OCCUPATIONAL HEALTH HAZARDS IN MINERALS EXPLORATION-
ASSESSING THE KNOWN AND UNKNOWN.

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GCG

health safety hygiene
identify measure review control

INTRODUCTION

- Challenges facing the mineral exploration industry.
- Likely health hazards for Mineral Exploration workers.
- Risk assessing health hazards- Where do I start???
  - Identify
  - Assess
  - ~~Control~~

WHY?

Minimise the risk of ill health from exposure to workplace stressors.

- Occupational Disease
- Legislative Requirements

CHALLENGES

- Resourcing
- Transient workforce
- Remote work areas
- Work environment
- Limited access to maintenance facilities
- Variable mineralisation
- Competitive cost driven market
- Lack of engineering controls in industry

Health Hazards

Health hazards may come in the form of:

— Biological hazards

— Chemical hazards

— Ergonomic hazards

— Physical hazards

TYPICAL EXPLORATION HEALTH HAZARDS

May include, but not limited to:

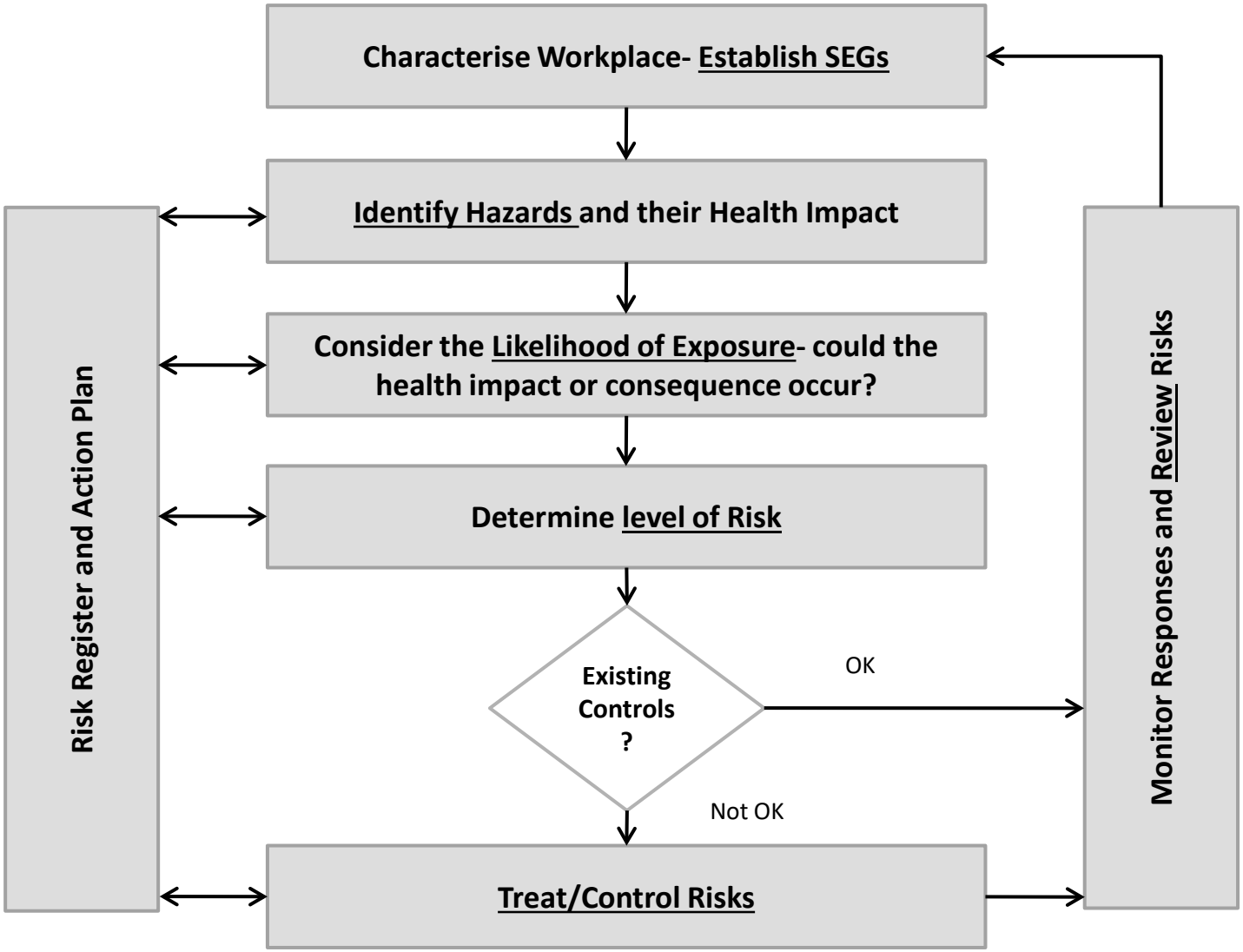
- Airborne Particulates
- Noise
- Vibration
- Naturally Occurring Radioactive Material (NORM)
- Thermal Stress
- UV Radiation
- Chemicals
- Ergonomics
- Water

Airborne Particulates- A closer Look

Airborne Particulates- A closer Look

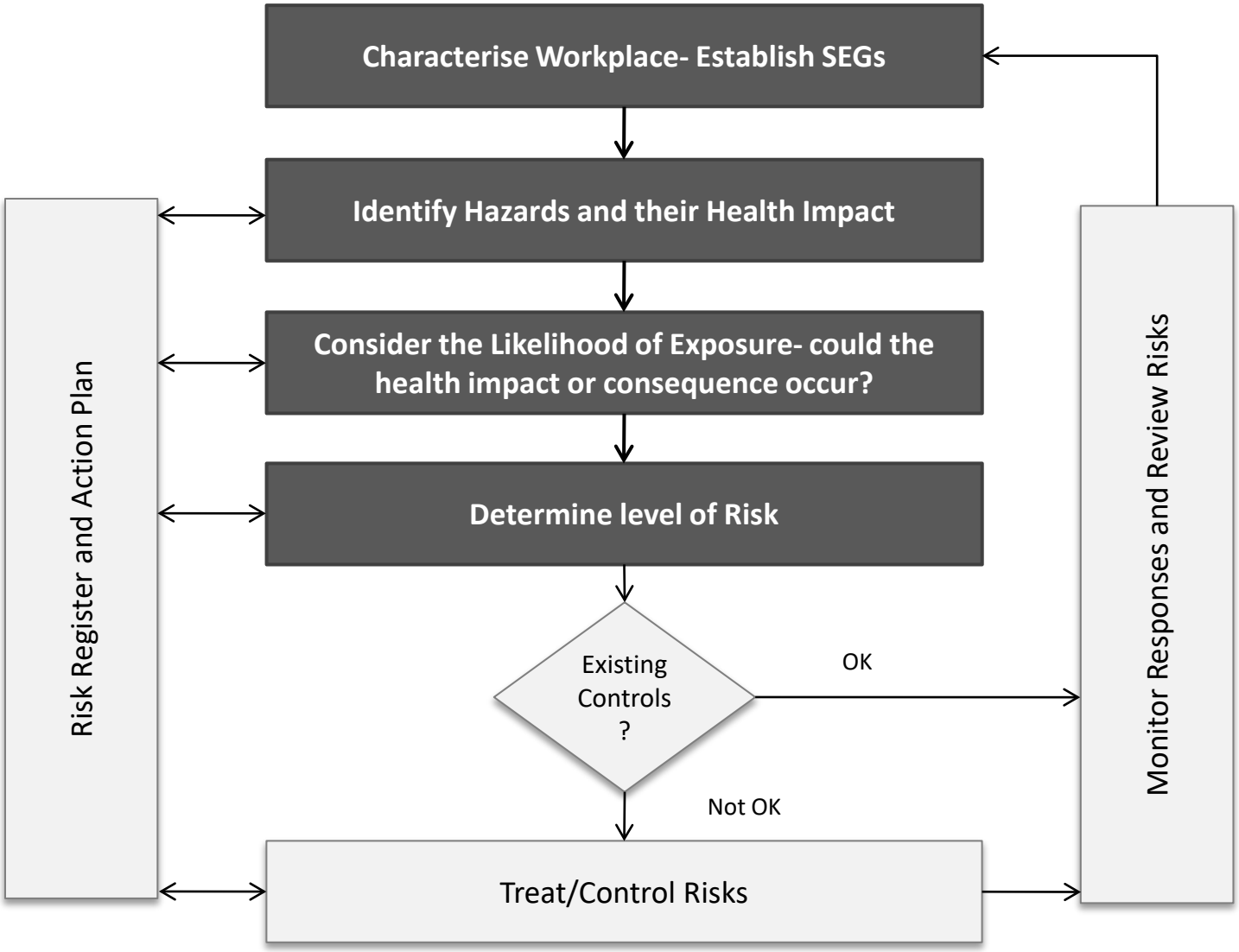
- Inhalable Dust
- Respirable Dust
  - Crystalline Silica
- Coal Dust
- Heavy Metals
- Asbestiform
- NORM

Health Hazard Risk Management Model



Source: Australian Institute of Occupational Hygienists- Simplified Occupational Risk Management Strategies.

Health Hazard Risk Management Model- Presentation Focus



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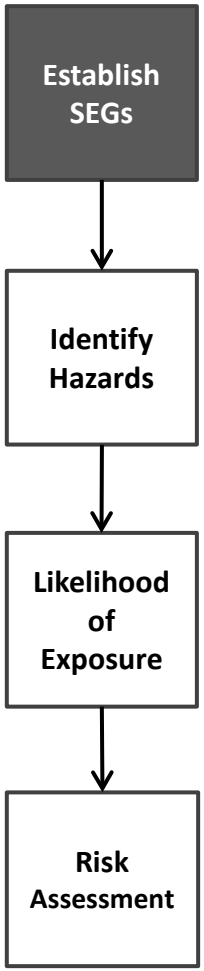
Health Hazard Risk Management Model- Presentation Focus

Source: Australian Institute of Occupational Hygienists- Simplified Occupational Risk Management Strategies.

1. Establish SEG's

Similar Exposure Groups = SEG's

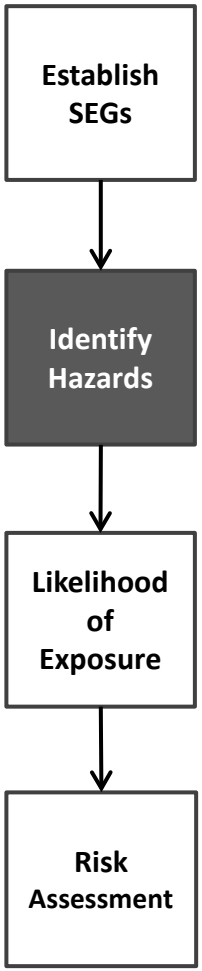
- Grouping of employees/contractors whose exposure to health hazards are similar.
- Risk management applied to a group rather than each individual.
- No simple way to define groups accurately. Commonly by role:
  - RC Driller
  - RC Offsider
  - RC Field Technician
  - RC Geologist
  - Diamond Driller
  - Diamond Drill Offsider
  - Supervisor/Technical
  - Etc.



2. Hazard Identification & Consequence

- Health hazards may change from site to site or even between drill holes.
- Systematic process to identify hazards:
  - Consider: Biological, Chemical, Physical &Ergonomic Hazards.
  - Culmination of Information at hand.
  - "Walkthrough Survey"
  - Consequence rating

- <u>Walkthrough Survey</u>
  - Process to identify and characterise hazards on site.
  - May involve:
    - Staff discussions, inspections, environment, products, methods.



2. Hazard Identification & Consequence [Cont]

— After hazards are identified, define consequence for each.

Example qualitative consequence scale:

RATING	CONSEQUENCE	DESCRIPTION
5	SEVERE	Can cause multiple fatalities or significant irreversible effects.
4	MAJOR	Can cause a single fatality or irreversible health effects or disabling illness to one or more persons.
3	MODERATE	can cause severe, reversible health effects of concern- could result in a LTI.
2	MINOR	Can cause reversible health effects of concern that would typically result in a MTI.
1	NEGLIGIBLE	Can cause reversible health effects of little concern that would result in a FAI at the most.

Source: *Australian Institute of Occupational Hygienists- Simplified Occupational Risk Management Strategies &* AS4360:2004

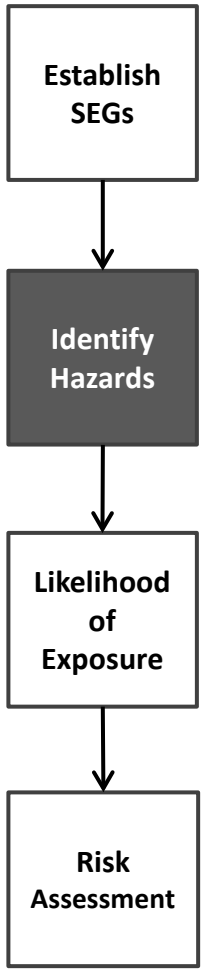
For example:

— Asbestos= 5

— Silica (RCS)= 5

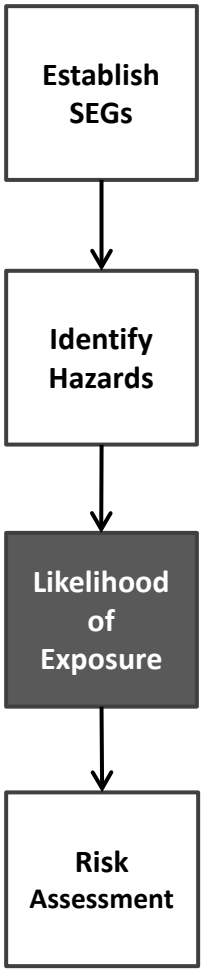
— Noise= 4

— Vibration= 3



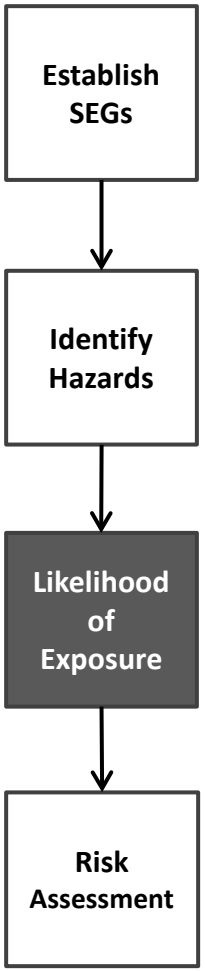
3. Exposure Characterisation & Likelihood

- Assessment may be ***'Qualitative'*** or ***'Quantitative'***
- Exploration: initial <u>qualitative</u> assessment?
- Perform follow up <u>quantitative</u> assessment if:
  - Exposures could exceed exposure limit
  - Exposure have resulted in complaints or adverse health effects
  - Exposures are to known carcinogens, reproductive toxins or ionising radiation.
- VARIABLE EXPOSURES?



3. Exposure Characterisation & Likelihood [CONT]

- Consolidate appropriate information and define likelihood.
- Likelihood rating will change dependant on variables.



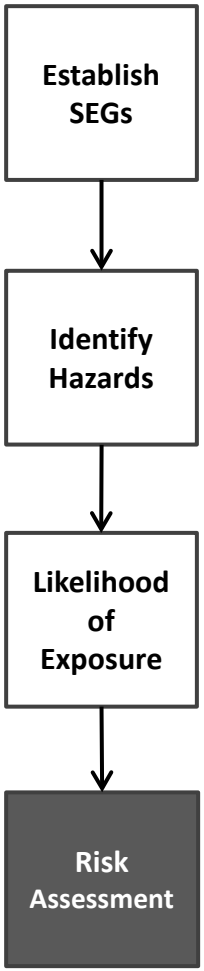
Example qualitative Likelihood scale:

RATING	LIKELIHOOD	DESCRIPTION
A	ALMOST CERTAIN	Regular contact with the potential hazard at very high levels.
B	LIKELY	periodic contact with the potential hazard at very high levels or regular contact with the potential hazard at high levels.
C	POSSIBLE	periodic contact with the potential hazard at high levels or regular contact with the potential hazard at moderate levels.
D	UNLIKELY	periodic contact with the potential hazard at moderate levels or regular contact with the potential hazard at low levels.
E	RARE	Periodic contact with the potential hazard at low levels.

Source: *Australian Institute of Occupational Hygienists- Simplified Occupational Risk Management Strategies* & AS4360:2004

4. Risk Assessment

- Perform risk assessment so controls can be applied.
- Hazards with very low exposure potential do not need to be assessed. Must be recorded and assessed periodically.



Example Risk Assessment Matrix:

Consequence Rating

Likelihood Rating	UNKNOWN	1 NEGLIGIBLE	2 MINOR	3 MODERATE	4 MAJOR	5 SEVERE
UNKNOWN	UNKNOWN					
A ALMOST CERTAIN		M	H	H	E	E
B LIKELY		M	M	H	H	E
C POSSIBLE		L	M	M	H	H
D UNLIKELY		L	L	M	M	H
E RARE		L	L	L	M	M

Risk Score Matrix- Example

— For consideration to graphically display results:

GCG	HEALTH HAZARD IDENTIFICATION AND ASSESSMENT												
	Printed copies of this document are not controlled.												
Assessment is based on no controls in place		**Qualitative Assessment (Walkthrough Survey, Professional Judgement & Industry Trends)**											
SEG No.	**Similar Exposure Group (SEG) Description**	*INS Dust PNOC*	*RES Respirable Dust*	*Silica Dust*	*Noise*	*Asbestos*	*Hazardous Substances*	*Thermal*	*Ergonomics*	*Biological*	*Vibration*	*UV Radiation*	*NORM*
[ID]001	RC Driller												
[ID]002	RC Offsider												
[ID]003	RC Field Technician												
[ID]004	RC Geologist												
[ID]005	Diamond Driller												
[ID]006	Diamond Drill Offsider												
[ID]007	Diamond Geologist												
[ID]008	Supervisors/Technical												

CONCLUSION

- Exploration projects will have hazards that require risk assessing.
- Systematic process to Identify, Assess and Control.
- May be performed internally by experienced and skilled persons, but expert advice must be sought for complex hazards or scenarios.
- Processes allows resources to be applied efficiently where required.

QUESTIONS?

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