

**GOLD FIELDS**



**SHAFT SAFETY SEMINAR 2008**  
**BEATRIX GOLD MINE**  
**G-BLOCK DECLINE**  
**CLEANING CONCEPTS**

F.P HEYNEKE

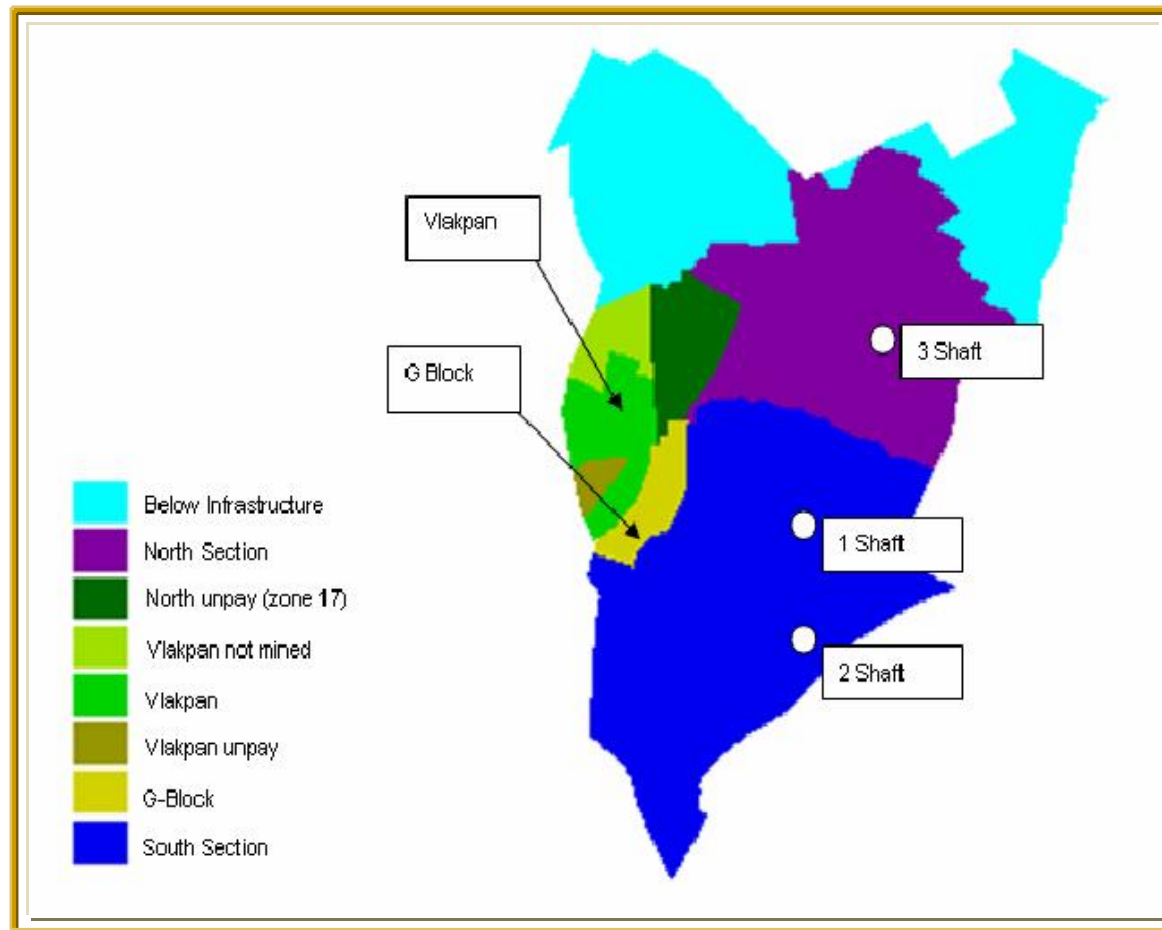


- **Background**
  - **Geographical layout**
  - **Sectional layout**
  - **Motivation & Constraints**
  - **Detail plan**
  - **Section plan**
- **Cleaning concepts**
- **Safety**
- **Conclusion**

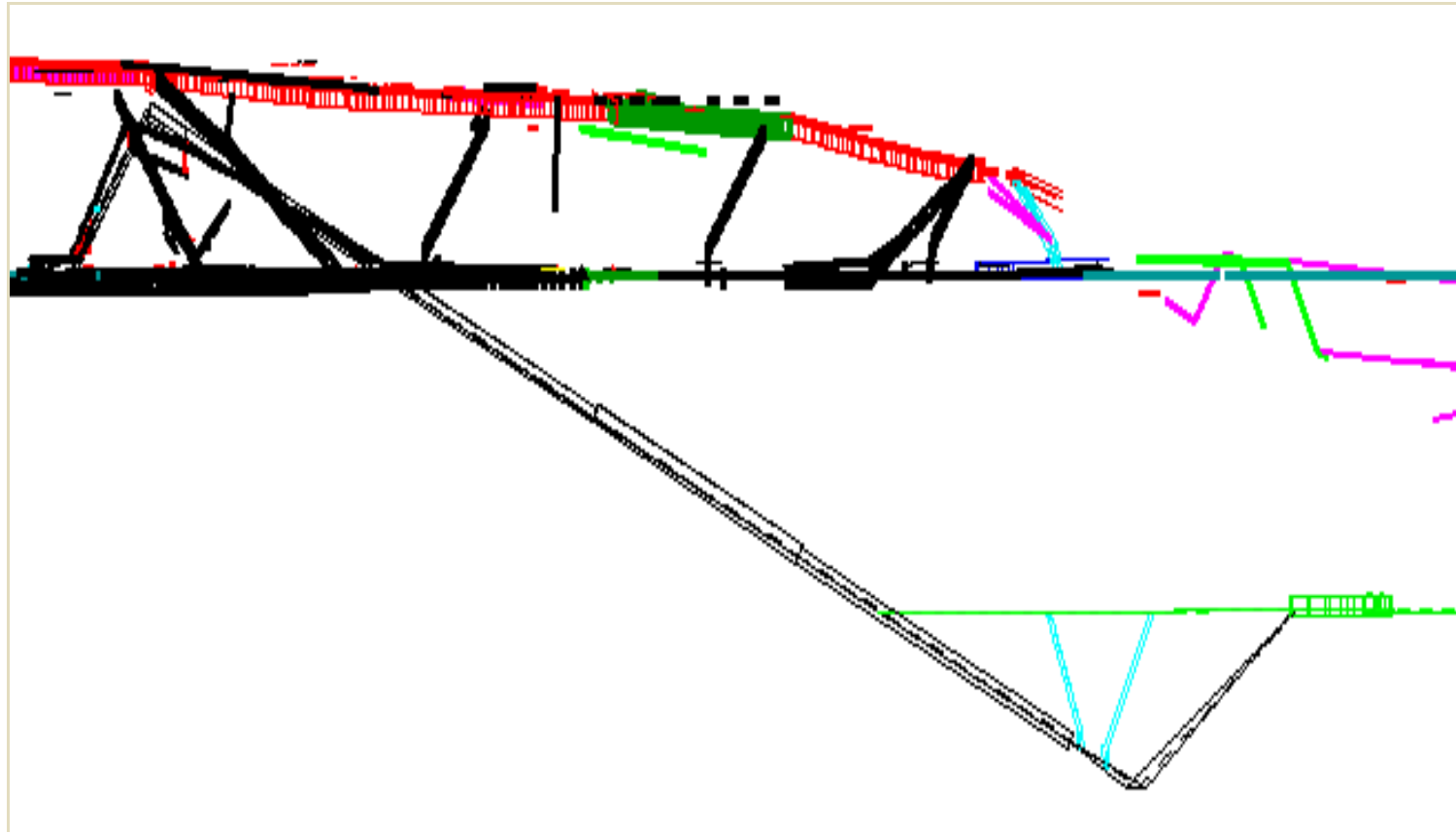
# Background – Geographical Layout



**GOLD FIELDS**



# Background: Sectional Layout



**Survey Section view**

## Project Motivation

- Ore resources – 351 000 Oz
- Gold Price – R100 000/kg
- Proximity & Logistics – Ore reserves close to current underground infrastructure; Access on 16 lev

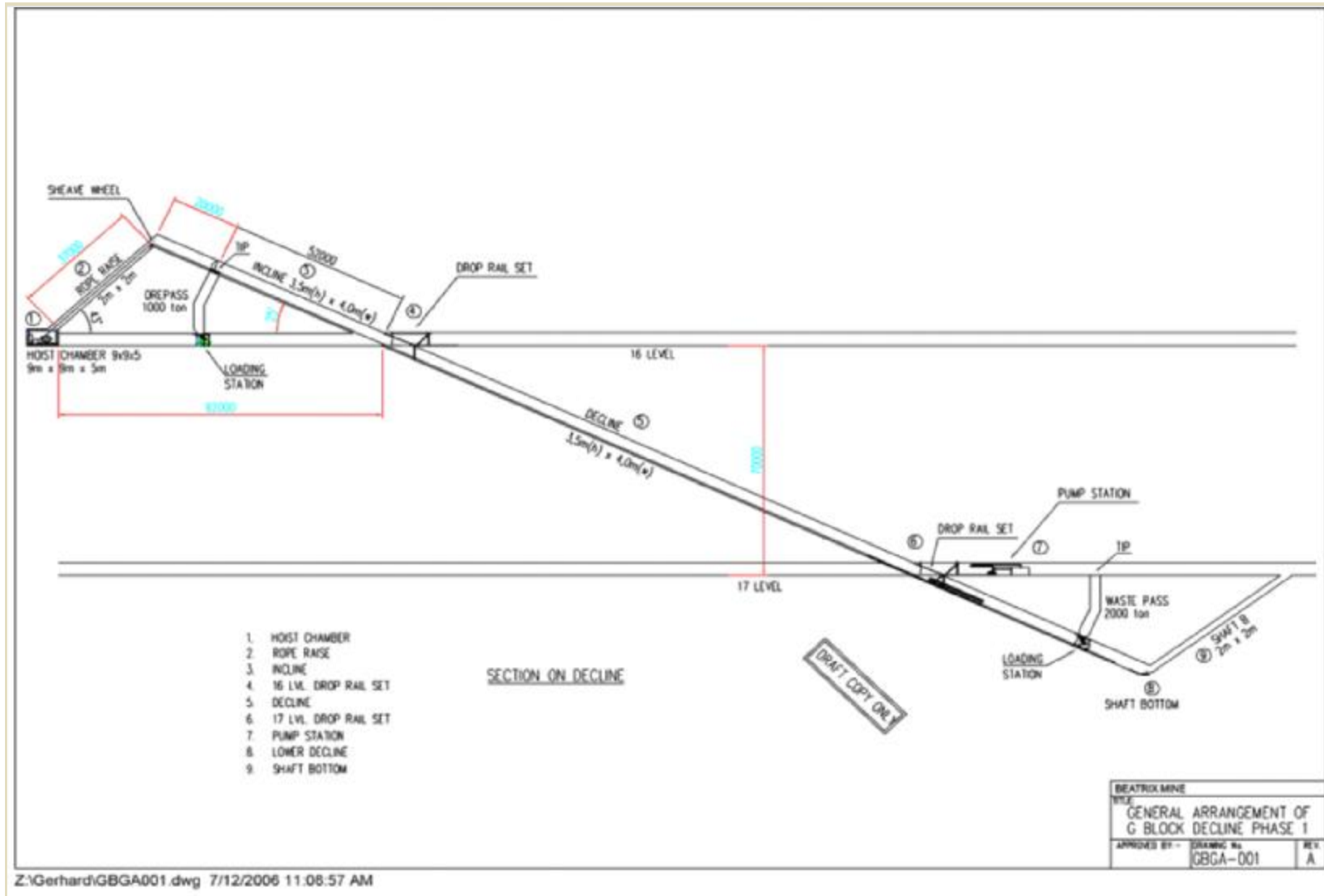
## Constraints

- Cleaning of development face – 85t per blast.
- Capital – IRR = 11% (Internal rate of return)
- Angle of Decline - 25°

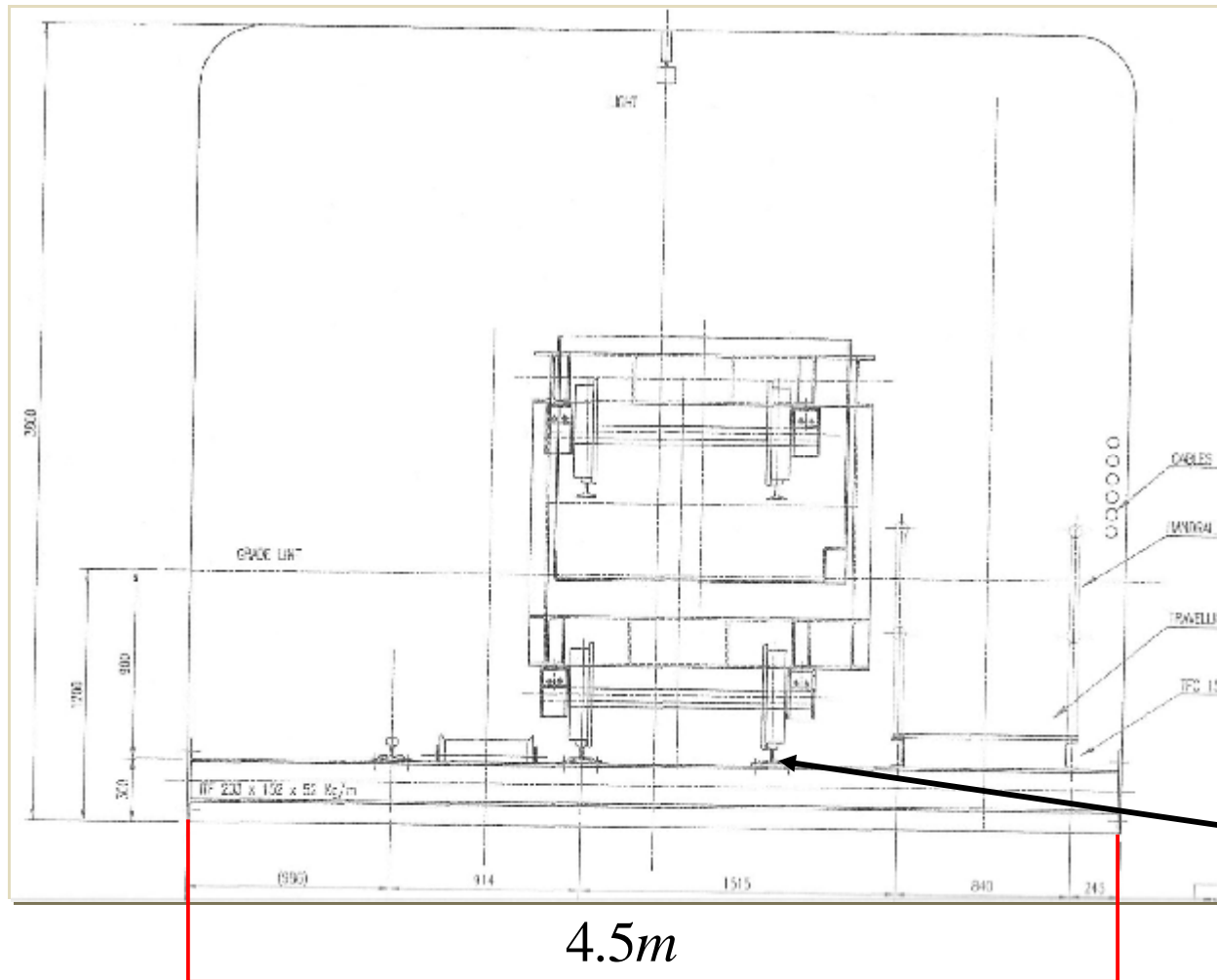
# Background: Decline Detail plan



**GOLD FIELDS**



# Background : Decline layout



Third Rail

# Cleaning Concepts : Scraper



- Availability
- Condition of footwall
- Unsuitable due to angle of decline

**Use a scraper to pull rock to the tips for removal**

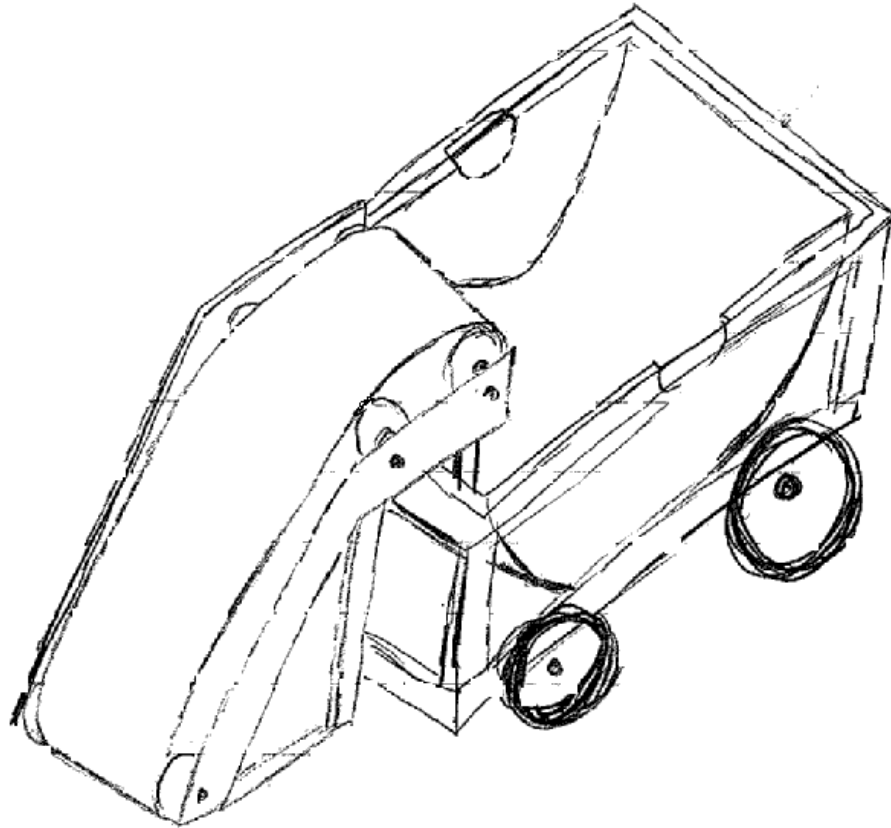
# Cleaning Concepts : Mechanized Loader



- Availability
- Loading Capacity
- Reach
- Operation & Proximity

**Use a Mechanized loader to load the rock onto a hopper behind it.**

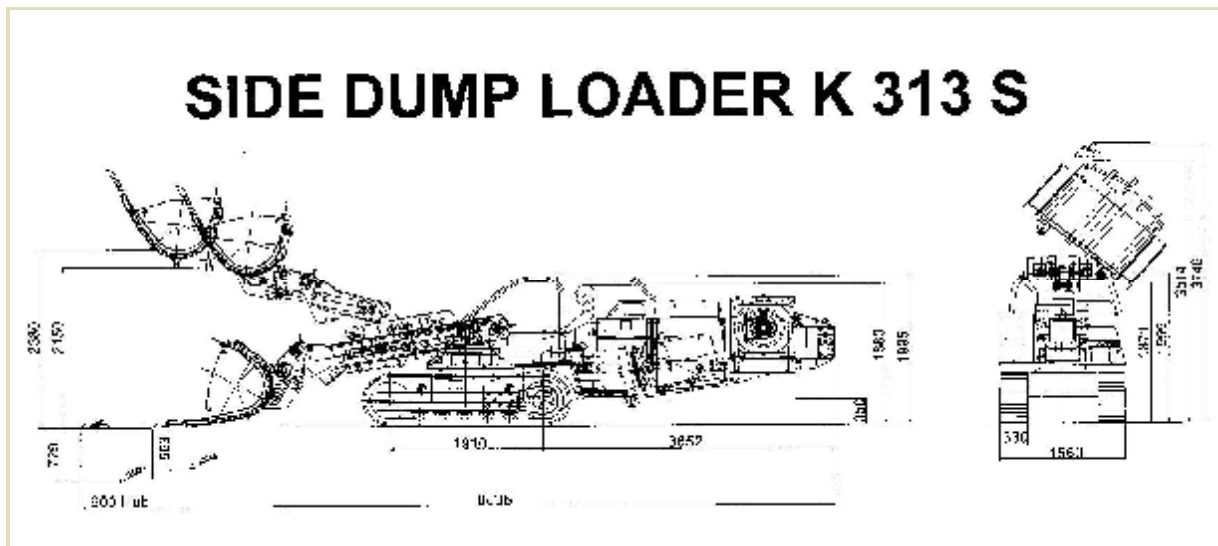
# Cleaning Concepts: Clip-on Funky Slide



- Low Expenditure
- Labor intensive
- Time consuming

**Build a clip-on funky slide, rock can be manually loaded onto the conveyor belt, that would tip it into the hopper**

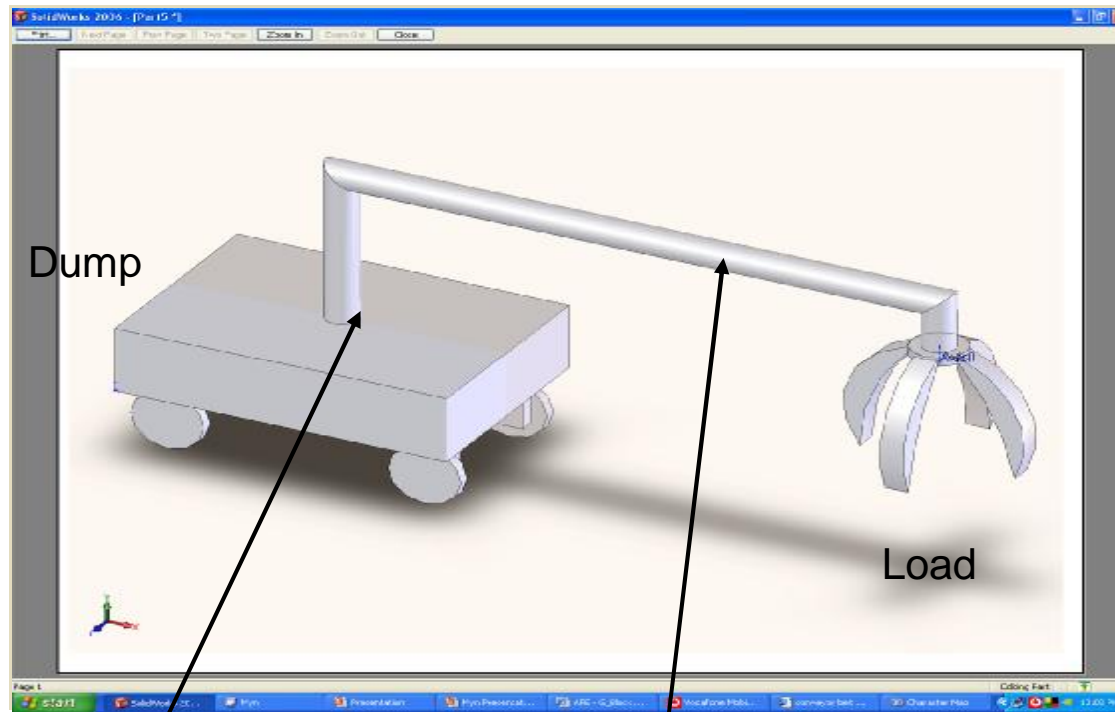
# Cleaning Concepts : Side Dump Loader



- Loading Capacity
- Timeous Completion
- High Capex
- Redundancy @end of project

**Use specialized mechanized equipment**

# Cleaning Concepts : Grab Car



Dump

- Loading Capacity
- Rigged on own sidewall rigging points

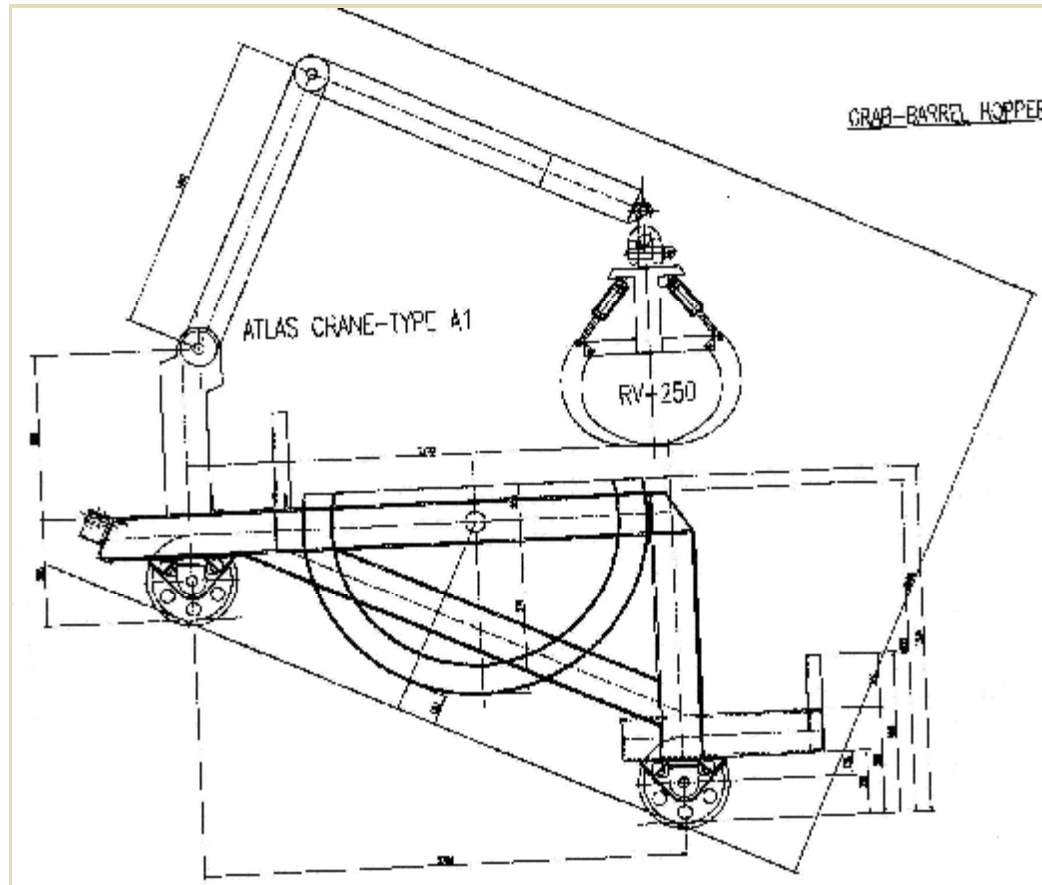
Load

180°  
Rotation

Telescopic  
Arm

**Attach a grab arm to a rail car**

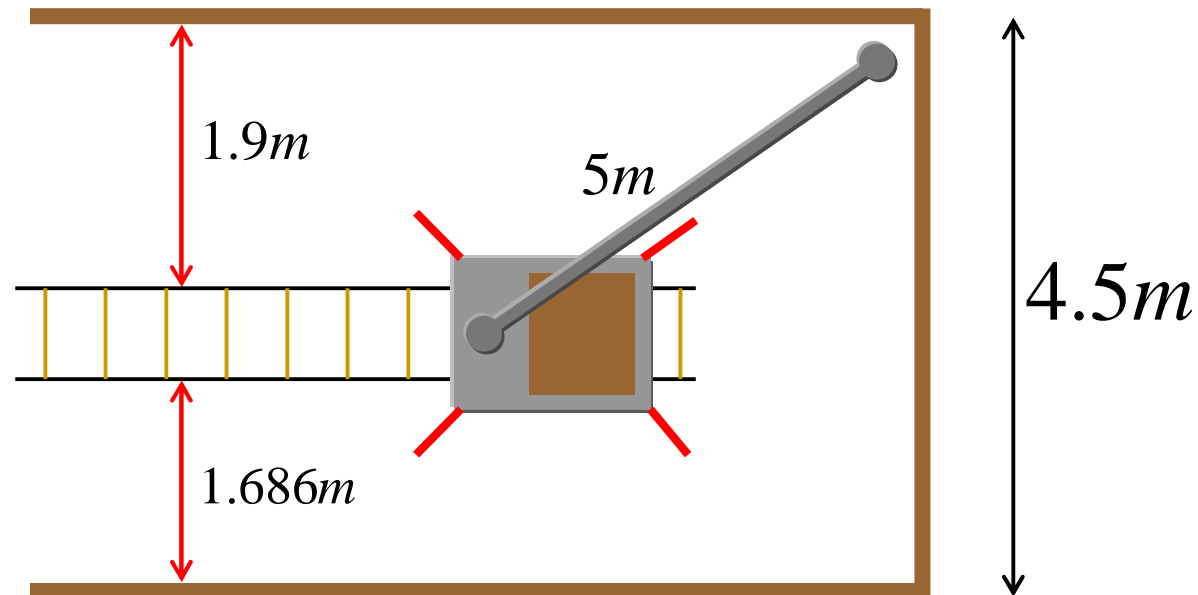
# Cleaning Concepts : Grab-Barrel Hopper



- Loading Capacity
- Timeous Completion
- Low Expenditure
- Remotely operated

**This is a special design where the grab arm is attached to the back of a hopper type car**

# Grab-Barrel Hopper: Stability



- Consider the stability of the car at the point where tipping risk is at a maximum
- Equip grab-barrel hopper with hydraulic outriggers.
- The design is stable with a Safety Factor of 1.08

# Comparison: Best two concepts



**GOLD FIELDS**

<b>Criteria</b>	<b>Grab-Barrel Hopper</b>	<b>Side Dump Loader</b>
<b>Safety</b>	Very good, improved by use of remote control	Very good, cabin is reinforced
<b>Cost</b>	Approximately R 375 000.00	Approximately R 7 000 000.00
<b>Clean entire face</b>	Yes, telescopic, rotating arm, with grab.	Yes, large loading capacity, and maneuverable.
<b>Equipping during advance</b>	Yes, relies on the rails for tipping.	Yes, if removed via 17-level after completion.
<b>Stability</b>	Yes.	Yes, good safety factor
<b>Timeous Completion</b>	Yes, risk of failure due to unproven technology	Yes guaranteed

# Some Safety Aspect Considered:



**GOLD FIELDS**

- Marshall wires/lasers
- Cubbies every 20m during sinking process
- Shaft equipped with steel sills on 1m intervals
- Dropsets installed on 16 & 17 lev for material cars – equipped with signaling to driver
- Cameras for driver to observe traveling way, skip at tips, loading area & travel in decline
- Safety devices on winder – overwind, underwind, overspeed, slackrope & tightrope.
- Locked bell system
- Remote wireless operation of grab-barrel hopper
- Tip full device
- Stability of grab-barrel hopper – equipped with hydraulic outriggers
- Biza Khuluma
- Trained and competent staff

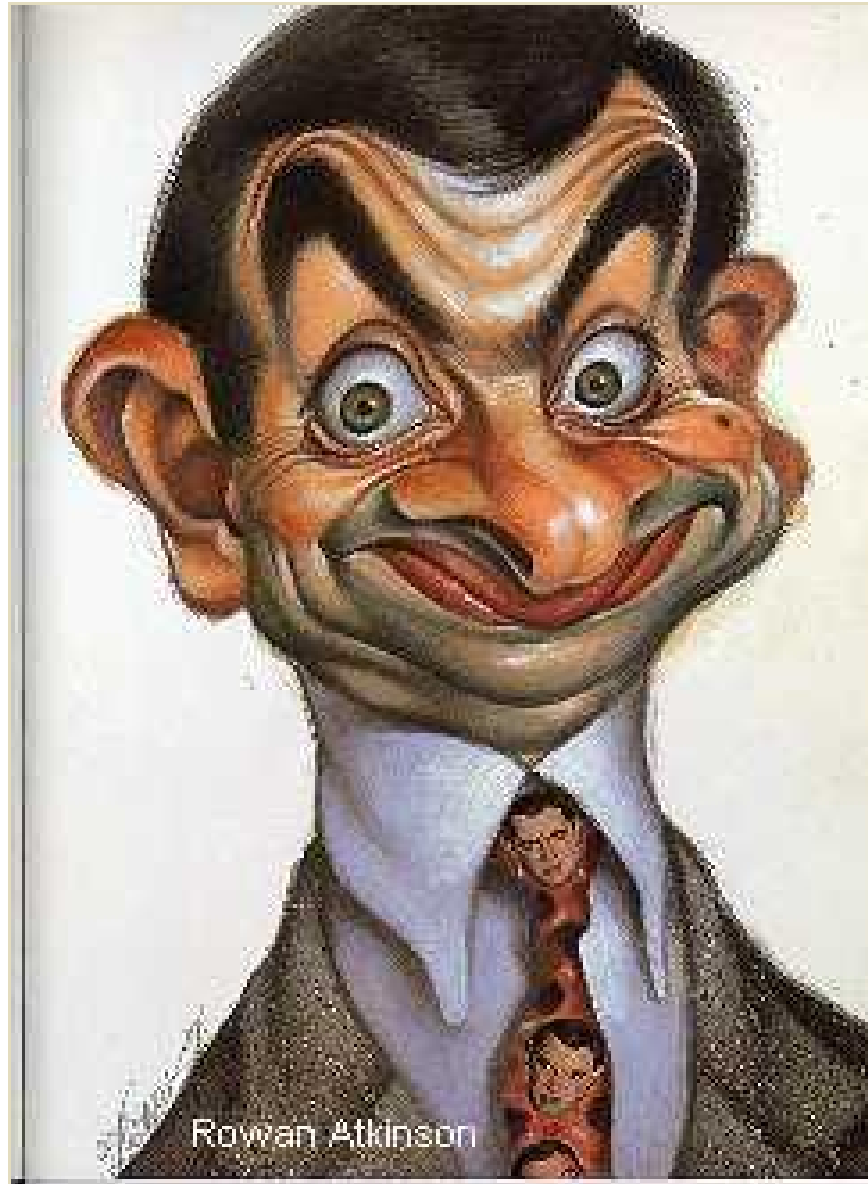


- There are numerous cleaning methods that can be used to clean at an angle of 25°
- Considering the priorities set
  - Cost efficiency
  - Timeous completion
  - Safety
- The Grab-Barrel Hopper seems to be the best cleaning option, satisfying these priorities and specifically our current scenario.
- There is a slight risk of failure since this is a new untested design, but if successful it will allow timeous completion with low expenditure.

Any questions.....?



**GOLD FIELDS**



Rowan Atkinson