

2014 FRA
Rail Program Delivery



***Risk Assessment -
“Top-down, Bottom-up”
Understanding the Basics***

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Definition – key words

Bottoms-Up

- Monte carlo simulation
- Ultimate flexibility
- Traditional
- Risk Register visibility
- Schedule / Cost integration

Top-Down

- Historical base
- Risk profile
- Delivery cycle
- Deliberately definitive
- Adaptable
- Counters Optimism

Pulling out risk



Cost

Schedule

Scope

Technical Capacity & Capability

Transit Capacity

Process



Input critical



The harsh reality ..



There is a lot of competition for Federal \$

High quality input ...



Optimism2 forms:



1.A range

- Least
- Most Likely
- Max



**Human beings are naturally narrowly bias
Especially when the extremes are unwelcome**

Optimism2 forms:



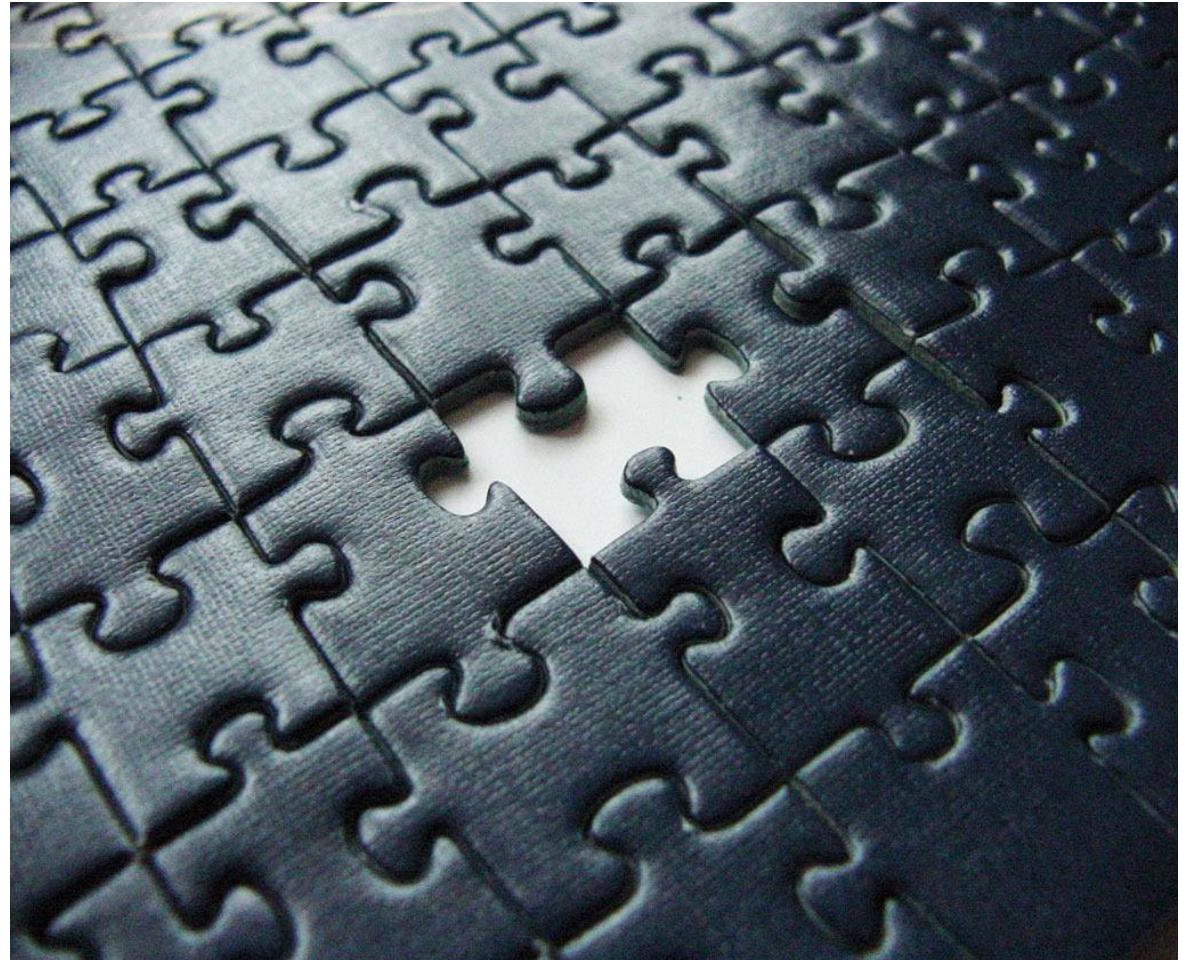
2. Discrete events

- Probability
- Event
- Impact
- Consequences

We are definitely going to be OK

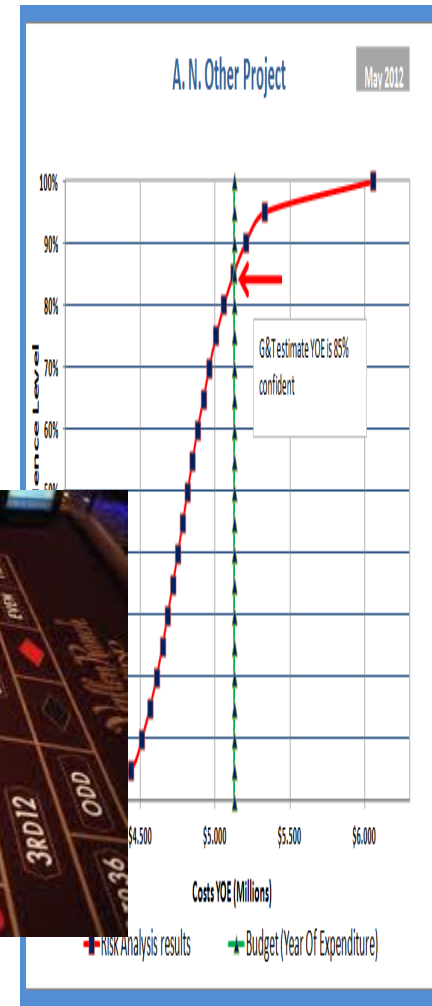
Bottom up

The assumption is you have all the pieces



PROJECT RISK REGISTER		Legend					GT				
< YOUR PROJECT >		Low (1)	Med (2)	High (3)	Very High (4)	Significant (5)	gardinertheobald				
REV : 00		Probability	< 10%	10-<50%	50%-<75%	75% -<90%	>90%				
DATE ISSUED : <DATE>		Cost	< \$250K	\$250K-<\$1M	\$1M-<\$3M	\$3M-<\$10M	>\$10M				
		Schedule	< 1 Mths	1-<3 Mths	3-<6 Mths	6-<12 Mths	> 12 Mths				
		Rating	1-<2	3 => 3.5	4	5	6				
ID	Phase	Risk Type	Risk Description [Event / Cause / Impact]	Notes / Discussion / Proposed Mitigation	Probability Rating (1-5)	Title Impact Rating (1-5)	Cost Impact Rating (1-5)	Risk Rating (1-5)	Minor Threat	Average Threat	Significant Threat
1	Site Select	Access	The existing tenant may not vacate the space to the intended schedule	This would incur additional costs in acceleration of the alterations and fit-out	4	2	2	8	✓	✓	
2	Site Select	Legal	The existing master lease agreement requires revising and agreement reached with other tenants which may take longer than schedule allowance	We could progress planning and design but would risk abortive costs if lease get contracted and delayed further	3	1	1	3	✓		
3	Site Select	Space	The space is not a perfect fit; proposed Architectural detailing may not be possible without significant additional alterations	Structural assessment and MEP survey is suggested prior to further design detailing	3	2	3	8		✓	
4	Design	Consent	Fire officer may require additional escape external staircase	Additional agreements with adjoining owners will be required	4	1	2	6		✓	
5	Design	Specification	Entrance lobby finishes are currently likely to be over budget allowances	Alternative materials specifications are required to remain with budget	5	1	3	10			✓
6	Construction	Access	Sharing the existing elevators may not be possible for bringing in and removal of construction related materials	External hoist could be provided but this would require additional negotiations with building owner	4	1	2	6		✓	

Roll the dice



What's wrong with a nice straight curve ?

One has to be “realistic”

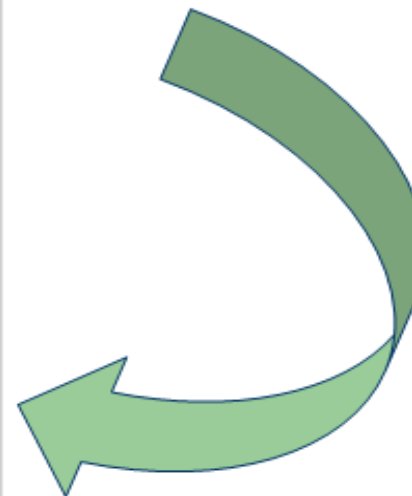
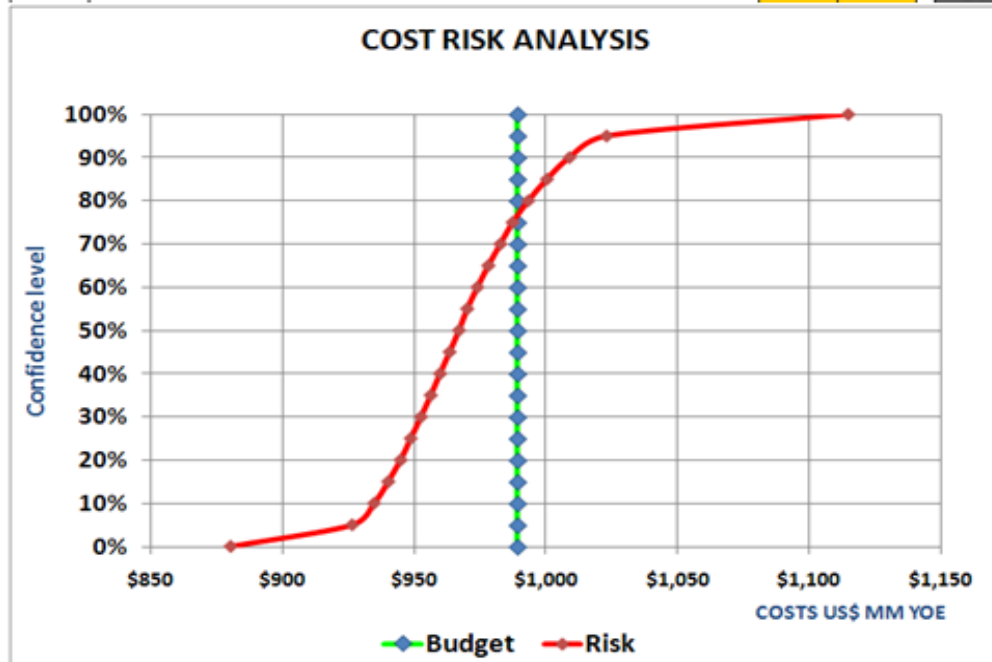


And...
there are things called:
“surprises”



Bottom- up monte carlo

Risk ID #	Risk Description	Prob	Cost	Prob	0%	10%	25%	50%	75%	90%	100%	
1	Relocation of facility causes delays	2	3	SDF								
2	May need to purchase more land	2	3		90%	\$ 2.00	\$ 2.25	\$ 2.50	\$ 2.75	\$ 3.00	\$ 4.00	\$ 5.00
3	Agreements not yet signed off with Rail roads	2	3		50%	\$ 1.00	\$ 2.00	\$ 3.00	\$ 5.00	\$ 7.00	\$ 10.00	\$ 25.00

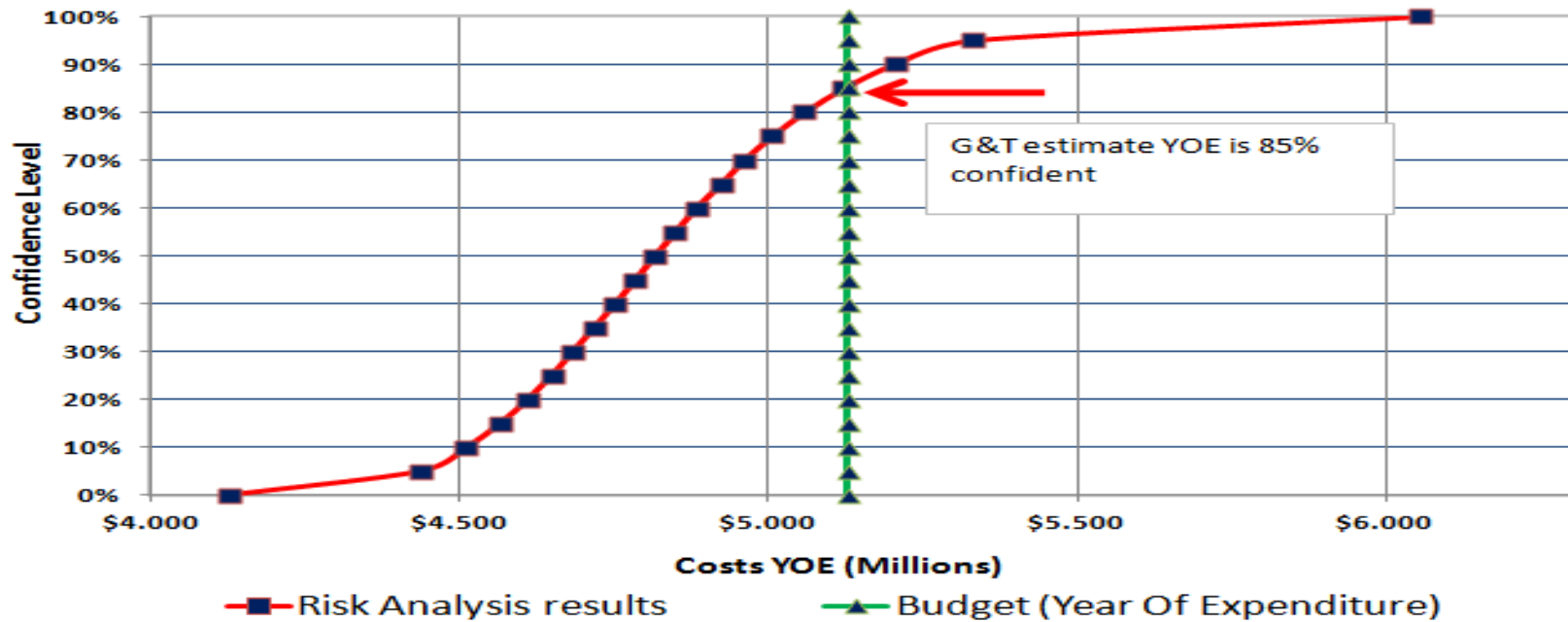


Risk
Register
to Monte
Carlo
Cost
Model

Output

A. N. Other Project

May 2012



**Output should be as expected ...or
certainly explainable**

Must have's bottom-up

- Result that can actually happen
- Explainable result
- Sensitivity analysis

Cautions

- Risks happen at the same time
- Mitigating one may mitigate all or none or somewhere in between



Summary bottom-up

Pro's

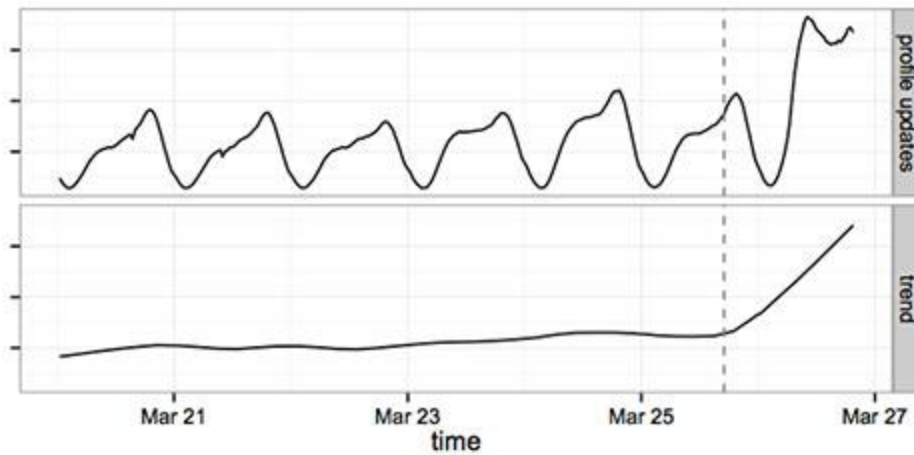
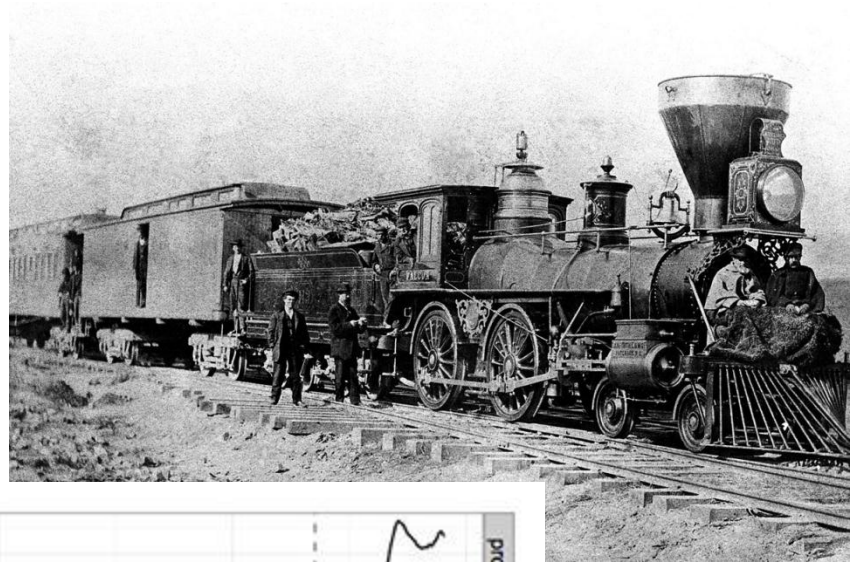
- A range requires asking why, why, why
- More visible
- More flexible
- Traditional backing



Con's

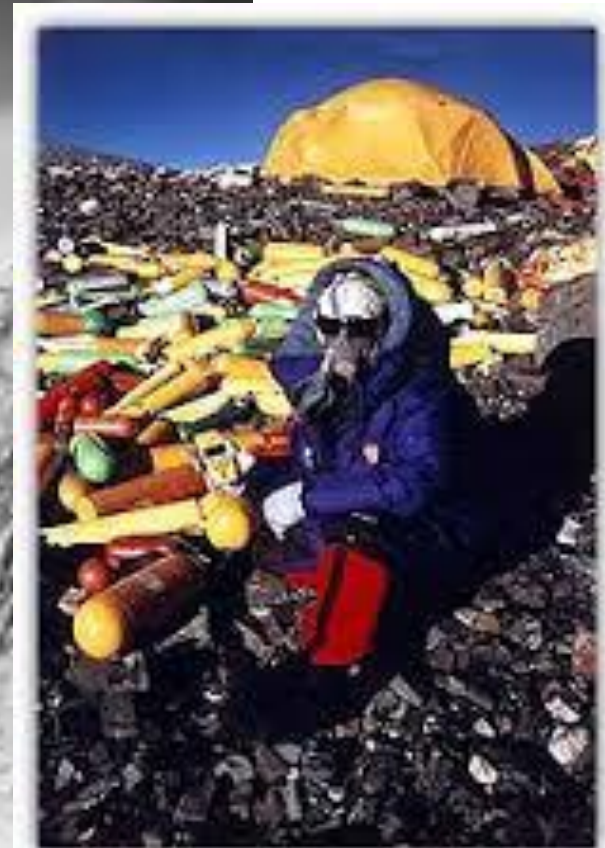
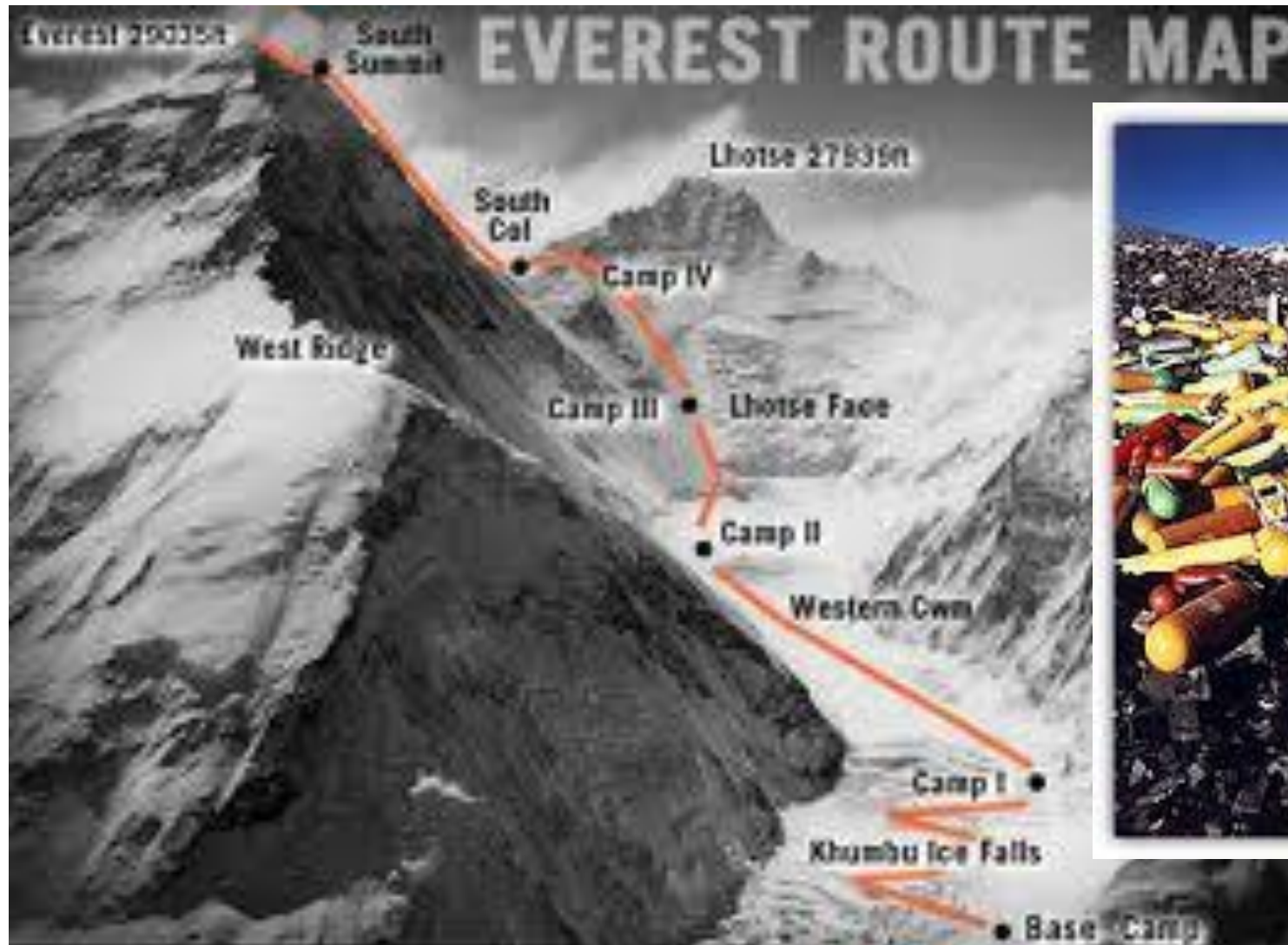
- Optimism bias
- Reliance on risk register
- Poor modeling
- Over reliance on software

Top Down

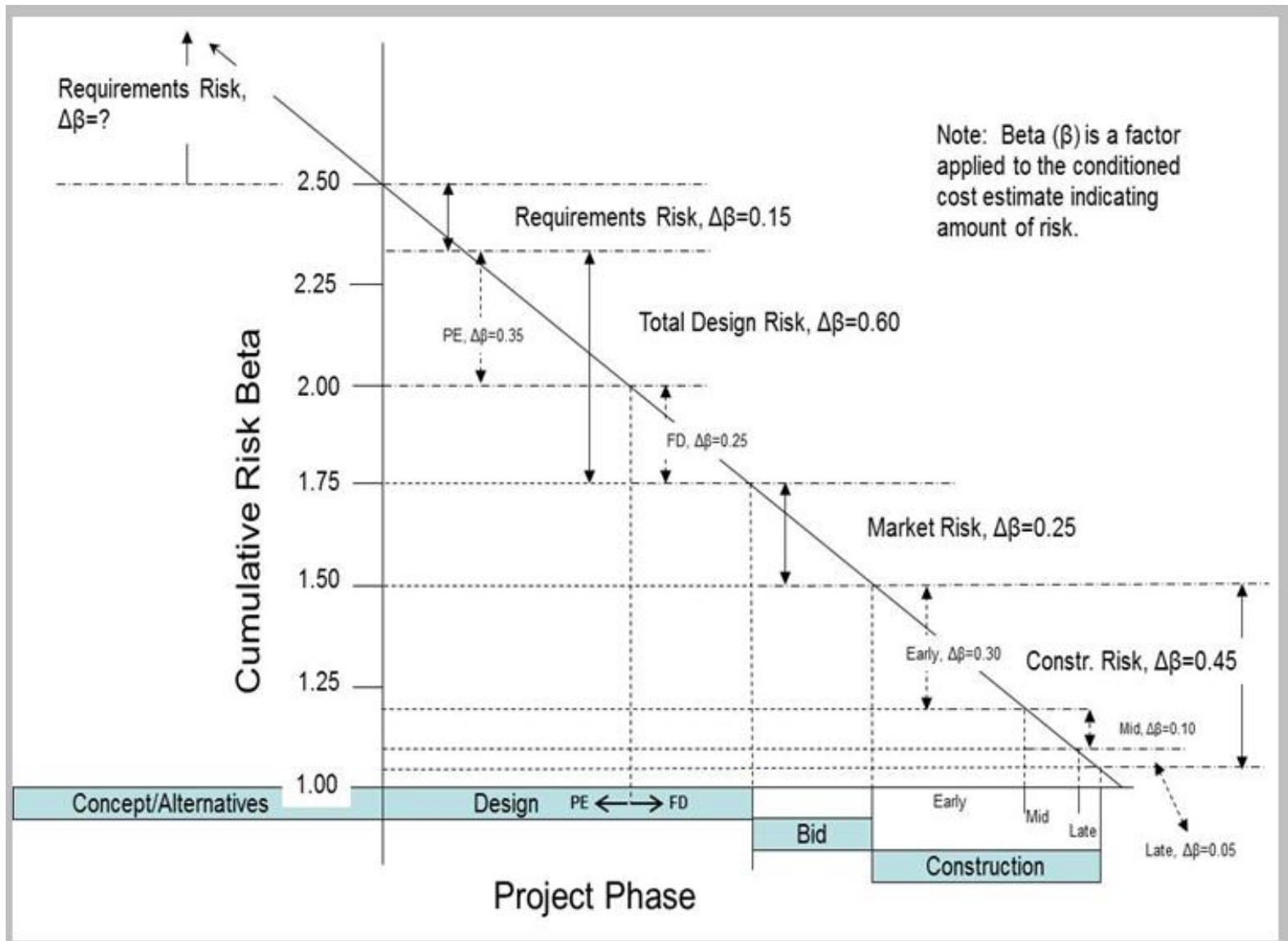


The expected profile

Top Down



Beta reduction factors

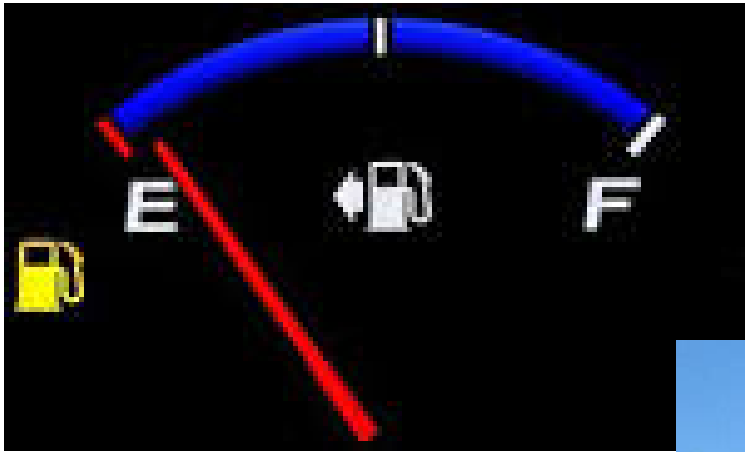


Risk profile

SCC	Category	P10	Req'ts Beta	Dsgn Beta	Mkt Beta	Constr Beta	Post Constr Beta	Total Beta	P90
SCC 10	Guideway								
10.01	Guideway: At-grade exclusive right-of-way	0	0.00	0.50	0.25	0.70	0.05	2.50	0
10.02	Guideway: At-grade semi-exclusive (allows cross-traffic)	11,440,499	0.10	0.40	0.25	0.70	0.05	2.50	28,601,247
10.03	Guideway: At-grade in mixed traffic	0	0.00	0.50	0.25	0.70	0.05	2.50	0
10.04	Guideway: Aerial structure	36,802,410	0.50	0.50	0.25	0.70	0.05	3.00	110,407,229
10.05	Guideway: Built-up fill	10,847,105	0.00	0.00	0.00	0.60	0.05	1.65	17,897,724
10.06	Guideway: Underground cut & cover	6,399,425	0.00	0.25	0.25	0.70	0.05	2.25	14,398,706
10.07	Guideway: Underground tunnel	0	0.00	0.50	0.25	0.70	0.05	2.50	0
10.08	Guideway: Retained cut or fill	34,820,691	0.30	0.50	0.25	0.70	0.05	2.80	97,497,935
10.09	Track: Direct fixation	0	0.00	0.50	0.25	0.70	0.05	2.50	0
10.10	Track: Embedded	2,846,197	0.00	0.50	0.25	0.70	0.05	2.50	7,115,492
10.11	Track: Ballasted	24,094,903	0.00	0.50	0.25	0.70	0.05	2.50	60,237,258
10.12	Track: Special (switches, turnouts)	3,931,064	0.30	0.50	0.25	0.70	0.05	2.80	11,006,979
10.13	Track: Vibration and noise dampening	1,006,862	0.00	0.50	0.25	0.70	0.05	2.50	2,517,156

Top Down

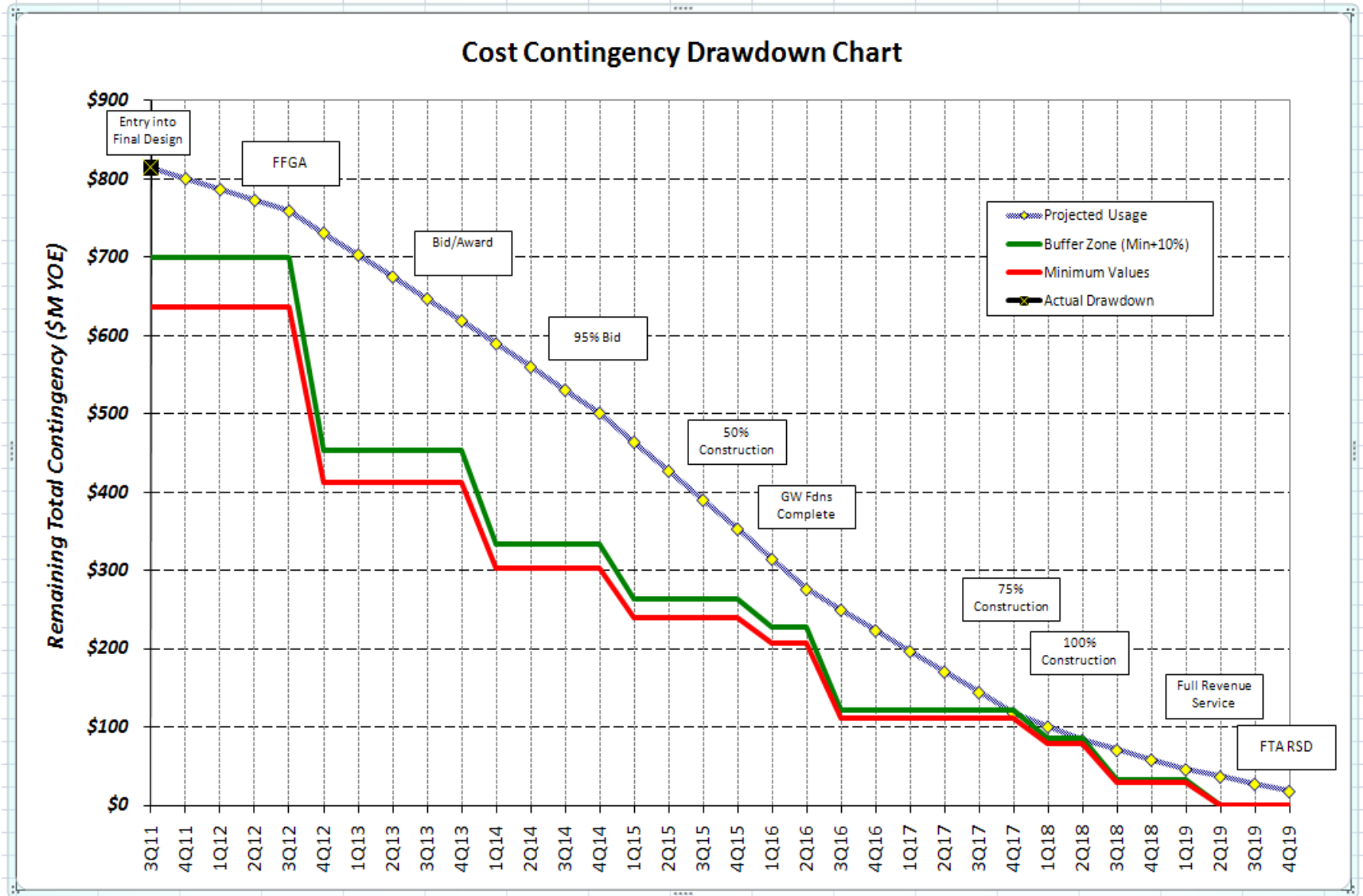
Guidance is at least 50% confidence



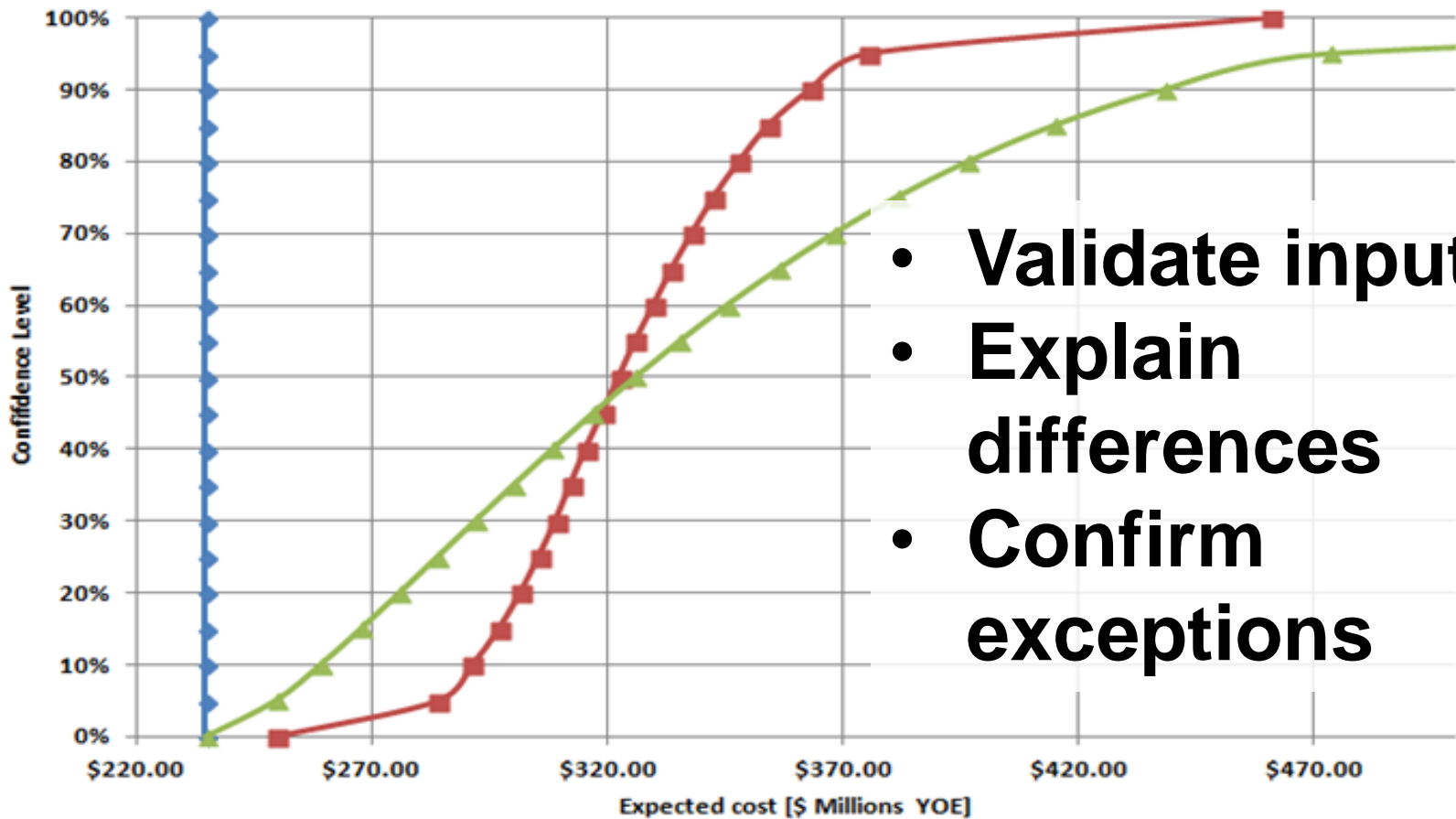
Secondary mitigation to meet at least 60%



Contingency draw down



Bottom Up v's Top Down



- Validate input
- Explain differences
- Confirm exceptions

◆ SABCE

■ Bottom Up Risk

▲ Top Down Risk

Schedule is bottom-up

The screenshot shows a software interface with two main panels. The left panel is a 'Risk View' table with columns: ID, T/O, Title, Quantified, Probability, and Impacted Task ID(s). The right panel is a 'Task View' showing a hierarchical tree of project activities.

ID	T/O	Title	Quantified	Probability	Impacted Task ID(s)
181	T	Supplemental EIS	<input checked="" type="checkbox"/>	10%	80
33	T	Norfolk Southern ROW Agreement delayed	<input checked="" type="checkbox"/>	35%	1260
78	T	TBM or other major breakdowns in tunnels	<input checked="" type="checkbox"/>	5%	1430,1050,610
126	T	ROW delays including condemnation	<input checked="" type="checkbox"/>	5%	1540,1170,1160,1150,1140,1120,1100,1130,1110,2140,...
11	T	ROD delayed - late documentation / legal objections	<input checked="" type="checkbox"/>	35%	160
22	T	Gwynn Fall bridge replacement by others delayed	<input checked="" type="checkbox"/>	55%	2390
18	T	Reduced headroom issues at Mulbery and Franklin [US40 Sect]	<input checked="" type="checkbox"/>	35%	1740
54	T	DELETED	<input type="checkbox"/>	0%	
56	T	Flood, fire, collapse etc - DTS station boxes and portals	<input checked="" type="checkbox"/>	5%	720,760,780,800,820,830,480
105	T	DTT Interventions / geotechnical - generic	<input checked="" type="checkbox"/>	70%	530
32	T	Extended surface alignment works for rebuilding City Blocks	<input checked="" type="checkbox"/>	35%	1840,1860,1850
121	T	Yard and shop relocation / significant changes	<input checked="" type="checkbox"/>	20%	2000
172	T	Systems installation, integration, testing delays	<input checked="" type="checkbox"/>	35%	230
185	T	Accident / Health and Safety Issue / Weather / Collapse	<input checked="" type="checkbox"/>	5%	240

The right panel shows a project hierarchy tree with nodes such as C.A - WHOLE ALIGN, C.A.AG - ROW, C.G - SEGMENT 1 - V, C.G.Q - Surface, C.H - SEGMENT 2 - C, C.H.J - Portal Co, C.H.K - Tunnel E, C.I - SEGMENT 3 - U, C.I.Q - Surface, C.I.UA - Yard an, C.J - SEGMENT 4 - D, C.J.J - Portal Co, C.J.K - Tunnel E, and C.J.PA - Station.

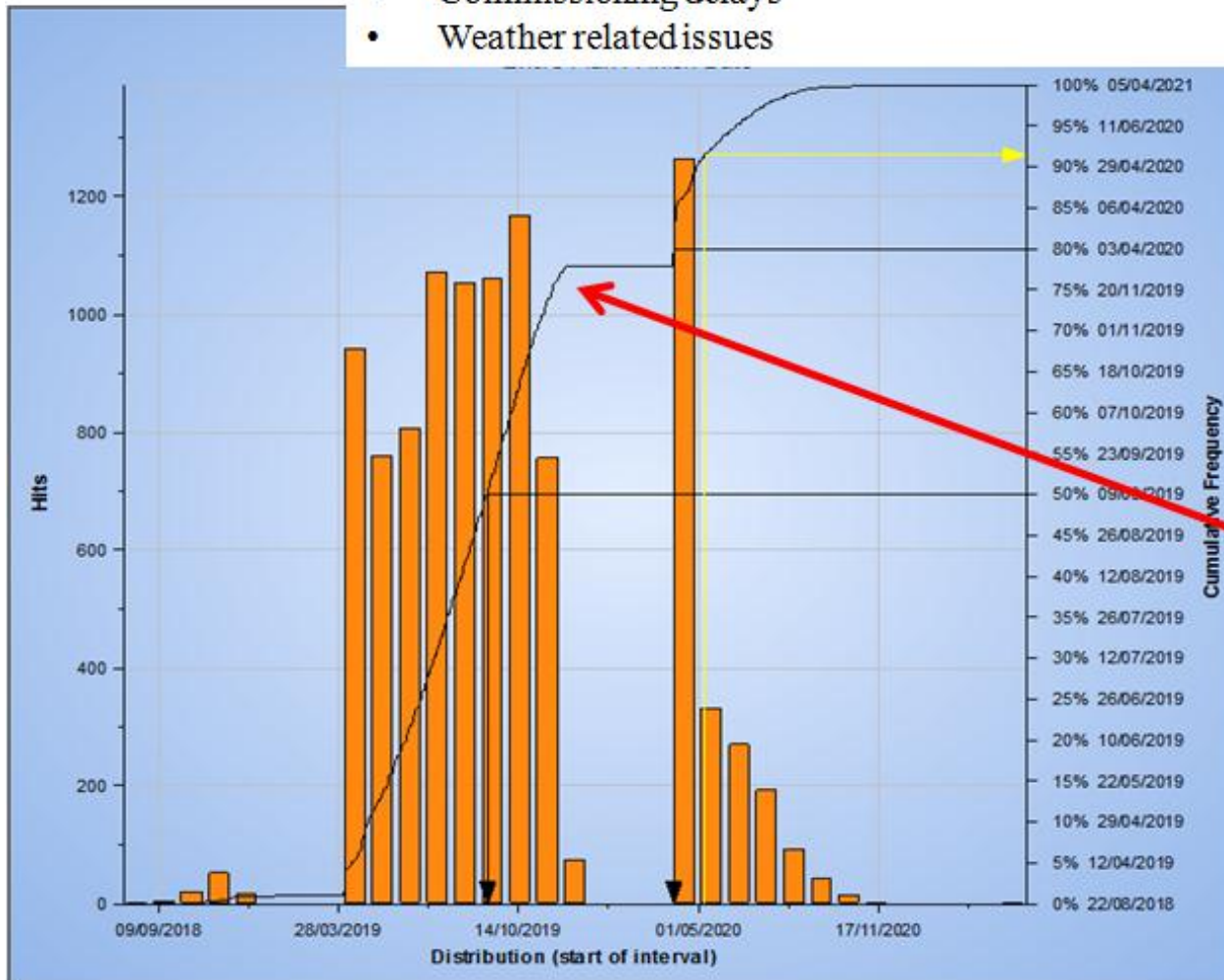
Red arrows point from the following text labels to the interface:

- Risks from risk register** points to the 'Title' column of the Risk Register table.
- Likelihood of risk happening** points to the 'Probability' column of the Risk Register table.
- Schedule activities** points to the project hierarchy tree.

Schedule sensitivities should be identified on TUESDAY and then taken from Risk Register, interpreted and reviewed Week 2

Schedule discrete events...

- Approval delayed
- Late bid / award
- Unexpected differing site conditions
- Commissioning delays
- Weather related issues

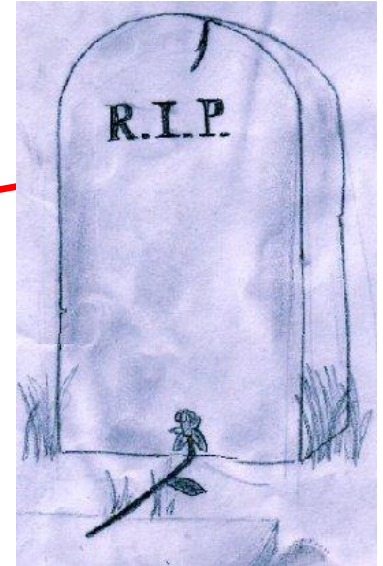


Avoiding
anticipated
'surprises' by up
front investment
is usually
'cheaper'

Risk analysis is the start



Risk Report



Risk Register

PROJECT RISK REGISTER		Legend	Low (L)	Med (M)	High (H)	Very High (V)	Significant (S)	GHI			
< YOUR PROJECT >		Probability	< 10%	10-50%	50%-75%	75%-90%	>90%	gardenintheobald			
REV 00		Cost	< \$20K	\$20K-\$50K	\$50K-\$75K	\$75K-\$100K	>\$100K				
DATE ISSUED : <DATE>		Schedule	< 1 Mths	1 > < 3 Mths	3 > < 6 Mths	6 > < 12 Mths	> 12 Mths				
		Rating	< 3	3 > = 4.5			> 4.5				
Risk ID	Phase	Risk Type	Risk Description (Event / Cause / Impact)	Notes / Discussion / Proposed Mitigation	Probability	Cost Impact (M, \$)	Schedule Impact (M, D)	Risk Rating (1-5)	Major Threat	Average Threat	Significant Threat
1	Site Select	Access	The existing tenant may not vacate the space to the intended schedule	This would incur additional costs in acceleration of the alterations and fit-out	4	2	2	4			
2	Site Select	Legal	The existing master lease agreement requires revising and agreement reached with other tenants which may take longer than schedule allowance	We could progress planning and design but would risk absorptive costs if lease get protected and delayed further	3	1	1	3			
3	Site Select	Space	The space is not a perfect fit - proposed architectural detailing may not be possible without significant additional alterations	Structural assessment and MEP survey is suggested prior to further design detailing	3	2	3	4			
4	Design	Construction	Fire officer may require additional escape external staircase	Additional agreements with adjoining owners will be required	4	1	2	4			
5	Design	Specification	Entrance lobby finishes are currently likely to be over budget allowance	Alternative materials specifications are required to remain with budget	4	1	3	4			
6	Construction	Access	During the working elevators may not be possible for bringing in and removal of construction-related materials	External hoist could be provided but this would require additional negotiations with building owner	4	1	2	4			

Mitigation plans

Presenter:

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