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URANIUM

Critical mineral potential of South Australia

Geological Survey of South Australia



Government
of South Australia

Department for
Energy and Mining



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South Australian Resources Information Gateway (SARIG)

SARIG provides up-to-date views of mineral, petroleum and geothermal tenements and other geoscientific data. You can search, view and download information relating to minerals and mining in South Australia including tenement details, mines and mineral deposits, geological and geophysical data, publications and reports (including company reports).

map.sarig.sa.gov.au



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Acknowledgement of Country

As guests on Aboriginal land, the Department for Energy and Mining (DEM) acknowledges everything this department does impacts on Aboriginal country, the sea, the sky, its people, and the spiritual and cultural connections which have existed since the first sunrise. Our responsibility is to share our collective knowledge, recognise a difficult history, respect the relationships made over time, and create a stronger future. We are ready to walk, learn and work together.

Uranium

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**Geological Survey of South Australia,
Department for Energy and Mining**

July 2025



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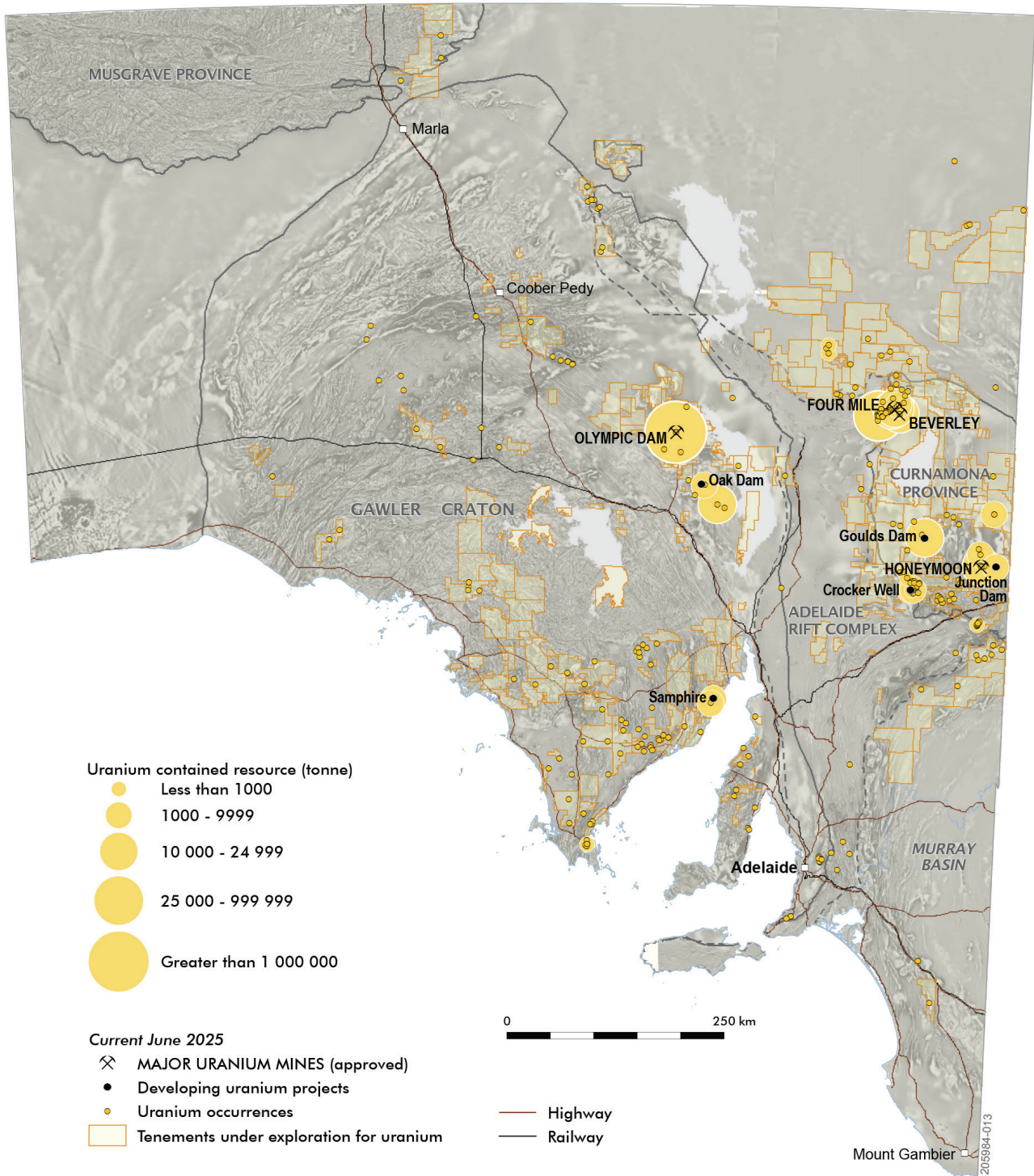


Figure 1. South Australian uranium occurrences.

<https://sarigbasis.pir.sa.gov.au/WebtopEw/ws/plans/sarig1/image/DDD/205984-013>

Uranium

Geological Survey of South Australia

ABOUT URANIUM

Uranium is a naturally occurring, mildly radioactive element, widely distributed in the Earth's crust, rocks, sediments, rivers and oceans. It is about as common as tin and more abundant than gold, silver or mercury.

Uranium ore is mined in open-cut or underground operations (sometimes with other metals such as gold or copper) or through in situ recovery (ISR) from wells drilled into the subsurface deposit. Ore is processed into uranium oxide concentrate (UOC) which contains uranium oxide as either U_3O_8 or UO_4 .

UOC is commonly termed yellowcake and exported in powder form in accordance with International Standards. It is chemically and physically stable, and cannot itself sustain a nuclear chain reaction. Significant additional processing (conversion, enrichment and fuel fabrication) is required before it can be used to generate power.

Australian uranium is only used for peaceful purposes – as a fuel for civilian nuclear power and to produce medical and industrial isotopes.

More information about uranium can be found at Resourceful SA Uranium – SACOME <https://www.sacome.org.au/resourcefulsauranium.html>.

URANIUM IN SOUTH AUSTRALIA

South Australia is the only producer of uranium in Australia and the fourth largest producer in the world. It is a major exporter of uranium oxide and attracts many companies (including global majors) to explore, develop and mine uranium. The state hosts:

- approximately 79% of Australia's economic demonstrated resources of uranium¹.
- approximately 23% of the world's uranium resources².

The Olympic Dam deposit is the largest uranium deposit in the world, containing more than 2.5 million tonnes of uranium oxide.

South Australia hosts four approved uranium mines – Olympic Dam, Beverley and Beverley North (~10 km north of Beverley), Four Mile (West and East) and Honeymoon. An advanced exploration/trial is located at Samphire.

SOUTH AUSTRALIA'S ADVANTAGE

- Has the demonstrated geology with high potential for further discoveries.
- Produces around 10% of the world's uranium, indicating there is significant potential for long term production and expansion.
- Has currently three active operational uranium mines with proven safety record.
- Demonstrated experience with technologies for processing uranium ore, developed from the State's uranium mines using different ore beneficiation processes.
- Strong regulatory framework with proven safe uranium handling and transportation systems over 35 years.
- Has one port (Port Adelaide) of only two Australian ports approved for uranium exports.

¹ Geoscience Australia - Australia Minerals 2024

² Geoscience Australia - Australia Minerals 2024

SUPPORTIVE GOVERNMENT

The South Australian Government openly and actively supports exploration for uranium in South Australia.

The project approvals process has been streamlined to improve transparency and promote efficiency in mining operations while effectively ensuring the safety and protection of the public, workers and the environment.

REGULATORY FRAMEWORK

Uranium exploration and mining in South Australia is governed by:

- *Mining Act 1971* and *Mining Regulations 2020*
- *Radiation Protection and Control Act 2021*
- *Roxby Downs (Indenture Ratification) Act 1982*
- *Environment Protection and Biodiversity Conservation Act 1999 (Cwth)*

The Act and the Regulations require licences for both exploration and mining on ground works. More information on searching for open ground and exploration licence applications can be found on the DEM website (see the related links section of this document).

South Australia requires companies to submit and have approved a PEPR (program for environment protection and rehabilitation) before any mining starts. These documents address all criteria, including environmental management and mine closure.

The Environment Protection Authority (EPA) is responsible for the administration of the *Environment Protection Act 1993* and the *Radiation Protection and Control Act 2021*. The South Australian Government has a Memorandum of Understanding (MoU) with the EPA to support the consistent and efficient environmental regulation of mineral resources.

The South Australian government works with the Commonwealth to streamline assessment and regulatory requirements under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Australian regulatory framework for the uranium industry is widely recognised as being effective and representing world's best practice. Export licences are granted under strict Commonwealth legislation that ensures uranium is used solely for the generation of electricity.

URANIUM EXPORTS

South Australia exports all the uranium oxide concentrate that is produced. No enrichment is undertaken in Australia. It is exported exclusively for the generation of electricity in civil nuclear reactors and contracts are in place with the United Kingdom, France, China, Sweden, Finland, Belgium, Japan, South Korea, Taiwan, Canada, the United States and Spain.

URANIUM PRODUCTION

Uranium is one of the state's major mineral commodities produced, with total sales value of >\$1 billion (3,564 t) in 2024. Between 2000 and 2024, South Australia has produced and exported over \$9.9 billion (115,900 t) of uranium oxide concentrate.

APPROVED AND OPERATING MINES

Company released resource estimates and production statistics for South Australia's major operating and approved mines are summarised in *South Australia's major operating/approved mines: resource estimates and production statistics*

<https://map.sarig.sa.gov.au/CrystalRunner/Report/Export/1?exportName=MajorProjects>

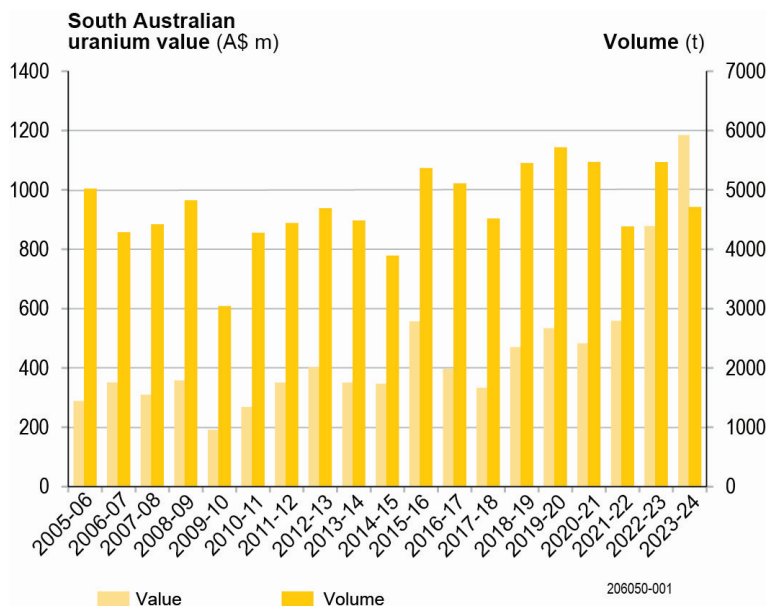


Figure 2. South Australian uranium production. (source: Resource production statistics)

Olympic Dam

- Multi-commodity underground mine producing copper, gold, uranium oxide and silver from world-class IOCG deposit.
- World’s largest uranium deposit.
- Total resource — 9,720 Mt at 0.59 % Cu, 0.20 kg/t U₃O₈, 0.26 g/t Au, 1 g/t Ag (30 June 2024)
- Total reserve — 558 Mt at 1.85 % Cu, 0.59 kg/t U₃O₈, 0.67 g/t Au, 4 g/t Ag (30 June 2024)
- Dominant uranium mineral is pitchblende with minor coffinite and brannerite.

More information regarding the mining operation, compliance reporting and approvals can be found at <https://www.energymining.sa.gov.au/industry/minerals-and-mining/mining/major-projects-and-mining-activities/major-operating-and-approved-mines/olympic-dam>

Four Mile

- Roll-front Uranium was discovered in 2005 at Four Mile, some 8 km northwest of the Beverley deposit and was a greenfield discovery.
- The Four Mile uranium prospects consist of the Four Mile East (FME) Uranium Mine (operation commenced 14 April 2014) and the Four Mile West Mine (FMW).
- FMW is one of the highest-grade uranium deposits of this type discovered anywhere in the world in recent times.
- FMW deposit is hosted in Cretaceous (glacial) and Eocene sediments. FME deposit is hosted in Eocene sediments.
- In-situ leaching/recovery mine.

More information regarding the mining operation, compliance reporting and approvals can be found at <https://www.energymining.sa.gov.au/industry/minerals-and-mining/mining/major-projects-and-mining-activities/major-operating-and-approved-mines/four-mile-uranium-mine>

Beverley and Beverley North

- Paleochannel-type mineralisation hosted by sandy paleochannels within the mud-dominated Miocene Namba Formation within the Callabonna Sub-basin.
- The ore zones occur at depths of 110–140 m over an area 4 by 0.5 km.

- Mineralisation is primarily coffinite with some uraninite.
- The Beverley Mining Lease and the Beverley North Mining Lease are currently in care and maintenance. However, the plant on the Beverley Mining Lease processes product from the Four Mile Uranium Mine.

More information regarding the mining operation, compliance reporting and approvals can be found at <https://www.energymining.sa.gov.au/industry/minerals-and-mining/mining/major-projects-and-mining-activities/major-operating-and-approved-mines/beverley-and-beverley-north-mines>

Honeymoon

- Paleochannel-type mineralisation in sandstone-hosted deposit of the Paleocene to Middle Eocene Eyre Formation.
- In-situ recovery mine.
- Returned to production in 2023 after a period of care and maintenance.
- Two potential future satellite projects: Gould's Dam (80 km NW of Honeymoon mine) and Jasons (13 km north of Honeymoon mine).

More information regarding the mining operation, compliance reporting and approvals can be found at <https://www.energymining.sa.gov.au/industry/minerals-and-mining/mining/major-projects-and-mining-activities/major-operating-and-approved-mines/honeymoon-uranium-mine>

DEVELOPING PROJECTS

Samphire

- Located on the Eyre Peninsula ~20 km southwest of Whyalla.
- Comprises two historical uranium prospects (Blackbush and Plumbush) on Alligator Energy's Exploration Licences ELs 5926 and 6350, and in 2025 were granted a retention lease (RL137).
- Sediment-hosted uranium mineralisation in Eocene paleochannels eroded into clay-altered uranium-rich Hiltaba Suite Samphire granite.
- Plan to utilise in-situ recovery (ISR) at the Blackbush deposit.

More information on Samphire uranium project can be found at <https://www.energymining.sa.gov.au/industry/minerals-and-mining/mining/major-projects-and-mining-activities/developing-projects/samphire-uranium-project> and Alligator Energy – Samphire <https://alligatorenergy.com.au/projects/samphire>.

Crocker Well

- Consists of six prospects, including Original, Crocker South and, within the Crocker Well East area, Central, Main Eastern, Southwestern and Western prospects.
- Magmatic-related uranium system with mineralisation predominantly hosted in shears, breccias and fractures within granitic rocks.
- Mineralisation is primarily thorian brannerite (also found at Olympic Dam) with some davidite.

Junction Dam

- 50 km west of Broken Hill within the Curnamona region of South Australia.
- Hosted in the Yarramba paleochannel, upstream from the Honeymoon Uranium deposit.
- The Junction Dam project includes Saffron, Bridget and Yolanda prospects.
- Uranium mineralisation hosted in the Eyre and Namba Formations at the Bridget Prospect.
- Inferred Resource of 2.4 Kt at 557 ppm U₃O₈.

- Uranium minerals uraninite and autunite identified.

More information can be found at Marmota – Uranium projects <https://marmota.com.au/projects/uranium/>.

URANIUM EXPLORATION

Total mineral exploration expenditure as of 2023–24 was \$302.9 million, a 31% increase from 2022–23 and the highest since 2011–12.

Mineral exploration companies spent \$551.4 million between 2000 and 2024 exploring for uranium in South Australia. This has led to multiple uranium discoveries including the Four Mile uranium deposit.

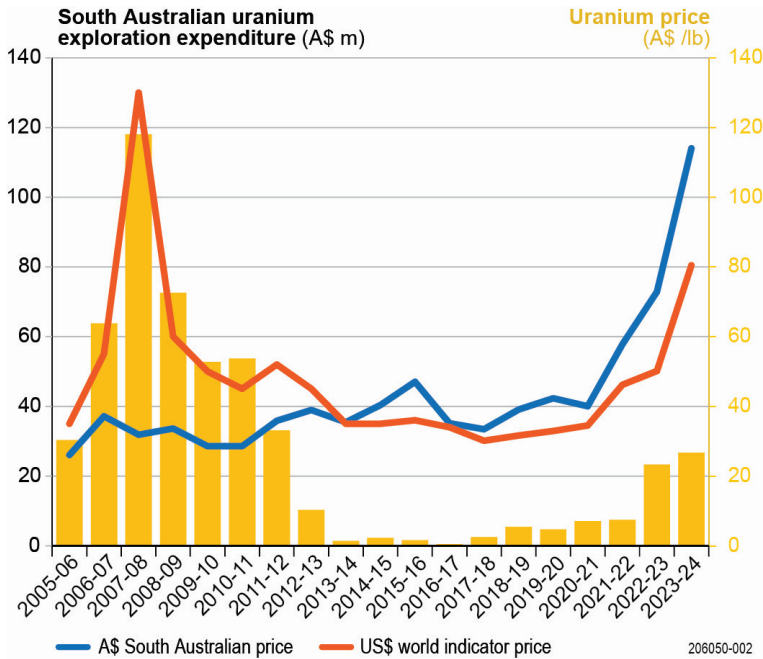


Figure 3. South Australian uranium exploration expenditure between 2005 and 2024.
Disclaimer: full figures for uranium not available for publication but included in totals where applicable unless otherwise indicated (ABS 2025).

Exploration licence holders listing uranium as a commodity can be found by searching SARIG <https://map.sarig.sa.gov.au/>.

EXPLORATION HIGHLIGHTS

Big Lake

- Located in the Cooper Basin oil and gas region within overlying Lake Eyre Basin sediments.
- Uranium occurrences identified from historic oil and gas well gamma logging and confirmed by limited uranium exploration in the region.
- Redox and roll front uranium mineralisation within paleochannels of Lake Eyre Basin sediments.
- Tenement EL 6367.

For more information see Alligator Energy (2025) <https://alligatorenergy.com.au/projects/big-lake>.

Gould's Dam

- Located ~80 km northwest of Honeymoon Mine in the Callabonna Sub-basin.

- Uranium mineralisation within well-developed lower Eyre Formation sands below a redox boundary.
- Mineralised aquifer amendable to ISR mining.
- Contains a JORC compliant resource of 25 Mlbs of indicated and inferred U₃O₈.
- Tenement EL 6512.

For more information see BOSS Energy Limited <https://bossenergy.com/honeymoon-project/exploration>.

Jasons

- Located ~13 km north of Honeymoon mine in the Callabonna Sub-basin.
- Uranium mineralisation is associated with and continuous within the lower Eyre Formation along a strike length of ~1000 m, open to the southeast and southwest.
- Contains a JORC compliant resource of 6.2 Mt at 790 ppm U₃O₈ for 10.7Mlbs contained U₃O₈ (inferred).
- Tenement EL 6512.

For more information see BOSS Energy Limited <https://bossenergy.com/honeymoon-project/exploration>.

Pirie Basin

- Located on the Eyre Peninsula on the western margins of the Pirie Basin.
- Sediment-hosted uranium deposit underlain by uraniumiferous Hiltaba Suite granite.

For more information see Orpheus Uranium Ltd <https://www.orpheusuranium.com/projects/pirie-basin-uranium-project>.

Cummins

- Located on the southern Eyre Peninsula.
- Targeting 'roll-front' mineralisation in reduced facies of Cenozoic paleochannels.
- Comprising tenements EL 6624 and EL 7056.

For more information see Core Energy Minerals <https://coreenergyminerals.com.au/our-projects/australian-projects>.

Yarramba Uranium Project

- The Everest Prospect is located 17 km north of the Honeymoon mine and within the northern reaches of the Yarramba paleochannel.
- Everest Prospect shows high-grade mineralisation trend over 4 km strike.
- Includes the Oban Deposit and Mt John Prospect, with several other satellite prospects under evaluation.

For more information see Koba Resources Limited <https://kobaresources.com/projects/uranium/yarramba-uranium-project> and joint venture partners Havilah Resources Limited <https://www.havilah-resources.com.au/exploration>.

NOTABLE DEPOSITS

South Australia's iron oxide Cu-Au (IOCG) deposits commonly contain elevated uranium which can be of economic interest. The Oak Dam East IOCG±U prospect is the only known location to also contain highly anomalous uranium in the overlying Mesoproterozoic Pandurra Formation.

Oak Dam East

- Located 65 km south-east of Olympic Dam.
- Contains a copper-uranium mineralised cap above and below the contact of the Pandurra Formation and underlying iron oxide-rich breccia.
- Separate to Oak Dam West where mineralisation is solely IOCG±U.

GEOLOGICAL ENVIRONMENTS

South Australia remains one of the most prospective regions in the world for uranium discoveries. Uranium mineralisation is widespread and found in most geological provinces throughout South Australia.

Uranium exploration has largely focused on four uranium mineral systems:

- Hybrid-uranium mineral system e.g., Olympic Dam, Acropolis, Emmie Bluff, Vulcan, Wirrda Well (breccia complex, iron-oxide–copper–gold±uranium (IOCG±U), i.e., ‘Olympic Dam’ style).
- Basin and surface-related uranium mineral system e.g. Four Mile, Beverley, Beverley North, Billeroo, Honeymoon, Oban, Warrior, Yarramba Paleochannels (sandstone-hosted) and Ranger and Jabiluka (unconformity-related).
- Magmatic-related uranium mineral system e.g. Curnamona Province (including the Mount Painter region and Crocker Well).
- Metamorphic-related uranium mineral system e.g. Curnamona Province (including the Mount Painter region), Radium Hill, the Mount Painter region and the Adelaide Rift Complex.

Known uranium occurrences and significant geological parameters for each deposit type have been collated and represented spatially as ‘key ingredients’ on the *South Australian uranium occurrences* map <https://pid.sarig.sa.gov.au/map/mesac25818>

The Geological Survey of South Australia undertakes work to determine the interaction between deposit type and these parameters, to improve predictive modelling outcomes and delineate areas of interest for uranium exploration.

HYBRID (IOCG±U) MINERAL SYSTEM

These hybrid deposit styles typically involve the mixing of magmatic-hydrothermal fluids with lower temperature fluids e.g. Olympic Dam (Wilson 2015).

It is clear from the giant Olympic Dam deposit that the c.1590 Ma Mesoproterozoic thermal event in South Australia introduced highly anomalous uranium throughout the crust. This event, coincident with emplacement of Hiltaba Suite granites and Gawler Range Volcanics and equivalents, affected all the central and eastern Gawler Craton as well as the central and northern Curnamona Province.

The legacy for explorers is a very large region prospective for hard rock IOCG±U deposits. The dense, hematite-rich mineralised systems are readily identified by detailed gravity survey data.

BASIN AND SURFACE-RELATED URANIUM MINERAL SYSTEM

Sandstone-hosted

The Gawler Craton and central Curnamona Province were eroded by widespread major river systems during the Cenozoic. Uranium has been deposited in reduced lithologies within these channel systems. At the Honeymoon deposit, the damming of the river systems and subsequent precipitation of uranium appears to be controlled by minor movements along small-scale faults within underlying basement. Cenozoic paleochannels have been explored and remain targets for uranium exploration e.g. Kingoonya, Wynbring, Narlaby, Wanilla, Garford etc.

Unconformity-related

Much of the upper part of the Gawler Range Volcanics was eroded and redeposited in the sedimentary succession of the Mesoproterozoic Cariewerloo Basin. Potential targets are at the base adjacent to graphitic schists within Paleoproterozoic metasediments or within this extensive, poorly explored basin adjacent to reduced lithologies. Investigations into the uranium potential of the Cariewerloo Basin have been undertaken by the Geological Survey of South Australia.

MAGMATIC-RELATED URANIUM MINERAL SYSTEM

In the Crocker Well area in the Curnamona Province, uranium primarily occurs as thorian-brannerite mineralisation as a disseminated accessory mineral or in fractures, breccias or quartz veins in sodic, plagioclase-rich granitoids and gneisses. Uranium in the form of davidite occurs in the east of the deposit and at the Mount Victoria deposit. The Mount Painter region of the northern Curnamona Province has highly anomalous uranium bearing c. 1590 Ma granites and introduced younger brannerite-rich systems.

METAMORPHIC-RELATED URANIUM MINERAL SYSTEM

Metamorphic-related uranium mineral systems involve deposition from either true metamorphic fluids, or fluids that have extensively reacted with metamorphic rocks at elevated temperatures. Metasomatic and some vein-style deposits are probably derived from a range of magmatic-hydrothermal to metamorphic fluids.

In South Australia, examples of metamorphic-related uranium systems occur in the Curnamona Province including Radium Hill and the Mount Painter region, as well as in the Adelaide Rift Complex.

NEW CONCEPTS AND PLAYS FOR URANIUM PROSPECTIVITY IN SOUTH AUSTRALIA

EARLY CRETACEOUS GLACIATION

Bulletin 57, by Dr Neville Alley and Stephen Hore, offers a major reinterpretation of Early Cretaceous stratigraphy along the southern margin of the Eromanga Basin. The study introduces new geological concepts that reshape the understanding of uranium prospectivity in South Australia. As uranium exploration in sedimentary basins progresses, this work is central to understanding how glacial processes influence uranium-hosting environments. It provides the first in-depth understanding of the Early Cretaceous Glaciation (ECG) and shows that younger Eromanga Basin sediments host reductants and potential uranium-enriched fluids. New models indicate that the ECG may have directly influenced the uranium budget at the likes of the Four Mile East and West deposits through processes such as sedimentary recharge events and glacial transport.

More information on Bulletin 57

<https://www.energymining.sa.gov.au/industry/geological-survey/geology/early-cretaceous-glaciation/bulletin-57>.

GRANITE WASH PLAY, COOPER BASIN

Granite wash from uriferous granites is a potential play for uranium systems, based on its discovery overlying uranium-rich Big Lake Suite (BSL) granites beneath the Cooper Basin. These BLS granites may be the primary source of uranium for overlying Permian sediments. Glacial environments provide physical and chemical processes leading to the mass movement of uranium-rich sediments into basins which can add significantly to the sedimentary-hosted uranium budget.

More information on refining uranium exploration models

<https://youtu.be/-a2JzCSuHvU>

GAWLER PHASE 2 PALEOCHANNEL MAPPING

The Gawler Phase 2 (GP2) project has enhanced uranium exploration tools in the central-western Gawler Craton by delivering new geophysical data and reprocessed night-time thermal (NTT) remote sensing imagery. Key outcomes include updated mapping of Paleozoic paleovalleys—critical for uranium targeting—using high-resolution gravity, AEM, and TMI surveys. Reprocessed ASTER NTT data (90 m pixel) also improved identification of buried drainage systems and paleocoastal dune complexes. Together, these datasets offer a near-3D view of the paleovalley architecture, improving the understanding of subsurface structures in a region of high resource potential within South Australia. These advancements are documented in *Eucla Basin and Peripheral Paleovalleys* <https://pid.sarig.sa.gov.au/document/2022d112408>

RELATED LINKS

South Australian uranium occurrences with mineral deposit listing
<https://sarigbasis.pir.sa.gov.au/WebtopEw/ws/plans/sarig1/image/DDD/204086-001>

Legislative framework

[Mining Act 1971](#)

[Mining Regulations 2020](#)

[Radiation Protection and Control Act 2021](#)

[Roxby Downs \(Indenture Ratification\) Act 1982](#)

[Environment Protection and Biodiversity Conservation Act 1999](#) (Cwth)

[Environment Protection Act 1993](#)

Departmental legislative documents

<https://www.energymining.sa.gov.au/industry/minerals-and-mining/forms-legislation-and-guidance>

Open ground search and exploration licence application

<https://www.energymining.sa.gov.au/industry/minerals-and-mining/maps-data-and-online-tools#accordion-727507-5>

PEPR (program for environment protection and rehabilitation) approvals

<https://www.energymining.sa.gov.au/industry/minerals-and-mining/mining/approved-programs>

Environment Protection Authority (EPA)

<http://www.epa.sa.gov.au/>

South Australian resource production statistics

<https://www.energymining.sa.gov.au/industry/minerals-and-mining/invest/resource-production-statistics>

Cariwerloo Basin

<https://www.energymining.sa.gov.au/industry/geological-survey/geology/cariwerloo-basin>

Curnamona Province

<https://www.energymining.sa.gov.au/industry/geological-survey/geology/curnamona-province>

South Australian commodity resource information (SARIG)

<http://map.sarig.sa.gov.au/MapView/StartUp/?siteParams=DashboardWidget%7CcommoditiesIndicators>

South Australia's Mineral Deposit (MinDep) database

<https://minerals.sarig.sa.gov.au/MineralDepositSearch.aspx>

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