Ardea Resources Limited

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ASX Symbol

ARL

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Issued Capital

Fully Paid Ordinary Shares
169,737,772

Performance Rights
7,167,000

Options
4,000,000

ABN 30 614 289 342

Kalgoorlie Nickel Project
Metallurgical Update – Mineralised Neutraliser

Ardea Resources Limited (**Ardea** or the **Company**) is pleased to present a progress report for the Kalgoorlie Nickel Project (**KNP**) Goongarrie Hub, notably the advancement of the Mineralised Neutraliser (**MN**) test work Research and Development (**R&D**) and related Pre-feasibility Study (**PFS**) update.

Ardea's base case is 2 x1.5Mtpa High Pressure Acid Leach (**HPAL**) autoclaves combined with a 0.5Mtpa Atmospheric Leach (**AL**) circuit using technology successfully deployed at existing nickel laterite operations.

PFS consolidation programs that are independent of final sale product are current.

Bench-scale metallurgy – Mineralised Neutraliser

The Mineralised Neutraliser concept involves the simple wet screen separation of magnesite-goethite-clay saprock into its constituent Serpentine-Goethite clay (termed "Fines") and Magnesite Neutraliser oversize (termed "Scats").

- Laboratory results have been received for a Mineralised Neutraliser bulk sample assaying 0.8% Ni which was designed to be representative of the full strike of the Goongarrie Hub Highway nickel laterite deposit.
- Screen beneficiation at 75 microns generated 23% **Fines assaying 1.2% Ni** and 77% Magnesite Neutraliser assaying 0.6% Ni.
- Good Acid Neutralisation Capacity (**ANC**) of the magnesite Scats was confirmed, completely validating Ardea's research test work objective.
- With the 3Mtpa HPAL model, **the Fines represent potentially 200ktpa of additional plant feed exceeding 1% Ni** as a minimal-cost feed to the Atmospheric Leach circuit.
- More importantly, the magnesite Scats replace imported limestone as process neutraliser, representing both a cost saving from reduced consumable import and reduced carbon emissions by not having to transport limestone neutraliser to site.
- **This is a major flowsheet refinement and is resulting in a significant upgrade to the PFS flowsheet.**

Pre-feasibility Study Work Streams

- Ore Reserve update well advanced, pit optimisations completed which now reflect access to the design pit-base Mineralised Neutraliser.
- Having selected the production pit locations, the site layout for the General Arrangement Plan is being finalised, with results of the requisite sterilisation drilling awaited ahead of finalising.
- Consulting engineer well advanced with independent study documents.
- Consulting environmentalist appointed for lodgement of EPA submissions.

Ardea's Managing Director, Andrew Penkethman said:

"The Feasibility Study for the Kalgoorlie Nickel Project - Goongarrie Hub has been focussing on the metallurgy of Material Types to allow the various mineralisation styles to be specifically matched to the High Pressure Acid Leach, Atmospheric Leach and Mineralised Neutraliser circuits.

For the Mineralised Neutraliser circuit, the separation of mineralised Serpentine-Goethite clay from Magnesite Neutraliser by simple low-cost screening is a significant processing breakthrough. The Serpentine-Goethite clay is geochemically very well suited as an Atmospheric Leach feed, and most importantly, is generated at minimal additional processing cost."

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1. BACKGROUND

The Pre-feasibility Study (**PFS**) for the KNP – Goongarrie Hub has been focussing on Material Types to allow the mineralisation to be variously matched to the High Pressure Acid Leach (**HPAL**), Atmospheric Leach (**AL**) and Mineralised Neutraliser (**MN**) circuits, maximising resource utilisation from a well understood and proven flowsheet.

The Vale Inco 2009 KNP PFS focussed on High Pressure Acid Leach processing, with only a cursory look at Atmospheric Leach even though Vale Inco bench-scale test work generated favourable leaching results.

Ardea Research and Development (**R&D**) subsequent to the 2018 Ardea PFS (ASX release 28 March 2018) has demonstrated the benefits through AL being able to regulate acid production, utilise the excess heat and steam from the acid plant and generate power off grid without fossil fuels, which in particular were not key benchmarks in any 2009 or 2018 programs. Similarly, the detailed material type R&D had not been previously done to quantify the benefits of Mineralised Neutraliser.

The concept of Mineralised Neutraliser has been developed by Ardea's R&D programs since 2017, using detailed drill-core logging and X-ray Diffraction (**XRD**) mineralogy with 60 element geochemistry.

The H2 2021 Goongarrie Hub core drilling for metallurgical bulk samples focussed on generating bulk samples for the new Mineralised Neutraliser concept as well as validating Atmospheric Leach. The KNP HPAL flowsheet is extensively validated in previous PFS work, so test material for HPAL was not sought in the H2 2021 drilling.

The MN hypothesis for testing was that magnesite saprock occurring at the base of the nickel laterite mineralisation could be segregated by simple screen beneficiation into a Mineralised Fines for the AL circuit and a Magnesite Scats for first stage neutralisation of the HPAL and AL nickel-cobalt solution discharge.

The "magnesite saprock" is in fact a "speleothem" cave deposit formed by partial dissolution of the carbonate within saprock underlying the nickel laterite mineralisation. This weathering process at Highway generates a mixture of both AL feed and neutraliser from within a single mining unit. The white magnesite typically "floats" in a variegated brown to dark green clay matrix, showing distinctive cave-fill textures. This mineralisation style has not previously been documented in Australian nickel laterite mineralisation and likely reflects unique palaeo-climatic and geographic effects within the Eocene-aged environment characterising the Goongarrie Hub.

Laboratory experiment results have been received for a magnesite-serpentine-goethite MN bulk sample from the Highway deposit assaying 0.8% Ni. Screening of crushed rock at 75 microns generated 23% **Fines assaying 1.2% Ni** and 77% **Magnesite Neutraliser** (termed "**Scats**") assaying 0.6% Ni with most importantly good Acid Neutralisation Capacity (**ANC**) at around 80% of the ANC of limestone imported 400km to Goongarrie.

With the 3Mtpa HPAL model, the Fines represent potentially 200ktpa additional tonnes exceeding 1% Ni as a minimal-cost feed to the AL circuit, with the Magnesite Scats replacing imported limestone as neutraliser.

This is a major flowsheet refinement and is resulting in a significant upgrade to the KNP PFS flowsheet.

An Australian provisional patent application covering Ardea's Mineralised Neutraliser R&D has been filed at IP Australia (AU2022903389 entitled "Acid Neutraliser Composition" filed 11 November 2022).

Ardea acknowledges the immense support of the Federal Government for R&D in the Lithium Ion Battery and renewable energy sectors, such support leading directly to breakthroughs such as those for the Goongarrie Mineralised Neutraliser R&D.

2. METALLURGY

Impetus for the KNP Mineralised Neutraliser experiments was to test whether magnesite could replace the calcite limestone invariably used for HPAL/AL sulphuric acid neutralisation:

- Simple screen beneficiation produced high-grade Serpentine Goethite Fines to supplement the AL circuit feed.
- The Magnesite Scats ANC is well suited to first stage Primary Neutralisation (refer Figure 3).
- The sulphuric acid reacts with magnesite to form soluble magnesium sulphate which goes to evaporation ponds. In contrast, the reaction with limestone is to form insoluble gypsum, which then becomes an additional solid requiring waste management and occupying valuable pit void tailings space.

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3. RESOURCES AND PLANT FEED

The Goongarrie Hub is located 70km northwest along established road and rail infrastructure from the world-renown mining centre, the City of Kalgoorlie-Boulder. Goongarrie is Ardea's most advanced project within the broader KNP. The Goongarrie Hub includes the Goongarrie deposits from south to north, Scotia Dam, Big Four, Goongarrie South and Goongarrie Hill, along with Highway some 30km to the north and Siberia North, approximately 30km to the southwest (Figure 1). The Goongarrie Hub Mineral Resource Estimate (**MRE**) of 561Mt at 0.68% nickel and 0.044% cobalt has the requisite HPAL and MN Material Types to service a 3Mtpa conventional, well-proven (notably Moa Bay, Coral Bay), "off-the shelf" HPAL operation.

The 2018 Goongarrie PFS was predicated on an HPAL operation treating 1.5Mtpa goethite mineralisation. With the flowsheet confirmation arising from the 2022 bench-scale metallurgy, the current PFS optimisation is based on 2x1.5Mtpa HPAL plant feed, along with some 0.3Mtpa AL plant feed with some 0.2Mtpa from MN Fines (the precise mix varies with individual pits and is such that all MN Fines slurry is pumped straight to AL with the hard-rock AL feed stockpiles on the ROM pad used to maintain the AL circuit at full capacity).

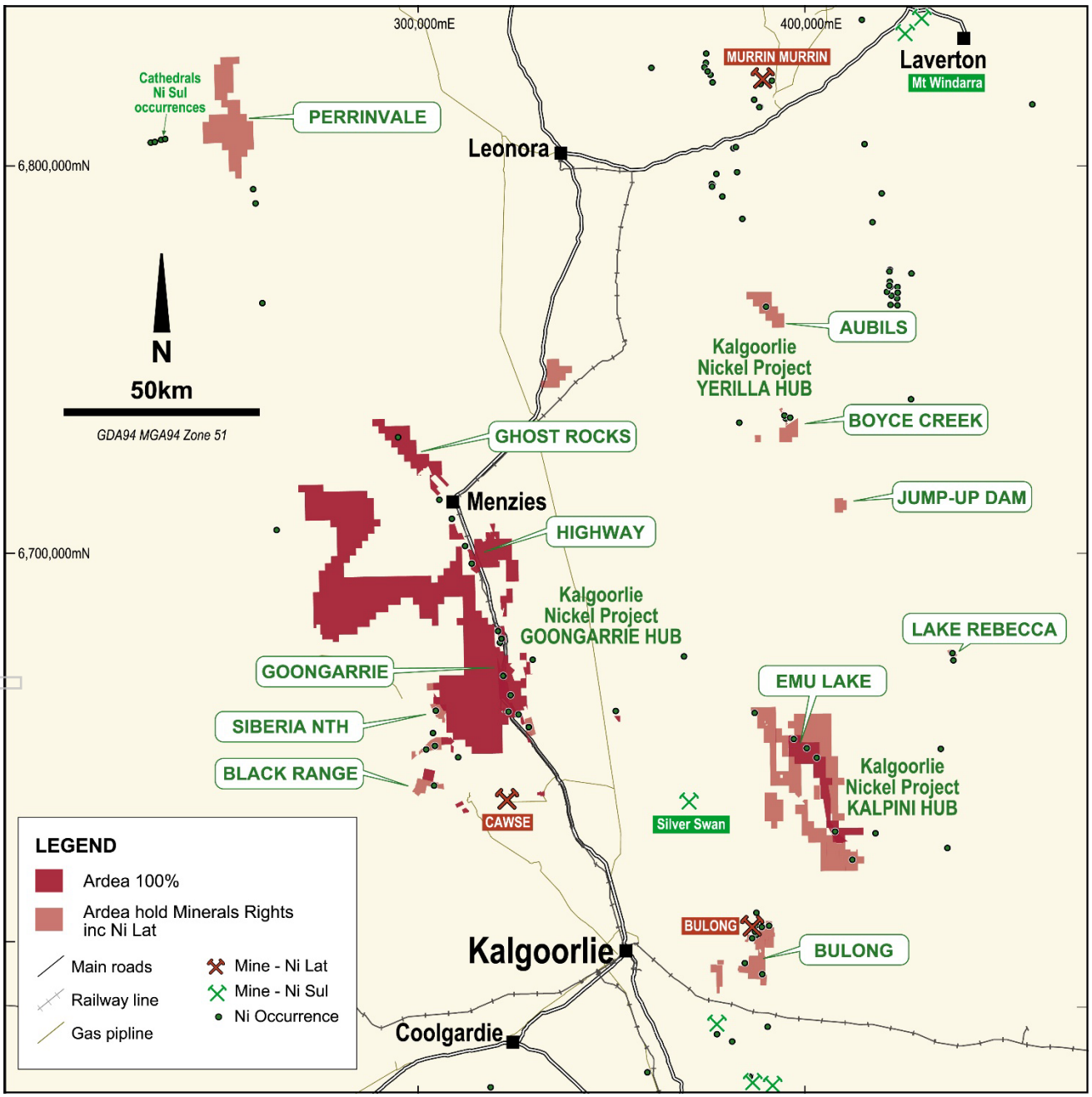

Figure 1: KNP location and infrastructure plan centred around the Goongarrie Hub. Projection GDA94 MGA94 Zone 51.

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4. MINING AND ENGINEERING STUDY TO DEFINE UPDATED ORE RESERVE

Mining and resource consultant Orelogy in Perth are completing detailed open pit resource optimisations and mining study of the Goongarrie Hub MRE aimed at converting the Indicated and Measured JORC Code (2012) MRE to a Proven and Probable Ore Reserve that supports the 3.5Mtpa flowsheet by considering relevant modifying factors.

In support of the updated Ore Reserve and Feasibility Study, Wood Engineers have been retained to provide engineering back-up (also refer Process Gap Analysis Study, ASX release 25 January 2022).

Ardea and supporting consultants are targeting completion of all PFS work in Q1 2023.

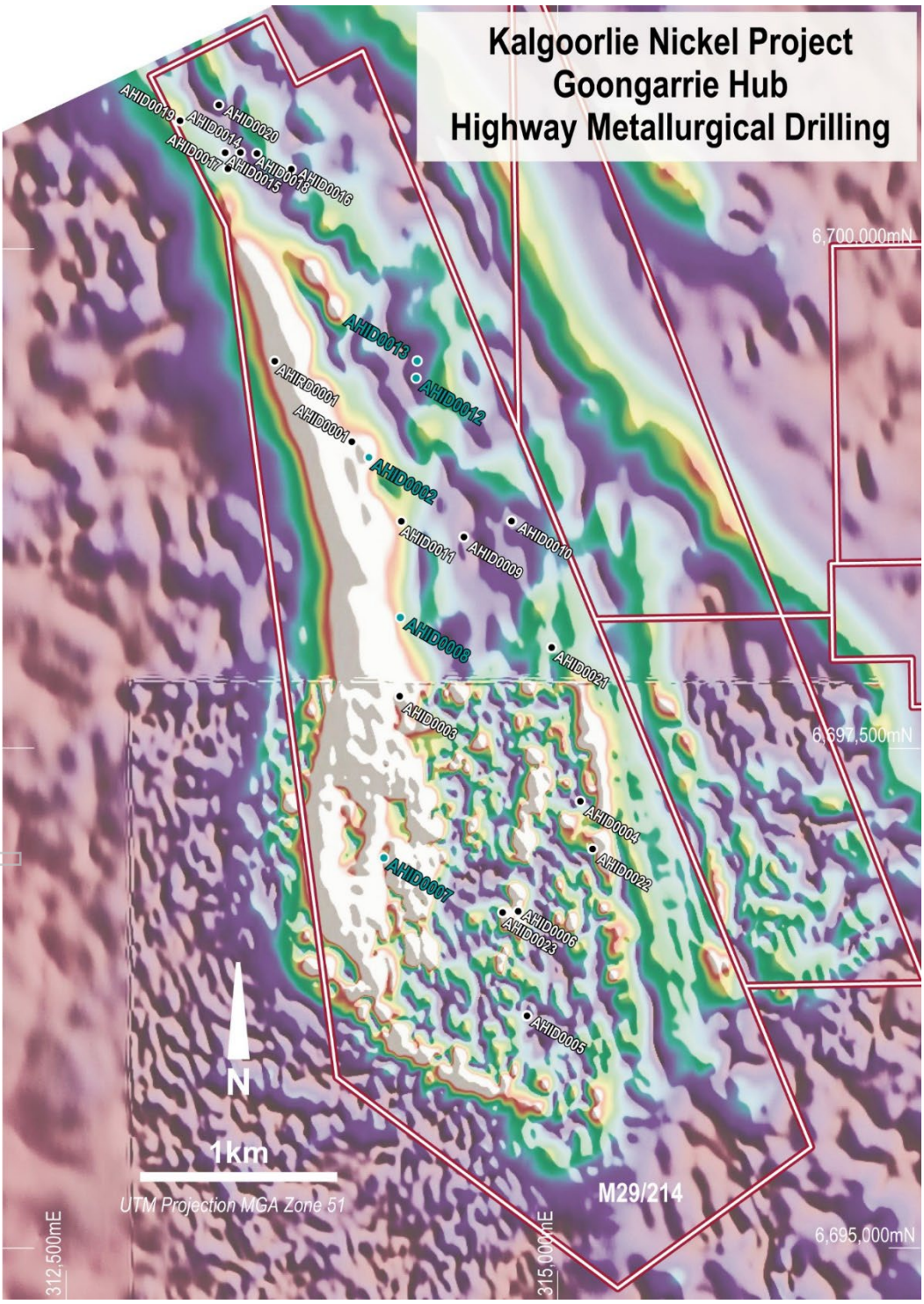

Figure 2: Highway nickel laterite deposit, collar location for Mineralised Neutraliser composites shown as teal color over a 2.5km strike in the Western Adcumulate host ultramafic flow, other holes white color. Projection GDA94 MGA94 Zone 51.

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5. ANALYTICAL RESULTS

A 60.5kg bulk sample generated from five separate diamond drill holes over the full 4km strike length of the Highway deposit (Figure 2). The composite was prepared using laboratory coarse residues.

NEUTRALISER SAMPLES - HEAD ANALYSIS								
Sample ID	**Al (%)**	**Co (%)**	**Cr (%)**	**Fe (%)**	**Mg (%)**	**Mn (%)**	**Ni (%)**	**Si (%)**
Undersize fraction (<75 µm)	0.89	0.046	0.81	12.0	14.6	0.170	1.20	12.6
Oversize fraction (subsequently milled <75 µm)	0.18	0.017	0.46	3.58	14.9	0.065	0.78	18.6

NEUTRALISATION RESULTS (Oversize fraction neutraliser milled to sub 75 µm)						
Stage	**Start Solution (mL)**	**H_2SO_4 (g/L)**	**Solids Added (g)**	**112.8 g/L H_2SO_4 Added (mL)**	**Solids Added (kg/t of H_2SO_4)**	**Acid Neutralised (kg/t of Solids)**
1 (pH 2.5)	3792	57.87	340	32	1298	771
2 (pH 5.0)	3877	2.94	140	5.6	5698	175
TOTAL			**480**	**37.6**		

NEUTRALISER FEED AND RESIDUE ANALYSIS (Oversize fraction neutraliser milled to sub 75 µm)							
Sample ID	**Mass (%)**	**Al (%)**	**Co (%)**	**Fe (%)**	**Mg (%)**	**Mn (%)**	**Ni (%)**
Feed (Milled <75 mm)	100.0	0.18	0.017	3.58	14.9	0.07	0.78
Stage 1 Residue	47.6	0.29	0.009	6.61	0.74	0.05	0.25
Stage 1 + Stage 2 Residue	60.5	0.26	0.010	5.77	6.77	0.05	0.55

METAL EXTRACTION (USING Si TIE METHOD) (TEST HY13296)							
Stage	**Mass Loss (%)**	**Al (%)**	**Co (%)**	**Fe (%)**	**Mg (%)**	**Mn (%)**	**Ni (%)**
Stage 1 (pH 2.5)	53.0	24.3	75.1	13.3	97.7	64.6	85.0
Stage 1+ Stage 2 (pH 5.0)	37.2	9.2	63.0	<0.1	71.5	54.6	55.7

Table 1 Mineralised Neutraliser bench-scale metallurgy, ALS metallurgical laboratory, Perth

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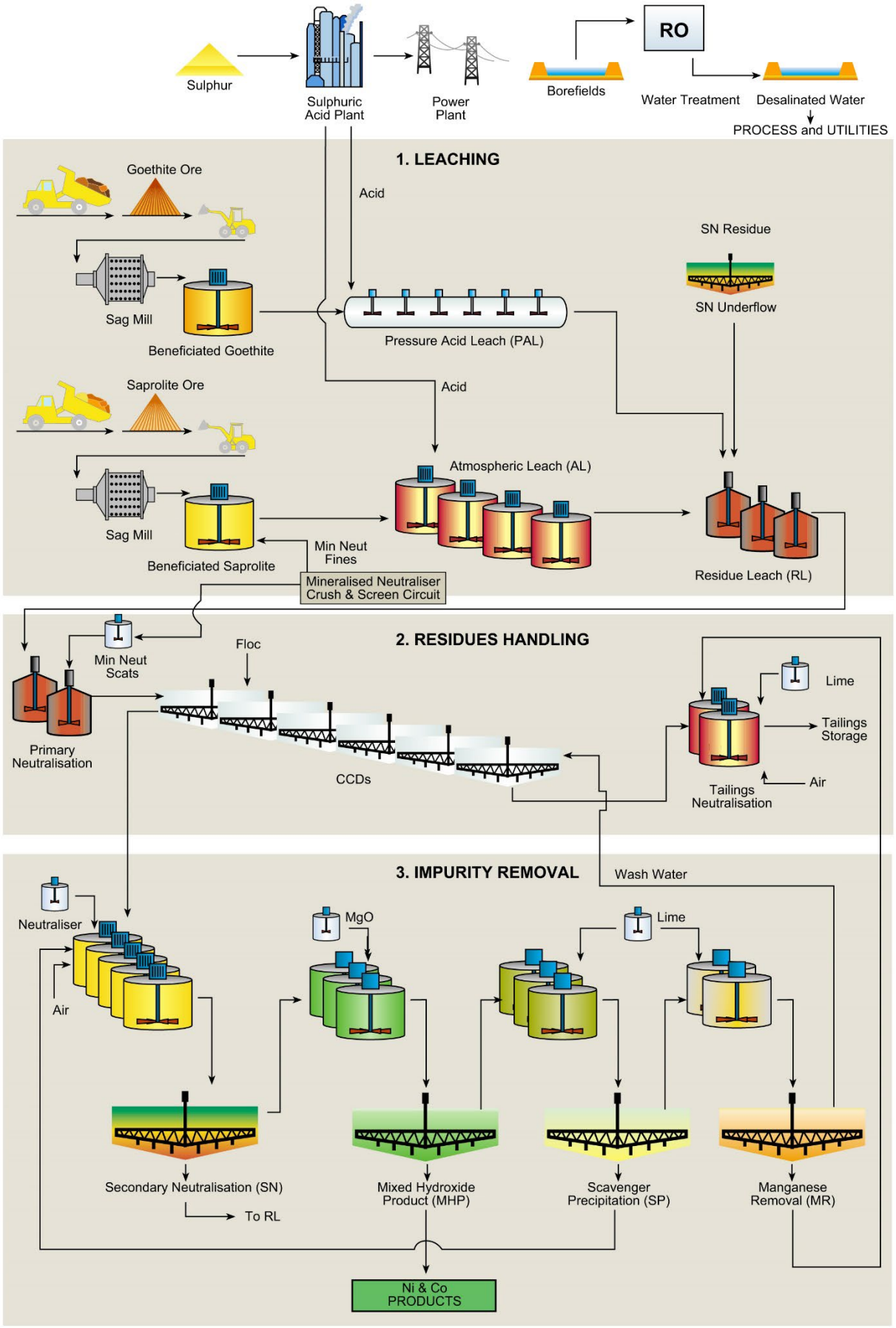

Figure 3 Schematic flowsheet incorporating Mineralised Neutraliser

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6. PROCESS TEST WORK AND STUDIES

The process updates were first announced in the 15 November 2021 ASX release, and incorporated twin HPAL autoclave trains, each treating 1.5Mtpa dry goethite solids, and a single AL train, processing 0.5Mtpa of nickel-bearing serpentine-goethite.

As per the current mass balance model, overall nickel and cobalt production is generated from approximately 3.5Mtpa plant feed to produce a Mixed Hydroxide Precipitate (**MHP**) intermediate product.

Process test work to date has been summarised in previous ASX releases (31 May 2021, 16 June 2021, 15 November 2021, 25 January 2022, 11 March 2022).

The present round of work has focussed on step-outs from the baseline investigations conducted previously in the Vale-Inco 2005-2009 and Ardea 2017-2018 PFS work. These include:

- Leach feed cut size increased to nominal minus 212 microns (was 75 microns), to allow additional leach feed tonnes albeit at slightly lower leach feed grade (facilitated by higher nickel price compared to historic studies).
- Atmospheric leaching of high nickel grade serpentine-goethite mineralisation.
- Acid neutralisation using mineralised in-pit magnesite resources.
- Nanofiltration purification of feed and process water streams.
- Systematic carbon accounting.
- Operational ESG Review, consultant study near completion, London-based firm, required for project finance accreditation.
- Site Sterilisation Study, aircore drilling program completed, drill assay results awaited.
- Project Risk Evaluation Study, independent shaping and benchmarking study completed.

Further studies have been identified for future implementation.

7. ONGOING DEVELOPMENTS

Ongoing work fronts will be concerned with the following activities and relations.

- Recruitment of a Project Director to manage the PFS and subsequent studies being finalised, key task will be recruitment of the Owners Team for the ongoing implementation studies.
- Ongoing plans – project management, construction, recruitment, organisational development.
- Confirmatory hydrometallurgical test work ongoing at ALS metallurgical laboratory, Balcatta.
- Detailed engineering, including materials of construction study, Ardea currently reviewing draft report.
- Local hydrogeology, contractor drilling programs and Ardea field crews completing work.
- Renewable energy options for the site, including carbon offsets.
- Vendor identification and qualification vetting.
- State and Local Government and government authority relations, with our regular meetings working up multiple “win-win” opportunities for both the Communities and Ardea.
- Logistics planning.
- Environmental permitting studies are being completed, such as the Lake Goongarrie ecology study, with these work streams being expedited using Ardea personnel and supporting specialist consultants.
- Project funding discussions are continuing with a number of groups, including Export Finance Australia (**EFA**) and overseas Export Credit Agencies (**ECA**) that have indicated that they would welcome being involved in project funding. ECA funding support is expected to be linked to the jurisdiction/s to which nickel-cobalt off-take is sent and where project development equipment is sourced from.

Progress in these and other areas will continue to be reported as milestones are achieved.

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Appendix 1 KNP Highway Prospect, Bench-scale Metallurgy, ALS Balcatta, WA Mineralised Neutraliser Composite Sample August 2022

Drill Hole	From m	To m	mat type	Geomet Regolith	Ni %	Co %	Mn %	Sc ppm	Cr ppm	Fe %	Mg %	Al %	*Si* %	LOI %	C %	Ca %	K %	Na %	Cl ppm	DryWt gm
AHID0012	8	10	SRBS	SRMG	0.66	0.018	0.04	6	2,630	4.1	15.9	0.5	*14.3*	32.2	9.2	1.7	0.01	0.1	2,350	5,637
AHID0012	10	12	SRBS	SRMG	0.27	0.012	0.05	2	1,720	3.0	17.5	0.1	*12.1*	35.6	10.0	2.8	0.01	0.2	2,850	5,676
AHID0012	12	14	SRBS	CVMG	0.24	0.009	0.04	2	1,430	2.7	20.9	0.0	*8.8*	40.0	11.2	1.1	0.01	0.2	3,300	3,292
AHID0012	14	16	SRBE	CVM	0.39	0.008	0.02	1	385	0.9	23.6	0.0	*6.9*	43.7	12.3	0.1	0.00	0.1	2,000	1,729
AHID0012	16	18	SRBS	CVMG	1.05	0.013	0.07	2	1,990	4.3	17.1	0.1	*14.3*	32.6	9.1	0.1	0.01	0.3	5,700	3,150
AHID0012	18	20	CLSB	CVMSG	1.77	0.019	0.12	4	4,050	7.3	8.6	0.1	*24.7*	18.5	5.5	0.1	0.01	0.4	6,700	4,531
AHID0012	20	22	SRBS	CVMSG	1.29	0.014	0.08	3	2,480	4.6	14.7	0.1	*17.6*	28.8	7.4	0.1	0.01	0.3	6,150	2,961
AHID0012	22	24	SRBS	CVMG	1.09	0.012	0.06	2	1,540	3.4	18.1	0.0	*13.3*	34.4	9.2	0.1	0.01	0.3	5,000	2,411
AHID0002	42	44	SRBE	SRMG	1.01	0.021	0.15	12	26,900	13.6	16.6	1.3	*7.3*	28.7	7.2	0.1	0.02	0.3	3,300	4,396
AHID0002	44	46	CLSB	CVMG	0.46	0.016	0.11	8	7,070	9.2	9.1	0.6	*25.9*	13.0	2.4	0.0	0.02	0.3	4,550	3,258
AHID0002	46	48	SRES	SRMG	0.42	0.014	0.11	6	5,900	8.3	12.4	0.3	*20.4*	20.7	4.8	0.1	0.01	0.3	4,650	4,462
AHID0008	16	18	SRBS	SRMSG	0.87	0.011	0.06	3	810	4.2	12.6	0.1	*21.5*	25.0	6.9	0.1	0.01	0.2	4,050	2,892
AHID0008	18	20	SRBS	SRMG	1.07	0.008	0.04	2	375	2.2	18.0	0.0	*14.3*	34.4	9.7	0.1	0.01	0.2	3,400	957
AHID0008	20	22	SRBS	SRMSG	0.61	0.012	0.09	3	825	4.4	11.1	0.1	*24.1*	22.1	5.5	0.1	0.01	0.3	4,900	2,096
AHID0008	22	24	SRBS	SRMG	0.45	0.009	0.07	3	790	4.0	18.5	0.0	*12.5*	35.5	9.4	0.1	0.01	0.4	5,850	2,920
AHID0013	6	8	SRBS	CLSMG	1.74	0.092	0.08	8	2,770	5.0	11.7	0.8	*21.2*	23.4	6.8	0.0	0.02	0.3	5,200	5,056
AHID0007	4	6	CLSB	CLSMG	0.55	0.022	0.05	3	3,980	3.0	10.4	0.1	*26.3*	20.0	5.8	0.1	0.01	0.2	3,250	3,086
AHID0007	6	8	SRBS	CLMG	0.31	0.010	0.03	2	2,130	1.8	16.2	0.1	*18.4*	29.8	9.0	0.1	0.01	0.1	2,500	1,967
			average	**CVMSG**	**0.82**	**0.021**	**0.08**	**5**	**4,472**	**5.3**	**14.7**	**0.3**	***17.0***	**28.1**	**7.7**	**0.5**	**0.01**	**0.3**	**4,232**	**60,477**

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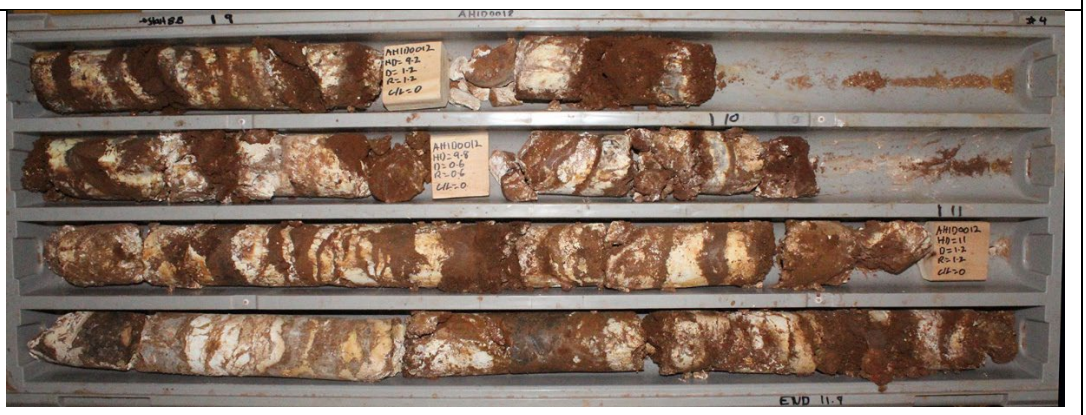
AHID0012	10	12	
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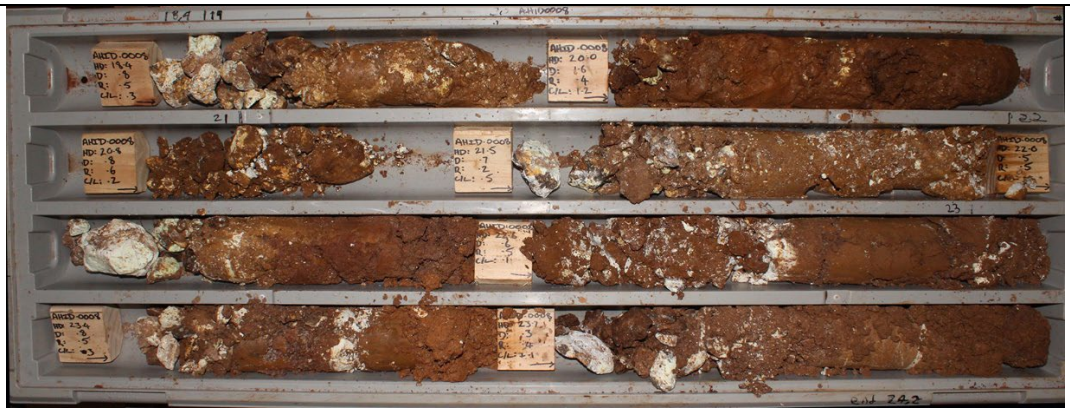
AHID0008	20	22	
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			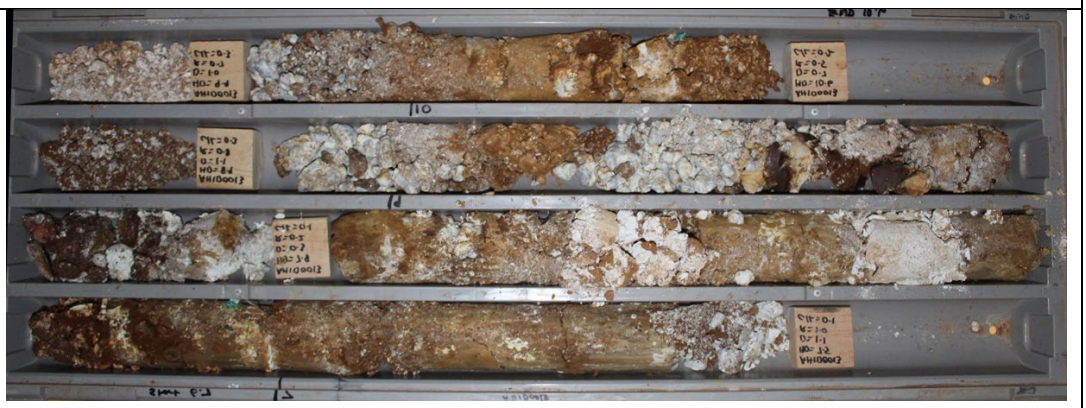

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This announcement is authorised for release by the Board of Ardea Resources Limited.

For further information regarding Ardea, please visit https://ardearesources.com.au/ or contact:

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About Ardea Resources

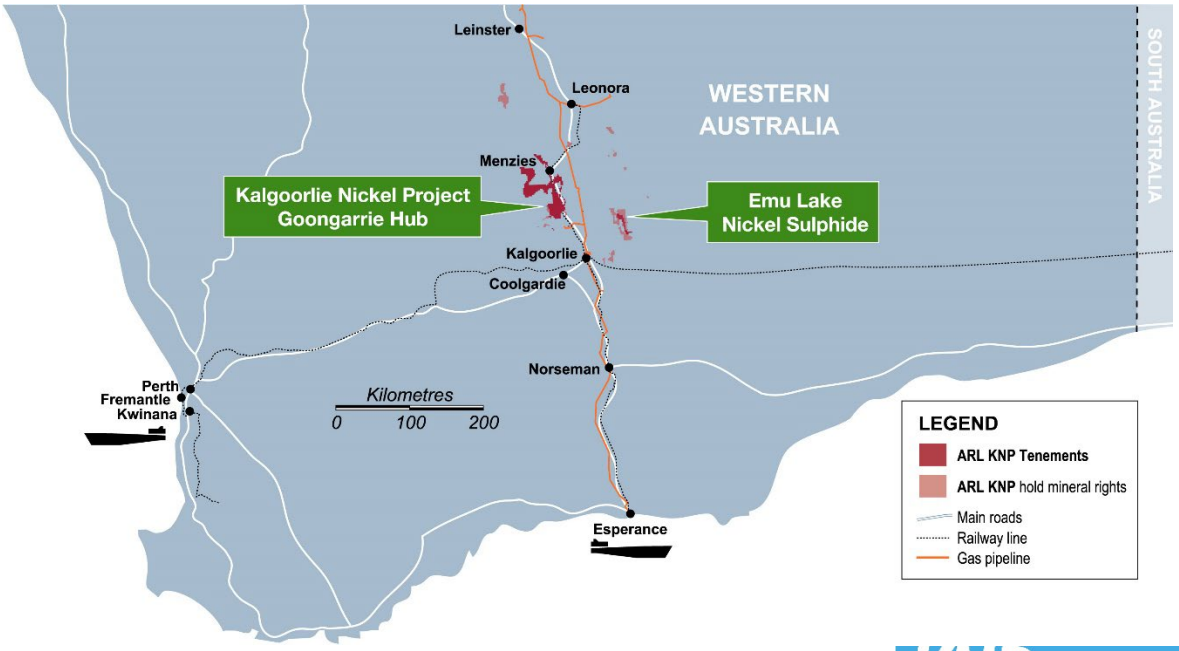
Ardea Resources (ASX:ARL) is an ASX-listed nickel resources company, with a large portfolio of 100%-controlled West Australian-based projects, focussed on:

- Development of the Kalgoorlie Nickel Project (**KNP**) and its sub-set the Goongarrie Hub, a globally significant series of nickel-cobalt and Critical Mineral deposits which host the largest nickel-cobalt resource in the developed world at **830Mt at 0.71% nickel and 0.046% cobalt for 5.9Mt of contained nickel and 380kt of contained cobalt** (Ardea ASX releases 15 February, 16 June 2021), located in a jurisdiction with exemplary Environmental Social and Governance (**ESG**) credentials, notably environment.
- Advanced-stage exploration at compelling nickel sulphide targets, such as Emu Lake, and Critical Minerals targets including scandium and Rare Earth Elements throughout the KNP Eastern Goldfields world-class nickel-gold province, with all exploration targets complementing the KNP nickel development strategy.

Ardea's KNP development with its 5.9 million tonnes of contained nickel is the foundation of the Company, with the nickel sulphide exploration, such as Emu Lake, as an evolving contribution to Ardea's building of a green, forward-facing integrated nickel company.

Put simply, in the Lithium Ion Battery (**LIB**) sector, the Electric Vehicle and Energy Storage System battery customers demand an ESG-compliant, sustainable, and ethical supply chain for nickel and other inputs. In the wet tropics, with their signature HPAL submarine tailings disposal and rain forest habitat destruction, an acceptable ESG regime is problematic. In contrast, the world-class semi-arid, temperate KNP Great Western Woodlands with its benign environmental setting is likely the single greatest asset of the KNP.

The KNP is located in a well-established mining jurisdiction with absolute geopolitical acceptance and none of the land-use and societal conflicts that commonly characterise nickel laterite proposals elsewhere. All KNP Goongarrie Hub production tenure is on granted Mining Leases with Native Title Agreement in place.



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CAUTIONARY NOTE REGARDING FORWARD-LOOKING INFORMATION

This news release contains forward-looking statements and forward-looking information within the meaning of applicable Australian securities laws, which are based on expectations, estimates and projections as of the date of this news release.

This forward-looking information includes, or may be based upon, without limitation, estimates, forecasts and statements as to management's expectations with respect to, among other things, the timing and amount of funding required to execute the Company's exploration, development and business plans, capital and exploration expenditures, the effect on the Company of any changes to existing legislation or policy, government regulation of mining operations, the length of time required to obtain permits, certifications and approvals, the success of exploration, development and mining activities, the geology of the Company's properties, environmental risks, the availability of labour, the focus of the Company in the future, demand and market outlook for precious metals and the prices thereof, progress in development of mineral properties, the Company's ability to raise funding privately or on a public market in the future, the Company's future growth, results of operations, performance, and business prospects and opportunities. Wherever possible, words such as "anticipate", "believe", "expect", "intend", "may" and similar expressions have been used to identify such forward-looking information. Forward-looking information is based on the opinions and estimates of management at the date the information is given, and on information available to management at such time.

Forward-looking information involves significant risks, uncertainties, assumptions, and other factors that could cause actual results, performance, or achievements to differ materially from the results discussed or implied in the forward-looking information. These factors, including, but not limited to, the ability to create and spin-out a gold focussed Company, fluctuations in currency markets, fluctuations in commodity prices, the ability of the Company to access sufficient capital on favourable terms or at all, changes in national and local government legislation, taxation, controls, regulations, political or economic developments in Australia or other countries in which the Company does business or may carry on business in the future, operational or technical difficulties in connection with exploration or development activities, employee relations, the speculative nature of mineral exploration and development, obtaining necessary licenses and permits, diminishing quantities and grades of mineral reserves, contests over title to properties, especially title to undeveloped properties, the inherent risks involved in the exploration and development of mineral properties, the uncertainties involved in interpreting drill results and other geological data, environmental hazards, industrial accidents, unusual or unexpected formations, pressures, cave-ins and flooding, limitations of insurance coverage and the possibility of project cost overruns or unanticipated costs and expenses, and should be considered carefully. Many of these uncertainties and contingencies can affect the Company's actual results and could cause actual results to differ materially from those expressed or implied in any forward-looking statements made by, or on behalf of, the Company. Prospective investors should not place undue reliance on any forward-looking information.

Although the forward-looking information contained in this news release is based upon what management believes, or believed at the time, to be reasonable assumptions, the Company cannot assure prospective purchasers that actual results will be consistent with such forward-looking information, as there may be other factors that cause results not to be as anticipated, estimated or intended, and neither the Company nor any other person assumes responsibility for the accuracy and completeness of any such forward-looking information. The Company does not undertake, and assumes no obligation, to update or revise any such forward-looking statements or forward-looking information contained herein to reflect new events or circumstances, except as may be required by law.

No stock exchange, regulation services provider, securities commission or other regulatory authority has approved or disapproved the information contained in this news release.

Compliance Statement (JORC Code 2012)

The metallurgy and industry benchmarking summaries are based on information reviewed or compiled by Mr. Michael Miller who is a Member of the Australasian Institute of Mining and Metallurgy and Mr. Tiong of Engineers Australia. Messrs Miller and Tiong are full-time employees of Ardea Resources Limited and have sufficient experience, which is relevant to the style of operation under consideration. Messrs Miller and Tiong have reviewed this press release and consent to the inclusion in this report of the information in the form and context in which it appears. Messrs Miller and Tiong own Ardea shares.

The resource estimation summaries are based on information reviewed or compiled by Mr. Ian Buchhorn, who is a Member of the Australasian Institute of Mining and Metallurgy. Mr Buchhorn is a full-time employee of Ardea Resources Limited and has sufficient experience, which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr Buchhorn has reviewed this press release and consents to the inclusion in this report of the information in the form and context in which it appears. Mr Buchhorn owns Ardea shares.

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Appendix 4 – JORC Code, 2012 Edition, Table 1 report

Section 1 Metallurgical Sampling Techniques and Data

(Criteria in this section applies to all succeeding sections)

Criteria	JORC Code explanation	Commentary
Sampling techniques *Note: Due to the similarity of the deposit styles, procedures and estimations used this table represents the combined methods for all Ardea Resources (ARL) Nickel and cobalt Laterite Resources. Where data not collected by ARL has been used in the resource calculations, variances in techniques are noted.*	• *Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *Aspects of the determination of mineralisationthat are Material to the Public Report.* • *In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases, more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.*	• All holes were sampled "in-principle" on a 2 metre down hole interval basis, with exceptions being made due to visual geological/mineralogical breaks, and end of hole final-lengths. All sampling lengths were recorded in ARL's standard core-sampling record spreadsheets. Sample condition, sample recovery and sample size were recorded for all drill-core samples collected by ARL. • The drill spacing was designed to augment historic drilling. New Ardea core holes were drilled at 4 metres distance to a historic RC hole representing a twin. The drilling will also contribute to provide material for the purpose of metallurgical testwork. • Industry standard practice was used in the processing of samples for assay, with 2m intervals of core collected in calico bags (HQ core was cut into quarters before compositing). As the drilling was within a 2012 JORC-compliant Indicated Ni-Co resource, prior knowledge of the resource peculiarities contributes and assists significantly to current interpretation of mineralisation. • Assay of samples utilised standard laboratory techniques with standard ICP-AES undertaken on 50 gram samples for Au, Pt and Pd, and lithium borate fused-bead XRF analysis used for the remaining multi-element suite. Further details of lab processing techniques are found in Quality of assay data and laboratory tests below.
Drilling techniques	• *Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (e.g. core diameter, triple or standard tube, depth of diamond tails,face-sampling bit or other type, whether core is oriented and if so, by what method, etc).*	• In this most recent program, Ardea drilled the Highway deposit with 23 diamond drill holes on a varying MGA94 z51 northing grid-spacing of 80m at several localities (see Figure 2). Holes were vertical (-90 degree dip), designed to optimally intersect the sub-horizontal mineralisation. HQ core samples were collected and stored in impala core trays. Sample condition, sample recovery and sample size were recorded for all drill samples collected by ARL.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• Core sample recovery was recorded by visual estimation of the core sample, expressed as a percentage recovery. Overall estimated recovery was approximately 80%, which is considered to be acceptable for nickel-cobalt laterite deposits. Core measurement calculations were based on driller rod measurements and runs recorded on core blocks. • Measures taken to ensure maximum core sample recoveries included conservative drill penetration rates to limit overgrinding and pressure, using water injection to maintain mud lubrication, as well as regular communication with the drillers when variable to poor ground conditions were encountered.
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• Drilling was undertaken for metallurgical purposes, and twinning comparison with previous historic RC holes. The level of logging detail utilised supports this type of review and was as follows: Visual geological logging was completed for all drilling both at the time of drilling (using standard Ardea laterite logging codes), and later over relevant met-sample intervals with a metallurgical-logging perspective. Geochemistry from historic data was used together with logging data to validate logged geological horizons. Nickel laterite profiles contain geochemically very distinct horizons and represent a sound validation tool against visual logging. The major part of the logging system was developed by Heron Resources Limited specifically for the KNP and was designed to facilitate future geo-metallurgical studies. It has been customised by Ardea Resources Limited as considered appropriate for recent developments. Planned drill hole target lengths were adjusted by the geologist during drilling. The geologist also oversaw all sampling and drilling practices. ARL employees and geologists supervised all drilling. Quarter core of all drilling has been retained for reference. • Visual geological logging was completed for all core on 1 metre intervals. The logging system was developed by Ardea personnel specifically for the KNP and was designed to facilitate future geo-metallurgical studies. Logging was performed at the time of drilling, and planned drill hole target lengths adjusted by the geologist during drilling. Hand held Niton XRF was also used to cross-check logging and specific rock properties.

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Criteria	JORC Code explanation	Commentary
		• The geological legend used by ARL is a qualitative legend designed to capture the key physical and metallurgical features of the nickel-cobalt laterite mineralisation. Logging captured the colour, regolith unit and mineralisation style, often accompanied by the logging of protolith, estimated percentage of free silica, texture, grain size and alteration. Logging correlated well with the geochemical algorithm developed by Heron Resources Limited for the Yerilla Nickel Project for material type prediction from multi-element assay data.
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	• 2 metre (and rarely 1 metre) composite samples were recovered using an Almonte automatic core saw (quarter core) and placed into a calico sample bag. Sample target weight was between 2 and 3kg. Where friable material was encountered, a chisel system was implemented to avoid core loss. Some moist oxide samples occurred in upper portions of core. • QAQC was employed. A standard, blank or duplicate sample was inserted into the sample stream 10 metres on a rotating basis. Standards were either quantified industry standards, or standards made from homogenised bulk samples of the mineralisation being drilled (in the case of the Ardea Yerilla project). Every 30th sample a duplicate sample was taken using the same sample sub sample technique as the original sub sample. Sample sizes are appropriate for the nature of mineralisation.
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* • *Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.*	• All Ardea samples were submitted to Kalgoorlie BV laboratories and transported to BV Perth, where they were pulverised. Analysis at BV Perth was by ICP utilising a 50g charge (lab method PGM-ICP24) for PGM suite elements (Au, Pt, Pd). Additional analysis was undertaken where analysis by silicate fusion / XRF analysis (lab method ME-XRF12n) for multiple grade attributes for laterite ores (Al_2O_3, As, BaO, CaO, Cl, Co, Cr_2O_3, Cu, Fe_2O_3, Ga, K_2O, MgO, MnO, Na_2O, Ni, P_2O_5, Pb, Sc, SiO_2, SO_3, SrO, TiO_2, V_2O_5, Zn, ZrO_2). Fusion / XRF analysis is an industry standard method used to analyse nickel laterite ores and BV is a reputable commercial laboratory with extensive experience in assaying nickel laterite samples from numerous Western Australian nickel laterite deposits. • BV routinely inserts analytical blanks, standards and duplicates into the client sample batches for laboratory QAQC performance monitoring. • Ardea also inserted QAQC samples into the sample stream at a 1 in 10 frequency, alternating between blanks (industrial sands) and standard reference materials. Additionally, a review was conducted for geochemical consistency between historically expected data, recent data, and geochemical values that would be expected in a nickel laterite profile. • All of the QAQC data has been statistically assessed. There were rare but explainable inconsistencies in the returning results from standards submitted, and it has been determined that levels of accuracy and precision relating to the samples are acceptable.
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• All Ardea samples were submitted to Kalgoorlie BV laboratories and transported to BV Perth, where they were pulverised. Analysis at BV Perth was by ICP utilising a 50g charge (lab method PGM-ICP24) for PGM suite elements (Au, Pt, Pd). Additional analysis was undertaken by sending subsamples to BV Perth where analysis by silicate fusion / XRF analysis (lab method ME-XRF12n) for multiple grade attributes for laterite ores (Al_2O_3, As, BaO, CaO, Cl, Co, Cr_2O_3, Cu, Fe_2O_3, Ga, K_2O, MgO, MnO, Na_2O, Ni, P_2O_5, Pb, Sc, SiO_2, SO_3, SrO, TiO_2, V_2O_5, Zn, ZrO_2). Fusion / XRF analysis is an industry standard method used to analyse nickel laterite ores and BV is a reputable commercial laboratory with extensive experience in assaying nickel laterite samples from numerous Western Australian nickel laterite deposits. • BV routinely inserts analytical blanks, standards and duplicates into the client sample batches for laboratory QAQC performance monitoring. • Ardea also inserted QAQC samples into the sample stream at a 1 in 20 frequency, alternating between duplicates splits, blanks (industrial sands) and standard reference materials. • Additionally, a review was conducted for geochemical consistency between historically expected data, recent data, and geochemical values that would be expected in a nickel laterite profile. • All of the QAQC data has been statistically assessed. Ardea has undertaken its own further in-house review of QAQC results of the ALS routine standards, 100% of which returned within acceptable QAQC limits. This fact combined with the fact that the data is demonstrably consistent and repeated for expected Ni/Co values within the lateritic ore profiles of both reported areas and is also consistent with nearby abundant historic drilling data, has meant that the results are considered to be acceptable and suitable for reporting.

Criteria	JORC Code explanation	Commentary
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• All drill holes were surveyed using an RTK DGPS system with either a 3 or 7 digit accuracy. The coordinates are stored in the exploration database referenced to the MGA Zone 51 Datum GDA94. • All holes drilled as part of the Highway program were vertical. No holes were down-hole surveyed except at EOH. The sub-horizontal orientation of the mineralisation, combined with the soft nature of host material resulted in minimal deviation of vertical diamond drill holes. • The grid system for all models is GDA94. Where historic data or mine grid data has been used it has been transformed into GDA94 from its original source grid via the appropriate transformation. Both original and transformed data is stored in the digital database. • A DGPS pickup up of drill collar locations is considered sufficiently accurate for reporting of resources, but is not suitable for mine planning and reserves.
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• The drill spacing was designed to augment historic drilling, and the entire program consisted of twinned core holes within 4 metres of historic RC holes. The program to date is part of a broader Definitive Feasibility Study (DFS) program. All proposed drilling has been completed at Highway. • Given the homogeneity of this style of orebody, the spacing is, for bulk-scale metallurgical work and probable mining techniques, considered sufficient. • Samples were collected at 2 metre composites.
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• All drill holes in this program are vertical and give a true width of the regolith layers and mineralisation within the modelled resource and have sufficient adjoining vertical holes which quantify regolith true thickness • On a local scale, there is some geological variability due to probable shear structure. However, this local variability is not considered to be significant for the project and often increases laterite ore preferentially within and adjacent to the structures. As the detailed shape of the orebody has already been well defined by an abundance of nearby resource drill holes, there is no expected bias to be introduced with reference to mineralised structures.
Sample security	• *The measures taken to ensure sample security.*	• All samples were collected and accounted for by ARL employees during drilling. All samples were stored in core trays, plastic wrapped and placed on pallets. Samples were transported to Kalgoorlie from logging site by ARL employees and submitted directly to BV Kalgoorlie. • The appropriate manifest of sample numbers and a sample submission form containing laboratory instructions were submitted to the laboratory.

Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• ARL has periodically conducted internal reviews of sampling techniques relating to resultant exploration datasets, and larger scale reviews capturing the data from multiple drilling programmes within the KNP.
		• Internal reviews of the exploration data included the following:
		  • Unsurveyed drill hole collars (less than 1% of collars).
		  • Drill Holes with overlapping intervals (0%).
		  • Drill Holes with no logging data (less than 2% of holes).
		  • Sample logging intervals beyond end of hole depths (0%).
		  • Samples with no assay data (from 0 to <5% for any given project, usually related to issues with sample recovery from difficult ground conditions, mechanical issues with drill rig, damage to sample in transport or sample preparation).
		  • Assay grade ranges.
		  • Collar coordinate ranges
		  • Valid hole orientation data.
		• The BV Laboratory was visited by ARL staff in 2021, and the laboratory processes and procedures were reviewed at this time and determined to be robust.

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Section 2 - Reporting of Bench-scale Metallurgical Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness ornational park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments*	• The tenement on which the Highway drilling was undertaken is M29/214. • The tenement and land tenure status for the KNP prospect areas containing continuous cobalt rich laterite mineralisation is documented in the Ardea 2021 Annual Report.
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• The Highway deposit was initially discovered by Heron Resources Ltd and subsequently drilled by Vale Inco Limited in a Joint Venture. Much historic assessment of the Black Range Project was undertaken by Heron Resources Limited.
Geology	• *Deposit type, geological setting and style of mineralisation.*	• The KNP nickel-cobalt laterite mineralisation developed during the weathering and near surface enrichment of Archaean-aged olivine-cumulate ultramafic units. The mineralisation is usually within 60 metres of surface and can be further subdivided on mineralogical and metallurgical characteristics into upper iron-rich material and lower magnesium-rich material based on the ratios of iron to magnesium. The deposits are analogous to many weathered ultramafic-hosted nickel-cobalt deposits both within Australia and world-wide. • Cobalt-rich mineralisation is typically best developed in iron-rich material in regions of deep weathering in close proximity to major shear zones or transfer shear structures and to a lesser extent as thin zones along the interface of ferruginous and saprolite boundaries at shallower depths proximal to shear structures. • The Cobalt Zone is associated with a distinctive geo-metallurgical type defined as "Clay Upper Pyrolusitic". Mineralogy is goethite, gibbsite and pyrolusite (strictly "asbolite" or "cobaltian wad"). The Cobalt Zones typically occur as sub-horizontal bodies at a palaeo-water table within the KNP (late stage supergene enrichment). This material is particularly well developed at Highway.
Drill hole Information	• *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:* • *easting and northing of the drill hole collar* • *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar* • *dip and azimuth of the hole* • *down hole length and interception depth* • *hole length.*	• All holes drilled in this most recent program are listed in "Appendix 1 – Collar location data".
Drill hole Information	• *If the exclusion of this information is justified on the basis that the information is not Materialand this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*	• All assay data relating to the metals of interest at Highway, namely cobalt, nickel, Sc, and chromium, are listed in "Appendix 2 – Assay results". Other elements were assayed but have not been reported here. They are of use and of interest from a scientific and metallurgical perspective but are not considered material and their exclusion does not detract from the understanding of this report.

Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.*
	• *Where aggregate intercepts incorporate short lengths of high-grade results and longerlengths of low-grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.*
	• *The assumptions used for any reporting of metal equivalent values should be clearly stated.*
		• Most drill hole samples have been collected over 2m down hole intervals.
		• **All newly defined nickel and cobalt intercepts at Highway were calculated using the following parameters:**
		  • Intercepts based on nickel distributions were first calculated using 0.50 % nickel minimum cut-off, 2 m minimum intercept, and 4 m internal waste. Such parameters define broad intercepts that may be cobalt bearing or cobalt poor. Intercepts are considered of interest where cobalt values exceed 0.05%.
		  • Intercepts based on cobalt distributions are then calculated using a 0.10 % cobalt minimum cut-off, 2 m minimum intercept, and 4 m internal waste. All significant cobalt intercepts are hosted within the broader nickel-based intercepts and tend to define higher-grade, shorter intercepts.
		  • Where core loss was an issue, and where the thickness of core loss was less than the internal waste thickness, grades in zones of core loss were taken as the weighted average of the intervals immediately above and below the core loss interval in question. This provides grade distributions downhole that are consistent with mineralised zones, where nickel and cobalt grades are observed to change gradually rather than randomly downhole. By defining zones of core loss as being of a value between the interval above and the interval below, a similarly smooth transition in grades downhole is achieved. This method of estimated grade in zones of core lossis therefore considered the most suitable means of defining grade in such zones at Highway.
		• Where an interval of core loss, through calculation, marked the beginning or end of a mineralised interval, this core loss interval was not included in that mineralisation interval.

Criteria	JORC Code explanation	Commentary
		Sc intercepts were defined by using a 20g/t Sc minimum cut-off, a 2 m minimum intercept, and a 4 m internal waste. Sc intercept distributions do not show a consistent relationship to nickel and cobalt mineralisation and are usually in the shallow subsurface. • Assay compositing techniques were not used in this assessment. • No metal equivalent calculations have been used in this assessment.
Relationship between mineralisation widths and intercept lengths	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. 'down hole length, true width not known').*	• The nickel-cobalt laterite mineralisation at Goongarrie South has a strong global sub-horizontal orientation. • All drill holes are vertical. • All drill holes intersect the mineralisation at approximately 90°to its orientation
Diagrams	• *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.*	• Maps and sections of the nickel and cobalt mineralisation are shown within the report. Every drill hole on every section drilled is shown.
Balanced reporting	• *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	• Not applicable to this report. All results are report either in the text or in the associated appendices. Examples of high-grade mineralisation are labelled as such.
Other substantive exploration data	• *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	• No other data are, at this stage, known to be either beneficial or deleterious to recovery of the metals reported. Uncertainties surrounding the possibility of recovery of the metals of interest are noted prominently in the report.
Further work	• *The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling).* • *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	• Further drilling is likely to be undertaken at Goongarrie South but has not yet been defined. Further drilling could include infill drilling as well as extension of lines to the north and south as appropriate. • Metallurgical assessment of all metals of interest at Highway is in progress under the current Definitive Feasibility Study (DFS) which commenced in mid-late 2021 within the KNP Goongarrie Hub.

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