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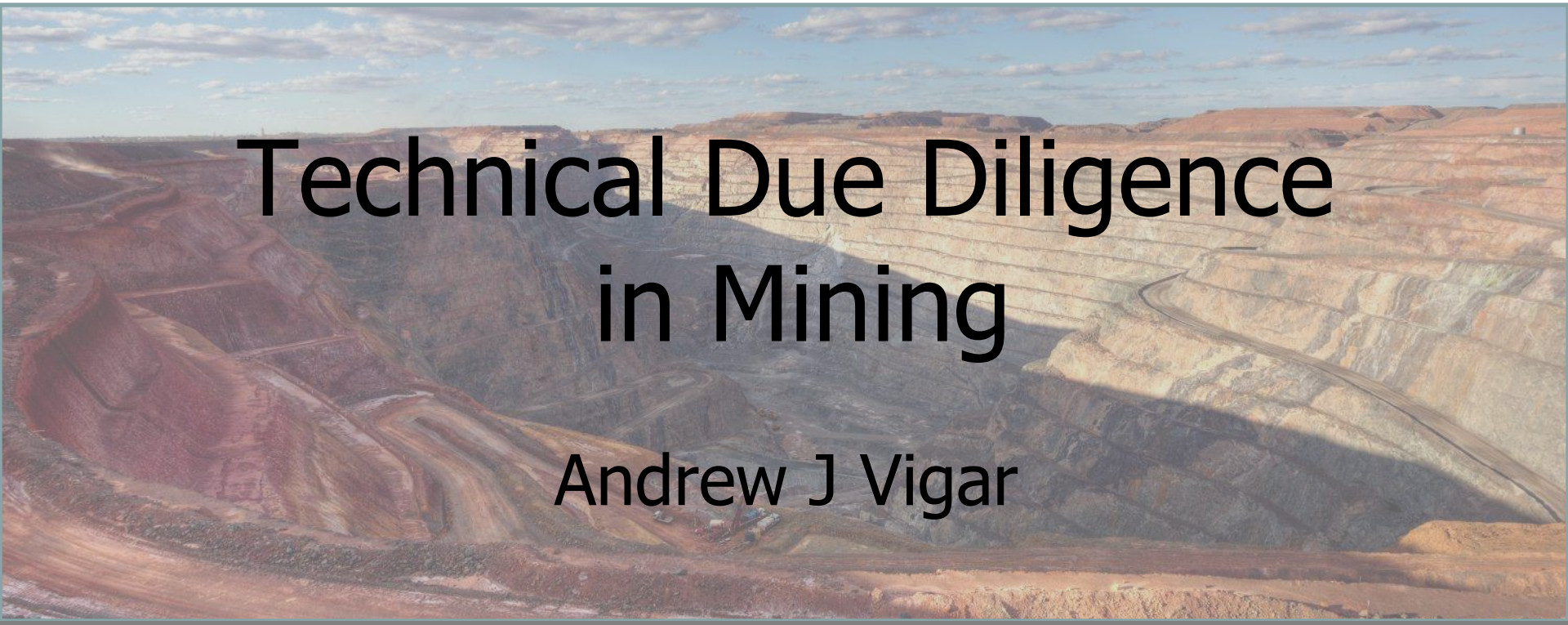

Technical Due Diligence in Mining

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Independent Report needed ?

- Stock Exchange investors require specialist advice in mining
- Keep the market informed
- Capital raisings for development
- Capital raisings for exploration
- Fraud and misleading promotions forced exchanges to regulate
- Internally, e.g. to assist in valuing of assets
- Need to be completed by a respected consulting

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Methodology

- Review previous audit material.
- Site based audit:
  - Collect and review site data
  - Selected audit of key data
  - Answers to prepared questions
  - Interviews with Mine Staff
- Evaluate and compare data.
- Complete report draft for company review of factual content.

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Agreed Scope

- Purpose of the report.
- Extent of responsibility of the Specialist.
- Clearly understood and agreed by both parties in writing.
- Scope and budget reflect the purpose.
- Team of suitable standard and approved.
- Variations agreed at the time in writing.

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Attitude

- Determine the purpose for which the resource estimates have been made.
  - Estimates made for short-term planning in a long established mine are often conservative.
  - Estimates in a feasibility study for a green-fields operation are often optimistic.
- A touch of cynicism is recommended as a survival instinct during the Due Diligence process.

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Technical Due Diligence Topics

- Geological Setting
- Mineralisation Styles, Ore Types and Controls
- Resource Estimates
- Mine Design, Production Schedule & Reserves
- Metallurgical Testwork
- Capital and Operating Costs
- Cash Flow Projections, NPV and IRR
- Social and Environmental
- Government and Right to Operate

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Mine Site Review

- Staffing & technical support
- Deposit geology
- Exploration programs
- Estimated deposit estimation
- Reserve conversion & estimates
- Grade & blend control
- Plant performance
- Reconciliation & closure

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Check List

- Checklist of technical issues to be addressed.
- Agreed between the Financier and Specialist as part of the initial project brief.
- Forwarded to the Miner well in advance of the site visit.
- Miner has time to prepare the technical supporting information for examination.
- Give examples of the required data and format.

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Background

- Project history, location
- Regional & deposit geology
- Deposit style, similar deposits local & world-wide
- Likely ore controls, Genesis concepts

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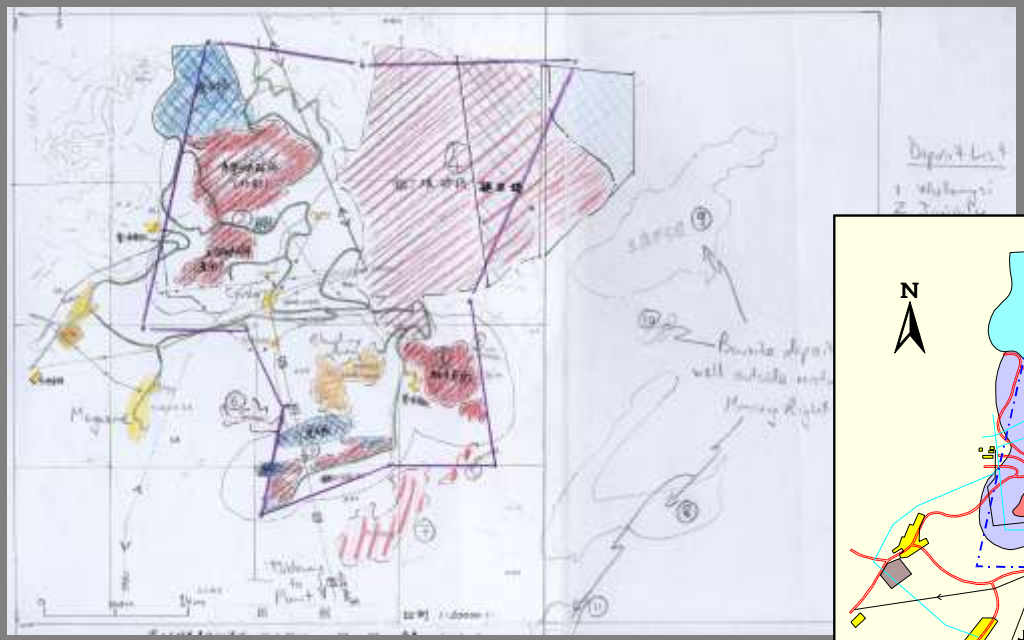
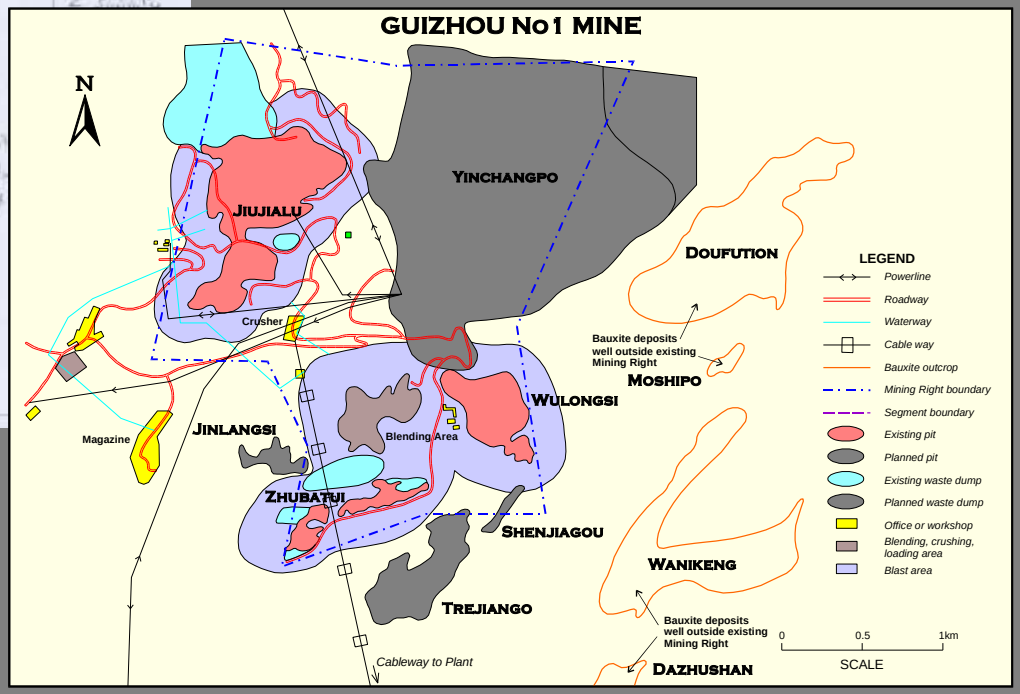
Example of Site Plans





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Project Staff

- Levels, management, documentation, overlap
- Live models, rock boards/specimens, academic back-up
- Experience, contacts, depth, enthusiasm, thinking

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Procedures & Records

- Documentation, execution, QA & ISO, audit trail
- Grids, surface samples, drill collars & down-hole
- Notebooks, maps, date/time, location, persons
- Exposure, lithology, structure, oxidation, alteration, mineralisation, structure.

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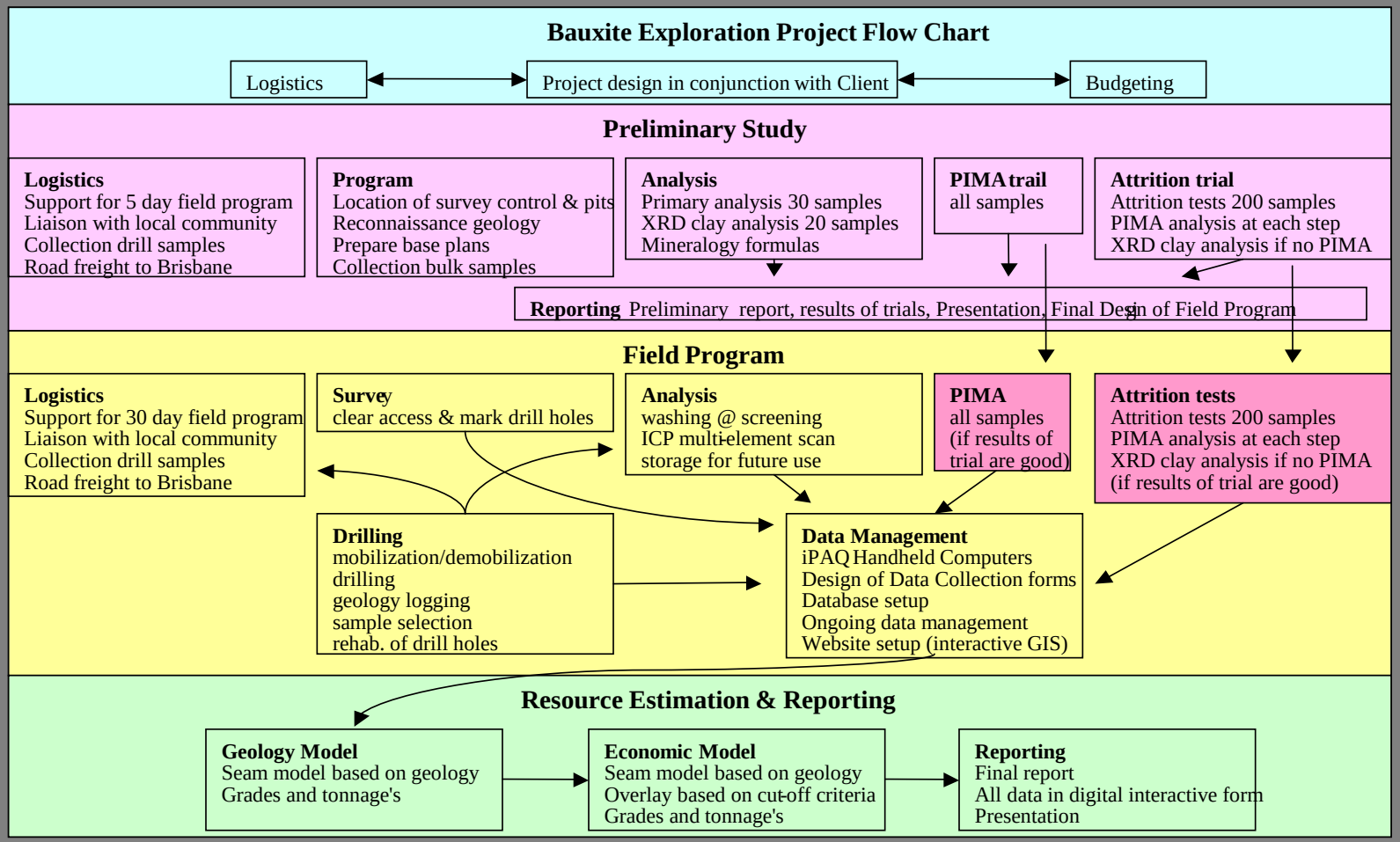
Clear Procedures



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Drilling and Sampling 1

- Procedures, documentation, responsibility
- Planning, authorisation, team activity
- Drilling conditions, companies, sample/core handling
- Types, hole sizes, drill campaigns
- Sample storage, documentation, security
- Sample recovery, loss and voids
- Lithology, alteration, mineralisation
- Structure

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Drilling and Sampling 2

- Weathering & oxidation, original vs post collection
- Tonnage factors, voids, core loss
- Metallurgical characterisation
- Geotechnical, RQD, fractures, point load, hardness
- Geophysics, down-hole, MagSus
- Sampling methods, data collection, validation, box marks
- Field records, thought & not just codes, team access

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Examples of Core Storage

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Database 1

- Field data to DB, methods, validation, authority
- Updates, audit trail, authority
- Types, access, KISS, back-ups, multiple locations, hard copy
- Map data
- Drill data

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Database 2

- Sample data, sample security, prep., analysis methods, lab independence, duplicates & standards, data transfer
- Interpretations, knowledge capture, data is not knowledge
- Plans & sections

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Data Verification

- Surface & underground type mapping
- Selected drill hole re-logs, sampling & assay if required

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Geology Models

- Fact vs Interp, Maps & sections, 3D thought
- Lithology, alteration, mineralisation, structure, oxidation, Met
- Regional context but local detail
- Concept of key mineralisation controls and sequence

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Resource & Reserves 1

- Procedures, documentation, responsibility
- Staff, mine/project experience
- Updates, audit trail, authority
- Data used, mixed types, data density & spatial variations, support
- Methods used, full documentation sufficient to reproduce
- Data projection, volume variance, smoothing, blanks
- Spatial changes in levels of data & knowledge

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Resource & Reserves 2

- Based on coherent geology model
- Geological/structural controls honoured, domains, constraints
- Other factors, eg Metallurgical, blasting, waste types
- Mining & treatment methods and costs
- Validation, checks with other methods, global estimates
- Plans & sections showing raw data, geology models & estimates

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Resource & Reserves 3

- Raw data vs estimates, against geology models, realistic
- Grade – tonnage variations, spatial variations, weathering
- Resource categories, why, support, makes sense

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Grade Control & Reconciliation

- Similar issues to resource estimation
- vs production, vs other estimates, vs previous estimates
- Grade control vs resource estimates
- Trends, projections, changes in geology

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Environment

- Impact, closure & rehabilitation

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Resource estimate is the key

- The Resource base is often stated at a lower cut-off than the reserve.
- The resource is largely fixed by the Feasibility Study stage, yet this has the largest impact.
- There is considerable scope with the advanced computer techniques currently available to seriously distort the grade/tonnage profile of a deposit, just are there powerful techniques available to get it right.

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International Systems

- Australian JORC
- Australian Valmin Code
- Canadian NI43-101
- SAMREC
- CRIRSCO
- UN UNFC
- General agreement on Resources, Reserves and Competent Person
- US SEC Guide7 – Reserves only

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JORC Code Requires

- Minimum for reporting Resources & Reserves
- Transparency
- Data and Assumptions
- Missing or inadequate data
- Resource has reasonable expectation of eventual economic exploitation
- Conversion of Resource to Reserves
- Personal responsibility - Competent Person
- Has some Limitations

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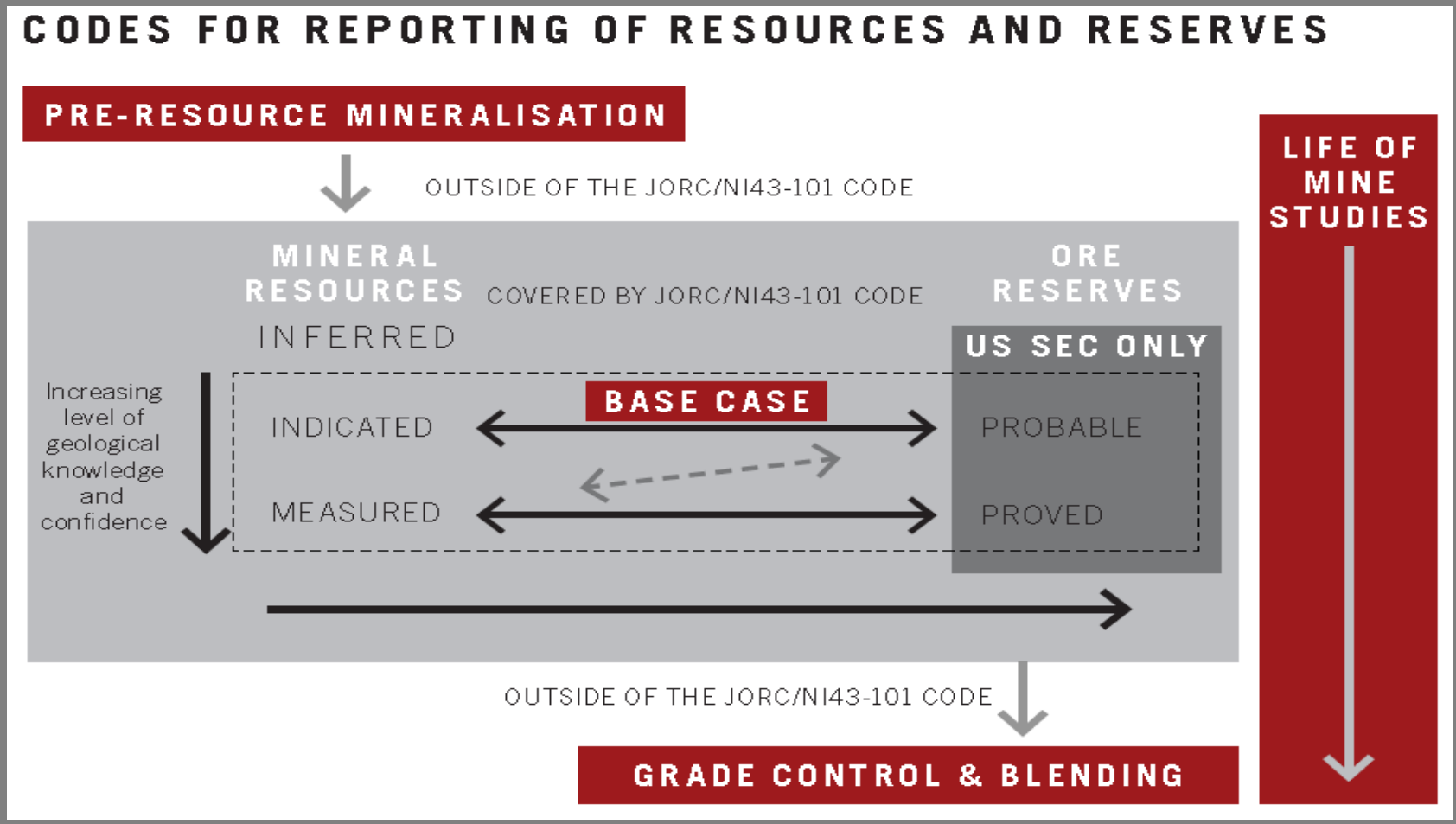
JORC Code & Beyond



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Estimation Issues

- A poor understanding of the geological controls will always lead to a poor resource estimate.
- Simple techniques such a polygonal estimation may highlight the strength of underlying geology knowledge.
- The over-estimation of grade is worse for the project than under-estimation but both are bad in that neither truly reflect the actual cash-flows.
- Have multiple methods been used and compared.

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Cut-off Grade

- Should be realistic and achievable
- The sensitivity of the estimates to changes
  - grade/tonnage curves
  - plans and sections of changes
- The Specialist will be required to comment whether the chosen mining method and costs reflect the chosen mining method.

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Reserves with time

- Variation of the resources and reserves with time
- Major milestones of the project
- Use a time-line chart
  - major changes in all areas the project milieu
  - not just the hard technical issues of the mine production team.

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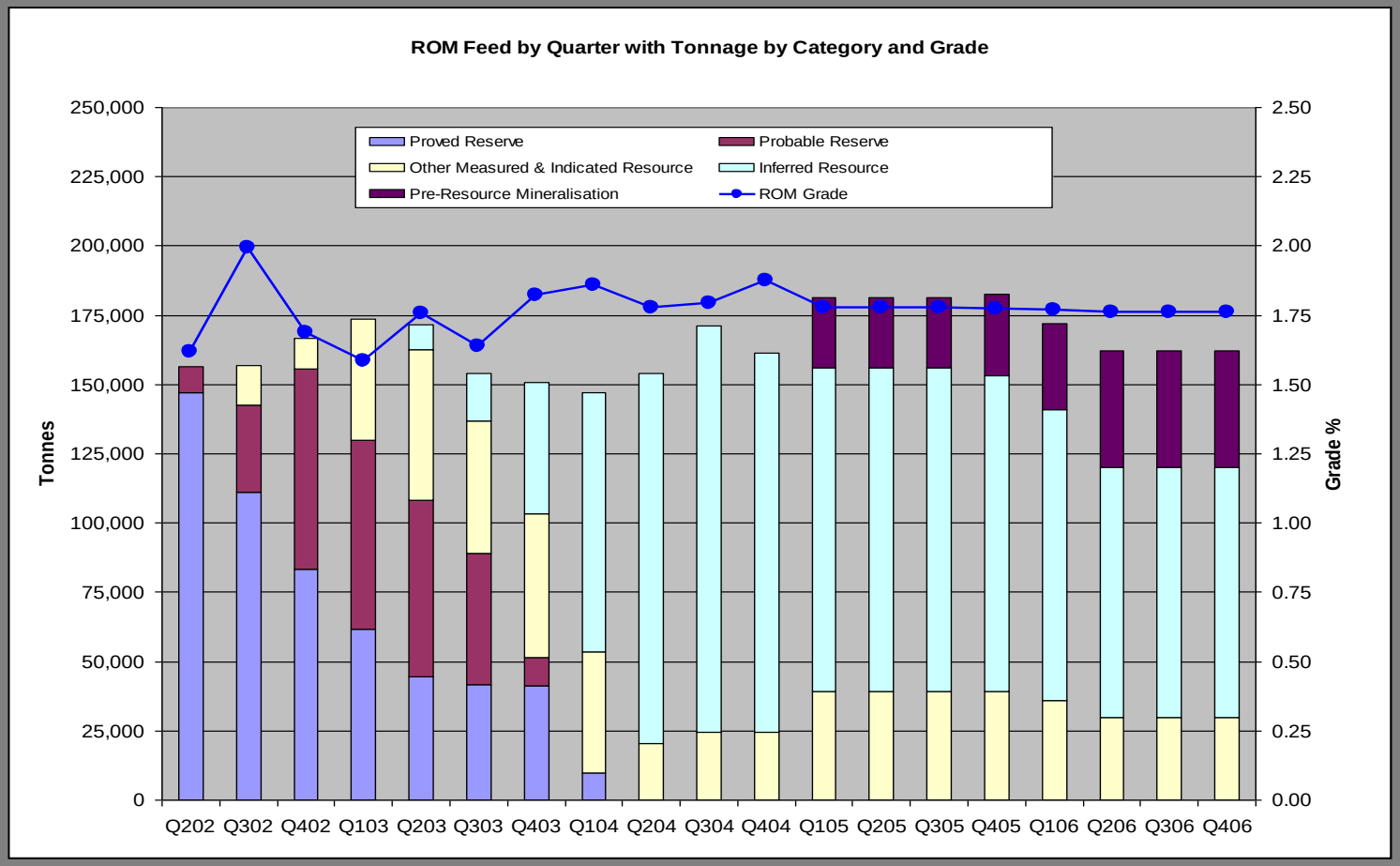
Ore Feed vs time



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Sensitivity and Risk

- Look at the likely range of values of the reserves rather than just state a single figure.
- The impact of variations to be tested, eg
  - impact of high values are dealt with (eg top-cutting)
  - grade tonnage curves
  - using different geological domains
  - changing the estimation methods
  - optimization of production plans

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Start-up risk

- A quick cash injection at the start from higher grade or lower cost ore.
- Small changes in the start-up period cash-flow can have a dramatic impact
- Negative impacts from which it will never be able to recover
- There are several recent major projects, which have stumbled at this first hurdle and thus completely removed their ability to ever repay the original debt.

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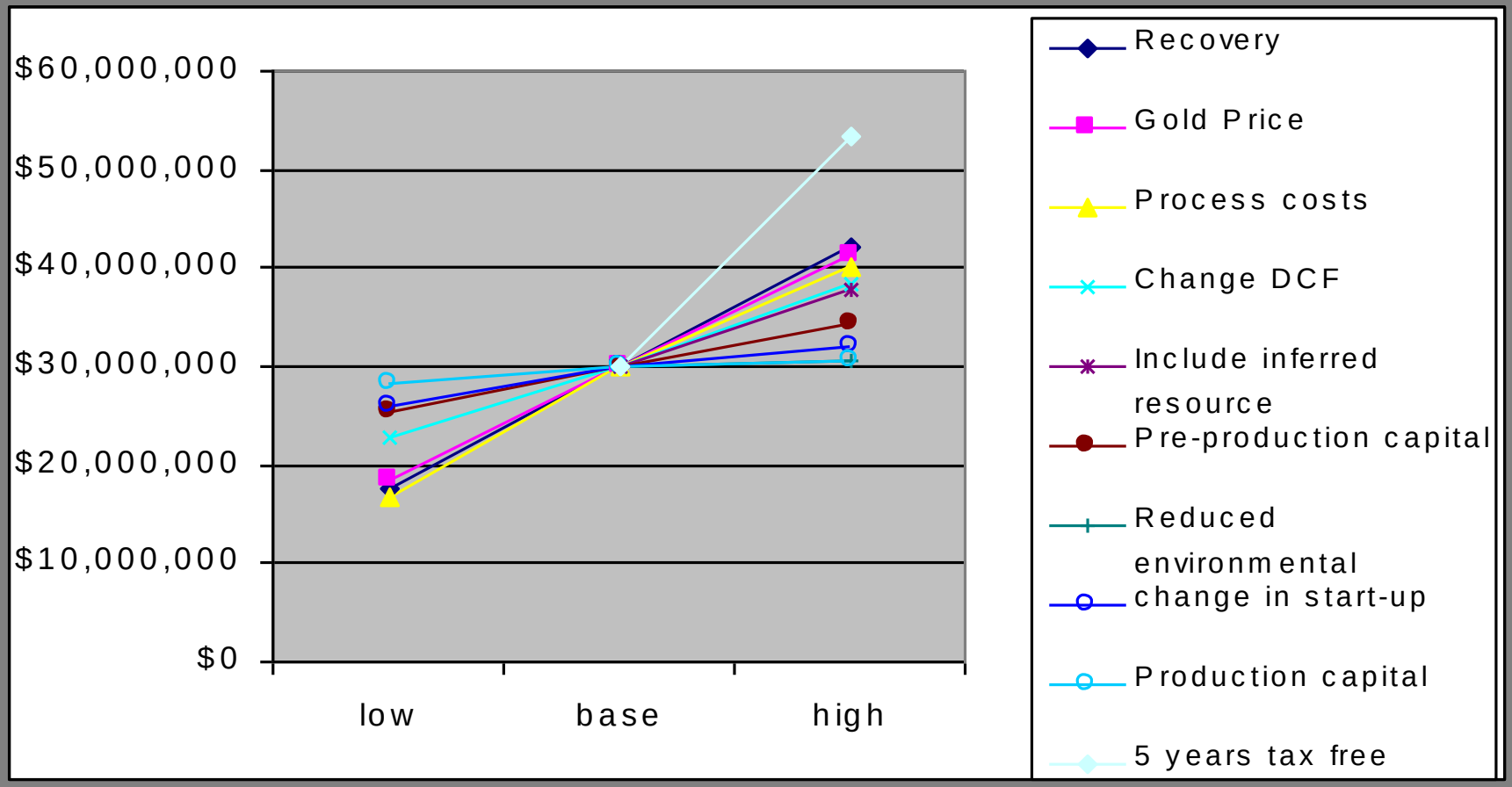
Sensitivity plot



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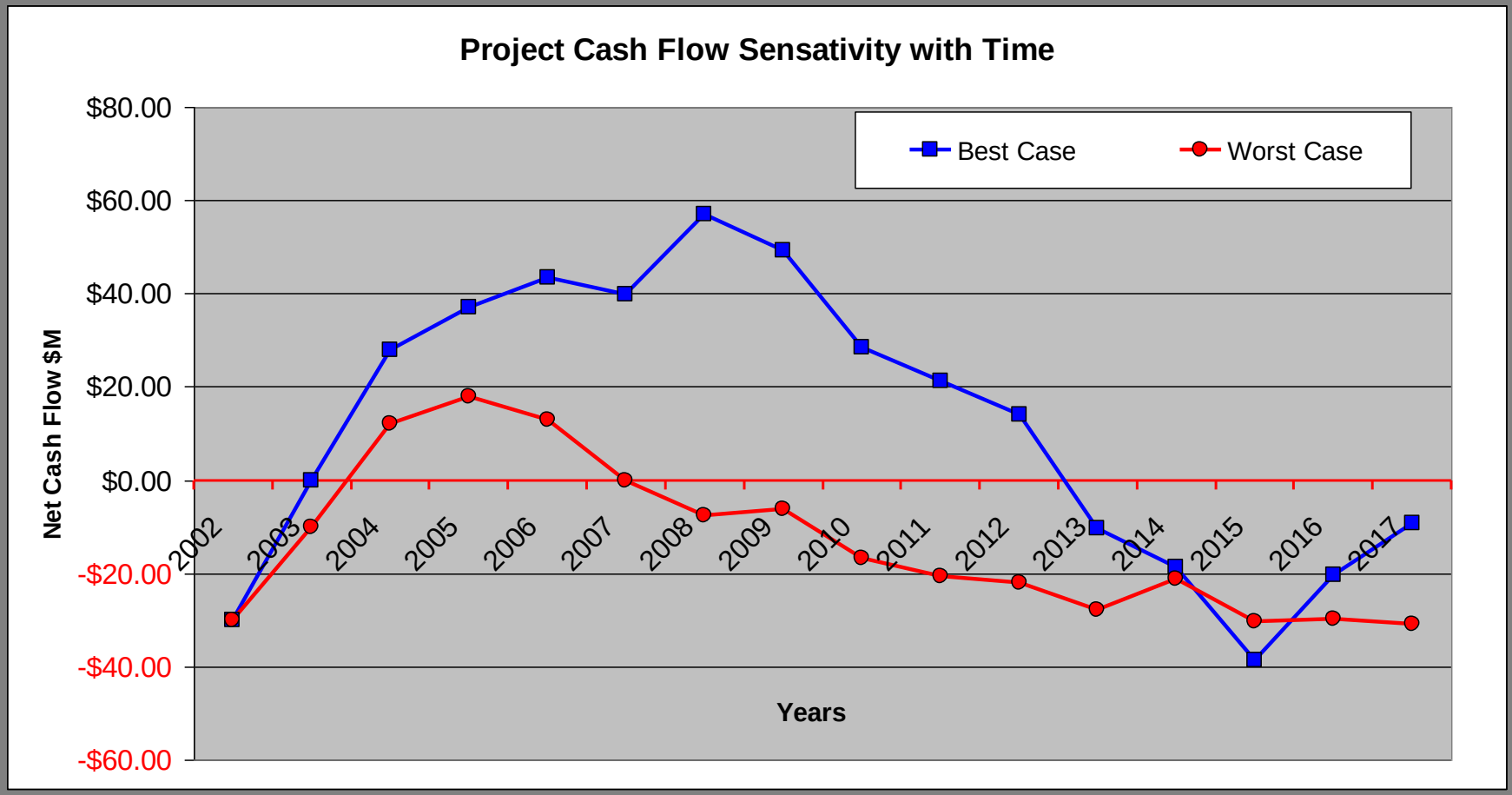
Cash Flow Sensitivity with Time



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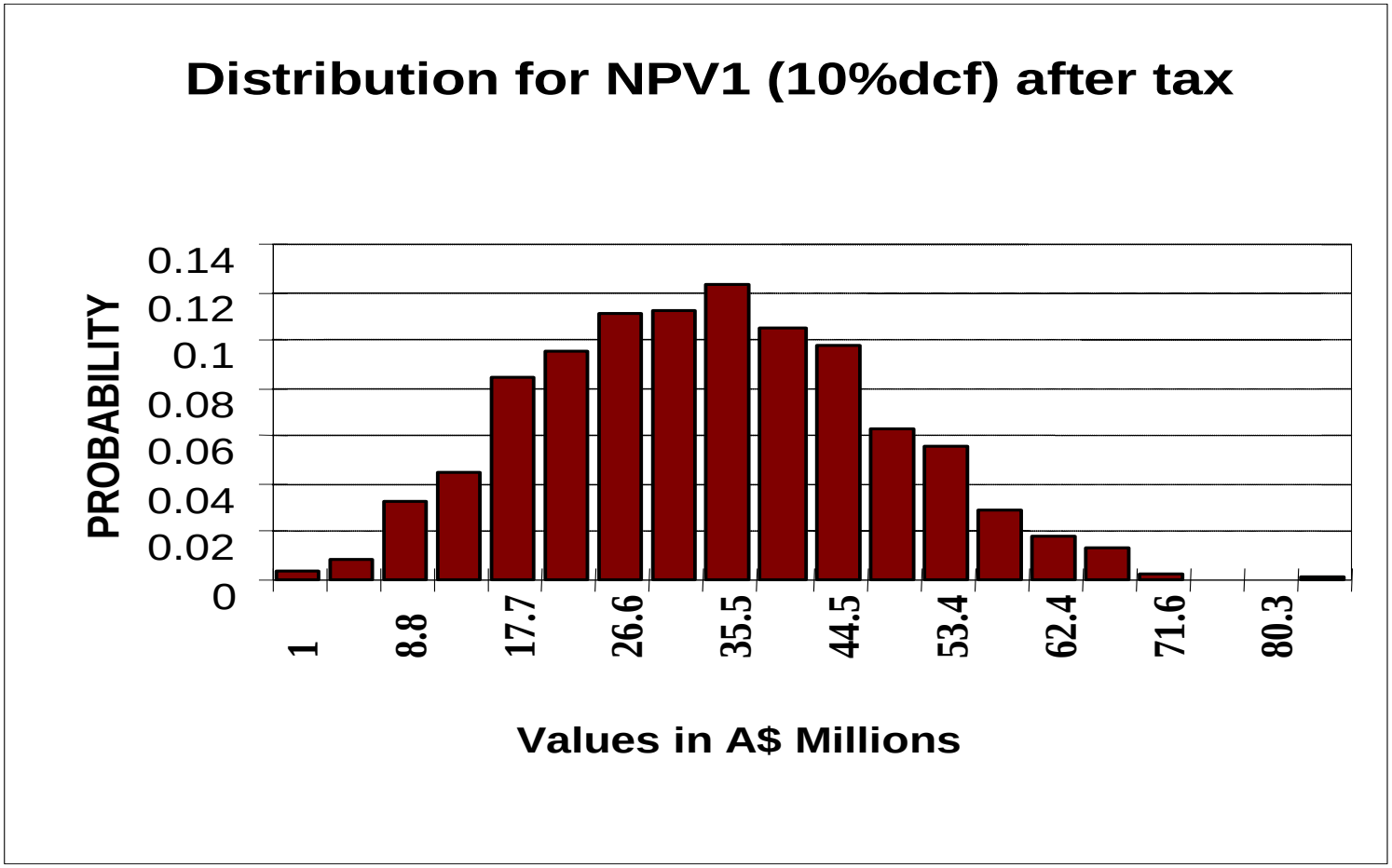
A range of likely outcomes



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Risk is OK

- The Financier is in the business of dealing with risk
- The expression of a reserve in terms of an expected outcome with upper and lower limits is quite acceptable
- The old practice of giving just one number will hide the risk factors
- Risk is not bad, it just needs to be known

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Risk Matrix

#	Risk Event	Likelihood	Consequence	Risk	Comment and Possible Mitigation
1	Geology: Ore Body Interpretation	Possible	Moderate	High	Correlation of veins where there are no old underground workings, in particular California low grade open pit. Requires closer spaced drilling within open pit.
2	Lack of understanding of Geological Controls	Possible	Moderate	High	Understand the geological controls of the ore zone and its related mineralisation so that more accurate and precise modeling can be conducted. This can be done from detailed logging which will then feed into the resource estimate and ultimately mining targets and ground support regimes.
3	Mineralisation may not extend to depth	Likely	Moderate	High	Mineralisation may be restricted at depth with a sudden drop in intensity and grade once below the “boiling zone”. Caution needs to be exercised with projections at depth No RL limit is placed on the current resource estimates. MA would suggest a limit at 100m rl.
4	Grade Capping	Possible	Minor	Moderate	Grade capping applied to informing sample composites is too high in some domains, resulting in over-influence of high grade samples on estimation. Review caps
5	Incorrect Resource estimate methodology distorts the grade tonnage curve	Possible	Major	Extreme	Incorrect estimation methodology according to the geology and statistics can distort the grade/tonnage curve and ultimate resource numbers, hence affecting all subsequent activities leading on to mine development.

Based on AS/NZS 4360:1999

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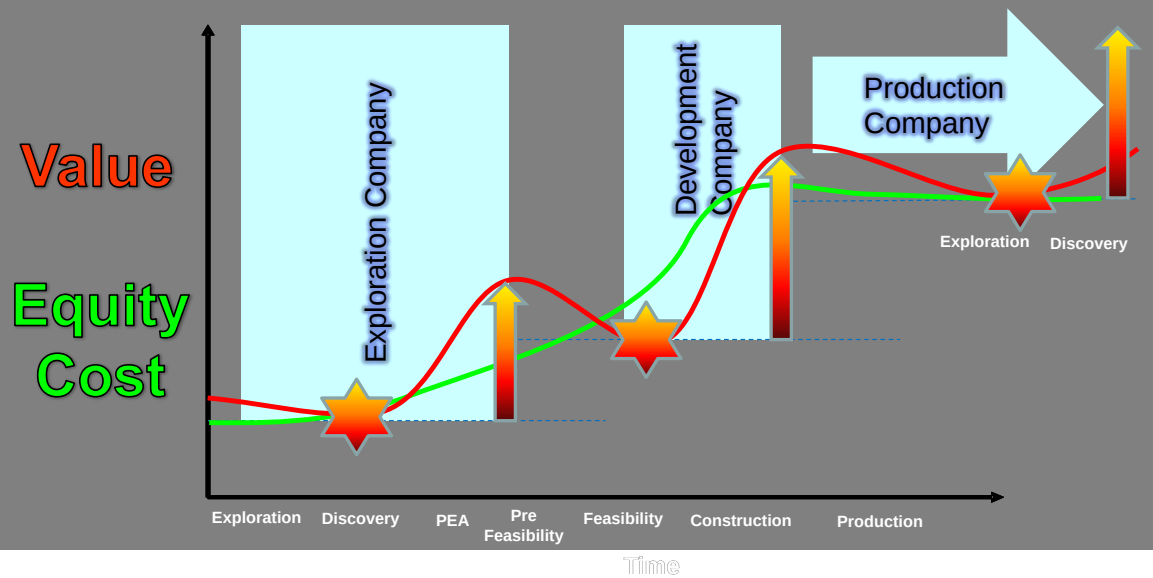
Margins in Mining – Where are they

- What is and is not included in C1 costs
- The real cost of Capital and how to hide it
- Overheads, R&D (incl. exploration) and core values
- Why high commodity prices do not equal high margins
- Value Waves
- Examples



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