

“Efficient Rescue Actions in Mines”

***Presented by
Malcolm D Smith***

***Provincial Mine Emergency Preparedness and Response
Coordinator / Mines Inspector.
Ministry of Advanced Education, Employment and Labour
Radiation & Mines Safety Unit,
Saskatchewan, Canada.***

Mine Emergency Preparedness Planning & Response



*The diversity of mineral deposits
terrain and mining methods
influence mines rescue by three important concerns.*

Firstly, the kind of emergency situations that can arise.

*Secondly, gaining access to the mine workings
so that life and property can be saved.*

*Thirdly, the types of hazards and difficulties
with which mines rescue teams have to contend.*

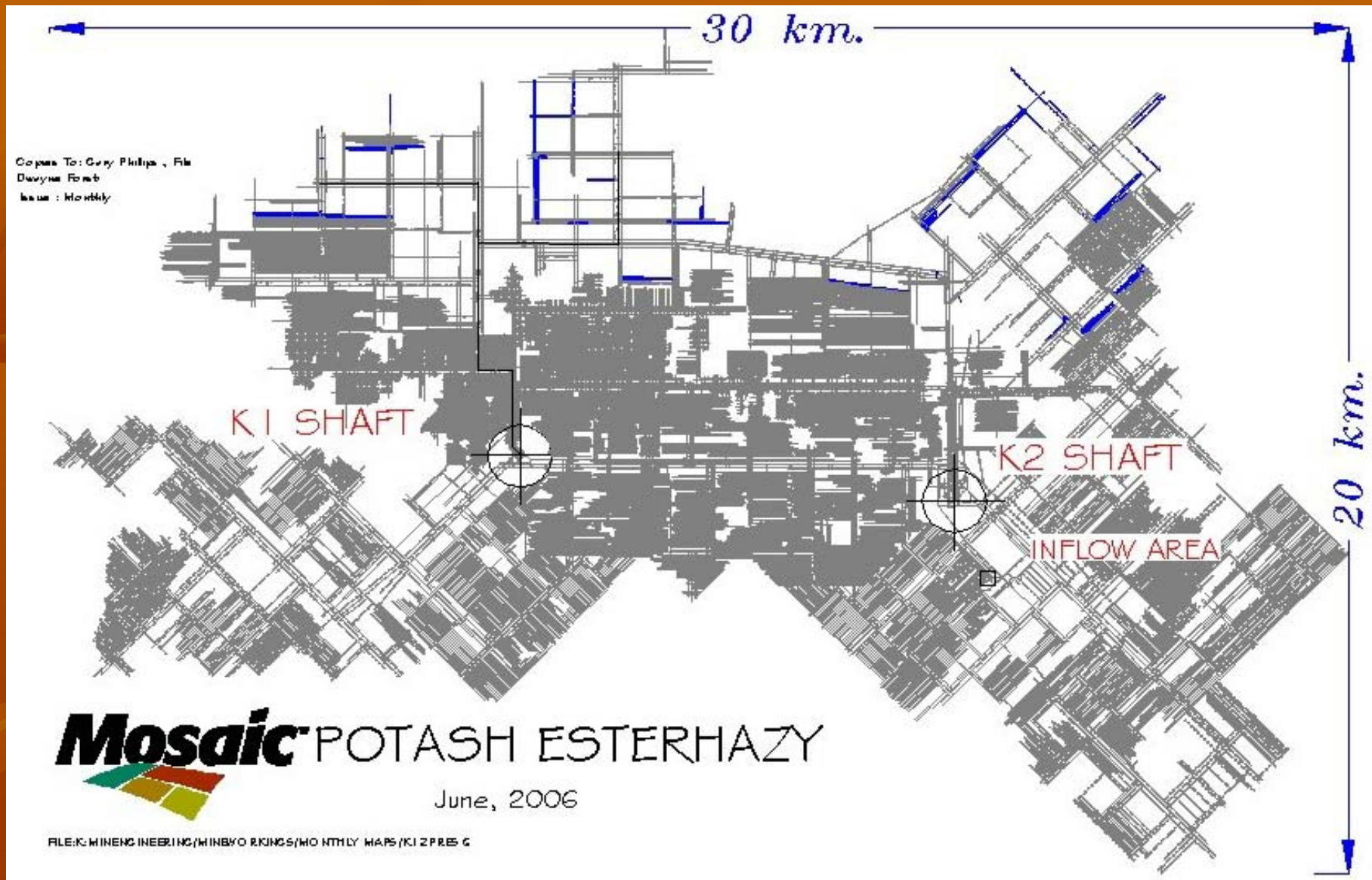
Mosaic Esterhazy Potash Mine Fire

January 29, 2006

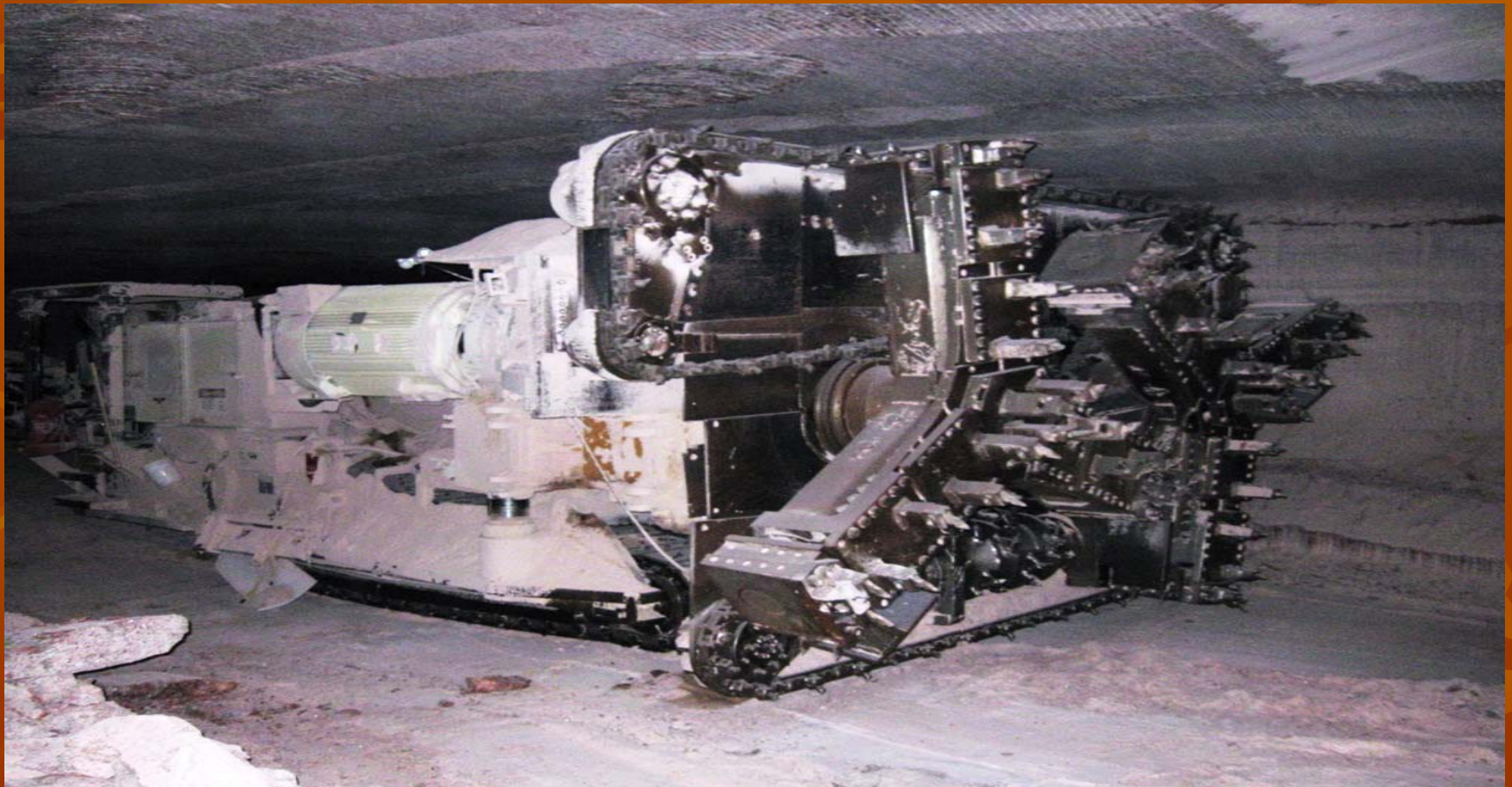


Mosaic's Esterhazy potash operations consist of two separate shafts and processing operations known as K1 and K2 with a workforce of 850 people. Mining is conducted in the Esterhazy member of the Prairie Evaporates formation at 945 meters below the surface.

The K2 operation is located about 15 km east of the town of Esterhazy and within a few kilometers of the Manitoba border. Production from K2 started in 1967 and annual production capacity is currently at 2.2 million short tons of refined KCl¹ production.



The Esterhazy underground potash ore is mined using a conventional room and pillar method with continuous boring machines.



Saturday, January 28th, 2006 on the shift prior to the fire being discovered, two (2) employees were deployed to decommission approximately 1500 feet of 16-inch diameter Sclair (polyethylene) pipe in the “Main Line Entry #000400”.



Pipe was dismantled by cutting the metal bolts from a flange connecting the pipe using a cutting torch. Cutting of the bolts around the pipe joints allowed high-temperature open flame from the torch to impinge on the interior of the pipe joints.

*Fire inside the pipe
was not detected as the
products of
combustion were
pushed down the open
ended pipe by the large
airflow of 130,000
cubic feet per minute
in the main entry
#000400*



*Early Sunday morning, January 29, 2006
this fire at the Mosaic K2 underground mine
caused 72 mine workers to retreat to refuge
stations throughout the mine and prompted
the mines rescue intervention.*



*Emergency response personnel,
Incident Management Team (IMT) and
Mines Rescue workers were notified and
began arriving at the mine site*



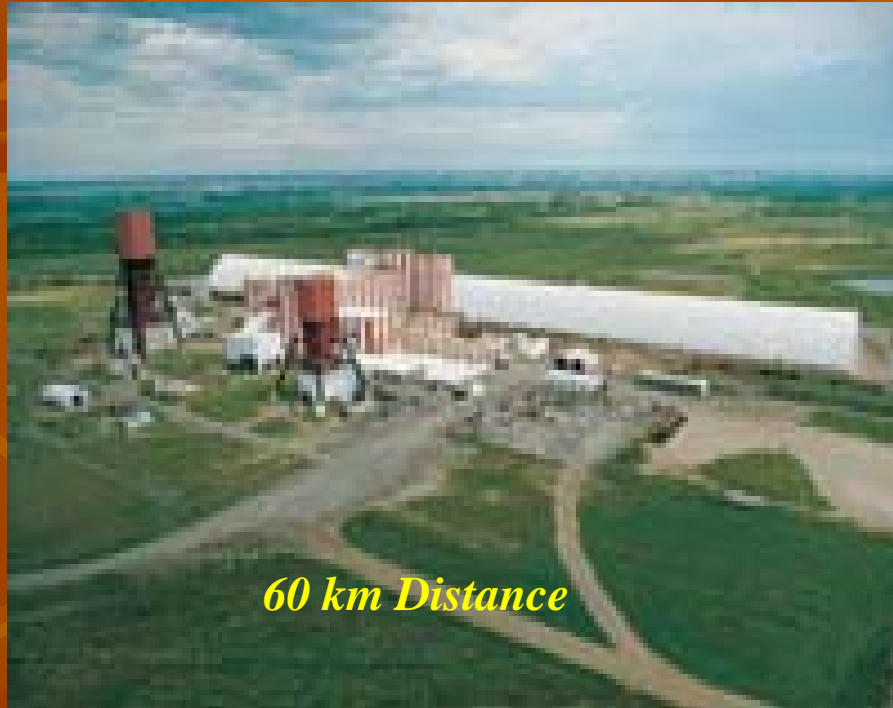
Southern Region Mutual assistance was initiated from PCS Rocanville mine, Central Region mutual assistance initiated from Mosaic Colonsay mine, with Central Mutual Assistance groups placed on alert.

Mine Rescue Teams Mobilized



- *Mosaic K1 & K2*
Av # Workers 844
- *Potash*
- *Single level operations*
- *BIO 240 Apparatus.*
- *38 Certified Active Mines Rescue Team members (Comb).*
- *6 Certified Active Instructors*

Southern Region Mutual Assistance was initiated from PCS Rocanville mine,



60 km Distance

- ***PCS Rocanville
Av # Workers 338***
- ***Potash***
- ***Single level operations***

- ***BIO 240 Apparatus.***
- ***27 Certified Active
Mines Rescue Team
Members.***
- ***3 Certified Instructors.***

Central Region Mutual Assistance Group Mines notified and placed on standby alert



PCS Allan



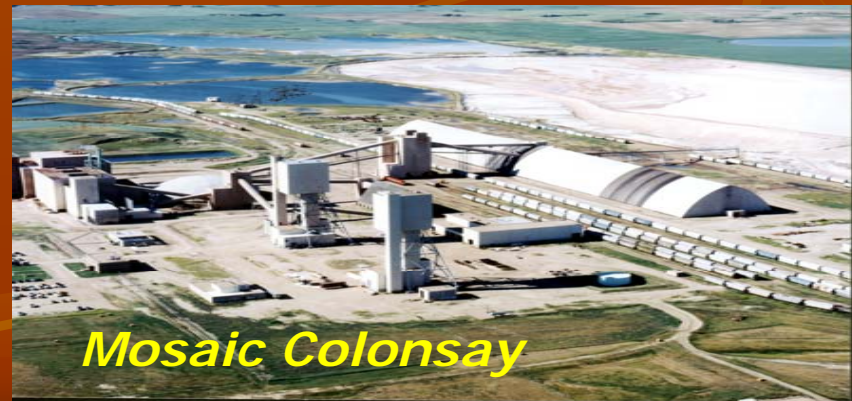
PCS Cory



PCS Lanigan



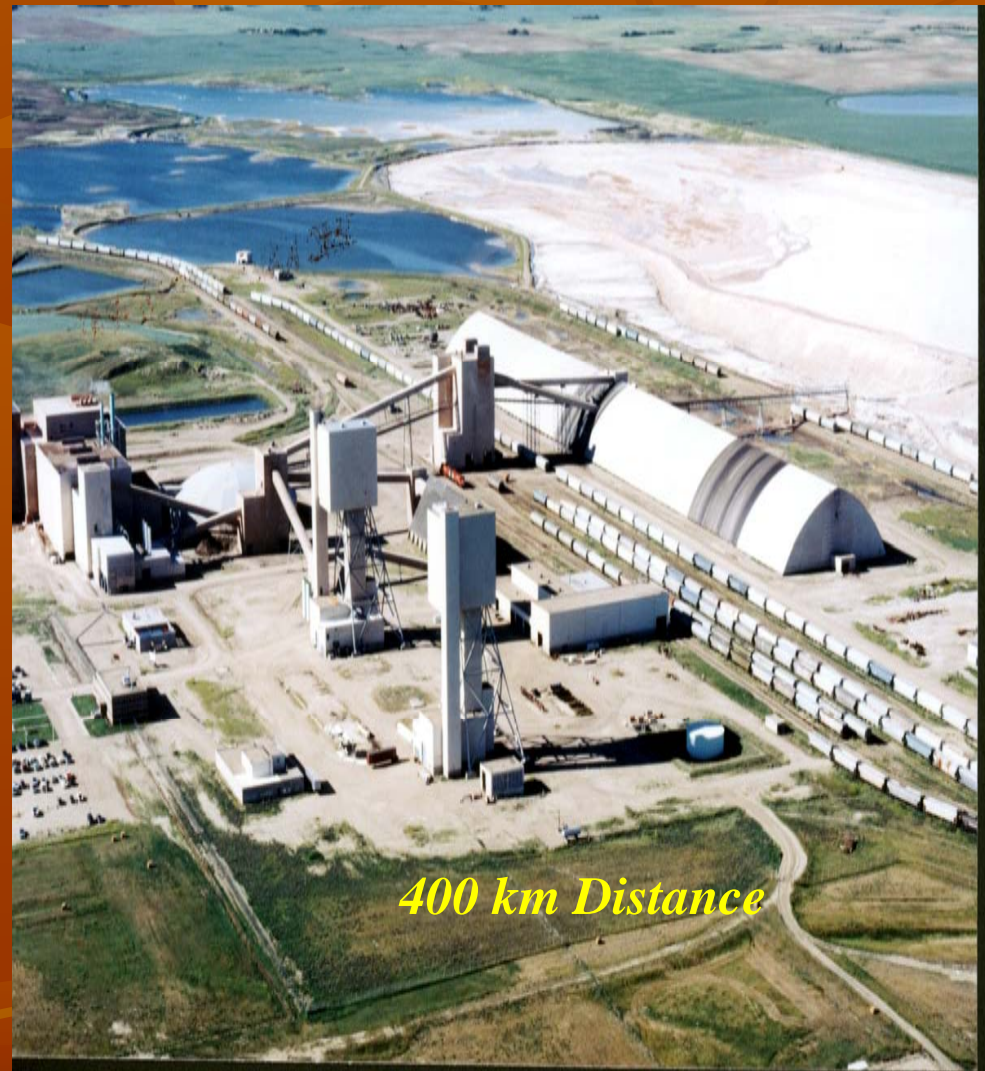
Agrium.



Mosaic Colonsay

Central Region Mutual Assistance mobilized from Mosaic Colonsay Mine

- *Mosaic Colonsay
Av # Workers 374*
- *Potash*
- *Single level operations*
- *BIO 240 Apparatus.*
- *3 Team Initial
Response.*
- *36 Certified Active
Mines Rescue Team
Members.*
- *5 Certified Instructors.*



The fire caused a total electrical power outage in the K2 mine, shutting down all electrical equipment, ventilation fans and communications



During the January 29, 2006 underground fire in the K-2 side of the combined K-1, K-2 mining complex, 72 workers took refuge in 8 locations.

Of these workers 71 were able to safely reach a refuge station within 10 minutes of being informed of the fire.

One worker in the area of the fire was unable to reach a refuge station for approximately 12 hours.

The # 000650 refuge station was totally isolated some 646 meters west from the fire location.

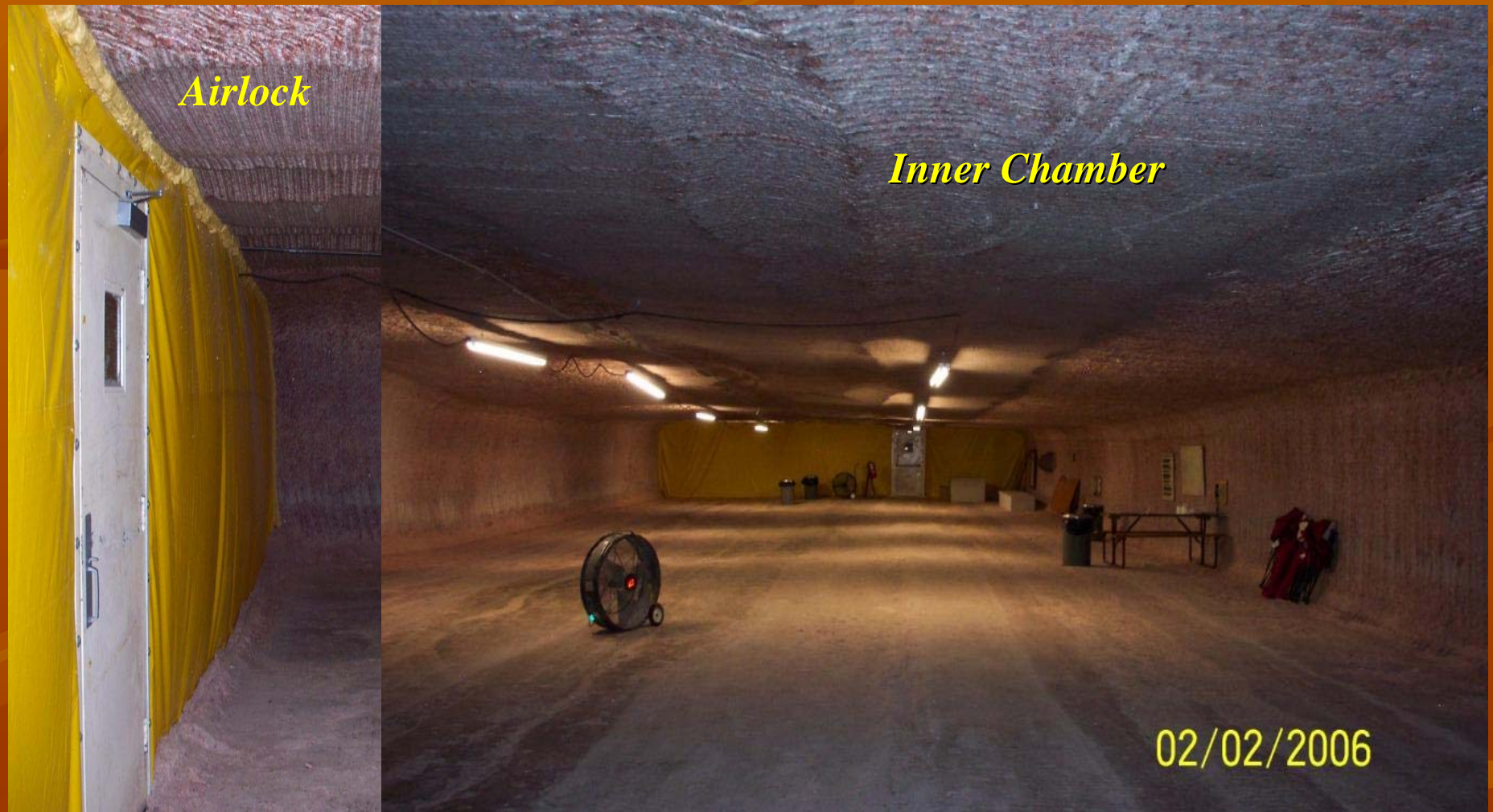
There was no electricity or phone communications to this refuge station for the duration of the incident

There is one entrance to this refuge station and has a total volume of 1203.5 cubic meters

The refuge station was first occupied by 31 employees from the water inflow area at approximately 1:38 AM January 29th.

At 3:40 PM, January 29th a Mosaic water sampler arrived.

Typical refuge stations throughout the mine



#000650 REFUGE STATION

REFUGE STATION INFORMATION

SIZE: 1203.5 m³

OF WORKERS: 32

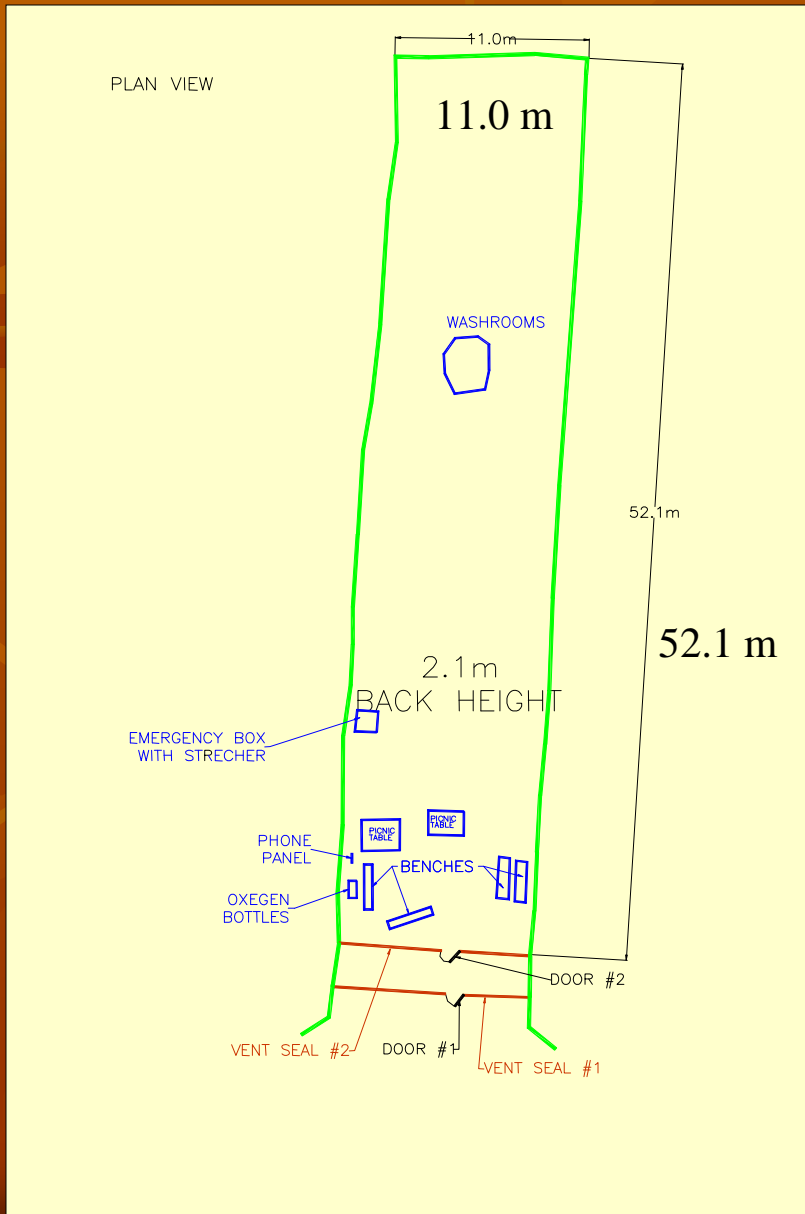
TIME SPENT REFUGED: 24 HRS

SUPPLIES

- **PHONES: 1**
- **FEMCO PHONES: 1**
- **WATER: 6 - 20 LITER JUGS**
- **TOILETS: 2**
- **OXYGEN: 2**

SUPPLY BOX

- **CAULKING**
- **FOAM**
- **BLANKETS**
- **FOOD**
- **FIRST AID BOX**
- **SPAD GUN**
- **SPADS**
- **BRATTICE**



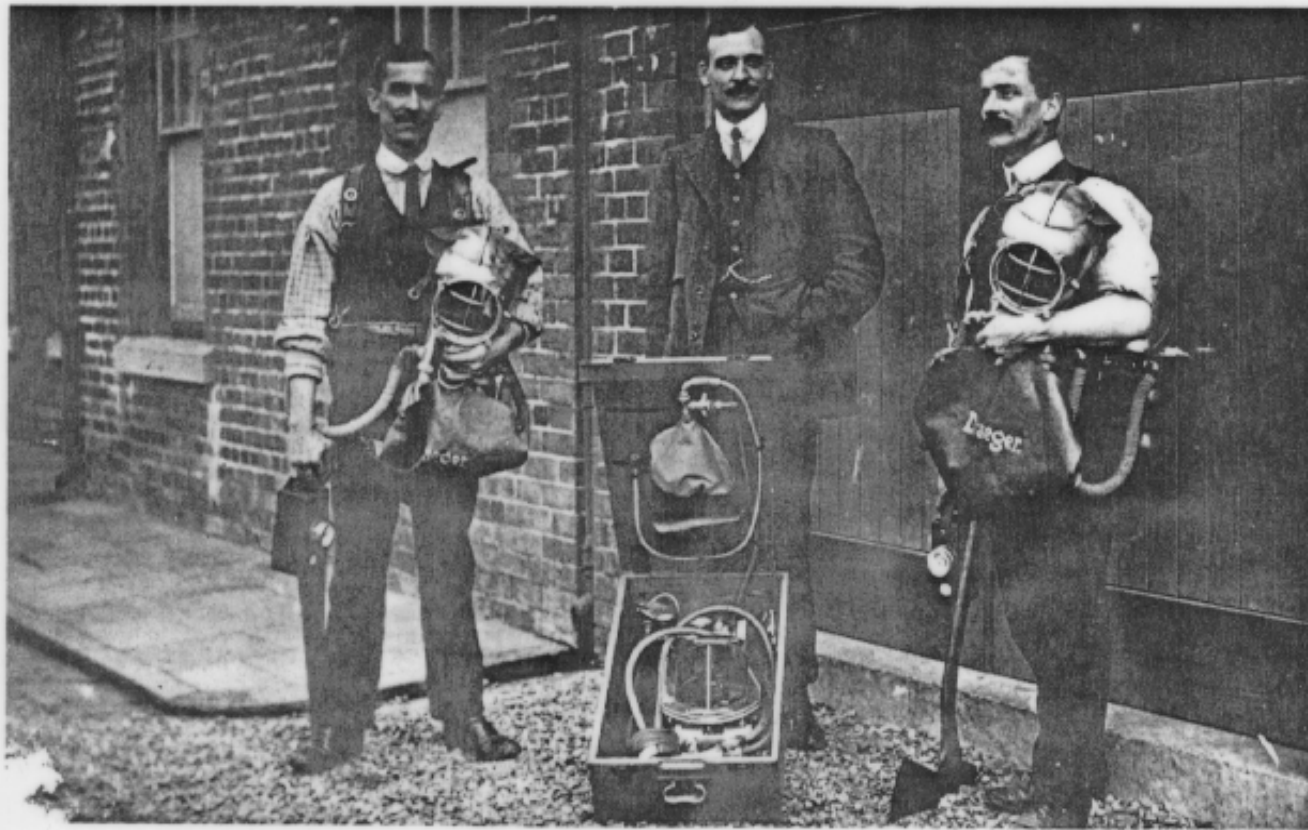
One worker was isolated in #000500 lunch area due to the smoke from the fire, and remained at this location for several hours utilizing filter self-rescuers for protection from the fire gases

He eventually traveled to the 000650-refuge station.

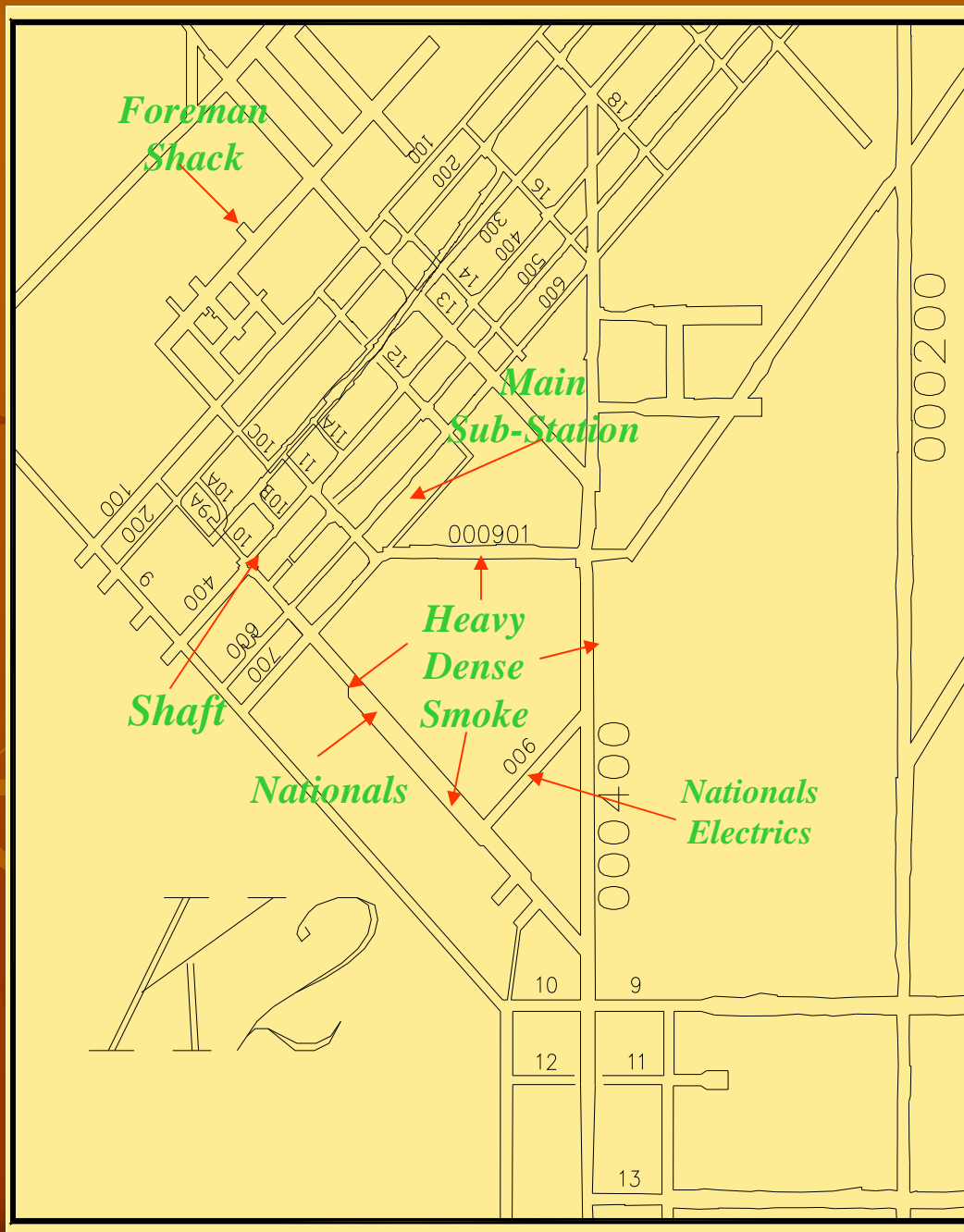


Mines rescue teams were organized with the skills required and given assignments and directives and deployed via K2 shaft to locate the source of the smoke.

Trade and Industry



102 Charles and Albert Adams, along with Arthur Winbourne, pose with some of the gear used in Mines Rescue in 1912



Team #1

Assignment Time

05:15-7:29

(1hr – 74mins)

**Confirm phone
status #5213 shaft
potash level**

**If no phone
communications
radio hoist room to
relay information.**

**Explore national
pumps and
electrical
substation.
Report to control.**



*Proceeded to fire area
distance 2.5 kilometers
Extinguish the fire
using the Multi-Tasker
Continue to the Inflow
area*

*#5 Refuge Station and
check on the workers
advise them of the
progress of emergency
operation*

Mines Rescue Vehicle



Multi-Tasker

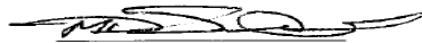
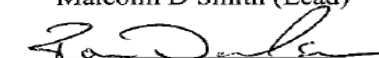
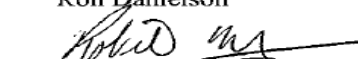
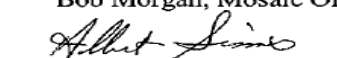
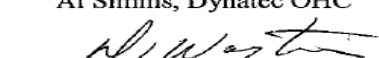
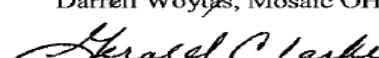
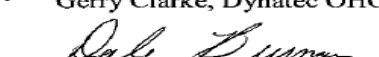
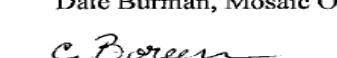


*Mosaic Esterhazy Potash
January 29, 2006
Mine Fire Investigation Report*



**Investigation into the Underground
Mine Fire
29-Jan-06**

Investigation of the underground mine fire that occurred January 29, 2006 at the Mosaic Esterhazy K1, K2 Potash mine was conducted by a joint investigation team consisting of Saskatchewan Labour, Mines Safety Unit Inspectors, Occupational Health Committee members from Mosaic and Dynatec company and worker representatives. This investigation is now complete and the investigation team is pleased to submit our report.

 Malcolm D Smith (Lead)	Mines Safety Unit
 Ron Danielson	Mines Safety Unit
 Bob Morgan, Mosaic OHC	Management Chair
 Al Simms, Dynatec OHC	Management Chair
 Darrell Woytas, Mosaic OHC	Employee Chair
 Gerry Clarke, Dynatec OHC	Employee Chair
 Dale Burman, Mosaic OHC	Employee Chair
 Charmaine Boreen, Mosaic OHC	Employee Member

The recommendations within this report are made on the findings of this investigation team. Any implementations of any of the recommendations should be based on a full and complete risk analysis.

“In the critical minutes following an incident the safety of the underground mine workers is largely influenced by their own actions.”

The lives of 72 mineworkers were put at risk because hot work procedures were not followed by the workers involved that resulted in the ignition of the pipe.

The main ingredient in the manufacturing of this pipe is polyethylene copolymer (>99%), which is a petroleum-based product. When the pipes burned, a large amount of heavy black carbon soot was released into the mine air, which reduced visibility to almost zero.

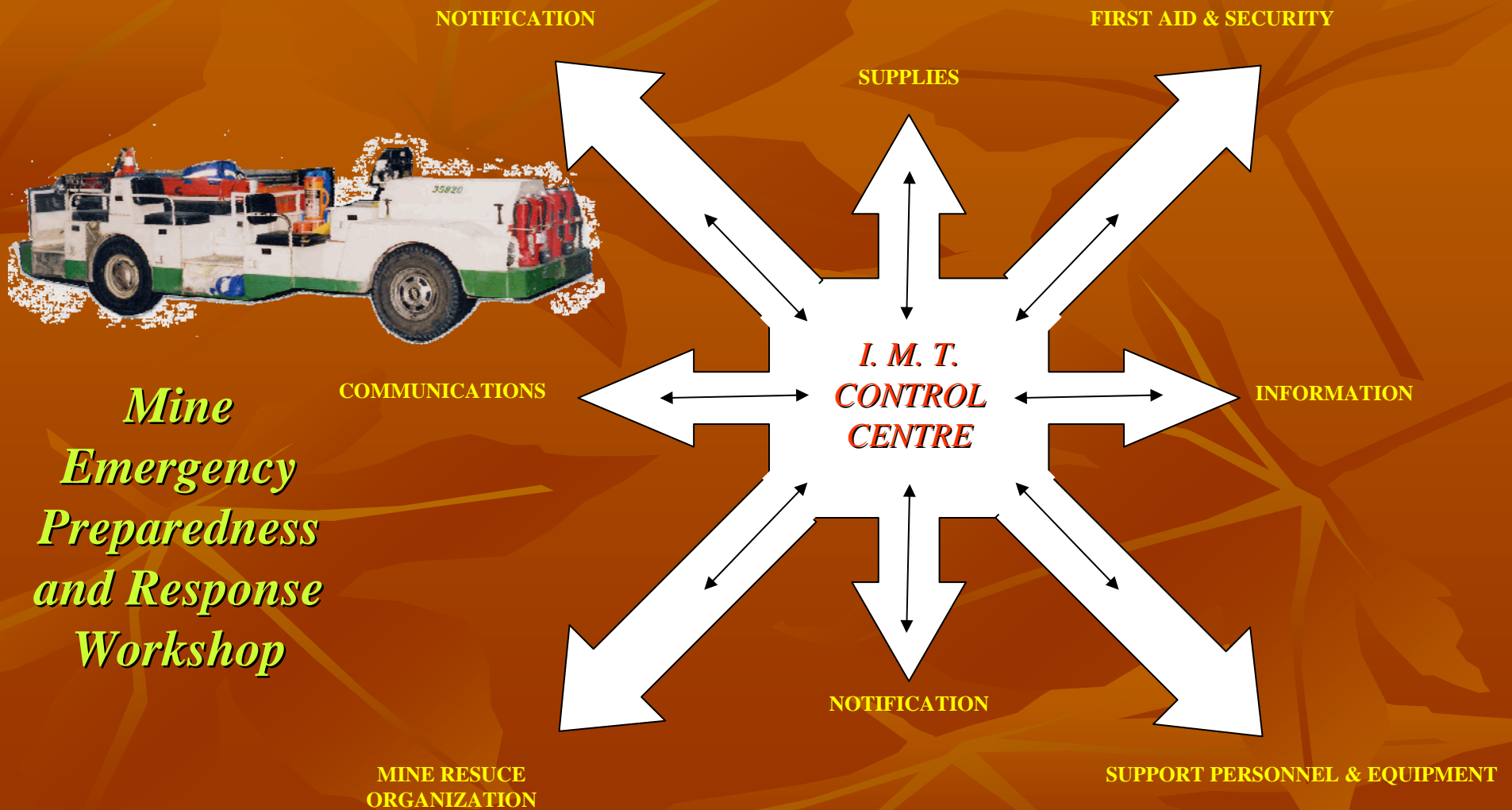
Some Investigation Findings Incident Management Team

To ensure the number and balance of the IMT is correct, this is by no means a criticism of the IMT performance, it is more a question of fatigue and how long a team should remain constituted until relieved.

The role of the IMT and individual roles and responsibilities of the members were not clearly defined, an advisory support group was not established to assist the IMT with risk analysis and problem solving.

It is essential that a significant number of the IMT members and senior management are trained in the established mine rescue procedures and practices.

During the emergency will management carry out their responsibilities they have been trained to do?



*Mine
Emergency
Preparedness
and Response
Workshop*

Some Investigation Findings Mines Rescue Teams

Response to the emergency involved 57 mine rescue workers, 6 equipment technicians with 17 mines rescue teams deployed during the 36 hours of emergency operation, mutual assistance an asset

The professional Mines Rescue workers response brought a successful conclusion to the incident with no injuries or loss of life.

The extreme underground environment created by the fire challenged the mines rescue teams established training competencies, physical and mental capabilities, throughout the emergency

On two occasions back up teams were mobilized, one team did lose direction due to the extreme conditions on the return part of the assignment.

How do we know beforehand how any team or member will respond?



Some Investigation Findings Refuge Stations

Electric fans could not be used. Heat and humidity was a concern for the workers most found that they felt cooler when lying on the floor and did so.

Toilet facilities were quickly filled to overflowing and the workers found it necessary to empty a large water bottle into their personal water containers and use it to urinate into.

Workers reported the auxiliary refuge station was adequate but would like to see electrical power for lights and fans. Extended periods in the dark was a concern.

Only one of the workers interviewed during this investigation encountered difficulty in reaching a refuge station. All other workers reported that they were able to reach a refuge station within ten minutes of being instructed to do so.

*Refuge
Station
Locator*



Mutual assistance support is a must.



Provincial Progress Initiatives

Saskatchewan Mines Rescue Instructors Forum Meetings

Challenges:

- *Mutual assistance training*
- *Transportation distances underground 10 > 25 km*
- *Customized rescue vehicles*
- *Team communications and route of travel locators*
- *Refuge station locating devices*
- *Emergency advance fresh air bases*
- *Personnel fit for duty and availability.*
- *Mine rescue workers pre-conditioning training*³⁹

Underground Mining Provincial Resources

Primary equipment

- *BG 4 Monitron & PSS*
- *BIO Marine 240S*
- *BIO Marine 240R*

Mines rescue workers

- *365 Certified active mines rescue workers.*
- *34 Certified active Instructors*

Underground Mines

- *Agrium (Potash)*
- *Cameco Cigar lake (Uranium)*
- *Cameco Rabbit lake (Uranium)*
- *Cameco McArthur Riv (Uranium)*
- *Claude Resources Seabee (Gold)*
- *PCS Cory (Potash)*
- *PCS Allan (Potash)*
- *PCS Lanigan (Potash)*
- *PCS Rocanville (Potash)*
- *Mosaic Collonsay (Potash)*
- *Mosaic K1 (Potash)*
- *Mosaic K2 (Potash)*

- *Average mining work-force 8775*

On January 29, 2006 the Mosaic Esterhazy mine experienced the largest and longest underground fire in Saskatchewan mining history

The underground fire at Mosaic Esterhazy aroused intense interest from the national and international news media. Mining companies should be aware that such news media attention may place additional demands on senior management at a time when they are already occupied with responding to the mine emergency.

*Neil Crocker
Chief Inspector of Mines*

***Mosaic Esterhazy Potash
January 29, 2006
Mine Fire Investigation Report***

WEB SITE

<http://www.securmine.net>

Will management's response be appropriate and timely to control the emergency before it escalates into a crisis or disaster?



**Sago Mine Explosion
January 2, 2006**



*Historical
failure
and
success*



**Esterhazy K2 Mine Fire
January 29, 2006**

Thank you



QUESTIONS P

