Voluntary Disclosure in Gold Mine Feasibility Studies

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Abstract

We investigate voluntary disclosure by pre production gold mining companies in their publically released gold mine feasibility studies. The disclosure setting is interesting due to the high information asymmetry, low proprietary costs of information and the likely strong relationship between disclosure and firm value. We find that disclosure is driven by off-shore project status and the number of external consultants named in the feasibility release. We then examine whether disclosure quality in gold mine feasibility studies might be useful in predicting project outcomes. A model of project failure is successfully developed with project attributes such as debt financing, economic disclosure, project type and toll milling arrangements all significant in predicting project outcomes.

Keywords: Voluntary disclosure, feasibility study, gold mining.

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1. Introduction

In this paper we investigate three questions relating to voluntary disclosure by gold mining companies in their *Gold Mine Feasibility Studies*.\(^1\) We first explore factors that are associated with the amount of disclosure made by firms. Our objective is to investigate whether variation across firms in their disclosures is linked systematically to several characteristics of the environment in which they operate. The characteristics we investigate include the geographic location of their mining projects (onshore or offshore), the nature of their mining activities (underground or open pit), the extent to which there is external consultants input into the feasibility study, and the direction of gold price movements preceding the feasibility study. We then investigate whether the ultimate success or failure of reported projects is associated with either the amount of disclosure, or with disclosure which departs from that predicted based on the operating characteristics described above. Our objective is to provide evidence regarding whether the quality of mining projects (as revealed by their ultimate success) is linked to disclosure decisions made by gold mining firms. Finally, we also investigate whether the associations uncovered relating to these first two questions are reflected in share price movements around the public release of feasibility studies. Our objective is to explore whether greater disclosure levels are associated with share price increases, and whether this depends on the extent to which disclosures assist in predicting the eventual success of the projects.

Gold Mine Feasibility Studies and the gold mining industry represent an attractive setting within which to investigate disclosure-related questions for several reasons. High information asymmetry between firms and investors is a feature of the mining industry due to its complex information environment (Ferguson and Crockett

\(^1\) A description of Gold Mine Feasibility Studies is provided in section 2.
Sector information is routinely non-financial and unstructured and includes information on rock types and formations, geotechnical, geophysical and geochemical disclosure relating to a mineral prospect(s). Moreover, many gold exploration companies are small with limited access to internal sources of finance so the feasibility study represents a major milestone, with its disclosures forming the basis for subsequent externally sourced project financing. Both of these factors point to disclosures within the feasibility study playing, potentially, a major role for the disclosing companies. In addition, the setting is unlikely to be contaminated by the presence of material proprietary costs associated with disclosures because the project is reasonably mature in terms of reserve and resource recognition at the time of disclosure. This means there is likely little to be gained from pre-empting competitors by pegging surrounding tenements, since this would have occurred at the earlier discovery phase. Moreover, gold extraction is a known process, so technology differences play only a minor role, and gold producers are also price takers with no scope for product differentiation, so proprietary costs associated with these aspects of anticipated costs and revenues are likely to be insignificant. Finally, for most of the firms in our sample, gold exploration and project development represents their sole or primary activity. This reinforces the importance of the feasibility disclosures for the firms. That is, in our setting it is likely that firms’ disclosure choices will ‘matter’.²

The remainder of the paper is structured as follows. In Section 2 we briefly describe the Australian disclosure environment relevant to Gold Mine Feasibility Studies. Section 3 describes the factors relating to firms’ gold feasibility disclosures that we investigate, as well as our specific research hypotheses. Section 4 outlines our

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² The disclosure setting is also interesting since the link between firm value and disclosure is potentially much stronger in this setting than in other disclosure settings.
research design, and briefly describes the sample. Results are described in Section 5, and section 6 briefly concludes the paper.

2. Pre-production disclosure environment

The mine life cycle for a mine developer typically evolves through a number of predictable project milestones. The life cycle generally commences with tenement acquisition leading to a drilling discovery. Should the discovery exhibit promising potential, the explorer will conduct further drilling campaigns with the objective of producing a defined resource. Once a resource has been defined, the company will typically conduct a scoping study with the objective of producing some preliminary ‘ballpark economics’ in order to justify further drilling and or a more intensive pre-feasibility study. Should the pre-feasibility study be successfully completed it will lead to the commencement of an often costly and lengthy ‘full’ or ‘bankable’ or definitive feasibility study. The full feasibility study is critical for the firm since it is the platform on which either equity or debt project finance is sought.

Depending on the company, it may disclose to differing degrees information on key aspects of the project such as the mining reserves/resources, mining method, the metallurgy, engineering, infrastructure, capital cost and operating cost estimates, project economics, project scheduling and environmental considerations. However the content of the disclosure is at the discretion of the company as there are no guidelines or specific disclosure ‘rules’. The deregulated Australian setting can be contrasted with Canadian pre production mineral development firms which are required to file a full technical report at feasibility completion in compliance with National Instrument

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3 A project may also be acquired, in which case it may have certain milestones completed already.
4 Chapter 5 of the ASX listing rules ‘Additional reporting for mining and exploration entities’ says nothing on specific reporting requirements for mining development firms apart from the need to report resources and reserves in compliance with JORC requirements.
43-101, which is more prescriptive and allows firms less discretion as to what is disclosed.\textsuperscript{5,6}

In terms of formal Australian Stock Exchange (ASX) regulations, there are three primary disclosure requirements that are relevant to both mining exploration and development companies. The first is the ASX’s quarterly activities reporting requirements. This is documented in Chapter 5 of the listing rules ‘Additional reporting on mining and exploration activities’. Listing rules 5.1 and 5.2 require mining producers and exploration companies to submit a record of activities each quarter. For example listing rule 5.2, applicable to exploration entities, suggests:

‘A mining exploration entity must complete a report concerning each quarter of its financial year and give it to the ASX. It must do so no later than 1 month after the end of the quarter.’

Specifically, the report must include each of the following:

5.2.1 Details of exploration activities and a summary of the expenditure incurred on those activities.

\textsuperscript{5} Item 25 in Form 43-101F1 requires disclosure relating to a range of factors including: information and assumptions concerning the mining method, metallurgical processes and production forecast; information concerning all test and operating results relating to the recoverability of the valuable component or commodity and amenability of the mineralization to the proposed processing methods; information concerning the markets for the issuer's production and the nature and material terms of any agency relationships; a discussion of whether the terms of mining, concentrating, smelting, refining, transportation, handling, sales and hedging and forward sales contracts or arrangements, rates or charges are within industry norms; a discussion of bond posting, remediation and reclamation; a description of the nature and rates of taxes, royalties and other government levies or interests applicable to the mineral project or to production, and to revenues or income from the mineral project; capital and operating cost estimates; an economic analysis with cash flow forecasts on an annual basis using proven mineral reserves and probable mineral reserves only, and sensitivity analyses with variants in metal prices and grade; a discussion of the payback period of capital with imputed or actual interest; and a discussion of the expected mine life and exploration potential.

\textsuperscript{6} The Toronto Stock Exchange (TSX) Venture Exchange, where most of Canada’s mining development firms are listed, requires in its Listing Rules initial disclosure of project economics to include ‘key assumptions and parameters including details regarding operating costs, mine and metallurgical recoveries, discount rates applied to net present value, mine life, production rate, capital costs, environmental costs, closure and rehabilitation costs and metal price and how each was determined.
5.2.2 Details of mining production and development activities of the entity relating to mining, mining exploration and related operations and a summary of expenditure incurred on those activities.

The requirement for mining companies to submit activities information on a quarterly basis is due to the perceived higher information asymmetry in the mining industry and the ASX’s desire to keep market participants informed. In contrast, non mining industrial entities generally need only lodge activities statements on a half yearly basis.

The second key disclosure requirement is also found in Chapter 5 of the ASX listing rules. This requires the public release of geological information to be in compliance with appropriate reserve and resource recognition and disclosure requirements laid out in the JORC code:

5.6 A report prepared by a mining entity or an entity which has an interest in a mining tenement must be prepared in accordance with Appendix 5A ‘The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves’ (The JORC Code) if the report includes a statement of Exploration results or Mineral resources or ore reserves.

Significantly, none of the specific disclosure provisions applicable to the mining industry say anything about the reporting of project economics for development companies and what should be contained in feasibility completion studies. Consequently, apart from the fact that any resources or reserves disclosed therein must be JORC compliant, it is entirely at the discretion of the company as to what will be disclosed in such releases.\(^7\)

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\(^7\) The quarterly activities report is accompanied by Appendix 5B, the mining exploration entity quarterly cash flow report, which is an accompanying document informing the market how an entity’s activities have been financed for the past quarter and its effect on the entity’s cash position.
There is one further, more general disclosure requirement applicable to all listed entities that mining companies are bound by. This is the ASX’s continuous disclosure requirement (listing rule 3.1). Listing rule 3.1 states:

3.1 Once an entity is or becomes aware of information concerning it that a reasonable person would expect to have a material effect on the price or value of the entities securities, the entity must immediately tell the ASX that information.

Not surprisingly, since feasibility completion is a major milestone for single project mining companies, all firms disclose it. However, rule 3.1 suggests only that feasibility completion should be disclosed (on materiality grounds). There are no additional specific provisions or guidelines in 3.1 regarding feasibility study completions and how they might be disclosed to the market.

3. Factors associated with disclosure

Because there are few specific disclosure requirements governing gold mine feasibility studies firms have a high degree of discretion over both the extent and nature of disclosures contained therein. In light of this we begin our research by investigating whether the extent of disclosure is associated with several factors specific to the environment within which gold exploration and development firms operate. Specifically we investigate four aspects of a firm’s environment that are potentially important: geographic location of the mining project (onshore or offshore), the nature of the proposed mining activities (underground or open pit), the extent to which the firm obtains external input into the feasibility study and the direction of gold price movements preceding the feasibility study.
Geographic location – onshore versus offshore

Anecdotally it has been suggested that Australian mining companies who own foreign projects trade at a discount to companies that have their projects based in Australia. More generally, but consistent with this stated concern, some existing evidence in the U.S. suggests that foreign earnings may be undervalued in the U.S. capital markets (Thomas (2000) and Callan, Hope and Segal (2004)). If the Australian share market does undervalue offshore mining prospects (and potential future earnings) then this provides an incentive for firms with offshore projects to respond with increased disclosure in an attempt to mitigate the information asymmetry or information risk that, presumably, forms the basis of the undervaluation. Alternatively, it is possible that any undervaluation of offshore projects is a response to poor disclosure regarding those prospects. As a result it is unclear what direction the association between disclosure and geographic location might exhibit across a broad sample of companies. Nevertheless we investigate whether an association is apparent for our sample.

Nature of mining activities – underground or open pit

Mines typically come in two forms – either open pit producers or underground producers. Generally with open pit mines mine overburden is removed exposing the ore body, which then allows the mining company to remove ore grade material to the processing plant. Open pits are more desirable when the ore body is situated in relatively close proximity to the surface, which minimises the extent of costly waste

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8 For example, in a recent March 2005 broadcast from the Prospectors and Developers Association of Canada (PDAC) Conference in Toronto, internationally renowned gold analyst Paul van Eeden commented in relation to Australian mining stock valuation: “The other thing that happens in Australia is that the Australian equities market often does not reward Australian based companies for non-Australian assets”. Paul Van Eeden’s interview can be found at: http://www.resourceschannel.com/video/pdac3_analysthourpve_1showmeta.wvx.

9 Some projects have a preliminary open pit phase, followed underground development that pursues deeper ore shoots. However, it is common that subsequent underground activity is preceded by an additional or separate ‘underground’ feasibility study.
material to be removed. In contrast, underground mines involve the construction of a box-cut from which an underground decline proceeds to the ore body. Underground mining and construction contains significantly higher risks. For example, ore reserve estimation is more difficult for deeper ore bodies due to the depth with which they occur from the surface and the additional expense involved in drilling. Further, underground mines have safety issues emanating from possible rock falls as observed recently in the Beaconsfield Gold Mine. Given the higher risk and greater information asymmetry involved in complex underground mines relative to open pit mines, firms may have greater incentives to disclose information about the deposit. We investigate whether this association is evident in our sample.

*External input into the feasibility study*

Feasibility studies have various degrees of external input ranging from those who are managed externally by a range of external consultants to those completed in-house – where the developmental firm manages elements of the feasibility such as resource assessment, metallurgical studies, process design, environmental management plans and capital cost estimates and implementation schedules. The identification of specific external consultants in the feasibility release potentially provides a signal of independence to the market in much the same manner as auditors have been noted to play a role in improving financial statement disclosure (Healy and Palepu 2001). We

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10 The relative amount of waste material to be removed in open pit mines is often disclosed in the form of the ‘strip’ or ‘waste to ore ratio’.
11 A useful anecdotal example of resource definition problems occurring for underground deposits is the reserve downgrade which occurred in 2006 at the Bendigo Gold Mines underground deposit (source Bendigo Mining ASX release 08/01/2006). A further recent example is provided by Lihir Gold in its ASX release on 30/04/2009. Lihir is a gold producer who made a takeover of Ballarat Goldfields only to find that following the decline development and access of ore stopes was possible Ballarat’s underground resource estimation was greatly overstated.
12 Refer to Allstate Exploration (ALX) announcement to the ASX on 26/04/2006 regarding a significant seismic event occurring at the Beaconsfield Gold mine “which resulted in rock falls in the mine”.

investigate whether this is reflected in the association between the extent of disclosure in mine feasibility studies and the number of external feasibility consultants named in the feasibility release.

*Direction of prior gold price movements*

Firms may have differing incentives to disclose depending on whether the commodities price environment is more or less favourable. For example, in hot commodities markets, CEO’s might have incentives to disclose more good news to take advantage of positive market sentiment. An argument in support of this assertion is that mine financing, be it through seasoned equity offers or debt financing, is likely to be more achievable when the stock price is high in a rising gold price environment. As a result, firms may be motivated to provide extended disclosures to support the increased market sentiment. Alternatively, in a rising gold price environment, gold mine share prices will be higher and firms may have less incentive, or need, to disclose information regarding a project’s prospects. As a result, we investigate for our sample whether there is an association between disclosure and the sign of prior gold price changes and whether it is positive or negative.

3.0 Sampling

Eighty nine firms having single project gold mine developments over the period from January 1990 to December 2007 are selected for the project. 5 companies with greater than 10% gold product sales to market capitalization are deleted from the sample. The remaining 84 firms represent the full sample of known feasibility disclosures made by pre-production gold project development firms over this period. Sample constituents are identified through searches conducted on Factiva and Aspect FinAnalysis.
A small number of companies jointly developing a project are included in the sample. For example, the current sample includes both the Beaconsfield Gold Mine venturers (Beaconsfield Gold and Allstate Exploration). Sensitivity analysis is conducted on companies having joint venture interests and in sample and out of sample joint venture parties.\(^\text{13}\)

An example of a standalone feasibility announcement made by Austindo Resources Corporation N.L. is provided in Appendix 3. There are several features of the announcement and disclosure worth noting. First, the project is foreign in a sense that it is located outside of Australia (Indonesia in this case). Second, it is a joint venture, where PT Antam Tbk holds a 16.24% interest. Third, it is an underground project. There are also minor expected by-product credits (silver). Last, the disclosure in the report is denominated in $US. This is common for projects located outside Australia (FOREIGN). In terms of further analysis conducted in section 4.3, economic disclosure for $US denominated disclosures are translated to $AUD at daily rates prevailing on the feasibility announcement date.\(^\text{14}\) We utilize the Austindo example in Appendix 3 whilst discussing the disclosure scoring system in Section 3.1.

### 3.1 Model specification

Based on prior literature and discussion, the voluntary disclosure model is specified as follows

\(^{13}\) Companies who are joint venturers in a deposit normally each report similar feasibility disclosures to the ASX.

\(^{14}\) Currency rates sourced from Reserve Bank of Australia (RBA).
\[ D = \alpha_0 + \alpha_1 \text{SIZE} + \alpha_2 \text{FINANCE} + \alpha_3 \text{FOREIGN} + \alpha_4 \text{OPENPIT} + \alpha_5 \text{AUDITOR} + \text{\alpha_6 SHAREHOLDING} + \alpha_7 \text{JORCCHANGE} + \alpha_8 \text{GOLDPRICE} + \text{\alpha_9 CONSULTANT} + \alpha_{10} \text{FAILEDPROJECT} + \varepsilon \] (1)

In this study voluntary disclosure comprises three elements; resources and reserves disclosure, financial disclosure and mine operating parameters disclosure. The first of these is RESERVE_DISC and includes any distinct and separate mine reserves and resources disclosure under the JORC classification system.\(^{15}\) The JORC classification system prescribes both ‘proved’ and ‘probable’ reserves and either ‘measured’, ‘indicated’ or ‘inferred’ resources. Firms may also simply disclose reserve or resource totals (as opposed to separate detailed breakdowns). Reserve or resource ‘totals’ are also recognised in the scoring system, where each separate disclosure attracts a point.

From the example in Appendix 3, from a maximum possible 7 points for resources and reserves, Austindo would score 4 since it provides separate quantum disclosures on both proved and probable reserves and a figure for inferred resources and a separate figure for total reserves.\(^{16}\)

In the same way, for ‘financial disclosure’ or FINANCE_DISC, each type of conventional financial comparator such as NPV, project discount rate, IRR and payback period that is disclosed by any company is collected. In addition, key project metrics such as production cash costs, gold price assumptions used in the feasibility study and capital expenditure amounts are also collected.\(^{17}\) The last element of

\(^{15}\) See appendix 4 for JORC code classification definitions.

\(^{16}\) A small number of firms disclose an inferred resource as part of ‘reserves’ due to the design of pit shells which often includes smaller amounts of inferred resources that fall outside of reserve models but fall within pit designs.

\(^{17}\) Cash production costs are disclosed by 61 firms or 72.6% of the sample. In 57 cases, the cash costs are provided directly. In 4 cases, the cash costs are calculated from tonnage production costs. For example for one firm the throughput rate of 540,000 tonnes per annum is multiplied by the .92 recovery rate and multiplied by the 3.76 grams per tonne fully diluted head grade = 1867968 production grams
FINANCE_DISC is disclosure of Cash Flow or EBIT figures on either an annual or a life of mine (LOM) basis. Financial disclosure thus has a maximum possible 8 points. Austindo would score 2 for FINANCE_DISC since it discloses cash cost ($US200) and capital expenditure ($US34 million).

For the last form of disclosure; mine operating parameters or OPERATING_DISC specific information is gathered on mine life, throughput rates, recovery rates, annual gold production and life of mine production expectations (A maximum possible score for OPERATING_DISC of 5). In this case, Austindo scores 4 since it discloses mine life (6 years), throughput rate (220,000 tpa) and an annual production estimate (70,000oz). Since Austindo discloses both mine life and expected annual production, we also attribute it with a life of mine production expectation, which is simply the product of the two.

The dependent variable in this study is measured two ways. First, total reserve, mine operating parameter and project economics disclosures are added together. This measure – TOTAL_DISC is akin to ‘total disclosure’. Austindo scores 10 under this measure (4 + 2 + 4).

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18 We also collect data on ‘head grade’ (15 separately disclosed), ‘mill-throughput grade’ (9 separately disclosed) or ‘diluted reserve grade’ (12 separately disclosed). Whilst the terminology differs, this is a key operating feature of mines – the grade of the material forming the mill feed. We do not attribute a separate variable to this for operating disclosure scoring purposes due to the fact that this attribute will be in large part picked up in resource and reserve quantum disclosure. Similarly, whilst 38 firms disclose a resource or reserve cut-off grade, this is directly reflected in ounces disclosed, so no additional score is credited to these cut-off grade disclosers. Last, 21 firms disclose a strip or waste-to-ore ratio (mine operating parameter). Since strip ratios are a feature of open-pit mines, these are excluded from the count so as to not bias scoring against underground projects.

19 Similarly if a firm discloses a mine life and a life of mine production expectation, we infer an annual production figure by dividing expected production by mine life. This is often the case where mine life is stated in months – i.e., shorter duration projects.
TOTAL_DISC = RESERVE_DISC + FINANCE_DISC + OPERATING_DISC \hspace{1cm}(2)

A second measure – ECON_DISC omits the RESERVE_DISC or resources and reserves scores, since it is likely that some form of resource or reserve disclosure had taken place previously by the company at the resource definition milestone(s) in compliance with Appendix 5A and listing rule 3.1 requirements. The second measure is akin to ‘economic disclosure’ since its focus is primarily on mine operating parameters and financials. Thus, the ECON_DISC represents a tighter measure of new information disclosed in the feasibility, but also potentially more value relevant information since it focuses on plant operating specifications and financial outcomes. Austindo scores 6 under this measure \((2 + 4)\).

ECON_DISC = FINANCE_DISC + OPERATING_DISC \hspace{1cm}(3)

Following evidence that voluntary disclosure is increasing in firm size (Ruland, Tung and George (1990), SIZE is measured as the log of the firm’s inflation adjusted market capitalization in the month immediately preceding the release of the feasibility information. Market capitalization data is obtained for all firms from the month immediately preceding each feasibility announcement date from the Australian Graduate School of Management’s Share Price-Price Relative database (SPPR). All respective market capitalisation size measures are inflation adjusted to 2007 dollars.\(^{20}\)

There is evidence that disclosure levels are increasing in leverage of a firm, since lenders require more information to assess the likelihood of a firm meeting debt

\(^{20}\) Inflation data is obtained from the RBA web site; http://www.rba.gov.au/
obligations (Jensen and Meckling, 1976). Craswell and Taylor (1992) argue that oil and gas company reserve disclosure increases with leverage, since information about reserves is important in the estimation of future cash flows. Gearing is largely non-existent for single-project development firms up until the time that the mine is financed. 21

Also noteworthy is that nearly all debt finance arrangements undertaken by mining (apart from convertible note issues) companies in Australia are through private debt as opposed to public debt. There are two implications of this financing environment. First, bank financing in a highly asymmetric information environment conveys a very strong reputation signal. Second and paradoxically, many debt financiers often require evidence of the ability to raise equity finance as pre-condition in providing debt drawdown. As such, the firm’s incentives to boost share prices through disclosure of good news to the capital market remains, even though additional private information may be signalled to a private financier. Thus, more disclosure might be expected for firms with projects that have a debt finance component. FINANCE is a dichotomous variable, which takes the value of 1 if the firm has obtained bank finance as part of the subsequent mine financing and 0 otherwise.

Craswell and Taylor (1992) document two additional controls in their model. The first is the separation of ownership and control. Owner manager conflicts arise as a result of the separation of the ownership and management of the firm. The rational manager has self interested incentives and information asymmetry acts to magnify such agency

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21 Craswell and Taylor (1992) also include cash flow risk as a predictor of disclosure levels and suggest that higher variance cash flows are increasing in disclosure levels. The co-efficient, whilst significant at the $p<.10$ level, is negative (contrary to expectations). Cash flow risk is omitted from this study since single project gold developers are yet to generate any form of material product sales and hence cash flow.
conflicts. Thus shareholders adopt monitoring mechanisms and management undertake bonding to mitigate asymmetries and potential conflicts of interest (Fama and Jensen, 1983).

One mechanism for reducing information asymmetry is to increase disclosure. Actions by managers to increase disclosure would reduce any remuneration discount management might obtain in the presence of high agency costs and/or information asymmetry. This separation of ownership and control can be measured in a number of ways. Craswell and Taylor argue that the extent to which the ownership of the firm is diffuse, rather than closely-held is likely to reflect the extent of management ownership, with closely held firms less likely to disclose to mitigate perceptions of agency conflicts.\(^{22}\) This study adopts two proxies for ownership dispersion in order to examine its impact on voluntary disclosure. The first TOP\(_{20}\) measures ownership concentration of the top 20 shareholders consistent with the prior literature. An alternative and more direct measure of agency costs is a measure of director share ownership (DIRSH). In this study DIRSH is calculated as the aggregate number of ordinary issued shares owned by the board of directors divided by the number of ordinary issued shares taken from the annual report preceding the release of the feasibility study. It is arguably a stronger measure of agency costs than TOP\(_{20}\) measure.\(^{23}\)

Craswell and Taylor also control for auditor quality in their model. They argue that larger audit firms have reputation at stake should their clients be associated with lower

\(^{22}\) They measure this using the top 20 shareholders as a proxy for ownership dispersion.  
\(^{23}\) Further sensitivity testing is undertaken examining weather the firm has executive option schemes in operation. Results are not sensitive to this alternative proxy for agency costs.
quality reporting (DeAngelo, 1981). Supporting evidence is found in the IPO literature, where Titman and Trueman (1986) argue that the selection of a high quality auditor signals high disclosure quality. Audit quality is designated AUDITOR and controlled for in the model using a large/small auditor dummy variable with 1 indicating a large auditor. Data is also collected on auditor opinion in the form of modified or going concern opinions (GOING_CONCERN). If an audit report attracts either a modified opinion or a going concern qualification it is designated a NON_CLEAN opinion.

Other idiosyncratic project related firm level control variables not included in the prior literature but included in this study include whether the project is being conducted in a joint venture capacity (JOINT_VENTURE). We also control for the nature of information release. Feasibility studies can be released on a standalone basis (absent noise), or can be released as part of ASX quarterly activities reporting requirements (with noise). The variable STAND_ALONE picks up this distinction in terms of information dissemination.

A further innovation in terms of control variables is a control for toll milling arrangements. This form of operation involves ore from an existing deposit being transported and processed through third party production facilities which removes the necessity for the construction of an on-site processing plant. A dummy variable (TOLL_MILLING) is used to indicate toll milling arrangements. The variable (PRODUCT_SALES) picks up the amount of gold sales revenue which is scaled by adjusted market capitalization. This data is collected to ensure that all firms in the

\footnote{Pre-production exploration and development firms will routinely discuss any exploration progress on their tenement portfolios when filing quarterly activities reports.}
sample are ‘pre-production’ firms. A further model control variable, JORC_CHANGE, is a dummy variable where the sample is split with post 1st September 1999 feasibilities coded 1 to incorporate JORC reforms, others coded ‘0’. A final innovation in terms of model control variables is the inclusion of a failed project indicator. The definition of a failed project is located footnote 25.

In terms of experimental variables, $H_1$ is tested with a dummy variable, ‘FOREIGN’ with 1 indicating the firm’s project is located offshore from Australia and domestic domiciled projects coded ‘0’. A dummy variable, OPEN_PIT is also adopted for the test of $H_2$, with an open-pit production profile coded as ‘1’ and underground developments coded ‘0’. For the test of $H_3$ a continuous variable for the number of feasibility consultants mentioned in the feasibility release is included in the model. This variable is designated CONSULTANT. Last, $H_4$ is tested using GOLD_PRICE, a continuous variable which is the percentage change in the spot gold price from 1 year prior to the feasibility completion announcement date.

4.0 Descriptive statistics

Descriptive statistics documented in Table 1 indicate in that each firm makes an average of 2.49 reserve disclosures (RESERVE_DISC), an average of 2.94 financial disclosures (FINANCE_DISC) and an average of 3.01 disclosures of mine operating parameters (OPERATING_DISC). In terms of the dependent variables, each firm averages 5.95 economic disclosures (ECON_DISC) and 8.44 feasibility disclosures in

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25 A failed project is one that has the following attributes. The project either:
1. Fails to attract financing in the 5 years following feasibility completion,
2. Is disposed in the following 5 years following feasibility completion
3. Is deferred, and is not reactivated within 5 years of feasibility completion, or
4. The company enters into external administration within 5 years of feasibility completion.

26 Alternative measures of this variable include an ex ante three year gold price change metric. Reported results are not sensitive to alternative measures of GOLD_PRICE.
Overall, a maximum of 18 possible disclosures is recorded, whilst some firms say nothing at all. Both dependent variables (ECON_DISC and TOTAL_DISC) exhibit normal distributional properties in their raw (unwinsorized) form.

In terms of test variables and controls, the average percentage holding by the TOP_20 is 59.25%. Ownership by the board of directors (DIRSH) shows an average shareholding of 15% by all board participants, which is not a surprise given that most small mining companies are often founded by a geologist(s) who often retain(s) a large percentage of their companies issued capital post IPO. In terms of existing gold operations, 71 firms or 84.5% of the sample report zero gold sales. 97.8% of firms report PRODUCT_SALES 2% or less than inflation adjusted market capitalization. This confirms that these companies are non-production companies, with some sourcing minor gold revenues from royalties. Descriptive statistics for FINANCE indicates that 53.57% of projects obtain some form of debt financing, whilst 66.7% of projects are open pit as opposed to underground mines (OPEN_PIT). Only 57.14% of firms are audited by large auditors (AUDITOR). In terms of audit opinion, 9.52% of firms attract a going concern qualification (GOING_CONCERN) in the financial statements for the fiscal year end dated immediately prior to the feasibility release. 20.24% have modified audit opinions (NON_CLEAN).

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27 In terms of other possible disclosure reported in feasibility completions (but not included in the disclosure scores); in 1 case there is a plant disposal value reported. In 1 further case, a breakeven gold price is reported. In 4 cases, an Australian dollar currency assumption is reported. In one case, a work index and in two other cases bulk densities are reported. Apart from this, any additional disclosure in the feasibility documents relates to an underlying metric already included in the study. For example 7 firms disclose total operating costs, which is simply cash operating costs plus a measure of amortisation of capital expenditure on a mine life or production unit basis. All firms disclosing total operating costs disclosed cash cost, which for comparison was disclosed by 61 firms. In other words, TOTAL_DISC picks up a near census of disclosure across the three key parameters – reserves, mine operations and project economics with only very minor exclusions.
Descriptive statistics also indicate that 63.1% of observations report their feasibilities post September 1st 1999 (JORC_CHANGE), whilst 38.1% of feasibility studies are conducted under joint venture arrangements (JOINT_VENTURE). 80.95% of feasibility completions are reported on a stand-alone basis (STAND_ALONE), whilst 19.05% of feasibilities completions are announced as part of mandated quarterly reporting which would contain other information. Descriptive statistics for CONSULTANT indicates that each feasibility names an average of 1.84 consultants. The maximum number of consultants named was 12, with the minimum number 0. The descriptives for TOLL_MILLING indicate that 11.9% of firms plan to produce through a mill owned and operated by another entity. Last, possibly the most interesting summary statistic in Table 1 is the results for FAILED_PROJECT. 46.43% of projects meet the failure definition in Footnote 25, suggesting gold project development is a high risk undertaking.

4.1 Multivariate analysis

Results from running OLS regression models are reported in Table 2. Models 1 and 2 report results for the variable TOTAL_DISC or ‘total disclosure’ with alternative proxies for information asymmetry in the form of director ownership and ownership diffusion. Model 1 utilizing TOP_20 shareholders obtains an adjusted R² of .46, with the F-statistic significant at p<.000. In terms of control variables, SIZE and TOP_20 are not significant. In terms of significant predictors, AUDITOR is significant at p=.012, but carries a negative co-efficient, suggesting that higher quality auditors result in lower feasibility disclosure (the opposite result to Craswell and Taylor (1991). FINANCE has a positive co-efficient consistent with expectations, the t-value is 2.21, significant at p<.05. The co-efficient on JOINT_VENTURE is also negative.
and significant at $p<.10$ suggesting firms operating under these structural arrangements disclose less. One possible reason may be greater risk of information leakage in such environments sees information withheld. the co-efficient for JORC_CHANGE is positive and significant at $p<.05$, suggesting changes implemented in the JORC Code in 1999 had a positive impact on disclosure. The co-efficient on FAILED_PROJECT is negative and significant at $p<.05$, suggesting managers with lower quality projects disclose less.

In terms of experimental variables, the test of $H1$ indicates that the coefficient for FOREIGN is positive and significant at $p<.10$, suggesting weak support for H1. In contrast, OPEN_PIT is also not significant in model 1, nor is GOLD_PRICE implying no support for H2 or H3. On the other hand, the co-efficient for CONSULTANT, the dummy for the feasibility manager is positive and strongly significant ($p<.00$) providing support for H4.

In model 2, the results of Model 1 are re-run with the same dependent variable, TOTAL_DISC, this time replacing TOP20 with the enhanced agency cost proxy DIRSH, proxying for percentage of shareholding by the board of directors. Once again the agency cost proxy is not significant in the model, although its sign is consistent with expectations. Other results in Model 2 are similar to Model 1.

In Model 3, the dependent variable is re-specified as ECON_DISC which includes only disclosure of mine operating parameters (OPERATING_DISC) and project economics (FINANCIAL_DISC) and thus removes scores for RESERVE_DISC. This dependent variable is more closely aligned with ‘new’ information disclosed in the
feasibility completion announcements, since reserve disclosure is likely to be released earlier on in the mine project life cycle. In Model 4, the alternative control for agency costs DIRSH is adopted. Models 3 and 4 report a similar adjusted $R^2$ of .45, with the $F$-statistic of 7.14 significant at $p<.000$.

The results in Models 3 and 4 are similar to those reported in Models 1 and 2 with the main difference being that FOREIGN is now significant at $p<.05$ in both Models. Coefficients for OPEN_PIT and GOLD_PRICE are once again not significant whilst the coefficients for CONSULTANT are consistent with those reported in Models 1 and 2. Once again, re-running Model 3 with the enhanced agency cost proxy DIRSH has no effect on the results. In summary, results in Table 2 provide support for H1 and H4, but no support for H2 and H3. What is also noticeable is the distinct lack of support for traditional agency proxies derived from the prior literature which suggests the need for idiosyncratic controls in industry based disclosure studies.

4.2 Failed project prediction

Descriptive statistics in Table 1 indicate that adopting the failed project definition located in Footnote 25, in excess of 46% of projects are failed projects. We now consider whether disclosure quality might assist in prediction of failed projects. A logit approach is applied where the dependent variable is FAILED_PROJECT with appropriate predictors including ECON_DISC along with two new predictors. First the Altman Z (ALTMAN_Z) score is included consistent with prior failure models.

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28 Collinearity diagnostics including variance inflation factors (VIFs) run on all 4 models indicate that all the VIF’s are less than 2, indicating no evidence of problematic multicollinearity. Inspection of scatter plots also indicates no influential outliers.

29 Our sample period ended on 31/12/2007. Implicitly this biases against recent projects being referred to as ‘failed’ which will downwardly bias the extent of failure in the sample. This represents a limitation in the study.
Second the variable TOLL_MILLING is included and controls for firms which elect to have their ore deposit process through third party facilities. By not building a standalone production facility, these projects are effectively de-risked and have lower likelihood of failure. The model is specified as follows:

\[
\text{FAILED\_PROJECT} = \alpha_0 + \alpha_1\text{SIZE} + \alpha_2\text{FINANCE} + \alpha_3\text{FOREIGN} + \\
\alpha_4\text{OPEN\_PIT} + \alpha_5\text{AUDITOR} + \alpha_6\text{ECON\_DISC} + \alpha_7\text{ALTMAN\_Z} + \\
\alpha_8\text{TOLL\_MILLING} + \alpha_9\text{CONSULTANT} + \alpha_{10}\text{NON\_CLEAN} + \varepsilon
\]  

(4)

Results are depicted in Table 3 once again for four models. Model 1 includes NON_CLEAN for auditor’s opinion, whilst in MODEL 2, NON_CLEAN is replaced by GOING_CONCERN. Model 1 is significant with a Chi-square statistic of 43.6, significant at \( p < .000 \) and reports a pseudo R2 of .41. Classificatory success is encouraging, with 78.6% of projects successfully classified by the model. In terms of significant predictors of project failure, debt financed projects have reduced likelihood of failure \( p < .05 \) which may support the notion that private debt financiers may possess some private information and would likely select high quality projects. ECON_DISC is also strongly significant (\( p < .01 \)), suggesting that higher quality project economic disclosure is also associated with successful projects under perfect foresight. Two other significant FAILED_PROJECT predictors also report intuitive co-efficients. OPEN_PIT, the proxy for development type has a negative co-efficient in Models 1 and 2, significant at \( p < .05 \). Logically underground projects involve much higher information asymmetry when it comes to features such as reserve estimation and can be impacted by geophysical or seismic events such as rock falls far more readily, so we would expect higher failure rates for such projects, although this result is sensitive to the precise definition of the dependent variable since it is no longer significant in
Models 3 and 4. Last, as expected, TOLL_MILLING arrangements result in lower failure (co-efficient significant at $p<.05$ across models 1-4) which is logical given that no production facilities are developed in house.

Models 2 – 4 of Table 3 report sensitivity analysis conducted on the project failure analysis reported in Model 1. In Model 2, the modified audit opinion control (NON_CLEAN) is replaced by a dummy identifying going concern opinions (GOING_CONCERN). There is no change in the primary results reported in Model 1. In models 3 and 4, the dependent variable is re-defined including two disposed projects where it was explicitly stated in the disposal announcement that the project had been mined successfully to completion prior to disposal (both short duration projects). Results are similar, although whilst the co-efficient is still negative, OPEN_PIT is no longer significant at conventional levels. Further sensitivity tests are conducted including JOINT_VENTURE and DIRSH as additional predictors. Once again results are similar to those reported in Models 1 and 2.

5.0 Conclusion

The completion of a feasibility study is a crucial phase of the mine development process, and is seen as a major project milestone. Yet, there is a significant void in the financial economics literature dealing with the mining industry in general, and specifically voluntary disclosure issues. This is despite the industry enjoying a resurgence brought about by higher commodity prices over the period from 2002 – 2008 in particular.
This study exists in a unique setting for disclosure research, since gold development projects undertaken by smaller companies exhibit negligible proprietary costs. Managers also have strong incentives to release good news with a view to optimising their chances of attracting project financing. This setting is arguably characterised by a stronger relationship between disclosure and firm value than in prior disclosure studies.

Voluntary disclosure is found to increase for off-shore projects, for those with external feasibility managers and for projects that ultimately have a debt component in their project financing mix. It is noted that the idiosyncratic industry specific information asymmetry proxies perform well in comparison with previous attempts to model voluntary disclosure in the mining industry using traditional agency cost proxies such as audit quality and director ownership. In fact after controlling for a number of different facets of the proposed project, audit quality is associated with lower disclosure levels. Last, failed projects depict lower disclosure magnitude consistent with a moral hazard interpretation.

Our second contribution is to identify ex ante project specific factors associated with project outcome. Results indicate that failed projects have lower levels of economics related disclosure, are more likely to be underground projects and projects constructing in house production and processing facilities as opposed to third party toll milling. Failed projects are less likely to be debt financed, perhaps not surprising given the private financier in the Australian setting may hold private information.
References


Table 1 Descriptive Statistics

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<th>Variables</th>
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<th>Minimum</th>
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Definitions
RESERVE_DISC = Count of JORC reserve and resource classifications and totals disclosed in the feasibility study.
FINANCE_DISC = Count of Financial parameters disclosed such as cash costs, capital expenditure, NPV, IRR, Payback period.
OPERATING_DISC = Count of Mine Operating Parameter disclosure such as throughput rate, recovery rate, mine life.
ECON_DISC = Sum of FINANCE_DISC and OPERATING_DISC
TOTAL_DISC = Sum of RESERVE_DISC, FINANCE_DISC and OPERATING_DISC
SIZE = Log of inflation adjusted market capitalization sourced from SPPR measured at month end prior to feasibility release
TOP20 = Proportion of the company’s shares held by the top 20 shareholders
DIRSH = % shareholding of the board of directors
GOLD_PRICE = Change in gold price over year prior to feasibility release
PRODUCT SALES = Gold sales revenue divided by firm market capitalization at feasibility release.
ALTMAN_SCORE = Altman Z score windsoized to the 97th percentile.
CONSULTANT = Number of external consultants mentioned in the feasibility release
FINANCE = Coded ‘1’ if the project has a debt financing component, else ‘0’.
FOREIGN = Coded ‘1’ if the project is located outside of Australia, else ‘0’.
OPEN_PIT = Coded ‘1’ if the project is an open pit mining operation, ‘0’ for underground operation.
AUDITOR = Coded ‘1’ if the company is audited by a large auditor, else ‘0’.
JORC_CHANGE = Coded ‘1’ if the project is the feasibility is released post September 1st, 1999, else ‘0’.
JOINT_VENTURE = Coded ‘1’ if the project is a joint venture, else ‘0’.
STAND_ALONE = Coded ‘1’ if the feasibility announcement is stand alone, ‘0’ if part of a quarterly activities report.
GOING_CONCERN = Coded ‘1’ if the audit report contains a going concern qualification, else ‘0’.
NON_CLEAN_OPINION = Coded ‘1’ if the auditor’s report contains a modified opinion, else ‘0’.
TOLL_MILLING = Coded ‘1’ if the processing option is a toll milling arrangement, else ‘0’.
FAILED_PROJECT = Coded ‘1’ if the project is failed as defined on p.14, else ‘0’.
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F-statistic (p-value)    | 7.34(<.000) | 7.28(<.001) | 7.14(<.000) | 7.14(<.000)
Adjusted R²              | 0.457       | 0.454       | 0.449       | 0.449
Sample Size              | N=84        | N=84        | N=84        | N=84

*All p-values are two-tailed tests

Variables Descriptions
ECON_DISC = Sum of FINANCE_DISC and OPERATING_DISC
TOTAL_DISC = Sum of RESERVE_DISC, FINANCE_DISC and OPERATING_DISC

Control Variables
SIZE = Log of inflation adjusted market capitalization sourced from SPPR measured at month end prior to feasibility release
TOP20 = Proportion of the company’s shares held by the top 20 shareholders
DIRSH = % shareholding of the board of directors
FOREIGN = Coded ‘1’ if the project is located outside of Australia, else ‘0’
OPEN_PIT = indicator variable, 1 = open-pit deposit
AUDITOR = indicator variable, 1 = Big N auditor
JORC_CHANGE = Coded ‘1’ if the project is the feasibility is released post September 1st, 1999, else ‘0’
GOLD_PRICE = Percentage change in gold price over year prior to feasibility release
CONSULTANT = Number of external consultants mentioned in the feasibility release
FINANCE = Coded ‘1’ if the project has a debt financing component, else ‘0’.
FAILED_PROJECT = Coded ‘1’ if the project is failed as defined on p.14, else ‘0’
JOINT_VENTURE = Coded ‘1’ if the project is a joint venture, else ‘0’
### Table 3 Project Failure Models

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<td>-0.44</td>
<td>-0.44</td>
</tr>
<tr>
<td>GOING_CONCERN</td>
<td>?</td>
<td>0.2</td>
<td>-0.23</td>
<td>0.05</td>
</tr>
<tr>
<td>CONSULTANT</td>
<td>0.18</td>
<td>0.18</td>
<td>0.15</td>
<td>-0.16</td>
</tr>
<tr>
<td>OPEN_PIT</td>
<td>-1.45</td>
<td>-1.45</td>
<td>-0.92</td>
<td>-0.96</td>
</tr>
</tbody>
</table>

Chi-square (p-value) | 43.666 | 43.69 | 41.966 | 41.669 |

Pseudo R² | 0.405 | 0.406 | 0.393 | 0.391 |

% correctly classified | 78.6 | 78.6 | 78.6 | 79.8 |

Sample Size | N=84 | N=84 | N=84 | N=84 |

*All p-values are two-tailed tests

Variables Descriptions

**Dependent Variable**

FAILED_PROJECT = Coded ‘1’ if the project is failed as defined in Footnote 25, else ‘0’. * Denotes modified sample as per discussion pp. 13-14.
Control Variables

SIZE = Log of inflation adjusted market capitalization sourced from SPPR measured at month end prior to feasibility release
FINANCE = Coded ‘1’ if the project has a debt financing component, else ‘0’.
ALTMAN_Z = Altman Z score (winsorized at 97th percentile)
AUDITOR = indicator variable, 1 = Big N auditor
FOREIGN = Coded ‘1’ if the project is located outside of Australia, else ‘0’.
ECON_DISC = Sum of FINANCE_DISC and OPERATING_DISC
NON_CLEAN = Coded ‘1’ if the audit report is a modified audit report.
GOING_CONCERN = Coded ‘1’ if the audit report contains a going concern qualification.
CONSULTANT = Number of external consultants mentioned in the feasibility release
OPEN_PIT = indicator variable, 1 = open pit deposit
TOLL MILLING = Coded ‘1’ if the planned process route is via a third party production facility.
Appendix 2. Gawler Craton granted Tenements (18/11/1996)
Appendix 3

CIBALIUNG GOLD PROJECT - BANKABLE FEASIBILITY STUDY COMPLETED AND ACCEPTED BY JOINT VENTURE PARTNERS

Austindo Resources Corporation NL (“ARX”) is pleased to announce the completion and acceptance by the Joint Venture of the Bankable Feasibility Study (“BFS”) for the Cibaliung Gold Project. The Project is located in the Province of Banten in west Java, Indonesia and is operated through a joint venture company – PT Cibaliung Sumberdaya (“CSD”) in which ARX is entitled to an 83.76% interest as at 30 June 2004 and PT Antam Tbk (“Antam”) retains a 16.24% interest. Subject to financing and regulatory approvals being completed, construction could start in the first half of 2005 with first gold production in early 2006. Key findings of the BFS are:

- Mine life of 6 years with a production rate of 220,000 tonnes per annum with recovery of gold and silver by a conventional CIL processing plant;
- Mining will be by conventional underground cut and fill stoping with decline access.
- Annual production of approximately 70,000 ozs gold equivalent based on Mineable Reserves and resources of 467,000 equivalent ounces of gold;
- Initial capital expenditure of some US$ 34 million;
- Average life of mine cash operating costs of less than US$200/oz.

The project has been designed with the potential for expansion since exploration, which has continued throughout the course of the Feasibility Study, has identified several priority targets that may form new economic shoots and lead to an increase in the project’s resources. The discovery of a new shoot could lead to an expansion in annual production to about 100,000 ounces. A new phase of diamond drilling will commence in September 2004 to test these targets.

The environmental approvals process is well advanced, having been progressed in parallel with the Feasibility Study. Two banking groups have been identified as possible providers of the debt component of the project’s financing. These banking groups have now commenced their due diligence and it is proposed to provide a mandate to one of these groups as soon as practicable. Prime Corporate Finance Pty Ltd has been appointed to provide financial advisory services to the Joint Venture. The most appropriate mix of debt and equity funding for the development of this project will be determined in this process.

Whilst the project financing and regulatory approvals are ongoing, a number of pre-implementation aspects of the project will be carried out to enable construction to be started as soon as project financing is in place. At this stage it is anticipated that the project financing will be finalised by early 2005. The pre-implementation work will include the preparation of design packages to tender the construction of the processing plant, surface infrastructure and development of the underground mine. Mineable Reserves and Resources for the project are set out in the following table:

<table>
<thead>
<tr>
<th></th>
<th>(000’s)</th>
<th>Tonnage</th>
<th>Gold g/t</th>
<th>Silver g/t</th>
<th>Gold Eq g/t</th>
<th>Gold oz</th>
<th>Silver oz</th>
<th>Gold Eq Oz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Proven Reserve</td>
<td></td>
<td>511</td>
<td>11.4</td>
<td>82</td>
<td>12.4</td>
<td>188</td>
<td>1,347</td>
<td>204</td>
</tr>
<tr>
<td>Total Probable Reserve</td>
<td></td>
<td>592</td>
<td>8.8</td>
<td>84</td>
<td>9.9</td>
<td>167</td>
<td>1,604</td>
<td>188</td>
</tr>
<tr>
<td>Total Inferred Resource (with mining factors applied)</td>
<td></td>
<td>285</td>
<td>7.5</td>
<td>67</td>
<td>8.3</td>
<td>68</td>
<td>609</td>
<td>76</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1,388</td>
<td>9.5</td>
<td>80</td>
<td>10.5</td>
<td>423</td>
<td>3,560</td>
<td>467</td>
</tr>
</tbody>
</table>
Appendix 4.

THE 2004 AUSTRALASIAN CODE FOR REPORTING EXPLORATION RESULTS, MINERAL RESOURCES AND ORE RESERVES (THE JORC CODE) - general relationship between Exploration Results, Mineral Resources and Ore Reserves

Relevant JORC Terminology and definitions (clause)

19. A ‘Mineral Resource’ is a concentration or occurrence of material of intrinsic economic interest in or on the Earth’s crust in such form, quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories.

20. An ‘Inferred Mineral Resource’ is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability.

21. An ‘Indicated Mineral Resource’ is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed.

22. A ‘Measured Mineral Resource’ is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and grade continuity.

28. An ‘Ore Reserve’ is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified. Ore Reserves are sub-divided in order of increasing confidence into Probable Ore Reserves and Proved Ore Reserves.

29. A ‘Probable Ore Reserve’ is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.

30. A ‘Proved Ore Reserve’ is the economically mineable part of a Measured Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.