

# QUIZ

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**ANSWER**



# MAIDEN ROCK UNDERGROUND PHOSPHATE MINES

presented by

**BILL MAEHL**  
**SPECTRUM ENGINEERING**

# Spectrum

Mining Engineers and  
AML Reclamation Specialists

# Engineering





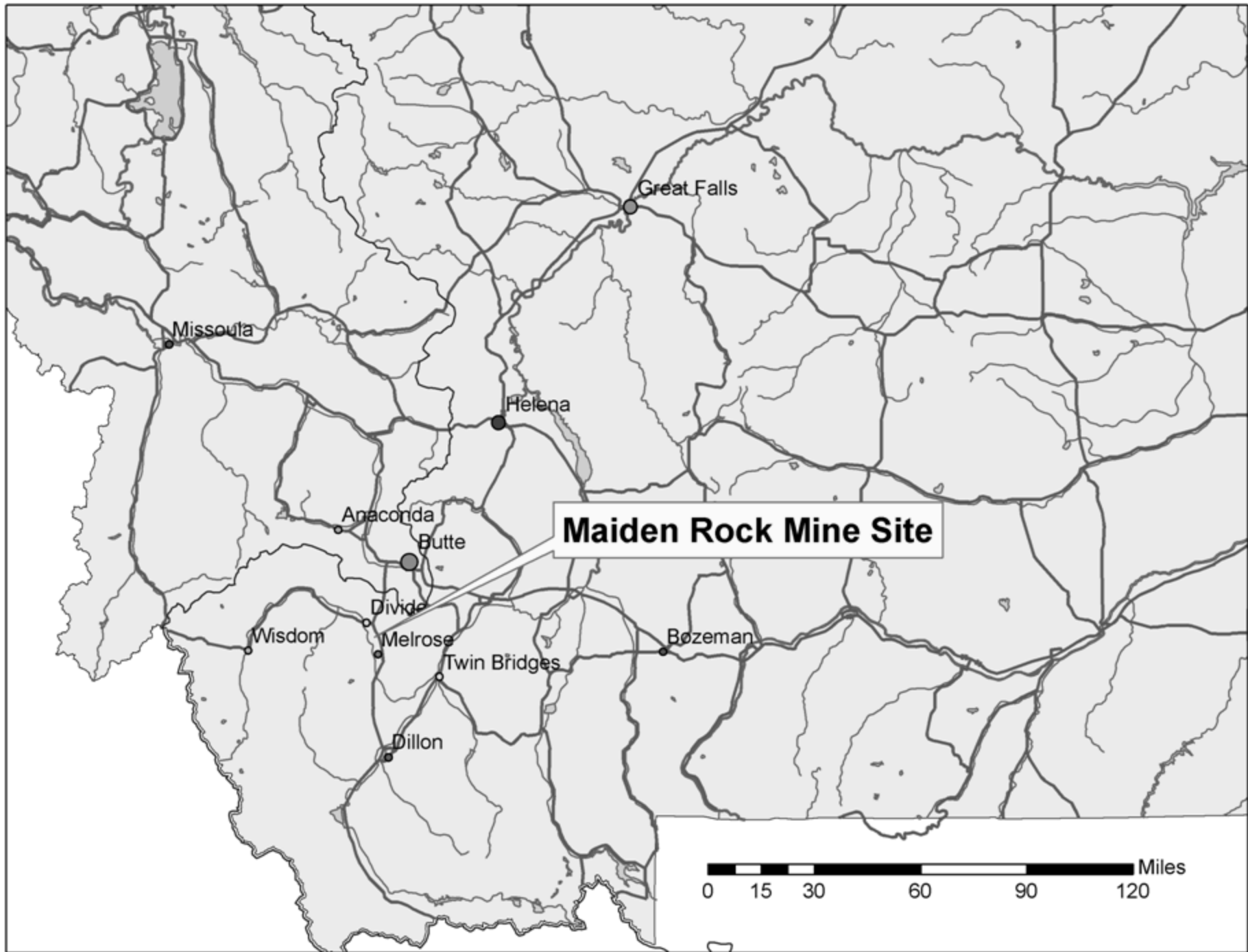
# WORLD PRODUCTION OF PHOSPHATE ROCK IN 2009

- CHINA – 55 MILLION TONS
- USA – 27.2 MILLION TONS
- MOROCCO/WESTERN SAHARA – 24 MILLION TONS
- ALL OTHERS – 51.8 MILLION TONS
- TOTAL OF 158 MILLION TONS

USGS MINERAL COMMODITY SUMMARIES, 1/2010

# PHOSPHATE MINING IN THE USA

- 2009 PRODUCTION – 27.2 MILLION TONS
- EMPLOYMENT – 2,600 PEOPLE
- MINED BY 6 FIRMS AT 12 MINES IN 4 STATES (FLORIDA & NORTH CAROLINA AT 85%, IDAHO & UTAH AT 15%)
- MARKETABLE PRODUCT VALUED AT \$1.4 BILLION F.O.B. MINE



# TWO BLM PHOSPHATE LEASES

## **Maiden Rock Lease Great Falls 086708**

- Lease Effective - 1/10/1947
- Production Dates - 1950 through 1967
- Tons Produced – 2,169,624
- Max. Yearly Production – 271,793 Tons

## **Canyon Creek Lease Great Falls 086751**

- Lease Effective - 5/18/1948
- Production Dates - 1952 through 1967
- Tons Produced – 3,303,211
- Max. Yearly Production – 383,259 Tons

# MINING STATISTICS

## Full Production

- Three Major Mine Areas
  1. Canyon Creek
  2. Maiden Rock
  3. East LaMarche
- Mined 2 Shifts/Day, 6 Days/Week
- Employed 50-135 Total Staff
- Produced Upwards of 1,100 TPD
- Canyon Creek Produced 50 Tons/Man Shift

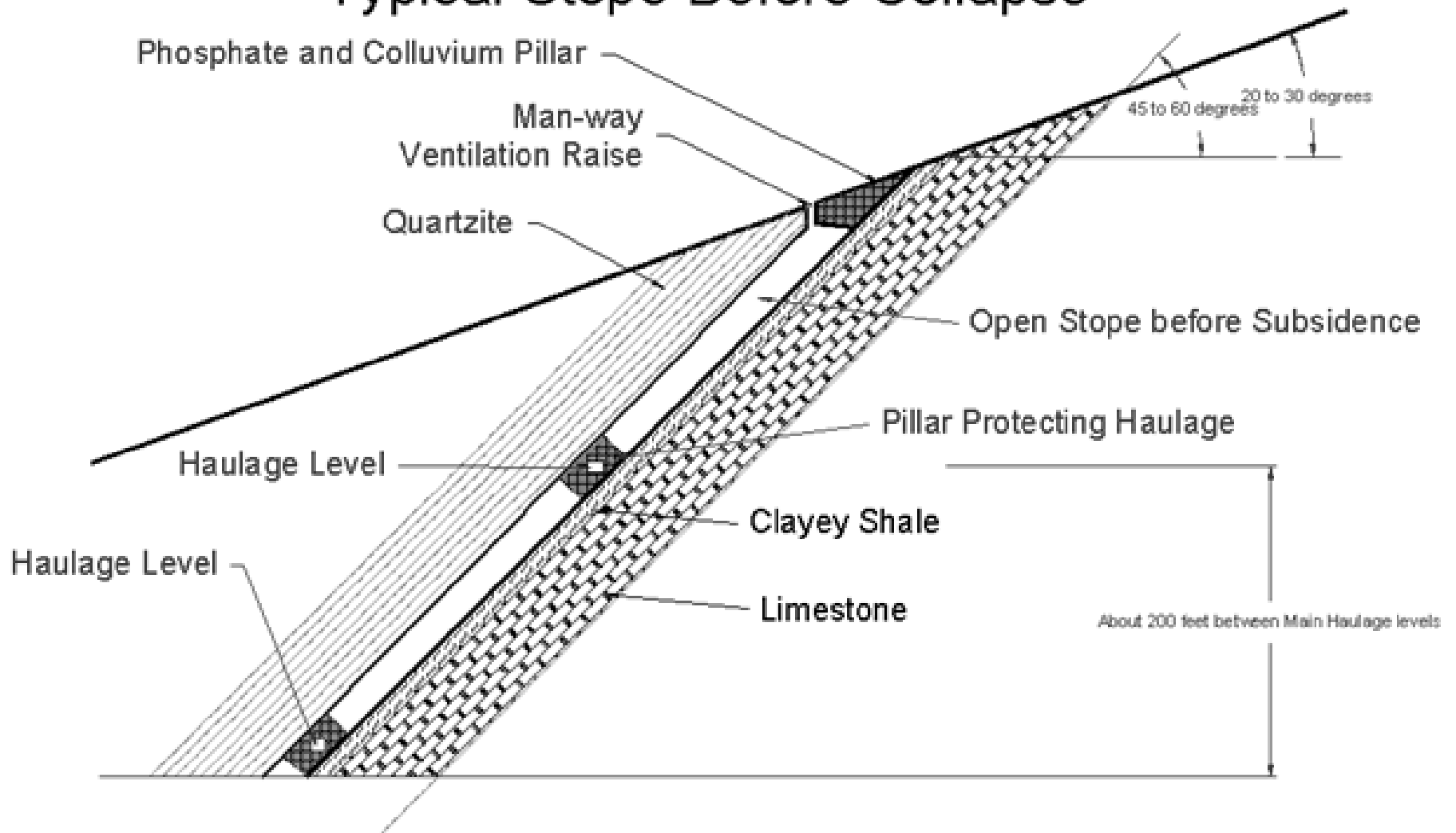


# TYPES OF HAZARDS

## Three Major Types of Hazards

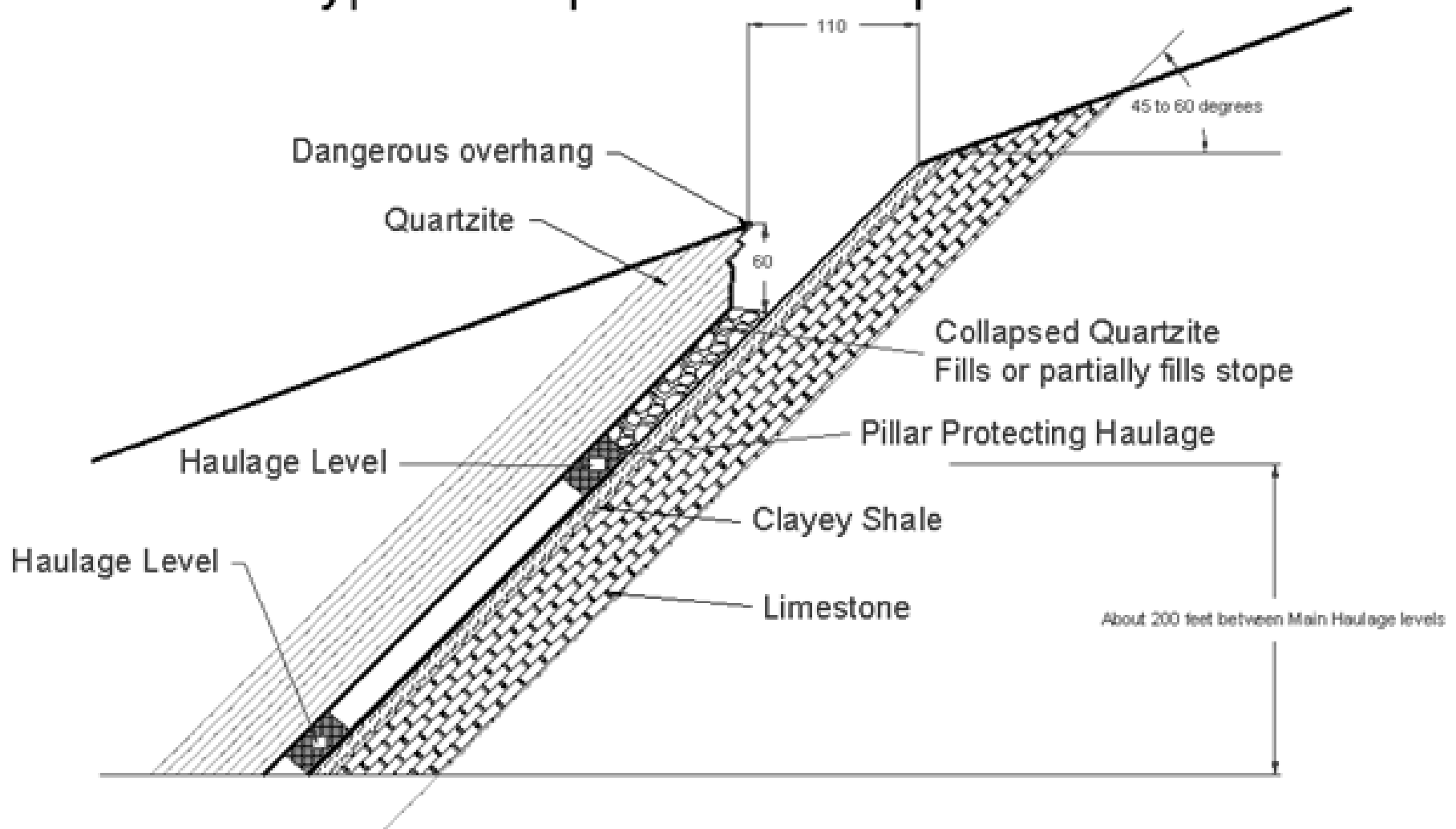
- Ventilation Raises
- Subsidence Craters
- Stope Collapses

# Typical Stope Before Collapse

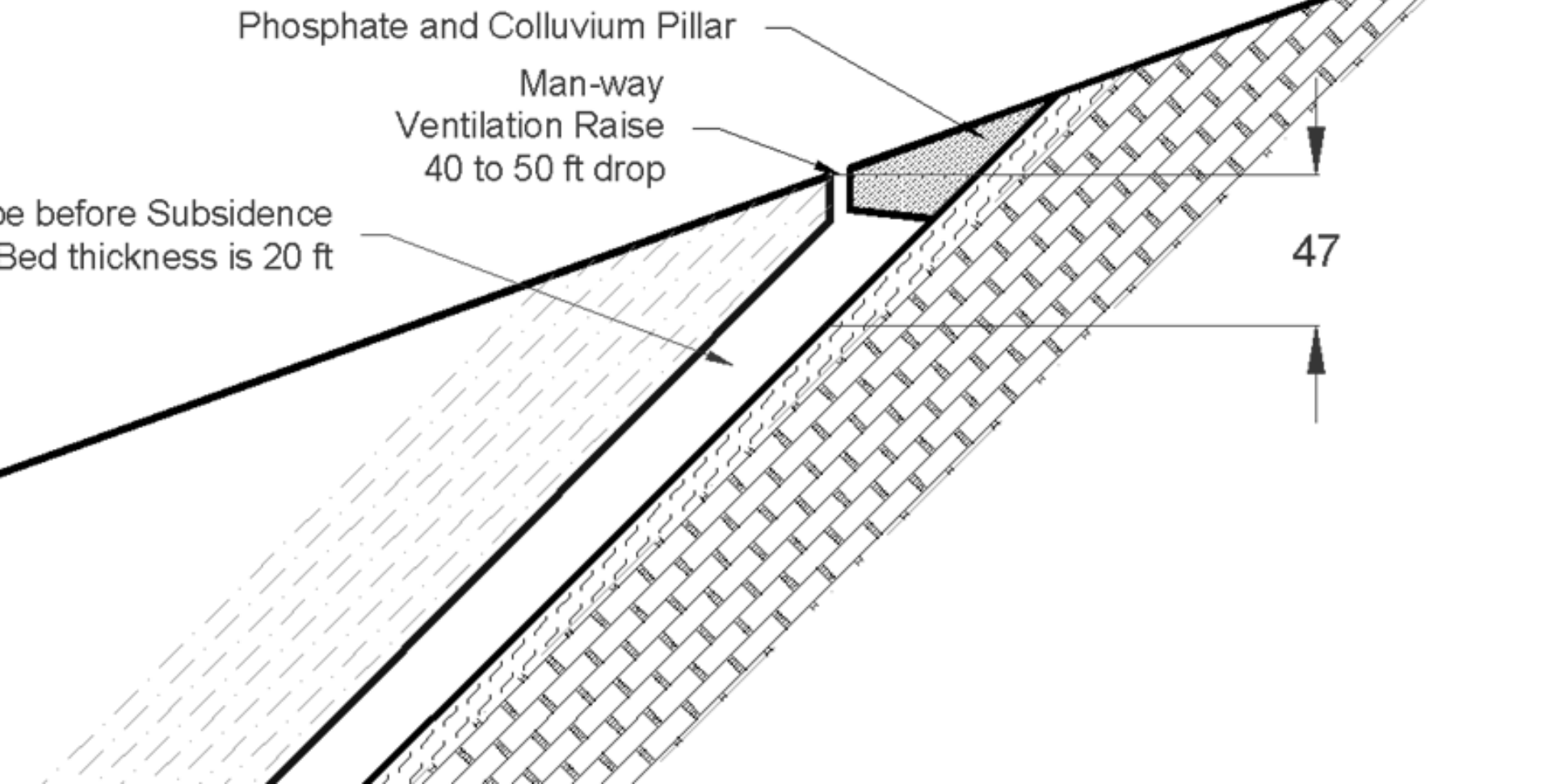




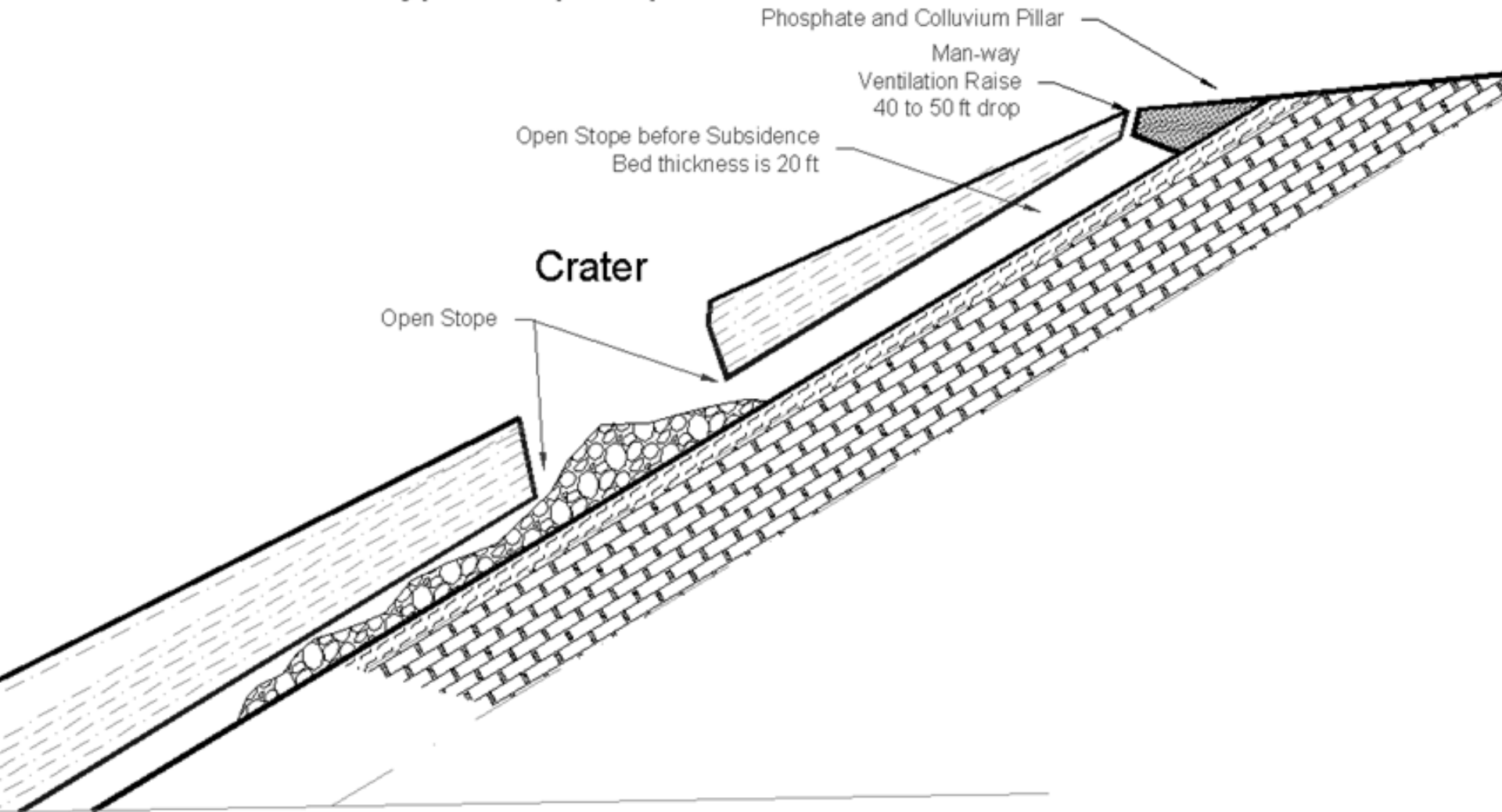
# Typical Stope After Collapse



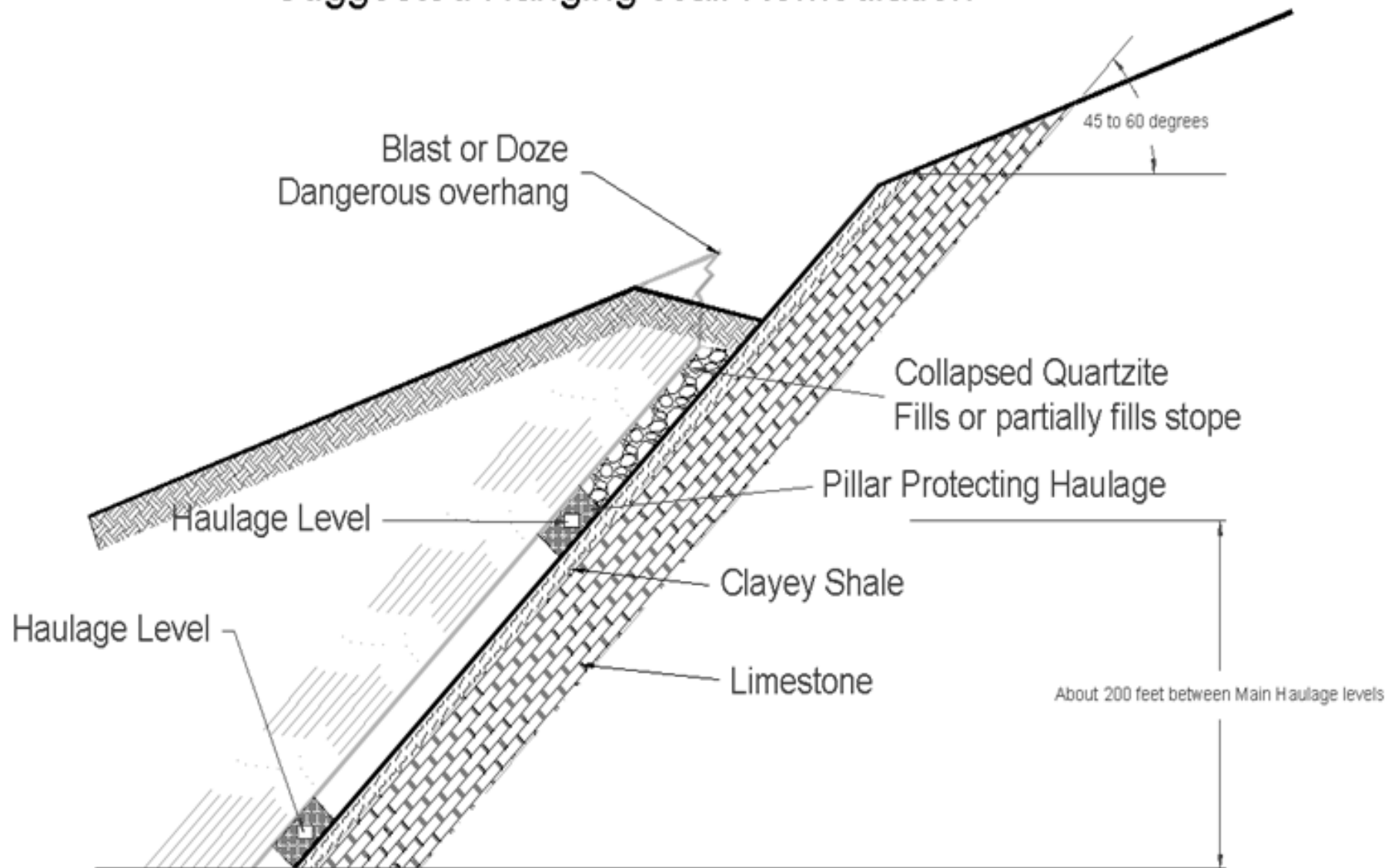
# Typical Stope Before Collapse



# Typical Dip Slope Crater



## Suggested Hanging Wall Remediation











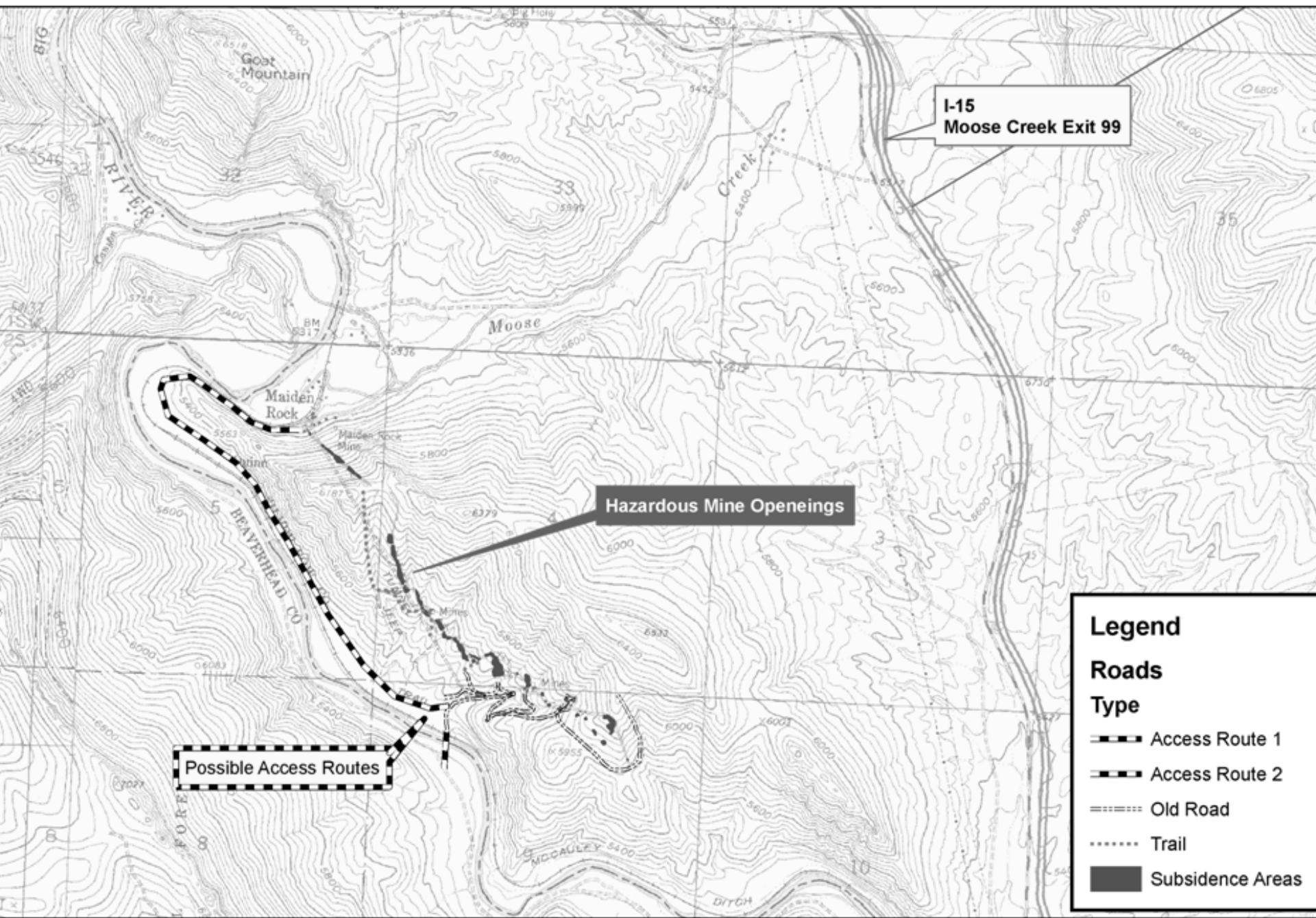




# MAIDEN ROCK MINE AREA

## LOCATION AND HAZARDS IDENTIFIED

# Maiden Rock Access

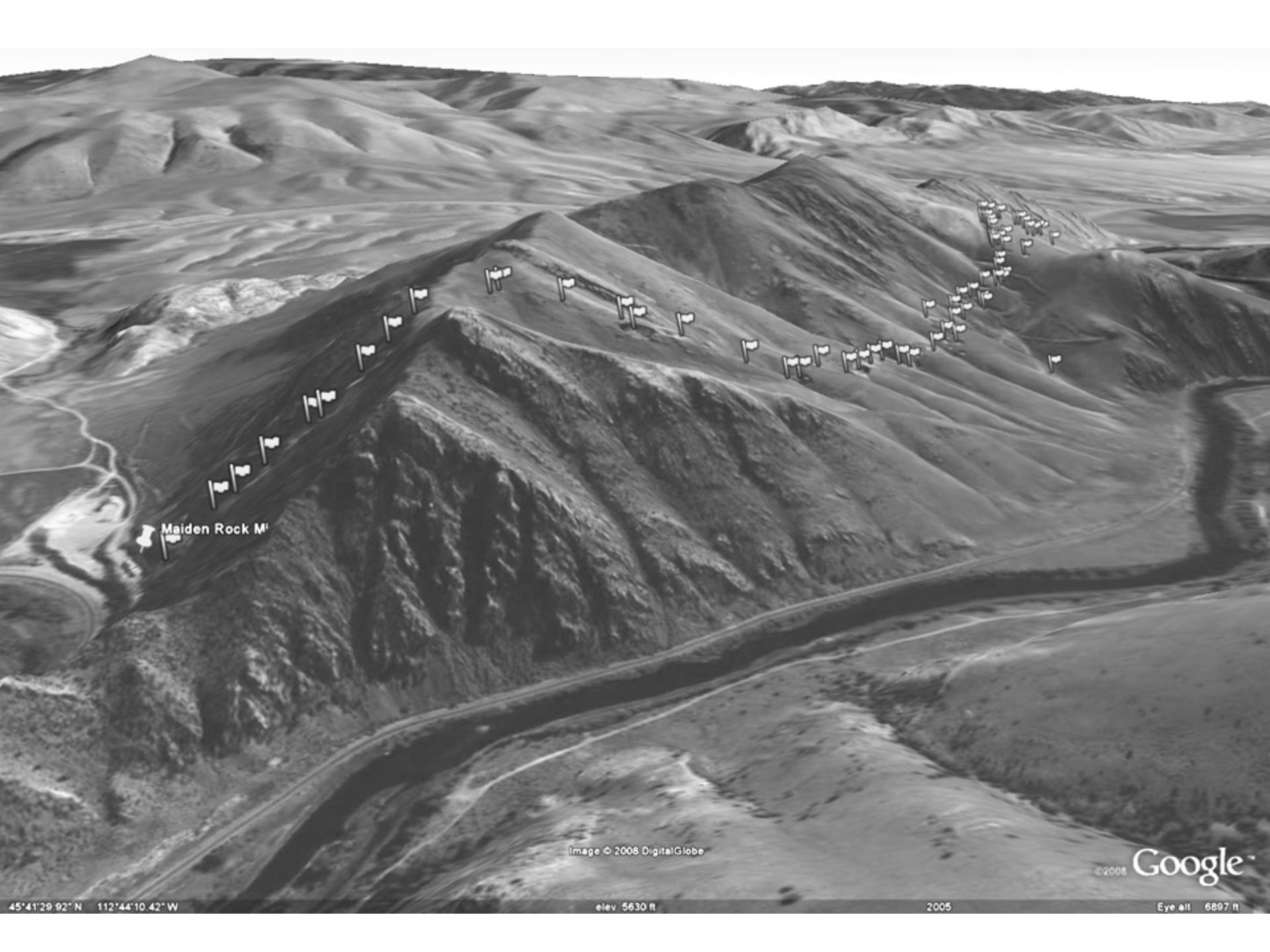


I-15  
Moose Creek Exit 99

Hazardous Mine Openings

Possible Access Routes

Miles



Maiden Rock M<sup>i</sup>

Image © 2008 DigitalGlobe

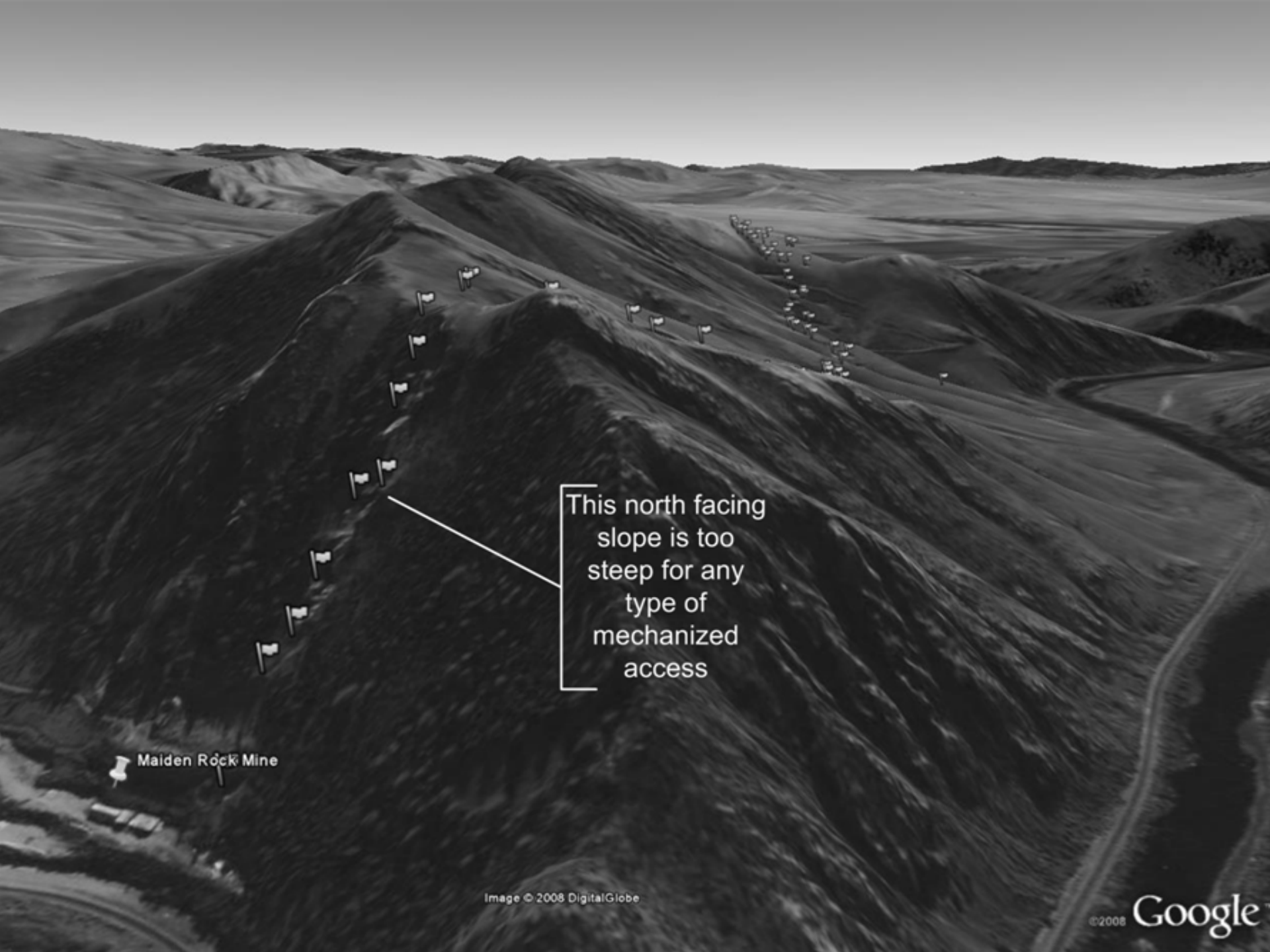
©2008 Google

45°41'29.92" N 112°44'10.42" W

elev. 5630 ft

2005

Eye alt. 6897 ft



This north facing slope is too steep for any type of mechanized access

Maiden Rock Mine



North Slope







**Figure 8. Fence has fallen into subsidence at MS118A (note the overhanging hazard).**

# MS001 Subsidence Crater





# MS002 Subsidence Crater



# M153A Raise



# MS004 Major Subsidence Crater



# MS004 Major Subsidence Crater





# M147A Subsidence





**5427 XC Adit**



**M139 Open Adit**









Powerline

MS135A crater

MS138 crater

Powerline

Lunchroom

Looking north from M142A



**M137A manway raise**

# MS001 Subsidence Crater





A black and white photograph of a geological site. The central feature is a large, roughly circular depression or crater-like structure with steep, layered walls. The rock layers are clearly visible, showing a distinct sedimentary or metamorphic structure. The surrounding terrain is hilly and covered with sparse, scrubby vegetation. In the upper right background, a person is visible standing on a ridge, providing a sense of scale. The overall scene is arid and rugged.

**M126A**

**M124A looking south**



**Full length of M123A looking south**



**M118A Subsidence**







Arch between M114 and M112

Fracture

North end of M114A



**Wire mesh and bolts at top  
of ridge near M12A**





**MCB**

# EAST LAMARCHE MINE AREA

## LOCATION AND HAZARDS IDENTIFIED

◉ GM RAISE

GM01

GM02

GM03

GM04

GM05

GM06

GM08

GM09

GM10

GM11

◉ Portal H

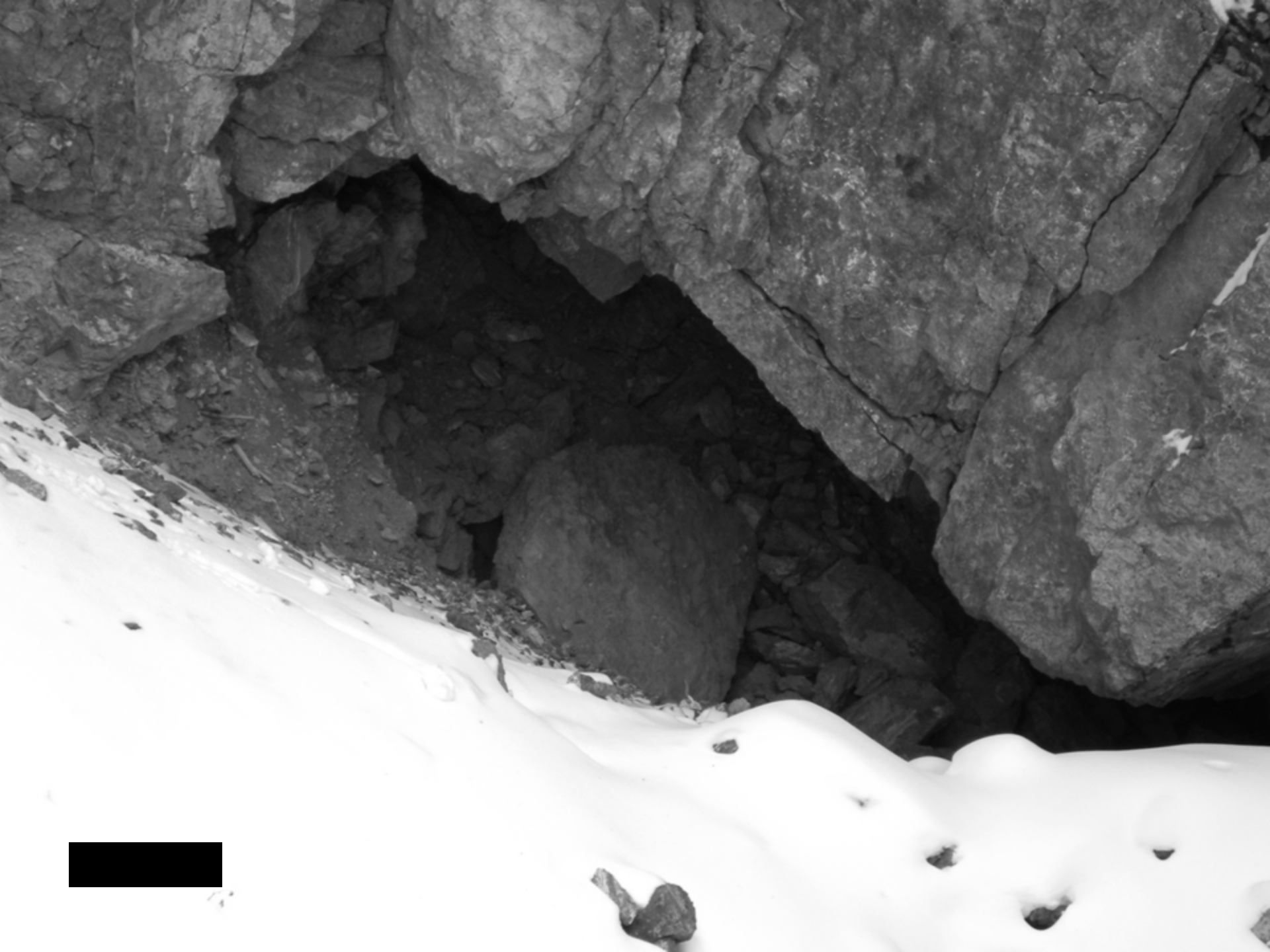
EAST LAMARCHE



























# CANYON CREEK MINE AREA

## LOCATION AND HAZARDS IDENTIFIED





Portal B

Portal C

Portal D

CC13

Waste Haul Portal

Portal E

CC12

CC11

CC10

CC09

CC08

CC07

CC06

Portal F

CC01

CC03

CC02

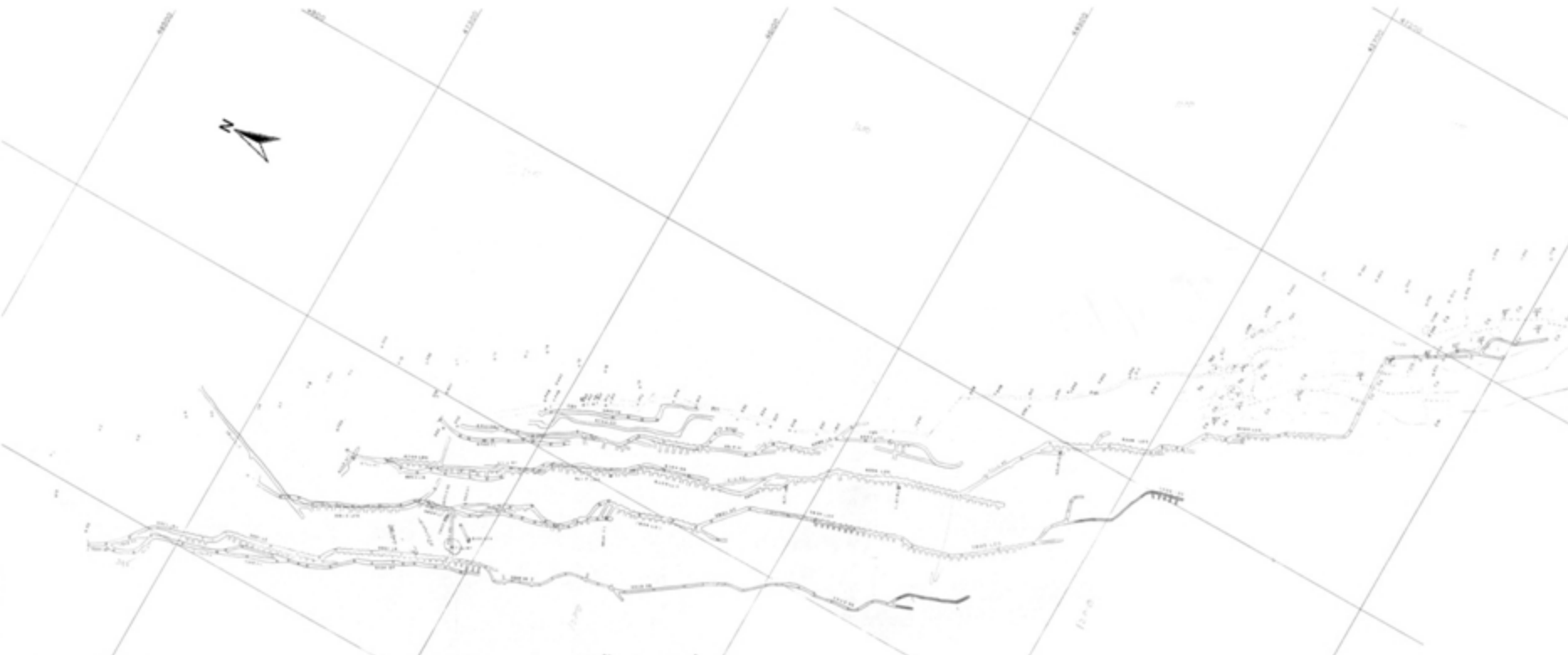
CC04

CC05

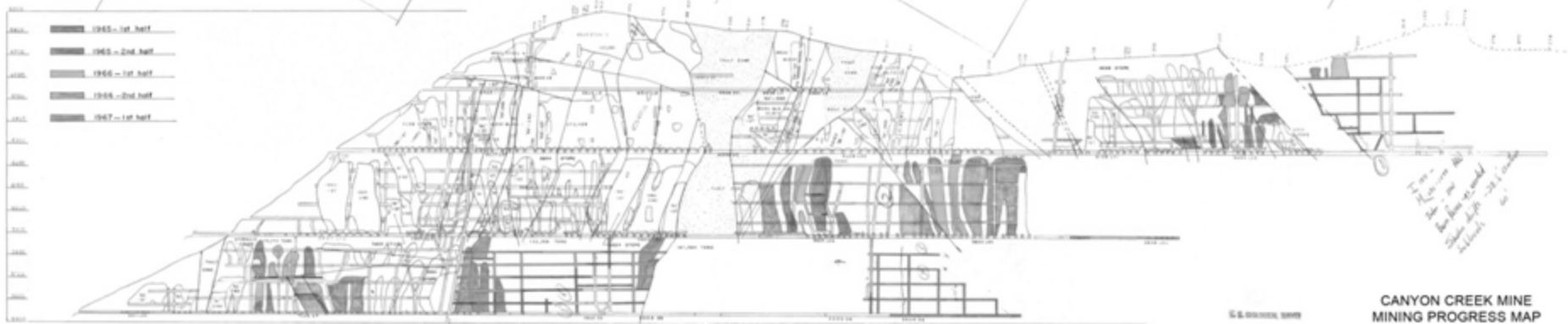
**CANYON CREEK**

© 2014 Google Earth™ Imagery Satellite





- 1965 - 1st half
- 1965 - 2nd half
- 1966 - 1st half
- 1966 - 2nd half
- 1967 - 1st half



This map was prepared  
 by the Stauffer Chemical Co.  
 from data furnished by  
 the Canyon Creek Mine  
 operated by the Stauffer  
 Chemical Co.

U.S. GEOLOGICAL SURVEY  
 JUL 17  
 RECEIVED  
 MEMPHIS, TENNESSEE

**CANYON CREEK MINE  
 MINING PROGRESS MAP**  
 INDUSTRIAL CHEMICAL DIV. - STAUFFER CHEMICAL CO.  
 PLAN SCALE: 1" = 450'  
 DATED: 1967





















# LaMARCHE MINE AREA

## LOCATION AND HAZARDS IDENTIFIED





LM01

Powder Magazine

LM02





# FOUR UNDERGROUND MINE AREAS

BLM NOW FACES A TOUGH  
DECISION AS TO HOW MUCH  
RECLAMATION TO DO TO  
RECLAIM THESE EQUIPMENT  
INACCESSIBLE SITES

THE CORP OF ENGINEERS  
AND BLM WILL PERFORM  
THE RECLAMATION DURING  
2010 WITH FUNDING FROM  
THE AMERICAN RECOVERY  
AND REINVESTMENT ACT OF  
2009 (ARRA)

**WAKE UP!**

**IT IS FINISHED.**

**THANK YOU FOR YOUR  
LONG-SUFFERING  
PATIENCE. NEXT YEAR I WILL  
TACKLE SAND AND GRAVEL.**