IF WOODLAWN AND MCPHILLAMYS WERE END-MEMBERS OF THE SILURIAN VOLCANIC HOSTED DEPOSITS, WHERE DOES THE WISEMANS CREEK FIT IN?

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Numerus ore deposits and many more prospects are hosted in the Silurian to early-Devonian basins of Eastern Australia. Two of the more important, McPhillamys gold deposit and Woodlawn base metal deposit exhibit different deposit styles however may be thought of as end members of the Silurian Basin deposits. Woodlawn is a zinc-copper-lead-silver-(gold) deposit and is well documented as a syngenetic exhalative volcanogenic hosted massive sulphide deposit (Jones et al., 2017; Fitzherbert et al., 2017).

McPhillamys is a gold deposit with variously elevated lead, zinc, copper and arsenic. The genetic model has been debated, although is more recently described as orogenic shear hosted gold (French et al., 2015), that is syndeformational epigenetic. McPhillamys is 200m wide, 800m long and has been drilled to 700m in depth. The Silurian dacitic volcaniclastic host is intensely sheared with the dominant alteration minerals being quartz, carbonate, chlorite, phengite and pyrite. The sulphides are dominantly pyrite and pyrrhotite.

Despite Woodlawn and McPhillamys being described as syngenetic and epigenetic respectively, they are both hosted in Silurian volcaniclastic basins and are both strongly deformed by both brittle and ductile deformation (French et al., 2015; Jones et al., 2017; Fitzherbert et al., 2017). The Silurian Wisemans Creek volcaniclastic basin exhibits volcanic rocks and mineralisation with similarities to those hosting both McPhillamys and Woodlawn. The Wisemans Creek area provides evidence for both syngenetic exhalative and syn-deformational epigenetic deposit origins.

The area has seen a rich history of small-scale mining for both gold and base metals (Williams I.R., 1960; Pogson & Watkins, 1998), although with little mining or exploration attention since the 1970's (Pogson & Watkins, 1998).

Gold exploration over the last two years has been focused on an area 4km long by 1.5km wide with the most advanced greenfields prospects being the historic Phoenix-Mabel zinc-copper-lead-silver-(gold) mines, the Phoenix East gold prospect and the Yvette gold prospect. Only three drill holes from 1965 have tested mineralisation in this area, two of which intercepted weak mineralisation and deserve following up.

Mining and Exploration History

Mines operating at the turn of the 20th Century in the Wisemans Creek Volcanics contributed to the growth of regional towns such as O'Connell and Wisemans Creek. The most important mining hubs were Blackmans Reef, Murphy's, North Wisemans, South Wisemans, Phoenix and Mabel. At the Phoenix mine, an estimated 3,000t of ore grading 4% copper was extracted over 15 years from open pits and underground until the mine's closure in 1911. Later, Mabel was mined during the depression for oxide gold using cyanide in corrugated iron tanks. Hundreds of minor workings have been found throughout the belt.

Regional Geology of Wisemans Creek

The Wisemans Creek Volcanic and volcaniclastic basin is located between Rockley and Oberon with its northern margin being truncated by the Bathurst Granite. It is a 15km long north-south trending rift basin often called the Native Dog Syncline (Pogson & Watkins 1998). This basin is centred on the Native Dog fault, which is the southern continuation of the Wiagdon fault, south of the Bathurst Granite.

The sequence of lithologies commencing at the western edge of the Native Dog Syncline and generally younging into the core of the syncline, are adapted from Williams I.R., (1960), Pogson & Watkins (1998) and recent field mapping:

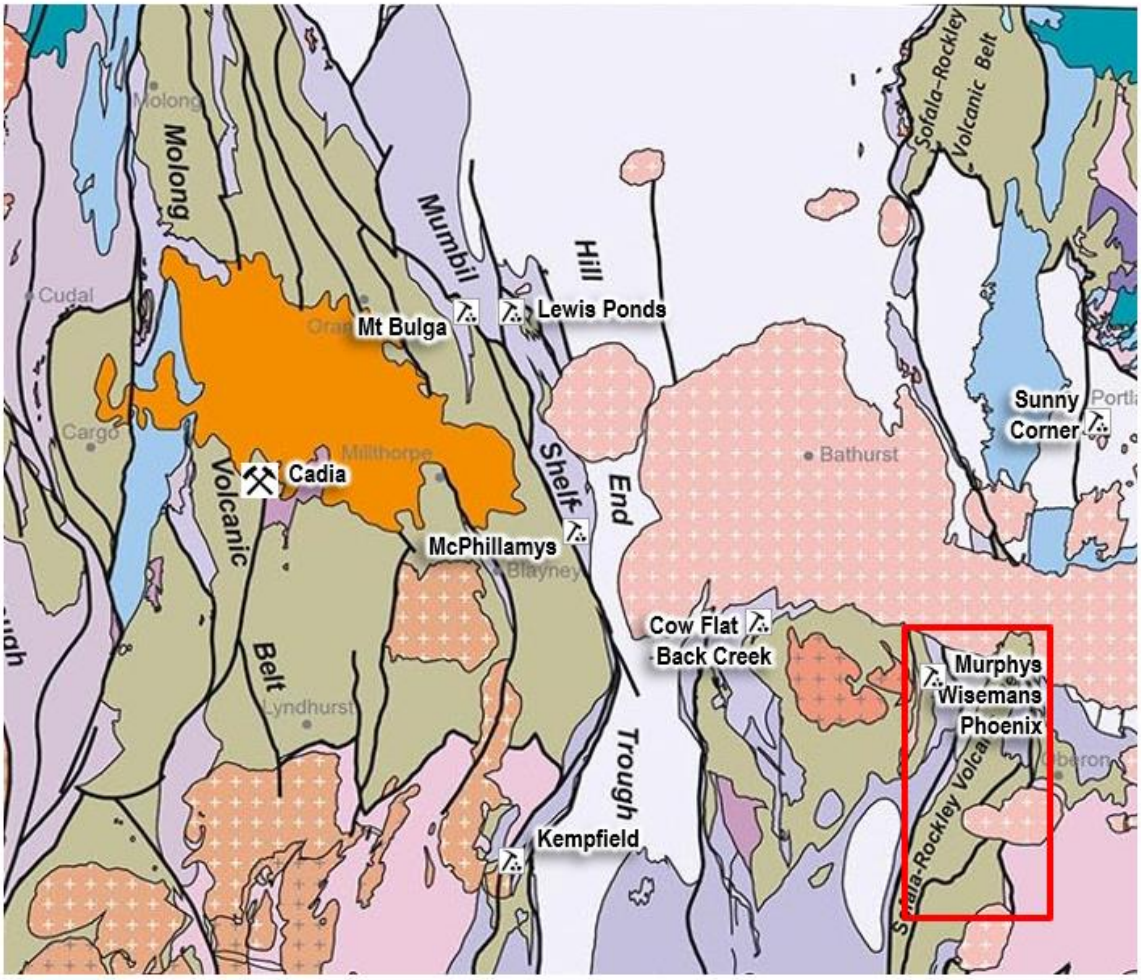
1. Ordovician Rockley Volcanics
2. Tanwarra Shales (Smt) (interpreted as the southern equivalent) marls and carbonates, carbonaceous lithic quartz-poor siltstones.
3. Podiform finely bedded limestones/siltstone (Smllms) with intense quartz replacement, minor disseminated pyrite. Likely Tanwarra shale replaced by massive quartz. Up to 300m in thickness with smaller allochthonous blocks hosted within Bells Creek volcanics
4. Pyritic chert; 2-5m thick, to 20% pyrite, traced over 5km in length
5. Late-Silurian Bells Creek Volcanics (Sml); Quartz-feldspar phyric rhyolitic volcanics and volcaniclastics
6. The Campbells Formation (Smc); Quartz-phyric rhyolitic volcanics and volcaniclastics
7. Devonian siltstones form the core of the Native Dog Syncline
8. Dolerite dyke; medium grained, quartz, magnetite, undeformed. Traced for 6km on western edge intruding the Tanwarra Shales and podiform quartz altered limestones/siltstones.

From west to east, overlying the Ordovician Rockley Volcanics is a sequence of marls and carbonates approximately 30m in thickness. This carbonate sequence has been found to host patchy, anomalous, base and precious metals. Above this are fine grained carbonaceous, lithic, quartz-poor siltstones thought to be the Tanwarra Shales, which produce relatively strong chargeable IP anomalies due to their carbon and pyrite content. A pyritic chert horizon containing weakly anomalous metals, marks the boundary between the fine grained, carbonaceous, lithic, quartz-poor siltstones and the quartz-phyric rhyolites of the Bells Creek volcaniclastics. This chert horizon can be seen in the geology map below, as the lode running intermittently through the Bells prospect and numerous historic workings for over 5km.

The Bells Creek volcanics (Sml) hosts the Murphys, Wisemans Creek Phoenix-Mabel, Yvette, Phoenix East and many other smaller prospects.

The Bells Creek Volcanics are folded, thrusted and uplifted along the Wiagdon-Native Dog fault (Pogson & Watkins 1998). Between the Rockley Volcanics and the quartz-phyric rhyolites of the Bells Creek volcaniclastics marks a rapid change into the hilly topography of the Native Dog fold and thrust belt, now approximately 3km wide. Foliation and bedding is moderate to steeply dipping to the west. The volcanics are overlain by and interfingered with the Campbells Formation (Smc) to the south (Williams 1960; Pogson & Watkins 1998).

Simplified Geology Map (2014) GSNSW



Lithologies Local to Mineralisation

The Bells Creek Volcanics in the vicinity of the Wisemans Creek-Phoenix-Mabel-Yvette mineralisation are composed of two main lithologies and two minor lithologies, all of which dip moderately to the west.

Quartz Phyric Volcaniclastics (Smlqpr)

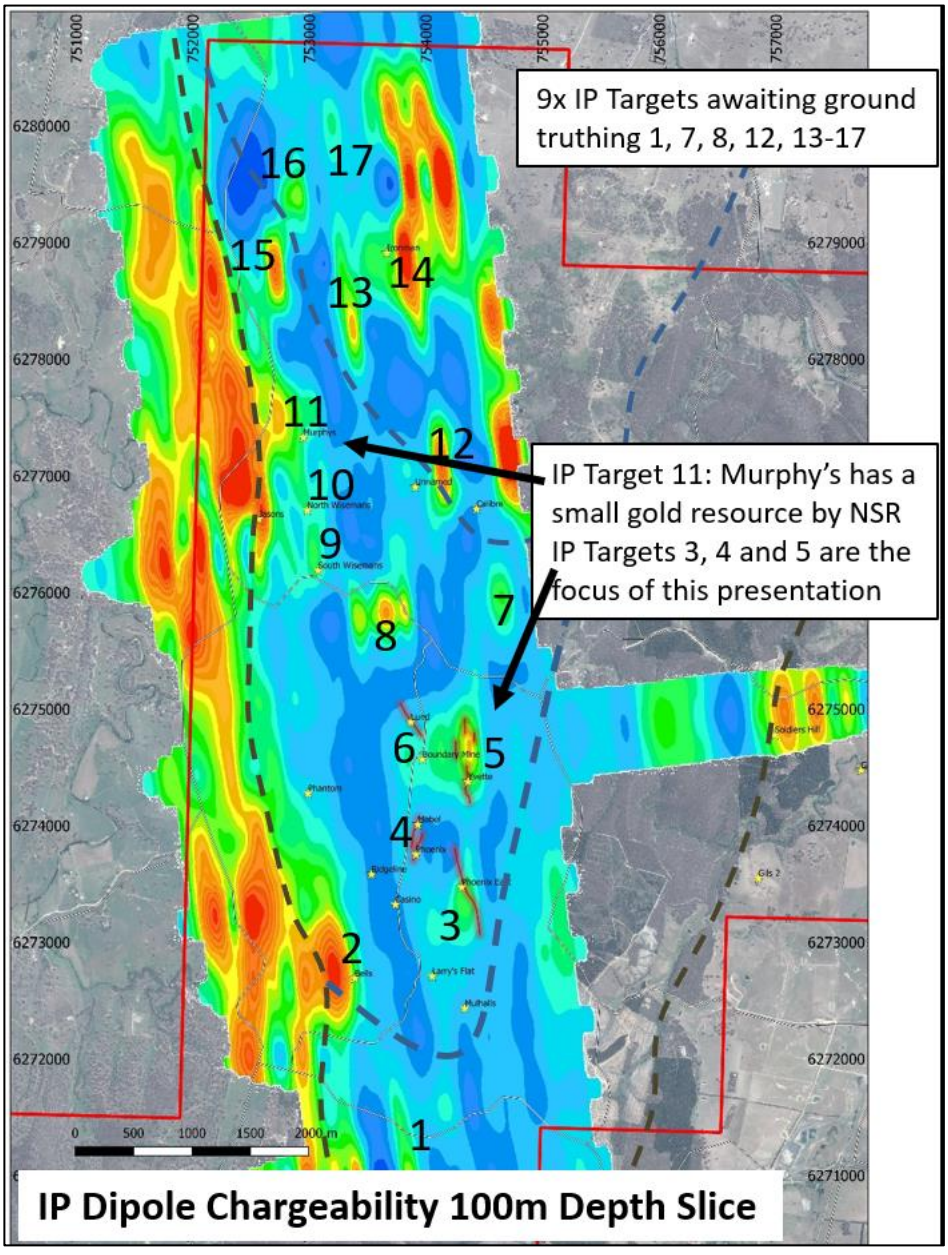
The most voluminous lithology is a massive quartz (3mm 15%) ± feldspar (3mm 10%), phyric, medium to course grained, volcaniclastics rhyolite with fine grained, micaceous and often chloritic groundmass, which has undergone strong ductile deformation, now schistose. The quartz phenocrysts are subhedral and highly translucent, while the feldspars are present as euhedral, stubby, laths. The volcaniclastics vary from a green to dark green, with patchy and wispy cream sericite.

Hydrothermal alteration has preferentially altered the muscovite groundmass to phengite and where fluid has fluxed, fine short veins remain, leading from the pressure shadows of the quartz phenocrysts.

Coherent Quartz-Phyric Massive Rhyolite (Smlcr)

A grey, massive and glassy, quartz (3mm 15%), phyric rhyolite, the groundmass of which is microcrystalline and grey in colour with common disseminated pyrite. Flow banding is rare towards the edges of the coherent bodies, as is brecciation on the contacts.

This facie is the only unit within the Bells Creek Volcanics which is not foliated. The foliated volcaniclastics can have intercalated beds within coherent units, showing the bimodal nature of the depositional environment, switching from effusive to eruptive. The intercalated beds are intensely foliated and altered, as ductile strain and fluid flow is preferentially hosted through the volcaniclastics over the coherent facies. Where hydrothermal alteration is present in the coherent rhyolite, it is focused on the contacts as weak sericite along brittle fractures and ultrafine to medium grained disseminated pyrite is common to 3% as is vein pyrite. Localised at the southern end of the Yvette prospect is disseminated arsenopyrite which carries low grades of gold to 1ppm.



Oxidation is very thin, often only millimetres deep due to the siliceous microcrystalline nature of the rock..

The coherent rhyolites are relatively magnetic and resistive when compared to the surrounding foliated volcaniclastic facies. Kilometre long, north striking zones of high IP resistivity are coincident with mappable units of the massive coherent rhyolite.

Chloritic Groundmass, Quartz-Phyric Coherent

Rhyolite Volcaniclastic Breccia (Smlcb)

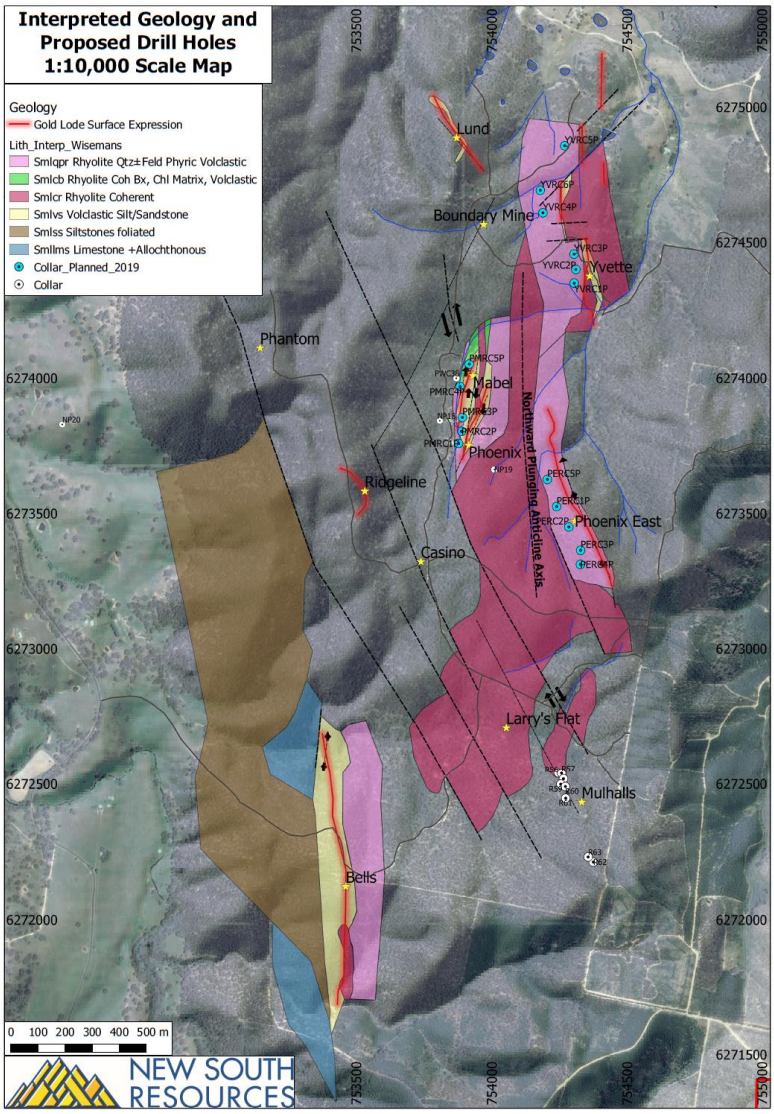
Far less abundant than the two lithologies above, is a white and green, chlorite matrix-supported, volcaniclastic breccia. Clasts are typically white, coherent, quartz-phyric, massive rhyolite (5cm, Smlcr) supported by a green, quartz (3mm 15%) phyric, medium grained, strongly foliated matrix. The units are approximately 30 metres thick with very distinct green

colour and massive clasts and foliated matrix. Weak to moderate quartz alteration permeates the units.

Volcaniclastic Sandstone (Smlv)

The host lithology of the Phoenix and Mabel base metal lodes is a tan coloured quartz sandstone-siltstone. It is 50m in thickness at its widest point. Localised zones have lithic breccias (<5cm), which are interpreted as turbiditic breccias of the same lithology and there are also zones with clasts of ex-sulphide boxwork. This unit is interpreted to have marked a quiescence period between volcanism, which is required to build metal flux. It has also been mapped at Yvette. This volcaniclastic sandstone is a mineralisation 'Marker Horizon'.

At Phoenix-Mabel the geometry of the siltstones is not uniform. The siltstones widen to 50 metres in apparent thickness at Mabel, but pinches out to the north with the Smlcb in the hangingwall and weakly chlorite altered clastic volcaniclastics in the footwall. To the south of the Phoenix Mine, the siltstones pinch into the surrounding quartz phyric volcaniclastics in a fault zone mapped in a shallow shaft 50m south of the main Phoenix shaft.



Quartz sericite pyrite alteration within this volcaniclastic sandstone is generally intense. In the footwall of the historic workings the alteration is most intense and often also has pyrite stringer veins still preserved from oxidation at surface.

Structural Setting

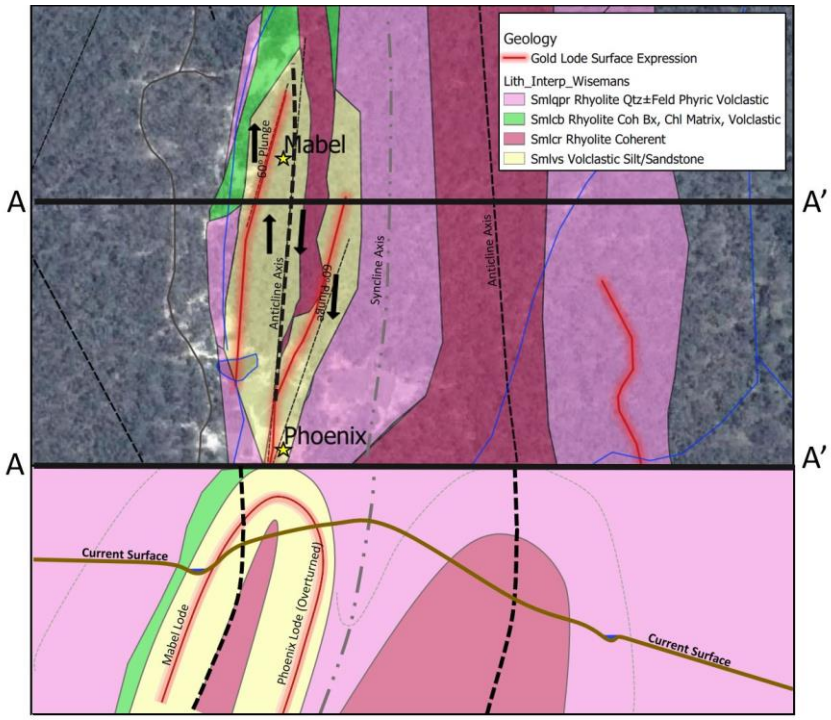
A large 0.5km wide by 1.5km long body of massive coherent rhyolite (Smlcr) is mappable to the south and on the eastern margin of Phoenix-Mabel. Ground magnetics, IP resistivity and outcrop mapping provide evidence of this coherent rhyolite forming the core of a large northward plunging anticline. The axis crosses Sheltons Gully creek between Mabel and Yvette and is marked by a zone of intense quartz veining. Smaller parasitic folds form in the limbs of the larger fold, one in the western limb at Phoenix-Mabel and potentially another in the eastern limb at Phoenix East.

Zones around the anticline have undergone both ductile and brittle deformation. The ductile deformation preferentially foliated the volcaniclastics and siltstones and is generally most intense near the contacts of the coherent rhyolite facies., Brittle deformation is mostly focus

in the coherent rhyolite, resulting in crackle breccias and thin veining. The strongest alteration is hosted in the foliated units due to their permeability.

Phoenix-Mabel Deposit Geology and Exploration Potential

The Phoenix-Mabel deposits are dominated by syngenetic VAMS base-metal features. They are located at IP anomaly #4 which lies within the western limb of the north-plunging regional anticline and the deposits themselves lie within opposite limbs of an overturned parasitic anticline (the Phoenix-Mabel anticline), with both fold limbs west dipping. The Phoenix deposit is hosted within the eastern limb of the Phoenix-Mabel anticline and overturned, while the Mabel deposit is in the western limb and not overturned. The Mabel and Phoenix lodes plunge in opposite directions, 60º to the north and 60º south respectively. These opposite angled plunges can be explained by dextral movement applied to the limbs of the anticline. Evidence for this hypothesis includes outcrop lineations and the dextral offset of 300m along the parasitic fold axis of the historic workings on either limb, suggesting NE to SW compression. The geometry of the historically mined out areas, shows Phoenix plunging to the south and a set of six 20m long en-echelon quartz veins mapped at surface in the footwall of Phoenix are further evidence of dextral movement. This lode plunge has implications for drill hole placement.



At the Phoenix deposit, diamond hole NP18 (Az 90º dip 60º, 260m EOH) drilled in 1965 by EZ Corporation demonstrates the deposit has been overturned which also has implications for exploration. Evidence for the overturned limb is the overturned ore body and alteration characteristics. From quartz phyric volcaniclastic rhyolite to Mine Sequence volcaniclastic siltstone (Smlvs), the alteration from top of hole to bottom grades chlorite, to chlorite sericite, moderate sericite pyrite with pyrite stockwork veins, into moderate quartz sericite pyrite with 8.8m at 1.0% Pb+Zn and 0.44g/t gold. The mineralisation is hosted in the Mine Sequence volcaniclastic siltstone in laminated pyrite to 10% and terminates downhole into a 2m thick massive pyrite horizon. The alteration below the massive pyrite horizon diminishes rapidly to background within a coherent rhyo-dacite. The Phoenix deposits feeder zone is now in the hangingwall above the massive pyrite cap in the footwall.

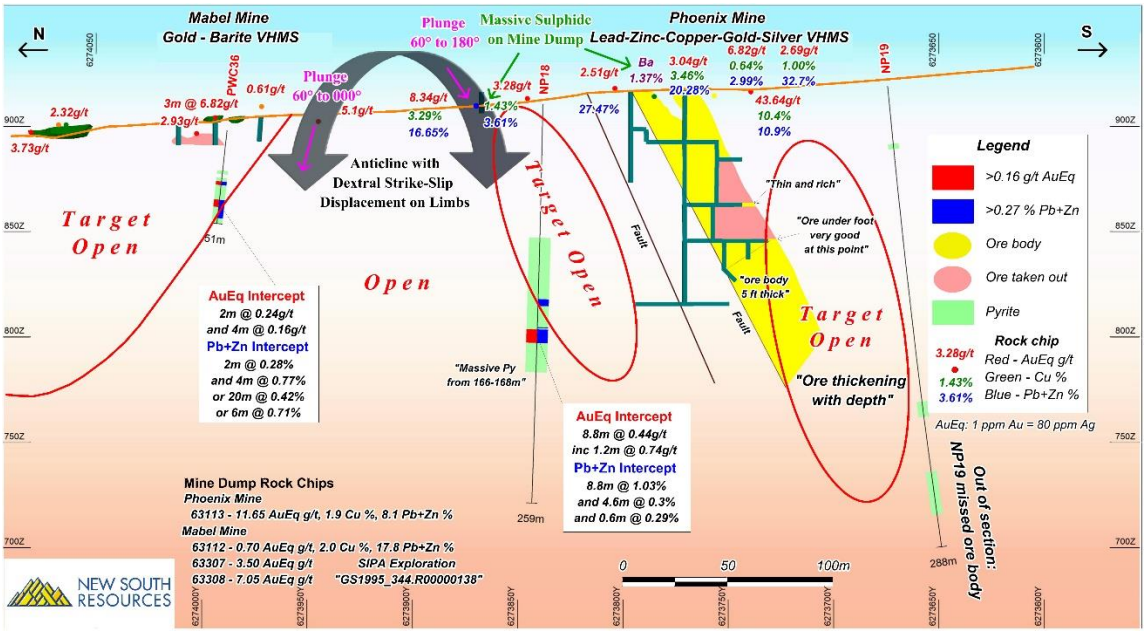
Historically the Phoenix mine produced an estimated 3,000t ore grading 4% copper from open pits and underground until the mines closure in 1911. Historic mine records document that the ore was sorted and roasted for copper while the high-grade zinc and lead material was discarded due to lower economic values.

Historic drawings and photographs show the outcropping lode is 50m wide by 100m deep with the lode at surface less than a metre wide but "*thin and rich*". At the 330ft base of the mine, the ore is described as "*5 foot thick"* and "*open at depth*".

Grab samples from the Phoenix dumps demonstrates zinc-lead rich lodes 21.8% Zn, 10.9% Pb, 1.0% Cu and 171.0g/t Ag and 0.5g/t Au and high gold-silver-copper rich lodes 6.3% Zn, 4.6% Pb, 10.4% Cu and 2,623g/t Ag and 10.8g/t Au. The ore is typically banded sphalerite, galena, chalcopyrite, tennantite-tetrahedrite. Significant deformation has affected the ore horizons with intense foliation forming chloritic siltstones and remobilising sulphides.

Another dump site 100m to the north next to a smaller 30ft underlay shaft recently assayed 1g/t Au, 580g/t Ag, 13.3% Zn, 3.3% Pb & 3.3% Cu, from a composite sample (#19R1001). This shaft is located in a massive sulphide lens and is directly 200m above the only drill hole intercepting the Phoenix lode, which intercepted low grades, 8.8m at 1% Zn+Pb and 0.45g/t AuEq, see the long section for locations. Given the southward plunge, this drill hole was drilled too far north to intercept the southern plunging lode. Between this smaller shaft and the mine were open pits targeting oxide ore. Beneath these open pits there is 100m width of untested ground between the 30ft shaft and the 330ft historic mine, taking the total true prospective width at Phoenix to 140m of striking lode. Drilling is planned in this area.

Mabel has similar geology to Phoenix only not overturned and the plunge is 60º to the north. Considerable amounts of barite are present at Mabel. Recent composite sampling in 2019 across the lode in the historic oxide pits graded 3m at 6.8g/t Au, 190 g/t Ag, 0.1% Cu, 1.3% Pb. Drilling is also planned under Mabel.



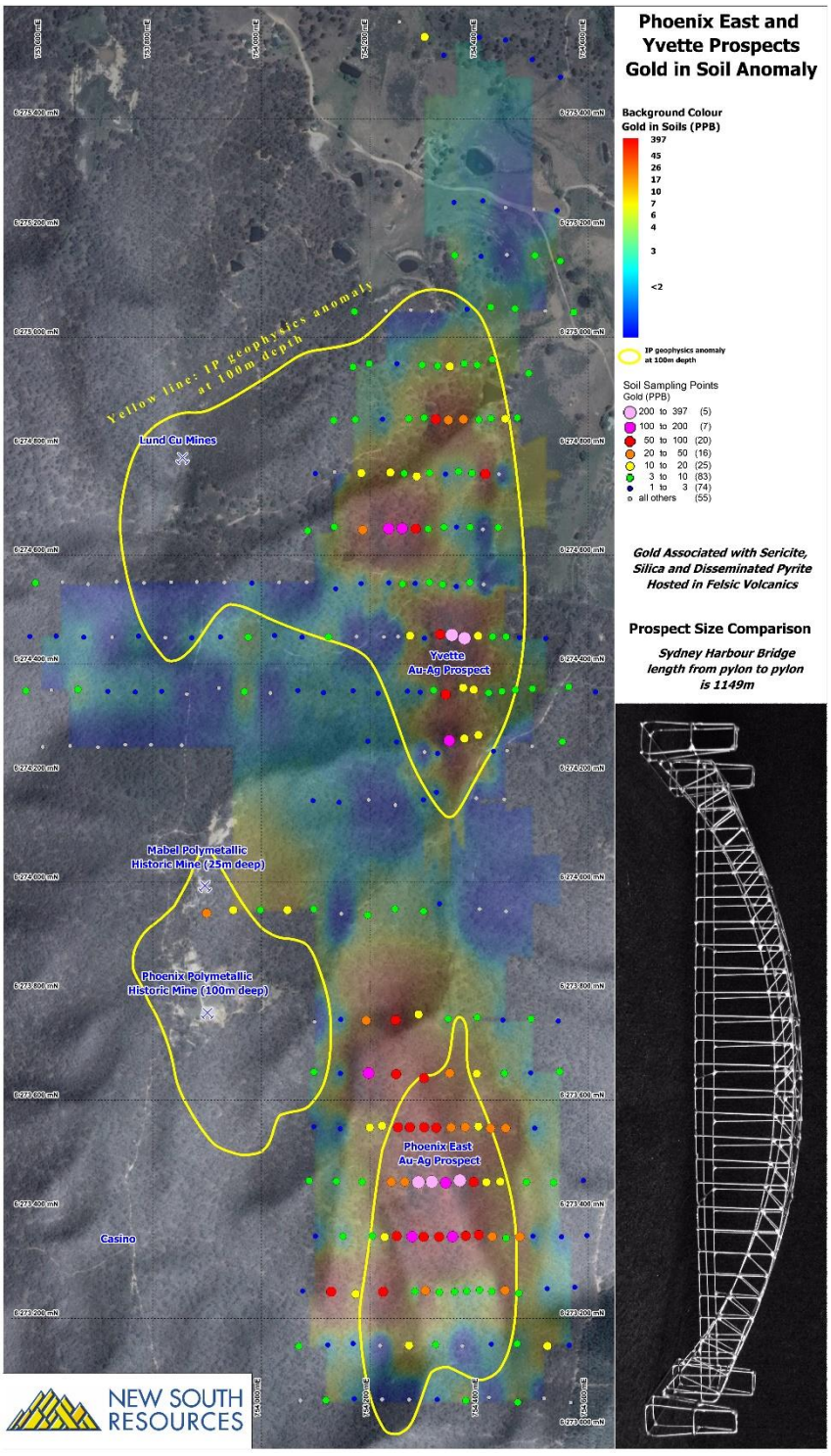
Phoenix-Mabel long section looking east, showing historic mine workings and drill holes, mine dump and rock chip samples and prospective areas. The north trending fold axis is between Phoenix and Mabel.

Yvette Prospect Geology and Exploration Potential

The Yvette prospect is IP anomaly #5 and is interpreted to have a syn-deformational epigenetic genesis. During periods of deformation the coherent rhyolite on the eastern flank acted as an impermeable boundary focusing fluid and stress through the adjacent, more ductile volcaniclastics. The Yvette anomaly is 800m in length with gold mineralisation

mappable and outcropping at surface. At surface the strongest mineralisation is hosted in intensely sheared volcaniclastics immediately adjacent to a thick massive coherent rhyolite, with gold grades being strongly associated with arsenopyrite and pyrite, grading 20m at 0.25g/t in composite trench sampling.

From east to west the stratigraphy commences with vibrant green chlorite, muscovite matrix altered, quartz-feldspar phyric volcaniclastics (Smlqpr), then a 50m thick coherent massive rhyolite (Smlcr) in the footwall, then the mineralised zone comprised of intensely quartz sericite pyrite altered, sheared and foliated, quartz, phyric volcaniclastics (Smlqpr) and sandstone (Smlvs). At the southern end of Yvette the coherent rhyolite expands to 100m in width, with intense quartz, sericite, pyrite alteration. Typically quartz sericite pyrite alteration starts in the footwall coherent rhyolites and continues into the foliated facies also with intense sericite, predominantly phengite. At the expansion zone, an inflection zone exists coincident with the most anomalous area for pathfinder elements and gold. This zone also has the most well-developed foliation boudinage and silica alteration. This 200x200m zone is considered to be the most prospective location of a steeply dipping ore shoot such as that seen at Discovery Ridge or Peak.

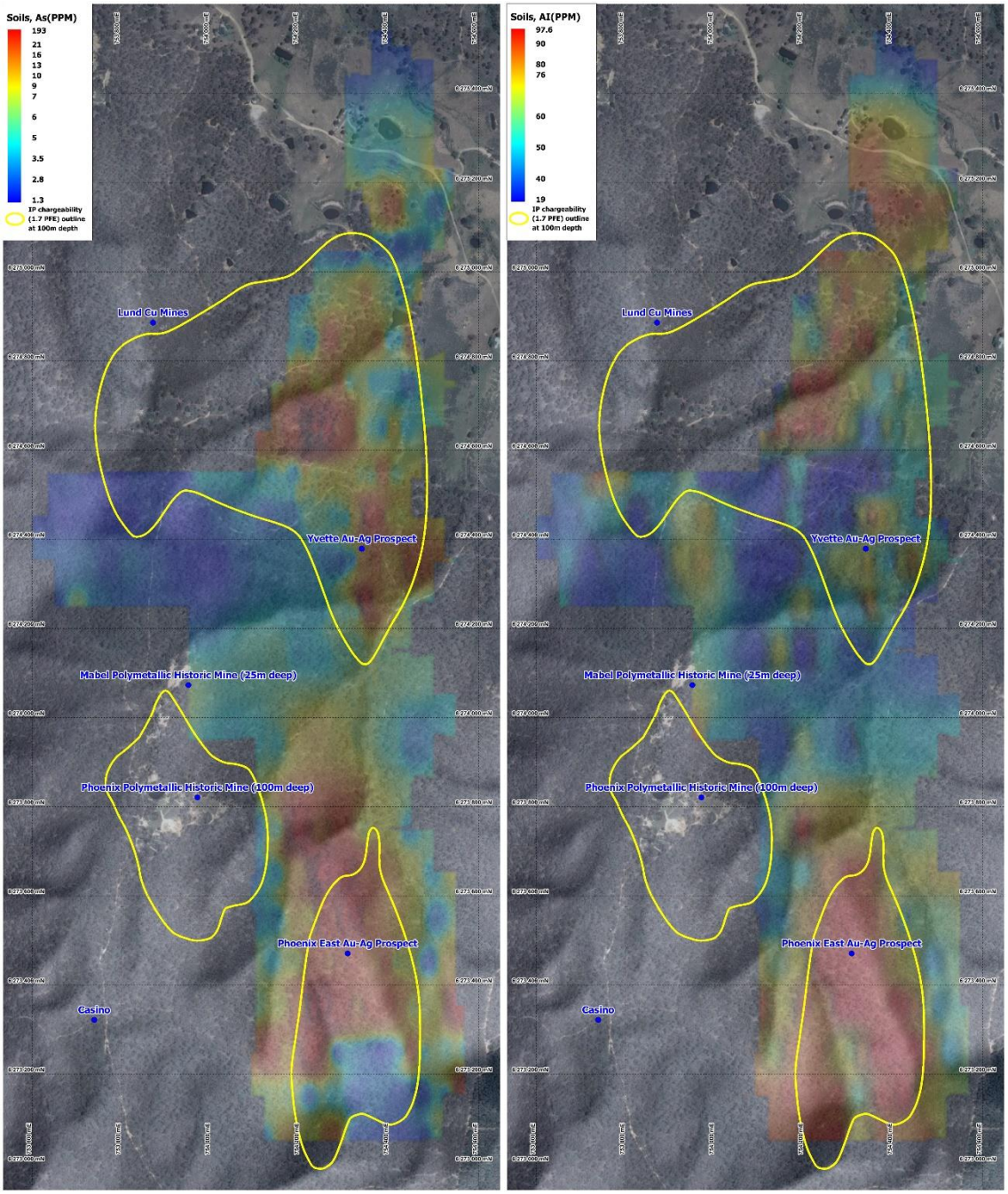


Phoenix East Deposit Geology and Exploration Potential

Unlike Phoenix-Mabel on the western limb, the Phoenix East prospect is situated on the eastern limb of the regional anticline. The prospect provides strong evidence for both syngenetic VAMS base-metal and syn-deformational epigenetic gold and is

800m in length and forms a high (1010m asl), long hill with over 100m of relief in which the ridge of the hill strikes 330 degrees. The rocks dip 60º due west and are primarily quartz-phyric, rhyolite volcaniclasts (Smlqpr) that have seen intense shearing leaving well-developed foliation boudinage fabric in the altered and mineralised zone. The footwall facies are also foliated, felsic volcaniclastic (Smlqpr) rocks predominantly altered to green chlorite, minor facies have green chlorite altered hyaloclastites in a fine-grained quartz-rich matrix, coherent rhyolite breccias in chlorite matrix and small domes of coherent massive rhyolite (Smlcr).

Mapping, soil and rockchip samples, highlight the footwall alteration grading from chlorite-muscovite up into a 60m thick zone of intense phengite, quartz and ex-sulphide at surface. The mineralised zone has anomalous soil geochemistry of Au (max 249ppb), Ag, As, Ba, Pb, Cu, Tl and weak Bi and Mo and up to 2.8g/t Au in rockchips hosted in numerous barite-rich gossans sampled from historic workings.



Soil geochem maps of arsenic (left) and Ishikawa alteration index (right) demonstrates the altered stratigraphy. Similar anomalies are evident for silver, copper, lead, antimony and thallium.

At Phoenix East, the area of outcropping rocks hosting the highest gold grades in soils and rockchips have ex-sulphide stockwork veins in the footwall and barite gossans in the hanging wall. Alteration diminishes in the hanging wall within 20 meters, back to feldspar phenocrysts in equal abundance to quartz phenocrysts. Drilling is planned at Phoenix East.

Conclusion

The Wisemans Creek district mineralisation exhibits similarities to both the Woodlawn deposit's syngenetic strataform base-metal mineralisation and to the McPhillamys deposit, by having the strongest gold mineralisation hosted in intensely sheared volcaniclastics. Gold exploration over the last two years has focused on the most advanced brownfield prospect, at the historic Phoenix-Mabel zinc-copper-lead-silver-(gold) mines and has discovered and defined the Phoenix East gold prospect and the Yvette gold prospect. Only three drill holes have historically tested mineralisation in this 2km gold and base-metal trend, two of which intercepted mineralisation. The area is considered to be highly prospective for Woodlawn style base-metal and McPhillamys style gold deposits.

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