PRESS RELEASE ASX/TSX: CDV
4 June 2019 2019-11

POSITIVE METALLURGICAL UPDATE ON THE NAMDINI PROJECT

Cardinal Resources Limited (ASX/TSX: CDV) is pleased to announce a positive development with respect to its metallurgical optimisation testwork activities. As a result of positive leach results, which are expected to enhance the project economics, further laboratory testwork has been initiated.

- **Positive leach recovery results reported from Aachen ™ pilot scale testwork**
- **Aachen™ is a relatively simple, proven process being used by a number of successful gold producers globally and specifically in Africa. These operations have consistently demonstrated an uplift in gold recoveries with Aachen™**
- **Aachen™ results on Namdini flotation concentrate indicates the following potential improvements:**
    - increased gold recovery *(Table 1)*
    - coarser regrind size compared with the current flowsheet
        - reduced power consumption (ie lower installed power requirements and Opex)
    - improved mass transfer of oxygen and reactivity of reagents
        - reduced reagent consumption leading to reduced operating costs
    - expected reduction of both Capex and in particular, Opex
- **Cardinal has already tested 4,447 kg** *(>4 tonnes)* **comprising 7 pilot scale composites from 47 drill holes** *(Table 2)* **across the entire deposit. Cardinal is finalizing the testwork programme with a further 2,310 kg** *(>2 tonnes)* **of samples from an additional 24 drill holes**
- **Final Aachen™ testwork is in progress to further support the results received to date for potential inclusion into the Namdini Feasibility Study**

Peter Lotz, Gold Process & Environment Manager, Maelgwyn Mineral Services Africa, stated:

*"Our **Aachen™** process is currently deployed at 9 different mine sites in 6 countries, with the longest service life of over 10 years on one of the largest bullion producers within the African continent.*

*"We've seen our process increase gold recoveries between 2% and 19% in gold producing operations. Former Randgold Resources (now Barrick), a major client of MMS, is using **Aachen™** equipment at its Loulo and Morila mines in Mali, at its Tongon operation in Côte d'Ivoire, and at the Kibali gold mine in the Democratic Republic of Congo.*

"We look forward to our continuing work with Cardinal in this regard".

Cardinal's Chief Executive Officer / Managing Director, Archie Koimtsidis stated:

"These highly encouraging results from the metallurgical optimisation programme are potentially an opportunity to further enhance the Namdini project financial outcomes and should be incorporated into the process flowsheet being designed by Lycopodium.

"The metallurgical optimisation test results recently received and evaluated show promising recovery, capital and operating cost improvements, which can be achieved over and above the current outcomes justifying incorporation into the Feasibility Study".

Cardinal has recently completed its current testwork to consider the introduction of an **Aachen™** system into the Namdini process flow sheet which is being established by Lycopodium. The testwork has been completed at the Maelgwyn Mineral Services Africa (**MMSA**) metallurgical laboratory in South Africa.

The base premise of the process is to scour the mineral surfaces and maximise oxygen transfer to the ore slurry prior to leaching, which enhances leach kinetics, resulting in improved recovery of gold. It is a relatively simple, proven process already being used at 9 gold producing mines.

In addition to a potential increase in gold recovery (and therefore a potential uplift to annual gold production rates), there are typically power and reagent savings (Opex savings) and installed power requirements (Capex savings) that can be realised.

Testwork on integrating the **Aachen™** process into the Namdini flowsheet demonstrated potential to increase recoveries for the Life of Mine study and also suggested an increase in the grind size from sub 10 microns (µm) into the coarser range of 20 to 45 microns (µm) for certain lithologies. Further testwork is ongoing to consider the optimal grind size and target recovery, with detailed cost/benefit analysis underway as part of the programme.

The **Aachen™** process has also been successfully used for cyanide destruction, post leach circuit, which will also be analysed for further Opex and Capex savings.

Table 1: Namdini **Aachen™** Leach Testwork Results – **Life of Mine (LOM)** Samples[1]

Regrind Size (P90 µm)	Metavolcanics (MVO)		Granite (GRA)		Diorite (DIO)	
	Aachen™ Leach Recovery[2] %	Range of possible overall Recovery[3] %	Aachen™ Leach Recovery[2] %	Range of possible overall Recovery[3] %	Aachen™ Leach Recovery[2] %	Range of possible overall Recovery[3] %
5 µm	91 - 95	**84 - 90**	92 - 96	**84 - 91**	90 - 96	**83 - 91**
9 µm	90 - 96	**82 - 91**	88 - 96	**81 - 91**	90 - 94	**82 - 89**
45 µm	84 - 88	**77 - 84**	95 - 97	**87 - 92**	93 - 95	**86 - 90**
75 µm	73 - 75	**67 - 71**	76 - 82	**70 - 78**	75 - 86	**69 - 82**

Notes

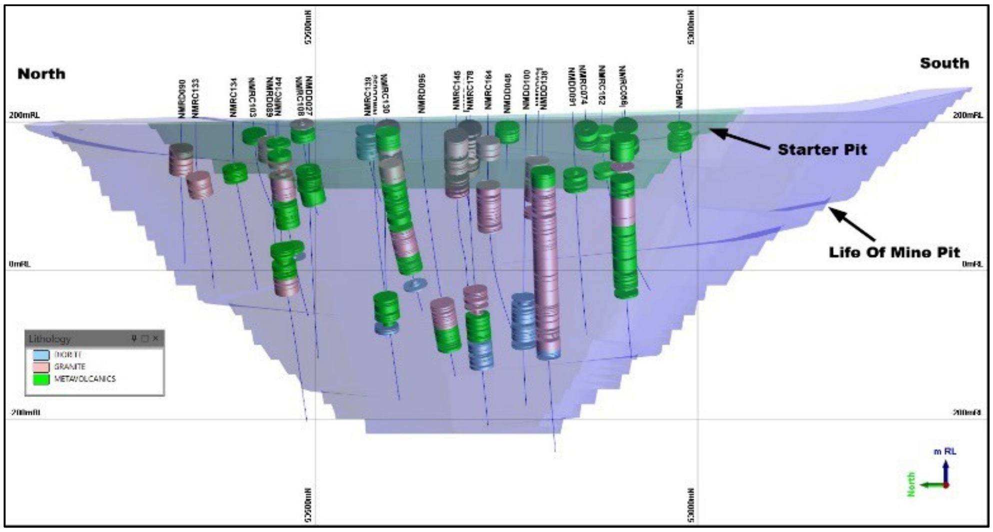
1. *Results represent pilot scale composites for each lithology (MVO, GRA, DIO)*
2. *Range of leach recoveries at incremental passes through the Aachen process*
3. *Range of possible overall recovery, calculated by multiplying Aachen leach recovery range by typical flotation recovery range (92-95%), which are results indicated in Cardinal's PFS NI 43-101 (25 October 2018)*

Table 2: Namdini **Aachen™** Leach Testwork – Summary Total of Samples Submitted by Cardinal

	Samples Mass (kg)	Number of Drill Holes	Number of Intervals (1m)	Number of Final Leach Data Points[1]
TOTAL	**4,447**	**47**	**2,048**	**84**

Note 1*: Leach data points are related to various regrind sizes for the total 7 Starter Pit and Life of Mine pilot scale composites*

Figure 1: Shows the drill hole locations for the composites of the **Aachen**™ testwork



Next Steps

As a result of the positive leach results which are expected to enhance Namdini Project economics, further testwork samples have been submitted. All aspects of the Feasibility Study are on track for delivery this quarter, however, Cardinal is reverting to the original Q3 - 2019 Feasibility Study publication timeline in respect of the Company's flagship Namdini Gold Project in Ghana so that final testwork results from the **Aachen**™ process can be incorporated.

Study Manager Lycopodium continues to accelerate the full integration of all project disciplines and to coordinate the efforts of our other study partners.

Lycopodium is a highly respected mining services company with over 25 years' global experience in the minerals industry, designing and building large-scale mines, processing plants and associated infrastructure, particularly in Africa and West Africa.

Project Development Partners

COMPANY	ROLE
Lycopodium	Feasibility Study Managers. Process plant and associated infrastructure. Capital and Operating cost estimation and compilation of the JORC and NI 43-101 Technical reports
Golder Associates	Mine planning and optimisation, pit design and mine scheduling, Geotechnical, Hydrology and Hydrogeological engineering
Orway Minerals Consultants	Comminution data analysis, crushing and grinding circuit option study
ALS Laboratory (Perth)	Metallurgical testwork to support the process design criteria
Knight Piésold Consulting	Tailings Storage Facility and selected infrastructure design
Independent Metallurgical Operations	Metallurgical testwork management, analysis and process flowsheet development
MPR Geological Consultants	Mineral Resource modelling of the Namdini Deposit
Orefind	Geology and deposit structural genesis
Sebbag Group International	Mine Design Review
NEMAS Consult	Environmental Impact Assessment Study
Whittle Consulting	Enterprise Optimisation of the Namdini Project
Maelgwyn Mineral Services Africa	AachenTM process metallurgical optimisation
BDO Advisory	Financial Model Integrity & Reviewer (PEA, PFS and FS)

ABOUT MAELGWYN – Aachen™ Process

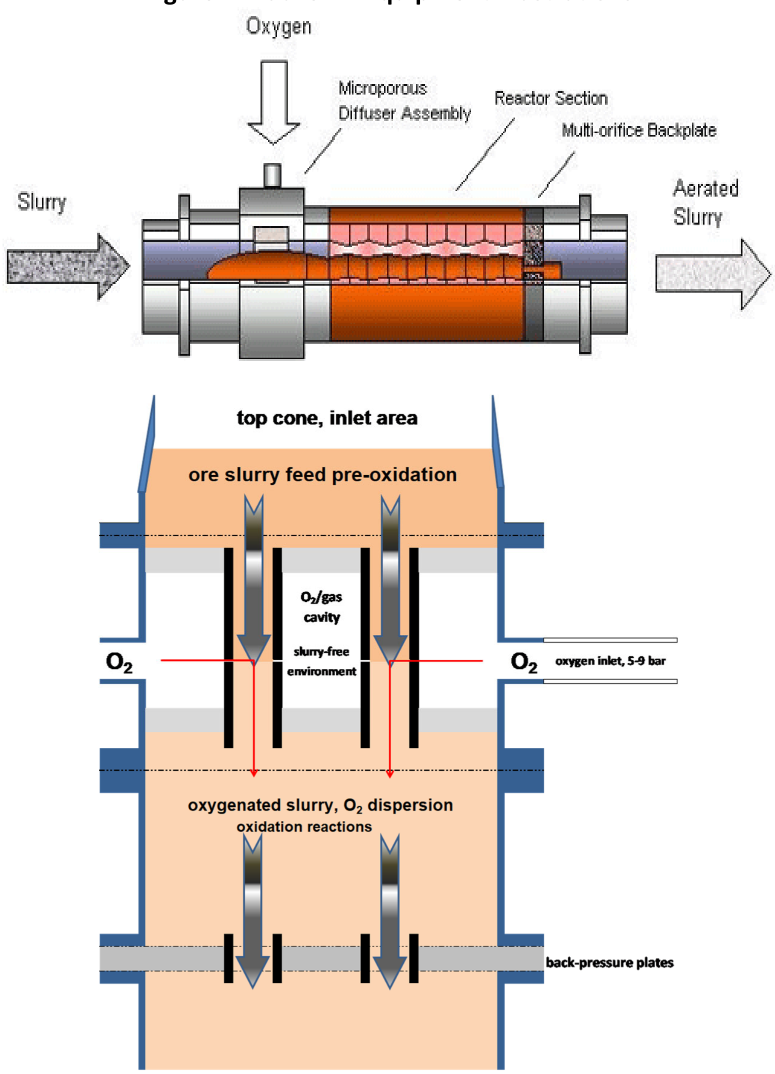
Maelgwyn Mineral Services (MMS) is a world leader in the development and implementation of innovative cost-effective technologies and processes in the field of mineral, chemical and waste processing. It has had many patents granted and has won a number of national innovation awards for its process.

The **Aachen™** process is one of Maelgwyn's primary business metallurgical technologies which can be tested at their fully certified and commercial laboratory in South Africa. The **Aachen™** process can be tested at bench and pilot scale in this laboratory.

The **Aachen™** process uses a pipe shear device designed to improve oxidation of slurries using oxygen. It uses a slot aerator to introduce micron-sized (200µm) oxygen bubbles into the device which has different chambers separated by orifice plates creating a highly efficient contact of oxygen to the slurry. The equipment is especially efficient for high- rate oxidation of sulphides which is ideal for Namdini's ore since the gold is particulate and occurs as free gold, in fractures in pyrite or in pyrite grains.

The objective is to increase efficient utilisation of the oxygen and as a consequence of the significant increase in real-time oxidation it could allow grind sizes to be coarser thus reducing overall power and reagent costs. The device contains no moving parts, and is designed to withstand erosive effects of mineral slurries.

Figure 2: Aachen™ Equipment Illustrations



MMS have commissioned more than 60 of the **Aachen™** units on the African continent, working with several high-profile mining companies across several jurisdictions.

Former Randgold Resources (now Barrick), a major client of MMS, is using **Aachen™** oxidation technology at its Loulo and Morila mines, in Mali, at its Tongon operation, in Côte d'Ivoire, and at the Kibali gold mine, in the Democratic Republic of Congo.

MMS has also provided the process to Liberian gold miner Avesoro Resources' (formerly Aureus Mining's) New Liberty gold mine and to South African gold miner Pan African Resources at its Barberton Mines operation, where the Aachen units are used in the cyanidation circuit and are also used to support the cyanide detoxification processes.

MMSA is also working on several tailings storage facility reclamation projects in South Africa and aims to use Aachen oxidation technology in the various reclamation processes.

Figure 3: Aachen™ Installation - Gold Mine Example 1

Figure 4: Aachen™ Installation – Gold Mine Example 2

Figure 5: Aachen™ Installation – Gold Mine Example 3

On-site Due Diligence

Cardinal Resources' management undertook a due diligence review of the **Aachen™** process in March 2019. The due diligence review included a site visit to the Maelgwyn laboratory facility in Northcliff South Africa followed by a site inspection of two **Aachen™** devices installed at a gold mine operating in Southern Africa.

A summary of observations made during the site visit is highlighted below:

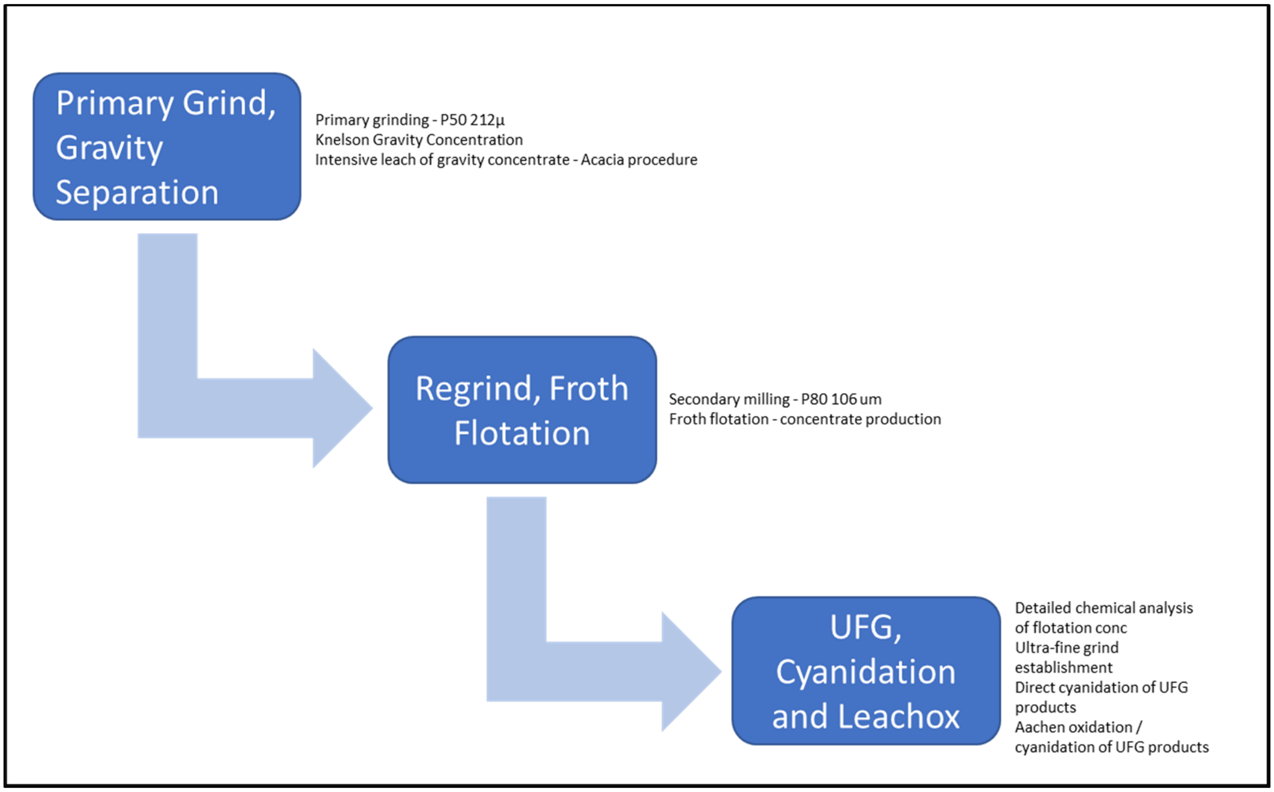
- There are 63 **Aachen™** units currently employed at 9 sites in Africa.
- Scale up from laboratory to full production has generally shown greater improvements. Generally, a 5% recovery improvement in the laboratory can translate into 7 or 8% in full-scale operation.
- Slurry input to the unit is generally ~2 m/s and the velocity through the contact zone is ~10 m/s. Oxygen is introduced with micron-sized bubbles (200µm), with + 10 m/s velocity.
- Maelgwyn expect 4,000 to 5,000 hours service between maintenance intervals based on operational experience.

In general terms, high shearing of slurry particles and high velocity of oxygen, results in improved kinetics by scouring the particle surfaces and accelerating the oxidation of the sulphide species which then allows for less residence time and less reagent requirements within the leaching circuit.

Aachen™ Testwork Procedure

The scope of work for the pilot scale experiments is outlined in the diagram below. The seven (7) bulk composite sample ID's were sequentially processed via primary milling, to a grind specification of 50% passing 212 µm, followed by Knelson gravity separation and secondary milling to 80% passing 106 µm. The milled gravity tails were subjected to froth flotation to generate concentrate for the subsequent **Aachen™** testwork series.

Figure 5: Aachen™ Testwork: Procedure – **Pilot scale**



Summary of the Aachen™ testwork results on Namdini samples:

Maelgwyn's **Aachen™** Process is showing encouraging results on a number of fronts with the most significant being:

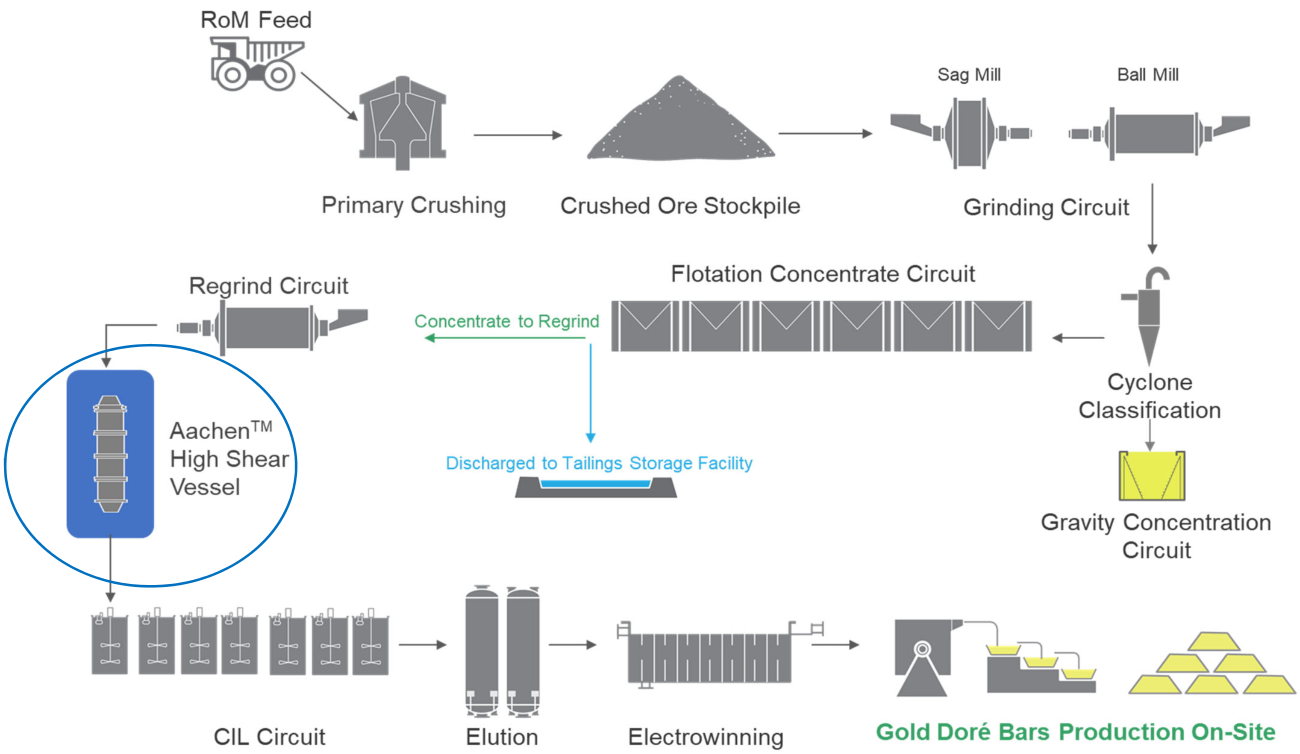
- Recovery improvement
- Leach kinetics
- Potential increase in grind size without compromising recovery
- Power and reagent consumption reduction, specifically oxygen and cyanide

All the above points could result in project economic benefits by reducing OPEX and CAPEX whilst improving gold recovery which has provided a clear path forward for Cardinal and the **Aachen™** process.

Position of Aachen™ equipment within Namdini Flowsheet

Aachen™ will be deployed after the flotation concentrate regrind circuit as indicated in Figure 6. The process throughput is relatively small since only flotation concentrate is treated through the device.

Figure 6: Position of **Aachen™** device in Namdini Flowsheet



ABOUT CARDINAL

Cardinal Resources Limited (ASX/TSX: CDV) is a West African gold exploration and development Company that holds interests in tenements within Ghana, West Africa.

The Company is focused on the development of the Namdini Project with a gold **Ore Reserve of 5.1Moz** (0.4 Moz Proved and 4.7 Moz Probable) and a soon to be completed Feasibility Study.

Exploration programmes are also underway at the Company's Bolgatanga (Northern Ghana) and Subranum (Southern Ghana) Projects.

Cardinal confirms that it is not aware of any new information or data that materially affects the information included in its announcement of the Ore Reserve of 3 April 2019. All material assumptions and technical parameters underpinning this estimate continue to apply and have not materially changed.

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This release has been independently reviewed by CSA Global (Perth) for JORC Code Compliance.
CSA Global have not verified the results presented.

Competent / Qualified Person Statement

All production targets for the Namdini Gold Mine referred to in this report are underpinned by estimated Mineral Resources and Ore Reserves which were prepared by competent persons and qualified persons in accordance with the requirements of the JORC Code and National Instrument 43-101- Standards of Disclosure for Mineral Projects (“NI43-101”), respectively (ASX/TSX press release dated 3 April 2019).

Scientific and technical information contained in this press release has been reviewed and approved by **Mr. Daryl Evans**, Independent Metallurgical Operations Pty Ltd (IMO), who is a ‘qualified person’ as defined by National Instrument 43-101 Standards of Disclosure for Mineral Projects (“NI43-101”). Mr. Evans holds a Qualified Professional status being a Fellow of the Australasian Institute of Mining and Metallurgy (FAusIMM). IMO is an independent consulting firm appointed by Cardinal. IMO and Mr. Evans consent to the inclusion of the matters in this report of the statements based on the information in the form and context in which it appears.

The scientific and technical information contained in this press release is based on information compiled and reviewed by **Mr. Richard Bray**, a Competent Person who is a Registered Professional Geologist with the Australian Institute of Geoscientists and a full-time employee of Cardinal Resources Ltd. Mr. Bray has sufficient experience which is relevant to the style of mineralization and type of deposit under consideration and to the activity which he has undertaken to qualify as a Competent Person as defined in the JORC Code 2012 and is a qualified person for the purposes of NI43-101. Mr. Bray is a full-time employee of Cardinal and holds equity securities in the Company. Mr. Bray has consented to the inclusion of the matters in this report based on the information in the form and context in which it appears.

ASX Listing Rule 5.23.2

The Company confirms it is not aware of any new information or data that materially affects the information included in this report relating to exploration activities and all material assumptions and technical parameters underpinning the exploration activities in those market announcements continue to apply and have not been changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcements. Cardinal confirms that it is not aware of any new information or data that materially affects the information included in its announcement of the Ore Reserve of 3 April 2019. All material assumptions and technical parameters underpinning this estimate continue to apply and have not materially changed.

Disclaimer

This ASX / TSX press release has been prepared by Cardinal Resources Limited (ABN: 56 147 325 620) ("Cardinal" or "the Company"). Neither the ASX or the TSX, nor their regulation service providers accept responsibility for the adequacy or accuracy of this press release.

This press release contains summary information about Cardinal, its subsidiaries and their activities, which is current as at the date of this press release. The information in this press release is of a general nature and does not purport to be complete nor does it contain all the information which a prospective investor may require in evaluating a possible investment in Cardinal.

By its very nature, exploration for minerals is a high-risk business and is not suitable for certain investors. Cardinal's securities are speculative. Potential investors should consult their stockbroker or financial advisor. There are a number of risks, both specific to Cardinal and of a general nature which may affect the future operating and financial performance of Cardinal and the value of an investment in Cardinal including but not limited to economic conditions, stock market fluctuations, gold price movements, regional infrastructure constraints, timing of approvals from relevant authorities, regulatory risks, operational risks and reliance on key personnel and foreign currency fluctuations.

Except for statutory liability which cannot be excluded and subject to applicable law, each of Cardinal's officers, employees and advisors expressly disclaim any responsibility for the accuracy or completeness of the material contained in this press release and excludes all liability whatsoever (including in negligence) for any loss or damage which may be suffered by any person as a consequence of any information in this Announcement or any error or omission here from. Except as required by applicable law, the Company is under no obligation to update any person regarding any inaccuracy, omission or change in information in this press release or any other information made available to a person nor any obligation to furnish the person with any further information. Recipients of this press release should make their own independent assessment and determination as to the Company's prospects, its business, assets and liabilities as well as the matters covered in this press release.

Forward-looking statements

Certain statements contained in this press release, including information as to the future financial or operating performance of Cardinal and its projects may also include statements which are 'forward-looking statements' that may include, amongst other things, statements regarding targets, anticipated timing of the feasibility study (FS) on the Namdini project, estimates and assumptions in respect of mineral resources and anticipated grades and recovery rates, impact of the potential implementation of the **Aachen™** process to the Namdini gold project, production and prices, recovery costs and results, capital expenditures and are or may be based on assumptions and estimates related to future technical, economic, market, political, social and other conditions. These 'forward–looking statements' are necessarily based upon a number of estimates and assumptions that, while considered reasonable by Cardinal, are inherently subject to significant technical, business, economic, competitive, political and social uncertainties and contingencies and involve known and unknown risks and uncertainties that could cause actual events or results to differ materially from estimated or anticipated events or results reflected in such forward-looking statements.

Cardinal disclaims any intent or obligation to update publicly or release any revisions to any forward-looking statements, whether as a result of new information, future events, circumstances or results or otherwise after today's date or to reflect the occurrence of unanticipated events, other than required by the Corporations Act and ASX and TSX Listing Rules. The words 'believe', 'expect', 'anticipate', 'indicate', 'contemplate', 'target', 'plan', 'intends', 'continue', 'budget', 'estimate', 'may', 'will', 'schedule' and similar expressions identify forward-looking statements.

All forward-looking statements made in this press release are qualified by the foregoing cautionary statements. Investors are cautioned that forward-looking statements are not guarantees of future performance and accordingly, investors are cautioned not to put undue reliance on forward-looking statements due to the inherent uncertainty therein.

SCHEDULE 1

Metallurgical Drill Hole Selection

Table 3: Meta-Data Listing of Drill Holes selected for the Metallurgical Composites

Hole ID	Depth (m)	Dip (°)	Azimuth (°)	mEast	mNorth	mRL	Grid_ID
NMDD019	89.3	-65.0	757295.28	1176885.83	214.31	373.14	UTM WGS84 Zone 30 North
NMDD021	87.8	-64.9	757429.92	1176978.00	215.09	259.04	UTM WGS84 Zone 30 North
NMDD024	86.5	-65.7	757410.82	1177180.82	204.94	330.97	UTM WGS84 Zone 30 North
NMDD027	90.2	-65.2	757442.27	1177278.88	202.71	351.72	UTM WGS84 Zone 30 North
NMDD048	88.3	-60.9	757639.49	1176989.18	206.28	83.50	UTM WGS84 Zone 30 North
NMDD091	93.2	-60.5	757379.92	1176939.53	214.25	347.07	UTM WGS84 Zone 30 North
NMDD096	88.0	-65.7	757363.06	1177204.67	204.50	425.05	UTM WGS84 Zone 30 North
NMDD100	87.9	-67.5	757383.66	1177000.84	210.82	427.96	UTM WGS84 Zone 30 North
NMDD132	92.0	-64.7	757353.94	1177335.16	202.10	453.38	UTM WGS84 Zone 30 North
NMDD134	88.0	-66.0	757321.16	1177088.09	207.45	453.84	UTM WGS84 Zone 30 North
NMDD138	86.2	-65.2	757278.30	1176992.94	210.23	501.40	UTM WGS84 Zone 30 North
NMRC056	93.6	-45.0	757432.77	1176863.83	216.93	145.00	UTM WGS84 Zone 30 North
NMRC074	93.6	-45.0	757449.55	1176913.72	217.76	67.00	UTM WGS84 Zone 30 North
NMRC103	93.6	-60.0	757656.76	1177321.83	200.68	149.00	UTM WGS84 Zone 30 North
NMRC108	97.6	-61.2	757591.38	1177267.44	202.56	150.00	UTM WGS84 Zone 30 North
NMRC129	94.3	-65.5	757458.98	1177173.69	205.17	300.00	UTM WGS84 Zone 30 North
NMRC130	94.5	-46.1	757572.09	1177157.47	205.32	162.00	UTM WGS84 Zone 30 North
NMRC133	89.8	-65.1	757559.54	1177411.71	199.28	250.00	UTM WGS84 Zone 30 North
NMRC134	88.8	-66.5	757518.86	1177368.02	200.72	250.00	UTM WGS84 Zone 30 North
NMRC139	88.5	-64.9	757683.60	1177167.03	202.00	130.00	UTM WGS84 Zone 30 North
NMRC144	88.2	-66.3	757520.91	1177308.46	201.55	300.00	UTM WGS84 Zone 30 North
NMRC145	88.1	-50.4	757469.45	1177080.63	209.73	312.00	UTM WGS84 Zone 30 North
NMRC152	90.0	-64.8	757472.60	1176887.70	217.26	291.00	UTM WGS84 Zone 30 North
NMRC164	88.8	-65.2	757483.27	1177036.70	210.81	350.00	UTM WGS84 Zone 30 North
NMRC178	89.7	-45.7	757542.45	1177052.58	210.18	200.00	UTM WGS84 Zone 30 North
NMRD089	88.6	-65.0	757566.85	1177313.74	201.04	253.00	UTM WGS84 Zone 30 North
NMRD090	88.6	-65.0	757611.66	1177423.07	198.46	211.00	UTM WGS84 Zone 30 North
NMRD096	88.4	-66.0	757326.44	1177146.74	206.28	393.25	UTM WGS84 Zone 30 North
NMRD153	88.5	-63.2	757485.13	1176783.92	213.14	173.11	UTM WGS84 Zone 30 North

Table 4: Summary of Individual 20m Composites selected for Metallurgical test work

Hole_ID	mFrom	mTo	Au g/t	LITHOLOGY
NMDD019	39	59	0.50	MetaVolcanics
NMDD019	59	70	1.41	MetaVolcanics
NMDD019	81	85	0.18	Granite
NMDD019	100	120	0.76	MetaVolcanics
NMDD019	120	124	1.29	MetaVolcanics
NMDD019	124	144	0.23	Granite
NMDD019	144	164	0.48	Granite
NMDD019	164	167	1.16	Granite
NMDD019	167	187	0.48	MetaVolcanics
NMDD019	187	207	0.43	MetaVolcanics
NMDD019	207	227	0.63	MetaVolcanics
NMDD019	227	247	1.51	MetaVolcanics
NMDD019	247	267	1.22	MetaVolcanics
NMDD019	267	275	1.58	MetaVolcanics
NMDD021	73	93	0.76	Granite
NMDD021	93	113	1.08	Granite
NMDD021	113	130	0.46	Granite
NMDD021	145	155	0.43	Granite
NMDD024	280	297	1.65	Diorite
NMDD024	308	316	0.27	Diorite
NMDD027	73	93	2.27	MetaVolcanics
NMDD027	93	103	3.85	MetaVolcanics
NMDD048	12	32	1.33	MetaVolcanics
NMDD048	32	33	0.14	MetaVolcanics
NMDD091	91	111	2.50	MetaVolcanics
NMDD091	111	119	2.68	MetaVolcanics
NMDD096	267	287	1.82	MetaVolcanics
NMDD096	287	307	1.78	MetaVolcanics
NMDD096	307	310	5.57	MetaVolcanics
NMDD100	267	287	2.92	Diorite
NMDD100	287	307	1.20	Diorite
NMDD100	307	327	0.87	Diorite
NMDD100	327	339	2.33	Diorite
NMDD132	189	209	6.38	MetaVolcanics
NMDD132	209	229	2.61	MetaVolcanics
NMDD132	229	232	0.65	MetaVolcanics
NMDD132	232	252	0.63	Granite
NMDD132	252	256	0.34	Granite
NMDD134	254	274	2.20	Granite
NMDD134	274	290	3.02	Granite
NMDD134	290	310	1.13	MetaVolcanics
NMDD134	310	328	1.33	MetaVolcanics
NMDD134	328	348	1.18	Diorite
NMDD134	348	368	1.32	Diorite
NMDD138	83	103	0.84	MetaVolcanics
NMDD138	103	123	0.89	Granite
NMDD138	123	143	0.95	Granite
NMDD138	143	163	0.93	Granite
NMDD138	163	183	0.74	Granite
NMDD138	183	203	0.70	Granite

Hole_ID	mFrom	mTo	Au g/t	LITHOLOGY
NMDD138	203	223	0.44	Granite
NMDD138	223	243	0.76	Granite
NMDD138	243	263	0.55	Granite
NMDD138	263	283	0.57	Granite
NMDD138	283	303	0.87	Granite
NMDD138	303	323	1.07	Granite
NMDD138	323	343	1.83	Granite
NMDD138	343	345	0.41	Granite
NMDD138	345	359	0.76	Diorite
NMRC056	30	38	0.81	MetaVolcanics
NMRC056	56	65	0.54	MetaVolcanics
NMRC056	74	76	0.12	MetaVolcanics
NMRC074	35	55	1.81	MetaVolcanics
NMRC074	55	67	2.85	MetaVolcanics
NMRC103	18	30	0.89	MetaVolcanics
NMRC108	0	13	1.49	Granite
NMRC108	13	28	0.66	MetaVolcanics
NMRC108	76	80	0.02	MetaVolcanics
NMRC108	89	105	0.76	Granite
NMRC108	105	125	0.32	MetaVolcanics
NMRC108	125	126	0.12	MetaVolcanics
NMRC108	126	127	0.44	Diorite
NMRC129	20	40	0.52	MetaVolcanics
NMRC129	40	42	0.24	MetaVolcanics
NMRC129	42	48	0.22	Granite
NMRC129	67	87	0.65	Granite
NMRC129	87	96	1.37	Granite
NMRC129	96	116	1.16	MetaVolcanics
NMRC129	116	136	2.40	MetaVolcanics
NMRC129	136	152	1.75	MetaVolcanics
NMRC129	161	163	0.04	MetaVolcanics
NMRC129	163	183	1.34	Granite
NMRC129	183	202	0.65	Granite
NMRC129	202	210	0.56	MetaVolcanics
NMRC129	211	230	1.82	MetaVolcanics
NMRC129	248	257	1.83	Diorite
NMRC130	15	25	0.89	Granite
NMRC130	44	51	1.32	Granite
NMRC130	52	72	2.99	Granite
NMRC130	72	86	1.76	Granite
NMRC130	86	93	0.59	MetaVolcanics
NMRC130	111	112	0.05	Diorite
NMRC130	123	134	0.37	Diorite
NMRC130	136	144	0.24	Diorite
NMRC130	148	149	0.11	Diorite
NMRC133	79	99	0.57	Granite
NMRC133	99	110	1.37	Granite
NMRC134	64	75	0.88	MetaVolcanics
NMRC134	76	85	1.16	MetaVolcanics
NMRC139	13	14	0.49	Diorite
NMRC139	15	18	0.06	Diorite
NMRC139	27	35	0.91	Diorite

Hole_ID	mFrom	mTo	Au g/t	LITHOLOGY
NMRC139	36	49	0.58	Diorite
NMRC139	50	56	0.51	Diorite
NMRC144	29	38	0.92	MetaVolcanics
NMRC144	41	42	3.40	MetaVolcanics
NMRC144	47	56	0.72	MetaVolcanics
NMRC144	56	76	1.52	Granite
NMRC144	76	96	1.47	Granite
NMRC144	96	116	0.66	Granite
NMRC144	116	117	3.49	Granite
NMRC144	117	137	1.61	MetaVolcanics
NMRC144	137	155	1.21	MetaVolcanics
NMRC144	187	193	0.35	MetaVolcanics
NMRC144	202	205	0.36	Diorite
NMRC145	36	56	0.57	Granite
NMRC145	56	76	0.97	Granite
NMRC145	76	96	0.99	Granite
NMRC145	96	116	1.52	Granite
NMRC145	116	135	2.34	Granite
NMRC152	30	50	1.60	MetaVolcanics
NMRC152	50	60	1.67	MetaVolcanics
NMRC152	86	100	0.71	MetaVolcanics
NMRC164	39	59	0.77	Granite
NMRC164	59	63	0.52	Granite
NMRC164	106	126	0.97	Granite
NMRC164	126	146	0.70	Granite
NMRC164	146	166	1.48	Granite
NMRC164	166	171	1.46	Granite
NMRC178	25	45	1.79	Granite
NMRC178	45	65	1.00	Granite
NMRC178	65	85	1.34	Granite
NMRC178	85	105	0.84	Granite
NMRC178	105	110	2.01	Granite
NMRD089	29	49	0.99	Granite
NMRD089	49	56.89	0.76	Granite
NMRD090	37	57	0.62	Granite
NMRD090	57	68	0.45	Granite
NMRD090	69	73	0.15	Granite
NMRD096	279	281	0.04	Granite
NMRD096	283	286	0.15	Granite
NMRD096	287	307	0.82	Granite
NMRD096	307	313	0.80	Granite
NMRD096	313	333	0.48	MetaVolcanics
NMRD096	333	348	1.58	MetaVolcanics
NMRD153	20	40	6.20	MetaVolcanics
NMRD153	40	54	3.22	MetaVolcanics

Notes:

- Grid coordinates are in WGS84 Zone 30 North.
- The 20m downhole intercept composites were calculated using weighted average

Appendix 1

JORC Code 2012 Edition – Table 1

Section 1 – Sampling Technique and Data

Criteria	JORC Code Explanation	Commentary
Sampling techniques	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.	Resource drilling comprises 175 diamond core holes and 151 Reverse Circulation (RC) drill holes totalling 87,140 m. Diamond core sampling includes half-core and quarter-core samples of HQ core size. RC drilling utilised face-sampling hammers of nominally 127 to 140 mm diameter, with samples collected by riffle splitting. Additional drilling including exploration and sterilisation drilling outside the resource area, and 10 by 15m spaced trial RC grade control drilling was not included in the resource estimation dataset.
	Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.	Field sampling followed Cardinal Namdini protocols including industry standard quality control procedures. Sample representativity is ensured by: RC samples: Collecting 1m samples from a cyclone, passing them through a 3-tier riffle splitter, and taking duplicate samplers every 20th sample. Diamond Core: For drilling prior to approximately April 2016 core was halved for sub-sampling with a diamond saw. From approximately April 2016 to June 2017 core was quartered for assaying. For drilling after June 2017 diamond core was halved for sub-sampling. Sample intervals range from 0.2 to 1.8 m in length, with majority of samples assayed over 1 m intervals.
	Aspects of the determination of mineralisation that 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.	After oven drying diamond core samples were crushed using a jaw crusher, with core and RC samples crushed to a -2mm size using an RSD Boyd crusher. Riffle split sub-samples were pulverised to nominally 85% passing 75 microns. Pulverised samples were fire assayed for gold using a 30 or 50-gram charge with an atomic absorption finish, with a detection limit of 0.01 g/t. Assays of greater than 100 g/t were re-analysed with a gravimetric finish.
	Selection of Composites for Aachen metallurgical test work.	A selection of representative 1 m samples from 47 drill holes were sent to Maelgwyn Laboratories South Africa for Aachen Metallurgical testwork. The drillhole samples selected were from different representative lithologies within the planned Starter Pit and Life of Mine pit. The samples were sent as competent HQ quarter core and crushed material rejects from SGS assay laboratories.

Criteria	JORC Code Explanation	Commentary
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.).	Diamond core drilling is completed with core size of HQ with tipple tube drilling through surficial saprolite and standard tubes for deeper drilling. Core was orientated using a digital Reflex ACT II RD orientation tool. Reverse circulation drilling utilised face sampling hammers of nominal 127 to 140mm diameter. The resource drilling comprises east-west trending traverses of holes inclined towards the east at generally 45^0 to 65° approximately perpendicular to mineralisation. All drill collars are surveyed using an RTK GPS with most diamond holes and deeper RC holes downhole surveyed at intervals of generally around 30 m using electronic multi-shot and gyroscopic equipment.
Drill sample recovery	Method of recording and assessing core and chip sample recoveries and results assessed.	Recovered core lengths were measured for 98% of the diamond resource drilling, showing generally very high recoveries, which average 99.8% for mineralised domain samples. RC sample recoveries were assessed by weighing recovered sample weights for 1m intervals. For the combined dataset estimated recoveries average 85% which is considered acceptable.
	Measures taken to maximise sample recovery and ensure representative nature of the samples.	All drilling activities were supervised by company geologists. Measures taken to maximise diamond core recovery included use of HQ core size with triple tube drilling through the saprolite zone, and having a geologist onsite to examine core and core metres marked and orientated to check against the driller's blocks and ensuring that all core loss is considered. RC sample recovery was maximised by utilising drilling rigs with sufficient compressor capacity, including auxiliary compressors to provide dry, high recovery samples. In cases where the RC rig was unable to maintain dry samples the hole was continued by diamond core drilling. RC sample condition was routinely logged by field geologists with less than 0.2% of resource RC samples logged as moist or wet.
	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.	No relationship is seen to exist between sample recovery and grade, and no sample bias is due to preferential loss/gain of any fine/coarse material due to the generally high sample recoveries obtained by both drilling methods employed.
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.	All drill holes were geologically logged and selected diamond core was geotechnically logged. The lithology, alteration and geotechnical characteristics of core are logged directly to a digital format on a Field Toughbook laptop logging system following procedures and using Cardinal geologic codes. Data is imported into Cardinal's central database after validation in Maxwell LogChief™ software.

Criteria	JORC Code Explanation	Commentary
		The geological and geotechnical logging is of appropriate detail to support the Mineral Resource estimation, and mining and metallurgical studies.
	Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.	Logging was both qualitative and quantitative depending on the field being logged. RC chips in trays and HQ core were photographed both in dry and wet form.
	The total length and percentage of the relevant intersections logged.	Geological logs are available for 86,728 (99.5%) of the resource drilling
Sub-sampling techniques and sample preparation	If core, whether cut or sawn and whether quarter, half or all core taken.	For sampling, diamond core was either quartered or halved with these sample types providing 36% and 64% of mineralised domain core samples respectively.
	If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.	RC samples were split using a three-tier riffle splitter. Rare wet were air dried prior to riffle splitting.
	For all sample types, the nature, quality and appropriateness of the sample preparation technique.	Sample preparation and gold assaying was undertaken by independent commercial laboratories. Most primary samples were submitted to SGS Ouagadougou or SGS Tarkwa for analysis by fire-assay with assays from these laboratories contributing around one third and two thirds of the estimation dataset respectively. Samples analysed by Intertek Tarkwa provide around 0.5% of the estimation dataset. After oven drying diamond core samples were crushed using a jaw crusher, with core and RC samples crushed to minus 2mm using an RSD Boyd crusher. Riffle split sub-samples were pulverised to nominally 85% passing 75 microns. The sample preparation is of appropriately high quality for Mineral Resource estimation.
	Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.	Procedures adopted to maximise representivity of samples include crushing and pulverising of samples prior to further sub-sampling by appropriate splitting techniques. Sample preparation equipment was routinely cleaned with crushers and pulveriser flushed with barren material at the start of every batch.
	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.	Measures taken to ensure sample representivity include use of appropriate sub-sampling methods, including riffle splitting for RC samples and halving, or quartering diamond core with a diamond saw. RC field duplicates were routinely collected, and selected samples were submitted for inter-laboratory check assaying.
	Whether sample sizes are appropriate to the grain size of the material being sampled.	Sample sizes are appropriate for the grain size of the sampled material.
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.	Samples are analysed for gold by lead collection fire assay of a 30 or 50g charge with AAS finish; the assay charge is fused with the litharge-based flux, cupelled and prill dissolved in aqua regia and gold tenor determined by flame AAS. The quality of the Fire Assaying and laboratory procedures are considered to be entirely appropriate for

Criteria	JORC Code Explanation	Commentary
		this deposit type. The analytical method is considered appropriate for this mineralisation style and is of industry standard. Pulverised samples were fire assayed for gold using a 30 or 50-gram charge with an atomic absorption finish, with a detection limit of 0.01 g/t. Assays of greater than 100 g/t were re-analysed with a gravimetric finish. The fire assays represent total analyses and are appropriate for the style of mineralisation. They are of appropriately high quality for Mineral Resource estimation.
	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.	No hand-held geophysical tools were used.
	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.	Monitoring of sample preparation and analysis included industry standard methods comprising routine submission of certified reference standards, coarse and fine blanks and inter-laboratory repeats. These procedures have confirmed the reliability and accuracy of the sample preparation and analysis with sufficient confidence for the Mineral Resource estimation. Acceptable levels of accuracy and precision have been established.
	Aachen metallurgical test work	Each metallurgical composite sample received at the Maelgwyn Laboratory was staged crushed via jaw and cone crusher to 100% passing 1.7 mm. The material was then split into 20 kg portions using spades and labour via the industry standard cone and quartering method. Each of the 20 kg samples was split into 1 kg portions using a rotary splitter, for purposes of chemical head assays, grind establishment and bench scale testwork. The Aachen testwork was performed in accordance with South African National Accreditation System (SANAS) industry standards.
Verification of sampling and assaying	The verification of significant intersections by either independent or alternative company personnel.	No individual drill hole results are reported in this announcement. Several small phases of independent core-sampling and assaying have been conducted.
	The use of twinned holes.	None of the drill holes in this report are twinned.
	Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.	Primary data were captured on field tough book laptops using LogChief™ Software. The software has validation routines and data was then imported onto a secure central database.
	Discuss any adjustment to assay data.	No adjustments were made to assays.
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.	All drill collars are surveyed by RTK GPS (±10mm of accuracy) with most diamond holes and deeper RC holes downhole surveyed at intervals of generally around 30 m using electronic multi-shot and gyroscopic equipment.

Criteria	JORC Code Explanation	Commentary
	Specification of the grid system used.	Coordinate and azimuth are reported in UTM WGS84 Zone 30 North.
	Quality and adequacy of topographic control.	Topographic control was established from aerial photography using 12 surveyed control points. A 1m ground resolution DTM was produced by Sahara Mining Services from a UAV survey using a DJI Inspire 1 UAV at an altitude of 100m. Topographic control is adequate for estimation of Mineral Resources and Ore Reserve.
Data spacing and distribution	Data spacing for reporting of Exploration Results.	Drill spacing is at 50m x 100m line spacing with infill to 50m x 50m and 10m x 15m in selected areas.
	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.	Drill data spacing and distribution are sufficient to establish geological and grade continuity for the Mineral Resource and Ore Reserve classifications were applied utilising this information. Mineralisation tested by generally 50 by 50 m and closer spaced drilling is assigned to the Indicated category, with estimates for zones with more closely spaced drilling classified as Measured. Estimates for panels not informed consistently 50 by 50 m drilling are assigned to the Inferred category.
Orientation of data in relation to geological structure	Whether sample compositing has been applied.	Drill hole assays were composited to 2m down-hole intervals for resource estimation.
	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.	Most resource drilling was inclined at around 45^0 to 60^o to the east, providing un-biased sampling of the mineralisation.
Sample security	The measures taken to ensure sample security.	Diamond core and RC samples were transported from the drill site by Cardinal vehicle to secure storage at the Bolgatanga field exploration office. Core yard technicians, field technicians and geologists ensured samples were logged, prepared and securely stored until collected for transportation to the assay laboratories by personnel employed by the assay laboratory. All samples submitted for assaying were retained in a locked secure shed until collected by laboratory personnel for transport to assay laboratory. Retained drill core and RC chips are securely stored in the core storage compound, and pulps are securely stored in the core shed A sign-off process between Cardinal and the laboratory truck driver ensured samples and paper work correspond. The samples were then transported to the laboratory where they were receipted against the dispatch documents. The assay laboratories were responsible for samples from the time of collection from the exploration office.

Criteria	JORC Code Explanation	Commentary
Audits or reviews	The results of any audits or reviews of sampling techniques and data.	Data is audited by Maxwell Geoservices (Perth), who have not made any other recommendations.

Section 2 – Reporting of Exploration Results
(Criteria listed in section 1 will also apply to this section where relevant)

Criteria	JORC Code Explanation	Commentary
Mineral Tenement and Land Status	Type, name/reference number, location and ownership including agreements or material issues with third parties including joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.	The Mining Licence covering Cardinal's Namdini Project over an area of approximately 19.54 sq. Km is located in the Northeast region of Ghana. The previous holder of the Mining Licence, Savannah Mining Ghana Limited (Savanah) completed an initial Environmental Impact Statement (EIS) and lodged the EIS with the Environmental Protection Agency of Ghana. The application by Savannah for a Large-Scale Mining Licence over an area of approximately 19.54 Sq. Km in the Upper East Region of Ghana covering Cardinal's Namdini Project has been granted by the Minister of Lands and Natural Resources of Ghana. Savannah applied for the assignment of this Large-Scale Mining Licence to Cardinal Namdini Mining Limited (Namdini), a wholly owned Subsidiary of Cardinal. The assignment has been granted by the Minister of Lands and Natural Resources of Ghana.
	The security of the tenure held at the time of reporting along with any known impediments to obtaining a license to operate in the area.	All tenements are current and in good standing. The Mining Lease for Namdini was granted for an initial 15 years which is renewable.
Exploration Done by Other Parties	Acknowledgment and appraisal of exploration by other parties.	Aside from Cardinal there has been no recent systematic exploration undertaken on the Namdini Project.
Geology	Deposit type, geological setting and style of mineralisation	The deposit type comprises gold mineralisation within sheared and highly altered rocks containing sulphides; mainly pyrite with minor arsenopyrite. The geological setting is a Paleoproterozoic Greenstone Belt comprising Birimian metavolcanics, volcaniclastics and metasediments located in close proximity to a major 30 km ~N-S regional shear zone with splays. The style of mineralisation is hydrothermal alteration containing disseminated gold-bearing sulphides.
Drill hole information	A summary of all information material to the understanding of the exploration results including tabulation of the following information for all Material drill holes: • <u>Easting and northing of the drill hole collar</u> • <u>Elevation or RL (Reduced Level –</u>	No individual drill hole results are reported in this announcement.

Criteria	JORC Code Explanation	Commentary
	elevation above sea level in meters) of the drill hole collar • Dip and azimuth of the hole • Down hole length and interception depth • Hole length If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.	There has been no exclusion of information.
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 aggregated intercepts incorporate short lengths of high grade results and longer lengths 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.	No individual drill hole results are reported in this announcement. Not applicable in this document.
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 resource drilling comprises east-west trending traverses of holes inclined towards the east at generally 45^0 to 65° approximately perpendicular to mineralisation.
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.	Appropriate maps with scale are included within the body of the announcement
Balanced Reporting	Where comprehensive reporting of all Exploration Results is not practical, representative reporting of both low and high grades and/or widths should	No individual drill hole results are reported in this announcement.

Criteria	JORC Code Explanation	Commentary
	be practiced to avoid misleading reporting of Exploration Results.	
Other substantive exploration data	Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observation; 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.	Density measurements available for Namdini comprise 11,047 immersion measurements performed by either Cardinal (9,652) or SGS Tarkwa or Ouagadougou (1,395) on diamond core. Oxidised and porous samples were wax-coated prior to density measurement.
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. Aachen metallurgical test work.	Exploration drilling will continue to target projected lateral and depth extensions of the mineralisation along with infill drilling designed to increase confidence in Mineral Resource estimates. A representative set of additional samples have been selected and sent for the next phase of **Aachen™** testwork at the Maelgwyn Laboratory in South Africa (805 one metre samples with a total mass of ~2,310kg). The total mass of sample available for Aachen testwork will be ~3,120kg.

Section 3 – Estimation and Reporting of Mineral Resources

Criteria	JORC Code Explanation	Commentary
Database integrity	Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.	The database is managed using DataShed© drill hole management software (Maxwell Geoservices) using SQL database techniques. Validation checks were conducted using SQL and DataShed relational database standards. All geological and field data is entered using data-loggers and software developed by Maxwell GeoServices, that includes lookup tables and fixed formatting (and protected from modification) thus only allowing data to be entered using the Cardinal geological code system and sample protocol. Data is then loaded to the DataShed database, which was managed by consultants Maxwell GeoServices. Cardinal technical personnel validated the database using Micromine software. The DataShed database is then reviewed against the original logging spreadsheets and the assay data checked against the supplied assay certificates. The Competent Person's independent checks of

Criteria	JORC Code Explanation	Commentary
		database validity included checking for internal consistency between, and within database tables and comparison of database entries with original source files. These checks, which included 99% of primary assays, 53% of down-hole surveys, and all collar surveys for the resource drilling showed no significant inconsistencies. The Competent Person's checks were conducted on the database compiled for resource estimation and in addition to checking Cardinal's master database also check for data-compilation errors.
	Data validation procedures used.	Following importation, the data goes through a series of digital checks for duplication and non-conformity, followed by manual validation by the relevant project geologist who manually checks the collar, survey, assay and geology for errors against the original field data and final paper copies of the assays. The process is documented, including the recording of holes checked, errors found, corrections made and the date of database update.
Site visits	Comment on any site visits undertaken by the Competent Person and the outcome of those visits. If no site visits have been undertaken indicate why this is the case.	Mr. Nicolas Johnson of MPR Geological Consultants Pty Ltd (MPR) visited the Namdini Gold Project in January 2017. Mr Johnson inspected drill core, mineralisation exposures and drilling and sampling activities and had detailed discussions with Cardinal geologists gaining an improved understanding of the geological setting and mineralisation controls, and the resource sampling activities. Mr. Richard Bray is a full-time employee of Cardinal and undertakes regular site visits.
Geological interpretation	Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.	Gold mineralisation is widespread within the metavolcanic, granite and dioritic units which can be interpreted and modelled with a high degree of confidence. There is a sharp mineralisation boundary with the metasediments in the footwall while the hanging wall contact exhibits a more diffuse mineralisation boundary. Higher-grade mineralisation (>0.5 g/t Au) can be traced along structural corridors related to a pervasive NW-SE foliation which has been warped around the more competent granite. There is abundant structural information from oriented core which confirms this interpretation.
	Nature of the data used and of any assumptions made.	The deposit's geological setting has been confidently established from drill hole logging and surface mapping.
	The effect, if any, of alternative interpretations on Mineral Resource estimation.	Geological setting of the Namdini mineralisation has been confidently established and alternative interoperations are considered unnecessary.
	The use of geology in guiding and controlling Mineral Resource estimation.	Logging, interpretation and modelling undertaken by Cardinal Resources' technical staff and specialist structural consultants Orefind Pty Ltd produced a three-dimensional model of key rock types, structures and oxidation zones. These wire-frames were used for

Criteria	JORC Code Explanation	Commentary
		flagging of the resource composites into oxide, transition and fresh subdomains, and assigning rock types and oxidation zones to the block model for density assignment and partitioning final resources by oxidation type. Depth to the interpreted base of complete oxidation ranges averages approximately 10 m. Interpreted depth to fresh rock ranges averages approximately 18 m. Resource modelling included a broad mineralised domain capturing drill hole intercepts of greater than 0.1 g/t. Domain interpretation included reference to geological logging, and is consistent with geological understanding. The mineralised domain trends north-northeast over approximately 1.3 km with horizontal widths ranging from around 90 to 400 m and averaging approximately 250 m. The domain dips to the west at around 60^{o} and is interpreted to around 860 m depth, well below the base of drilling.
	The factors affecting continuity both of grade and geology.	The continuity of grade is associated with a pervasive foliation, alteration, sulphides and the spatial distribution of lithologies including the interaction between structure and lithological competency contrasts. A broad zone of anomalous mineralisation is interpreted. Geological setting and mineralization controls have been established with sufficient confidence for the current estimates.
Dimensions	The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.	The mineralised domain trends extend over 1.3 km of strike with an average horizontal width of approximately 250 m. Mineral resources are constrained within an optimal pit, and extend from natural surface to the bit base at around 580 m depth.
Estimation and modelling techniques	The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.	Mineral resources were estimated by Multiple Indicator Kriging (MIK) with block support adjustment. The modelling included a broad mineralised domain capturing drill hole intercepts of greater than 0.1 g/t, and oxidation domains outlining oxidised, transitional and fresh zones. Grade continuity characterised by indicator variograms modelled at 14 indicator thresholds. All class grades were derived from class mean grades, with the exception of upper bin grades, which were generally derived from bin medians, or for the case of fresh mineralised domain bin means inclusive of a 50 g/t upper cut. The modelling used a three-pass octant-based search strategy giving estimates extrapolated to a maximum of 92.5m from composite locations. Estimated resources include a variance adjustment to give estimates of recoverable resources for selective mining unit dimensions of 5 m east by 10 m north by 2.5 m in elevation. The variance adjustments were applied

Criteria	JORC Code Explanation	Commentary
		using the direct lognormal method. Data viewing, compositing and wire-framing was performed using Micromine software. Exploratory data analysis, variogram analysis and modelling, and Mineral Resource estimation utilised FSSI Consultants (Australia) Pty Ltd (FSSI) GS3M software. The modelling technique is appropriate for the mineralisation style, and potential mining method.
	The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.	Resulting Mineral Resource estimates were compared with the previous estimate performed by Roscoe Postle Associates Inc. ("RPA"). For the same area covered by RPA, the MPR estimate statistics and results are within 5% for grade, tonnes and ounces at the cut-off grade. MPR's estimate has the benefit of additional drilling and covers a larger area accounting for the global variances. Recent independent reviews were also conducted by Golder Associates Pty Ltd.
	The assumptions made regarding recovery of by-products.	There is no assumption made regarding the recovery of any by-product.
	Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).	Block modelling included estimation of sulphur and arsenic. These attributes are not included in mineral resources.
	In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.	Block dimensions used were 12.5 mE by 25 mN by 5 mRL and chosen due to this dimension approximating the average resource drill spacing in the areas of tightest resource drilling. The modelling includes a three-pass octant search strategy with search ellipsoids aligned with the average domain orientations. Search radii and minimum data requirements are: Search 1: 65 by 65 by 15 m (16 data), Search 2: 97.5 by 97.5 by 22.5 m (16 data), Search 3: 97.5 by 97.5 by 22.5 (8 data).
	Any assumptions behind modelling of selective mining units.	Estimated resources include a variance adjustment to give estimates of recoverable resources for selective mining unit dimensions of 5 m east by 10 m north by 2.5 m in elevation with grade control sampling on an 8 by 12 by 1.25 m pattern. The variance adjustments were applied using the direct lognormal method.
	Any assumptions about correlation between variables.	The modelling did not include any specific assumptions about correlation between variables.
	Description of how the geological interpretation was used to control the resource estimates.	Interpretation of the mineralised domain used for resource modelling included reference to geological logging, and the domain is consistent with geological understanding. A three-dimensional model of key rock types and oxidation zones was density assignment and partitioning final resources by oxidation type.
	Discussion of basis for using or not using grade cutting or capping.	Statistical analysis showed the gold population in the mineralized domains to be highly skewed and generally having moderate to high coefficient of variation. All class grades were derived from class mean grades, with the exception of upper bin grades, which were

Criteria	JORC Code Explanation	Commentary
		generally derived from bin medians, or for the case of fresh mineralised domain bin means inclusive of a 50 g/t upper cut.
	The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.	Model validation included visual comparison of model estimates and composite grades, and review of swath plots. Additional checking included comparison of model estimates with independent grade control models produced from the trial GC drill data, which showed close agreement.
Moisture	Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.	Tonnages are estimated on a dry basis.
Cut-off parameters	The basis of the adopted cut-off grade(s) or quality parameters applied.	The cut-off grade of 0.5 g/t sed for Mineral Resource reporting reflect Cardinal's interpretation of the potential project range of gold prices and process plant recoveries and operating costs for a potential operation.
Mining factors or assumptions	Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.	Estimated resources include a variance adjustment to give estimates of recoverable resources for selective mining unit dimensions of 5 m east by 10 m north by 2.5 m in elevation with grade control sampling on an 8 by 12 by 1.25 m pattern. The variance adjustments were applied using the direct lognormal method. The Mineral Resource is constrained within an optimal pit shell based on a long-term gold price of US$1,950 /oz using factors relevant to location and proposed processing and mining method, comprising conventional drill, blast, load and haul unit operations.
Metallurgical factors or assumptions	The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.	Gold mineralisation is mainly associated with pyrite in all three main rock types being metavolcanic, granite and diorite. Metallurgical testwork has proved that due to the gold being associated with sulphides, the ore is highly amenable to efficient flotation techniques. Metallurgical testwork has also confirmed that the ore is amenable to conventional milling and flotation, followed by regrinding and cyanide leaching of the flotation concentrate in a carbon-in-leach process. Metallurgical testwork has been completed indicating that a non-flotation conventional gold process can be applied to all oxide domains. Oxide content (in gold and tonnage terms) of the orebody is less than 5%. Bulk samples have been taken for bench-scale and pilot-scale metallurgical testwork for the key areas of the flowsheet. Sample selection and therefore metallurgical testwork has included high grade, low grade, ore body variability and sulphur variability for all ore lithologies.

Criteria	JORC Code Explanation	Commentary
		Metallurgical testing using industry standard gold techniques has demonstrated an average LOM gold recovery rate of 82%. A conventional grind-flotation-regrind-CIL flowsheet continues to be the preferred process option. Recovery appears to be dependent on head grade and upon the ratio of the different lithologies, which change as the Mineral Resource model is updated and depending upon the cut-off grade. No deleterious elements have been identified in the testwork that could affect the saleability or price of the gold doré produced.
Environmental factors or assumptions	Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.	Cardinal's exploration activities are undertaken such that any potential emissions and effects associated exploration activities, which could include habitat modification and associated visual effects, are kept to a minimum. NEMAS Consult Ltd (NEMAS), of Accra, Ghana, has been contracted by Cardinal to undertake the Environmental Impact Assessment study for the Project. NEMAS has undertaken a site reconnaissance visit and completed the Scoping stage of the process in accordance with the Ghanaian Environmental Protection Agency procedures for the EIA. The Environmental Impact Statement (EIS) to complete the process of Environmental Protection Agency (EPA) approval in accordance with Regulations 15(1b) and (1c) of the Environmental Assessment Regulations, 1999 (LI 1652) and Ghana's Environmental Impact Assessment (EIA) Procedures, the Environmental Protection Agency (EPA). Further detailed environmental studies are continuing. Cardinal believes that there are unlikely to be any specific environmental issues that would preclude potential eventual economic extraction.
Bulk density	Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples. The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.	Resource data acquisition included routine immersion measurements of bulk densities for samples of diamond core. The bulk density database for the Mineral Resource estimate comprises 11,047 measurements. Oxidized and porous samples were wax-coated prior to density measurement. Lengths specified for these samples range from 0.01 to 1.4 m and average 0.3 m. Bulk density is determined using Archimedes principal on DD core samples. ➢ Oxide – 2.06 ➢ Transition Metavolcanics – 2.54 ➢ Transition Granite – 2.54 ➢ Transition Diorite – 2.58 ➢ Transition Metasediments – 2.58 ➢ Fresh Metavolcanics – 2.81

Criteria	JORC Code Explanation	Commentary
		➢ Fresh Granite – 2.73 ➢ Fresh Diorite – 2.82 ➢ Fresh Metasediments - 2.82
	Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.	Bulk densities were assigned to the estimate by rock type and weathering zone. The assigned values were derived from the average of the available measurements for each zone. Assigned densities vary from 2.00 for strongly weathered metavolcanic to 2.82 t/m^3 for fresh diorite and metasediments.
Classification	The basis for the classification of the Mineral Resources into varying confidence categories.	Resource model blocks were classified as Measured, Indicated or Inferred on the basis of search pass and three wire-frames outlining more closely drilled portions of the mineralisation. The classification approach assigns estimates mineralization tested by generally 50 by 50 m and closer spaced drilling to the Indicated category, with estimates for more zones with closely spaced drilling classified as Measured. Estimates for panels not informed consistently 50 by 50 m drilling are assigned to the Inferred category. Classification of the area of Grade Control sampling as Measured is warranted by the close agreement between resource and Grade Control estimates.
	Whether appropriate account has been taken of all relevant factors (ie., relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data). Whether the result appropriately reflects the Competent Person's view of the deposit.	The resource classification accounts for all relevant factors and reflect the competent person's views of the deposit.
Audits or reviews	The results of any audits or reviews of Mineral Resource estimates.	Mineral Resource reviews including comparative modelling have previously been undertaken by independent external consultants.
Discussion of relative accuracy/ confidence	Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.	Confidence in the accuracy of the estimates is reflected by their classification as Measured, Indicated and Inferred.

Criteria	JORC Code Explanation	Commentary
	The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.	The Mineral Resource has been classified as Indicated and Inferred with the Indicated Resource considered to be of sufficient confidence to allow mine planning studies to be completed. The geostatistical techniques applied to estimate the Namdini deposit are deemed appropriate for the anticipated bulk mining method proposed.

Section 4 - Estimation and Reporting of Ore Reserves

Golder Associates Pty Ltd estimated the Ore Reserve in accordance with the JORC Code (2012). The term 'Ore Reserve' is synonymous with the term 'Mineral Reserve' as used by Canadian National Instrument 43-101 'Standards of Disclosure for Mineral Projects' (NI 43-101, 2014) and conforms with CIM (2014). The JORC Code (2012) is defined as an 'acceptable foreign code' under NI 43-101.

Criteria	JORC Code Explanation	Commentary
Mineral Resource estimate for conversion to Ore Reserves	Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve. Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.	The Mineral Resource model used as input to the mining model was the MIK model supplied by MPR (February 2019) using parent cell sizes of 12.5x25x5 m (X, Y, Z). The Ore Reserve is wholly inclusive of the Mineral Resource for the Namdini Gold Project.
Site visits	Comment on any site visits undertaken by the Competent Person and the outcome of those visits. If no site visits have been undertaken indicate why this is the case.	The Competent Person (Ore Reserves) visited the Namdini Gold Project site in Ghana on 14 and 15 December 2017. The site has road access and is readily accessible for power, water and additional infrastructure requirements.
Study status	The type and level of study undertaken to enable Mineral Resources to be converted to Ore Reserves. The Code requires that a study to at least Pre-Feasibility Study level has been undertaken to convert Mineral Resources to Ore Reserves. Such studies will have been carried out and will have determined a mine plan that is technically achievable and economically viable, and that material Modifying Factors have been considered.	A Preliminary Feasibility Study has been completed and a NI43-101 Technical Report for the TSX was submitted in October 2018. Ore Reserves are declared for the Namdini Gold Project based upon a mine plan and mine designs that are deemed technically achievable and have been tested for economic viability using input costs, metallurgical recovery and expected long term gold price, after due allowances for royalties.

Class	Ore tonnes (Mt)	Contained ounces (Moz)	Grade (Au g/t)
Proved Oxide	1.0	0.1	1.21
Probable Oxide	3.0	0.1	1.08
Proved Fresh	6.4	0.3	1.33

Criteria	JORC Code Explanation	Commentary
		Probable Fresh — 131.2 — 4.6 — 1.13 Total Proved and Probable — 138.6 — 5.1 — 1.13 Apparent differences may occur due to rounding.
Cut-off parameters	The basis of the cut-off grade(s) or quality parameters applied.	A marginal cut-off grade (COG) was estimated for gold using a gross long-term gold price of US$1300/oz. Input processing costs of $14.30/t plus $1.50/t stockpile reclaim using an estimated 82% metallurgical recovery. A marginal COG was estimated as: *process cost / (net gold price * process recovery)* i.e. COG = ($14.30 + $1.50) / ($39.67 * 82%) giving 0.5 g/t (to one significant figure) Using this marginal COG, the proportion of ore, and the gold grade above the COG, were defined in the mining model and the parcelled (ore + waste) blocks were exported for open pit optimisation.
Mining factors or assumptions	The method and assumptions used as reported in the Pre-Feasibility or Feasibility Study to convert the Mineral Resource to an Ore Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design). The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated design issues such as pre-strip, access, etc. The assumptions made regarding geotechnical parameters (eg pit slopes, stope sizes, etc), grade control and pre-production drilling. The major assumptions made and Mineral Resource model used for pit and stope optimisation (if appropriate). The mining dilution factors used. The mining recovery factors used. Any minimum mining widths used. The manner in which Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion. The infrastructure requirements of the selected mining methods.	The Namdini Gold Project will be mined by medium scale conventional open pit mining equipment. The mining process will include drill and blast, and conventional load and haul operations. There is a minimal amount of free-dig material with most material requiring drilling and blasting. Mining will be carried out using staged cut-backs with four identified Stages being incorporated into the LOM final pit. Oxide ore will be stockpiled temporarily and treated separately within the process plant as a batch process at the end of life of mine. Waste rock will be dumped separately with the waste rock piles on the western side of the pit. The pit slopes have been assessed from a detailed geotechnical investigation by Golder with the Oxide (upper material) requiring an estimated overall slope angle of 40°, Slope angles in the fresh rock have been determined in accordance to the lithology type, and zone within the pit in accordance with the prescribed geotechnical parameters. Grade control drilling will precede ore identification and ore mark-out on a bench basis. The mining model has assumed that sufficient account for estimated ore loss and dilution was incorporated into the Mineral Resource model through the resource estimation technique (MIK with post-processing of variance adjustment and change of support). Moderate bulk mining (minimal selectivity) will be used with 400 t excavators feeding 130 t rigid body haul trucks. The ore will be mined in a series of three flitches within a 10m bench and the waste rock will be mined in 10m benches

Criteria	JORC Code Explanation	Commentary
		where practicable. A minimum mining width of 80m was assumed. Inferred Mineral Resources have been considered as waste material. There is minimal Inferred Resource material within the final pit design. Mining infrastructure requirements will be provided by the selected mining contractor with the mining performed on an outsourced basis.
Metallurgical factors or assumptions	The metallurgical process proposed and the appropriateness of that process to the style of mineralisation. Whether the metallurgical process is well-tested process or novel in nature. The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied. Any assumptions or allowances made for deleterious elements. The existence of any bulk sample or pilot scale test work and the degree to which such samples are considered representative of the orebody as a whole. For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?	Metallurgical process recoveries have been defined on various samples for Oxide and Fresh ore. Metallurgical testwork was carried out by ALS Laboratories Perth, Australia and Maelgwyn Mineral Service Laboratory, Johannesburg, South Africa. An average estimated 90% for the oxide ore and 82% recovery for the Fresh ore was applied in the LOM plan and the pit optimisation process. Testwork is ongoing. The process plant will be a conventional crush, grind, flotation, regrind (of flotation concentrate), Carbon-In-Leach with elution circuit, electrowinning and gold smelting to recover the gold from the loaded carbon to produce doré. Maelgwyn **Aachen**™ shear reactor technology was tested at their laboratory testing facility in South Africa. These results have been incorporated into the recovery figures used in the updated reserve estimates. The regrind size has been selected as a P90 of 9um. No deleterious elements have been identified in the testwork that could affect the saleability or price of the gold doré produced. Testwork carried out to date indicates that the Namdini Gold Project can use a conventional gold recovery process plant with fine regrind circuit and existing proven process. Namdini will produce a readily saleable gold doré which will be exported for refining.
Environmental	The status of studies of potential environmental impacts of the mining and processing operation. Details of waste rock characterisation and the consideration of potential sites, status of design options considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.	NEMAS on behalf of Cardinal submitted their Environmental Impact Statement report in October 2018 to the Environmental Protection Agency for approval. The report covers all regulatory requirements for environmental impacts, mitigation plans and monitoring programmes. The approval process is nearing completion.
Infrastructure	The existence of appropriate infrastructure: availability of land for plant development, power, water, transportation (particularly for bulk commodities), labour, accommodation; or the ease with which the infrastructure can be	Lycopodium completed FS level study of the infrastructure requirements including power, water, road access, and waste management. The site will be accessed by a new ~25 km gravel road linking the site to the existing national road N10 between Pwalagu and Shia. The N10 provides good access to the major cities and ports in southern Ghana and no

Criteria	JORC Code Explanation	Commentary
	provided, or accessed.	upgrades of the N10 will be undertaken. The site access road will follow a similar route to the proposed new power line north of Pwalagu.
Costs	The derivation of, or assumptions made, regarding projected capital costs in the study. The methodology used to estimate operating costs. Allowances made for the content of deleterious elements. The derivation of assumptions made of metal or commodity price(s), for the principal minerals and co- products. The source of exchange rates used in the study. Derivation of transportation charges. The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc. The allowances made for royalties payable, both Government and private.	Costs were provided by Lycopodium to a FS level. Capital and operating costs were estimated for the proposed 9.5 Mtpa processing operation. Operating costs were compiled from quotations, database and a variety of sources and compared against existing and planned gold mining operations elsewhere in Ghana. Mining costs built up from first principles by Golder Associates using vendor quotations and current databases to derive contractor equivalent rates. These rates were to previous fully quoted submissions from the two largest in-country mining contractors and supported by similar mining operations in Africa. The estimated base mining cost used an incremental cost increase with depth to account for increased haulage costs. All costs were determined on a US dollar (US$) basis.
Revenue factors	The derivation of, or assumptions made regarding revenue factors including head grade, metal or commodity price(s) exchange rates, transportation and treatment charges, penalties, net smelter returns, etc. The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.	An allowance for 5% royalties was used in the pit optimisations and financial modelling associated with the LOM planning assessment. An additional $1.10 per ounce of doré bar has been allowed for as TC/RC costs. Gold will be the single product commodity from the Namdini Gold Project with the gold product being exported as doré.
Market assessment	The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future. A customer and competitor analysis along with the identification of likely market windows for the product. Price and volume forecasts and the basis for these forecasts. For industrial minerals the customer specification, testing and acceptance requirements prior to a supply contract.	Gold is a readily traded commodity and no specific market study has been carried out. Advice regarding the forward-looking gold price was provided by Cardinal Resources. No projected or oversupply of gold is envisaged which could affect the product market pricing. The long-term price of gold has been assumed to be US$1,300 for the financial model evaluation metrics The gold will be sold as doré.
Economic	The inputs to the economic analysis to produce the net present value (NPV) in the study, the source and confidence of these economic inputs including estimated inflation, discount rate, etc.	High-level economic analysis indicates that the project is economically viable using a discount rate of 10%. The project has been tested against the primary value drivers of gold price, processing costs, mining costs and capital expenditure.

Criteria	JORC Code Explanation	Commentary
	NPV ranges and sensitivity to variations in the significant assumptions and inputs.	
Social	The status of agreements with key stakeholders and matters leading to social licence to operate.	A feasibility level social study and relocation action plan is currently being carried out by NEMAS and Mark Addo Associates respectively, including active engagement of local and state regulatory bodies.
Other	To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserves: Any identified material naturally occurring risks. The status of material legal agreements and marketing arrangements. The status of governmental agreements and approvals critical to the viability of the project, such as mineral tenement status, and government and statutory approvals. There must be reasonable grounds to expect that all necessary Government approvals will be received within the timeframes anticipated in the Pre-Feasibility or Feasibility study. Highlight and discuss the materiality of any unresolved matter that is dependent on a third party on which extraction of the reserve is contingent.	There are no known current impediments to the progression of the project or foreseen encumbrances to the granting of a licence to operate. Continued discussions with the regulatory authorities and submission of the mine plan and closure plan to the Ghanaian authorities are continuing as part of the Feasibility study
Classification	The basis for the classification of the Ore Reserves into varying confidence categories. Whether the result appropriately reflects the Competent Person's view of the deposit. The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).	Probable and Proved Ore Reserves are declared for the Namdini Gold Project. Measured and Indicated Resources within the final pit design that have been scheduled for processing have been converted to Ore Reserves after application of the Modifying Factors.
Audits or reviews	The results of any audits or reviews of Ore Reserve estimates.	The Pre-feasibility and scoping study outputs have been the subject of internal review by the contributing parties and external review by other consultants. The feasibility study is continuing and due for completion in Q3 - 2019. No fatal flaws were identified by external consultants
Discussion of relative accuracy/ confidence	Where appropriate a statement of the relative accuracy and confidence level in the Ore Reserve estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the	Ore Reserves have been classified as Proved by conversion of Measured Resource material above the 0.5 g/t Au cut-off grade within the final pit design. While Probable Ore Reserves have been estimated by the conversion of Indicated Resource material above the 0.5 g/t Au cut-off grade within the final pit design. The Ore Reserve was estimated from the Mineral Resource after consideration of the level of confidence in

Criteria	JORC Code Explanation	Commentary
	reserve within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors which could affect the relative accuracy and confidence of the estimate. The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used. Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have a material impact on Ore Reserve viability, or for which there are remaining areas of uncertainty at the current study stage. It is recognised that this may not be possible or appropriate in all circumstances. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.	the Mineral Resource and taking account of material and relevant modifying factors including mining, processing, infrastructure, environmental, legal, social and commercial factors. The Probable Ore Reserve estimate is based on Indicated Mineral Resources. No Inferred Mineral Resource was included in the Ore Reserve. The Ore Reserve represents the economically mineable part of the Measured and Indicated Mineral Resources. The key to the accuracy of the Ore Reserve is the underpinning Mineral Resource that is considered to be of sufficient confidence to allow mine planning studies to be completed. The proposed mine plan is technically achievable. All technical proposals made for the operational phase involve the application of conventional process that is widely utilised in the gold industry. The key factors that are likely to affect the accuracy and confidence in the Ore Reserves are: • Changes in gold prices and sales agreements • Accuracy of the underlying Resource Block Models • Changes in metallurgical recovery • Mining loss and dilution