Mponeng Mine

United for SAFE Gold

Ledging planning process

30 June 2017

ANGLOGOLD ASHANTI

DISCLAIMER AND CONFIDENTIAL

The information shared by the Mine (Mponeng), is prepared as technical information used solely at Mponeng mine. This information includes and is limited to:

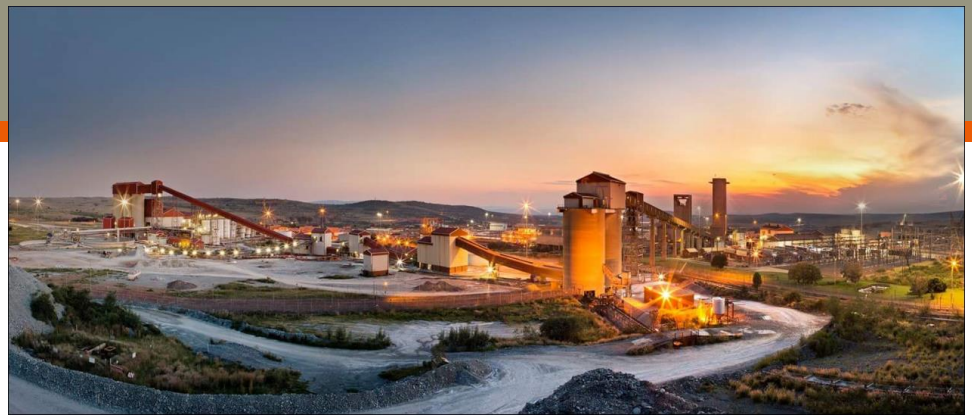
1. Mponeng Ledging presentation dated 30 June 2017
2. Method Statements
3. Ledging support standards
4. Ledging training Pack

This information shared, involve known and unknown risks, uncertainties and other factors that may cause a different outcome if applied on other business units within the company and/or other mines outside AngloGold Ashanti. Conditions prevalent at other mines might not necessarily be conducive for direct implementation, whether fully or partially of these methods or processes described in the information above.

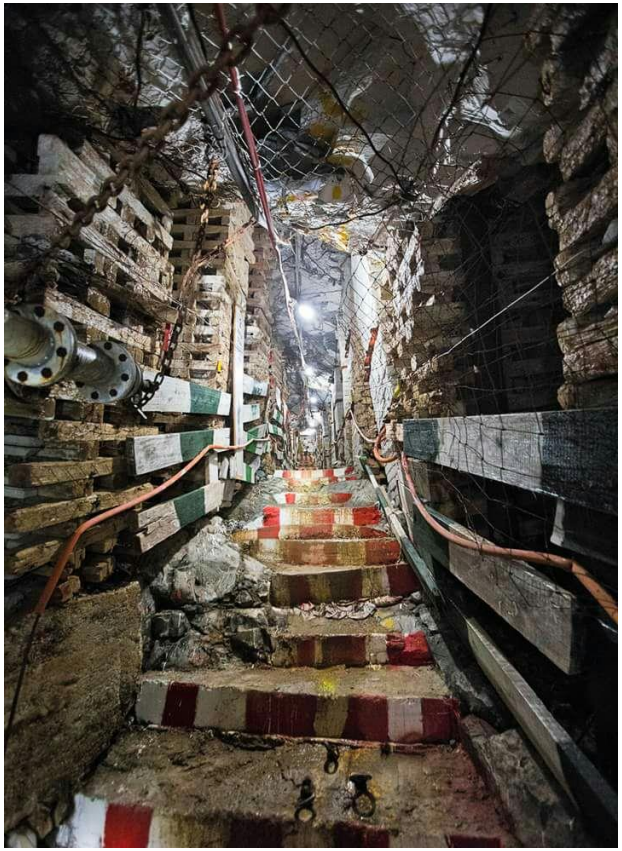
Readers are cautioned not to place undue reliance on this information without investing time and effort to ensure the correct application at other business units within the company and/or outside AngloGold Ashanti.

This information is shared in the spirit of improving on current methods and processes throughout the industry and Mponeng mine is of the view that this information is based on current knowledge and is applied at the current time at the mine. The mine is under no obligation to update this information in a public way if the information becomes irrelevant, changes or is replaced all together.

Agenda

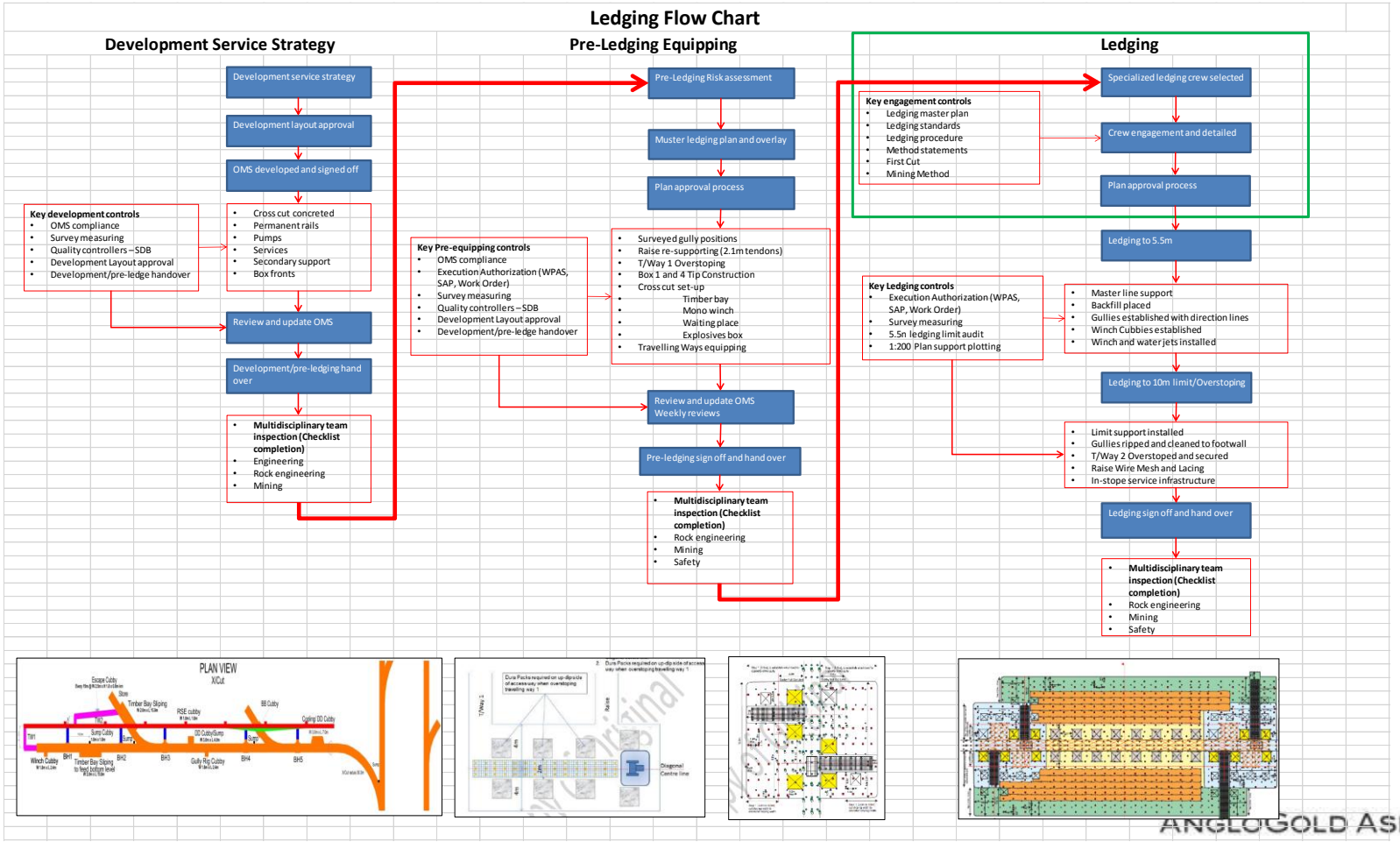


1. Ledging overview
2. Ledging planning (Step-by-step)
3. Ledging crew preparation
4. Ledging execution



Ledging overview

- 3 Main components
  1. Development strategy
  2. Pre-Ledging strategy
  3. Ledging strategy



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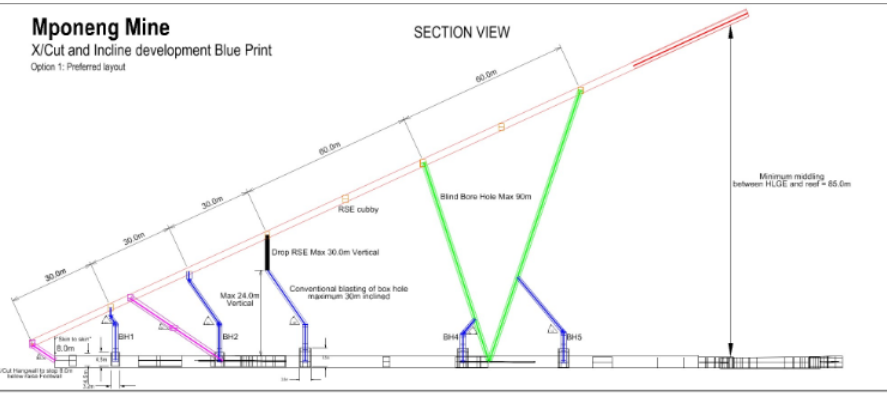
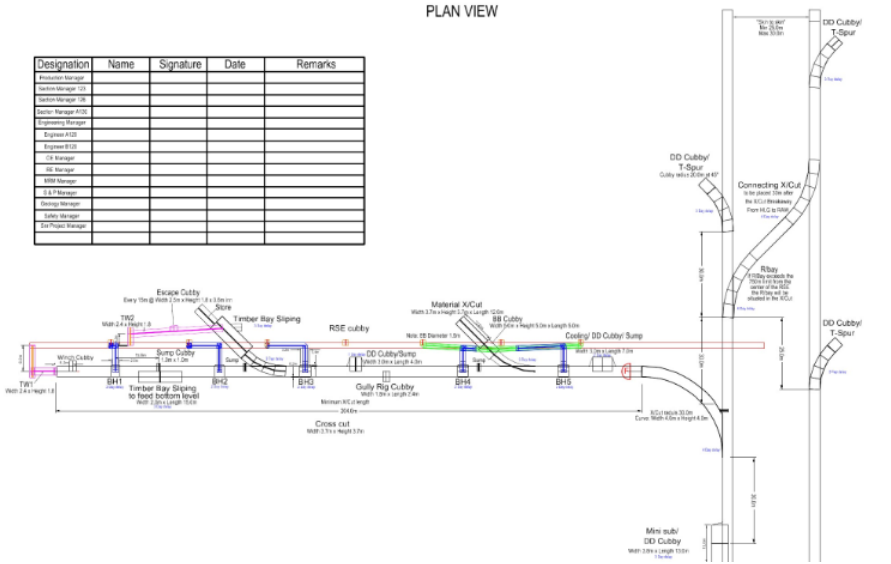
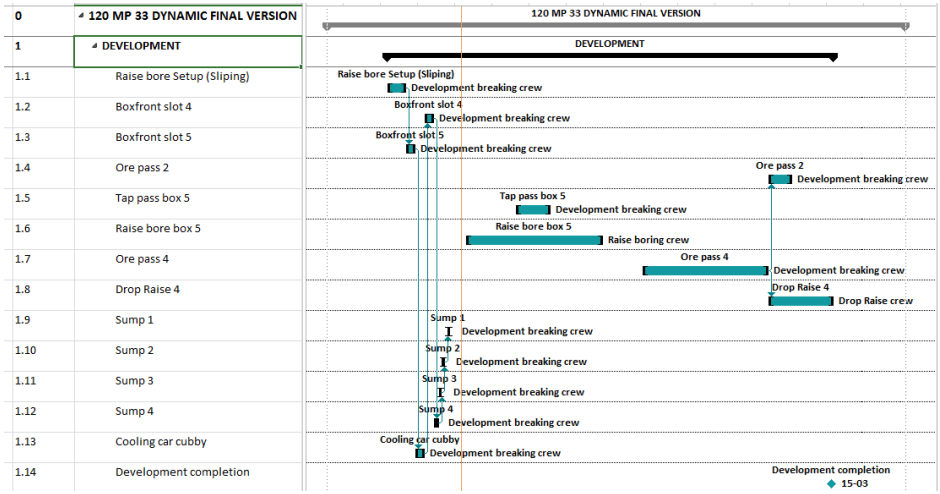




Development requirements

- X/cut
- Raise bore site
- Box front slots
- Ore passes
- Tap passes
- Material X/cut
- Cooling car Chamber
- Gully rig Chamber
- Pump Sumps
- Travelling ways
- Raise
- Drop raising



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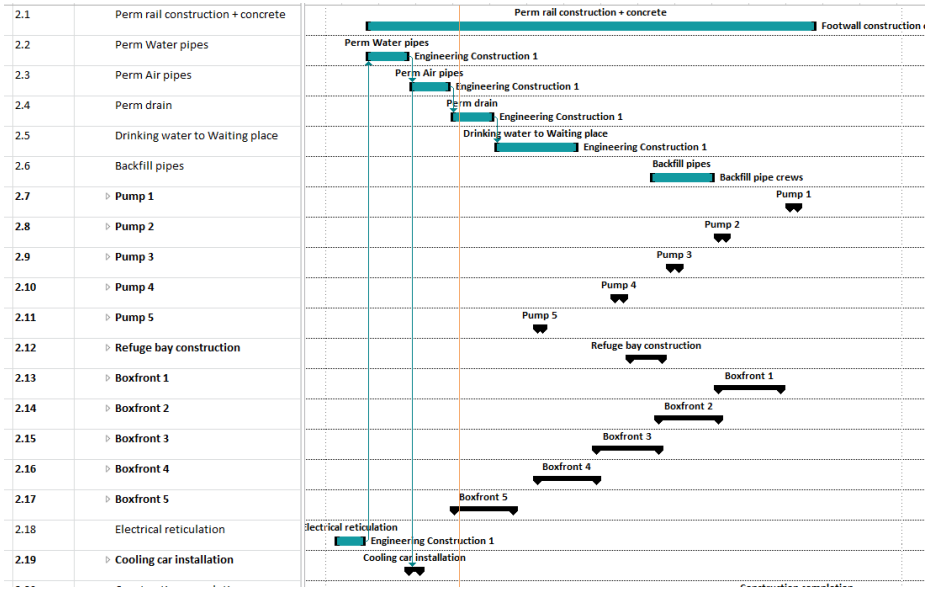

Development construction requirements

- X/cut footwall construction
- Permanent Services (Air, water, drain, drinking water, backfill)
- Electrical reticulation
- Box fronts
- Cooling car
- Ventilation doors
- Pumps

Development Support requirements

- Wire mesh and lacing
- X/cut (follow behind)
- Box front slot strapping
- Strapping of bullnoses
- Material X/cut

Ledging overview

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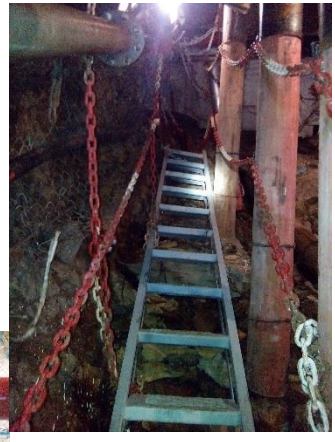
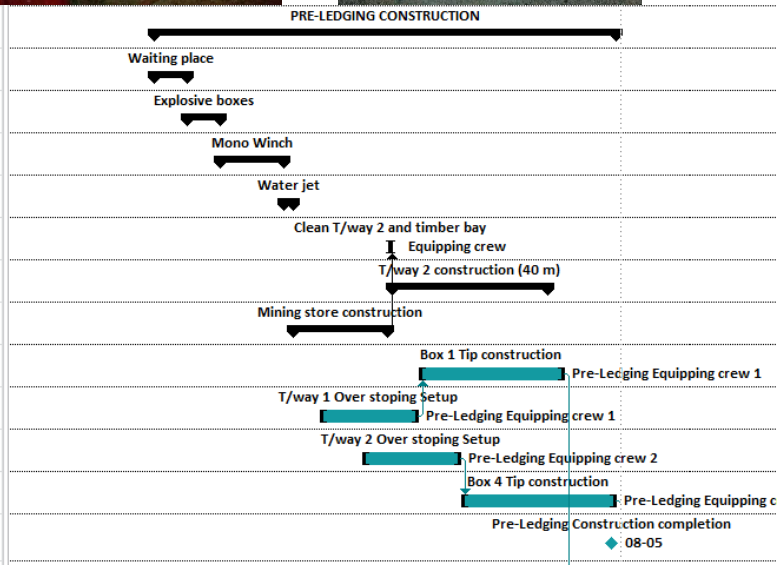
Pre-Ledging construction requirements

- Waiting place
- Explosive boxes
- Timber bay and Mono winch
- Travelling way equipping
- Refuge bay
- Mining store



4	PRE-LEDGING CONSTRUCTION	
4.1	Waiting place	
4.2	Explosive boxes	
4.3	Mono Winch	
4.4	Water jet	
4.5	Clean T/way 2 and timber bay	
4.6	T/way 2 construction (40 m)	
4.7	Mining store construction	
4.8	Box 1 Tip construction	
4.9	T/way 1 Over stoping Setup	
4.10	T/way 2 Over stoping Setup	
4.11	Box 4 Tip construction	
4.12	Pre-Ledging Construction completion	



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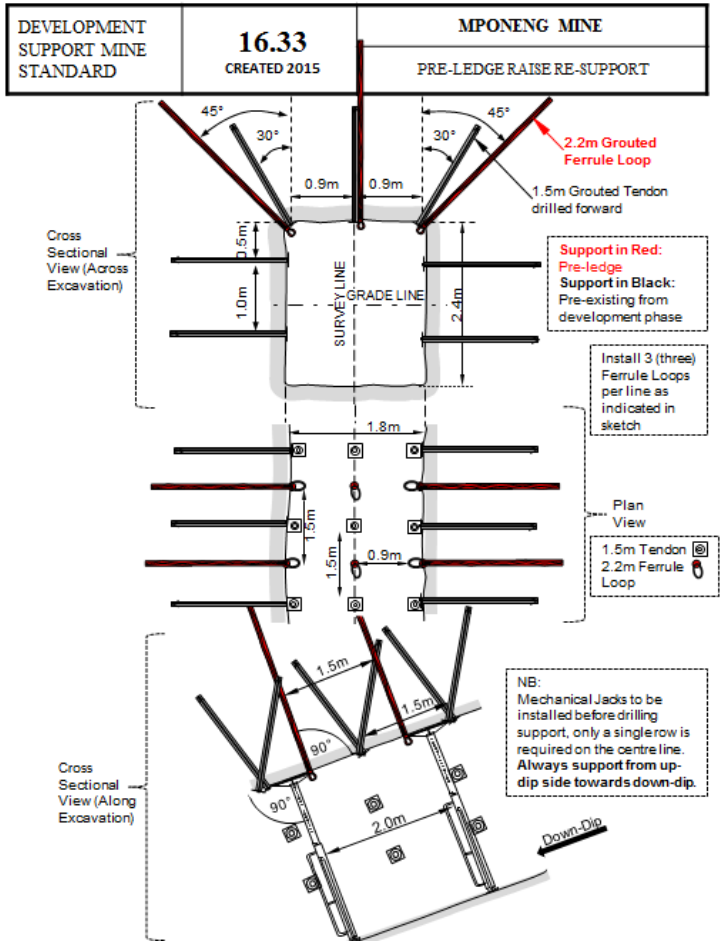
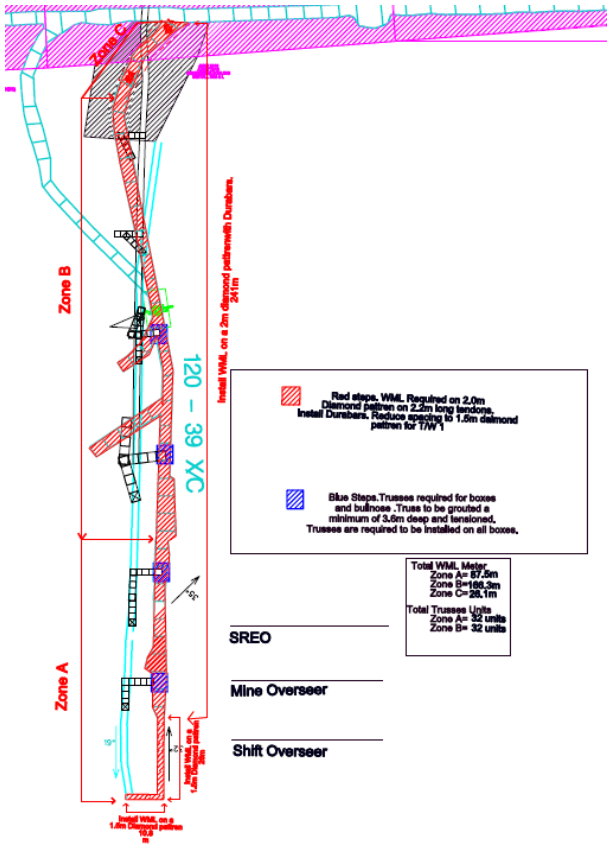


Pre-Ledging support requirements

- Wire mesh and Lacing of Traveling ways
- Raise Ferrule loops
- Geological support



Ledging planning (Step-by-step)

Pre Raise holing visit by Mine Overseer (Holing area safe)

Holing of excavation. All development, development construction and Secondary support to be completed including quality control

Strip ventilation columns, Mark the reef position on raise side walls by Miner and geologist

Physical inspection team (Multi disciplinary team lead by Section Manager)

Prepare a pre-inspection plan (Box and gully positions, Pillars, known geology, Ventilation layout, mining front profile etc.)

Survey check measurements

Doing the **Pre-Ledging Risk assessment** with multi-disciplinary team including IBRA

(Annexure B)

Schedule all work identified during pre-ledging risk assessment to be completed prior to Ledging commencing

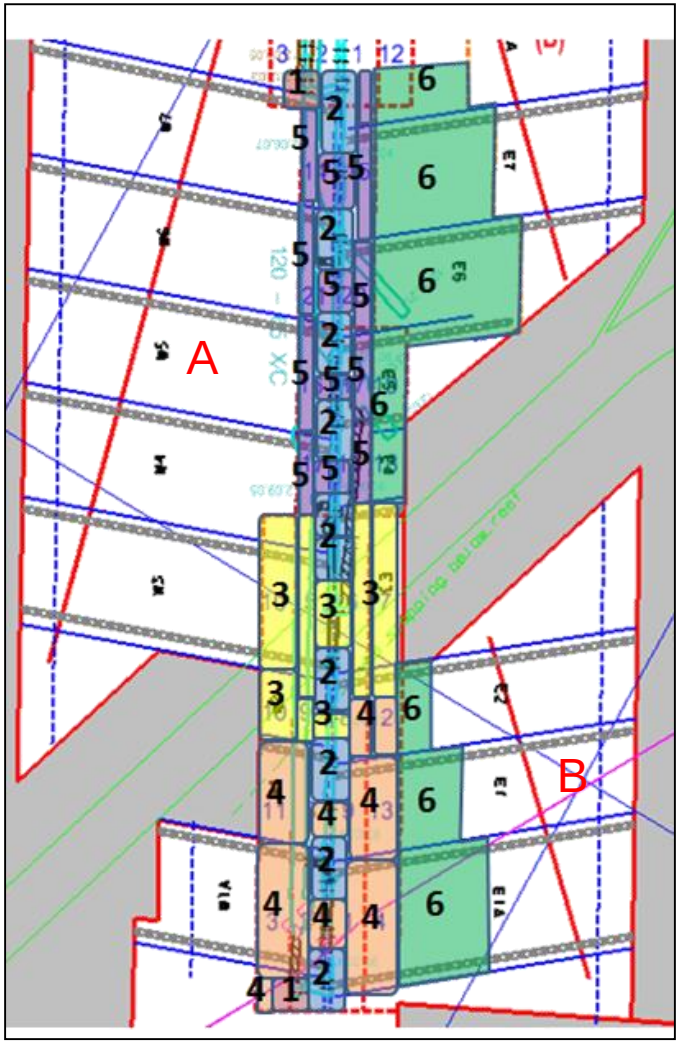
Create the "Blueprint" plan

Sign off on the plan

The “Blueprint” plan

Methodology

1. Secure access ways (Traveling way 1 and 2)
2. Create “attacking points” (Tipping areas)
3. Secure geological structure areas
4. Over-stope/Under-stope the X/cuts
5. Ledging of remaining ground up to 10m ledging limit
6. Create profile on Block A and Block B



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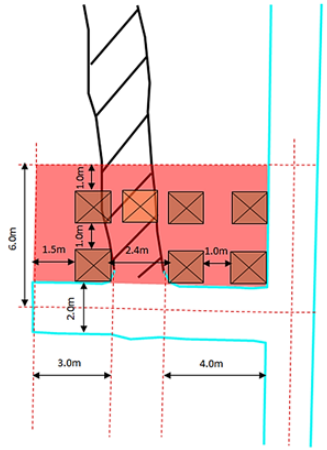
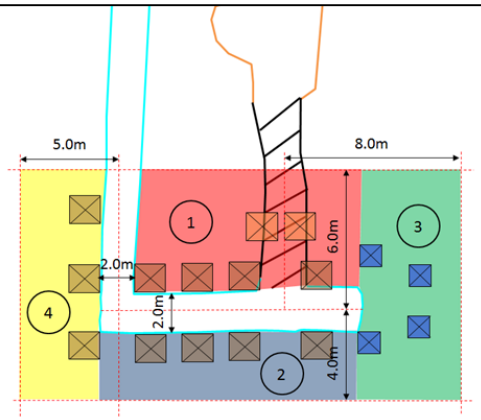
Ledging requirements

- Traveling way over-stoping
- Tip area preparation (attacking points) and equipping for ledging
- Full cut panel ledging
- Over and Under stoping of X/cuts



Step 1:
Demarcate Reef and center lines of raise and reef connecting.
Step 2:
Up-Dip Reef Connecting face up to 6.0m from Reef Connecting center line.



Step 1:
Up-Dip Reef Connecting face up to 6.0m from Reef Connecting center line.
Step 2:
Down-Dip Reef Connecting face up to 4.0m from Reef Connecting center line.
Step 3:
Breast mine perpendicular (90°) away from the center raise up to a distance of 8.0m from the travelling way 1 holing point center line.
Step 4:
Breast mine perpendicular (90°) away from the center raise up to a distance of 5.0m from the raise center line.

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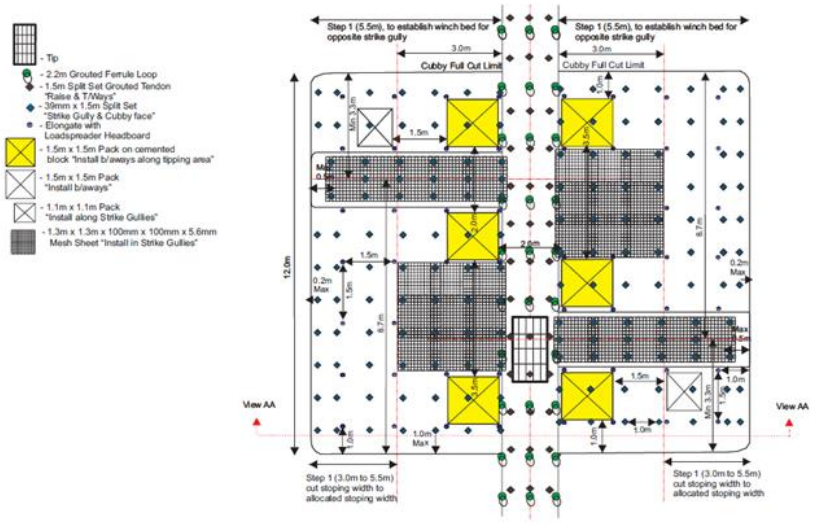
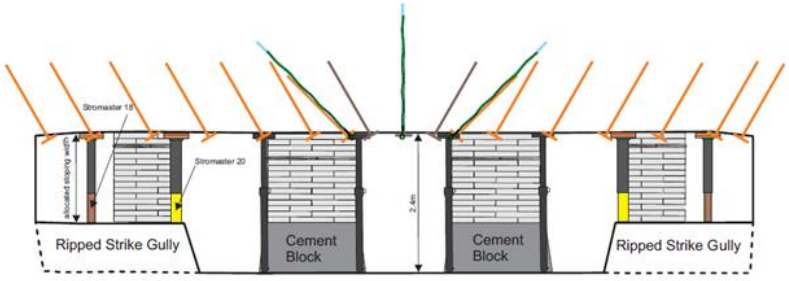


Cubby Establishment (Plan View)



Section View "AA" of Step 1 mining

Ledging requirements

- Traveling way over-stoping
- Tip area preparation (attacking points) and equipping for ledging
- Full cut panel ledging
- Over and Under stoping of X/cuts

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Ledging requirements

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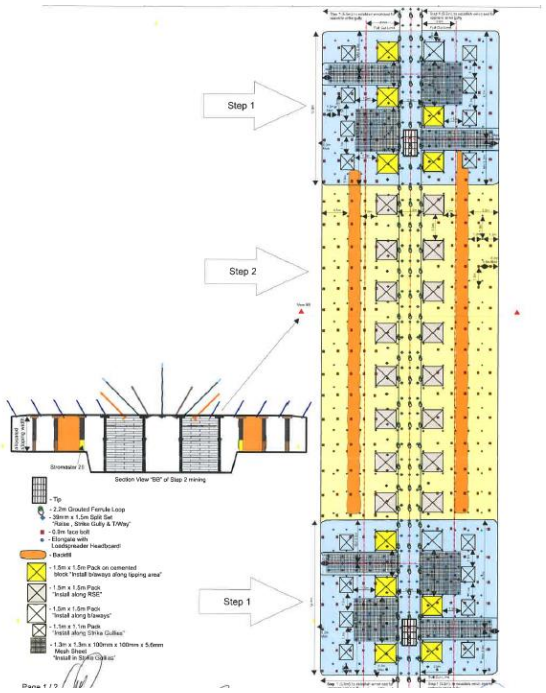

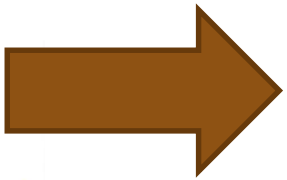

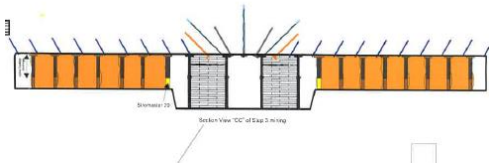

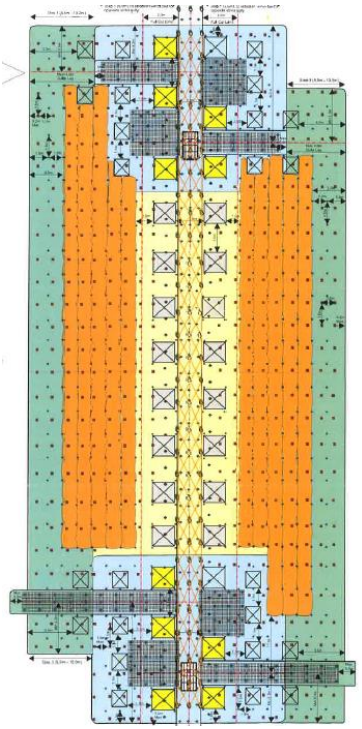

Ledging overview

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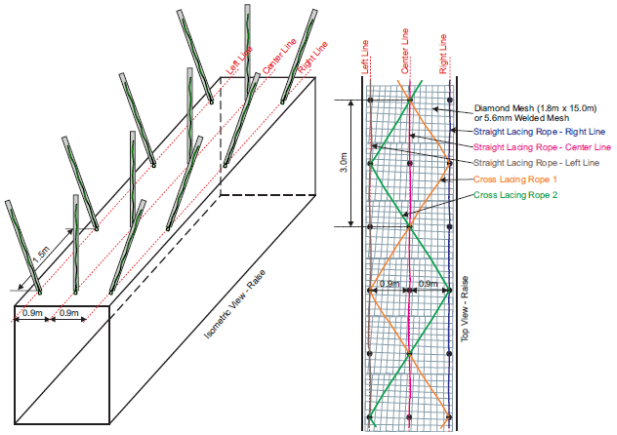
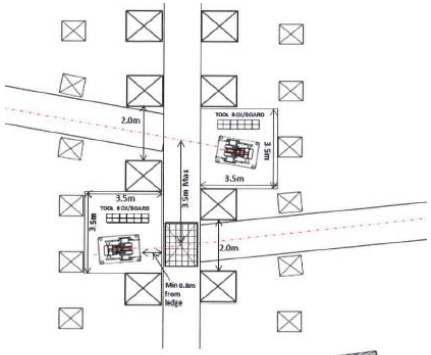
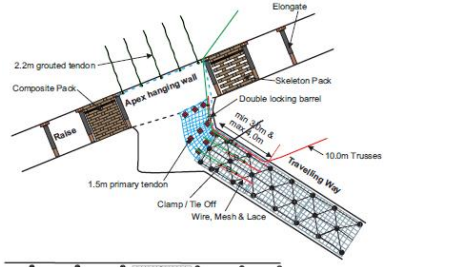
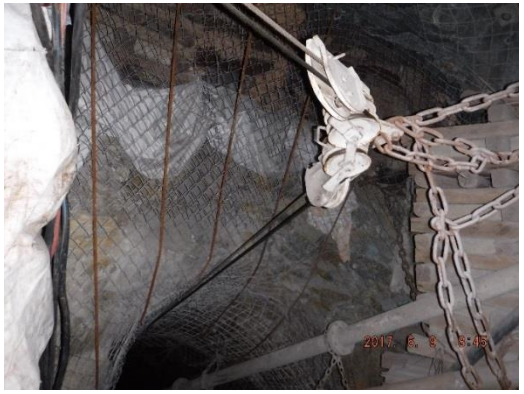
Ledging support requirements

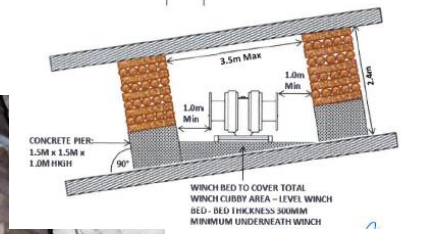
- Master line packs on concrete piers
- Gully establishment
- Post Ledging Wire mesh and Lacing

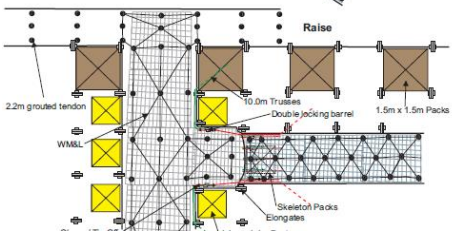




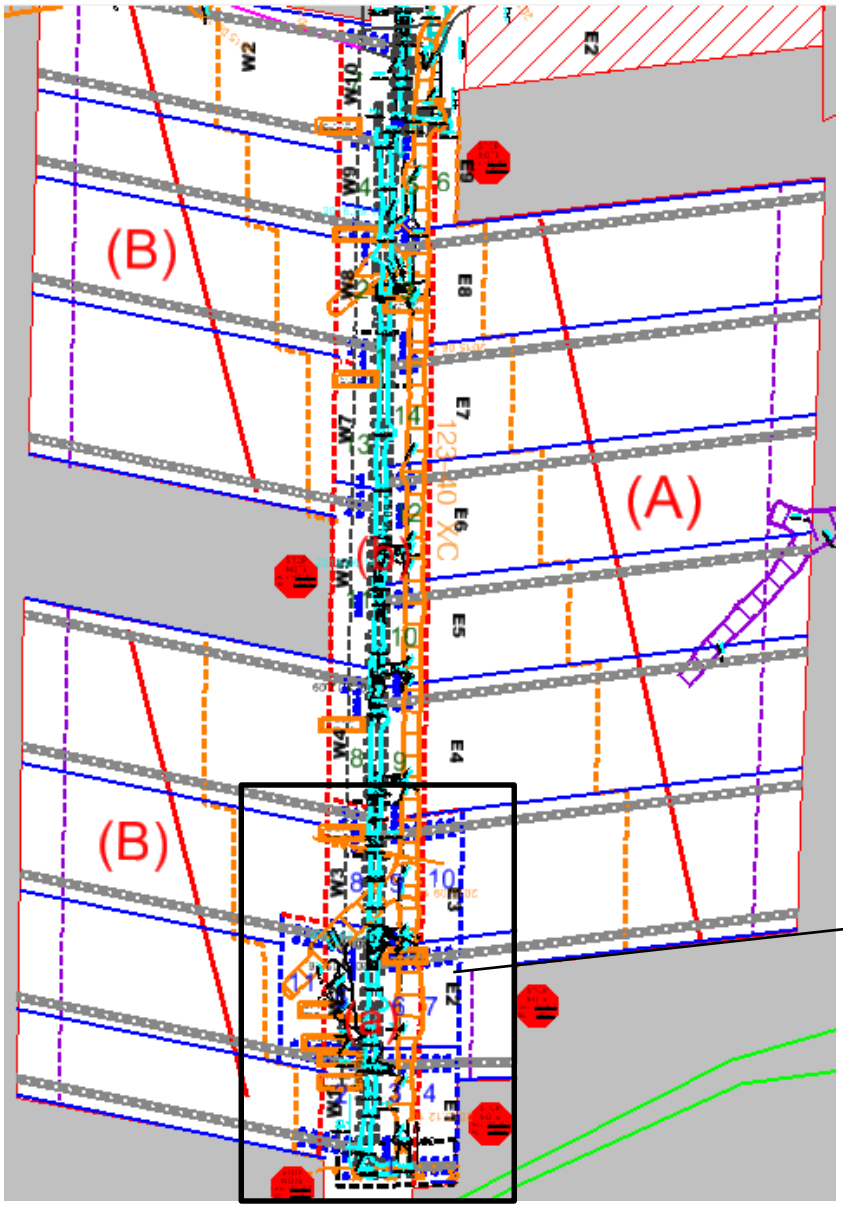




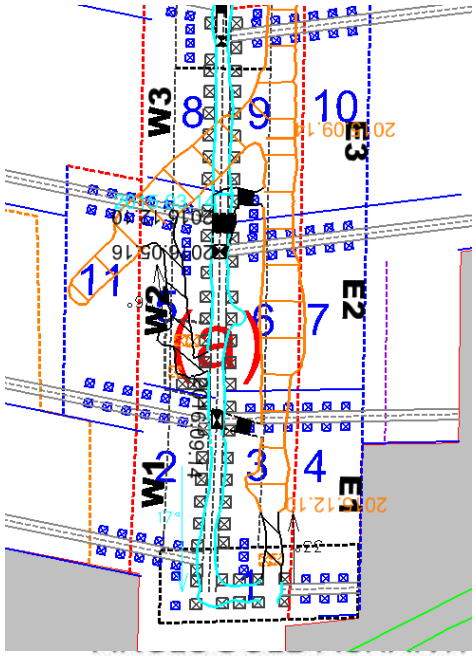




The “Blueprint” plan

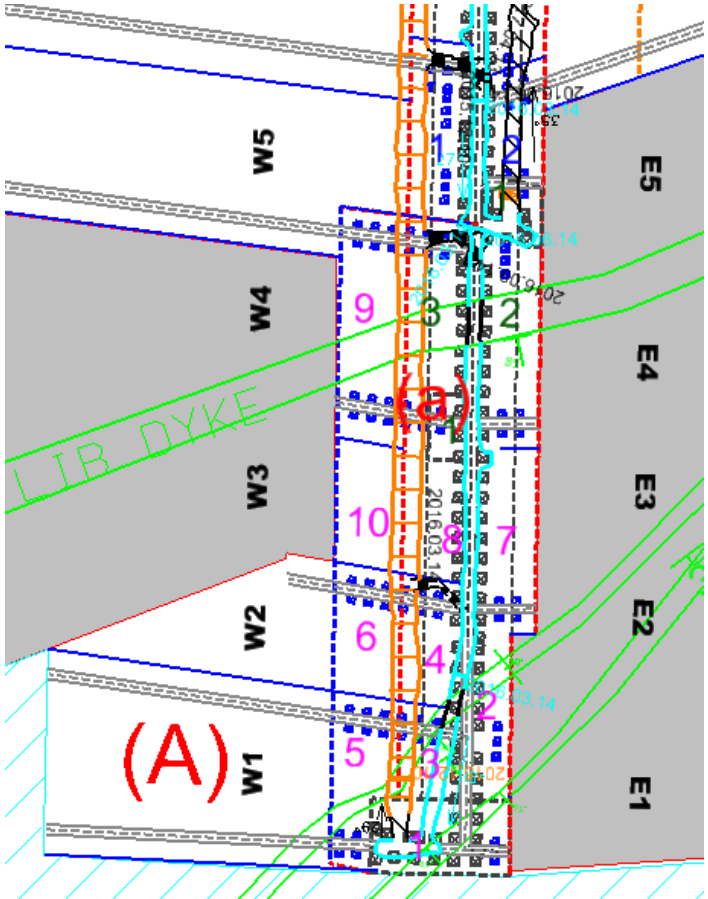


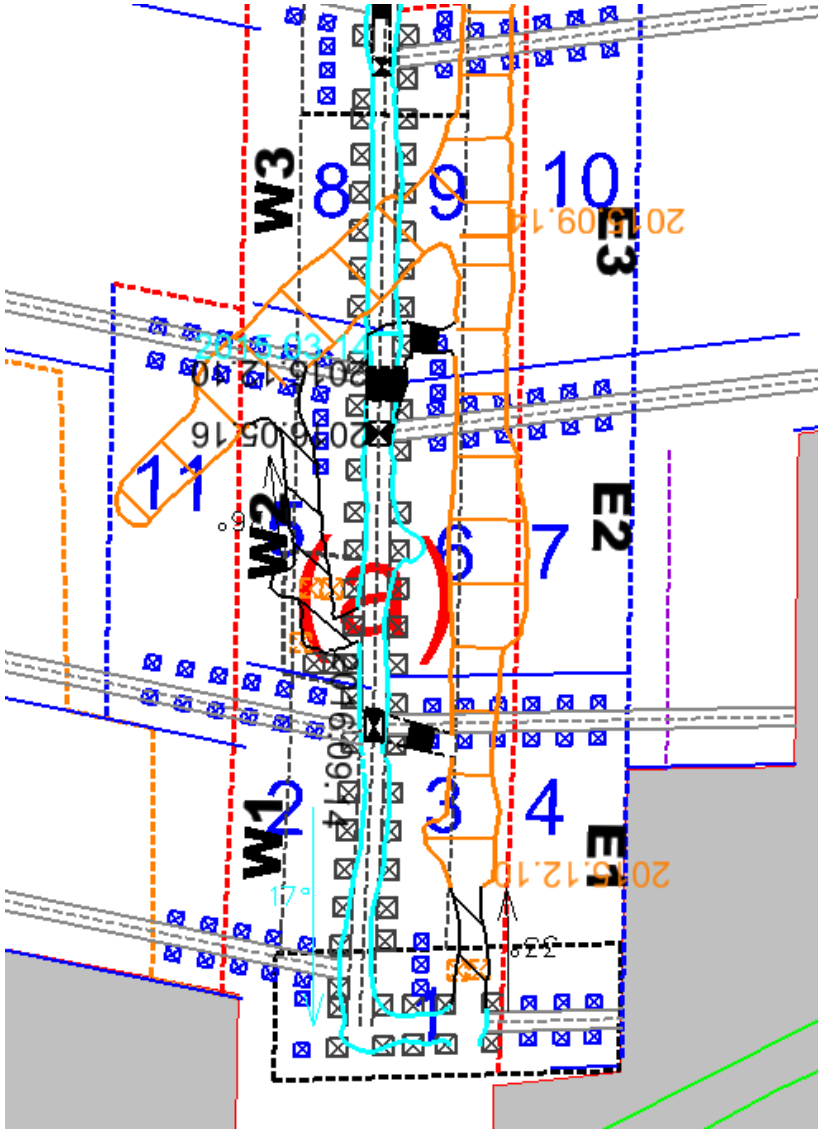
1. Mining profile and Sequence Block sequence, Over/Under hand configuration
2. Profiling limits (Orange lines)
3. Panel layout and length (Maximum 30m)
4. Box positions
5. Pillar positions (Minimum 30m thickness)
6. Ledging limits (10m)
7. Over/Under stoping limits (20m)



The “Blueprint” plan

1. Securing of traveling ways
2. Ledging sequence numbering
3. Ledging support requirements (Short interval controls)
4. Bracket pillar limits (Geology)





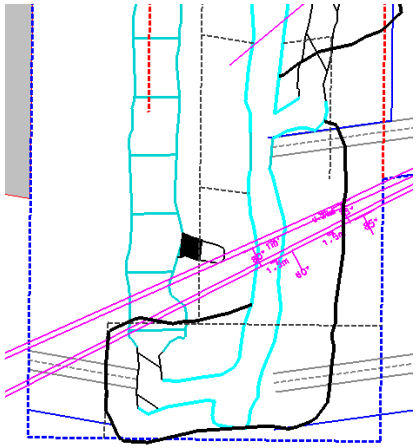
Ledging crew preparation

1. All Ledging to be done by dedicated ledging crews
2. All crews to be sensitized by the Mine Overseer on the following:
   a) Ledging training pack (General ledging orientation and training)
   b) Ledging procedure
   c) Hazards associated with Ledging and with the new working place
   d) Controls to mitigate the risk
   e) Equipment and equipping requirements of the Ledging area
   f) Method statements for critical areas (Step-by-step method)
3. Record to be kept on all employees that participated in the training, furthermore, as far as practically possible, changes to members of the ledging gangs must be prohibited.
4. This process to be followed every time the crew moves into a new raise line
5. During the Work place specific Risk assessment and Pre-Ledging risk assessment, members of the crew (Team leader, Safety rep, including night shift) needs to be involved.

Ledging Execution (Cycles)

		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		
		d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	d/s	n/s	
Ledging	P1	S		SR	CL	SR	CL	SR	CL	S		B	CL	S		B	CL	S		B	CL	S		B	CL	S		B	CL	S		B	CL	S		B	CL	S		B	CL	S		B	CL	S		10.5
Ledging	P1	S		SR	CL	SR	CL	SR	CL	S		B	CL	S		B	CL	S		B	CL	S		B	CL	S		B	CL	S		S		B	CL	S		B	CL	S		B	CL	S		10.5
	P2																							S		SR	CL	S		SR	CL	SR	CL	S		B	CL	S		B	CL	S		B	CL	S		4.5
Cubbies (Pre-led crew)	C1e	S		SR		CL		SR		CL		SR		CL		B		CL		B		CL		B		CL		B		CL		B		CL		S												6.5
	C1w																																					S		SR		CL		SR		CL		1.0
	C2e	S		SR		CL		SR		CL		SR		CL		B		CL		B		CL		B		CL		B		CL		B		CL		S												6.5
	C2w																																					S		SR		CL		SR		CL		1.0
Cubbies (Full Led crew)	C1e	S		SR	CL	SR	CL	SR	CL	S		B	CL	B	CL	B	CL	B	CL	B	CL	S																						SW				6.5
	C1w																							S		SR	CL	SR	CL	SR	CL	S		B	CL	B	CL	B	CL	B	CL	B	CL	S		SW		6.5
	C2e	S		SR	CL	SR	CL	SR	CL	S		B	CL	B	CL	B	CL	B	CL	B	CL	S																						SW				6.5
	C2w																							S		SR	CL	SR	CL	SR	CL	S		B	CL	B	CL	B	CL	B	CL	B	CL	S		SW		6.5
T/W 1 Over stoping (Pre-led crew)	N	S		B		CL		B		CL		B		CL		S																										SW				3.0
	S	S														B		CL		B		CL		B		CL		S														SW				3.0
	E	S																										B		CL		B		CL		B		CL		S						SW		3.0
	W	S																												B		CL		B		CL		B		CL		S				SW		3.0
T/W 1 Over stoping + Cubby (Full Led crew)	N	S		B	CL	B	CL	B	CL	S																																						3.0
	S	S								B	CL	B	CL	B	CL	S																																3.0
	E	S														B	CL	B	CL	B	CL	S																										3.0
	W	S																				B	CL	B	CL	B	CL	S																				3.0
	C1e	S																										SR	CL	SR	CL	SR	CL	S		B	CL	B	CL	B	CL	B	CL	B	CL	S		6.5
Cubbies + P1 (Full led crew)	C1e	S		SR	CL	SR	CL	SR	CL	S		B	CL	B	CL	B	CL	B	CL	B	CL	S																										6.5
	P2																							S		SR	CL	SR	CL	SR	CL	S		B	CL	S		B	CL	S		B	CL	S		B	CL	5.5

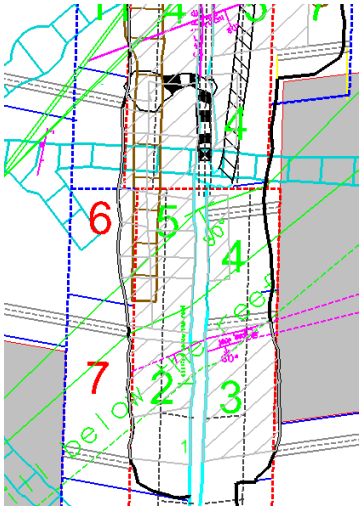
Ledging Execution (Cycles)



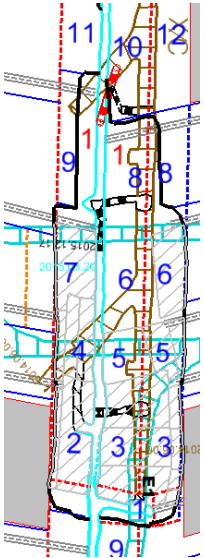
1. Secure access ways

2. Create “attacking points

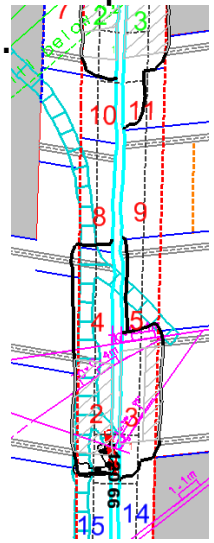
3. Secure geological structure areas



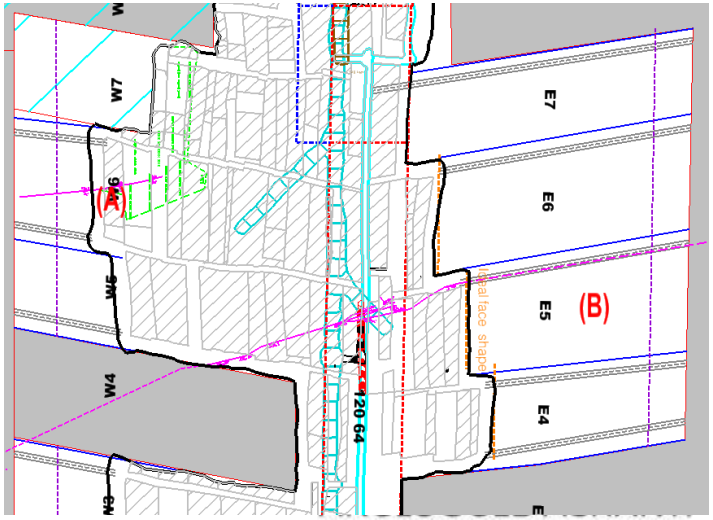
4. Over-stope/Under-stope the X/cuts



5.Ledging of remaining ground up to 10m ledging limit.



6. Create profile on Block A and Block B



THANK YOU……