breaking new ground

AFRICAN EXPLOSIVES LIMITED

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DECONTAMINATION OF THE EXPLOSIVES SITE AT MODDERFONTEIN

BY

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OVERVIEW

- History
- Planning
- Pilot Study
- Issue House C2
- Method of Decontamination Blasting
- Removal of Floors
- Contamination below surface
- Dam II

HISTORY

- Manufacture of dynamites commenced in 1896 for the goldmines
- There were three factories each with a batch nitroglycerine (NG) hill
- Cartridging was handfilling, Schrader, Ardeer, Hall, du Pont and Rollex packers
- During the 1970's the batch hill plants were replaced with two continuous NG plants
- Six Tellex mixers replaced some Atlas mixers in the 1980's
- In 1984 production reached 110000 tons of NG explosives
- The plant was closed in 1994

45 SQUARE KILOMETRE SITE

LAYOUT OF THREE FACTORIES

PLANNING

- **The Project Manager**
  - Had communication with an ICI Canadian Manager who previously demolished and decontaminated a number of factories
  - Required a detailed knowledge of the manufacturing processes of NG and NG explosives
  - Required experience of management and operation of the Modderfontein factories
    - To determine where liquid NG could have contaminated the site
    - To determine where explosives could have contaminated the site
    - To select positions for blasting (particularly in drains and near doorways)
  - Focus was then on floors, storm water gutters and drains
  - Consequently storm water drain drawings were used for planning the blasting

PILOT STUDY

- **The plants were demolished during 1998/9**
- **A study was undertaken to determine where NG may be found on the site**
  - A grandfather exercise was carried out with employees before closure
  - The Company Central Records and Chief Inspector archives were searched for occurrence records
  - Historical drawings from the drawing office were extracted
  - It was decided to use blasting to decontaminate the site
- **After blasting trials it was concluded that**
  - Where liquid NG had been processed there would be NG present
  - Where powdered explosives had been processed less NG would be found
  - Where gelatinous explosives were processed there would be minimal NG
  - All process buildings would be treated equally

ISSUE HOUSE C2

- An explosion in 1985 destroyed NG Issue House C2
- There was a spill of 900kg of NG
- The site was buried for safety while production continued
- In 2000 a programme was undertaken to find and destroy this NG
- Shaped charges were used to penetrate the concrete bunker
- NG was intercepted and destroyed (previous SAFEX paper)
- Blasting was undertaken in drains from the Issue House and NG was found

AERIAL PHOTO OF C2

PHOTO OF C2 DEBRIS

PHOTO OF C2 DEBRIS

EXCAVATION OF DEBRIS

METHOD OF DECONTAMINATION BLASTING

- 10g/m and 40g/m detonating cords were ineffective during trials
- Emulsion explosives of 38mm and greater diameter were effective
- Canadian experience also required 38mm diameter emulsion to be used
- Each blast was closely monitored as the site was next to operating factories
- Areas of positive reaction were reblasted until there were no further sign of reaction
- Based on experience as the work progressed, reblasting was undertaken as required

REMOVAL OF FLOORS

- There is potential for small amounts of contamination to remain under concrete floors
- Given suitable conditions this will gradually biodegrade and dissolve
- Floors were then excavated or drilled and blasted to enhance this process
- Redundant field magazine floors were burnt, demolished and excavated

CONTAMINATION BELOW THE SURFACE

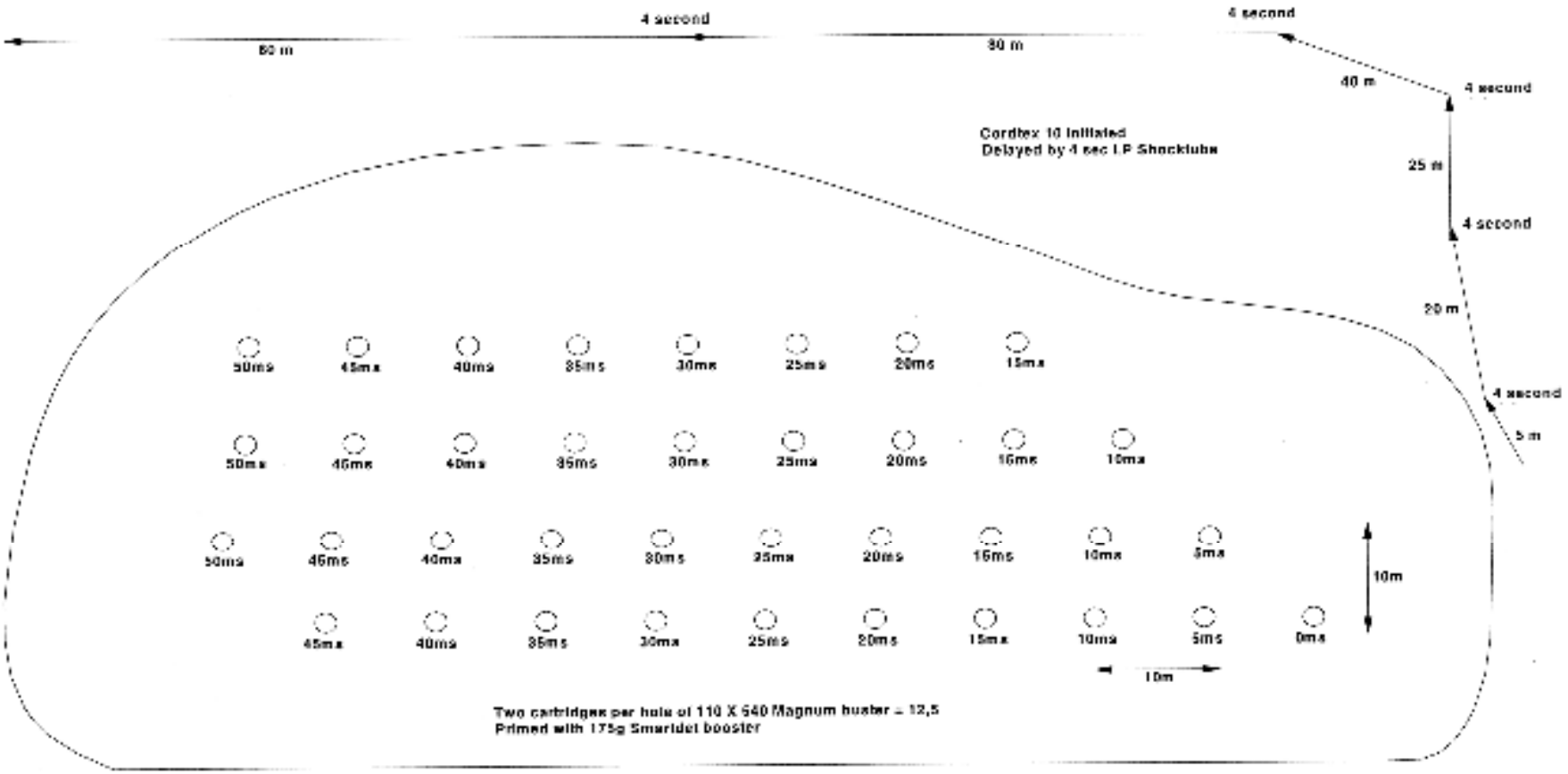
- The effectiveness of penetration by the blasting at depth was challenged by auditors
- It is thought that NG could be adsorbed in clay nodes or retained in the granitic bedrock fissures
- With time ground water will gradually dissolve any contamination
- Sample boreholes have shown no contamination in the ground water
- A draw down borehole is positioned for ongoing ground water sampling

DAM II

- This dam has handled the NG plant effluent since 1896
- Sampling of the sediment for NG was undertaken on occasions in the past
- The sediment was now extensively sampled down to bedrock
- Traces of NG were found in clay sediment layers
- Large portions of the dam were blasted down to bedrock with no reaction

DAM II PHOTO WITH LINERS BEING POSITIONED

DAM II POSITION OF CHARGES



SUMMARY

• Number of process buildings	200	
• Length of drains on site	12km	
• Length of drains blasted	6km	
• Quantity of explosive used	Factory 1	9,033kg
•	Factory 2	4,297kg
•	Factory 3	1,373kg
• Number of magazines	55	

- My thanks to African Explosives to for the opportunity to report here on this project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