Valuation of Mineral and Coal Assets – Challenges and Opportunities

SMEDGE
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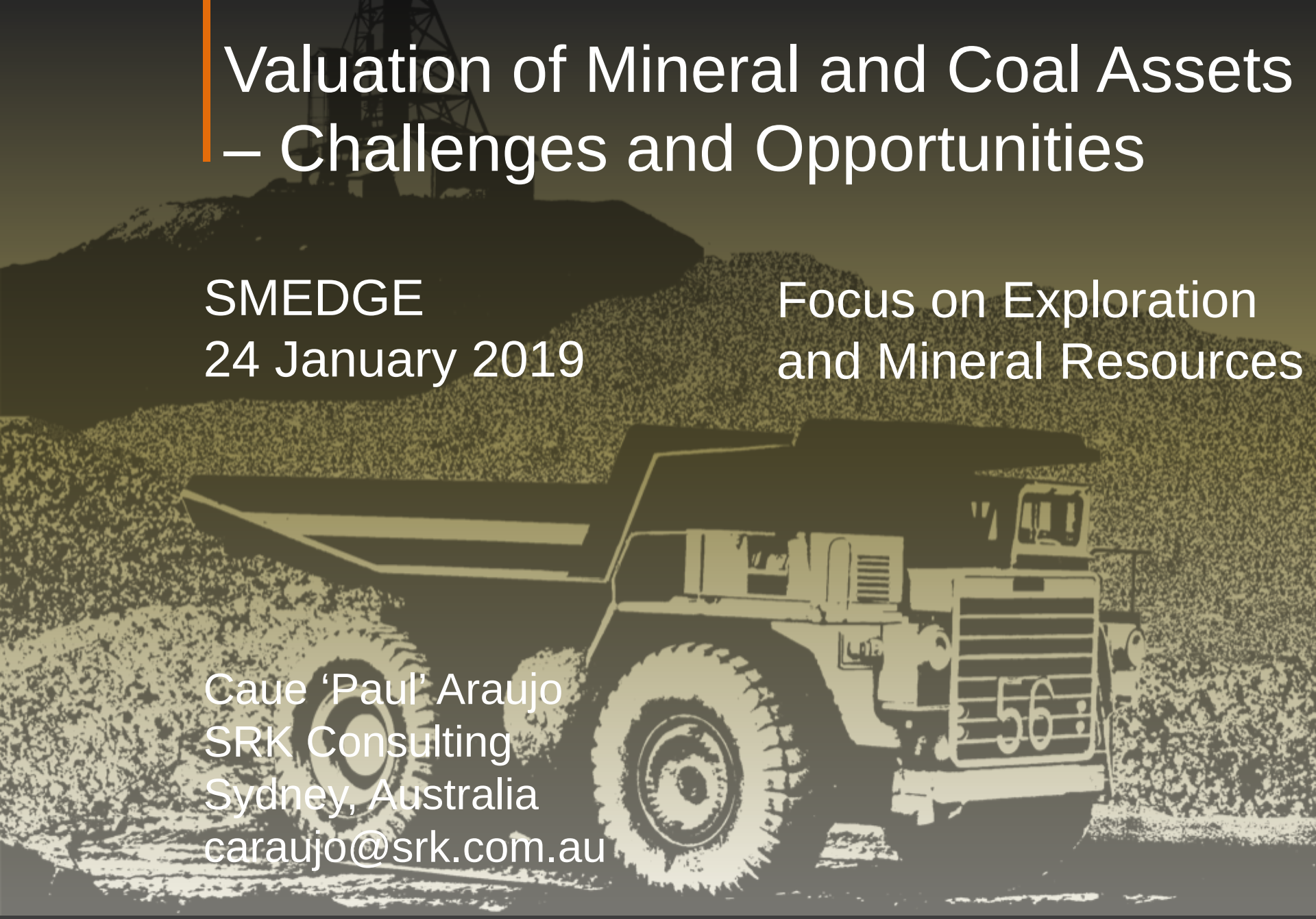
Focus on Exploration and Mineral Resources



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Content

- Introduction
- Codes, standards, guidelines and industry practice
- Common Valuation Methods
- Conclusions

Introduction

What is being valued?

Components of mining company's share price:

- Mineral properties
- Other assets and liabilities (e.g. cash and debt)
- Commodity markets and general market sentiment
- Quality of management
- Market recognition and liquidity

Introduction

What is being valued?

As defined in the VALMIN Code (2015), mineral assets comprise all property including (but not limited to) tangible property, intellectual property, mining and exploration tenure and other rights held or acquired in connection with the exploration, development of and production from those Tenures.

This may include the plant, equipment and infrastructure owned or acquired for the development, extraction and processing of Minerals in connection with that Tenure.

Introduction

What is the purpose of the valuation?

VALMIN Compliant/ Non-Compliant Valuations:

- Value Opinion vs Full Valuation
- “Technical Value”
- “Market Value” of mineral properties
- “Investment Value”
- “Selling Value”
- “Bidding Value”
- Stamp Duty Disputes
- JV Partners Disputes
- Third-Party Opinion

Introduction

What is “Market Value”?

“Market Value” is the estimated amount (or the cash equivalent of some other consideration) for which the Mineral Asset should exchange on the date of Valuation between a willing buyer and a willing seller in an arm’s length transaction after appropriate marketing where the parties had each acted knowledgeably, prudently and without compulsion.

Introduction

What is “Market Value”?

- Value that would have been paid
- Open and unrestricted market
- Between informed and prudent parties
- Acting at arms length

Introduction

Project development stage	Criterion
Early stage exploration	Mineralisation may or may not be defined, but where Mineral Resources have not been identified.
Advanced exploration	Considerable exploration has been undertaken and specific targets identified that warrant further detailed evaluation, usually by drill testing, trenching or some other form of detailed geological sampling. Sufficient work has been completed on at least one prospect to provide both a good understanding of the type of mineralisation present and encouragement that further work will elevate one or more prospects to the Mineral Resource category.
Pre-development	Mineral Resources have been identified and their extent estimated (possibly incompletely), but where a decision to proceed with development has not been made. Properties in the early assessment stage, properties for which a decision has been made not to proceed with development, properties on care and maintenance and properties held on retention titles are included in this category if Mineral Resources have been identified, even if no further work is being undertaken.
Development	Tenure holdings for which a decision has been made to proceed with construction or production or both, but which are not yet commissioned or operating at design levels. Economic viability will be proved by at least a Pre-Feasibility Study.
Operating	Tenure holdings, particularly mines, well fields and processing plants, that have been commissioned and are in production.

Source: VALMIN Code, 2015

Introduction

Typical information required for valuations:

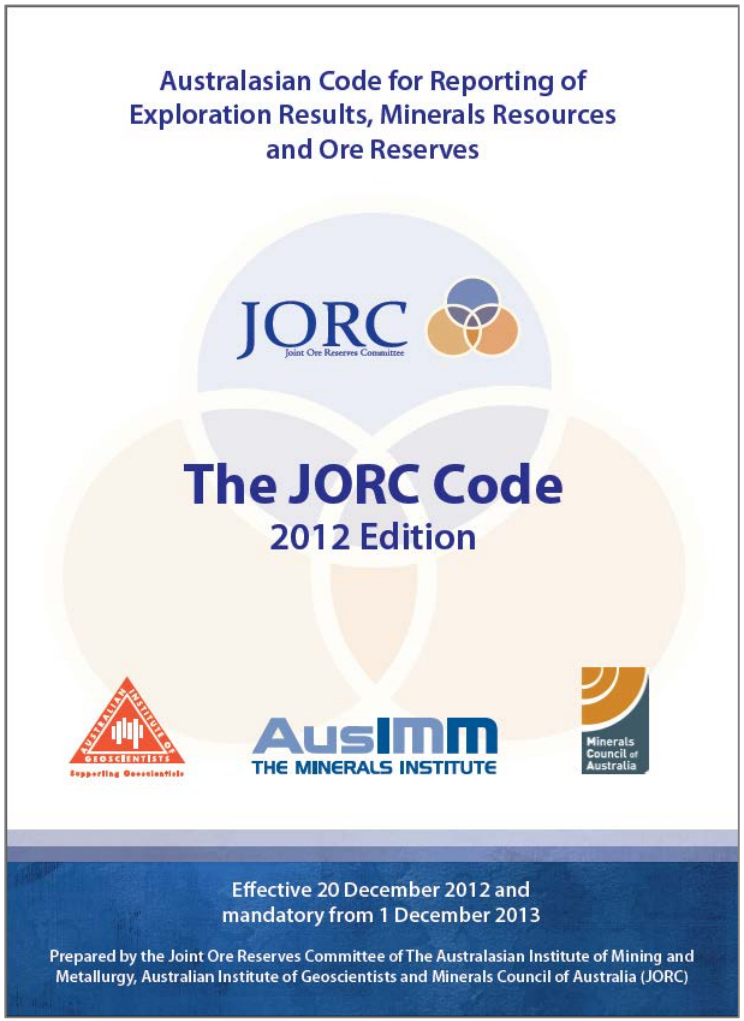
- An independently validated tenement schedule outlining tenement number, area (in square kilometres), ownership (including mineral rights, clawback provisions, royalties, etc.), date of grant, date of expiry, taxes, rents, rates, minimum exploration expenditures, encumbrances, i.e. legal, Native Title, environmental, social
- Details of expenditure history (by tenement) to estimate the value of the exploration information
- Copy of any material agreements and contracts (i.e. service, joint venture, off-take, royalty)
- Any reports outlining recent exploration, such as annual reports
- Reports outlining the potential of the tenements

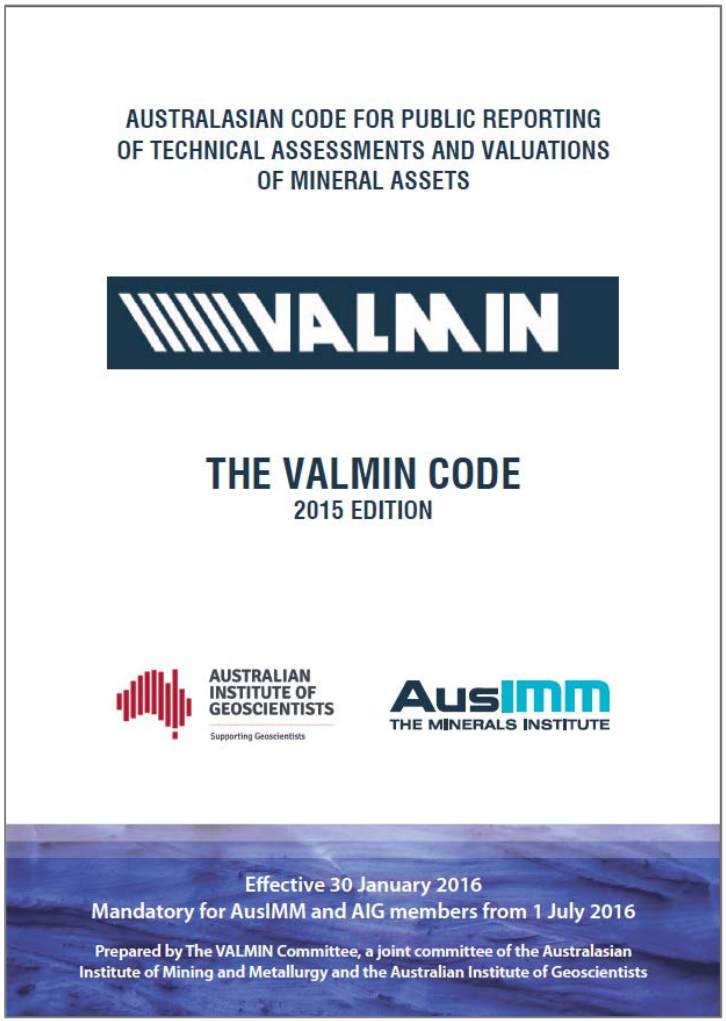
Introduction

Typical information required for valuations:

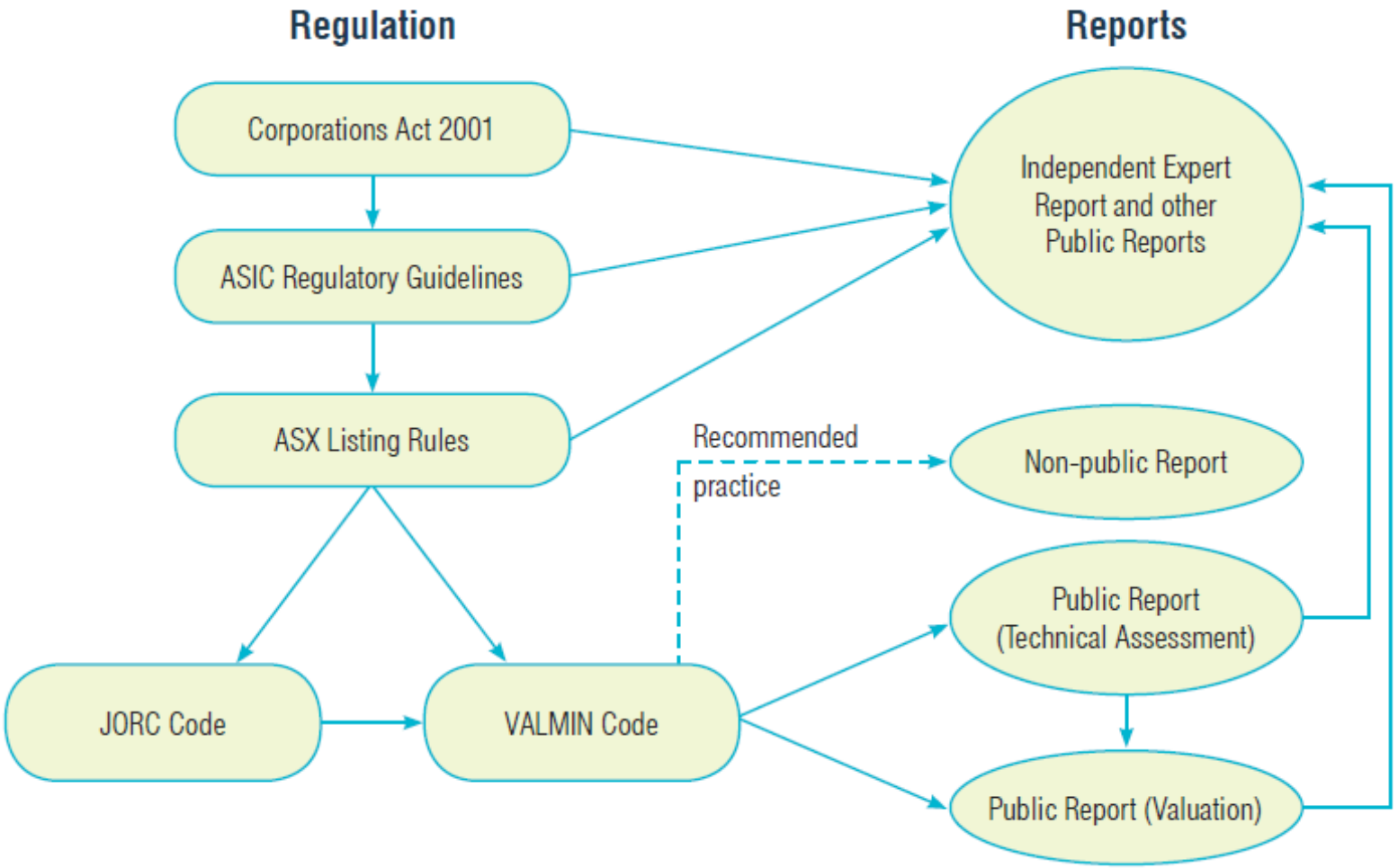
- Any Mineral Resource estimates (either current or historical) or exploration target estimate
- Any test work and processing studies
- Any mining, geotechnical, infrastructure or environmental studies
- Previous and/or current feasibility studies or technical studies
- Any valuations or independent expert's reports on actual or adjacent properties considered relevant (i.e. within the last five years)

Codes


Australasian Code for Reporting of Exploration Results, Minerals Resources and Ore Reserves
JORC
Joint Ore Reserves Committee
The JORC Code
2012 Edition
AusIMM
THE MINERALS INSTITUTE
Minerals Council of Australia
Effective 20 December 2012 and mandatory from 1 December 2013
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)

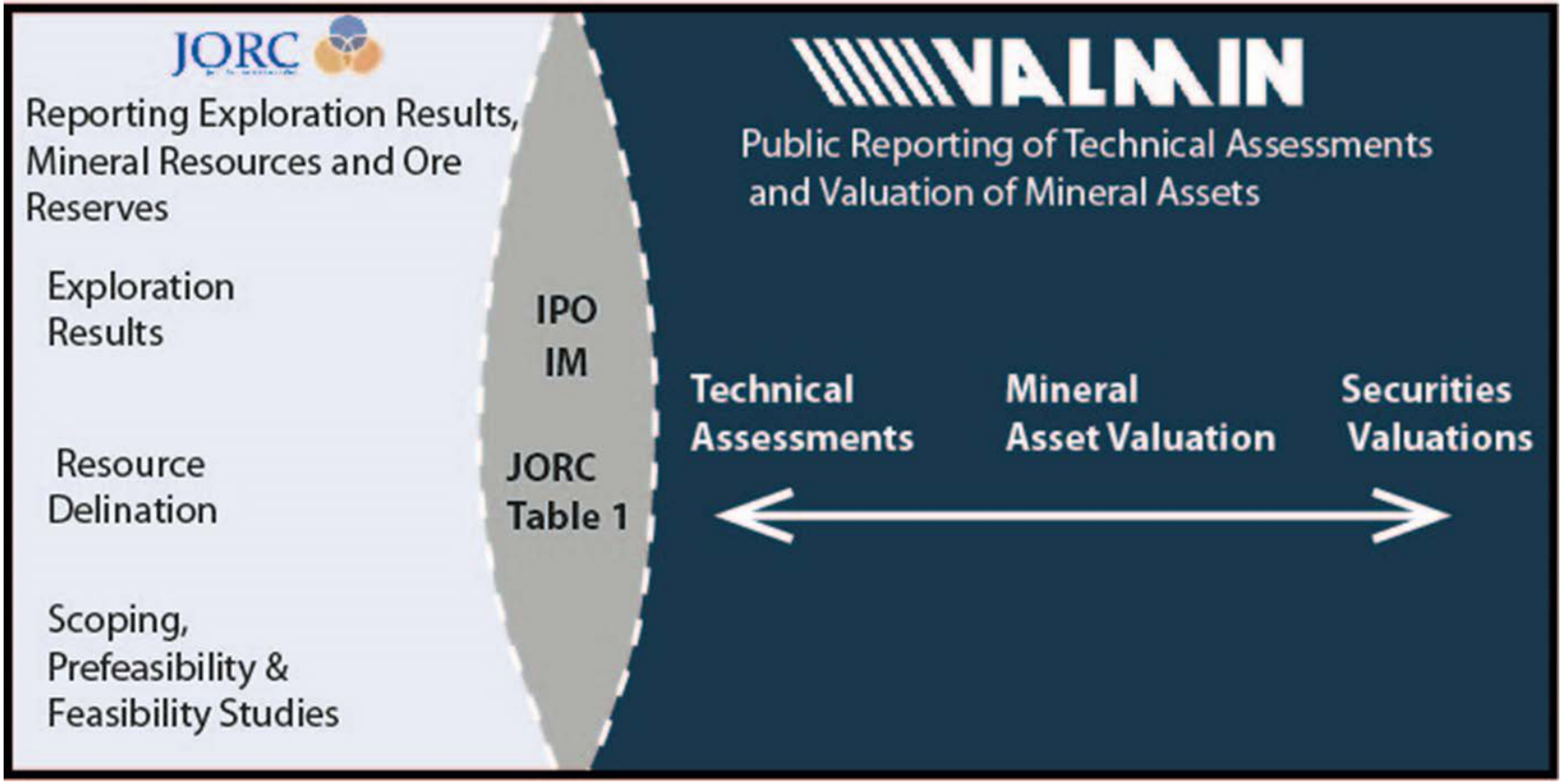

AUSTRALASIAN CODE FOR PUBLIC REPORTING OF TECHNICAL ASSESSMENTS AND VALUATIONS OF MINERAL ASSETS
VALMIN
THE VALMIN CODE
2015 EDITION
AUSTRALIAN INSTITUTE OF GEOSCIENTISTS
Supporting Geoscientists
AusIMM
THE MINERALS INSTITUTE
Effective 30 January 2016
Mandatory for AusIMM and AIG members from 1 July 2016
Prepared by The VALMIN Committee, a joint committee of the Australasian Institute of Mining and Metallurgy and the Australian Institute of Geoscientists

Interaction



Source: VALMIN, 2015

Interaction



Source: McCarthy, 2014

Codes & guidelines

Technical Reporting Codes

- Provide **minimum s**tandards, recommendations and guidelines
- Principles of transparency and materiality in reporting

Reporting is subject to **interpretation**, therefore require greater transparency and consistency.

JORC (2012) & VALMIN (2015)

Materiality
All reasonable information expected

Transparency
Clear, unambiguous presentation

Competence
Work completed by Competent Person

+ VALMIN (2015)

Independence
May be required depending on circumstance

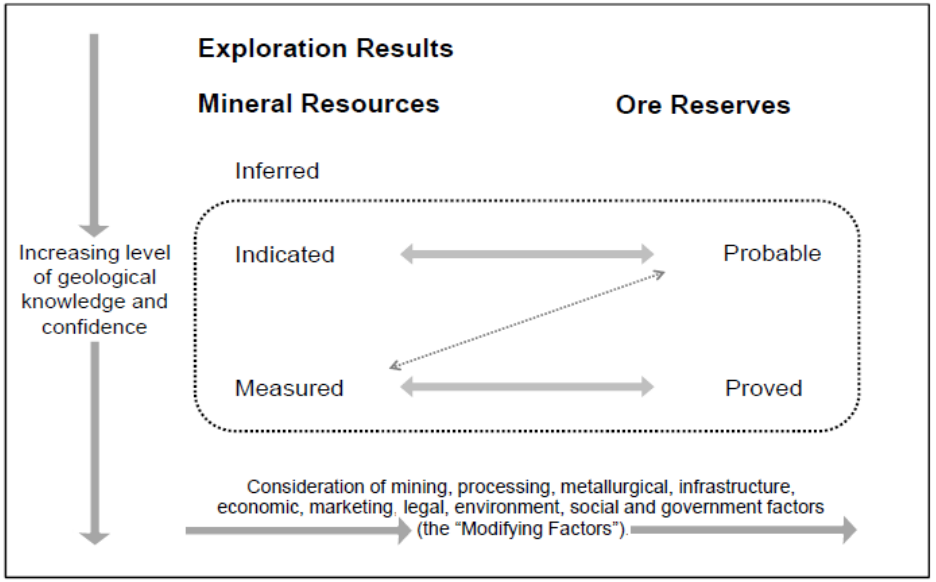
Reasonableness
Impartial assessment that a third party would reach a similar conclusion

Codes

Reporting definitions

Don’t forget about:

- Development stages
- Timing
- Level of technical-economic study
- Level of confidence in all relevant factors, including SEG factors
- Transparent, consistent, balanced reporting
- “If not, why not” basis



Source: JORC Code, 2012

Competence requirements

JORC (2012) & VALMIN (2015)

Membership

Member or Fellow of:

- AusIMM
- AIG
- Recognised Professional Organisation with an 'enforceable code of ethics'

Experience

Minimum 5 years experience in:

- Style of mineralisation or type of deposit under consideration; and
- Activity which that person is undertaking

+ VALMIN (2015)

Experience

Technical Assessment:
Minimum 5 years experience in Technical Assessment

Valuation:
Minimum additional 5 years (i.e. ten years in total) experience in valuation of mineral assets

Familiarity

VALMIN & JORC Codes, Corps Act, ASIC/ASX policy & court decisions

Valuation Approaches

Valuation Approach	Valuation Method	Development Properties	Marginal Development Properties	Exploration Properties
Income	Discounted Cash Flow	Yes	Maybe	No
	Real Options	Yes	Yes	No
Cost	Appraised Value	No	Yes	Yes
	Geoscience Factor	No	Maybe	Yes
Market	Comparable Transactions	Yes	Yes	Yes
	Option Agreement Terms	Yes	Yes	Yes

Valuation Approaches

Income Approach:
- Based on expectation of income
- Discounted cash flow method and variations

Market Approach:
- Based on principle of substitution
- Sales comparison/ comparable transactions

Cost Approach:
- Cost of equivalent property
- Appraised value method
- Multiple of exploration expenditures
- Geoscience factor

At least two valuation methods should be considered for each mineral asset.

Valuation of Non-Producing Assets

Why Non-Producing Assets have value?

- They represent potential for eventual mineral production through
- Exploration discovery
- Enhancement of existing mineral resources
- Improved circumstances, (e.g. new roads or higher metal prices)

Valuation of Non-Producing Assets

Why Non-Producing Assets have value?

- New ownership
- A market exists for non-producing mineral properties
- With mineral resources or without mineral resources
- Deals are commonly option or farm-in agreements

Valuation of Non-Producing Assets

Most commonly used methods:

- Actual Transactions
- Comparable Transactions
- Joint Venture Terms
- Past Effective Expenditure/ Prospectivity Enhancement Multiplier (PEM)
- Geoscience Factor (i.e. Kilburn Method)
- SRK Geological Risk
- Metal Transaction Ratio (MTR)
- Yardstick/ Rule of Thumb Method

Comparable Transactions Analysis

- Commonly used in valuations for assets in any stage of development
- No true comparables – mineral properties are unique
- Market size is small with relatively few transactions
- Can use transactions on a number of similar properties to obtain a range of values

Comparable Transactions Analysis

- Complex property deals need analysis to obtain a value of the property
- Can adjust comparable transaction values by property area or by metal contained in resource
- Transaction date is very important since market activity and value change over time

Comparable Transactions Analysis

Use similar characteristics to those of subject property:

- Commodity or group of commodities, e.g. gold
- Political jurisdiction
- Location, access, infrastructure
- Property size
- Geological setting
- Mineral deposit type
- Stage of exploration and exploration potential
- Exploration results and targets
- Activity on neighbouring properties
- Similar resource tonnage and grade, if any

Comparable Transactions Analysis

Option Agreement Analysis/ JV Terms:

- Analysis needed for valuation of market transactions
- Most non-producing mineral property transactions are option or earn-in agreements to earn an interest in the property
- The option or earn-in period may last several years; three to four is common
- Earn-in terms include cash, stock, work commitments and royalties
- Usually first year is firm and subsequent years optional
- Option agreement terms analysis:
  - Schedule of payments and work commitments
  - Estimate probability of realization of future commitments
  - Date of the agreement is the valuation date

Comparable Transactions Analysis

Published description of the deal:

X Resources can earn a 60% interest in a Rare Earths property of Y Corporation by making payments totalling $600,000 and expending a total of $2,500,000 on exploration over four years. The first year requires $50,000 cash on signing and an expenditure commitment of $250,000. Further optional annual payments and work commitments are shown in the following analysis table.

Comparable Transactions Analysis

Year of Agt.	Commitment	Payment Schedule	Expl. Exp Schedule	Prob. of Realiz'n.	Value Component
1	Firm	$50K	$250K	100%	$300K
2	Optional	$100K	$500K	50%	$300K
3	Optional	$150K	$750K	25%	$225K
4	Optional	$300K	$1,000K	10%	$130K
Totals for 60% Int.		$600K	$2,500K		$955K
Value of 100% Interest in the Property (rounded)					$1,600K

Prospectivity Enhancement Multiplier

- Based on the principle of “Past Expenditure”
- A premium (or discount) multiplier is applied to the total cost of exploration to date, depending on whether the exploration has enhanced the prospectivity of the ground or not
- Multiplier typically ranges from 0.5 – 3.0
- Historical expenditures must be declared as audited
- Issue – Subjective choice of multiplier value

Kilburn Method

Ranking of appropriate factors applied to a Base Acquisition Cost (BAC).

The BAC represents the average cost incurred by a Tenement Holder or Explorer to identify, apply for and then retain a unit area of the exploration licence of title (Goulevitch and Eupene, 1994), including statutory expenditure costs. The BAC forms the starting value from which a technical valuation range is then estimated.

The factors used for the technical rating include Off-property, On-property, Geology and Anomaly factors. The ranking of these key factors will either enhance or reduce the intrinsic value of a property. A further factor, the Market factor, may then be considered in order to derive a Fair Market Value.

Kilburn Method

Rating	Off Property Factor	On Property Factor	Geological Factor	Anomaly Factor	Quality Factor (Product type)	Location/ Infrastructure Factor
0.1			Unfavourable geological setting	No mineralisation identified – area sterilised		Unable to access market
0.5	Unfavourable district/basin	Unfavourable area	Poor geological setting	Extensive previous exploration provided poor results	Low quality with impurities	
0.7					Low quality without impurities	Located at distance to market but supporting infrastructure in development
0.9			Generally favourable geological setting, under cover or complexly deformed or metamorphosed	Poor results to date	Reasonable quality with impurities	
1.0	No known mineralisation in district	No known mineralisation on lease	Generally favourable geological setting	No targets outlined	Reasonable quality without impurities	Located at distance to market but supporting infrastructure in place
1.5	Minor workings	Minor workings or mineralised zones exposed		Target identified, initial indications positive	High quality with impurities	
2.0	Several old workings in district	Several old workings or exploration targets identified	Multiple exploration models being applied simultaneously		High quality without impurities	
2.5			Well defined exploration model applied to new areas	Significant grade intercepts evident but not linked on cross or long sections		In proximity to market with appropriate infrastructure in place to access
3.0	Mine or abundant workings with significant previous production	Mine or abundant workings with significant previous production	Significant mineralised zones exposed in prospective host rock			
3.5				Several economic grade intercepts on adjacent sections		
4.0	Along strike from a major deposit	Major Mine with significant historical production	Well understood exploration model, with valid targets in structurally complex area, or under cover			
5.0	Along strike for a world class deposit		Well understood exploration model, with valid targets in well understood stratigraphy			
6.0			Advanced exploration model constrained by known and well understood mineralisation			
10.0		World Class Mine				

Source: Modified after Xstract, 2009 and Agricola Mining Consultants, 2011.

Geological Risk Method

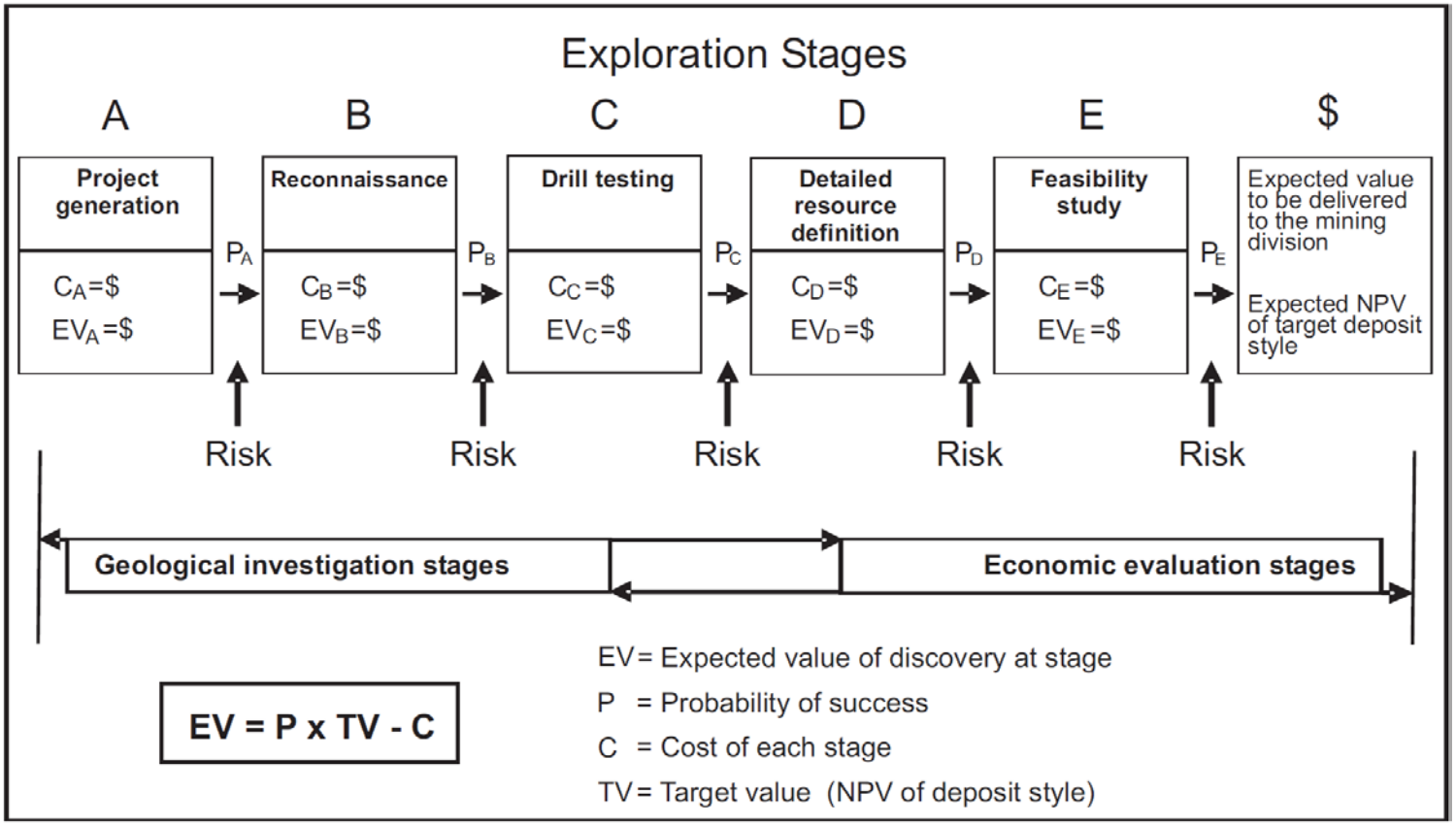


FIG 1 - Schematic diagram of the Geological Risk Method (after Lord *et al*, 2001).

Geological Risk Method

Risk probability P = P1 × P2 × P3 × P4	
P1 Source	
The source for the area is not well defined or differentiated, and there is extensive evidence of mineralisation in the region, so all projects were given the value one.	
P2 Pathway	**Probability assigned**
Very favourable gold bearing structure <3 km	0.9
Moderately favourable gold bearing structure <3 km	0.7
Slightly favourable gold bearing structure <3 km	0.6
Unnamed major structure defined by aeromagnetics	0.6
Unknown/no information	0.5
Structure, but not favourable for gold	0.3
Evidence of no structure	0.3
P3 Fluid	
Presence of near economic drill intercepts	0.9
Significant soil anomaly	0.7
Significant RAB anomaly	0.7
Moderate soil anomaly	0.6
Moderate RAB anomaly	0.6
Unknown/no information	0.5
No significant anomalies – target tested	0.2
P4 Trap	
Within recognised local structures that host deposits	0.9
Within recognised local structures (favourable orientation w.r.t. regional structures)	0.8
Within second/third order structures, favourable orientations	0.7
Evidence for disrupted stratigraphy through faults, folding – within bend or dilational jog add 0.1 (to above values)	0.6
Favourable lithology and/or rheology contrast	0.6 - 0.7
Unknown/no information	0.5
Lies outside second/third order structures	0.3 - 0.4

Metal Transaction Ratio (MTR)

- Valuation of properties with more than one metal in the mineral resources (polymetallic deposits)
- Metal Transaction Ratio (MTR) is the ratio of the transaction value to the gross in situ “dollar content” of all metals in the resource
- Gross in situ “dollar content” uses metal prices as of the transaction date
- Analogous to $ per unit metal expressed as % of metal price

Yardstick / Rule of Thumb Method

Under the yardstick method of valuation, specified percentages of the spot price is used to assess the likely value. Commonly used yardstick factors as applicable to gold are:

- Measured Resources - 2% to 5% of the spot price
- Indicated Resources - 1% to 2% of the spot price
- Inferred Resources - 0.5% to 1% of the spot price
- Exploration Targets - <0.5% of the spot price

Valuation of Mineral Resources

Use comparable properties for valuation:

- Same commodity, e.g. gold, uranium, copper
- Same political jurisdiction
- Similar geological setting
- Similar mineral deposit type
- Similar size and grade of resource
- Similar stage of exploration or development

Determine $/unit metal for market comparables:

- Analyse transaction terms to get property value
- Calculate units of metal in mineral resource estimate
- Calculate $ per unit metal, e.g. $/oz Au, $/lb U_3O_8 or $/lb Cu

Analyse $/unit metal values to determine an appropriate range of values for the subject property.

Valuation of Producing Assets

Most commonly used methods are:

- Discounted Cashflow (DCF)/ Net Present Value (NPV Model)
- Real Options
- Comparable Transactions
- Option Agreement Terms

Conclusion

- Investors have access to an array of public information
- Inconsistent use of reporting definitions, supporting information/ project assumptions and outcomes may be confusing and even misleading
- Confirming the correct project development context is essential for assessing the risk, opportunity, relative confidence and value associated with a resource project
- Value of exploration and other non-producing mineral properties lies in their potential for hosting a viable mining operation

Conclusion

- Comparable transactions method works reasonably well using properties similar to the subject property
- Technical experience and judgement is a critical requirement for valuation of non-producing mineral properties
- Mineral property asset value is but one component of the value of a mining company and the share price

SRK Key Personnel - Valuations

Jeames McKibben, BSc Hons, MBA, Chartered Valuation Surveyor (MRICS), MAusIMM(CP), MAIG – Principal Consultant

Jeames McKibben is an experienced international mining professional having operated in a variety of roles including consultant, project manager, geologist and analyst over more than 24 years. He has a strong record in mineral asset valuation, project due diligence, independent technical review and deposit evaluation. As a consultant, he specialises in mineral asset valuations and Independent Technical Reports for equity transactions and in support of project finance. Jeames has been responsible for multi-disciplinary teams covering precious metals, base metals, bulk commodities (ferrous and energy) and other minerals in Australia, Asia, Africa, North and South America and Europe. He has assisted numerous mineral companies, financial, accounting and legal institutions and has been actively involved in arbitration and litigation proceedings. Jeames is a current member of the VALMIN Committee.

Caue Araujo, BSc (Geology), MBA (Project Management & Finance), MAusIMM – Principal Consultant

Caue Araujo is an experienced mining professional with skills and experience encompassing geology, commercial leadership, mining finance and investment strategy, mineral economics, economic modelling and project management. Caue has participated in mining project evaluations and technical due diligence (Mergers & Acquisitions), and Mineral Resource/Ore Reserve audits

(NI 43-101, JORC, VALMIN and US SEC). He has prepared independent technical reports, exploration valuations and global strategic geological exploration assessments across a range of geological environments and commodities. Most recently Caue held the roles of Global Iron Ore Industry Director at the Australian Mineral Economics Group (AME) and General Manager SRK Consulting Brazil. He has in-depth knowledge of technical and commercial aspects of the iron ore industry, and significant exposure to other base metal, precious metal and industrial mineral deposits in Australia, Brazil, Canada, Africa and Russia. Prior to consultancy, Caue gained experience in iron ore open pit grade control, brownfield exploration target generation, geologic 3D modelling, long-term planning and ISO quality internal audits while working for Vale S.A. in Brazil.

Steve Gemell, BE (Mining) (Hons), FAusIMM(CP), MAIME, MMICA – Corporate Associate Consultant

Steve Gemell is a professional mining engineer with over 40 years' experience, having worked throughout Australasia and in North and South America, Africa, Asia, Europe and Oceania. He has been Principal of Gemell Mining Engineers, a multi-discipline consultancy, since its formation in Kalgoorlie in 1984. His experience includes operational management from shift boss to resident manager level, and supervision of open pit and underground mines, and CIP/CIL, flotation and alluvial processing plants. He has subsequently held executive and non-executive directorships, including the positions of CEO and Chairman, in numerous listed mining and exploration companies, and was for some years a Visiting Fellow at the University of New South Wales.

SRK Key Personnel - Valuations

Anthony Stepcich, BEng (Mining), MSc (Mineral Economics), GDip (Finance & Investment), Dip (Technical Analysis), FAusIMM(CP) – Principal Consultant

Anthony Stepcich is a Mining Engineer with 22 years' experience in the mining industry, having gained both underground and open-pit metalliferous experience, and open-pit coal experience. Anthony has postgraduate qualifications in finance and economics. He specialises in open-pit design and scheduling and project evaluations. Anthony is a Competent Person for the reporting of Ore Reserves in accordance with JORC Code (2012). Anthony is also an Expert in accordance with the VALMIN Code (2005) for the public reporting of valuations across multiple commodities. Anthony has experience working in Australia and Indonesia.

Karen Lloyd, BSc(Hons), MBA, FAusIMM – Associate Principal Consultant

Karen Lloyd has more than 20 years international resource industry experience gained with some of the major mining, consulting and investment houses globally. She specialises in Independent reporting, mineral asset valuation, project due diligence, and corporate advisory. Karen has worked in funds management and analysis for debt, mezzanine and equity financing and provides consulting and advisory in support of project finance. She has been responsible for multi-disciplinary teams covering precious metals, base metals, industrial minerals and bulk commodities in Australia, Asia, Africa, the Americas and Europe.