Mines and Wines of the Southwest post-conference excursion 6–9 September 2019

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Australasian Exploration Geoscience Conference
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Incorporating the AIG, ASEG, PESA, and WABS

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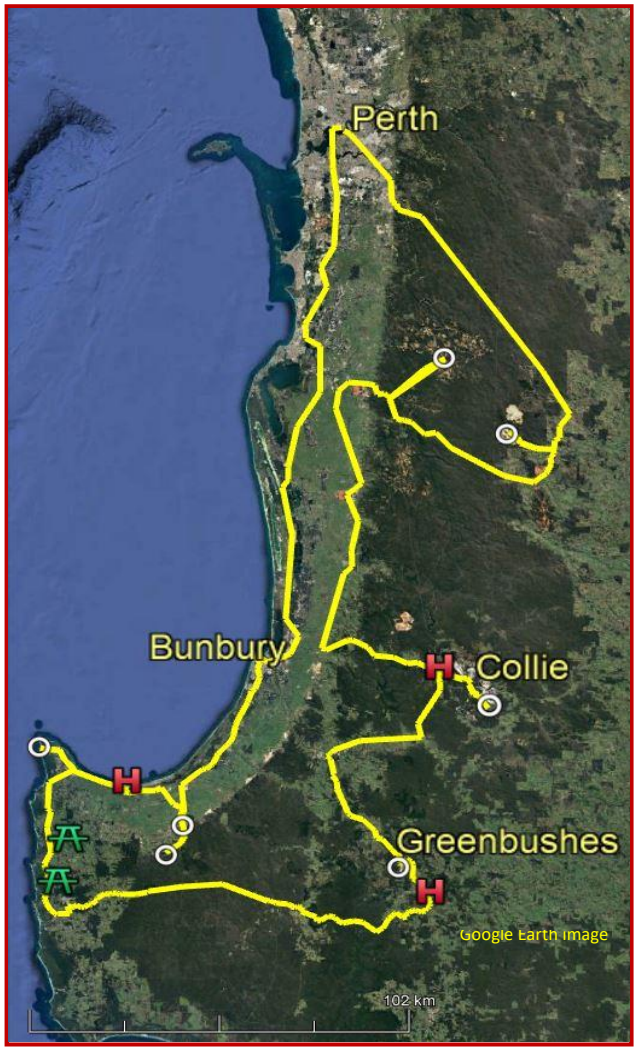
Overview: To visit five minesites and one potential gasfield, including:

- Boddington gold mine
- Darling Range Bauxite
- Collie coal
- Greenbushes Li-Ta deposit
- Sue's Road heavy-mineral sand deposit
- Whicher Range gasfield

In addition, there will be visits to one or two of the renowned high-quality Margaret River wineries and a viewing of some high-grade metamorphics and overlying Cenozoic outcrops on the spectacular far west coast of Western Australia.



Route of excursion

Please register your interest as early as possible **with a payment of $1800 by COB on Wednesday 31st July** — repaid if there are insufficient numbers. Later registrations are feasible only if there are at least 14 people registered and paid for by that date — up to 31 participants are possible.

Itinerary:

Friday 6th: after an early morning start drive to Boddington to view Newmont's gold mine and in the afternoon Alcoa's Huntley bauxite mine, finishing at Collie for the night.

Saturday 7th: examine the Yancoal coal mine, Collie Sub-basin in the morning and then the Talison lithium-tantalum open-cut operations at Greenbushes, then drive to Bridgetown for the night.

Sunday 8th: head west to the Margaret River wine district for viewings and tastings before viewing high-grade metamorphics of the Leeuwin complex and finishing overnight near Busselton.

Monday 9th: in morning visit Doral's Sue's Road heavy-mineral titanium-zircon mine and then to the Whicher Range gasfield before returning to Perth.

Logistics: This 4-day (3 nights) excursion will have an early Friday start, will end in Perth late on Monday and will cover almost 1000 km. Included is transport from the pick-up locality and back to Perth by coach and high-quality motel accommodation that includes all meals. It is planned that several winemakers will provide talks and tastings of local wines in the evenings. More details will be provided later.

The weather can be expected to be excellent with average temperatures in the region ranging from a minimum of about 10°C to a maximum of about 20°C. There may be rain on one or two days, but is unlikely to be heavy or continuous unless a cold front passes during the excursion.

Attire and safety: Steel-capped boots, long-pants and long sleeved shirt are necessary if you wish to leave the coach at the mine sites. Other personal protective equipment will be supplied at those localities. You may want to bring your geological hammer, hand lens and backpack with water bottle.

Mines and sites

Boddington gold, one of the largest gold producers in Australia, is hosted in 2.7 Ga tonalitic intrusives of the Saddleback Greenstone Belt, a component of the Yilgarn Craton. Although there are some indications the mineralisation may be hydrothermally-related, there are still questions raised about the genesis of the orebody. The history of the exploration is inspiring.

The Darling Range bauxite deposits, are dominantly hosted in deep-weathered granitoids of the Darling Range Batholith, a large 2.26 Ga to 2.55 Ga body covering the southwestern corner of the Yilgarn Craton. The regolith, developed through much of the Cenozoic, has an upper layer with economic concentrations of gibbsite. This mining area produces over 20 Mt of bauxite per annum from many relatively small, shallow open cuts. Alcoa's rehabilitation is world-renowned and provides excellent examples of post-mining restoration of native vegetation. After being disregarded for years, a mineralogical breakthrough allowed the development of these deposits.

Bauxite outcrop in Darling Range deposit

The Permian **Collie Coalfield** is preserved within a mid-Palaeozoic down-faulted block within the Yilgarn Craton. The coal is relatively low-ash and found within three main coal measures in seams up to 11 m thick, although the thickest has been worked out at shallow depths. Yancoal operates the Premier coal mine that produces coal for power generation and industrial uses. Initially operated as underground mines, commencing in the late 1800s, all the Collie operations are now open-cut.

The Greenbushes open cut, operated by Talison Lithium, contains one of the largest known hard-rock lithium-tantalum deposits on Earth that was originally developed for its alluvial tin. Located in a large (3.3 km-long) pegmatite, it formed in the Yilgarn Craton at about 2.65 Ga. Initially an open-cut operation, an underground tantalum mine was later opened but more recently has been expanded as a lithium-dominant open cut.

Examining rock dump for minerals, Greenbushes

Sue's Road open cut is a relatively new heavy-mineral sand mine producing ilmenite, zircon and leucoxene at the base of the Whicher Scarp. This mine is representative of the widespread Cenozoic heavy mineral sand deposits that have provided a major World resource over several decades. The shallow, elongate open-cuts have beach- and dune-sand concentrations of heavy minerals at different paleo-strandline levels in the youngest sediments of the Perth Basin. These deposits present some interesting exploration case studies.

The Whicher Range gas accumulation, lies below the upper side of the Whicher Scarp from Sue's Road in a large doubly-plunging anticline in siliciclastic strata of the Perth Basin. Although potentially holding a large in-place volume of up to 10^{11} m^3, the flow rate from the five wells rapidly decreased to uneconomic rates over a few days. The gas reservoir lies at about 4000 m depth within the Permian Sue Group that are lateral equivalents of the upper part of the coal measures at Collie.

Leeuwin Complex metamorphics, underlie the longitudinal Leeuwin–Naturaliste ridge along the far southwest coast. These will be visited at Sugarloaf Rock where the metamorphic grade in the mafic to granitic gneisses reached between upper amphibolite to granulite grade at about 520 Ma. Cenozoic dunal lime sands along this spectacular coast rest unconformably on metamorphic rocks.

Margaret River wineries. It is planned for one or two visits on the Sunday so that delegates can appreciate the setting and perhaps a little of the excellent wines from locally grown vines growing on the deep-weathered regolith over Leeuwin Complex metamorphics and strata of the Perth Basin.