-pebble conglomerate and quartz sand is derived from a braid stream environment or shallow tidal flat. Either setting would have to provide a means of winnowing a large percentage of the non-quartz portion of the source rock from the sediment. This is a common rock type and setting for late Precambrian and Cambrian time in many parts of the world, although the volume of quartz and quartzite conglomerate here is greater than other areas familiar to the writer.

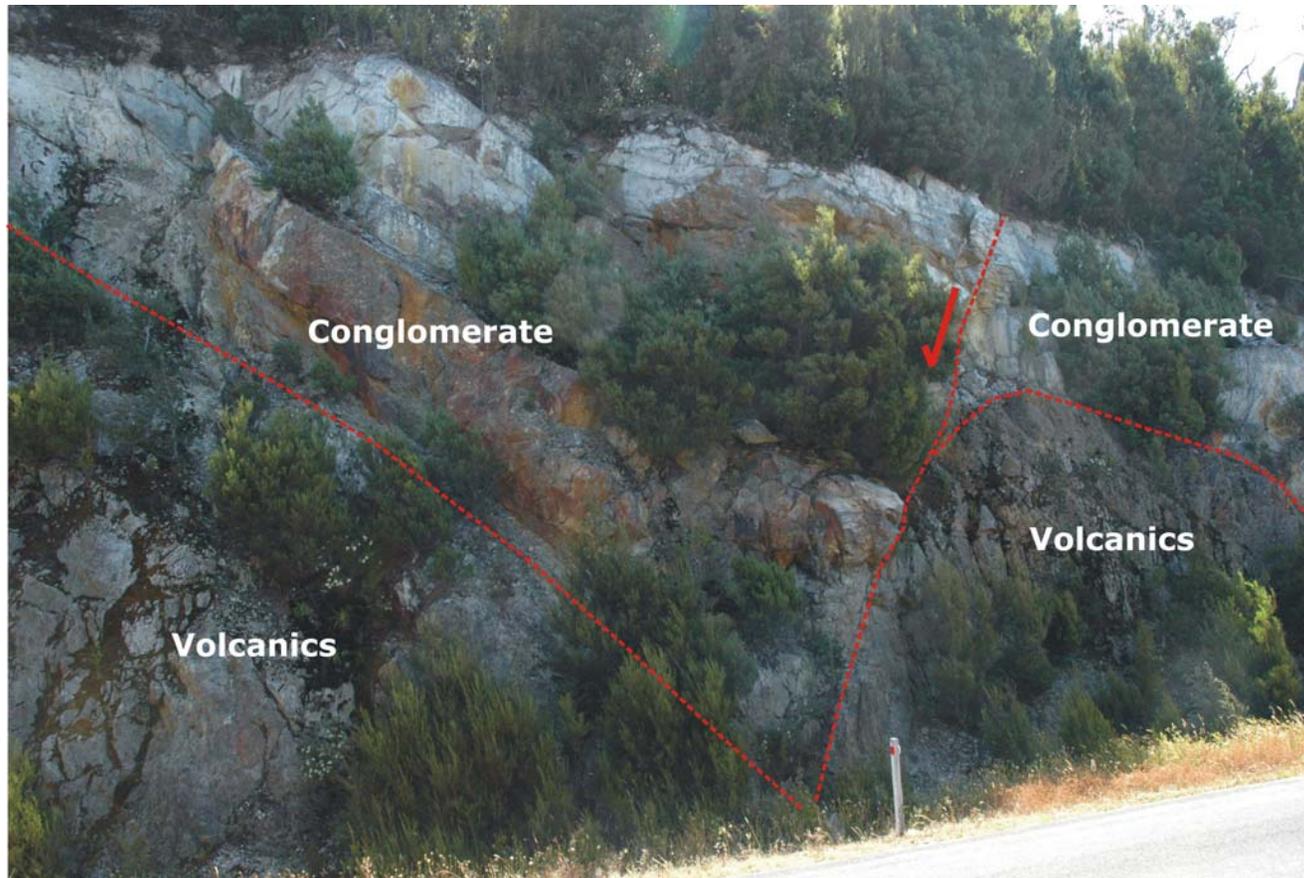
Initial compression in approximately E-W direction may have uplift the source area and initiated mild open folding of the Mt Read volcanics. Any normal faults perpendicular to the stress field would have been rotated to a steeper configuration. Movement along the detachment faults is likely to have been minimal. Folds in this stage and axial planar fabric (if any) probably trend approximately N-S.



- 9) Continued deformation would have tightened the folds along with in-folding of the earlier part of the siliciclastic sequence (dark gray). Flexural slip along bedding planes and at low oblique angles to bedding were probably very common. Slickensides attributed to flexural slip are shown in the photos below. Similar features have been observed on many bedding surfaces and display subvertical slip directions. The detachment faults would have undergone reactivation and likely considerable flexural slip offset. Boudins of massive silica within surrounding more ductile sericitic rocks could easily have formed at this time.

Along the Tyndal Range from south of Mount Lyell to north of Henty, the Owen Conglomerate forms open folds with internal thrust faults. This fold geometry does not match that of the underlying volcanics and early part of the siliciclastic sequence. It is interpreted here that the

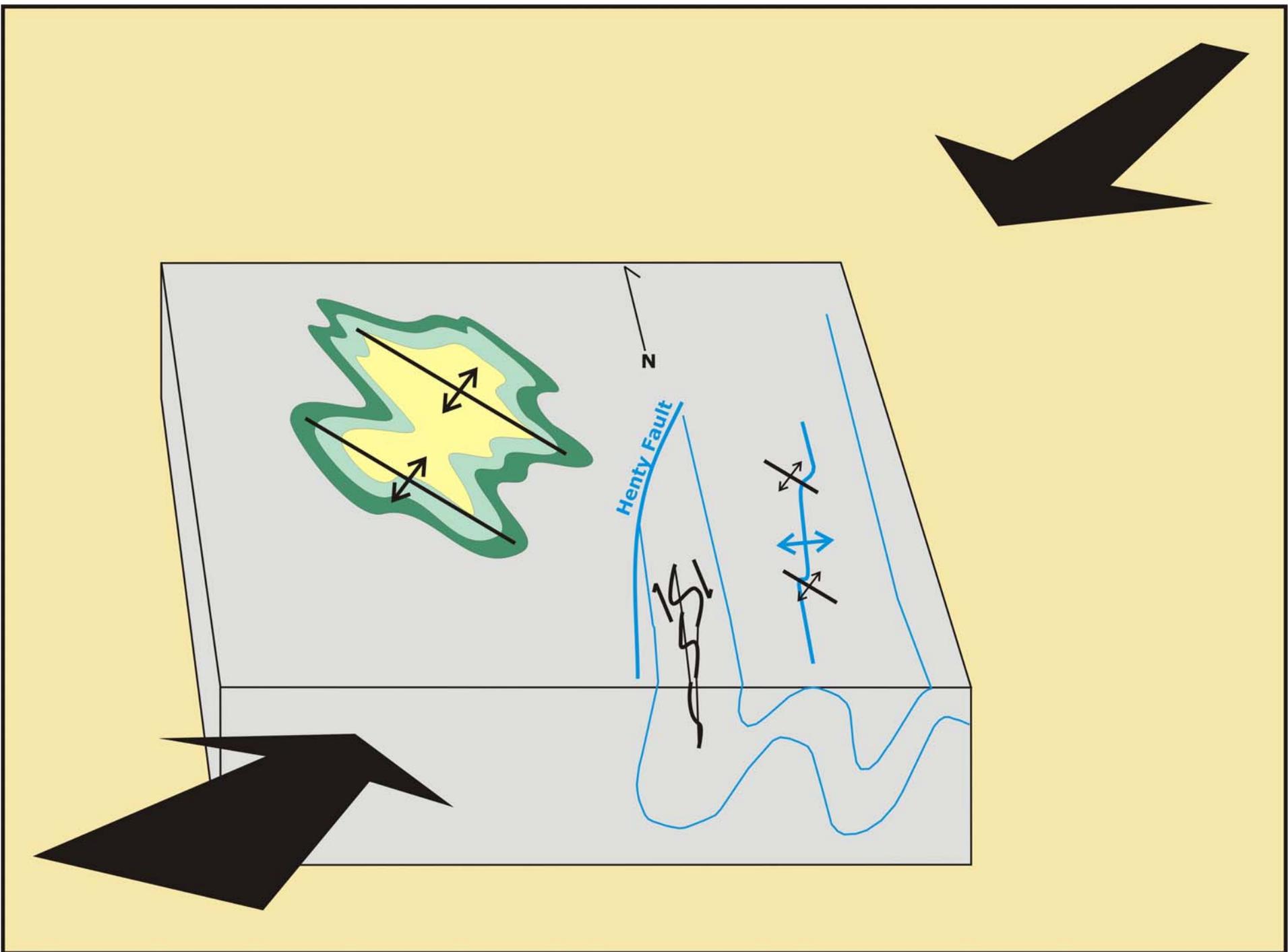
Owen Conglomerate may have been thrust emplaced over earlier siliciclastic sediments, thus juxtaposing an open-folded upper plate against a more tightly folded lower plate.



In this photo, Owen conglomerate is in conformable fault contact with underlying volcanic rocks with approximate N-S shear/foliation fabric. The overlying conglomerate has no such fabric. The sheared contact is offset by a normal fault. This fault and, by analogy, other similar faults in the Mt Lyell area might be late stage and relate to relaxation of the compressional episode of deformation.



These photos show steeply east-dipping quartzite and conglomerate with dragged cleavage consistent with right-side-up and left-side-down offset along bedding plane surfaces. The third photo shows subvertical slickensides on the bedding plane surface. This is interpreted as a flexure slip feature. A syncline is to the right (east) and an anticline to the left (west).



10) This diagram depicts the Devonian Taberaberan Orogeny which affected western Tasmania, Victoria and parts of the Lachlan Fold Belt in New South Wales. Silurian – Devonian sediments which overlie the Mt Read volcanics are prominently folded about northwest-trending axes with steep limbs. It is very difficult to imagine that these overlying sediments were folded to this intensity without affecting the underlying volcanic and sedimentary rocks. Importantly, deformation at this time appears to have been compression in a NE-SW direction, oblique to existing folds and fabric (shown in this diagram in blue). The imposition of an oblique stress field would have resulted in cross-folding and egg-carton-like interference patterns. This has not been observed, but could be present. The interpretation here proposes that existing fold hinges and stratigraphy (blue) undergo combined oblique dextral shear and tightening (overturning?) of existing folds. Planar elements such as bedding and parallel faults (Henty) would likely undergo the addition of peculiar “rumple” folding (shown in black). The idea here is that a planar element develops a fold along strike and then it grades back into a planar element. Axial planes would likely show formation of “Z” patterns resulting from dextral shear. Some strain and accommodation of folding in Silurian and Devonian rocks might be accommodated along faults such as the Henty.

In summary, it appears as if the Henty deposit formed contemporaneously with volcanism, magmatism and extensional deformation. Magmatic derived fluids similar to those that produce high sulfidation deposits may have flowed upward along a proto-Henty detachment fault. These fluids produced carbonate, massive sulfide lenses, massive silicification, and surrounding sericitization. These hydrothermal events in combination with extensional deformation produced the Henty deposit.

The deposit was buried by the Lynchord tuff and subsequent siliciclastic sediment. Deposition of siliciclastic sediment began when a source area (Proterozoic basement to the east) was uplift due to onset of compressional deformation. This compression resulted in initial folding of the volcanics, Henty deposit and early overlying siliciclastic sediment. Continued deformation caused conglomerate layers to be thrust over the sequence.

The Devonian Taberaberan Orogeny induced compressional deformation in a NE-SW direction oblique to existing folds and planar fabric. This caused dextral folding and “rumpling” of pre-existing planar elements, and probable overturning of the strata in the Henty area.