MinEx CRC

2024 YEAR IN REVIEW

BRINGING NEW EXPLORATION TECHNOLOGY TO MARKET

Australian Government
Department of Industry, Science and Resources

AusIndustry
Cooperative Research Centres Program

KEY NUMBERS

355/367
Phase 2 milestones met

61
Peer-reviewed scientific publications

23
Participant Sponsors

50%/50%
Pro-female gender split on MinEx CRC Board of Directors (excluding CEO)

20
Affiliate Sponsors

55
Postgraduate enrolments to date (on target for 60)

15
Postgraduate completions to date (on target for 50)

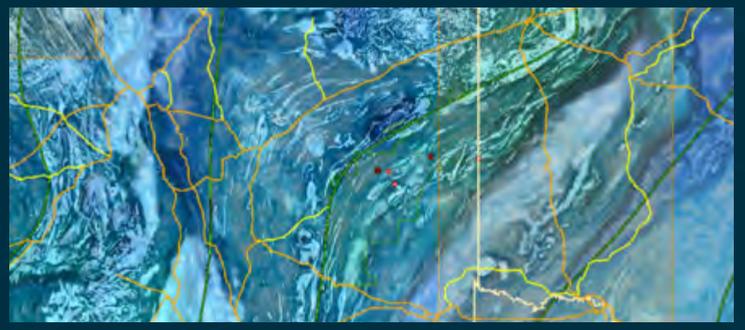
1,500m+
drilled with CT drilling technology

3
Media Releases distributed showcasing key technical outcomes

14K
Total YouTube views

MinEx CRC

RESEARCH FOCUS



MinEx CRC remains focused on delivering :

1. **cheaper, faster, safer and cleaner mineral exploration technology,**
2. **in-field sensing and data science to enable informed decisions while drilling, and**
3. **pre-competitive geoscience data to de-risk exploration in frontier mineral provinces, delivered by the National Drilling Initiative.**

ADVANCING TECHNOLOGY

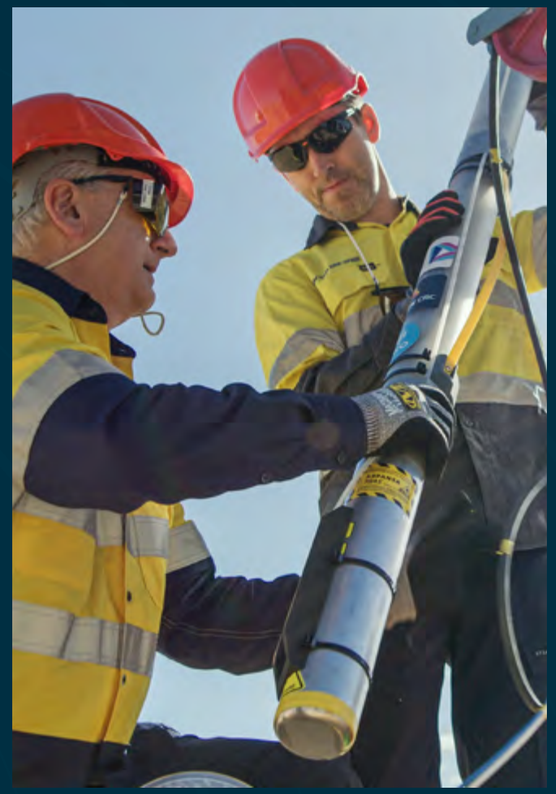
Program 1: Drilling

- Field prototypes for our automated drilling (AutoDrill) and fluid management systems (iFluid, Hobby and Unforgiven) for conventional rotary and RC drilling platforms are complete, have undergone preliminary field trials and are ready for long-term field deployments with MinEx CRC Participants starting in 2025.
- Used 'Woody' single impact drilling experiments to build a library of percussion bit-rock interactions that can be used to assess drilling performance and model rock mechanical properties during drilling operations.
- Collected logging-while-drilling (LWD) data from the MinEx CRC SMART bottom hole assembly (BHA) including our downhole gamma tool and drill string optic fibre distributed acoustic sensor (DAS) seismic receiver.
- Conducted successful trials of the hardware and operating procedures required to 'kick-off' from an existing drill hole during CT drilling, creating the potential for multiple deviations from the same collar location.

MinEx CRC WA NDI Campaign in collaboration with the Geological Survey of Western Australia.

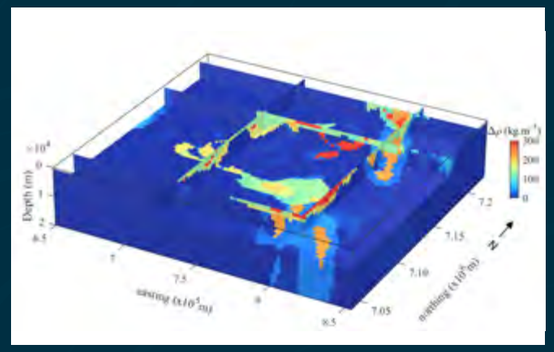
Program 2: Data From Drilling

- Filed a provisional patent based on our prototype downhole LIBS system, which incorporates a high-powered, variable-focus laser and optics and spectrometers capable of detecting all elements on the periodic table to part per million levels. Completed first field trials of LIBS downhole geochemical tool.
  The tool returned geologically sensible data under various operating parameters and could detect and measure Cu and Li concentrations at levels useful for mineral exploration.
- Filed a provisional patent based on our prototype downhole swept frequency EM tool, which incorporates coil and control circuit design, generation of multiple 'swept' source frequencies and data processing methods to extract multiple petrophysical parameters from the signal response.
- Designed and built a prototype electromagnetic three-component (3C) source ideal for borehole seismic applications.
- Tested two machine learning approaches for denoising DAS data (traditional supervised methodology and noise-to-noise) on seismic-while-drilling DAS data. Tests demonstrated the increase of signal-to-noise of the DAS data, specifically for data acquired with low-power (low cost) sources.

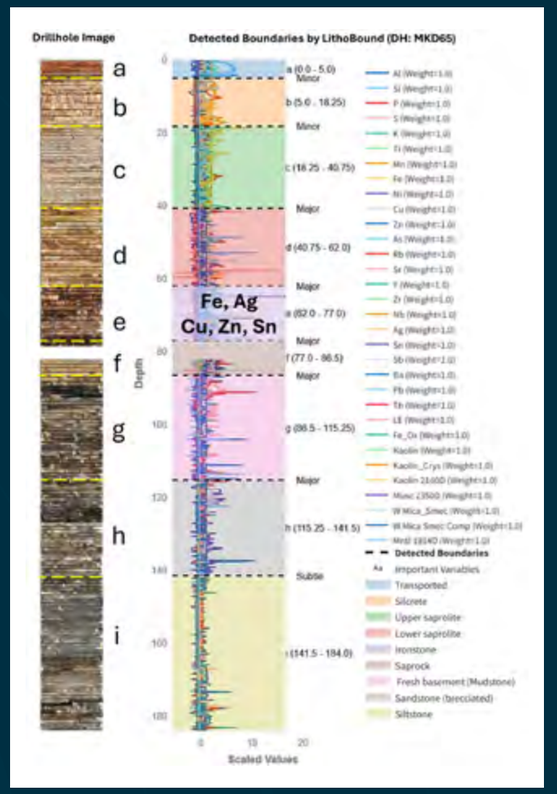


MinEx CRC researchers Steve Tassios, CSIRO (left) and Ben van der Hoek, UniSA (right) during first field trials of the LIBS downhole geochemical tool.

MinEx CRC Downhole Swept Frequency EM Tool.



3D Gravity inversion with disjoint interval bound constraints of the Yerrida Basin, Western Australia, using the Tomofast-x inversion platform.



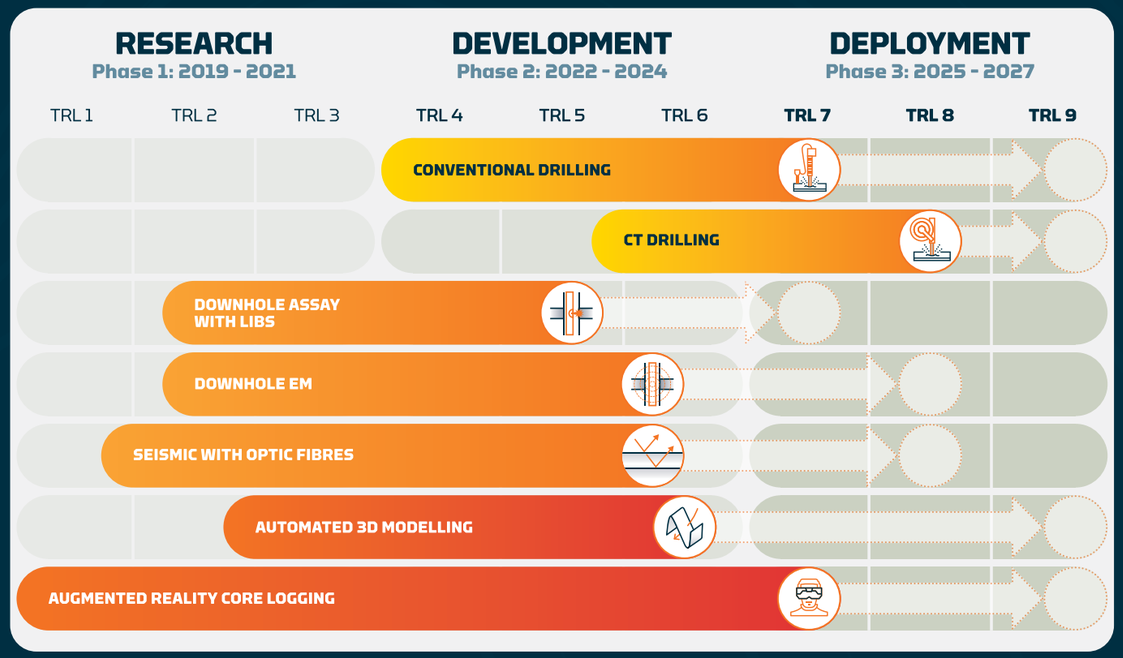
Geological boundaries detected by LithoBound using field-based geochemical and spectral data acquired from a drillhole near McKinnons gold mine in Cobar, NSW. The automated workflow highlights a critical zone (interval 'e') above the saprock, identifying effective variables for delineating secondary enrichment.

Program 3: National Drilling Initiative

- Completed NDI drilling campaigns in the Paterson Province (Nifty) and Madura Province (Moonera) in collaboration with the Geological Survey of Western Australia.
- Analyses of Delamerian and Delamerian Margins NDI samples have been used to refine and constrain the tectonic history and mineral potential of the eastern margin of Australia approximately 500 million years ago confirming the potential of the area to host significant deposits of base and precious metals.
- Developed the Lithobound web application for automated cover interface detection from drill-site geochemical (pXRF) and mineralogical (ASD and TIR) analyses.
- Applied joint inversion of seismic and AEM data for improved detection and mapping of cover boundaries, including the base of cover.
- Continued development of in-situ same mass radiogenic isotope measurement techniques aimed at increasing the number of mineral phases amenable to in-situ dating, focussing on mineral phases associated with ore deposits or hydrothermal alteration; Rb-Sr dating of whole rocks, feldspars, micas and clays; Lu-Hf dating of carbonates, apatite, epidote and garnet and Re-Os dating of sulphide minerals (especially molybdenite).

MinEx CRC researcher Yanbo Cheng (Geoscience Australia) undertaking experiments.

TECHNOLOGY READINESS LEVELS | MARCH 2024



PROJECT KEY:

CONVENTIONAL DRILLING
50% productivity improvement in conventional drilling systems

CT DRILLING
Cheaper, faster, safer drilling for mineral exploration

DOWNHOLE ASSAY WITH LIBS
Accurate ppm assay across the periodic table

DOWNHOLE EM
Swept frequency EM tool for electrical and magnetic properties

SEISMIC WITH OPTIC FIBRES
Low-cost rapid deployment seismic options

AUTOMATED 3D MODELLING
Rapid, probabilistic geological models

AUGMENTED REALITY CORE LOGGING
Multi-user interactive core logging enhanced with data overlay

COMMERCILISATION PROGRESS

During the past year, four commercial licence assignments were completed successfully,

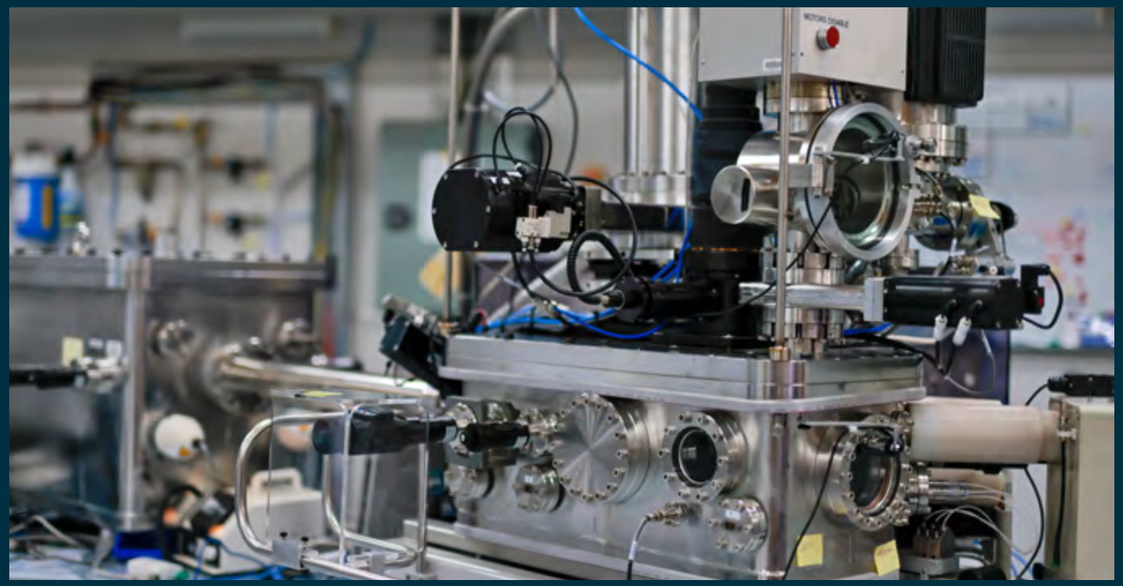
- Hobby: A system to achieve fluid automation for drilling mud systems, supported by Curtin University and the Federal Trailblazer program.
- Auto-drill, also through Curtin University and Trailblazer, is a high-tech early-stage drilling rig automation system that facilitates a step change in drilling optimisation using data. Curtin University has committed significant funding to support Auto-drill and Hobby by funding a Drilling Analytics Research Centre (DARC).
- LogAR (CSIRO) an augmented reality platform and practical tool for geological logging tasks.
- The MinEx CRC CT500 drill rig and its associated IP are being leased to a start-up company (DIG CT) undertaking CT drilling on behalf of MinEx CRC . DIG CT is endeavouring to expand the demand for, and use of, MinEx CRC CT drilling technology through safely and actively utilising the current equipment and by stimulating demand and facilitating or placing orders for the manufacture of additional CT Rigs.

COMMUNICATIONS & EVENTS

- Three media releases were distributed during the reporting period titled:
  - 'Augmented Reality Core Logging a Step Closer Under New Commercial Deal'.
  - 'Australian-designed Drilling Tech Set to Revolutionise Exploration via DIG CT Commercialisation Deal'.
  - One Ministerial Press Release was distributed in collaboration with Tom Koutsantonis, MP Minister for Energy and Mining, South Australia, titled 'Strong Mining Sector Sets Pace for Growth'.
- A suite of 'pre-commercial product brochures' to act as a go-to document for those seeking more technical context around MinEx CRC research was created, titled as below:
  - Pre-commercial Product Brochure: LIBS Downhole Geochemistry Tool
  - Pre-commercial Product Brochure: Downhole Swept Frequency EM Tool
- Research outcomes were featured in prominent industry publications such as Australia's Mining Monthly, Australasian Drilling Magazine, miningnews.net and the Precompetitive Review.
- The MinEx CRC Open Day was held on June 4 in Perth, with 127 attendees, spanning 32 organisations.
- The annual Mid-Year Science Review was held on June 5 in Perth, with 103 attendees, spanning 22 organisations.
- MinEx CRC 's fifth Annual Conference: Frontier Exploration was held on 15-16 November in Perth. Over 155 delegates attended the 2-day conference spanning 28 organisations.
- 9 Videos uploaded to MinEx CRC TV
- 14K YouTube views in total
- 39K Visitors to the MinEx CRC website

MinEx CRC researcher Jess Stromberg (CSIRO) during first field trials of the LIBS downhole geochemical tool.

MinEx CRC completed Postgraduate student, Alexander De Vries Van Leeuwen (UniSA).



Geoscience Australia laboratory equipment.

EDUCATION

- As of June 30 2024, MinEx CRC had 36 Postgraduate students enrolled.
- Six MinEx CRC postgraduate students completed during this reporting period, bringing the total number of postgraduate completions to fifteen. The completing students are employed as follows:
  - **Alex De Vries Van Leeuwen (PhD):** Externally Funded Research Fellow, University of Adelaide
  - **Mahtab Rashidifard (PhD):** Geophysicist, Geological Survey of Western Australia
  - **Jie Yu (PhD):** Research Associate, Curtin University
  - **Elizabeth Bruce (Masters by research):** Undertaking a PhD project at the University of Western Australia with MinEx CRC Project 6
  - **Naina (PhD):** CSIRO
  - **Victor Santos (PhD):** Rotating Equipment Engineer, ERM Consulting
- Seven video conferences were held throughout the reporting period to engage students and ensure they feel supported within the CRC environment.
- Eight students presented TEDx-style talks at the Annual Conference held in November 2023.

MinEx CRC completed Postgraduate student, Alexander Simpson (University of Adelaide).

EQUITY, DIVERSITY AND INCLUSION (EDI)

MinEx CRC is committed to growing and supporting an equitable, diverse, and inclusive environment where everyone feels safe, valued, supported, and treated fairly with dignity and respect.

The MinEx CRC Board (excluding the CEO) comprises eight members, 50% male and 50% female.

PERCENTAGE OF BOARD (EXCLUDING THE CEO)

The MinEx CRC Executive Management Committee, including the CEO, comprises eight members, 62.5% male and 37.5% female.

PERCENTAGE OF EXECUTIVE MANAGEMENT COMMITTEE, INCLUDING CEO

Research Leads for the nine primary programs are 78% male and 22% female.

PERCENTAGE OF RESEARCH LEADS FOR THE NINE PRIMARY PROGRAMS

SPONSORS

Majors, METs & Survey Participants

Research Participants & Affiliates

REVENUE & EXPENDITURE

Revenue ($'000)	FY24	FY23	FY22	FY21	FY20	FY19	Total
Commonwealth Funding	5,500.0	5,500.0	5,500.0	5,798.5	6,597.0	2,729.5	31,625.0
Other Government Grants	425.0	28.0	-	-	-	-	453.0
Participant Contributions	3,540.0	6,421.1	5,600.0	7,023.0	4,811.8	12,067.5	39,463.4
Affiliates Contributions	295.0	215.0	210.0	185.1	285.0	150.0	1,340.1
DET CRC Unspent Participant Contributions	-	-	-	-	-	113.6	113.6
Non-financial asset acquired for Nil Consideration	-	-	-	-	850.0	-	850.0
Gain on Sale of CT System to DIG CT Pty Ltd	1,301.0	-	-	-	-	-	1,301.0
Interest Income - Finance Lease CT System	20.5	-	-	-	-	-	20.5
Interest Income	465.8	365.3	70.1	112.9	300.5	124.0	1,438.6
Royalty Income	280.0	127.4	52.1	34.1	-	-	493.6
Other Income	123.7	18.1	79.8	9.6	122.2	30.8	384.2
Total Revenue	**11,951.0**	**12,674.9**	**11,512.0**	**13,163.2**	**12,966.5**	**15,215.4**	**77,483.0**
Expenditure ($'000)							
Research Program Expenditure							
- Program 1	2,047.8	1,871.9	1,905.5	2,576.7	2,121.4	486.1	11,009.4
- Program 2	1,392.6	1,361.1	1,292.8	1,610.1	1,524.6	544.8	7,726.0
- Program 3	4,838.1	6,866.8	5,686.0	10,405.2	1,859.8	653.5	30,309.4
- Opportunity Fund & Other Projects	993.0	759.8	580.2	204.8	-	-	2,537.8
Total Research Program Expenditure	**9,271.5**	**10,859.6**	**9,464.5**	**14,796.8**	**5,505.8**	**1,684.4**	**51,582.6**
Education & Training	552.8	575.4	432.3	504.4	384.5	200.0	2,649.4
Management Expenses	845.7	841.3	717.2	418.2	492.3	503.8	3,818.5
Royalty Expense	104.2	85.5	28.7	22.0	-	-	240.4
Salaries & Wages - Drill Crew	1,099.2	1,372.3	987.8	97.2	-	-	3,556.5
Salaries & Wages - Head Office (incl Directors Fees)	1,218.1	1,167.4	1,049.8	1,046.7	996.9	1,005.3	6,484.2
	3,820.0	**4,041.9**	**3,215.8**	**2,088.5**	**1,873.7**	**1,709.1**	**16,749.0**
Total Expenditure	**13,091.5**	**14,901.5**	**12,680.3**	**16,885.3**	**7,379.5**	**3,393.5**	**68,331.6**
Restricted (Deficit)/ Surplus	**(1,140.5)**	**(2,226.6)**	**(1,168.3)**	**(3,722.1)**	**5,587.0**	**11,821.9**	**9,151.4**

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Department of Industry, Science and Resources

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