

# Where Are We Going In This Hand Basket?

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Where are we going in this hand basket?

## Where Are We Going In This Hand Basket?



# Lawrence Devon Smith

Where are we going in this hand basket?



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Lawrence Devon Smith is Principal Consultant at LDSA. He is a mining engineer with over 40 years experience in economic evaluations and project engineering for mining, metallurgical, and industrial projects. He holds a B.A.Sc. from the University of Toronto and an M.Eng. Mining from McGill University.

Larry has worked as Director Project Evaluations at Barrick Gold and has held similar positions with BHP-Billiton Base Metals, Rio Algom, SNC-Lavalin, Kilborn, Inco, and Vale.

His evaluation experience includes economic evaluations, targeting and ranking studies, scoping studies, optimization studies, pre-feasibility and feasibility studies, risk assessment, and due diligence work for banks and mining companies. Larry has published a number of papers on mineral project evaluation, discount rates, and risk assessment, and is considered an expert in these fields.

Larry teaches mineral project evaluation and mineral economics at the University of Toronto, Schulich School of Business at York University, as well as in-house courses and seminars. He also presents "Introduction to Mining" workshops for investors, management, finance personnel, lawyers, and indigenous peoples.

Larry has been on the executives of CIM Toronto and the CIM Mineral Economics Society (MES). He is the recipient of the CIM Robert Elver award for Mineral Economics, and is a Fellow of CIM and a CIM Distinguished Lecturer.



# Where Are We Going In This Hand Basket?

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Where are we going in this hand basket?

## How Have We Done?

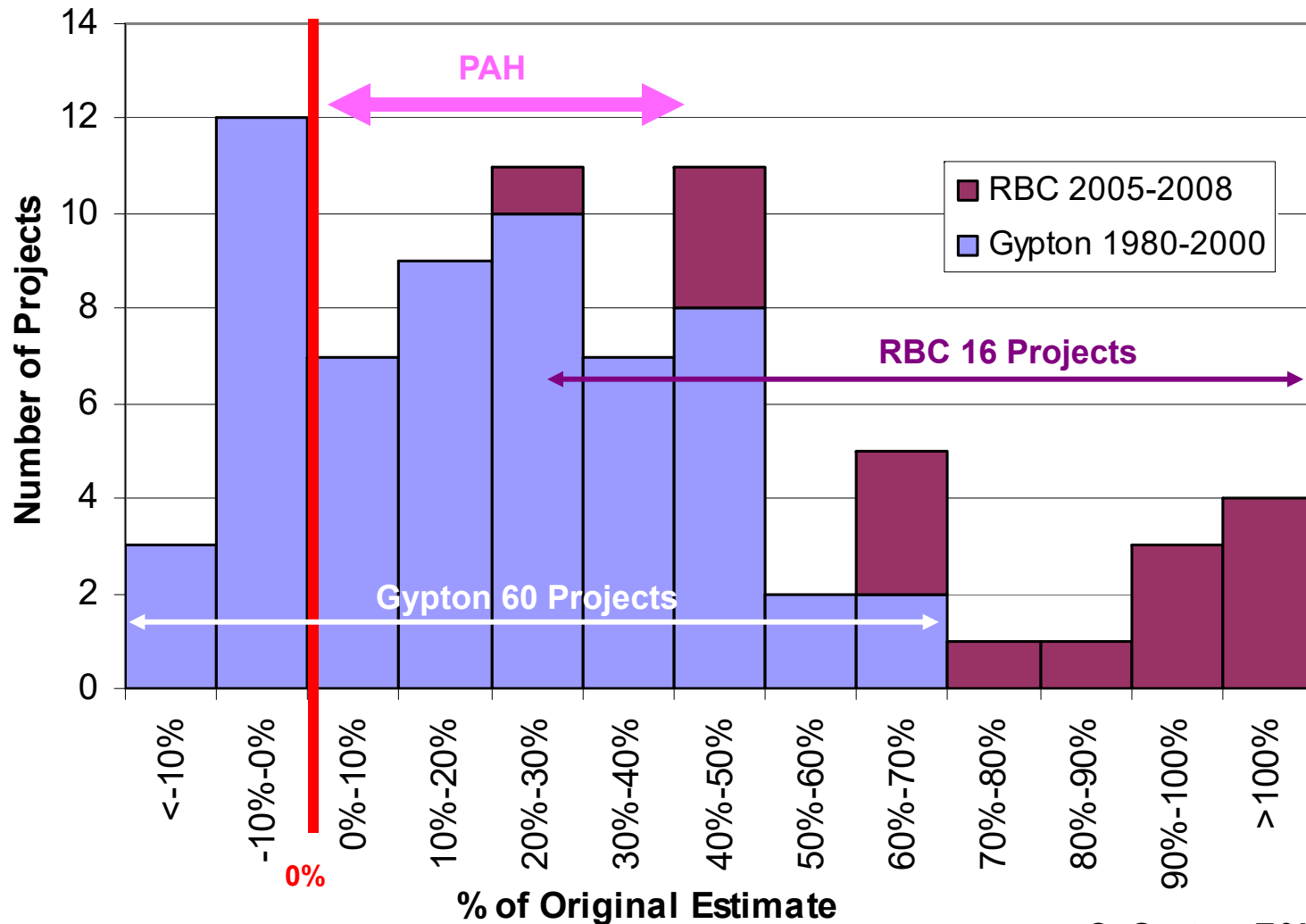


# How Have We Done?

## Feasibility Studies & Capital Performance

4

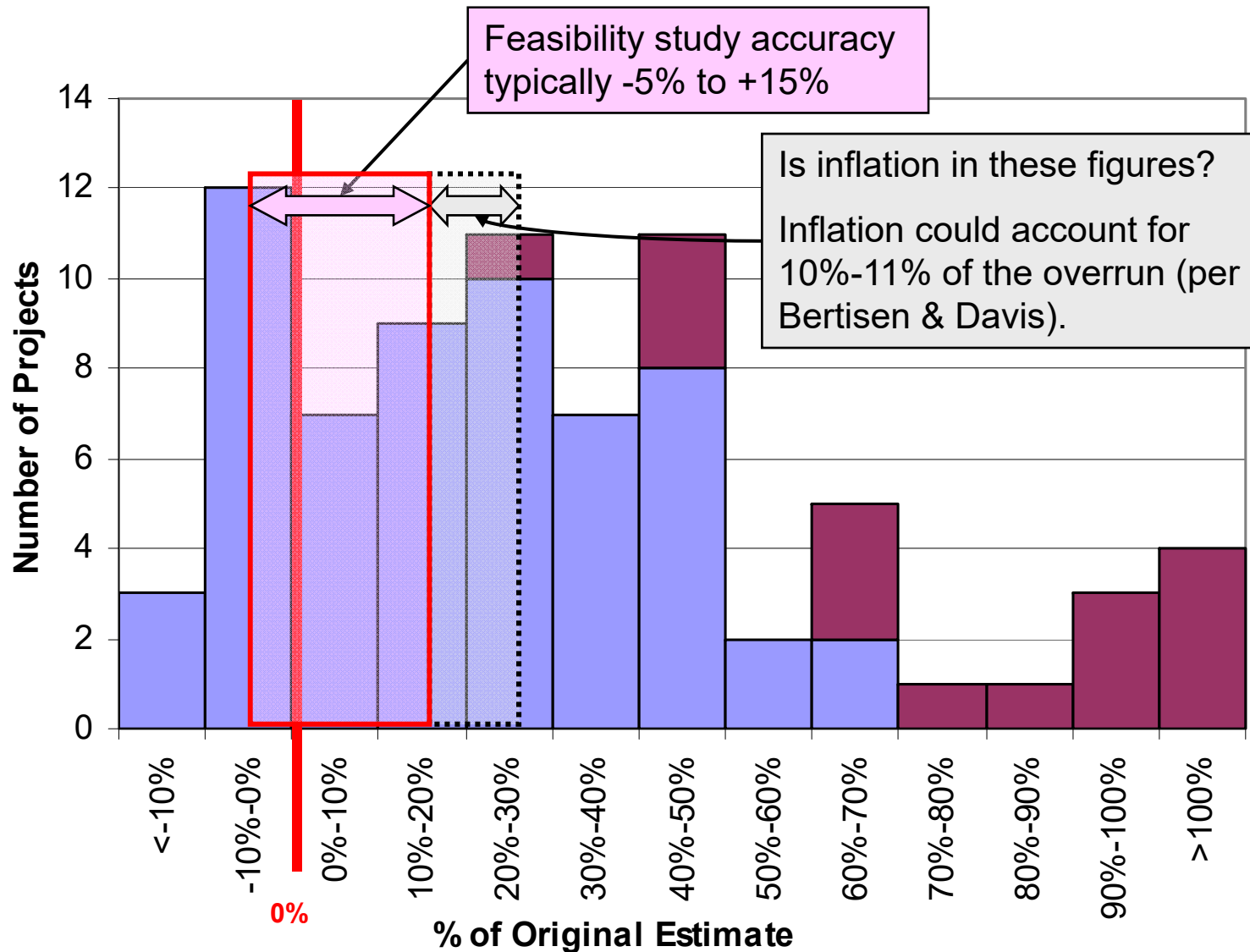
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# How Have We Done?

## Feasibility Studies & Capital Performance

Where are we going in this hand basket?



# How Have We Done?

## Feasibility Studies & Capital Performance

Where are we going in this hand basket?

- Owner Project Management: Gaps in project team experience and skills, insufficient owner participation, and unqualified personnel;
- Estimating: Errors and omissions, untested or faulty assumptions in critical areas, and unqualified personnel;
- Logistics: Inadequate assessment of how to supply the project during development and operations.
- Construction Management: Inadequate or inappropriate staffing levels and unqualified personnel; and
- Site Investigations & Basic Engineering: Inadequate or incomplete investigation, evaluation and interpretation of critical site-specific conditions;
- Limited resources, specifically:
  - limited risk capital
  - limited qualified personnel.
- Limited time:
  - always pressure to produce the study as quickly as possible.
  - artificial deadlines, such as board meetings and presentations to bankers or analysts.



# How Have We Done?

## Feasibility Studies & Capital Performance

Where are we going in this hand basket?

### No association or weak association with percentage capital cost overruns

- ✗ Financing
- ✗ Company size
- ✗ Project size
- ✗ Mining method
- ✗ Infrastructure requirements
- ✗ Power requirements
- ✗ Project location
- ✗ Primary commodity
- ✗ Processing method
- ✗ Project history

### Strong association with percentage capital cost overruns

- ✓ Commodity market “heat” at beginning of construction
- ✓ Integrated design/build teams
- ✓ Project “quality” (IRR, NPV)



# How Have We Done?

## Feasibility Studies & Capital Performance

Where are we going in this hand basket?

- Strong association between capital cost overruns and the following project characteristics:
  - ✓ **Commodity market “heat” at beginning of construction** (as measured by a ratio of trailing commodity basket prices)
    - Hotter markets = larger overruns
    - Cooler markets = smaller overruns
  - ✓ **Integrated design/build teams**
    - Feasibility author same as build (EPCM) team = smaller overruns
    - Feasibility author independent from build (EPCM) team = larger overruns
  - ✓ **Project “quality”** (as measured by feasibility IRR or NPV:CAPEX ratio)
    - Marginal projects = larger overruns
    - Stronger projects = smaller overruns





# How Have We Done?

## Feasibility Studies & Capital Performance

Where are we going in this hand basket?

- After years of work and millions of dollars
- After all those positive press releases
- Can the CEO & board afford to say “No”?



*Delivering Smarter Solutions*

ISSUE NO. 57 — August 2004

***Feasibility Study Does Not  
Necessarily Mean Feasible***

***Sometimes the answer is NO!***



# How Have We Done? Engineering Cost Estimates

10

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Engineer's estimate is  
the cost of  
construction in heaven



# How Have We Done?

## Project Costs and Schedule Overruns

Where are we going in this hand basket?

- **Remoteness**
  - High elevation (usually accompanied by severe weather)
  - Arctic (with severe weather conditions)
  - Third world (accompanied by poor infrastructure and political instability)
  - **Suggest adding up to 50% to costs and schedule.**
- **Unconventionality**
  - New process, construction or engineering concepts.
  - Problems with ramp-up and reaching full capacity.
  - **Suggest adding up to 50% to costs and schedule.**
- **Earthwork**
  - “The devil is in the dirt.”
  - **Suggest adding up to 100% to earthwork capital budget.**
- **Schedule**
  - **Suggest adding ~ 10% to the schedule and increase capital cost by 1% of total project capital for each month of delay (in addition to the effects noted above)**

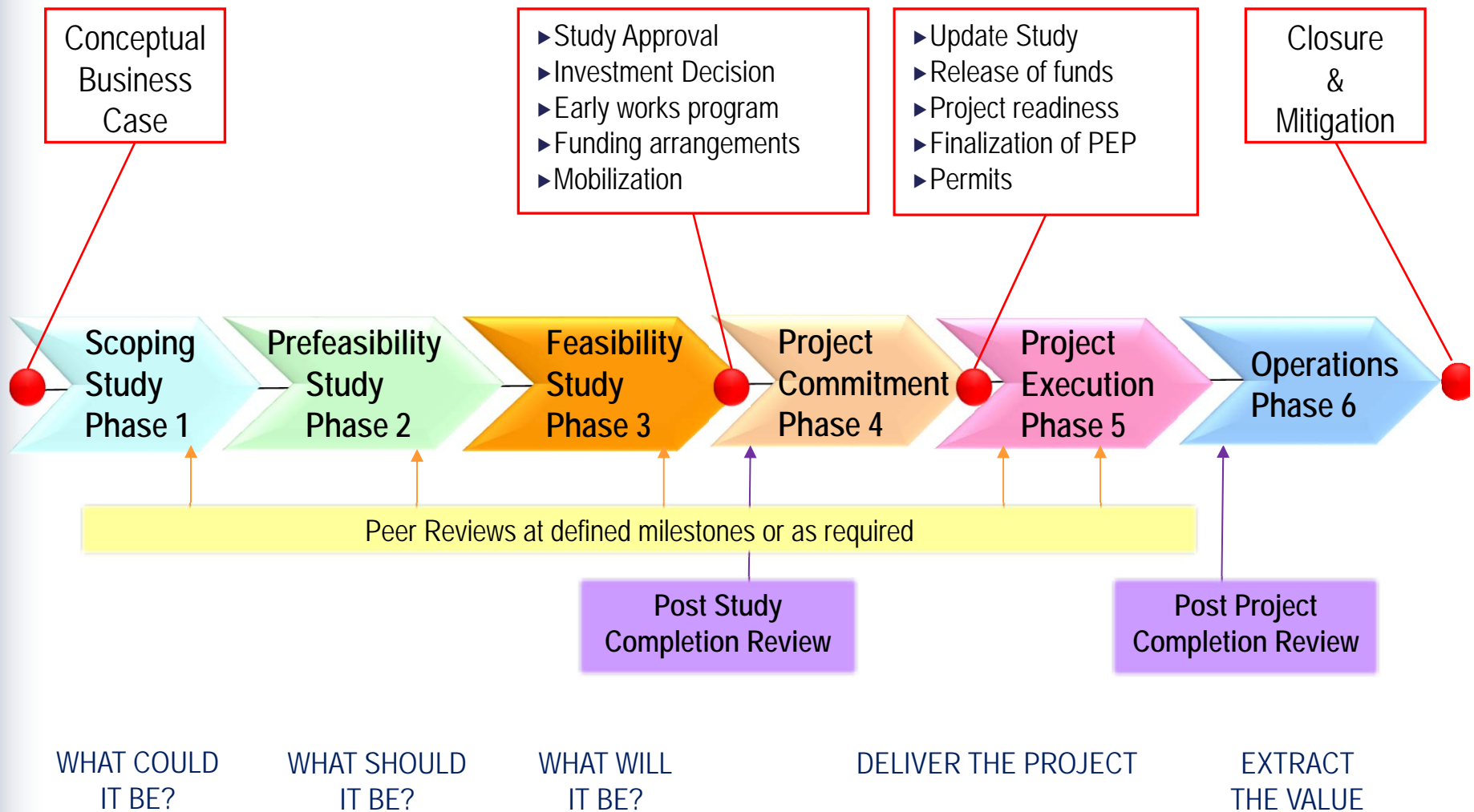


# How Have We Done?

## The Ideal (Idealistic) Phased Approach

12

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# How Have We Done?

## What Is The Value Of “Value Engineering”

Where are we going in this hand basket?

- Value Engineering has become part of the process
- Is it adding value?
- Is it just cutting costs?
- Do the savings actually materialize?

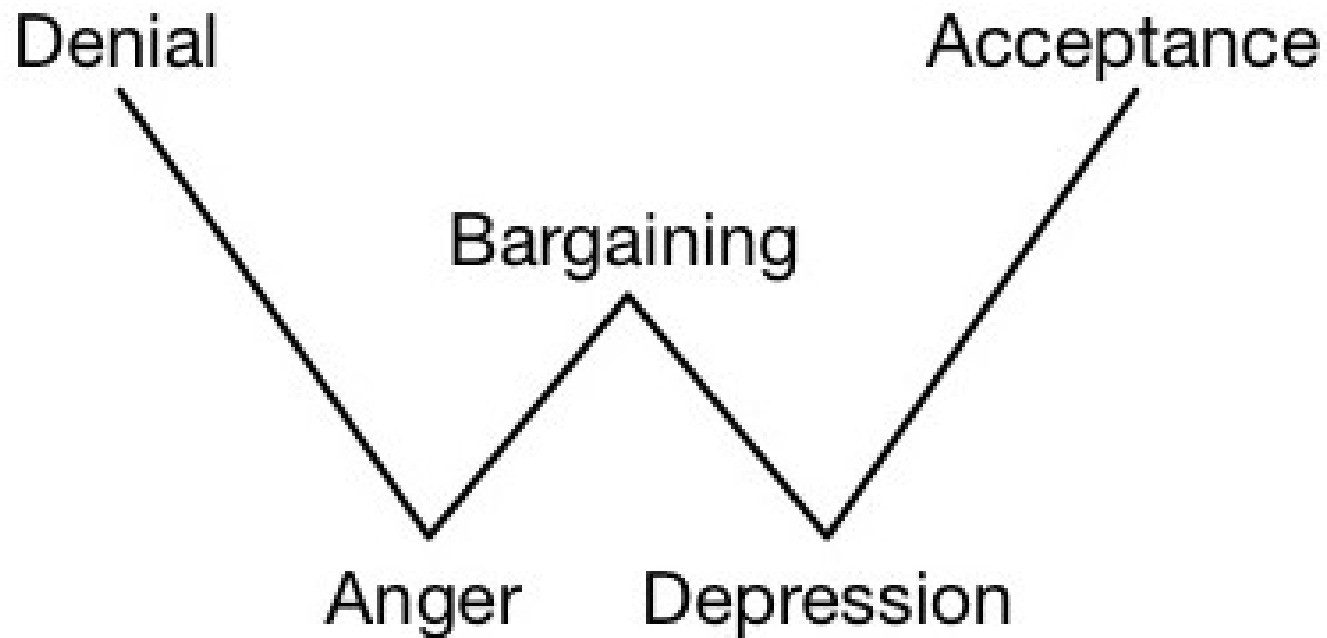


# How Have We Done?

## Elisabeth Kubler-Ross - Stages of Dying

14

Where are we going in this hand basket?

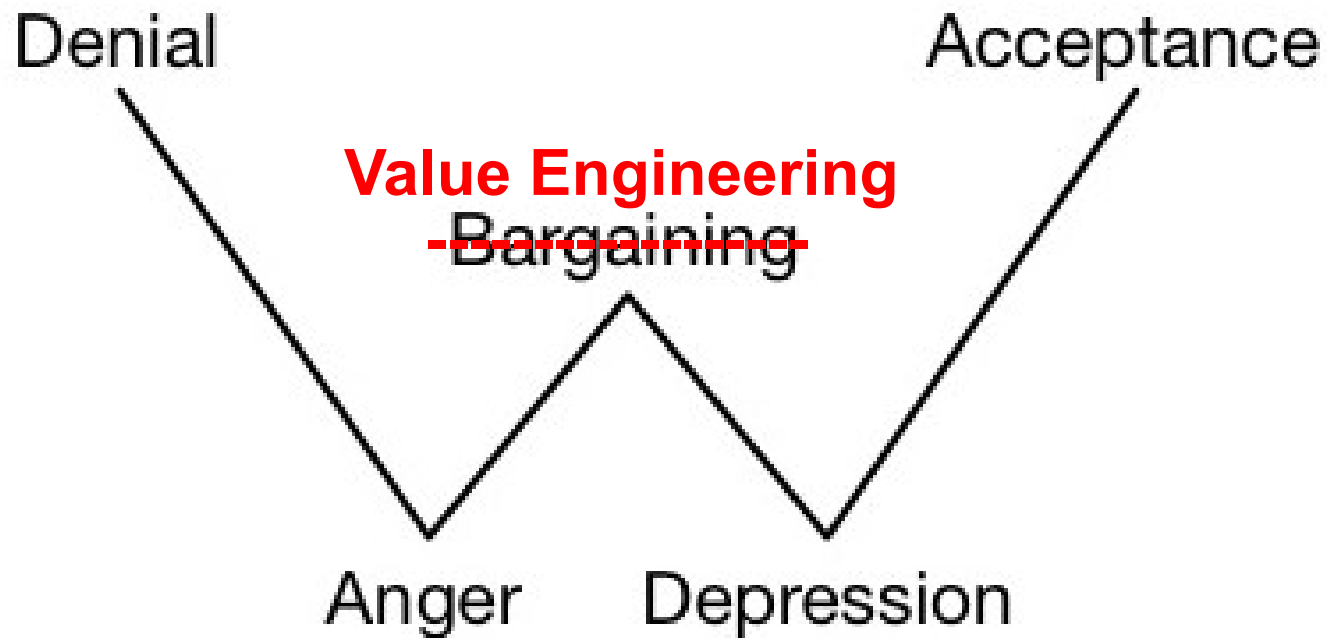


# How Have We Done?

## Stages of A Project

15

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# How Have We Done?

## Re-Risking Project Estimates

Where are we going in this hand basket?

- What risks have been created by “Value Engineering”?
- “Re-Risk” the estimate to get it back to a realistic value:
  - Not just adding back dollars to the estimate.
  - Re-assess the risks associated with the “Value Engineered” estimate.





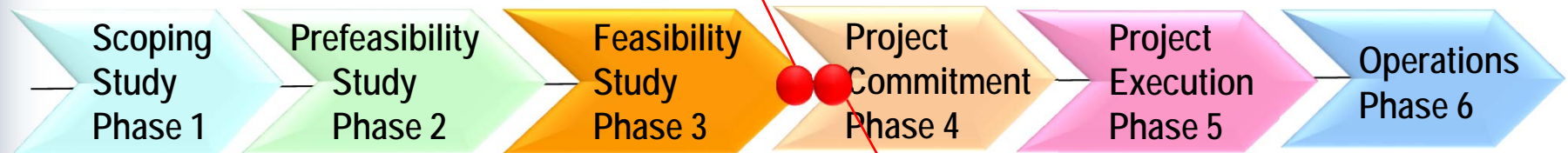
# How Have We Done?

## Phased Approach (With Amendments)

17

Where are we going in this hand basket?

**“Value Engineering”**



**Re-Risking**



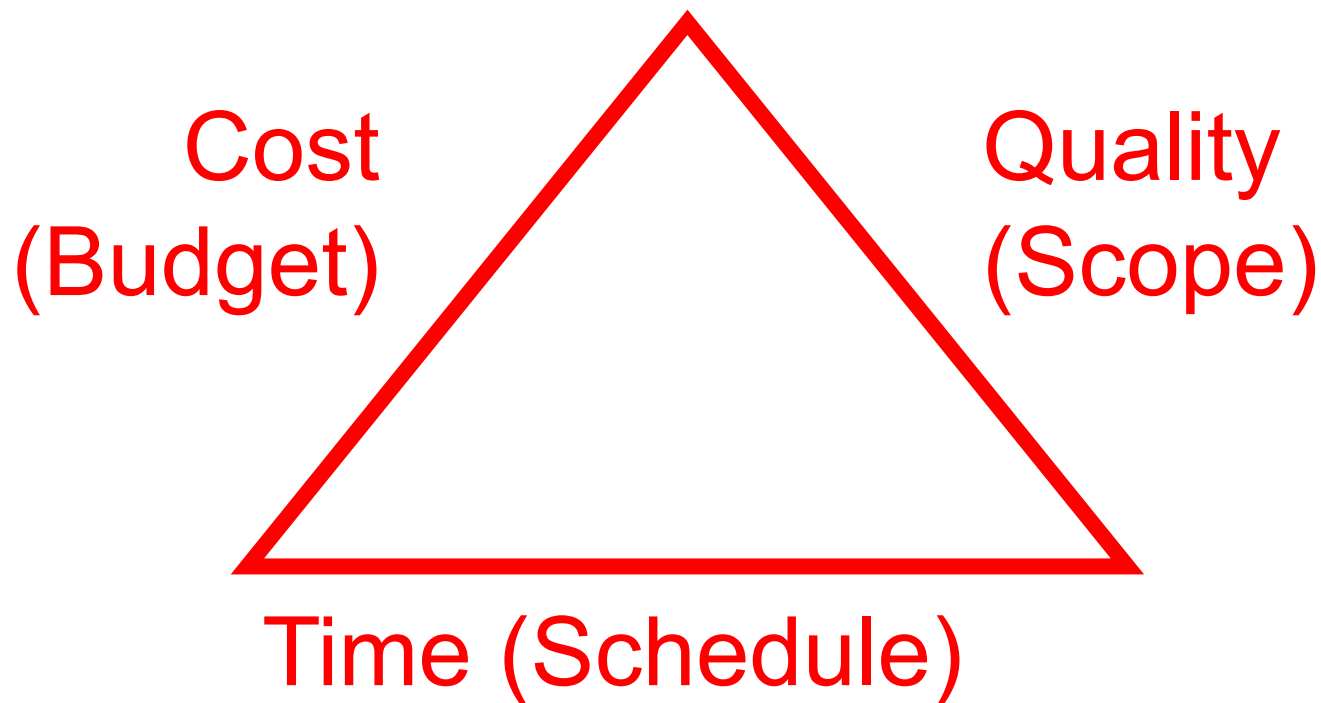
# How Have We Done?

## Monitor And Control Capital Spending

18

Where are we going in this hand basket?

- A model of project management in which time, cost, and quality are represented as the three sides of a triangle. A change to one side will have some effect on at least one of the other two sides.
- **“Cost, Quality, Time - Choose any two”.**



# How Have We Done?

19

## Scope Changes: Original Contract & Change Orders

Where are we going in this hand basket?



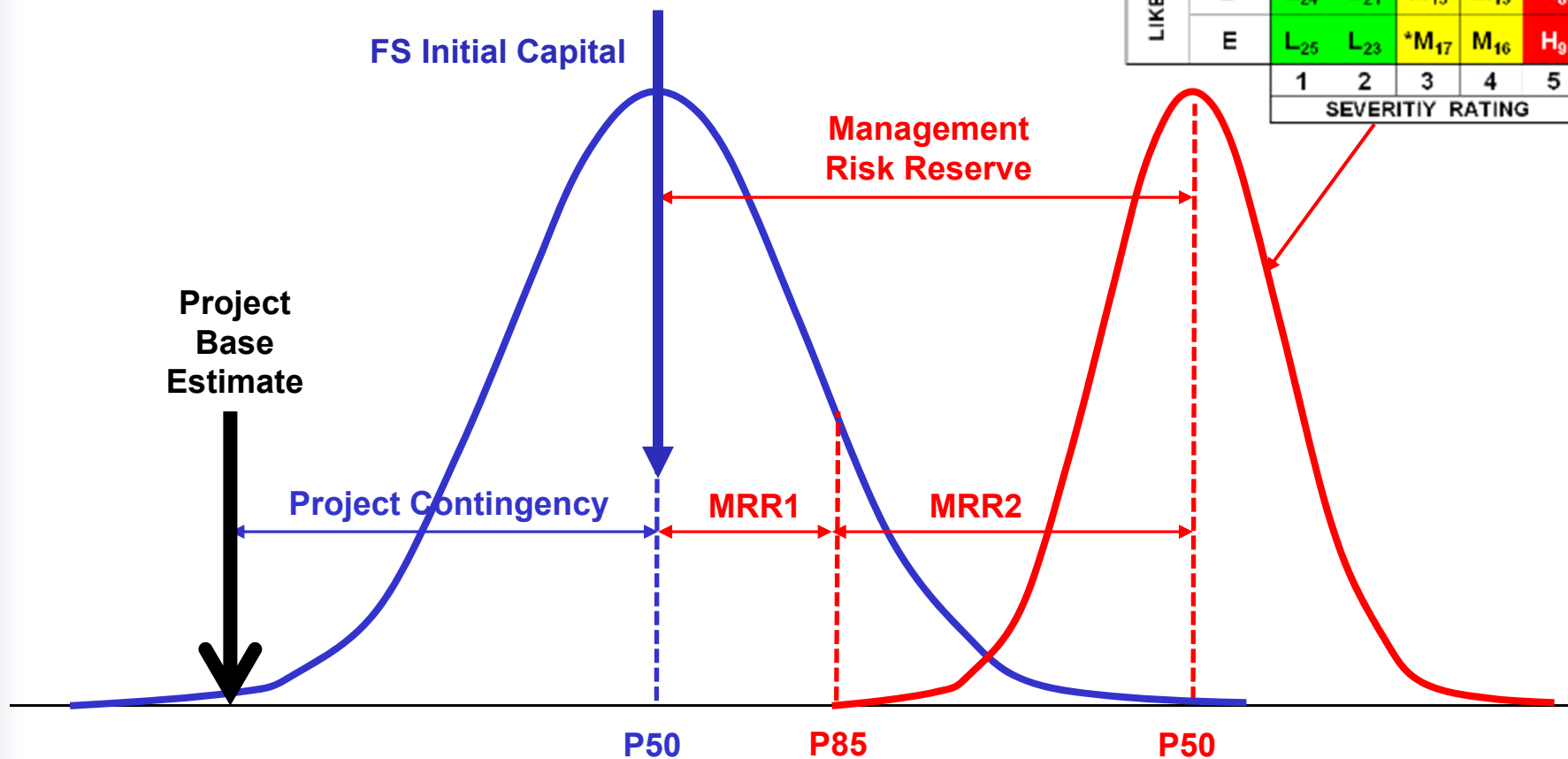
# How Have We Done?

## Management Risk Reserves Excluded

Where are we going in this hand basket?

- Contingency is part of the Capital estimate
- Management Risk Reserves are not:
  - MRR1 (potential CAPEX over-expenditure)
  - MRR2 (risk events)

RISK RATING MATRIX						
LIKELIHOOD RATING	A	L <sub>18</sub>	M <sub>11</sub>	H <sub>6</sub>	H <sub>3</sub>	H <sub>1</sub>
	B	L <sub>20</sub>	M <sub>14</sub>	M <sub>10</sub>	H <sub>4</sub>	H <sub>2</sub>
	C	L <sub>22</sub>	L <sub>19</sub>	M <sub>12</sub>	H <sub>7</sub>	H <sub>5</sub>
	D	L <sub>24</sub>	L <sub>21</sub>	M <sub>15</sub>	M <sub>13</sub>	H <sub>8</sub>
	E	L <sub>25</sub>	L <sub>23</sub>	*M <sub>17</sub>	M <sub>16</sub>	H <sub>9</sub>
		1	2	3	4	5
SEVERITY RATING						



# Where Are We Going In This Hand Basket?

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## Skills Shortage





# Skills Shortage

22

## Top 10 Strategic Business Risks in Mining & Metals

Where are we going in this hand basket?

### 2009-2010

1. Cost containment
2. Industry consolidation
3. Access to capital
4. Maintaining social license to operate
5. Climate change concerns
6. Skills shortage could delay projects
7. Infrastructure access creating bottlenecks
8. Access to secure energy
9. Resource nationalism
10. Pipeline shrinkage (lack of new discoveries)

### 2011-2012

1. Resource nationalism
2. Skills shortage
3. Infrastructure access (to markets)
4. Maintaining social license to operate
5. Capital Project Execution
6. Price & Currency Volatility
7. Capital Allocation
8. Cost Management
9. Interruptions to Supply (Natural Disasters)
10. Fraud and Corruption, Sovereign Risk

### 2013-2014

1. Capital allocation
2. Margin protection & productivity improvement
3. Resource nationalism
4. Social license to operate
5. Skills shortage
6. Price and currency volatility
7. Capital project execution
8. Sharing the benefits
9. Infrastructure access
10. Threat of substitutes



# Skills Shortage

## Develop And Maintain Qualified Personnel

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Where are we going in this hand basket?

- Mining companies have reduced or eliminated:
  - their technical teams
  - their Capital Projects teams
  - Their project controls teams
- EPCM consultancies have reduced or eliminated their technical personnel.
- At the same time...
- Accountants and lawyers have remained and have been promoted into senior positions:
  - Senior management
  - “C Suite”
  - Boards of Directors

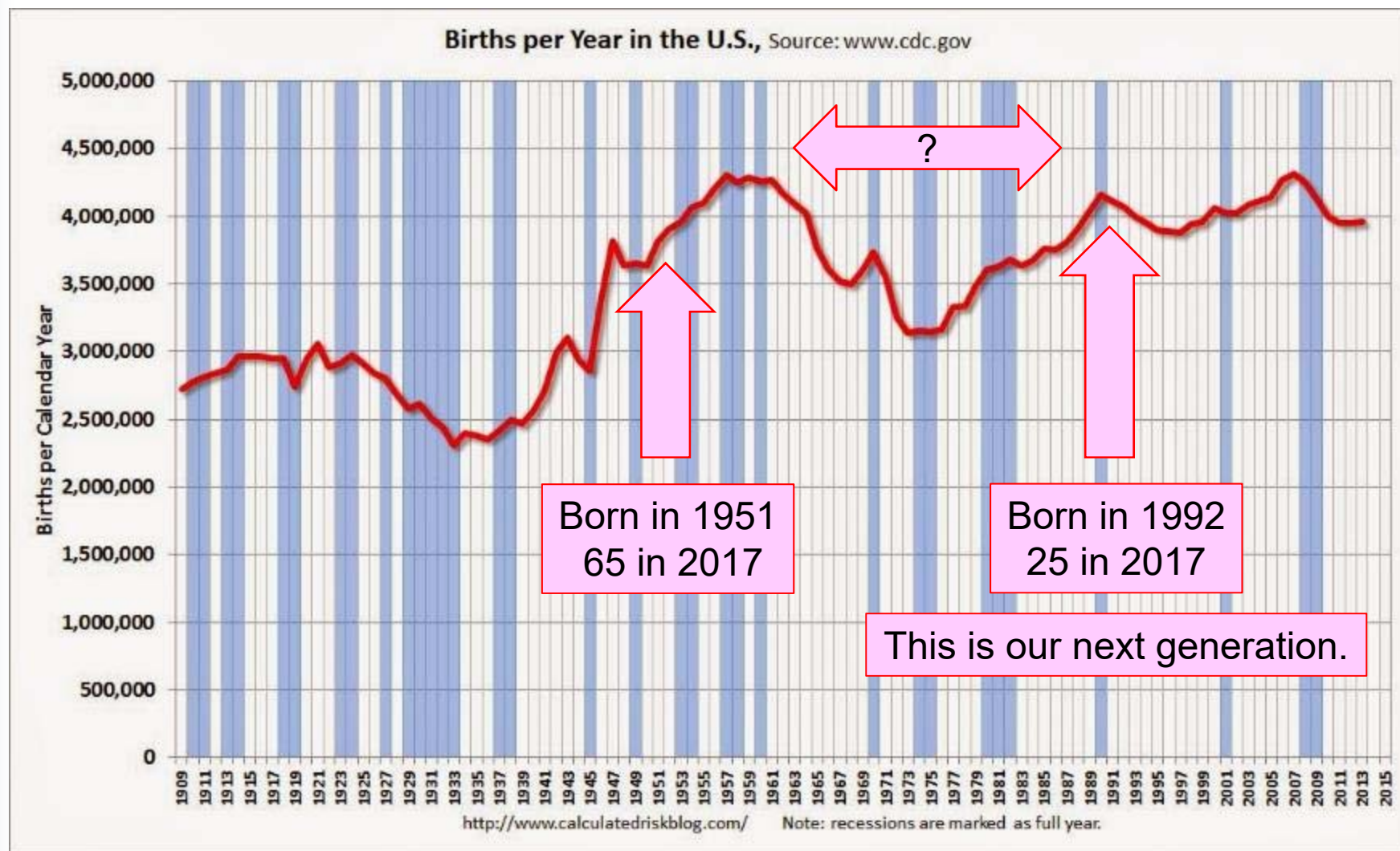


# Skills Shortage

## Train And Mentor Young Professionals

24

Where are we going in this hand basket?





# Skills Shortage

## Train And Mentor Young Professionals

Where are we going in this hand basket?

### Problem:

- The next generation of mining professionals are in their mid twenties.
- The generation before them was smaller and many left the industry in the downturns.
- The generation before that, the Baby Boomers with 40+ years of experience, have “retired” and may not be interested in coming back full time.

### Proposed Solution:

- Young professionals don’t have experienced mentors.
- Invite the Baby Boomers to stay on or come back:
  - Part time
  - As mentors
  - As “life coaches”
  - As reviewers



# Skills Shortage Millennials

26

Where are we going in this hand basket?

## Caution 1:

- The generation of children coming through schools now have been trained from birth to hate mining.
- Many are not likely to seek careers in mining.

## Caution 2:

- As Baby Boomers begin to close out their RRSPs mining stocks will be coming onto the market.
- Mining stocks are not attractive to Millennials.



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## Cycles & Timing

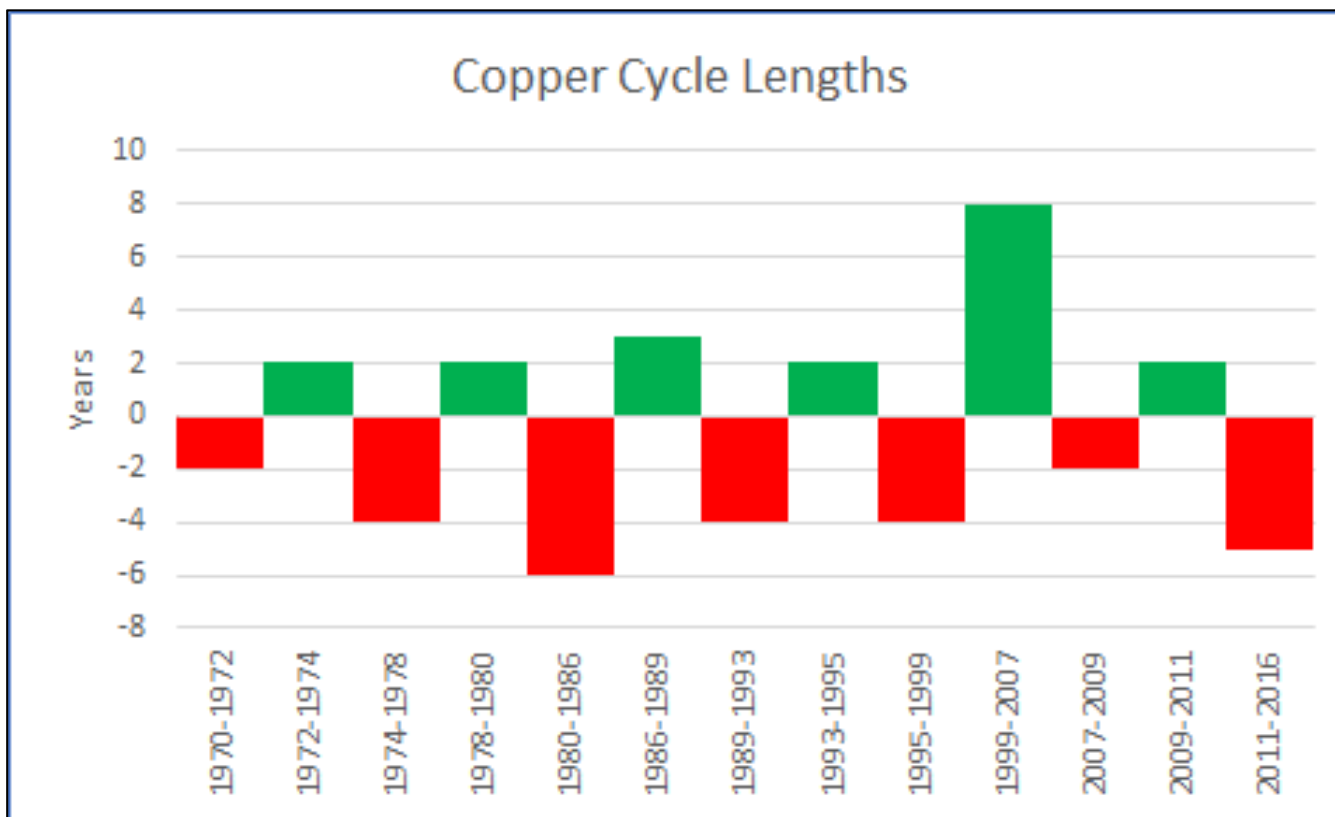


# Cycles & Timing

## Think Past The Current Cycle

28

Where are we going in this hand basket?



### Average Cycle Lengths (BMO):

3.9 year Down Cycle

3.2 year Up Cycle including 1999-2007

2.2 year up-Cycle excluding 1999-2007

### Base Metal Project Timing (CRU):

4.8 years Studies

3.3 years Permitting & Finance

3.4 years Construction

# Cycles & Timing

**“I don’t have time for this.”**

- Given the average term expectancy of a CEO, why would they commit to a project at any stage? It will not show any benefit until after they are gone.
- Value / success is measured by share price.
- The “market” doesn’t reward anything more than 1 or 2 quarters forward.

“Market Heat”  
begins



Up/Down Cycle: 3-5 yr

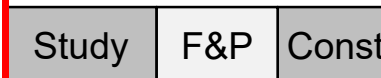


Full Project Cycle: 21 yr

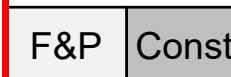


*Exploration  
by Juniors*

Study+F&P+Construct: 11 yr



Finance/Permit+Constr: 6-8 yr



Construct: 3-4 yr



*Likely to start-up in a down cycle*

CEO term: 3-7 yr



Market View: 3-6 months



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## Where Are We Going In This Hand Basket?

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# Social License To Operate



# Social License To Operate

## A Major Issue

31

Where are we going in this hand basket?

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# Social License To Operate

## Costs & Schedules

Where are we going in this hand basket?

### Environmental

- Most of our environmental obligations are “known”:
  - Existing legislation & international standards
  - They may be expensive but the limits are known
  - The schedules may be long but they are “known”
  - They will continue to evolve

### Social

- Much of our social obligation is not yet known:
  - Little legislation or international standards or examples as guidelines
  - The costs seem to have no limit
- Negotiations are time consuming and highly political
- Local people want a “piece of the action”.
  - The new “resource nationalism”





# Social License To Operate

## How Is Mining Seen?

33

Where are we going in this hand basket?



# Social License To Operate Not Just The Local People

Where are we going in this hand basket?

- There will be increasing social pressure from people who are:
  - Far from the mines
  - Are not directly impacted by a mine not going forward.
  - Don't recognize the role of metals and mining in their lives.
- They will be more concerned with the welfare of "endangered" species ...
- ... than the livelihood of local people who want the opportunities the mines would bring



# Social License To Operate

## Do You Know The Local People?

Where are we going in this hand basket?

- Do you know who the local people are?
- Do you know what their concerns are?
- Have you met with them?
- Do they understand mining?
- Has anyone in the history of the project “soiled the bathwater”?
- Allow adequate time to develop a rapport and trust with the local community.
- These people are major stakeholders in your project.



# Social License To Operate

## Stakeholders versus Shareholders

Where are we going in this hand basket?

- Why are we so worried about shareholders?
  - Most of the shareholders that make your shares go up and down are largely “day traders”.
  - Are they even around long enough to get a dividend?
  - They have a short term view that the market keeps trying to satisfy.
- Stakeholders are there for the long haul
  - Long term shareholders
  - Original investors
  - Partners
  - Employees and management
  - Suppliers and contractors
  - **Local communities**
  - **Governments**



## Where Are We Going In This Hand Basket?

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Where are we going in this hand basket?

# Where Are We Going? The Mine Of The Future





# The Mine Of The Future Disclaimer

38

Where are we going in this hand basket?



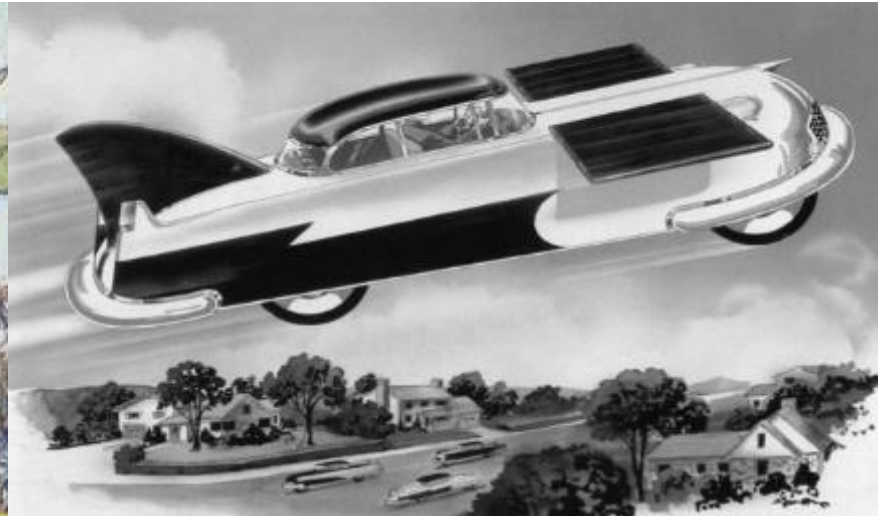
Please read all instructions and warnings before use. Must be 18 years of age or older to proceed further. Enter at your own risk. Do not enter. Speed limit - 28.8 or higher. Stop here on red. Hostess will seat you. Trucks over 4 tons excluded. Void where prohibited by law. Some assembly required. This is a test of the emergency broadcast system - this is ONLY A TEST! List each check separately by bank number. Batteries not included. Contents may settle during shipment. Any resemblance to persons living or dead is purely coincidental. Use only as directed. For indoor or outdoor use only. Wearing of this garment does not enable you to fly. We make no other warranties, expressed or implied. Do not use while operating a motor vehicle or heavy equipment. Postage will be paid by addressee. Postal service will not deliver mail without postage. No postage necessary if mailed in the United States. Subject to CAB approval. This is not an offer to sell securities. May be too intense for some viewers. See other side for additional listings. This product is meant for educational purposes only. For recreational use only. For office use only. For entertainment purposes only. Only 1 winner per household. Do not disturb. All models are over 18 years of age. Apply only to infected areas. If condition persists, consult your physician. Take two of these and call me in the morning. An apple a day keeps the doctor away. Now with new plastic applicator. High altitude directions-increase cook time by 10 minutes. This is not an attorney advertisement or referral service. No user-serviceable parts inside. Website contains small parts and is not intended for use by children under the age of eighteen. This compact disc was originally recorded on analog equipment. Freshest if eaten before date on carton. Times are approximate. Do not disturb. Simulated picture. Please remain seated until the ride comes to a complete stop. Return your seatback and tray table to their normal upright position. Your seat cushion can be used as a flotation device. In the event of decreased air pressure, oxygen masks will pop out of the top of your monitor. The call you have made requires a 20 cent deposit. Breaking seal constitutes acceptance of agreement. For off-road use only. Do not block intersection. No trespassing. No stopping or standing. Don't even think about parking here. No parking when road is snow covered. As seen on TV. One size fits all. Product will be hot after heating. Do not iron clothes on body. Remove clothing before distributing in washing machine. Do not use while sleeping. Do not use on food. Many suitcases look alike. Contains a substantial amount of non-Tobacco ingredients. Colours may fade. Insert this end first. We have sent the forms which seem right for you. This page made from 100% recycled electrons. Slippery when wet. No substitutions allowed. For a limited time only. 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Webmaster is also not responsible for items left, lost or stolen. At participating locations only. Sold by weight, not by volume. Penalty for private use. See label for sequence. This web site rated 'R' for Mature audiences. Do not take with alcohol. Sealed for your protection - do not use if safety seal is broken. Substantial penalty for early withdrawal. Do not write below this line. Falling rock. Use seatbelts even with airbags. Do not stop on railroad tracks. Lost ticket pays maximum rate. Your cancelled check is your receipt. Add toner. Place stamp here. Avoid contact with skin. Sanitized for your protection. Employees must wash hands before returning to work. Caution, coffee is served HOT. Be sure each item is properly endorsed. Sign here without admitting guilt. Slightly higher west of the Mississippi. Employees and their families are not eligible. Beware of dog. Contestants have been briefed on some questions before the show. Filmed in front of a live, studio audience. Call now to ensure prompt delivery. Leave off the last S for savings. Calls may be monitored for quality assurance or training purposes. Please make your selections from the following menu. All representatives are still busy assisting other callers. Please stay on the line and a representative will be with you when they feel the need. Please call back during our normal business hours. You must be present to win. Winners need not be present to win. No passes accepted for this engagement. This space ( ) intentionally left blank. Do not use this product with a petroleum based lubricant. No animals were harmed in the preparation of this web site; only humans. This web page contains no CFCs. Discontinue use if nausea or dizziness occurs. Shading within a garment may occur. Use only in a well-ventilated area. Keep away from fire or flames. No soliciting. Bridge freezes before road surface. Stop, get ticket. Right lane must turn right. Left lane must turn left. Middle lane must make up their damn minds. This site runs on unleaded fuel only. Objects in mirror may be closer than they appear. Buses and carpools with two or more people only. No hitchhiking. Components may be hot. Silica gel - do not eat. Not to be used in conjunction with any other offer. Details on reverse side. Shoplifters will be prosecuted to the fullest extent of the law. We reserve the right to check all bags, coats & personal belongings upon exiting this page. Recycle. Fragile - handle with care. This side up. No jumping or diving. No running by the pool. Register has less than \$50 after dark. Driver does not carry cash. No swimming unless lifeguard is present. Swim at your own risk! Please do not wade in fountain. Guaranteed low prices. Not transferable. Actual size not shown. Contents under pressure. Do not intentionally inhale vapours. Replace with same type. Approved for veterans. Please be kind, rewind. Booths for two or more. Check here if tax deductible. Action figures sold separately. No preservatives added. Some equipment shown is optional. Price does not include tax. Do not remove any HTML tags under penalty of law. Hand wash only - tumble dry on low heat. No Canadian coins. Short circuit may cause fire. No more than 3 transactions per car. Not recommended for small children. Pre-recorded for this time zone. Reproduction strictly prohibited. No alcohol, dogs or horses. Not for resale. List at least two alternate dates. Blackout dates may apply. Viewing by pregnant women may result in fetal injury, premature birth and low birth weight. First pull up, then pull down. Insert Tab A into Slot B. Call toll free number before digging. Some of the trademarks mentioned in this product appear for identification purposes only. Record additional transactions on back of previous stub. Unix is a registered trademark of AT&T. Do not fold, spindle or mutilate. No transfers issued until the bus comes to a complete stop. 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# The Mine Of The Future

## Remember When The Future Looked Like This?

Where are we going in this hand basket?

"The future is not what it used to be."





# The Mine Of The Future

## Remember When We Thought We Had A Better Idea?

Where are we going in this hand basket?

"The future is not what it used to be."





# The Mine Of The Future

## What Will the Mine of the Future Look Like?

Where are we going in this hand basket?

- Remote control operations?
  - You can't move maintenance off-site.
  - Sensors get dirty and malfunction.
- Amazing new technology?
  - Truckless haulage?
  - Rail-veyors?
  - Dirigibles?
  - Robots and automation?
- Some visions are probably fanciful.



# The Mine Of The Future

## What have we learned about the future?

Where are we going in this hand basket?

### Don Mills

- The modern suburb in 1955
- Curved streets and cul-de-sacs to limit traffic volume
- Model copied all over North America
- Depends on cars and cheap gas
- Poor access for transit



### New modern city planning

- Trending towards simple grid system running off of a commercial “high street”
- Easy walking access.
- Simplified infrastructure.
- Very easy access for transit.
- Pompeii



# Where Are We Going In This Hand Basket?

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## Partnering & Outsourcing



# Partnering & Outsourcing

## Resist The Inclination To Acquire Companies

Where are we going in this hand basket?

### Buy or Buy Into Projects

- Focus your funds on viable projects.
- Focus your efforts on viable projects.

### Don't Buy Companies

- M&A stories often end poorly.
- You pay a lot for duplicated corporate services
- “Synergies” are typically overstated.
- M&A is generally driven by the heat of the moment.
  - Barrick will reduce the value of goodwill — an intangible asset related to some of its past acquisitions — by about \$1.8 billion US. (Canada Press Jan 22, 2016)

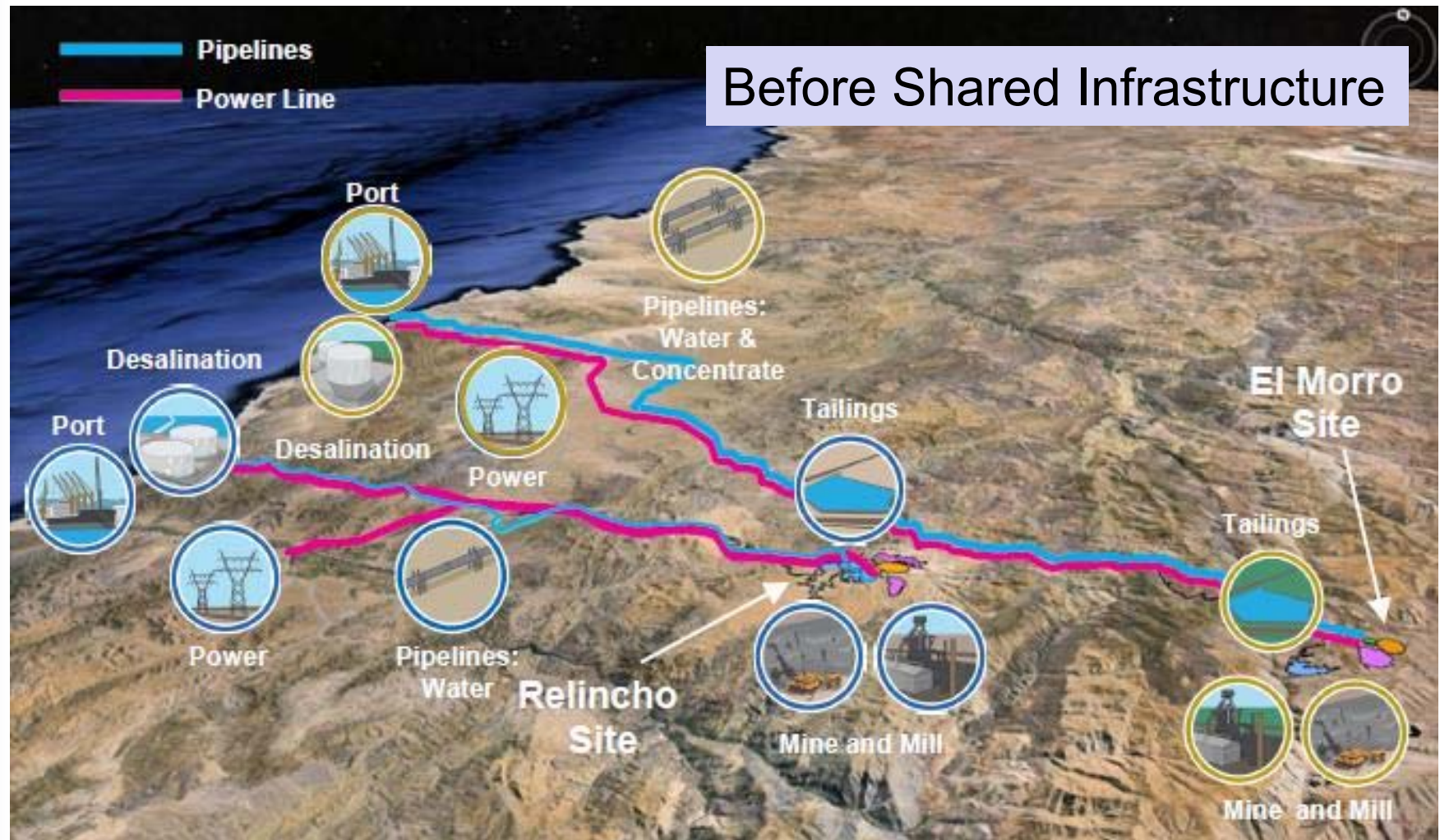




# Partnering & Outsourcing Develop Projects Jointly

45

Where are we going in this hand basket?

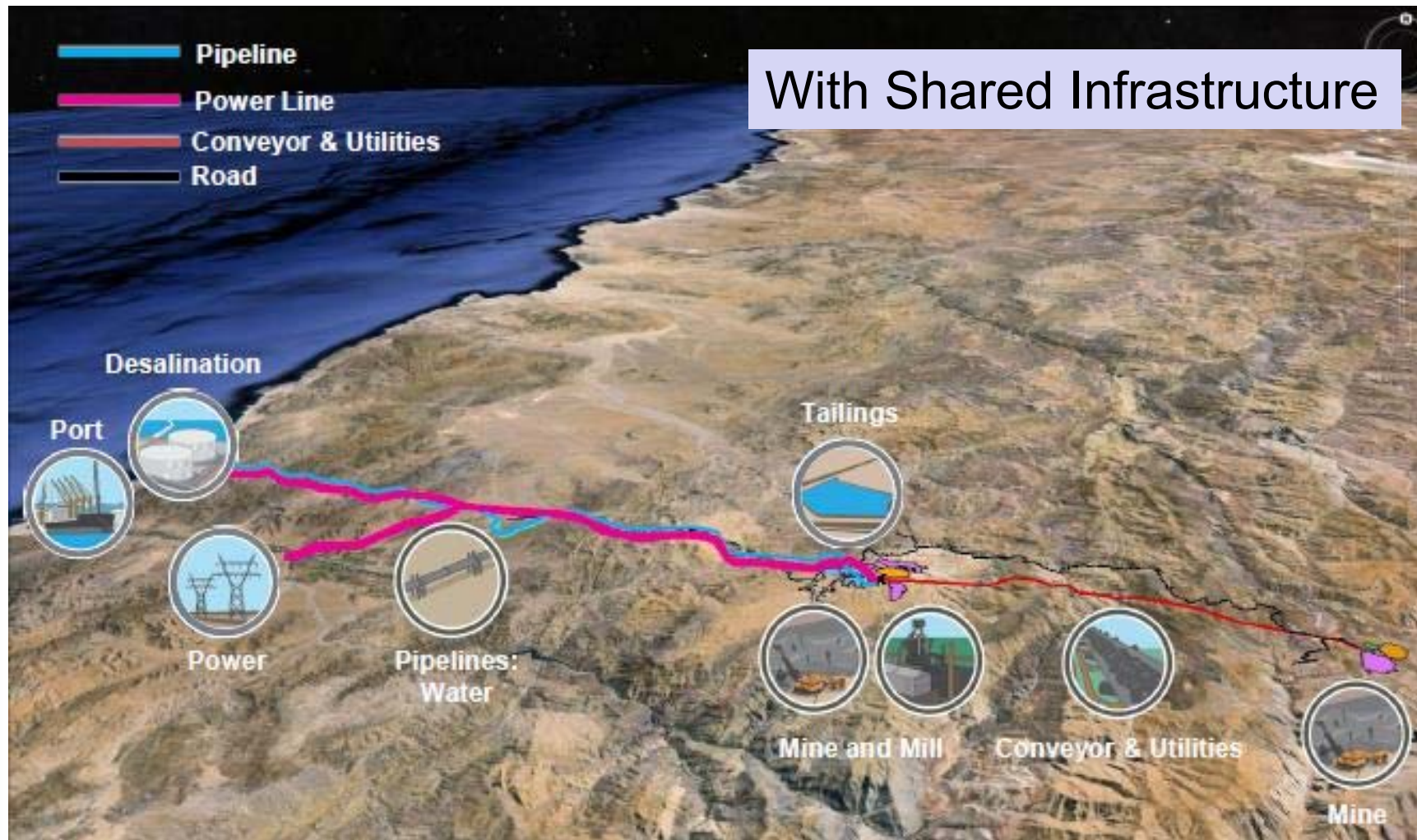




# Partnering & Outsourcing Develop Projects Jointly

46

Where are we going in this hand basket?



L.D.Smith - CIM 2017

Project Corridor - Building a Better Project Together  
Teck & Goldcorp, August 27, 2015, Santiago, Chile

# Partnering & Outsourcing

## What Not To Outsource

Where are we going in this hand basket?

- In mining it is essential that the mining company controls the basic elements of the value chain:
- Mineral Resource / Reserve
  - Legal rights to develop the minerals in the ground
  - Social license to operate
  - Environmental permits and approvals
- Mine planning
  - To maximize the extracted value of the mineralization
  - So as not to waste or sterilize mineralization
- Metallurgical recovery
  - To maximize the recovered value of the mined material
  - Legal rights to a water supply for the mill



# Partnering & Outsourcing

## Outsourcing Opportunities

Where are we going in this hand basket?

- Existing mining outsourcing & leasing practice:
  - Mine equipment leasing & maintenance
  - Rail lines & rolling stock
  - Ports
  - Ocean freighters
- We can add to this list:
  - Camp construction and operation
  - Road construction and maintenance
  - Power supply construction and maintenance
  - Power distribution construction and maintenance
  - Water supply construction, operation, and maintenance
  - Concentrate pipeline construction, operation, and maintenance
- Why not also add:
  - Processing plant construction and maintenance (not operation)
  - Tailings Storage Facilities construction, operation, and maintenance
  - Tailings Storage Facilities Closure and Post-Closure obligations





# Partnering & Outsourcing

## Accounting Versus Cash – Think Cash

Where are we going in this hand basket?

- Typically a CFO will say no to outsourcing because,
  - Outsourced assets are shown on “the books” as a liability if the mining company is the sole user.
  - This extra liability upsets the appearance of the balance sheet.
  - The balance sheet is not “clean”.
  - (Remember, these are the same principles that make billions of dollars disappear to clean up these same balance sheets.)
- From a cash point of view:
  - I can potentially reduce billions from my initial capital
  - I can reduce execution and schedule risks
  - I will pay the outsourcing companies operating fees that allows them to make a return that should be less than the return on my project (which is improved with the reduced capital).
  - I can structure the outsourcing contract to transfer ownership to me over time.



## Where Are We Going In This Hand Basket?

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Where are we going in this hand basket?

# Wither The Mining Corporation?



# Whither the Mining Corporation?

- Where are we going in this hand basket?
- Given the issues and restrictions on mining companies:
    - Life expectancy of the CEO
    - The extremely short term focus of the market
    - Restrictions from accountants and banks
    - Irregular and extensive cycles
    - Cost overruns and poor decision making
    - Destruction of shareholder value
    - (please add your own ....)
  - **Perhaps mining is too important to leave in the hands of publicly traded companies?**
  - But if not public companies, then whom?
    - Governments? (Hint: NO !)
    - Crown corporations? (Hint: NO !)
    - Private firms?



# Where Are We Going In This Hand Basket?

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Where are we going in this hand basket?

## Closure Costs



# Closure Costs

## The Impact of “Long-Term”

Where are we going in this hand basket?

- Closure obligations will increasingly require long term monitoring and treatment.
- Obligation periods could be measured in decades and even centuries.
- Closure costs over very long periods will increase to significant values.

### Long-Term Monitoring & Treatment

1,000,000 Annual Cost

Inflation Rate	Annual at year 100	NPV of Perpetual Monitor & Treat
0.0%	1,000,000	100,000,000
1.0%	2,704,814	270,481,383
2.0%	7,244,646	362,232,306
3.0%	19,218,632	640,621,066
4.0%	50,504,948	1,262,623,705
5.0%	131,501,258	2,630,025,157

$$=\$1M \cdot (1+i)^n$$

$$= \text{Annual} / (i)$$



# Closure Costs

## The Impact of “Long-Term”

Where are we going in this hand basket?

- The sinking fund that would have to be set up to provide these funds over a 100 year monitoring period could accumulate into hundreds of millions or billions of dollars.
- Who can we trust to maintain this fund and not dip into it?
  - The mining company?
  - The government?
- Who will be around for 100 years to undertake this obligation?
  - The mining company?
  - The jurisdiction?
- Perhaps only insurance companies have the longevity and integrity for this role.
- Note: Governments may decide to tax the significant amounts of interest earned by these trust funds. If so, the magnitude of the required contributions will increase significantly. We need to press governments to allow this interest to be tax free, as in an RRSP.



# Where Are We Going In This Hand Basket?

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Where are we going in this hand basket?

## Acid Rock Drainage

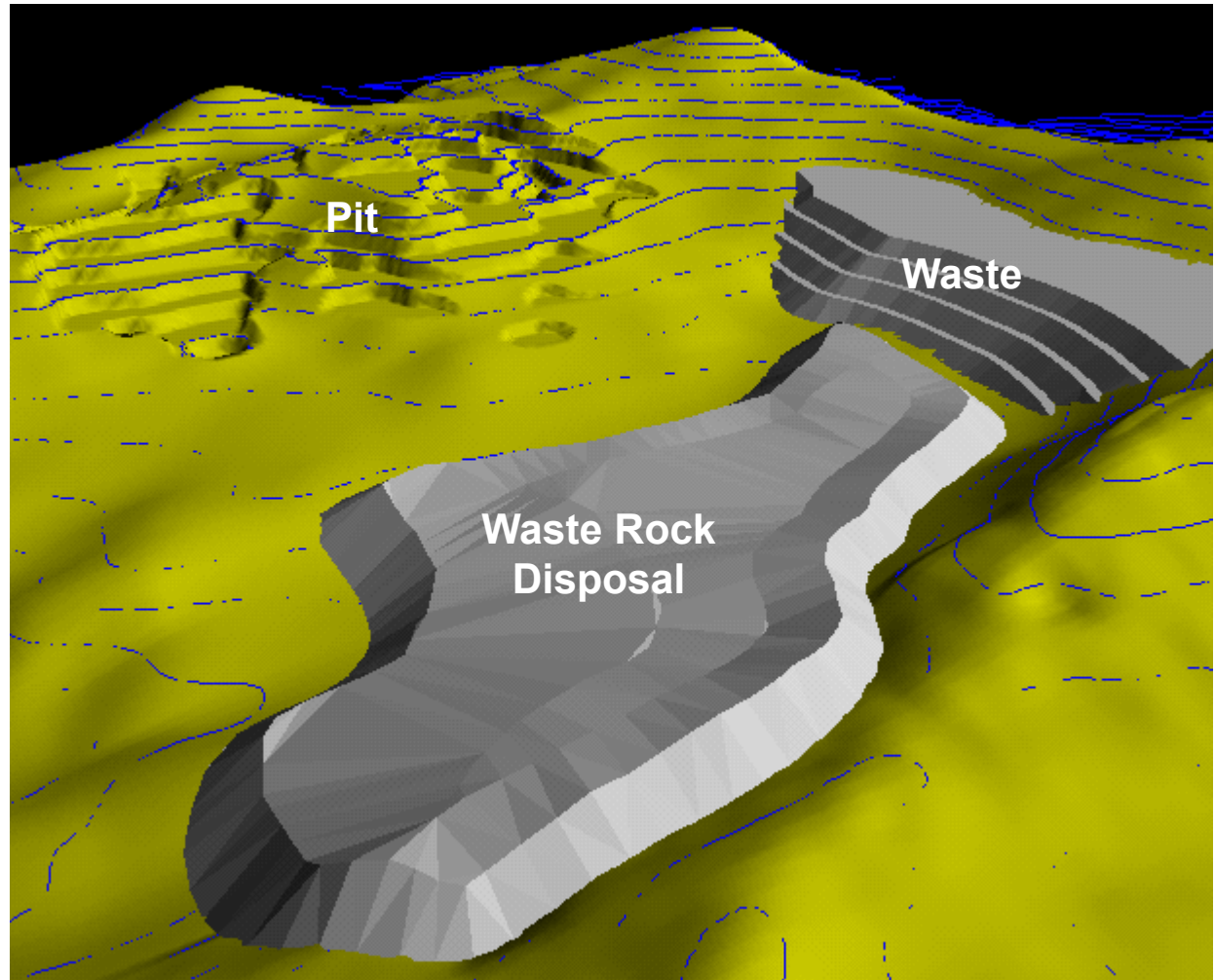


# Acid Rock Drainage (ARD) Mining More Waste Than Ore

56

Where are we going in this hand basket?

- Most of the material moved for an open pit is waste.
- Open pit mining is essentially waste handling.
- Waste is broken, excavated, and exposed to air, water, and temperature changes.
- Acid Rock Drainage (ARD) from waste disposal areas is a potential problem.
- (ARD depends on the type of rock.)



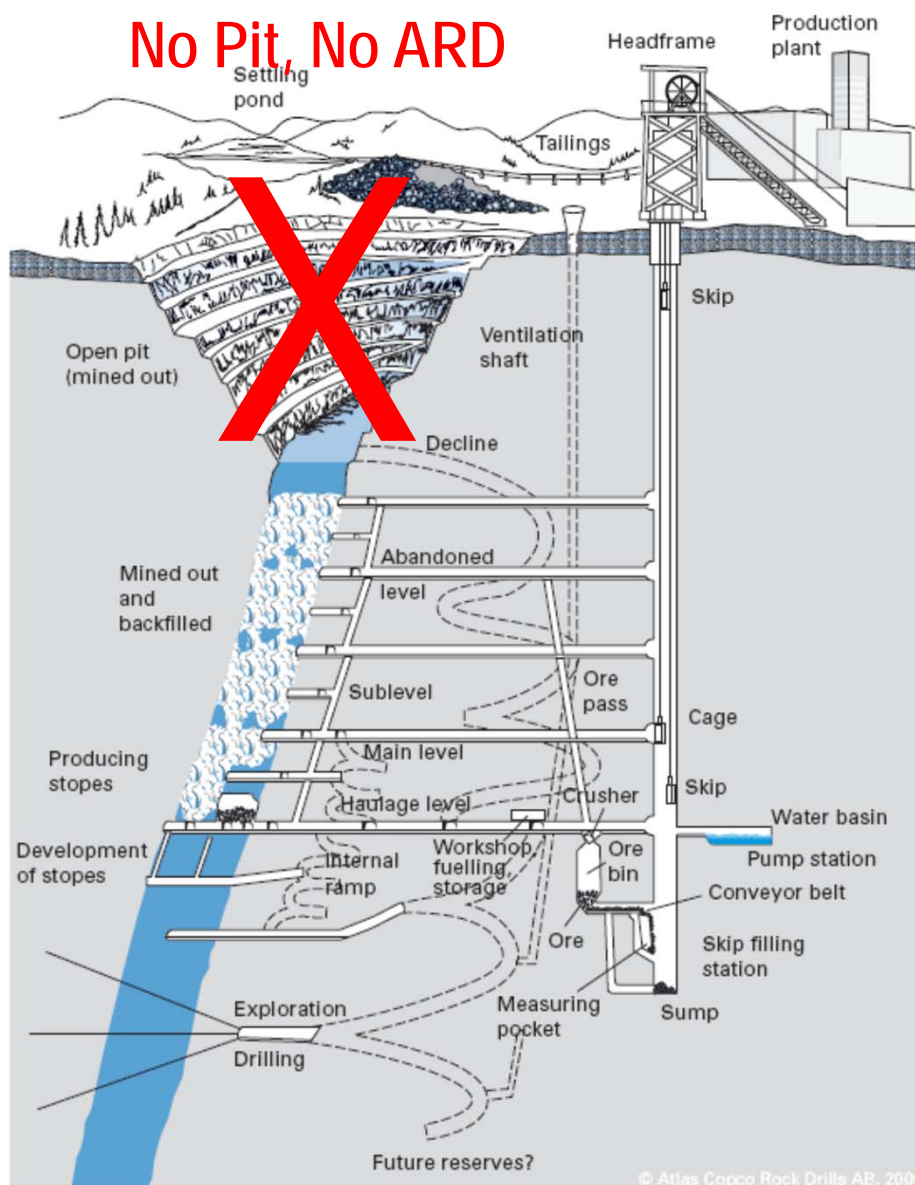


# Acid Rock Drainage (ARD) An End To Open Pit Mining?

57

Where are we going in this hand basket?

- Concerns about Acid Rock Drainage from open pit mines could:
  - Cause treatment obligations and costs to become so high that open pit mining might not be economic.
  - Prevent open pit mines with ARD generating waste rock to not be permitted.
- Underground mining could become the economic alternative.
- Underground mines will likely be encouraged or legislated to place their tailings back underground.



## Where Are We Going In This Hand Basket?

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Where are we going in this hand basket?

# What Else Could Possibly Go Wrong?



## What Else Could Possibly Go Wrong?

Where are we going in this hand basket?



## What Else Could Possibly Go Wrong?

Where are we going in this hand basket?



# What Else Could Possibly Go Wrong? Metal Prices Rise Significantly

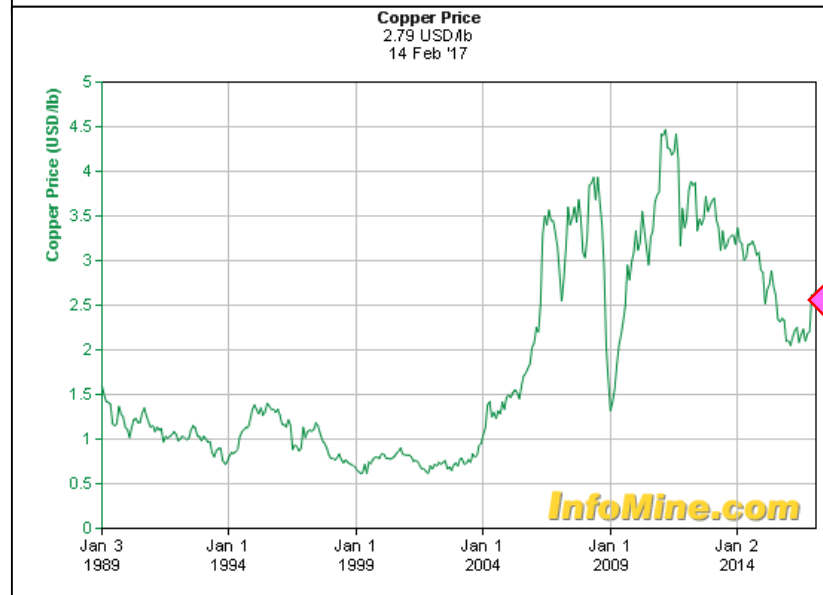
Where are we going in this hand basket?



Gold  
From 1990



Copper  
From 1990

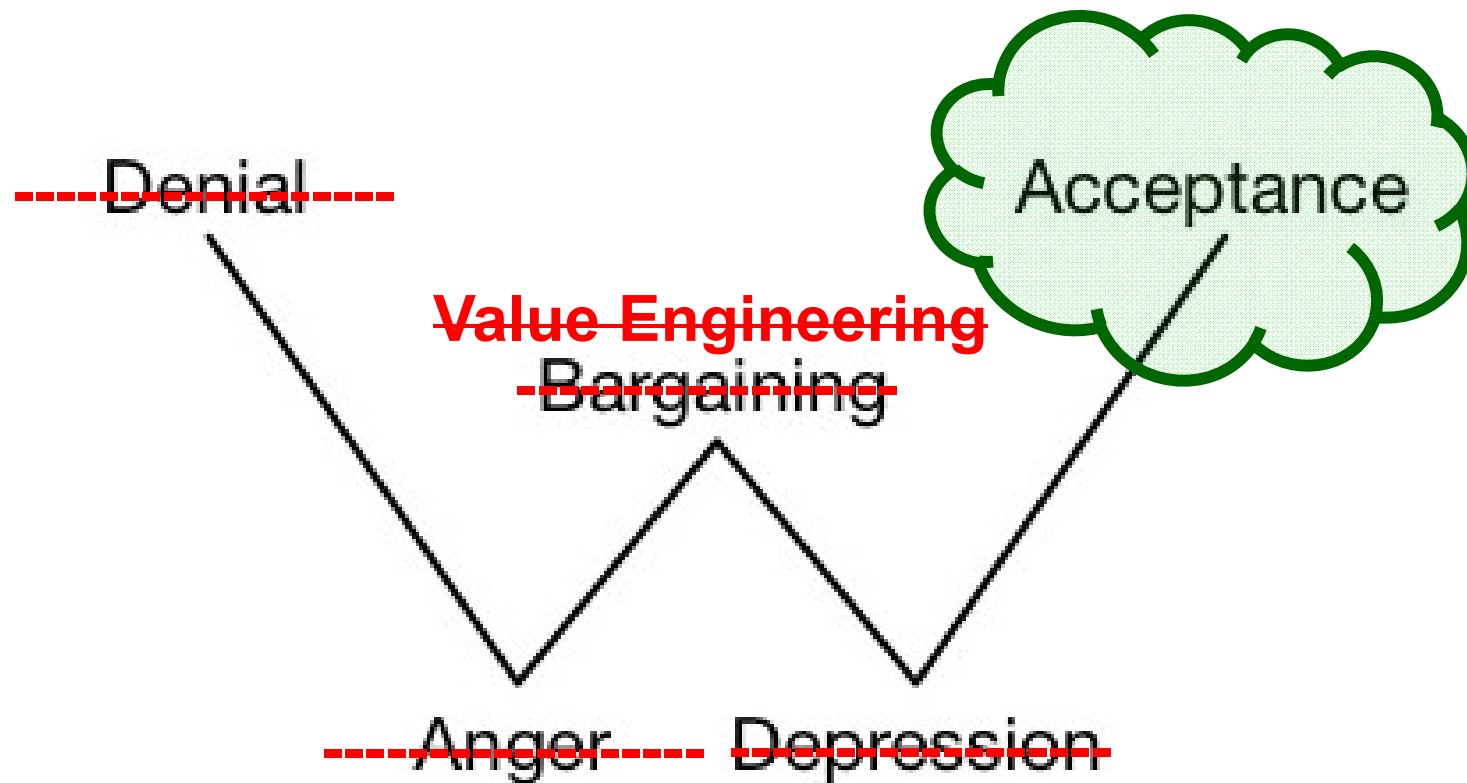


# What Else Could Possibly Go Wrong?

## Haubrich's "Market Heat" Driver Takes Over

62

Where are we going in this hand basket?



# What Else Could Possibly Go Wrong?

## Rectal-Cranial Inversion; History Repeats Itself

63

Where are we going in this hand basket?



- Market Heat will drive the “GO” decision.
- Projects will be advanced too quickly.
- Schedules will be unrealistic.
- Important stage gate stages will be missed.
- Projects start-ups will likely miss the “Up” cycle.
- And we will try to do all of this with a shortage of qualified personnel.



# Where Are We Going In This Hand Basket?

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Where are we going in this hand basket?

## Ending on a Positive Note



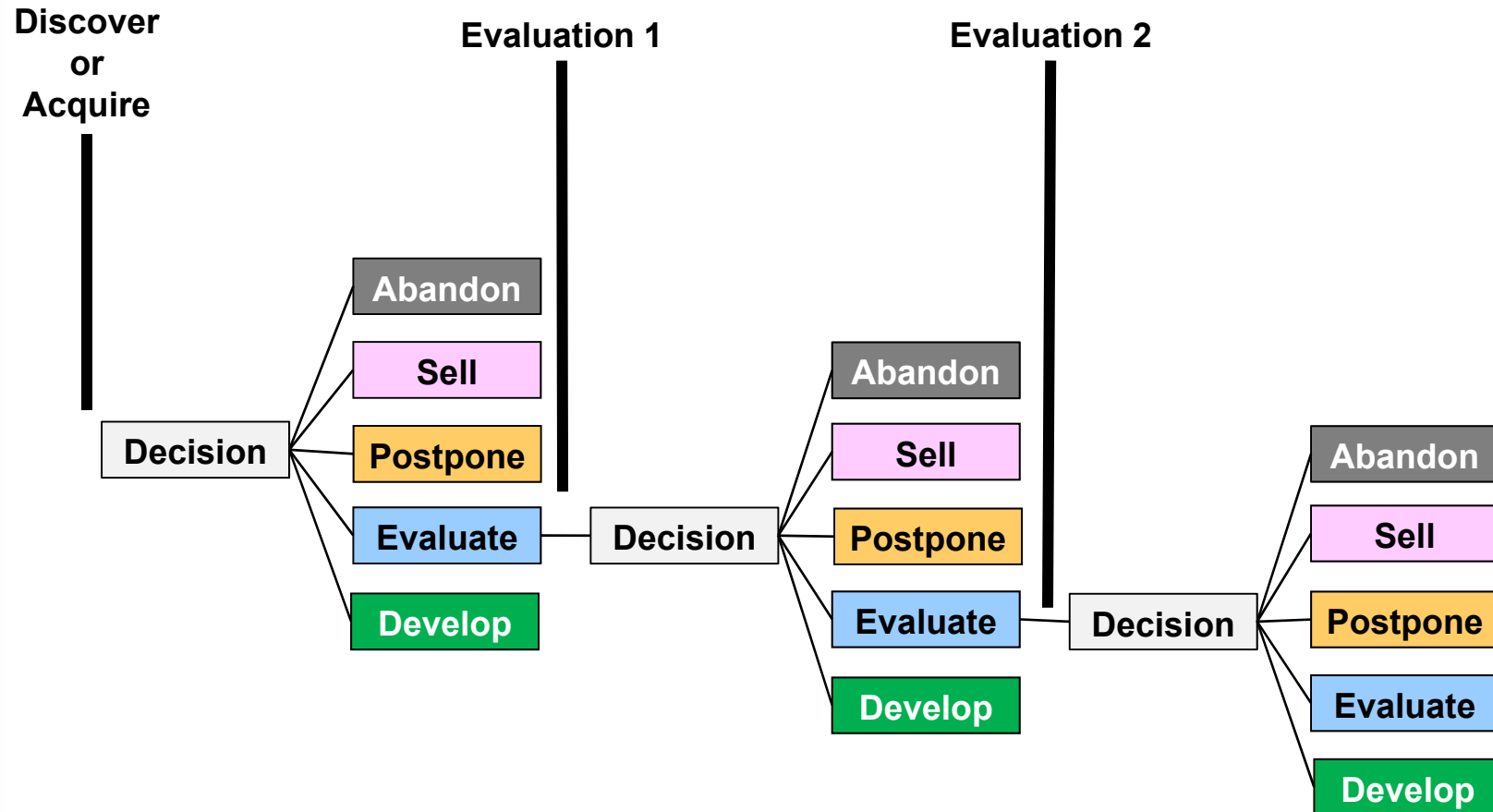


# Project Decision Tree

## Delay is an Option

65

Where are we going in this hand basket?



# Project Decision Tree

## Sometimes the Answer is No

66

Where are we going in this hand basket?



**Sometimes the Answer is “No!”**



# Where Are We Going In This Hand Basket?

Where are we going in this hand basket?



Questions?



# Where Are We Going In This Hand Basket?

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## Notes

Where are we going in this hand basket?



# Press Releases

## The Facts

69

Where are we going in this hand basket?

- The Facts:
  - On the back of a photograph of Remus Starr, showing him standing on the gallows, are the words:

*"Remus Starr: Horse thief, sent to Montana Territorial Prison, 1885. Escaped 1887, robbed the Montana Flyer six times. Caught by Pinkerton detectives, convicted and hanged, 1889."*



# Press Releases

## What the Reader Sees

70

Where are we going in this hand basket?

### The Facts:

On the back of a photograph of Remus Starr, showing him standing on the gallows, are the words:

"Remus Starr: Horse thief, sent to Montana Territorial Prison, 1885. Escaped 1887, robbed the Montana Flyer six times. Caught by Pinkerton detectives, convicted and hanged, 1889."

### The Press Release:

"Remus Starr was a famous cowboy in the Montana Territory. His business empire grew to include acquisition of valuable equestrian assets and intimate dealings with the Montana railroad. Beginning in 1885, he devoted several years of his life to service at a government facility, finally taking leave to resume his dealings with the railroad. In 1887, he was a key player in a vital investigation run by the renowned Pinkerton Detective Agency. In 1889, Remus passed away during an important civic function held in his honor when the platform upon which he was standing collapsed."

**Danger: Your own people may start believing the press release.**



# Think Outside The Box

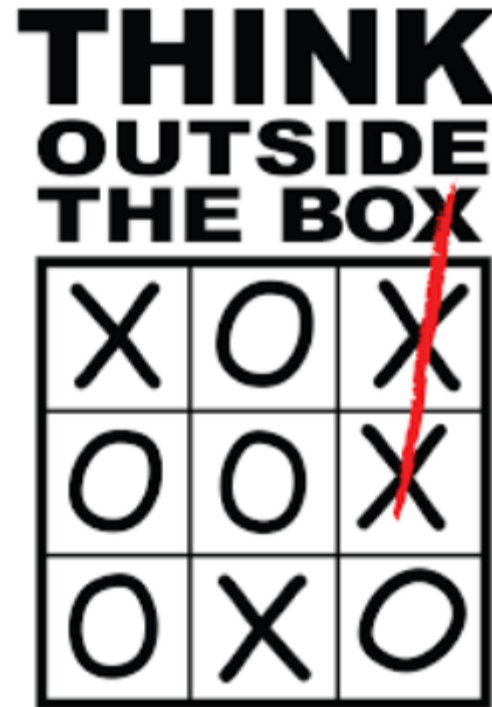
Where are we going in this hand basket?





# Think Outside The Box

Where are we going in this hand basket?

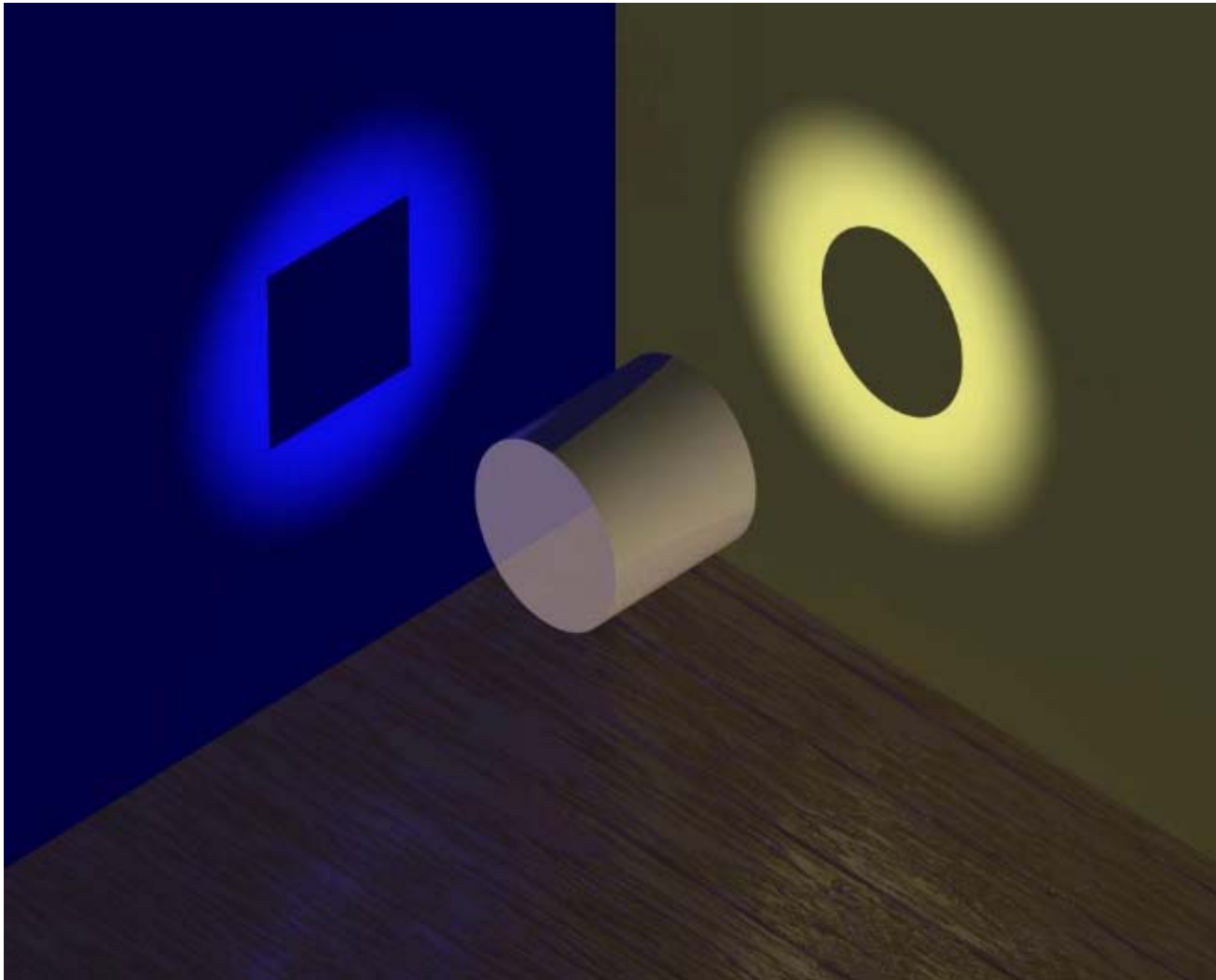


# Think Outside The Box

## Square Peg Round Hole

73

Where are we going in this hand basket?



# Risk Assessment Re-Risking & Due Diligence

74

Where are we going in this hand basket?

- Select excellent people
- Build the right team
- Make sure they will tell you “No.”
- Listen to their advice
- Act on their recommendations



**Grumpy**



**Grumpy**



**Grumpy**



**Dopey**



**Happy**



**Doc**



**Number  
Cruncher**

