PRESS RELEASE ASX/TSX: CDV
Thursday, 18 April 2019 2019-10

ADDENDUM TO NAMDINI ORE RESERVE PRESS RELEASE

Cardinal Resources Limited (ASX/TSX: CDV) is pleased to provide further updates in the form of an addendum to the Ore Reserve press release on the Namdini Gold Project in Ghana (ASX/TSX press release dated 3 April 2019).

The Namdini Gold Project Feasibility Study is progressing and is expected to the delivered this quarter, one quarter ahead of schedule (ASX/TSX press release dated 10 April 2019).

The Company has lodged this addendum to the announcement on the 3 April 2019, attached herewith, which provides the relevant modifying factors and updates thereof on each of the criteria under ASX listing rule LR 5.9.1 supporting the 5.1 Moz Ore Reserve Estimate.

The Company herewith also provides a PFS update report to that from 18 September 2018. The Company confirms that it is not aware of any new information or data that materially affects the information included in its press release 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.

This addendum demonstrates the assumptions made since the ASX/TSX Cardinal Namdini Pre-Feasibility Study press release dated 18 September 2018 which underpin the updated Ore Reserve press release dated 3 April 2019.

The 5.1 Moz Ore Reserve figures are presented in table form below:

Ore Reserve Category	Tonnes (Mt)	Grade (g/t Au)	Contained Gold (Moz)
Proved	7.4	1.31	0.4
Probable	131.2	1.12	4.7
Proved and Probable	**138.6**	**1.13**	**5.1**

Table 1: Summary of Namdini's Proved and Probable Ore Reserve estimate at 0.5 g/t Au cut off**.**

The financial modelling of the project is current as per the PFS report dated 18 September 2018 with the Base Case selected option being 9.5 Mtpa. For further details in relation to the economic results please see press release dated 18 September 2018.

Of the three throughput options being the 4.5 Mtpa, 7.0 Mtpa and 9.5 Mtpa, the 9.5 Mtpa Business Case was selected as the preferred option to move into the Feasibility Study (FS) phase, based upon this option being the optimum NPV. This is presented in section 16.3 of the Addendum and for further details in relation to this evaluation are provided in the ASX/TSX announcement dated 18 September 2018.

The updated PFS economic evaluation, for the 9.5 Mtpa option, has not changed significantly and the change is not material and therefore the PFS economic figures are still relevant and within the accuracy (+30 % / -20 %) of the 9.5 Mtpa option of the PFS dated 18 September 2019.

UPDATED PRE-FEASIBILITY STUDY PARAMETERS – CAUTIONARY STATEMENT

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.

The updated PFS report referred to in this announcement is based upon a Proved and Probable Ore Reserve derived from Measured and Indicated Mineral Resources. No Inferred Mineral Resources have been included in the estimation of Ore Reserves. The Company advises that the Proved and Probable Ore Reserve provides 100% of the total tonnage and 100% of the total gold metal underpinning the updated Ore Reserve. No Inferred Mineral Resource material is included in the Life of Mine plan.

Unless otherwise stated, all cost estimates are in US dollars and are not subject to inflation/escalation factors and all years are calendar years. The updated PFS has been prepared to an overall capital expenditure (CAPEX) level of accuracy of approximately -30% to +20%. This announcement has been prepared in compliance with the JORC Code (2012) and the current ASX Listing Rules and in accordance with National Instrument 43-101 – Standards of Disclosure for Mineral Projects of the Canadian Securities Administrators (CIM 2014).

The Company has concluded that it has a reasonable basis for providing forward looking statements included in this announcement. The detailed reasons for this conclusion are outlined throughout this announcement and in Forward Looking and Cautionary Statements.

RESERVE UPDATE INPUTS AND MODIFYING FACTORS – SUMMARY (DETAILS ARE TABLED ON NEXT PAGE)

The Namdini Gold Project Reserve Update (ASX/TSX release dated 3 April 2019) is based upon the following key input parameters:

- A revised Mineral Resource model, compiled by MPR Geological Consultants using all the current drillhole data. This is as issued in the 3 April 2019 ASX/TSX release.
- A Proved and Probable Ore Reserve and detailed monthly mining and processing schedules, derived entirely from the Ore Reserve, produced by Golder Associates Pty Ltd ("Golder") after the application of mining parameters, ore haulage costs based on in-country contractor miner supplier inputs and owner mining cost models, processing inputs and geotechnical pit design considerations. These modifying factors are as of 3 April 2019.
- The cut-off grade parameters have been updated; however, the cut-off grade estimate remains the same as of the ASX/TSX announcement 18 September 2018 Cardinal Namdini Pre-Feasibility Study.
- Geotechnical inputs and parameters for Life Of Mine pit design from Golder (Perth), as of the ASX/TSX announcement 18 September 2018 Cardinal Namdini Pre-Feasibility Study.
- Process engineering design, capital and operating costs by Lycopodium Limited (Perth). This remains as of the PFS 18 September 2018.
- Metallurgical recovery inputs based on testwork by ALS Global (Perth) and recent testwork results from Maelgwyn Mineral Services Africa (Johannesburg, South Africa), interpreted by Independent Metallurgical Operations (IMO, Perth).
- Process infrastructure design including and not limited to, waste, residue, tailings storage and water management design by Knight Piésold Consulting (Perth). (ASX/TSX announcement 18 Sept 2018 Cardinal Namdini Pre-Feasibility Study).
- Other cost inputs e.g. supporting infrastructure, HV power, administration and accommodation by owner's team and external consultants' inputs. (ASX/TSX announcement 18 September 2018 Cardinal Namdini Pre-Feasibility Study).
- The status of the social and environmental approvals, mining tenements, other government factors and other infrastructure requirements for selected the mining method remains the same as per the ASX/TSX announcement 18 September 2018 Cardinal Namdini Pre-Feasibility Study.
- For the updated PFS the economic evaluation, for the 9.5 Mtpa option, has not changed significantly and therefore the PFS economic figures are still relevant and within the accuracy (+30 % / -20 %) of the 9.5 Mtpa option of the PFS dated 18 September 2019.

RESERVE UPDATE INPUTS AND MODIFYING FACTORS (DETAIL)

The ASX/TSX 3 April 2018 Release does not represent a material change from the ASX/TSX 18 September 2018 Release, however, the following information is supplied in accordance with ASX Listing Rule 5.91:

Comparison of Modified Assumptions

ASX/TSX 18 September 2018 Release	ASX/TSX 3 April 2018 Release
Updated Assumptions and Outcomes	
The company is not aware of any material changes to the assumptions and outcome from the ASX/TSX 18 September 2018 Release to the ASX/TSX 3 April 2018 Release. However, the company herewith summarises the updated information from the ASX/TSX 18 September 2018 Release.	
Costs were provided by Lycopodium to a PFS level. Capital and operating costs were estimated for three process plant ore feed throughputs: 4.5 Mtpa, 7.0 Mtpa and 9.5 Mtpa. Operating costs were compiled from quotations, database and a variety of sources and compared against existing and planned operations elsewhere in Ghana. Mining costs were provided by Golder based on 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 with depth to account for increased haulage costs. The depth of mining increases in line with standard mining cost principles. All costs were determined on a US dollar (US$) basis.	Costs were provided by Lycopodium to a FS level. Capital and operating costs were estimated for the proposed 9.5 Mtpa processing operation. Operating costs were compiled from quotations, database and a variety of sources and compared against existing and planned gold mining operations elsewhere in Ghana. Mining costs built up from first principles by Golder Associates using vendor quotations and current databases to derive contractor equivalent rates. These rates were to previous fully quoted submissions from the two largest in-country mining contractors and supported by similar mining operations in Africa. The estimated base mining cost used an incremental cost increase with depth to account for increased haulage costs. All costs were determined on a US dollar (US$) basis.
An allowance for 5% royalties was used in the Optimisations and financial modelling associated with the LOM planning assessment. Gold will be the single product commodity from the Namdini Gold Project with the gold product being exported as doré.	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.
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$1,250 for the financial model evaluation metrics The gold will be sold as doré bars.	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 bars.

ASX/TSX 18 September 2018 Release	ASX/TSX 3 April 2018 Release
The criteria used for classification, including classification of the mineral resources on which the ore reserves are based	
Mineral Resources were classified on the basis of estimation search passes. A progressively less stringent three pass search strategy produced the three categories of confidence. The highest confident estimate uses a search ellipse of approximately the same dimension of the dominant drill spacing and a significant number of resource composites selected from within an octant constraint. The search radii are expanded and sample criteria relaxed for the second and third categories. The current drill hole spacing does not support Measured Mineral Resources, only Indicated (search pass 1) and Inferred (combined search pass 2 and 3) is reported. The resource classification accounts for all relevant factors and reflect the competent person's views of the deposit. There is an acceptable degree of confidence for tonnes above the cut-off grade due to the pervasive gold mineralization exceeding the cut-off grade. The average grade of the deposit above the cut-off grade is sensitive to the treatment and volumes applied to high grades. The majority of the resources require additional drilling to facilitate conversion to Measured category and the current classification designation support this.	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.
Only Probable Ore Reserves are declared for the Namdini Gold Project. No Measured Resource is present in the current Mineral Resource model. Indicated Mineral Resource material was converted to Probable Ore Reserves where that material was within the final pit design and was scheduled for processing after application of the Modifying Factors.	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.
The Ore Reserves have been classified as Probable by 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 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	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 the Mineral Resource and taking account of material and relevant modifying factors including mining, processing,

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Resource was included in the Ore Reserve. The Ore Reserve represents the economically mineable part of the Indicated Mineral Resources. There is no Proved Ore Reserves since no Measured Mineral Resource has yet been defined. 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 technology that is widely utilised in the gold industry. Financial modelling completed as part of the PFS shows that the Project is economically viable under current assumptions. Material Modifying Factors (mining, processing, infrastructure, environmental, legal, social and commercial) were considered during the Ore Reserve estimation process. 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	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 technology 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
The mining method selected and other mining assumptions, including mining recovery and mining dilution factors	
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 the majority of 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. 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	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 40º, Slope angles in the fresh rock have been determined in

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angle of 40°, whilst an overall slope angle of 40° was allowed for in Fresh rock. 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 (MIK with post-processing of variance adjustment and change of support) technique. Moderate bulk mining (minimal selectivity) was assumed with 400~600 t excavators feeding 100~150 t rigid body haul trucks. A minimum mining width of 60 m 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.	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 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.
The processing method selected and other processing assumptions, including the recovery factors applied and allowances made for deleterious elements	
Metallurgical process recoveries have been defined on various samples for Oxide and Fresh ore. Metallurgical testwork was carried out by ALS Laboratories Perth, Australia. An average estimated 90% for the oxide ore and 84% 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. The regrind size was selected as a P90 of 6um. 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 standard gold	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's 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.

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recovery process plant design with no innovative technology required. Namdini will produce a readily saleable gold doré which will be exported for refining.	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 technology. Namdini will produce a readily saleable gold doré which will be exported for refining.
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 $14.49/t plus $1.50/t stockpile reclaim using an estimated 86% metallurgical recovery. A marginal COG was estimated as: process cost / (net gold price * process recovery) i.e. COG = ($14.49 + $1.50) / ($39.63 * 86%) 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.	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.
Estimation methodology	
Resource model is Multiple Indicated Kriging (MIK)	Resource model is Multiple Indicated Kriging (MIK)
Updated modifying factors, including status of environmental approvals, mining tenements and approvals, other governmental factors and infrastructure requirements for selected mining methods and for transportation to market.	
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.	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.

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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.	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.
All tenements are current and in good standing. The Mining Lease for Namdini was granted for an initial 15 years which is renewable.	All tenements are current and in good standing. The Mining Lease for Namdini was granted for an initial 15 years which is renewable.
An initial environmental study was completed by NEMAS. This study was commenced in early 2017 with the PFS report component expected in September 2018. Further detailed environmental studies are continuing.	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.
A Pre-feasibility level environmental and social study is currently being carried out by NEMAS including active engagement of local and state regulatory bodies.	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.

ABOUT CARDINAL

Cardinal Resources Limited (ASX/TSX: CDV) is a West African gold-focused 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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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.

Scientific and technical information contained in this press release has been reviewed and approved by **Mr. Daryl Evans**, Independent Metallurgical Operations Pty Ltd, 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). Mr. Evans is an independent consultant appointed by Cardinal. Mr. Evans consents 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 information in this press release that relates to Namdini Ore Reserves and mining studies is based on information compiled and reviewed by **Mr Glenn Turnbull**, a Competent Person who is a Chartered Engineer and Member of the Australasian Institute of Mining and Metallurgy and a full-time employee of Golder Associates. Mr Turnbull 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 Turnbull has no economic, financial or pecuniary interest in the company and consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.

The information in this press release that relates to Namdini Mineral Resources is based on information compiled and reviewed by **Mr Nicolas Johnson**, a Competent Person who is a Member of the Australian Institute of Geoscientists and a full-time employee of MPR Geological Consultants Pty Ltd. Mr Johnson 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 Johnson has no economic, financial or pecuniary interest in the company and consents to the inclusion in this report of the matters based on his 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.

JORC 2012

This report contains information extracted from the following reports which are available for viewing on the Company's website www.cardinalresources.com.au :

- 10 April 2019 Feasibility Study & Project Finance Update
- 03 April 2019 Cardinal's Namdini Ore Reserve Now 5.1Moz
- 26 October 2018 Technical Report on Namdini Gold Project Filed on Sedar
- 18 September 2018 Cardinal Namdini Pre-Feasibility Study 4.76Moz Ore Reserve

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

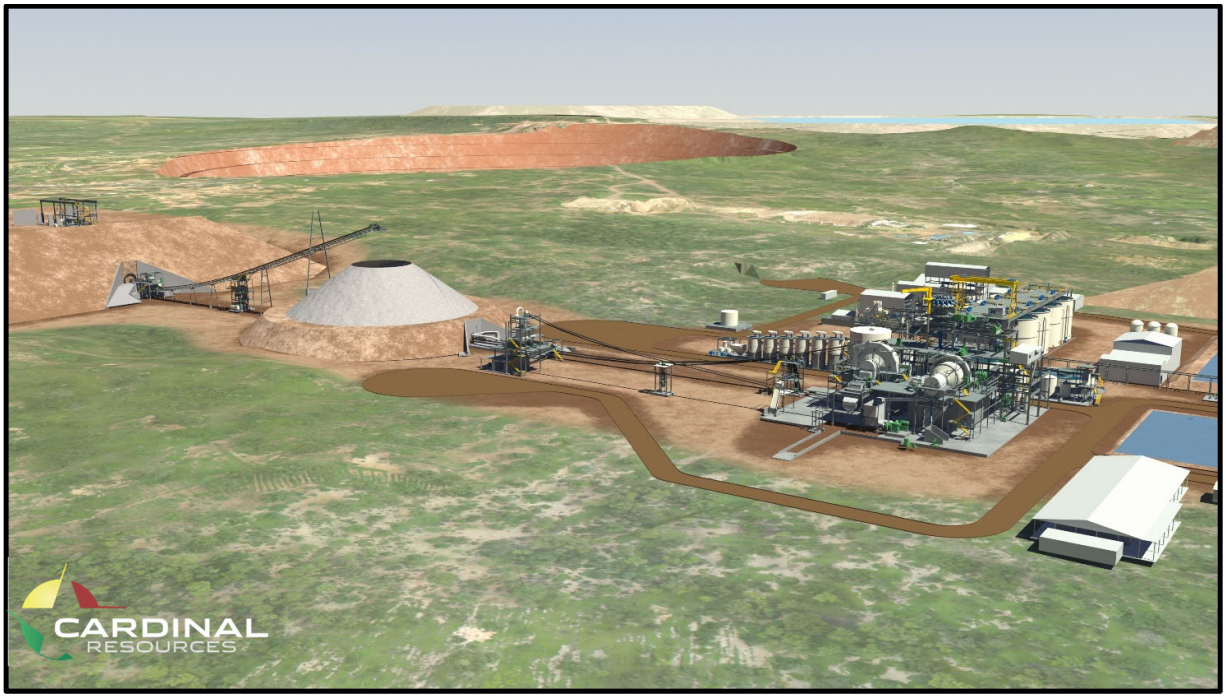
Certain statements contained in this press release, including information as to the future financial or operating performance of Cardinal and its projects may also include statements which are 'forward-looking statements' that may include, amongst other things, statements regarding targets, anticipated timing of the feasibility study (FS) on the Namdini project, estimates and assumptions in respect of mineral resources and anticipated grades and recovery rates, 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.

Namdini Gold Project

Ghana, West Africa



Prepared For: Cardinal Resources

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1. Introduction

The principal activity of the Company (and its subsidiaries) is gold exploration in Ghana. The Company holds interests in five tenements prospective for gold mineralization in Ghana in two NE-SW trending Paleo-Proterozoic granite-greenstone belts: the Bolgatanga Project and the Namdini Gold Project ("**Namdini Gold Project**" or "**Namdini**"), which are, respectively, located within the Nangodi and Bole-Bolgatanga Greenstone Belts in northeast Ghana, and the Subranum Project, which is located within the Sefwi Greenstone Belt in southwest Ghana.

The main focus of activity is the Namdini Gold Project where a Measured and Indicated Mineral Resource of **182 Mt** grading **1.1 g/t Au** for **6.5 Moz Au** and an Inferred Mineral Resource of **12 Mt** grading **1.2 g/t Au** for **0.5 Moz Au** each at a 0.5 g/t Au cut-off grade, have been established. The map below shows the location of the Namdini Gold Project and the Company's other properties in Ghana.

Figure 1 Cardinal Resource's Tenements in Ghana

2. Parameters and Material Assumptions

The PFS study estimates, were completed to an accuracy of +30 % / -20 % for the 9.5 Mtpa option and was undertaken based on only open pit mining from the existing February 2019 Mineral Resources. The proposed plant comprises a primary crushing, milling (SAG + ball), re-crush, gravity, flotation, concentrate regrind and CIL circuit.

Metallurgical testwork carried out to date indicates that gold can be satisfactorily recovered from Namdini ore using conventional flotation, regrind and Carbon In Leach (CIL) of the flotation concentrate. The testwork is considered sufficient to determine that the Namdini Mineral Resource represents a deposit with potential economic extraction. Estimation of capital costs was prepared by Lycopodium for the process plant and associated infrastructure.

Golder Associates Pty Ltd ("Golder") provided open pit mine engineering services. The work comprised collation of input parameters, open pit optimisation studies, pit designs and detailed NPV optimised mine schedules. A series of shells from the open pit optimisations was selected and used to generate engineering pit designs that included a Starter Pit and Life Of Mine (LOM) stages for the LOM production schedule.

Golder estimated the Ore Reserve in accordance with the JORC Code (2012). The JORC Table 1 is displayed in Appendix 1.

This Ore Reserve estimate is based on the revised February 2019 Mineral Resource model. Golder provided an estimate of mining, both owner miner and contract estimates, including haulage, drill and blast, rehabilitation and administration costs. Lycopodium provided processing cost estimates.

The Ore Reserve was estimated from the Mineral Resource after consideration of the level of confidence in the Mineral Resource and considering material and relevant modifying factors including mining, processing, infrastructure, environmental, legal, social and commercial factors. The Proved and Probable Ore Reserve estimate is based on Measured and 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 proposed mine plan is technically achievable. All technical proposals made for the operational phase involve the application of conventional technology that is widely utilised in the gold industry.

Modifying Factors (mining, processing, infrastructure, environmental, legal, social and commercial) were considered during the Ore Reserve estimation process. The PFS incorporates a number of factors and assumptions as outlined in the sections below.

3. Gold Price Used

Table 1 below describes the gold price assumptions used for the purposes of the updated Ore Reserves.

Selection Case	Gold Price
Mine scheduling was used to maximise value through deferring of larger strip-ratio cut-backs until later in the mine life. The maximum value pit was selected using a discounted average Net Present Value and determined to align with a Revenue Factor ("RF") shell of approximately $1,225/oz using estimated LOM input prices and costs. Pit shells were converted into engineering designs.	US$ 1,225 / oz
Trial open pit optimisations were run in Whittle 4X at a US$1,300/oz gold price (which was the appropriate gold price at the time of the optimisation runs) to define the base of potentially economic material. Four cut back pits were then selected and full mine designs applied.	US$ 1,300 / oz
The Financial Model Input gold price for all options was US$ 1,300 / oz.	US1,300 / oz

Table 1 Gold Price Table

4. Study Team

The consultants and their roles are tabulated below in Table 2:

COMPANY	ROLE
Lycopodium Limited	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 Pty Ltd	Mine planning and optimisation, pit design and mine scheduling, Geotechnical, Hydrology and Hydrogeological engineering
Orway Minerals Consultants Pty Ltd	Comminution data analysis, crushing and grinding circuit option study
ALS Laboratory (Perth)	Metallurgical testwork to support the process design criteria
Knight Piésold Consulting Pty Ltd	Tailings Storage Facility and selected infrastructure design
Independent Metallurgical Operations Pty Ltd	Metallurgical testwork management, analysis and process flowsheet development
MPR Geological Consultants Pty Ltd	Mineral Resource modelling of the Namdini Deposit
Orefind Pty Ltd	Geology and deposit structural genesis
Sebbag Group International Pty Ltd	Mine Design Review
NEMAS Consult Pty Ltd	Environmental Impact Assessment Study
Whittle Consulting Pty Ltd	Enterprise Optimisation of the Namdini Project
BDO Advisory Pty Ltd	Financial Model Integrity & Reviewer (PEA, PFS and FS)

Table 2 Study Team

5. Mining Licence / Property Title

During the quarter ended 31 December 2017, a Large-Scale Mining Licence covering the Namdini Mining Lease was assigned to Cardinal Namdini Mining Limited ("**Cardinal Namdini"**), a wholly owned subsidiary of Cardinal, by the Minister of Lands and Natural Resources under the Ghanaian Minerals and Mining Act 2006 (Act 703). The Large-Scale Mining Licence, which covers 19.54 km^2 in the Dakoto area of the Talensi District Assembly in Upper East Region of Ghana evidenced by a Mining Lease, is for an initial period of 15 years and is renewable for up to a further thirty (30) years.

Cardinal Namdini has recently completed an EIS ("Environmental Impact Statement") report for Namdini and has filed the EIS with the Environmental Protection Agency ("**EPA**"). In accordance with EPA 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) issued a public notification on the proposed Namdini Gold Mining Project.

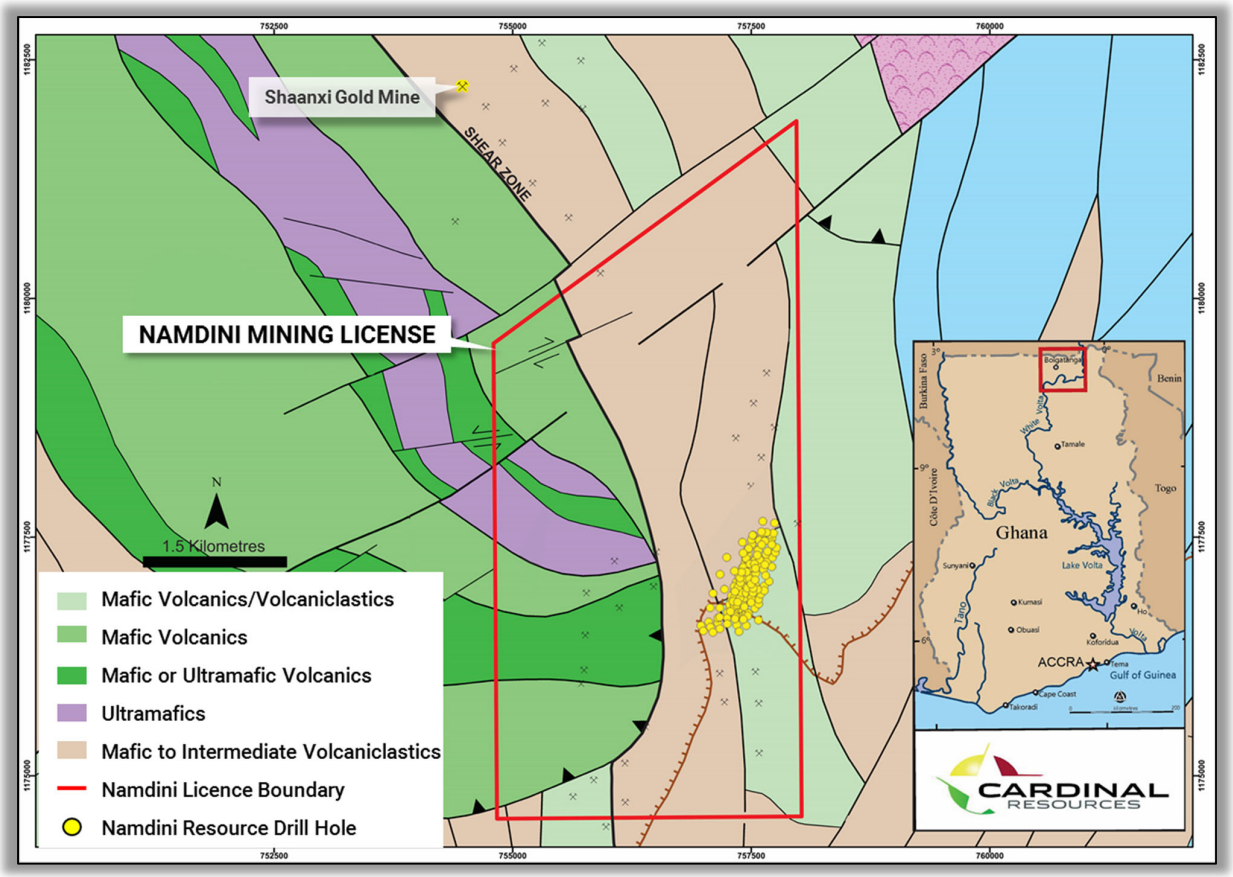

Figure 2 Namdini Project proximity map

6. Namdini Global Mineral Resources

Independent mining industry consultant, MPR Geological Consultants Pty Ltd ("**MPR**") was commissioned by Cardinal to estimate the Mineral Resources of the Namdini deposit. The Mineral Resource estimate was reported in accordance with the JORC Code (2012) as shown in Appendix 1 – JORC Table 1. The Mineral Resource estimate, summarized in the following table (Table 2), reports the Mineral Resources by category and material type (weathering) above a 0.5 g/t gold cut-off grade. The classification categories of Measured, Indicated and Inferred Mineral Resources under the JORC Code (2012) are equivalent to the CIM categories of the same name (CIM, 2014).

Mineral Resource Category	Type	Tonnes (Mt)	Gold Grade (g/t Au)	Contained Gold (Moz)
Measured	Oxide	1.1	1.23	0.04
Measured	Fresh	6.4	1.33	0.27
Measured Resource	**Total**	7.5	1.31	0.32
Indicated	Oxide	3.3	1.08	0.11
Indicated	Fresh	171	1.11	6.10
Indicated Resource	**Total**	174	1.11	6.21
Measured and Indicated	**Oxide**	4.40	1.12	0.16
Measured and Indicated	**Fresh**	177	1.12	6.38
Measured and Indicated	**Total**	182	1.12	6.53

Table 3 Namdini Measured and Indicated Mineral Resource estimate at 0.5 g/t cut off – April 2019

Mineral Resource Category	Type	Tonnes (Mt)	Gold Grade (g/t Au)	Contained Gold (Moz)
Inferred	Oxide	0.04	1.0	0.001
Inferred	Fresh	12	1.2	0.46
Inferred Resource	**Total**	**12**	**1.2**	**0.46**

Table 4 Namdini Mineral Resource Inferred estimate at 0.5 g/t Au cut off - April 2019

Table 3 and Table 4 and Notes:
Mineral Resource estimates are reported inclusive of those Mineral Resources converted to Ore Reserves. The Mineral Resources and Ore Reserves conform with and use JORC Code (2012) recommendations and Canadian Institute of Mining, Metallurgy and Petroleum Standards (CIM, 2014)

7. Geology

The Namdini gold deposit is a large, structurally controlled, orogenic gold deposit with numerous features similar to deposits found elsewhere in late Proterozoic Birimian terranes of West Africa. The Namdini gold deposit has so far been delineated over a strike length of 1,150m, up to 300 m wide and 700m deep and is situated within the Nangodi Greenstone Belt.

In 2016, geological consultants from Orefind Pty Ltd conducted an on-site structural study and developed a structural framework with controls on, and geometry of, gold mineralization comprising the Namdini deposit.
Orefind concluded that the rock types comprising the Namdini Project included a steeply west dipping Birimian sequence of interbedded, foliated, metasedimentary and metavolcanic units which have been intruded by a medium-grained granitoid and diorite. The southern part of the Project is covered by flat-lying Voltaian Basin clastic sedimentary rocks that have been deposited unconformably on the Birimian sequence and postdate mineralization and the host sequence.

Underneath the weathering profile, the Birimian units include metasedimentary, metavolcanic, granitoid (tonalite) and diorite. The metasedimentary and volcaniclastic lithologies have been intensely altered with a resulting pyrite-carbonate-muscovite-chlorite-quartz assemblage. Alteration is most prevalent in the volcaniclastic units. Similarly, the tonalite is extensively altered and has been overprinted by silica-sericite-carbonate assemblages.
In all rock types, the mineralization is accompanied by visible disseminated sulphides of pyrite and very minor arsenopyrite in both the veins and wall rocks. In diamond drill core, the mineralized zones are visually distinctive due to the presence of millimetre to centimetre wide quartz-carbonate veins that are commonly folded and possess

yellow-brown sericite-carbonate selvages. Rare visible gold occurs in strongly altered granite and is associated with sub-millimetre wide silica-sericite shears.

7.1 Drilling Techniques

The input dataset used for the Namdini Mineral Resource estimate comprises a total of 175 HQ diamond core holes and 151 RC drill holes totalling 87,140 m as of the 4th Feb 2019.

Reverse circulation drilling (nominally 5¼ inch diameter) was usually 200 m or less in depth. Most reverse circulation holes were downhole surveyed at 30 m intervals.

Diamond drilling was HQ in both weathered and fresh rock. All diamond holes were downhole surveyed at 30 m intervals. All HQ core was orientated.

The resource drilling comprised east-west trending traverses of easterly inclined holes. Hole spacing varied from around 12.5 by 25 metres in shallow portions of southern part of the deposit to around 50 by 50 metres and broader in the north and at depth.

7.2 Sampling

All reverse circulation samples were collected at the drill site over 1 m intervals and split using a multi-stage riffle splitter.

Diamond core was generally sawn in half; with half sent for assaying, and half retained in core trays for future reference. One metre samples were taken and submitted to an independent laboratory for assaying. At the laboratory, both core and reverse circulation samples followed a standard procedure of drying, crushing and grinding. The pulverised samples were thoroughly mixed on a rolling mat ("carpet roll") and then 200 g of sub-sample was collected. Internal laboratory checks required at least 90% of the pulp passing 75 microns. A 50 g charge was produced for subsequent fire assay analysis.

Very good recovery of both core and reverse circulation samples were recorded and considered to be representative of the mineralisation defined by the drilling.

7.3 Sample Analytical Methods

Cardinal used two laboratories for its sample submissions, SGS Ouagadougou Laboratory in Burkina Faso and SGS Tarkwa Laboratory in Ghana. The independent SGS commercial geochemical analytical laboratories are officially recognized by the South African National Accreditation System (SANAS) for meeting the requirements of the ISO/IEC 17025 standard for specific registered tests for the Minerals Industry.

As part of the Cardinal QAQC, a suite of internationally accredited and certified reference material (standards) and locally sourced blanks were included in the sample submission sequence. The standards cover gold grade ranges expected at Namdini. Interlaboratory umpire analyses were also conducted.

Certified reference material (blanks and standards) were submitted into the sample stream at a rate of 1 in 22 samples. Duplicate samples of reverse circulation chips were taken at a rate of 1 in 22.

No employee, officer, director, or associate of Cardinal carried out any sample preparation on samples from the Namdini Project exploration programme. Drill core was transported from the drill site by a Cardinal vehicle to the secure core yard facility at the Bolgatanga Field Exploration Office only.

All samples collected for assaying are retained in a locked, secure storage facility until they are collected and transported by the SGS laboratory personnel. Retained drill core is securely stored in the core storage facility and pulps and coarse rejects returned from the laboratories are securely stored in the exploration core logging area and at a nearby secure location in Bolgatanga, Ghana.

7.4 Survey Control

Drill hole collars were surveyed using differential GPS (DGPS), with most diamond holes and deeper RC holes down hole surveyed at intervals of generally around 30 metres using electronic multi-shot and gyroscopic

equipment.

7.5 Bulk density data

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. Bulk densities were assigned to the estimate by rock type and weathering zone. The large majority of the Namdini deposit is fresh rock. Assigned bulk densities vary from 2.00 tonnes per cubic metre (t/m^3) for strongly weathered metavolcanic to 2.82 for fresh diorite and metasediments

7.6 Geological and structural modelling

Logging, interpretation and modelling were undertaken by Cardinal Resources' technical staff using Maxwell Geoservices (Perth) "Logchief" software and specialist structural consultants Orefind Pty Ltd, (Davis and Cowan, 2016-2017) resulting in a three-dimensional model of key lithologies, structures and weathering zones.

7.7 Estimation Methodology

MPR estimated recoverable resources for Namdini using Multiple Indicator Kriging ("**MIK**") with block support adjustment, a method that has been demonstrated to provide reliable estimates of recoverable open pit resources in gold deposits of diverse geological styles. The Mineral Resource was estimated using multiple indicator kriging using GS3M software developed by FSSI Consultants (Australia).

Estimation was constrained within a mineralization envelope (wireframe) based on geological logging and grade thresholds. The three-main host lithologies are granite, metavolcanics and diorite. Where geological contacts were not clearly controlling the distribution of mineralization, a grade cut-off of approximately 0.1 g/t Au was used to construct Mineral Resource boundaries.

The domain trends north-northeast over 1.3 km and dips approximately 60^o to the west with an average horizontal width of approximately 350 m. The Mineral Resource can reasonably be expected to provide appropriately reliable estimates of potential mining outcomes at the assumed selectivity, without application of additional mining dilution or mining recovery factors. Validation of the MIK model was undertaken visually and statistically and reviewed independently.

Parent block dimensions of 12.5 mE by 25 mN by 5 mRL were used for estimation. All sample assays were composited to 2 m prior to estimation.

7.8 Variance Adjustment

The resource estimates include a variance adjustment to give estimates of recoverable resources at various gold cut off grades. The variance adjustments were applied using the direct lognormal method. The variance adjustment factors reflect comparatively large scale, open pit mining consistent with Cardinal's perception of potential mining scenarios. The variance adjustment factors were estimated from the variogram model for gold grades assuming mining selectivity of 5 metres by 10 metres by 2.5 metres (across strike, strike, vertical) with high quality grade control sampling on an 8 by 12 by 1.25 metre pattern. The variance adjustments can reasonably be expected to provide appropriately reliable estimates of potential mining outcomes at the assumed selectivity, without application of additional mining dilution or mining recovery factors.

7.9 Classification

The Namdini Mineral Resource has been classified into the Measured, Indicated and Inferred categories, in accordance with the JORC Code (2012) and the CIM Standards (CIM, 2014). A range of criteria were considered in determining this classification including geological and grade continuity, data quality and drill hole spacing.

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.

The three progressively more relaxed search criteria used for MIK estimation are presented in Table 5. The search ellipsoids were aligned with the general mineralization orientation.

Search	Radii (m) (x,y,z)	Minimum Data	Minimum Octants	Maximum Data
1	65, 65, 15	16	4	48
2	97.5, 97.5, 22.5	16	4	48
3	97.5, 97.5, 22.5	8	2	48

Table 5 Search criteria for Mineral Resource classification.

- The classification reflects the level of confidence in the geological continuity.
- Mineral Resource classification was also based on information and data provided from the Cardinal database. Descriptions of drilling techniques, survey, sampling, sample preparation, analytical techniques and database validation, indicate that data collection and management is well within industry standards. The database represents an accurate record of the drilling undertaken at the Project.
- A trial optimisation was run at a US$1,950/oz gold price to define the basis for Reasonable Prospects for Eventual Economic Extraction ("RPEEE"). All blocks outside this shell are unclassified and not reported.
- Drill hole location plots were used to ensure that local drill spacing conformed to the minimum expected for the various resource categories.

7.10 Constraining Pit Shell

To provide estimates with reasonable prospects for eventual economic extraction, Mineral Resources are reported within an optimized pit shell produced by Golder Associates. The optimization parameters reflect a large scale conventional open pit operation and a gold price of USD $1,950 / oz.

MPR considers the estimation technique and parameters appropriate for this style of mineralisation. The Ore Reserve estimation has converted 80% of the Measured and Indicated Mineral Resources to Proved and Probable Ore Reserves.

8. Mining

The mine design and Ore Reserve estimate is based on the revised Mineral Resource model. Trial open pit optimisations were run in Whittle 4X at a US$1,300/oz gold price (which was the appropriate gold price at the time of the optimisation runs) to define the base of potentially economic material. Four cut back pits were then selected and full mine designs applied.

The Ore Reserve reported is a sub-set of the Measured and Indicated Mineral Resource which can be extracted from the mine and processed with an economically acceptable outcome.

Mining of the Namdini project has been assumed to be medium-scale using conventional open pit mining equipment. The mining process will include drill and blast as well as conventional load and haul operations. There is expected to be a limited amount of free-dig material with the majority of material assumed to require drilling and blasting. Mining will be carried out using staged cut-backs with four identified stages incorporated within the LOM final pit. The mining schedule incorporates movement of ore and waste on 10m mining benches, by year for each of the four mining stages.

Oxide ore will be stockpiled temporarily and batch-fed into the process plant when suitable volumes are available. Waste rock will be stockpiled separately on the western side of the pit.

The metallurgical work carried out to date indicates that gold can be satisfactorily recovered from Namdini ore using conventional flotation, regrind and Carbon In Leach (CIL) cyanidation techniques. The work is considered sufficient to determine that the Namdini Mineral Resource represents a deposit with potential for economic extraction.

8.1 Mining Factors

The *in-situ* deposit Mineral Resource Model is the basis for the mining model used for the Life of Mine (LOM) pit planning and assessment reporting. The resource model has cell dimensions of 12.5 metres (east) by 25 metres (north) by 5 metres (elevation). The MIK variance adjustment assumes a moderately selective mining unit (SMU) of 10 metres x 5 metres x 2.5 metres, which has been applied to Namdini's large-tonnage, disseminated deposit.

Mining will consist of a conventional hydraulic shovel operation typically using 400 tonne class excavators in a face-shovel configuration and 150 tonne class rigid body dump trucks hauling on designed access roads. An auxiliary mining fleet of dozers, graders, water carts and utility vehicles will support the mining operation.

Mining is proposed on 3 to 4 metres flitches in the ore, within 10 metre benches. The base case optimisation was determined using Measured and Indicated Mineral Resources only.

A gold cut-off grade of 0.5 g/t Au was applied to the mineralised material. Process costs and mining costs were supplied by independent consultants and compared with similar gold projects. Gold grades were supplied with the model as estimated proportional grades using the MIK recoverable resource estimation technique.

For purposes of selecting the optimum Whittle pit for mine design purposes, Golder Associates estimated a mining base surface cost of USD $2.86 / t of rock mined based on experience with similar mining operations in the region, which includes grade control sampling, laboratory assay analysis and supervision costs. The input process and G&A for the baseline 9.5 Mtpa option cost were estimated at USD $14.30 / t milled plus an additional USD $1.50 / t allowance for stockpile reclaim – all tonnes were assumed to be on a dry basis.

Once the optimum selected Whittle pit was selected and mine design completed, a detailed mining movement schedule was supplied to two prospective mining contract companies to assist with the provision of a detailed mining cost estimate. Further discussions and negotiations will continue with suitable mining contractors prior to any award of the mining contract.

The most recent metallurgical testwork, was used to estimate the recoverable fraction from the Oxide, Transition and Fresh ore components, with gold grade and proportion of the block at varying MIK cut-off points coded in the block model.

Using the identified marginal Cut-off Grade, the proportion of ore per parcel and gold grade above the Cut-off Grade were included within the mining model to allow export of the parcelled (ore + waste) blocks to the pit optimiser for open pit optimisation.

A minimum mining width of 80 metres was assumed. Mining dilution and recovery are addressed in the modelling method (MIK with variance adjustment) and the utilisation of flitch mining. No Inferred Mineral Resources have been included within the LOM planning. Mining Infrastructure requirements were assumed to be provided by the selected mining contractor with the mining performed on an outsourced basis.

Grade control will be based on sampling from reverse circulation drilling spaced at approximately 10mE by 15mN with samples taken at 1.5 metre intervals downhole. All Grade Control sampling assays are assumed to be determined by fire assay at the mine site. Standard QAQC protocols will be applied which comprise 1 in every 10 samples. Minimal infrastructure is required for the selected mining method.

8.2 Geotechnical Parameters

In support of the mine design, Golder Associates carried out a study of existing geotechnical information, reviewed information on mineral resource estimates, conducted a detailed pit geotechnical drilling campaign supervised by a site visit by a senior Golder Associates engineer and gathered detailed rotary core logging data from selected drill locations within the Namdini project area.

The Life of Mine pit design considers slope performance based on models developed from laboratory results of sampled drill core. The results present feasibility level slope designs based on data collected in the field and data and reports made available by Cardinal Resources.

Based on geotechnical and hydrogeological considerations from site investigations at the project area, the design sectors were designated around Namdini Pit.

Inter-ramps (bench stacks) in slightly weathered to fresh rock should consist of four benches. These are to be separated by 25 metre ramps or geotechnical berms. This means that a 25-metre geotechnical berm should be included after every 80 metres of fresh rock benches.

8.3 Pit Optimisations

Pit optimisations were completed using the Lerchs-Grossman (LG) algorithm in Whittle 4X™ software to calculate the optimal pit at specified input parameters that were determined prior to the study. A wireframe pit shell for each gold price considered was the resultant output. One of these was selected as the base for the final LOM pit design. A pit of approximately 1 Moz was chosen as the First Stage Pit to maximise discounted cash flow and minimise capital payback time.

8.4 Mine Scheduling

Mine scheduling was used to maximise value through deferring of larger strip-ratio cut-backs until later in the mine life. The maximum value pit was selected using a discounted average Net Present Value and determined to align with a Revenue Factor ("**RF**") shell of approximately $1,225/oz using estimated LOM input prices and costs. Pit shells were converted into engineering designs prior to export of the contained resource model for scheduling purposes.

A commercial linear programming software package (Minemax™ Scheduler) was used to model the mining sequence, the processing plant and different ore feeds to maximise NPV for the nominated parameters and constraints. Major constraints included the mill throughput, mining limits and oxide feed proportion. The material selection to satisfy processing requirements was based on cut-off grade, mineable ore, processing and selling costs.

The mine scheduling programme includes revenue and cost information. The scheduling software assesses the value generated by each block to determine whether the block is fed directly to the plant, stockpiled or treated as waste. Further financial analysis to determine more realistic absolute financial indicators and sensitivity analysis are performed separately, using the tonnes and grades extracted from the schedule.

The mine design of the Namdini Project consists of a series of nested conventional pit layouts with orebody access provided by a series of ramps. The orebody can be considered a layered sequence consisting of strongly oxidised, moderately oxidised, transition, and fresh mineralised zones.

High-level mine production schedules were evaluated for the 9.5 Mtpa mill throughput using a Starter Pit with subsequent pushbacks to the final LOM pit extent.

The schedules allowed an initial ramp up for the process plant in before full process plant production was assumed. In order to gain maximum value from the 9.5 Mtpa option, an estimated total peak rock movement of some 40 Mtpa is required in year 7 of the schedule.

8.5 Mine Design Criteria

The mine design criteria were developed to allow for development and assessment of designs to provide a plant feed rate of 9.5 Mtpa.

The maximum mining movement has allowed for a strip ratio of up to 3 : 1 in order that the initial optimisations are not 'mining-limited'. The final Life of Mine strip ratio is 1.9 : 1.

The pit design considered the geotechnical requirements for berms, face angle batter and catch-berms for the lithology within the block model to establish the engineered pit design in which the Ore Reserves are contained.
The pit was designed with four stages, the initial stage being for early access to the higher-grade ore near the surface. The second stage is largely an expansion of the initial stage targeting the ore to a greater depth. The stage designs were created for optimal ore delivery from the first two stages due to their low strip ratio and waste rock movement. The third and fourth stages contain a greater proportion of waste rock. A minimum mining width of 80 metre was established between the stages.

The pit designs have targeted the maximum discounted value pit shell at a USD $1,225 / oz gold price. The pit optimisation using the Whittle 4XTM software was used to identify the optimum pit shell with the Inferred Resource material considered as waste rock. The identified pit was then considered for practical staging in order to minimise waste movement and improve the cashflow for the project. The analysis allowed the selection of four stages with the initial stage targeting a relatively higher-grade area of ore near surface. Access was allowed to the first three stages by a ramp from the northern edge of the pit as the volume of waste rock in the first three stages is considered modest. The final fourth stage has a main access ramp on the western side of the pit to provide a shorter haul to the waste rock dump given that the final stage has a higher strip ratio than the preceding three stages. Having the primary access on the western side of the pit reduces waste rock haulage costs and thus improves the overall value.

Stage design was largely focused on targeting maximum value change points within practical mining constraint limits, such as the minimum mining width for the pushbacks.

Table 6 represents the key estimated production results.

KEY ESTIMATED PRODUCTION RESULTS	UNIT	9.5 Mtpa
Life of Mine – Gold	(koz)	5,050
Average Mine Head Grade	g/t Au	1.13
Ore Reserve Mined at 0.5 g/t cut-off grade	Tonnes (Mt)	138.6
Life of Mine Strip Ratio	W:O	1.9 : 1
Mine Life	years	14

Table 6 Key Estimated Production Results

Summary of the key production assumptions for Table 6 are below:

- Trial open pit optimisations were run in Whittle 4X at a US$1,300/oz gold price (which was the appropriate gold price at the time of the optimisation runs) to define the base of potentially economic material.
- The pit designs have targeted the maximum discounted value pit shell at a USD $1,225 / oz gold price.
- Mining costs built up from first principles using recent mining fleet quotations from which a contracting cost was established and benchmarked against two of the largest in-country mining contractors.
- 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^{o}, Slope angles in the fresh rock have been determined in accordance to the lithology type, and zones within the pit in accordance with the prescribed geotechnical parameters. These have been not changed from the PFS dated 18 September 2018.
- The final strip ratio has increased from the previous PFS pit (18 September 2018) due to the design requirements of extra berms and haulage roads to achieve the targeted deign depth.

The Company notes these are a summary of the key production assumptions and for complete details please refer to Section 8 of the report.

The Company has considered the updated production schedule does not materially differ from the production schedule disclosed in the PFS dated 18 September 2018.

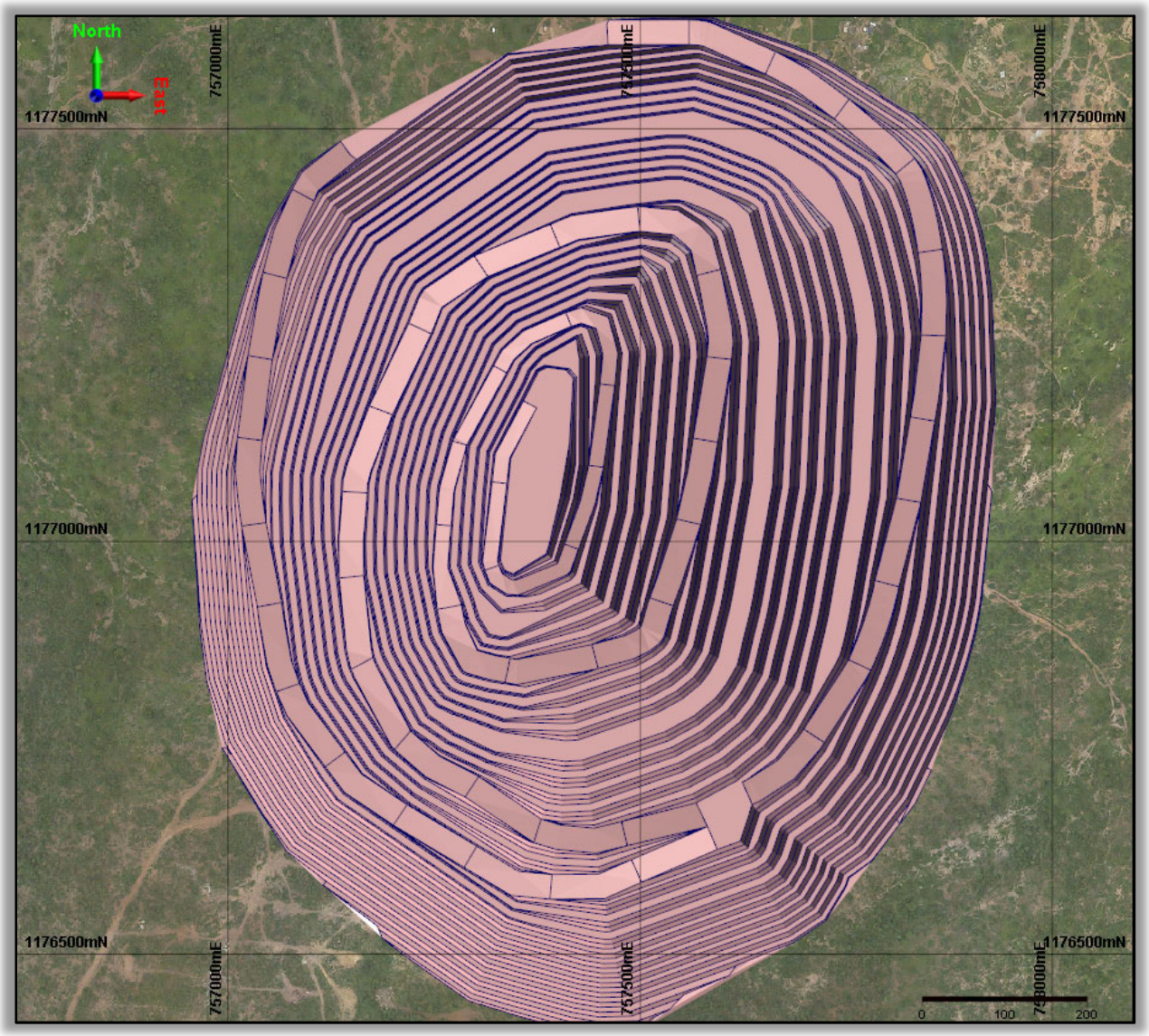

Figure 3 Plan view of the Namdini Pit Design

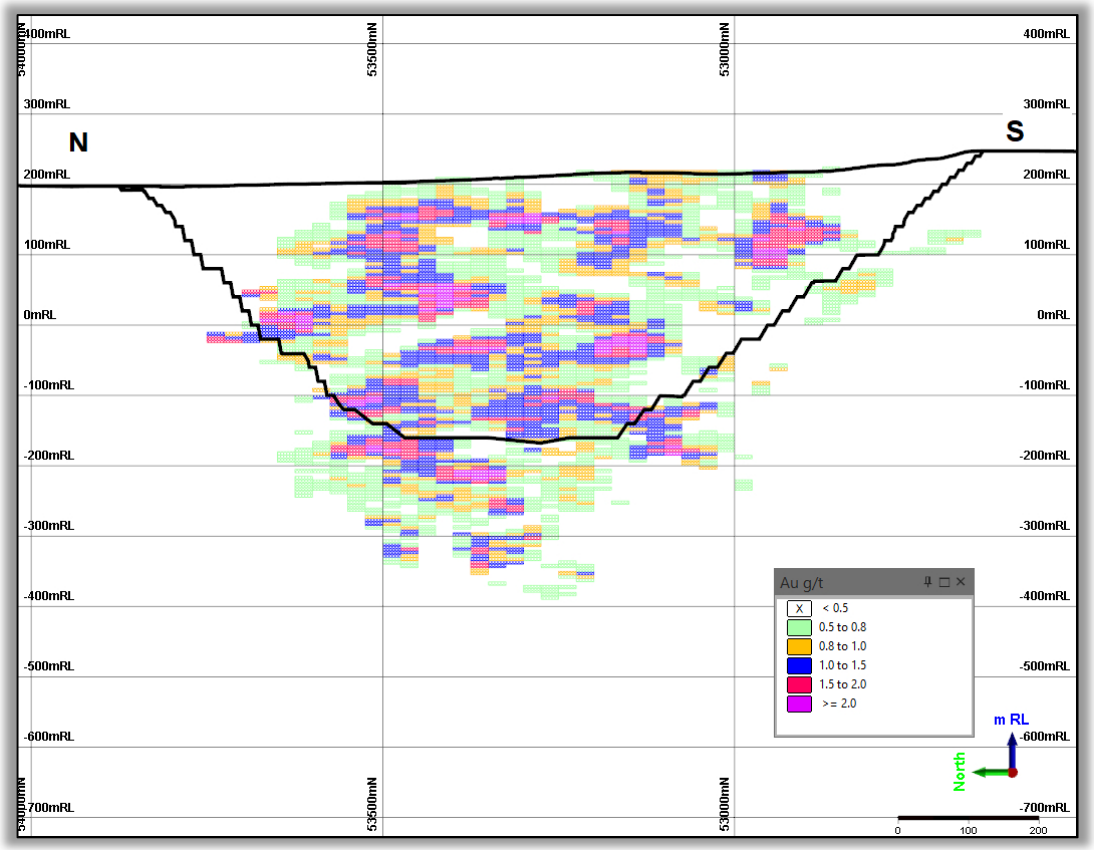

Figure 4 Typical Long Section view of the Namdini Pit Design and Block Model

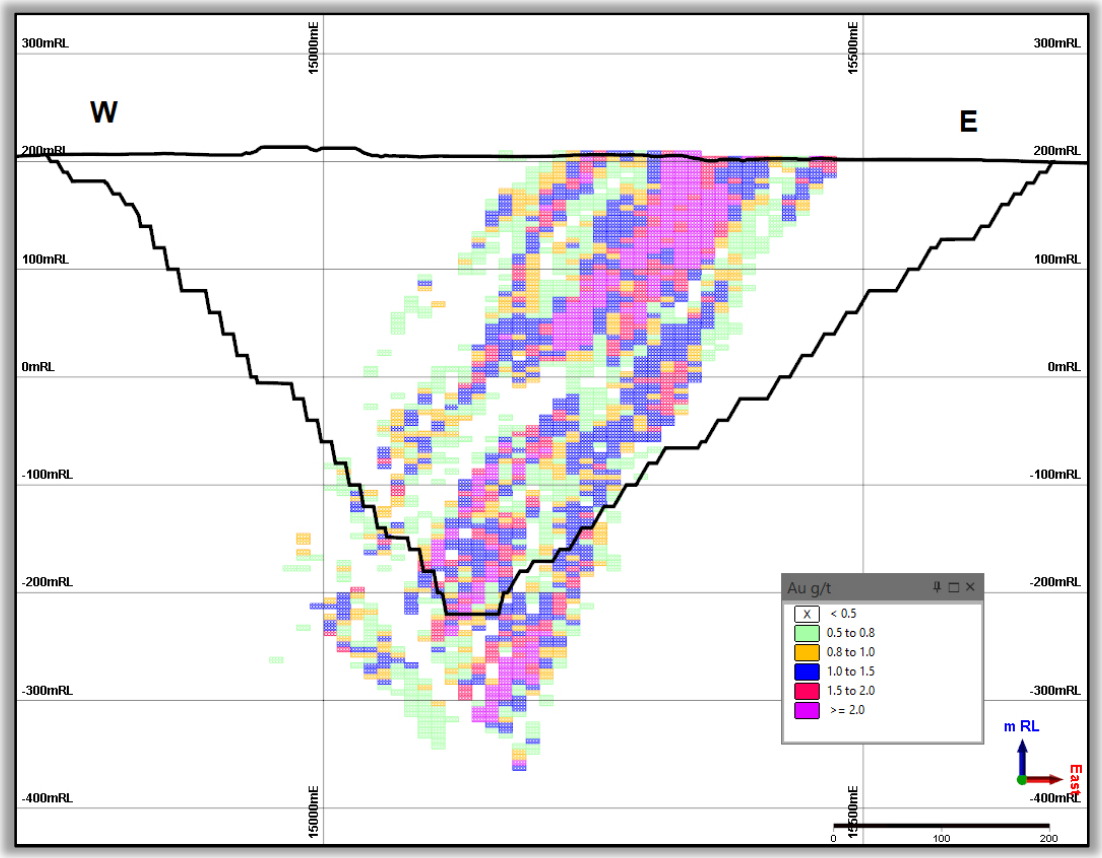

Figure 5 Typical Cross Section view of the Namdini Pit Design and Block Model

9.1 Mining Cost

The updated Reserve assumes the mining contractor will bear the total mining capital cost under an outsourced mining arrangement with the costs recovered by the mining contractor on a cost per tonne mined basis.

Mining costs built up first principles using recent mining fleet quotations from which a contracting cost was established and benchmarked against two of the largest in-country mining contractors. The estimated base mining cost has an applied incremental cost with depth, to account for increased haulage costs and the depth of mining increases in line with standard mining cost principles. All costs have been determined on a US dollar basis.

9.2 Cut-off Parameters

An estimated marginal cut-off grade was established at 0.5g/t using an assumed long-term gold price of US$1,300/ounce. The provided Mineral Resource model was validated and used to develop a mining model, as the basis for the Life Of Mine ("LOM") plan and economic assessment.

Gold royalties were assumed at 5% of gold price, with payable gold estimated at 99.8% of doré exported. The net gold price was thus $39.67/g. The input processing cost were updated in March 2019 to $14.30/t plus an additional $1.50/t allowed for stockpile reclaim giving a total of $15.80/t of mill feed (as dry tonnes). Thus, the marginal cut-off grade ("COG") was estimated as: *process cost / (net gold price * process recovery)* 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 proportions of ore, above cut-off within the blocks were exported for open pit optimisation.

The 0.5 g/t Au cut-off approximates an operational parameter that the Company believes to be applicable. This is in accordance with the guidelines of Reasonable Prospects for Eventual Economic Extraction ("RPEEE") per the Canadian Institute of Mining, Metallurgy and Petroleum "CIM Definition Standards for Mineral Resources and Mineral Reserves" (CIM, 2014) and the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code 2012).

9.3 Ore Reserve

Ore Reserves were estimated for the Namdini Gold Project as part of this PFS Reserve Update by Golder, which is summarised in Table 7. The total Probable Ore Reserve is estimated at 138.6 Mt at 1.13 g/t Au with a contained gold content of 5.1 Moz.

The Ore Reserve for the Project is reported according to the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, JORC Code 2012 and Canadian Institute of Mining, Metallurgy and Petroleum "CIM Definition Standards for Mineral Resources and Mineral Reserves" (CIM, 2014). The Mineral Resource was converted applying Modifying Factors. The Probable Ore Reserve estimate is based on the Mineral Resource classified as Indicated. Table 7 presents a summary of the Ore Reserves on a 100% Project basis at a US$1,300/oz gold price.

Ore Reserve Category	Type	Tonnes (Mt)	Gold Grade (g/t)	Contained Gold (Moz)
Proved	Oxide	1.0	1.21	0.1
Proved	Fresh	6.4	1.33	0.3
Proved Reserve	**Total**	**7.4**	**1.31**	**0.4**
Probable	Oxide	3.0	1.08	0.1
Probable	Fresh	128.2	1.13	4.6
Probable Ore Reserve	**Total**	**131.2**	**1.12**	**4.7**
Proved and Probable	**Oxide**	**4.1**	**1.11**	**0.2**
Proved and Probable	**Fresh**	**134.5**	**1.13**	**4.9**
Proved and Probable	**Total**	**138.6**	**1.13**	**5.1**

Table 7 LOM Ore Reserve Estimate

Table 7 Notes:

1. The Ore Reserve conforms with and uses JORC Code 2012 recommendations and Canadian Institute of Mining, Metallurgy and Petroleum "CIM Definition Standards for Mineral Resources and Mineral Reserves" (CIM, 2014)

2. The Ore Reserve was evaluated using a gold price of US$1,300/oz with US$1,225/oz pit optimisation chosen for ore reserve pit design to maximise cash flow.
3. The Ore Reserve was evaluated using an average cut-off grade of 0.5 g/t
4. Ore block grade and tonnage dilution was incorporated through the use of an MIK recoverable resource estimation model which was demonstrated to incorporate an expected level of equivalent ore loss and dilution for the scale of mining envisaged
5. All figures are rounded to reflect appropriate levels of confidence. Apparent differences may occur due to rounding

10. Mineral Processing and Metallurgical Testing

10.1 Introduction

The phase of metallurgical testwork continued to focus on the same flowsheet as presented in Cardinal's PFS study. (ASX/TSX 18th September 2019). The flowsheet is described as a conventional primary crush, SAG/Ball mill, re-crush, flotation, regrind and carbon-in-leach circuit.

The fresh metallurgical testwork was carried out by ALS Laboratory in Perth, Australia and at the Maelgwyn Laboratory in Johannesburg, South Africa.

10.2 Results

Key findings from the testwork were:

Comminution:

- The JK Drop Weight Test showed A*b values ranged between 30 and 42 for the PQ samples.
- The SMC Variability Test showed derived A*b values between 30 and 47 for the HQ samples.
- The BBWi test indicated a range between 14.7 and 19.7 with an average of 16.9 kwh/t.
- Bond Abrasion Index ranged between 0.03 and 0.29, with the Granite ore type having the highest values.

Mineralogy:

- Native gold is the predominant gold bearing mineral with very low silver (Ag) content (<2 ppm Ag).
- Pyrite is the dominant sulphide mineral in the composites where the majority of the gold is associated.
- P80 of the pyrite ranged from 82 µm to 93 µm.
- Pyrite is classified as 'well-liberated' from the host rock minerals with close to 85% liberation.
- Free gold particles were detected during a thorough optical search (using a binocular stereo-microscope) of the unmounted gravity concentrates. These gold grains are approximately 200 µm in diameter and rounded in appearance.
- Organic carbon ranged from 0.03% to 0.09%; leach kinetic response did not indicate preg-robbing behaviour which was verified by a Preg-Robbing Index (PRI) test which indicated a 0.03 to 0.06 PRI.

Flotation:

- High gold recoveries averaging 95% to concentrate for the majority of composites.
- Fast flotation kinetics observed with most of the gold recovered in less than 8 minutes.
- The addition of a co-collector blended with base case (PAX) collector did not show a definite benefit to gold recovery.
- Upfront gravity gold recovery improved total gold recovery and mostly eliminated variability in the flotation tails grade.
- Gravity and flotation resulted in average tail grades ranging from of 0.03 to 0.15 g/t.
- Flotation mass recovery to concentrate averaged 7% w/w; concentrate grade based on the Starter Pit composite averaged approximately 30 g/t without gravity recovery and approximately 20 g/t with prior gravity recovery.

All gravity gold, flotation, regrind and leach results were analyzed to produce two regression recovery curves, one for

the starter pit and one for the life of mine samples. These curves were then applied to the varying head grades of the mine schedule to yield an overall recovery result.

Leach:

- Maelgwyn's Aachen shear reactor technology was tested at their laboratory testing facility in South Africa with encouraging results. These results have been incorporated into the recovery figures used in the updated reserve estimates.
- Concentrate leach feed grades based on Starter Pit and separate Life of Mine lithology composites ranged between 10 g/t and 27.5 g/t, ranging between 15 and 17 g/t on average.
- Leach residues ranged from 0.14 – 0.16 g/t on a whole ore basis, assuming an average flotation concentrate mass recovery of 7% and a regrind P90 of 9um

Comminution and metallurgical testwork has provided preliminary information about the physical characteristics and metallurgical response of the three Namdini lithologies.

The processing route for the Namdini ores would be: crush, primary grind, sulphide flotation followed by regrind and CIL cyanidation of the flotation concentrate.

Oreway Mineral Consultants (OMC) has utilised the comminution results for comminution circuit selection and mill sizing. A primary crushing and SABC comminution circuit (open circuit SAG mill with recycle pebble crushing followed by closed circuit ball mill/hydro-cyclones) was selected by OMC based on the available comminution parameters.
The process design based off the metallurgical testwork is as follows:

- A primary grind size of 80% passing 106 microns was selected for the primary grind design of the PFS assessment.
- A gravity concentration circuit has been incorporated given the presence of gravity recoverable gold (GRG).
- The laboratory flotation testwork indicated fast sulphide flotation kinetics; the circuit comprises six (6) stages of rougher flotation.
- The flotation concentrate is reground and subjected to a shear reactor and pre-aeration before CIL.
- Gold recovery will be via a conventional CIL with elution circuit, electrowinning and gold smelting to recover the gold from the loaded carbon to produce doré.
- Industry typical design parameters were assumed for the PFS where testwork was not completed.
- Detailed metallurgical testwork is continuing for the Namdini project under the direction of Cardinal to support completion of the PFS.
- Gold is recovered using primary crushing, milling (SAG + ball), re-crush, gravity circuit (Knelson Concentrator), flotation, concentrate regrind circuit and a CN/CIL circuit.

10.3 Conclusions

Key aspects supporting selection of the process flowsheet include:

- The fresh metallurgical testwork yielded an overall life of mine recovery of 82%
- The recovery results were calculated by totalizing the gold recovered by gravity (less gravity losses), flotation and leach recoverable gold. (gravity recovery – less losses - plus flotation recovery multiplied by leach recovery)
- The results as reported in the PFS were used in support of this announcement. The previous oxide metallurgical testwork was performed on a whole of ore leach recovery testwork regime which yielded an average of 90% recovery
- Metallurgical testwork carried out to date indicates that the Namdini project can deliver a standard gold recovery process plant design with no innovative technology required.
- The metallurgical process includes well-tested technology for all unit operations.

- No deleterious elements were identified in the testwork that could affect the sale ability or price of the gold doré produced.
- Namdini will produce readily saleable gold doré which will be exported for refining.

11. Process Plant

Annual nominal throughput processing option of 9.5 Mtpa were investigated as part of the PFS. Note that this option is designed to meet the International Cyanide Management Code for the manufacture, transport, and use of cyanide in the production of gold (Cyanide Code).

The assessment of the comminution circuit identified that 9.5 Mtpa is the largest throughput that can be achieved with dual pinion mill drives.

11.1 Flowsheet

The process plant design incorporates the following unit process operations:

- Single stage primary crushing with a gyratory crusher to produce a crushed product size of 80% passing (P_{80}) 150 mm.
- Crushed ore feeding a coarse ore stockpile (12 hours live) with ore reclaim via two apron feeders.
- Two stage SAG / Ball milling in closed circuit with cyclones to produce a P_{80} grind size of 106 µm and includes recrushing of pebbles from the SAG mill.
- Gravity recovery circuit consisting of a gravity scalping screen, one 70-inch centrifugal concentrator and a CS4000 intensive leach reactor.
- Rougher flotation to produce a gold-rich sulphide concentrate.
- Outotec HIGMill™ technology is selected to regrind flotation concentrate
- Thickening of the flotation tails for water recovery prior to disposal in a separate non-cyanide tailings storage facility (TSF).
- High Intensity regrind of the flotation concentrate followed by thickening to carbon in leach (CIL) tankage and reduce overall reagent consumption.
- A concentrate CIL circuit incorporating one pre-leach tank and seven CIL tanks for gold and silver adsorption.
- A 3.5 tonne split AARL elution circuit, electrowinning and smelting to recover gold and silver and produce doré.
- CIL tailings treatment incorporating cyanide destruction by sulphur dioxide and oxygen.
- Concentrate CIL tailings disposal in a lined tailings storage facility.

Figure 6 indicates the selected PFS flowsheet for the Namdini project.

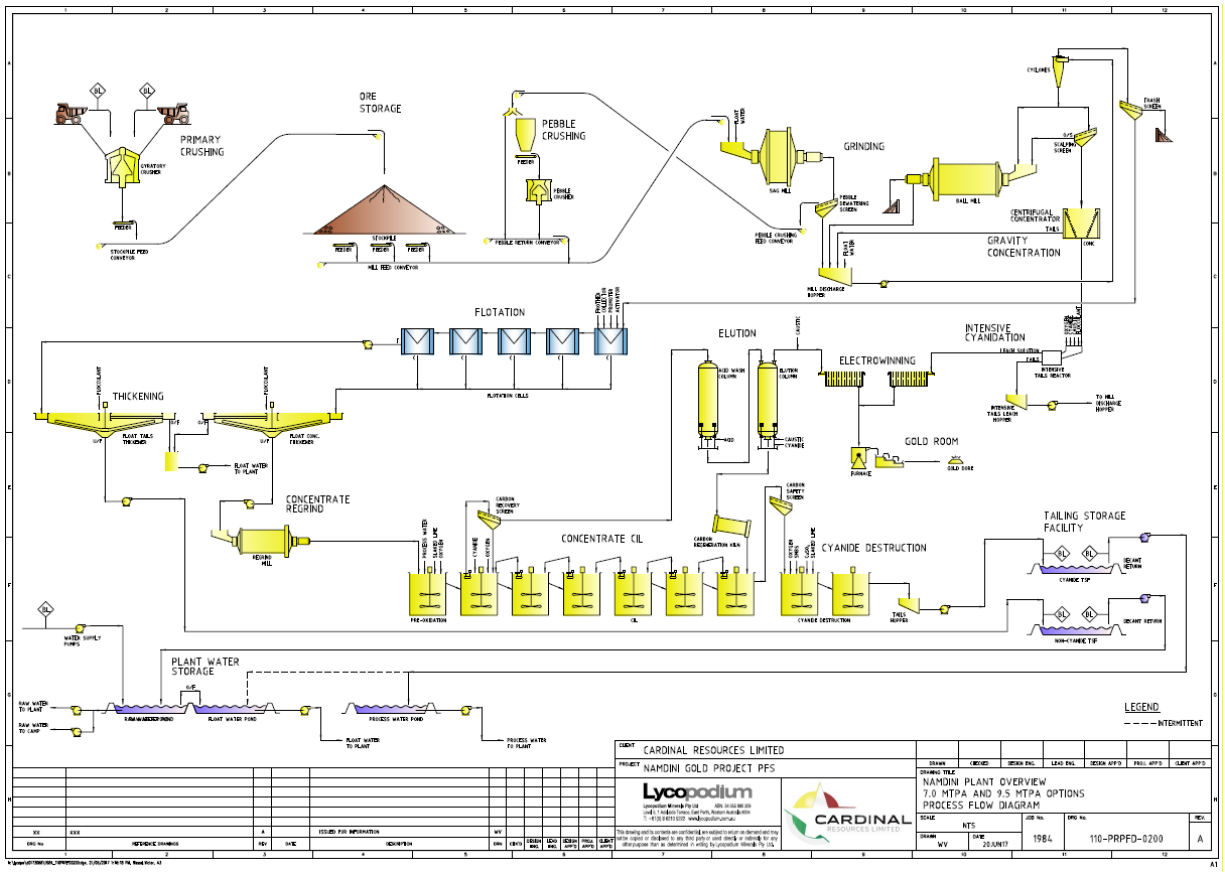

Figure 6 Overall process flow diagram Infrastructure

Lycopodium has completed PFS level analysis covering all related aspects of the infrastructure requirement including power, water, road access and waste management.

The site will be accessed by road from the west with a new, approximately 25 km, gravel road linking the site to the existing national road N10 between Pwalagu and Winkogo. The N10 provides good access to the major cities and ports in southern Ghana and no upgrades of the N10 will be required. The site access road will follow a similar route to the proposed new power line for the existing substation north of Pwalagu.

Infrastructure will include the following dedicated elements:

- Unsealed road
- HV power line
- Water supply line from the White Volta River.

The site is located approximately 20km outside Bolgatanga and 180km from Tamale. Serviced camp style accommodation will also be integrated in the proximity of the operation. A shuttle bus service will operate to and from site as required.

Cardinal Resources has sufficient area on its leases to cater for its planned land requirements.

11.2 Site Facilities and Layout

11.2.1 General

A site layout was developed based on the following information:

- Total ore tonnage – 138.6 Mt
- Process throughput – 9.5 Mtpa.
- Flotation / Concentrate split – 92.5% : 7.5%)

- Tailings to Flotation TSF – 128.2 Mt
- Tailings to CIL TSF – 10.4 Mt
- Life Of Mine pit extent
- Life Of Mine waste dump footprint
- 1 m contour topography over approximately 9 km by 6 km plan area broadly encompassing the project area, together with a preliminary site access corridor from the west and north-west
- Mining lease boundary.

The site infrastructure lay-out is indicated in Figure 7.

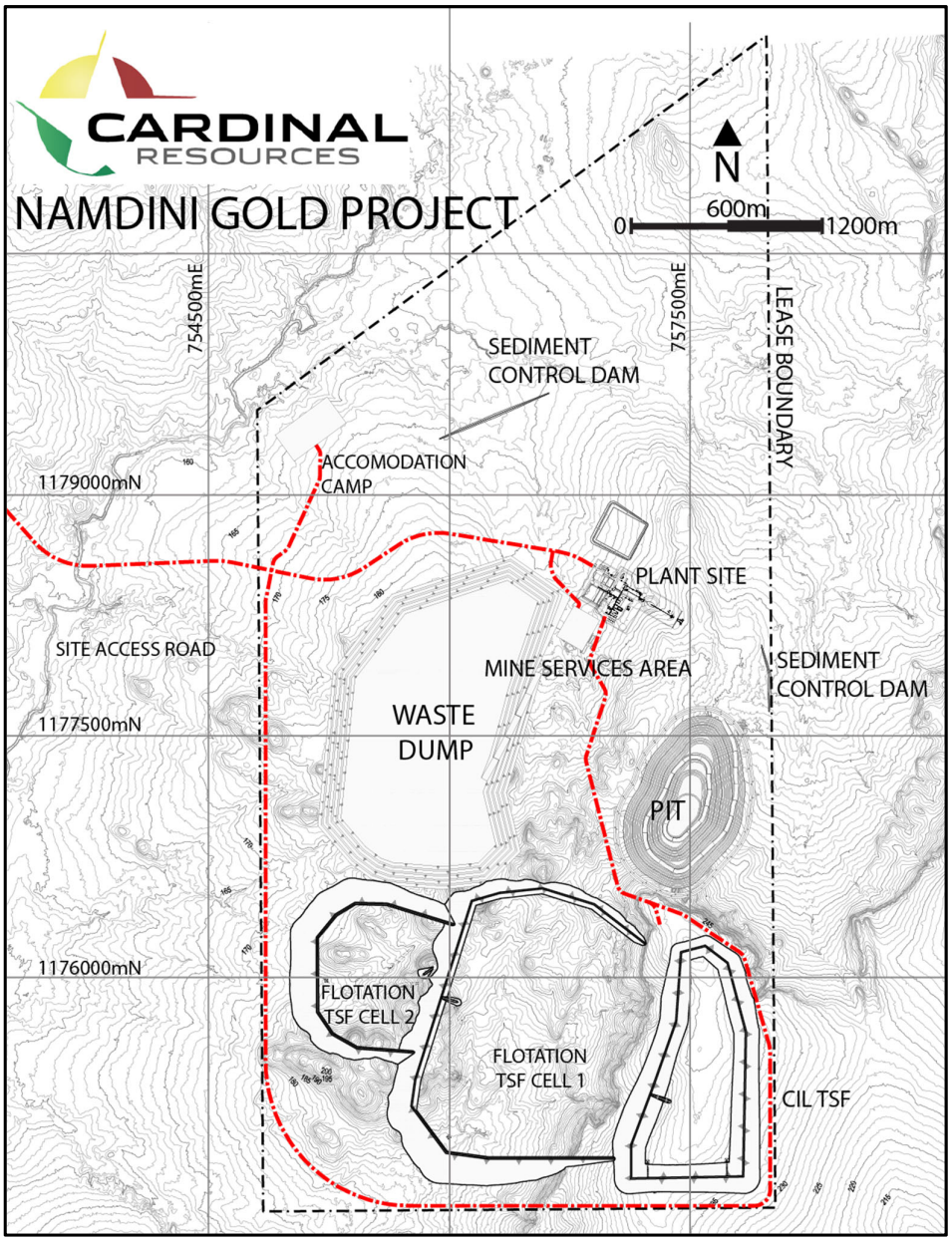

Figure 7 Site infrastructure layout

11.3 Waste Dump

Approximately 260 Mt (130 Mm^3) of waste will be generated from the life of mine open pit development. The waste dump will be located directly to the west and northwest of the open pit, and is bounded to the east by the project mining lease. The waste dump design was carried out by others.

11.4 Process Plant and Mine Services Area

The process plant (and mine services area) will be located on relatively flat terrain to the north-northwest of the open pit and directly to the northeast of the waste dump.

11.4.1 Tailings Storage Facilities

The lease boundary, pit outline and waste dump footprint were provided. In addition, the consultant was advised of a number of medium to high grade anomalies to the north and northwest of the pit which were not yet sterilised. On this basis, the available area for siting of tailings storage facilities was limited to south and southwest of the open pit. For the PFS (Pre-Feasibility Study) the design concepts for the facilities were to site the Flotation TSF to the west of the plateau using the escarpment as the eastern perimeter of the facility and to site the CIL TSF on the plateau to the south of the open pit. For the PFS the TSF, designs have been further optimised using these locations and incorporating more recent topography for the site area together with the updated design parameters.

11.5 Hydrogeology / Hydrology

A hydrogeological fieldwork programme was undertaken comprising a hydro-census of surrounding properties to identify groundwater users. Groundwater exploration drilling of five pairs of boreholes converted to deep and shallow monitoring wells was completed. Characterisation of groundwater quality by sampling and laboratory analysis, groundwater monitoring and hydraulic testing was completed. Development of a conceptual model for assessment of pit inflows, potential impacts on mine dewatering on local, plus regional groundwater and surface water systems, has been completed in support of the mine design.

A hydrology programme including the development of a stormwater plan and overall site water balance was also completed. Hydrological design criteria are being developed, largely based on International Finance Corporation requirements.

11.6 Geotechnical Investigation

A geotechnical investigation of the Flotation TSF, CIL TSF and Process Plant sites was carried out as part of the pre-feasibility study in order to investigate the sub-surface conditions and to provide geotechnical parameters for design.

A summary of the findings is as follows:

- The sub-surface profiles at each of the proposed infrastructure locations generally comprises a variable thickness of alluvial / colluvial and/or residual / saprolite soils overlying bedrock. With depth the residual / saprolite soils increasingly exhibit parent rock structure and generally caused excavation refusal. Metavolcanic, metasediments or granite bedrock was encountered below the residual / saprolite horizon at each infrastructure location and at relatively shallow depth. The rocks exhibited extremely to very low strength becoming medium to high strength with depth. Details relating to individual horizons and depths at each infrastructure location are available in a separate report.
- Groundwater was not encountered during this investigation. It is understood that the groundwater is at an average depth of 42 m within the open pit footprint.
- A detailed laboratory testing programme is in progress.
- Recommended geotechnical parameters for analysis and design purposes were estimated and are available in a separate report.
- Substantial quantities of borrow material may be sourced from the alluvial, colluvial and residual / saprolite horizons which are present across the site. However, a detailed borrow materials assessment will be required as part of the next phase of the project development in order to delineate and quantify specific sources of particular materials for the earthworks construction.

11.7 Roads

11.7.1 Site Access

A new site access road is to be constructed between the main N10 route and the project site. The access corridor is aligned approximately west-southwest to east- northeast and will originate at a junction with N10 approximately 16 km south-southeast of Bolgatanga and terminate at the process plant. The corridor will be shared with the mains power supply to the project over the whole alignment and with the raw water supply from the White Volta River over the last 9 km. The site access road will connect with a network of internal roads which link the various site facilities. The N10 provides good access to the major cities and ports in southern Ghana and no upgrades of the N10 will be undertaken. The national road N10 will be the most likely route used for transporting construction materials and operating supplies to the site from the ports in southern Ghana.

11.7.2 Site Roads

Site roads will be 'fit for purpose' and will comprise haul roads for mining use, full width gravel roads for frequent traffic by site light and heavy vehicles and basic access tracks for infrequent access by light vehicles to site infrastructure.

11.8 Power

11.8.1 Power Supply

The design is based on establishing a grid power supply to the process plant. This is achieved by constructing a new GRIDCo switchyard near the process plant to step-down the incoming 161 kV supply to 11 kV for plant power distribution. The preliminary scope includes:

- Augmentation to the existing GRIDCo's Bolgatanga substation
- Construction of a new 161 kV power line between Bolgatanga and new GRIDCo substation near the process plant
- Construction of a new 161/11 kV, 45/50 MVA, switchyard, near the process plant.

No allowance has been made for Reactive Compensators to stabilise the grid power supply during start-up of mill drives, as it was assumed that the grid supply is steady and healthy, based on the previous observations and measurements carried out by Cardinal.

11.8.2 Power Distribution

The plant power distribution voltage will be maintained at 11 kV. The 11 kV supply feeder from the GRIDCo switchyard will feed the plant main 11 kV distribution board located near the milling area switchroom for distribution of 11 kV power supply to various sections of the process plant.

For the process plant utilisation, the 11-kV supply will be stepped down to 415 V at the switchrooms using 11 kV / 415 V distribution transformers. These transformers will be fed from the main 11 kV switchroom / switchboard. These LV switchrooms will house 415 V motor control centres (MCCs). These LV MCC / switchrooms will be located at various load centres of the process plant for LV power distribution.

11.8.3 Emergency Power Supply

Emergency power for process plant essential drives / facilities during grid power supply outages will be supplied from 2 x 2.5 MVA, High Speed (HS) diesel generator units operating on diesel fuel oil. These emergency power generators are connected to the process plant main 11 kV distribution switchboard to be operated during grid power outages. The emergency power is not meant to be used for sustaining the operations of the plant. The purpose of the emergency power supply is to provide power during grid power outage to the following critical areas of the process plant:

- Plant administration building.
- Guard house.
- 30% of area lighting.

- Control room power.
- Thickener rake system.
- CIL tank agitators.
- Thickener under flow pumps (50%).
- Fire detection and alarm systems.
- Essential facilities in the mine service area.

Based on the power supply reliability study done by Cardinal, the grid supply is assumed to be very reliable and the expected number of power outages per annum could be low, hence the utilisation of the emergency power station could be relatively low. The changeover from the grid supply to the emergency power will be done manually. No automatic changeover has been allowed in the study.

11.8.4 Construction Power

The construction power demand is estimated to be about 1,500 kVA during peak construction activities. One 2,500 kVA diesel (natural gas) generator set will supply power to the different areas of the process plant and mine site during construction.

This diesel generator set will be used as part of the mine emergency power supply for the process plant and mine site upon the completion of the construction. All mining and construction contractors have based their quotes on construction site power supplied by generator sets.

11.9 Water Supply

A river abstraction system will be installed to provide any shortfall in process water requirements during the operation. An abstraction tower will be constructed on the northern bank of the White Volta River approximately 8.5 km to the west of the process plant. This will comprise submersible pumps situated within an intake tower located within a trench excavated into the northern bank of the White Volta River. A water storage facility will store 30 days' supply of process water to account for periods during which pumping from the river is not permitted. The facility will comprise a lined "turkey's nest" pond located directly to the north of the process plant.

A pipe branch from the main raw water pipeline will supply the potable water treatment plant located at the camp that will purify the water after which it will be reticulated across the site. A vendor packaged modular potable water treatment plant including filtration, ultraviolet sterilisation and chlorination will be installed at the accommodation camp with the treated water reticulated to the site buildings, ablutions, safety showers and other potable water outlets.

11.10 Sewage and Waste Management

11.10.1 General

Grey water and effluent from all water fixtures will drain to gravity sewerage systems at the camp and plant site. Where gravity flow is not practicable, suitable macerator pumps will be used. Effluent will be treated in a sewage treatment plant located adjacent to the camp. The effluent treatment demand for the plant has been estimated at 55 m^3/day with the sewage treatment plant having been sized accordingly. Treated effluent will be discharged into leach drains. Treatment plant sludge, following chlorination, will be suitable for direct landfill burial in unlined pits.

11.11 Solid Wastes

Wastes will be sorted and reused or recycled as far as the limited access to recycling facilities allows. General solid wastes will be deposited into a landfill and promptly covered to deter vermin and scavengers. Materials such as cyanide packaging will be burnt and the ashes buried, under supervision, on site beneath mine waste to prevent unauthorised use.

11.12 Hydrocarbon Wastes

Waste lubricating oils will be returned to the supplier for recycling. Hydrocarbon contaminated materials will be spread on volatilisation pads for decontamination before disposal in landfill sites.

11.13 Water Management

A water management model was developed in order to understand the TSF water balance and the TSF / plant interaction so as to determine the TSF water demand, and to generate design embankment crest levels to maintain containment throughout the operation. The model was developed in order to calculate process water shortfall and hence to quantify the volume of water required from external sources.
The main components of the water management model are:

- Tailings storage facilities consisting of one CIL cell and two flotation cells
- Rainfall run-off from TSF catchment area
- Process plant balance.

The model was setup as a monthly time-stepped model to cover the whole operational life of each facility. A detailed water balance was carried out for both average conditions and a range of extreme climatic conditions, as follows:

- Average rainfall and evaporation conditions.
- 100-year ARI 72-hour storm events with no evaporation or decant return.
- 100-year ARI wet precipitation at the middle and towards the end of TSF operating life.

Results indicate the following:

- The CIL plant only requires a small quantity of the CIL decant return, hence no external make up other than a nominal raw water requirement is needed. As a result, a large proportion of the CIL decant return needs to feed the flotation plant as recycle.
- The flotation plant requires some additional water make up. This can be sourced either from the Flotation TSF in the wet season if available (currently limited to 90% of water in slurry, however higher values are possible) or the river abstraction system.

11.14 Tailings Storage Facilities

11.14.1 Tailings Testing

Tailings were subject to physical testing. Results indicate that flotation tails will have a rapid rate of supernatant release of 46% of contained water excluding rainfall. CIL tails would be similar but at a slower rate. Ultimate settled density (air dried) was 1.47 t/m^3 for CIL tails and 1.67 t/m^3 for flotation tails.

Geochemical testing indicated the following:

- The flotation tailings samples recorded negative net acid producing potential (NAPP) values and weakly alkaline net acid generating (NAG) pH values. Therefore, the diorite and metavolcanic flotation tailings are classified as Acid Consuming (AC) and the granite rougher tailings as Non-Acid Forming (NAF).
- The CIL tailings sample recorded a positive NAPP and a low NAG pH, resulting in a classification of Potentially Acid Forming (PAF).
- On the basis of the multi-element results, both the Flotation and CIL TSF's should be designed to prevent the loss of solids. The Flotation TSF will require a basic cover system on closure. The cover system for the CIL TSF will be driven by the need to control acid generation by precluding oxygen and water ingress to limit ongoing oxidation of the tailings and seepage.
- Based on supernatant analysis, the flotation tailings facility will require a compacted soil liner to limit seepage. In addition, the facility should have an underdrainage system to limit the hydraulic head acting on the soil liner. The CIL tailings facility will require a robust engineered liner system, likely comprising of a compacted soil liner with overlying HDPE liner and underdrainage system.

11.15 Tailings Storage Facility Design

11.15.1 Flotation TSF

The Flotation TSF will be constructed as a side valley-type storage facility to the southwest of the open pit. The facility will be constructed as two cells with zoned earth fill perimeter embankments and will be lined with a low permeability compacted soil liner. The total basin area will be 311 Ha and is designed to accommodate 138.6 Mt of tailings. The TSF embankments will be constructed in stages to suit storage requirements with Stage 1 constructed initially to provide capacity for the first 12 months of operation and subsequent stages constructed using downstream, modified centreline and upstream raise construction methods.

The TSF basin area will be cleared, grubbed and stripped of topsoil. A 300 mm depth compacted soil liner will be constructed over the entire TSF basin area as either reworked insitu material (assumed 70%) or imported Zone A (30%) material.

The TSF design incorporates an underdrainage system comprising a network of branch and collector drains in each cell. The underdrainage system drains by gravity to a collection sump located at the lowest point in each cell. Supernatant water will be removed from the TSF via a submersible pump (designed by others) mounted in a decant tower. Temporary decants will be provided to suit the tailings deposition schedule in each cell. The final decants will be located along the divider embankment between the two cells.

11.15.2 CIL TSF

The CIL TSF will be constructed as a paddock-type storage facility to the south of the open pit. The facility will be constructed as a single cell with zoned earthfill perimeter embankments and will be lined with compacted soil liner overlain by a synthetic HDPE geomembrane. The total basin area will be approximately 45 Ha and is designed to accommodate 16 Mt of tailings. The TSF embankments will be constructed in stages to suit storage requirements with Stage 1 constructed initially to provide capacity for the first 12 months of operation and subsequent stages constructed using downstream raise construction methods to a final elevation of RL266.0 m (all throughput options). Staged embankment crest elevations will vary between throughput options.

The TSF basin area will be cleared, grubbed and topsoil stripped, and a 200 mm depth compacted soil liner will be constructed over the entire TSF basin area as either re- worked in-situ material (assumed 30%) or imported Zone A (70%) material. This will be overlain by a 1.5 mm thick smooth HDPE geomembrane liner.

The TSF design incorporates an underdrainage system comprising a network of branch and collector drains. The underdrainage system drains by gravity to two collection sumps located at the lowest points in the cell at the southeast and southwest corners.

Supernatant water will be removed from the TSF via a submersible pump mounted in a decant tower located along the western embankment of the facility.

In order to mitigate seepage losses through the basin area, minimise the phreatic surface in the embankments, and increase the settled density of the deposited tailings, a number of seepage control and underdrainage collection features have been integrated into the design of each facility. The seepage control and underdrainage collection systems will consist of the following components:

- Cut-off trench.
- Low permeability soil liner.
- Synthetic HDPE geomembrane.
- Basin underdrainage collection system.
- Underdrainage collection sump.
- Leak collection system.
- Upstream toe drain.

Each cell of the Flotation TSF will operate with a series of three decant towers which will be constructed, operated and subsequently decommissioned to suit the staged development of the facility and of the tailings beaches in each cell. The CIL TSF will operate with a single decant tower throughout the life of the facility.
The decant towers will be raised as required with each embankment lift and will consist of the following components:

- An access causeway constructed of local coarse gravel material.
- A slotted concrete decant tower consisting of 1.8 m square slotted precast concrete sections surrounded by clean waste rock with a minimum size of 100 mm.
- A submersible pump with float control switches mounted on a lifting hoist.
- The decant pump in each tower will be raised on a regular basis to ensure that no tailings enters the pump intake.
- The tailings storage facilities have been designed to completely contain storm events during operation up to and including an annual exceedance probability (AEP) of 1 in 1,000 (Flotation TSF Cell 2) or 1 in 10,000 (Flotation TSF Cell 1 and CIL TSF) on top of the predicted maximum pond level under average climatic conditions, without the emergency spillways operating. Consequently, exceeding the storm storage capacity of the facilities at any stage of operation is unlikely. Regardless, in the event that the storage capacity of a facility is exceeded, water which cannot be stored within the facility will discharge via an engineered spillway.

11.16 Workforce Accommodation

11.16.1 Construction Accommodation

An area adjacent to the permanent camp and the contractor laydown areas will be made available to be used by the early earthworks and accommodation camp installation contractors. All contractors will provide their own temporary accommodation and will not be accommodated in the permanent camp. The permanent camp will be used for the Owner, EPCM contractor staff and senior contractor personnel subject to availability.

11.16.2 Permanent Accommodation Camp

Where possible, employment will be offered to suitably qualified and experienced Ghanaians. All unskilled and semi-skilled positions will be filled by residents of local towns and villages. A bus service will be provided to and from local population centres for workers. It is anticipated that a significant number of skilled Ghanaians from outside the immediate area will be allocated their own accommodation in local towns such as Bolgatanga.

Expatriate and key Ghanaian employees from outside the local area will be provided with accommodation. The project is based on accommodating 200 persons in a permanent camp. The camp will include a dry mess / kitchens, laundry, gymnasium, wet mess and recreational facilities.

The cost estimate is based on a fully modular camp facility. However, it is likely that the camp will be a mix of imported, modular, prefabricated buildings and blockwork construction. Experience is that costs are similar but that modular units can be brought on site and ready to use in a shorter timeframe, and require a smaller site labour force for erection. A commitment to local content will drive the use of local blockwork construction where the building is not schedule critical.

11.17 Communication System Infrastructure

Site communications will consist of the following:

- Internal communications and IT services will be via a site wide fibre optic network.
- A local mobile phone provider will be contracted to upgrade existing facilities on site and provide a link into the local, national and international telecommunication network.
- A radio network will be established with dedicated operational, security and emergency channels.
- A local ground station will be installed to provide global satellite voice and data connection.
- Satellite TV and internet connection will be provided at the accommodation camp.

11.18 Fuel and Lubricant Supply

Diesel fuel will be stored on site. Allowance has been made for six 62.5 m^3 self-bunded fuel storage tanks. These will be mounted on concrete plinths and will include piping, pumps, meters and an electrical fuel management system. A small office will be included.

Fire water and other services will be provided to the fuel depot.

11.19 Explosive Storage and Handling

It is anticipated that a contract will be entered into with a recognised supplier of mining explosives to establish their own facilities on site and supply emulsion explosives, initiators, detonators and other blasting consumables as needed.

11.20 Security and Fencing

Site security is based on concentric lines of fencing and control. Areas of the lease where operations are actively taking place or where items of decentralised infrastructure are located will be patrolled by the security team.
The process plant, mine services area and general administration area will be enclosed within a patrolled 2 m chain link fence line to discourage casual entry. The main point of entry will be where the main access road enters the site. This point of entry will be provided with a gate and manned security post. Access from the mine haul road through the mine services area will also be monitored by a manned security post. Entry into the fenced areas will require a mine identity card and/or proof of legitimate business beyond that point.

The process plant itself will be enclosed by a double line of security fencing monitored by closed circuit cameras. The fence line will be provided with perimeter lighting. Entry will be via a single monitored security post and will be strictly controlled. Exit from the plant area will be subject to a search of vehicles, toolboxes and 'pat down' and/or metal detector search of all persons.

Access to the Gold Room within the plant will be restricted and strictly controlled. Extensive camera surveillance will be installed and entry points will be monitored and alarmed. All personnel allowed into the area will be accompanied and monitored by members of the security team. Persons leaving the area will be subject to a comprehensive search of themselves and any tools or equipment leaving the building.

The accommodation camp will be fenced and provided with a manned entry gate to prevent unauthorised access.
The tailings storage facility will be provided with a perimeter stock fence comprising three strands of barbed wire to prevent wildlife access to the facility. Active landfill areas will be fenced to prevent wildlife and vermin access.

11.21 Operational Facilities

11.21.1 Administration

- Administration Office
- Site Warehouse
- Clinic / emergency response

11.21.2 Plant Area

Workshops, warehouses and the like will be of structural steel frame and metal cladding construction on concrete slabs. Office and amenity areas associated with the main structures will generally be of transportable / prefabricated style construction although concrete blockwork construction will be considered to provide additional local content if the schedule allows.

11.22 Mine Services Area Facilities

An area will be provided for the mining contractor to establish their offices, workshops and other facilities. Power, potable water and connection to the site sewerage facilities will be provided. The area will also have an office for the Owner's geology / mining technical team who will share the contractor's facilities such as changerooms to avoid duplication.

The Mine Services Area facilities based on a quotation are summarised below:

- Vehicle workshop, tyre store and warehouse.
- Mine vehicle washdown bay.
- Mine contractor's offices.
- Explosives contractor facilities.
- Lube storage.
- Crib / Training rooms.
- Ablutions.

11.23 Airstrip

An airstrip is proposed to service the site with freight shipments both inwards and outwards, and gold shipments outwards. The airstrip will be located approximately 2.5 km to the west-southwest of the accommodation camp and directly to the south of the site access road.

12. Operating Costs

The purpose of this operating cost estimate is to provide substantiated costs which can be utilised for a preliminary assessment of the viability of the Namdini Project. The operating costs have been developed by:

- Lycopodium - Processing and General and Administration costs
- Golder - Mining costs
- Cardinal – Owners costs.

Operating costs have been determined for a mine operating 24 hours per day, 365 days per year. The operating estimate is considered to have an accuracy of ±30%, is presented in United States dollars (US$) and is based on prices obtained during the first quarter of 2019 (1Q19). Study currency exchange rates were confirmed by Cardinal Resources.

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.

Using these fully quoted submissions and Golder Associates first principles mining cost build up, a reduction in the $/t mining cost was realised, when compared to the PFS dated 18 September 2018. This mining cost differential is within the accuracy of the updated PFS and the Company has determined this is not a material change.

All costs were determined on a US dollar (US$) basis.

The 9.5 Mtpa option was the base case selected for the updated PFS.

The operating costs have been compiled from a variety of sources, including the following:

- The LOM expected mass recovery to flotation concentrate is 7.5%. This is based on recent testwork showing good gold recovery to concentrate at this mass pull.
- Flotation reagent consumption based on recent prefeasibility optimisation testwork.

- Leaching reagent consumption based on industry norms in anticipation of final testwork results.
- Calculated reagent usage regimes for cyanide detoxification prior to testwork.
- Modelling by OMC for crushing and grinding energy and consumables, based on the final comminution testwork.
- Typical industry data from equipment vendors.
- Budget pricing or Lycopodium's database of prices for consumables.
- Lycopodium's database of costs for similar sized operations.
- Additional operating costs were added by Cardinal to allow for the finer grind results
- Mining costs were solicited from two of the largest in-country mining contractors. The estimated base mining cost has an applied incremental cost with depth, to account for increased haulage costs and the depth of mining increases in line with standard mining cost principles.

Operating Costs per tonne of **ore processed (138.6 Mt of ore)** are tabulated below:

Operating Cost Processing	9.5 Mtpa (US$ / t)
Power	5.03
Reagents & Consumables	3.63
Maintenance Materials	0.44
Assay Laboratory	0.18
Operations & Maintenance Labour	0.43
Administration Labour	0.47
Total G&A	**1.58**
TOTAL	**11.29**

Table 8 Operating Costs

Owners Costs are tabulated below:

Owner's Cost	9.5 Mtpa (US$ / t)
Grade Control	0.76
Tailings Sustaining Capital	1.07
10% ROM Rehandle	0.07
Owners G & A	0.60
TOTAL	**2.5**

Table 9 Owners Cost

Sustaining costs provided by consultants and Cardinal were compiled from a variety of sources and compared against existing and planned operations elsewhere in Ghana and remain the same as PFS.

Sustaining Costs which include rehabilitation and mine closure are tabulated below:

UNIT	9.5 Mtpa
US$ (M)	**170**

Table 10 Sustaining Costs

13. Capital Costs

The capital cost presented in the PFS study was seen as representative and within the accuracy allowance at the time for this PFS update and therefore has not changed.

UNIT	9.5 Mtpa
US$ (M)	**414**

Table 11 Capital Costs

The mining establishment cost was provided by in-country mining contractors. The process plant and infrastructure costs were estimated by Lycopodium. The costs for the TSF were provided by Knight Piésold. The capital costs include owner's project cost and contingency as calculated by Lycopodium.

The capital cost estimate for the, were completed to an accuracy of +30 % / -20 % for the 9.5 Mtpa option and was undertaken based on only open pit mining from the April 2019 Mineral Resources. The proposed plant comprises a primary crushing, milling (SAG + ball), re-crush, gravity, flotation, concentrate regrind and CIL circuit.

Overall plant layout and equipment sizing was prepared with sufficient detail to permit an assessment of the engineering quantities for the majority of the facilities for earthworks, concrete, steelwork and mechanical items. The layouts enabled preliminary estimates of quantities to be taken for all areas and for interconnecting items such as pipe racks.

Unit rates for labour and materials were derived from responses to BQRs sent to fabricators and contractors experienced in the scale and type of work in the region.

Budget pricing for equipment was obtained from reputable suppliers with the exception of low value items which were costed from Lycopodium's database of recent project costs.

For the accommodation camp, offices, workshops and similar items, appropriate budget pricing was obtained from reputable suppliers of similar prefabricated designs.

Knight Piésold provided the design and quantities of the following infrastructure items that were subsequently costed by Lycopodium.

The capital cost estimate includes:

- Direct costs of the Project development
- Indirect costs associated with the design, construction and commissioning of the new facilities
- Owner's cost associated with the management of the Project from design, engineering and construction up to the handover to operations and Project close-out
- Insurance and operating spares, first fills
- Costs associated with operational readiness and pre-production operations
- Growth allowance on quantity, pricing and unit rates variance
- Contingency on project scope definition and risks.

The material quantities and unit cost estimates were developed from engineering drawings, estimates and calculations at the level required for PFS and validated against estimates from similar sized projects.

14. Environmental

NEMAS Consult 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 scoping study included preliminary field surveys, literature reviews and examination of appropriate legal and regularity frameworks.

In compliance with the above regulations, the Namdini Gold Project was registered with the Ghana EPA for environmental permitting. The EPA in response to the registration application by the Proponent in a letter dated 23 November, 2016 indicated that the project which falls under schedule 2 makes mandatory a full-scale Environmental Impact Assessment ("EIA") study and submission of Environmental Impact Statement ("EIS") to the EPA.

In compliance with directives by the EPA, a scoping report was prepared and submitted to the Agency on 22nd June, 2017, which also set out the Terms of Reference ("ToR") for the EIA and EIS (the "ESIA") study. The scoping report

highlighted the following issues among others: Project Description, Environmental and Social baseline conditions (mostly from secondary sources) and key environmental and social issues of impact and some preliminary proposed mitigation measures. The scoping report also captured the various national and internals laws, policies and guidelines that shall be triggered in course of the study. Additionally, the concerns of some key stakeholders consulted were captured in the report and other key stakeholders needed to be consulted were also identified.

On receiving the Scoping Report the EPA posted a Scoping Report Notification on page 24 of the August 18, 2017 edition of the Ghanaian Times (a government owned daily newspaper with a wide national circulation) requesting persons who have an interest, concern or special knowledge relating to the potential environmental effect of the proposed undertaking to contact or submit such concerns, etc., before the Environmental Impact Statement notification, to the Executive Director at its National Office in Accra and/or the Regional Director at its Regional office in Bolgatanga or the Managing Director of the proponent's company in Bolgatanga. The EPA also provided copies of the Scoping Report to the Talensi District Assembly in Tongo and to its Regional Office in Bolgatanga.

NEMAS have submitted Cardinal EIS to the Ghanaian EPA for approval.

15. Social

The PFS Environmental study was progressed by NEMAS, including active engagement of local and state regulatory bodies. Cardinal has an excellent relationship with neighbouring stakeholders, including engagement with the local stakeholders. Granted mining leases cover all of the proposed mining and processing assets. There are no title claims pending.

Expatriate and skilled Ghanaians from outside the local community will be accommodated in a single status camp on site. An allowance for an accommodation camp to house up to 200 people has been made in the capital cost estimate. The local workforce will be bussed from the neighbouring population centres. Compensation agreements are being negotiated for the proposed mining operation.

16. Economic Evaluation

16.1 Forward-looking Information

For the updated PFS the economic evaluation has not changed significantly and therefore the PFS economic figures are still relevant and within the accuracy of the PFS dated 18th Sept 2019.

The results of the economic analysis represent forward-looking information that is subject to a number of known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those presented within this report. Forward- looking statements in this report include, but are not limited to, statements with respect to future gold prices, the estimation of the Ore Reserves and Mineral Resources, the realisation of Ore Reserve estimates, unexpected variations in quantity of mineralized material, grade or recovery rates, geotechnical and hydrogeological factors, unexpected variations in geotechnical and hydrogeological assumptions used in mine designs including seismic events and water management during the construction, operations, closure, and post-closure periods, the timing and amount of estimated future production, costs of future production, capital expenditures, future operating costs, costs and timing of the development of new ore zones, success of exploration activities, permitting time lines and potential delays in the issuance of permits, currency exchange rate fluctuations, requirements for additional capital, failure of plant, equipment or processes to operate as anticipated, government regulation of mining operations, environmental, permitting and social risks, unrecognized environmental, permitting and social risks, closure costs and closure requirements, unanticipated reclamation expenses, title disputes or claims and limitations on insurance coverage.

16.2 Methodology Used

The Project has been evaluated using a discounted cash flow (DCF) analysis. Cash inflows consist of quarterly and annual revenue projections. Cash outflows consist of capital expenditures, operating costs, taxes and royalties. These are subtracted from the inflows to arrive at the annual cash flow projections.

To reflect the time value of money, annual net cash flow (NCF) projections are discounted back to the Project valuation date using selected discount rates. The discount rate appropriate to a specific project depends on many

factors, including the type of commodity; and the level of project risks (e.g. market risk, technical risk and political risk). The discounted, present values of the cash flows are summed to arrive at the Project's net present value (NPV). In addition to the NPV, the internal rate of return (IRR) and the payback period were also calculated. The IRR is defined as the discount rate that results in an NPV equal to zero. The payback period is calculated as the time required to achieve positive cumulative cash flow for the Project.

Cardinal's Free Cash Flow calculation is derived by the total revenue generated, minus total costs. The calculation therefore is total recovered ounces, multiplied by the gold price selected, minus the total cost per ounce. Pre-Tax cash flow is before tax is deducted, while Post-Tax is after tax deduction.

16.3 PFS Business Case Selection

Financial Summary at US$1,250 / oz Gold Price

KEY ECONOMIC RESULTS	UNIT	9.5 Mtpa	7.0 Mtpa	4.5 Mtpa
Development Capital Cost	US$ M	414	348	300
All in Sustaining Costs (AISC)[1]	US$ / oz	769	823	895
Total Project Payback	Years	1.8	2.5	2.8
Pre-Tax NPV US$ (@ 5% discount)[2]	US$ M	927	759	514
Post-Tax NPV US$ (@ 5% discount)[2]	US$ M	586	478	317
Pre-Tax IRR	%	49	42	31
Post-Tax IRR	%	38	32	24
Pre-Tax Free Cash Flow	US$ M	1,469	1,324	1,044
Post-Tax Free Cash Flow	US$ M	945	849	667

Table 12 Key Economic Result

Table 12 *Notes:*
[1] *Cash Costs + Royalties + Levies + Life of Mine Sustaining Capital Costs (World Gold Council Standard)*
[2] *Royalties calculated at flat rate of 5% & corporate tax rate of 35% used; both subject to negotiation.*

Of the three throughput options being the 4.5 Mtpa, 7.0 Mtpa and 9.5 Mtpa, the 9.5 Mtpa Business Case was selected as the preferred option to move into the Feasibility Study (FS) phase for the based upon this option being the optimum NPV. For further details in relation to this evaluation, refer to the ASX/TSX announcement 18 September 2018 Cardinal Namdini Pre-Feasibility Study.

17. Funding

Cardinal will utilise a staged funding approach for the ongoing development of the Namdini project. Cardinal has budgeted for the Feasibility Study out of their existing cash balance, which includes the senior secured credit facility of US$25M with Sprott (Release 2018-14 "Cardinal Successfully Finalises US$25M Sprott Facility"). The Board believes that there are strong reasonable grounds to assume that future funding will be available to fund Cardinal's pre-production capital for the development of Namdini as envisaged in this announcement.

- Cardinal is confident that it will continue to increase Mineral Resources at the project to extend the mine life beyond what is currently assumed in the PFS.
- The current market conditions indicate an encouraging outlook for the gold market enhances the Company's

view of the ability to finance the Namdini project.

- The strong production and economic outcomes delivered in the Namdini PFS are considered by the Cardinal Board to be sufficiently robust to provide confidence in the Company's ability to fund its pre-production capital through conventional debt and equity financing.
- Cardinal is in discussions with a number of financial advisors and substantial mining investment funds with a view to fund Namdini in stages to production. These financiers have extensive track records of funding similar stage companies through the Feasibility Study, construction financing and into commercial production.

18. References

Cardinal, 2019 Press Release 'Feasibility Study and Project Finance Updates' by Cardinal Resources Limited to ASX/TSX dated April 10, 2019.

Cardinal, 2019. Press Release 'Cardinal's Namdini Ore Reserve Now 5.1 Moz' by Cardinal Resources Limited to ASX/TSX, dated April 3, 2019.

Cardinal, 2018. Press Release 'Cardinal Upgrades Indicated Mineral Resource to 6.5 Moz', by Cardinal Resources Limited to ASX/TSX, dated March 5 2018.

CIM, 2014. Canadian Institute of Mining, Metallurgy and Petroleum Definition Standards for Mineral Resources and Mineral Reserves. Prepared by the CIM Standing Committee on Reserve Definitions. Adopted by CIM Council on May 10, 2014

JORC Code, 2012. Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (The JORC Code 2012 Edition). Prepared by the Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC), effective 20 December 2012.

MPR, 2018. Technical Report on Mineral Resource Estimation for the Namdini Gold Project, Ghana by MPR Geological Consultants Pty Ltd, 18 April, authored by Nic Johnson.

NI 43-101, 2014. Canadian National Instrument 43-101, 'Standards of Disclosure for Mineral Projects', Form 43-101F1 and Companion Policy 43-101CP, May.

18.1 Appendix 1

18.2 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.
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^{o} approximately perpendicular to mineralisation.

Criteria	JORC Code Explanation	Commentary
		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. 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	*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.

Criteria	JORC Code Explanation	Commentary
and sample preparation	*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 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.

Criteria	JORC Code Explanation	Commentary
	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.
Verification of sampling and assaying	*The verification of significant intersections by either independent or alternative company personnel.* *The use of twinned holes.* *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* *Discuss any adjustment to assay data.*	No individual drill hole results are reported in this announcement. Several small phases of independent core-sampling and assaying have been conducted. None of the drill holes in this report are twinned. 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. 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.* *Specification of the grid system used.* *Quality and adequacy of topographic control.*	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. Coordinate and azimuth are reported in UTM WGS84 Zone 30 North. 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.* *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 spacing is at 50m x 100m line spacing with infill to 50m x 50m and 10m x 15m in selected areas. 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.* *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.*	Drill hole assays were composited to 2m down-hole intervals for resource estimation. Most resource drilling was inclined at around 45^0 to 60^o to the east, providing un-biased sampling of the mineralisation.

Criteria	JORC Code Explanation	Commentary
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.
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:* • *Easting and northing of the drill hole collar* • *Elevation or RL (Reduced Level – 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*	No individual drill hole results are reported in this announcement.
	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.

Criteria	JORC Code Explanation	Commentary
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^o 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 be practiced to avoid misleading reporting of Exploration Results.*	No individual drill hole results are reported in this announcement.
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).*	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.

Criteria	JORC Code Explanation	Commentary
	Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	

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 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

Criteria	JORC Code Explanation	Commentary
		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 effect, if any, of alternative interpretations on Mineral Resource estimation.* *The use of geology in guiding and controlling Mineral Resource estimation.*	The deposit's geological setting has been confidently established from drill hole logging and surface mapping. Geological setting of the Namdini mineralisation has been confidently established and alternative interoperations are considered unnecessary. 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 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*	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

Criteria	JORC Code Explanation	Commentary
	method was chosen include a description of computer software and parameters used.	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 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. *Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).*	There is no assumption made regarding the recovery of any by-product. 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. *Description of how the geological interpretation was used to control the resource estimates.*	The modelling did not include any specific assumptions about correlation between variables. Interpretation of the mineralised domain used for resource modelling included reference to geological logging, and the domain is consistent with geological understanding. A

Criteria	JORC Code Explanation	Commentary
		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 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.*	The optimal pit shell generated for constraining resources assumes conventional milling of mineralized material, followed by flotation, regrinding and cyanide leaching of the concentrate. 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.
Environmental factors or assumptions	*Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of*	Cardinal's exploration activities are undertaken such that any potential emissions and effects associated exploration

Criteria	JORC Code Explanation	Commentary
	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.	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 ➢ 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

Criteria	JORC Code Explanation	Commentary
		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.* *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.*	Confidence in the accuracy of the estimates is reflected by their classification as Measured, Indicated and Inferred. 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.
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.

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
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.

Criteria	JORC Code Explanation	Commentary
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 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 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 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^{o}, 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 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 technology 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.*	Metallurgical process recoveries have been defined on various samples for Oxide and Fresh ore. Metallurgical testwork was carried out by ALS Laboratories Perth, Australia. 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.
	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*	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 technology.

Criteria	JORC Code Explanation	Commentary
	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?*	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 provided, or accessed.*	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 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.

Criteria	JORC Code Explanation	Commentary
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.*	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.
	A customer and competitor analysis along with the identification of likely market windows for the product.	No projected or oversupply of gold is envisaged which could affect the product market pricing.
	Price and volume forecasts and the basis for these forecasts.	The long-term price of gold has been assumed to be US$1,300 for the financial model evaluation metrics
	For industrial minerals the customer specification, testing and acceptance requirements prior to a supply contract.	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.
	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:*	There are no known current impediments to the progression of the project or foreseen encumbrances to the granting of a licence to operate.
	Any identified material naturally occurring risks.	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
	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.	
Classification	*The basis for the classification of the Ore Reserves into varying confidence categories.*	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.
	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).	

Criteria	JORC Code Explanation	Commentary
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 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.*	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 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 technology 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