SAFETY REPORT

Annual Overview

April 2014 – March 2015

Version 1, 4 June 2015

Prepared by:

Pragmaticus Research

PO Box 1614
NORMANVILLE SA 5204

admin@pragmaticusresearch.com.au

www.pragmaticusresearch.com.au

CONTENTS

TABLES

FIGURES

SUMMARY OF RECOMMENDATIONS

1. INTRODUCTION

Ground Geophysical Survey Safety Association (GGSSA) engaged Pragmaticus Research to develop a safety reporting system for its members. This is the first Annual Overview report, which includes a summary of the first year's results (April 2014 to March 2015), comparison of these results with national and international data (where possible) and recommendations for improvements to the system as it goes into its second year.

Details of individual incidents reported may be found in each of the four quarterly reports prepared to date.

2. SUMMARY OF ANNUAL DATA

2.1 Incident Reports

Incidents can fall into one or more of the following three categories: occurrence of harm or injury (most serious), near miss, and identified risk (least serious). For incidents that were reported in two categories, the most serious category is used in the following analysis.

A total of 65 incidents have been reported in the first year of operation of the GGSSA safety reporting system. This is comprised of 20 occurrence of harm or injury, 26 near miss and 19 identified risk incidents, as shown in Figure 1.

Figure 1 Incident type (annual)

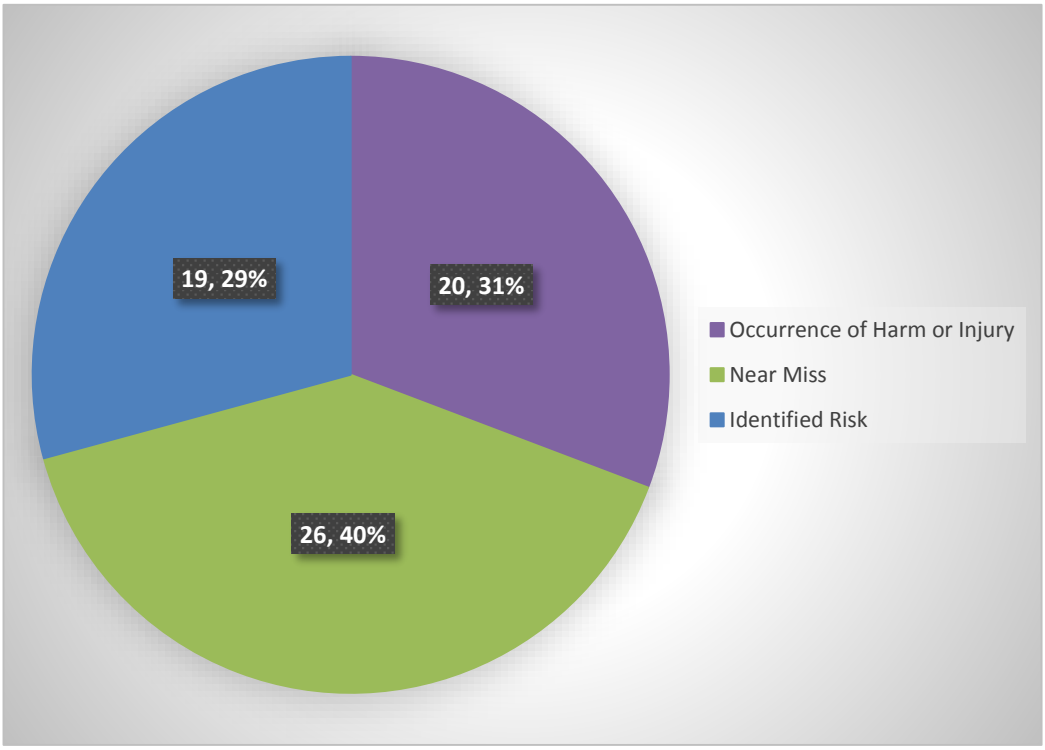


Table 1 shows the breakdown of incident type by quarter and annually.

Table 1 Incident type by quarter

Quarter	Occurrence of harm or injury		Near miss		Identified risk		Total
Apr-Jun 2014	3	(33%)	3	(33%)	3	(33%)	9
Jul-Sep 2014	4	(24%)	11	(65%)	2	(12%)	17
Oct-Dec 2014	5	(29%)	7	(41%)	5	(29%)	17
Jan-Mar 2015	8	(36%)	5	(23%)	9	(41%)	22
Annual Total	20	(31%)	26	(40%)	19	(29%)	65

Table 2 summarises the number of incidents involving the injury of a person, based on the number of persons injured as stated on the survey form, and the total number of persons injured. It is noted that this gives a slightly different result than Table 1, because of inconsistencies in data reporting (ie. members sometimes classified an incident as near miss but then stated that one or more persons were injured).

Table 2 Incidents involving injury by quarter

Quarter	Number of injury incidents	Total number of persons injured
Apr-Jun 2014	4	5
Jul-Sep 2014	6	6
Oct-Dec 2014	6	6
Jan-Mar 2015	8	8
Annual Total	24	25

2.2 Risk Pattern Summaries

2.2.1 Overall Risk Patterns

Table 3 shows the difference in risk patterns between mobilisation and surveying phases for the first year, while Table 4 shows the breakdown of numbers of incidents and incident rates by quarter. The time series trend in incident rates by phase is illustrated in Figure 2.

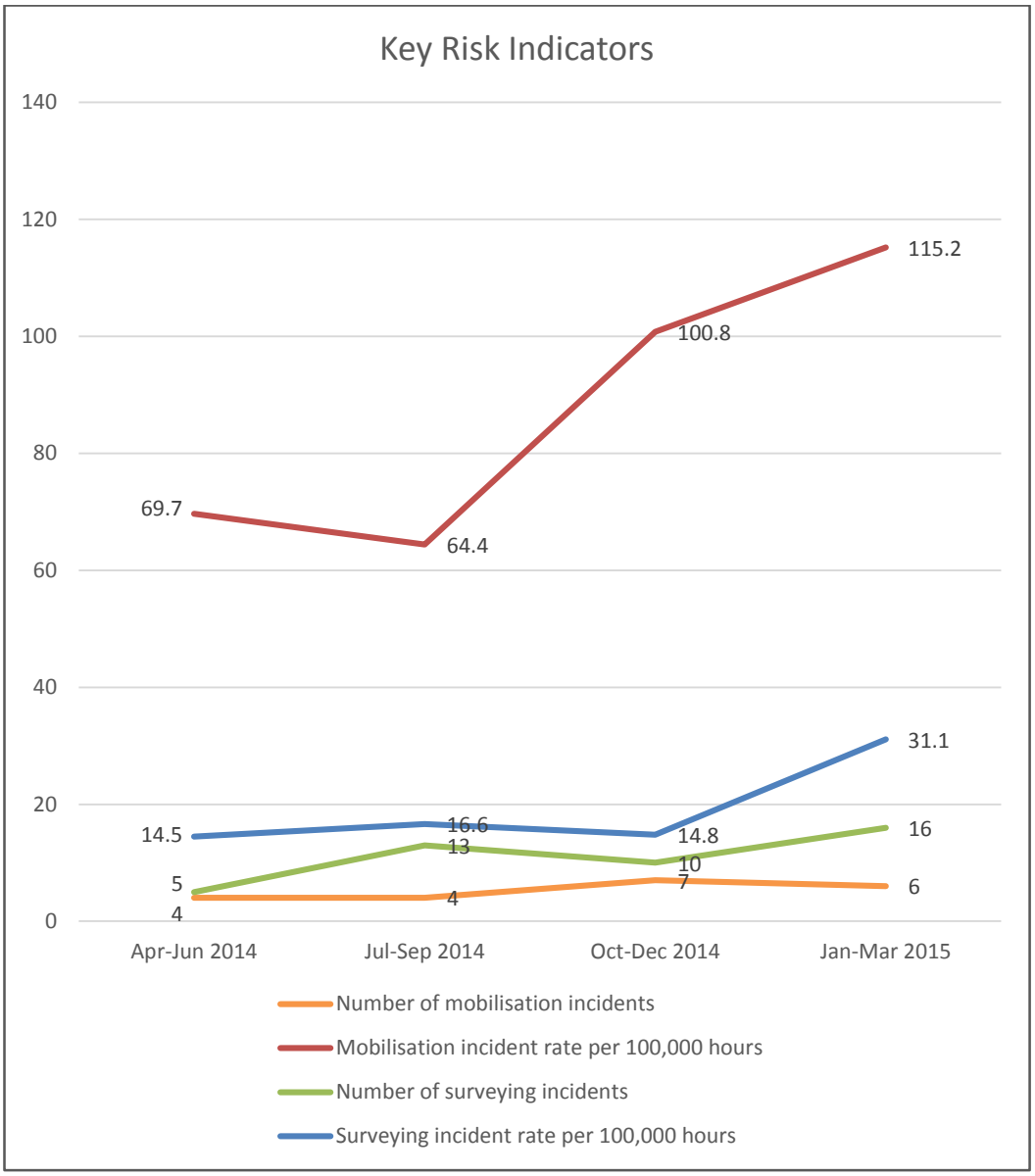
Table 3 Annual risk pattern

	Mobilisation Phase	Surveying Phase	Total
Hours worked	24,103	231,806	255,909
Number of incidents	21	44	65
Incidents per 100,000 hours	87.1	19.0	25.4

Table 4 Quarterly risk pattern

	Apr-Jun 2014	Jul-Sep 2014	Oct-Dec 2014	Jan-Mar 2015	Annual
Numbers of incidents					
Total incidents reported	9	17	17	22	65
Mobilisation incidents	4	4	7	6	21
Surveying incidents	5	13	10	16	44
Rates per 100,000 hours					
Overall incident rate	22.3	20.2	22.8	38.8	25.4
Mobilisation incident rate	69.7	64.4	100.8	115.2	87.1
Surveying incident rate	14.5	16.6	14.8	31.1	19.0

Figure 2 Key risk indicators



Whilst the number of mobilisation incidents is consistently lower than the number of surveying incidents (although within the same order of magnitude), the rate of mobilisation incidents per hours worked is consistently much higher than the rate of surveying incidents. The time spent in mobilisation is typically about 10% of the time spent in surveying.

The rates of mobilisation and surveying incidents both show an upward trend. This is thought to indicate that members are becoming more diligent in reporting all incidents (even if they are not considered 'serious'). By reading each quarterly report, each member is able to see the types of incidents reported by other members, and over time the different members will reach a similar threshold of reporting for incidents.

It is important to note that the above tables and graphs are based on total incidents, and do not represent injury rates, as identified risk and near miss incidents are also included.

There is significant variation in incident rates between members. For confidentiality reasons, it is not appropriate to provide details of the different incident rates for individual members. However, over the first year of reporting, the highest quarterly rate for a single member company was 1,111 incidents per 100,000 hours for mobilisation and 275 incidents per 100,000 hours for surveying.

2.2.2 International Comparisons

GGSSA has members from within Australia and overseas. As there is only one member from each country outside of Australia, it is not possible to present individual country results without identifying the companies. Table 5 compares incident rates between Australian and overseas members.

Table 5 Comparison of risk patterns for Australian and overseas members

	Australia	**Overseas**	**Total**	**Ratio A:O**
Mobilisation phase				
Exposure hours	14,720.9	9,382.0	24,102.9	1.6
Incidents	16	5	21	3.2
Incident rate per 100,000 hours	108.7	53.3	87.1	2.0
Injuries	2	0	2	-
Injury rate per 100,000 hours	13.6	0.0	8.3	-
Survey phase				
Exposure hours	80,024.1	151,782.0	231,806.1	0.5
Incidents	24	20	44	1.2
Incident rate per 100,000 hours	30.0	13.2	19.0	2.3
Injuries	10	8	18	1.3
Injury rate per 100,000 hours	12.5	5.3	7.8	2.4

The mix of mobilisation hours and survey hours differs markedly between Australian and overseas companies reporting in our system. Overall, Australian members reported a total of 94,745 hours worked over the year and International companies 161,164 hours. Of these hours, Australian companies spend 16% of their time on mobilisation and overseas companies 6%.

More incidents occurred during the mobilisation phase than the surveying phase for both Australian and overseas members (by a factor of approximately 4). However, in each phase, the Australian incident rate is approximately double that of the overseas rate. The Australian injury rate is also approximately 1.5 times higher than the overseas rate.

Overall, the data indicate that Australia is a higher risk environment, with a clear contribution from longer proportionate exposure to mobilisation and higher risks during both mobilisation and surveying.

More total hours are reported from overseas than from Australia indicating that Australian companies are much smaller. The number of exposure hours per member in Australia is roughly one tenth that of overseas members.

2.3 Member Participation in the GGSSA Safety Reporting System

Member participation has increased over the first year of operation of the safety reporting system. Only one member has consistently failed to contribute data, and in the most recent quarter, all other members have participated. Members are becoming more confident in completing the data forms and are reporting more incidents, suggesting that members' thresholds for what types of incidents they consider worth reporting are becoming more consistent.

Table 6 Number of members submitting reports, by quarter.

	Apr-Jun 2014	Jul-Sep 2014	Oct-Dec 2014	Jan-Mar 2015
Number of members who submitted a report	7	8	8	11
Number of members who reported one or more incidents	3	5	5	7
Number of members who reported zero incidents	4	3	3	4

2.4 Detailed Patterns

2.4.1 Type of Incident and Setting

Tables 7 to 9 summarise the information provided in detailed incident reports relating to the type of incident and the setting within which it occurred, ie. the phase of operation and the geosurvey method being used at the time. Note that, because more than one incident type and survey method can be specified for each incident, the totals exceed the total number of incidents reported.

Table 7 Type of incident

Incident Type	Number of incidents	Percentage of incidents	Number of persons injured
Occurrence of harm or injury	20	31%	25
Near miss	28	43%	-
Identified risk	26	40%	-
Total	**74**		25
Note: more than one incident type can be reported for each incident.			

Table 8 Geosurvey method

Geosurvey Method	Number of incidents	Percentage of incidents	Percentage of methods
IP	39	60%	57%
EM	21	32%	31%
CSAMT	3	5%	4%
HeliSAM	3	5%	4%
Line cutting	1	2%	1%
MP	1	2%	1%
Total	**68**		100%
Note: more than one method can be reported for each incident.			
Zero incidents were reported for the following methods: BH EM, BH IP, BH other physical properties, seismic, GPR, gravity, magnetic, nat field			

Table 9 Survey phase

Survey Phase	Number of incidents	Number of persons injured	Persons injured per incident	Total person hours lost	Average person hours lost per incident
Mobilisation or demobilisation	21	7	0.3	92	4.4
Surveying	44	18	0.4	116.5	2.6

2.4.2 Contributing Factors

Tables 10 to 12 summarise the various factors that contributed to the incidents as reported on detailed incident reports.

Table 10 Human and system factors

Human and System Factors	Number of incidents	Percentage of incidents	Percentage of human and system factors
Misjudgement of risk (a person underestimated the level of risk in a task or operation)	20	31%	32%
Failure to adhere to SOP (e.g. missed a step in a defined standard operation procedure)	11	17%	18%
Fatigue (fatigue contributed to misjudgement or failure to follow procedure)	9	14%	15%
Procedural deficiency (standard procedure was not adequate to prevent harm)	6	9%	10%
Loss of control of vehicle	4	6%	6%
Strength exceeded (a person was exposed to energy level or weight that was beyond their physical capacity)	2	3%	3%
Other human and system factors (as specified by member)			
Broken trailer stub axle	1	2%	2%
Cracked split rim	1	2%	2%
Electrical failure on generator	1	2%	2%
Hazard identification	1	2%	2%
Improper labelling	1	2%	2%
Lawbreaking	1	2%	2%
Loose spare tyre	1	2%	2%
Rocky terrain	1	2%	2%
Uncontrollable environmental factors	1	2%	2%
Uneven surface	1	2%	2%
Total	**62**		100%
No human and system factors reported	9	14%	
Note: more than one human and system factor can be reported for the same incident			

The four most frequently mentioned human and system factors account for three quarters of the factors mentioned:

- Misjudgement of risk (a person underestimated the level of risk in a task or operation)
- Failure to adhere to SOP (e.g. missed a step in a defined standard operation procedure)
- Fatigue (fatigue contributed to misjudgement or failure to follow procedure)
- Procedural deficiency (standard procedure was not adequate to prevent harm)

This paints a picture of poor risk identification both at operator and management level. The environment in which the work is undertaken is unforgiving and it is critical that risk assessment skill and risk management procedures are finely honed.

It is encouraging that most of the incidents reported don't result in injury. It appears that the recognition and management of hazards immediately prior to a possible injury event is well developed. However, there needs to be better foresight and better pre-emptive risk management.

It is also clear that the industry will need to develop a different set of risk management skills and procedures than industries that work in a fixed or static environment. Procedures for building risk prediction skills could be a focus for GGSSA

Table 11 Contributing factors

Contributing Factors	Number of incidents	Percentage of incidents	Percentage of contributing factors
Mechanical failure (e.g. failure of a structure, mechanical breakdown or other physical fault of equipment)	17	26%	24%
Exposure to natural elements (e.g. sun and hot weather)	17	26%	24%
Motor vehicle or road surface (e.g. pothole caused loss of control)	8	12%	11%
Chemicals (e.g. chemical burn or poisoning)	2	3%	3%
Lifting equipment (failure of or lack of control associated with lifting equipment e.g. vehicle jack unstable)	2	3%	3%
High voltage equipment (injury associated with high voltage equipment including, shock, burn, or eye flash injury)	2	3%	3%
Other contributing factors (as specified by member)			
Altitude	1	2%	1%
Environmental and diet changes	1	2%	1%
Exposure to environment hazard - fauna/flora	1	2%	1%
Failed fluxgate cable	2	3%	3%
Hazard identification	1	2%	1%
Heat	1	2%	1%
Improper labelling	1	2%	1%
Parking on slopes	1	2%	1%
Potential exposure to high voltage	1	2%	1%
Rocky terrain	1	2%	1%
Snatch strap failure	1	2%	1%
Time constraints	1	2%	1%
Topography	2	3%	3%
Language	1	2%	1%
Torn Truck Tarp	1	2%	1%
Uneven roads	1	2%	1%
Vehicle bogged	2	3%	3%
Windscreen	1	2%	1%
Work on the collection of the truck	1	2%	1%
Total	**70**		
No contributing factors reported	7	11%	

Zero incidents were reported for contributing factor laser equipment (e.g. burn or eye flash injury)
Note: more than one contributing factor can be reported for the same incident

Vehicles are a major contributing factor to risk of injury. The difficult terrain encountered, long travelling distances and lack of access to maintenance and repair facilities away from base compound the risk.

Table 12 Mechanism of injury factors

Mechanism of Injury Factors	**Number of incidents**	**Percentage of incidents**	**Percentage of mechanism of injury factors**
Vehicle loss of control	8	12%	15%
Hitting object with body (moving person hits against a stationary object)	4	6%	7%
Exposure to heat or hot object (includes hot working environment)	4	6%	7%
Fall on level < 1.2m (slip, trip, stumble)	3	5%	5%
Mechanical (cutting, crushing, puncturing)	3	5%	5%
Dehydration	3	5%	5%
Electrical shock	3	5%	5%
Fall from height > 1.2m	2	3%	4%
Fire or flame	2	3%	4%
Being hit by object (object is moving and strikes a stationary or moving person)	1	2%	2%
Other mechanism of injury factors (as specified by member)			
Broken trailer stub axle	1	2%	2%
Contact with chemical	1	2%	2%
Drinking non bottled water	1	2%	2%
Equipment damage	1	2%	2%
Exposure to extreme cold object	1	2%	2%
Fatigue	2	3%	4%
Hitting object with equipment	1	2%	2%
Lack of oxygen	1	2%	2%
Large crack in split rim tyre	1	2%	2%
Loss of tyre	1	2%	2%
Motor vehicle crash	1	2%	2%
Object fell off trailer	1	2%	2%
Pick up with unstable load	1	2%	2%
Pulled excessive weight	1	2%	2%
Rocky terrain - vehicle damage	1	2%	2%

Slipped on wet log on the ground	1	2%	2%
Strain injury - non lifting	1	2%	2%
Trailer dislodged	1	2%	2%
Traversing over uneven terrain	2	3%	4%
Wildlife	1	2%	2%
Total	**55**		100%
No mechanism of injury factors reported	17	26%	
Zero incidents were reported for natural radiation, non ionising radiation, ionising radiation, chemical poisoning, envenomation			
Note: more than one mechanism of injury factor can be reported for the same incident			

The mechanism of injury profile is similar to that reported for the mining industry as a whole in worker's compensation statistics. Vehicles and rough and unpredictable environments leading to falls are predominant factors.

It appears that there is a need to better understand the tolerance levels of machines and workers. In fixed work environments, supervision can be used to develop a culture of risk prediction and avoidance. In the survey industry, however, unsupervised work is common and there is a culture of toughing it out to get the job done. Traditional methods of safety improvement are less likely to be effective and more innovative procedures will be required. In line with Haddon's view of injury prevention, passive controls through innovative design of equipment and tasks are most likely to bring reward in terms of risk management.

2.4.3 Patterns of Injury and Treatment

Table 13 Treatment type

Treatment Type	**Number of incidents**	**Percentage of incidents**	**Percentage of treatment type**
None	47	72%	70%
First aid	14	22%	21%
Doctor's room, emergency department or outpatient treatment	5	8%	7%
Admission to hospital for more than 24 hours	1	2%	1%
Total	**67**		100%
No treatment type reported	0	0%	
Note: more than one treatment type can be reported for the same incident			

Overall injuries are not severe, but the potential for catastrophic injury is clear. Access to appropriate care in remote places needs to be a focus for the industry. It is proposed

to introduce a system of risk scoring in the second year of operation of the safety reporting system, which will take into account the probability of a severe event to assist with setting priorities for prevention.

Table 14 Body part injured

Body Parts	**Number of incidents**	**Percentage of incidents**	**Percentage of body parts**
Lower limb (leg and/or foot)	8	12%	42%
Upper limb (arm and/or hand)	4	6%	21%
Trunk (includes back)	3	5%	16%
Head	2	3%	11%
Systemic	1	2%	5%
Eye	1	2%	5%
Total	**19**		**100%**
Note: more than one body part can be reported for the same incident			

Table 15 Type of injury

Type of injury	**Number of incidents**	**Percentage of incidents**	**Percentage of type of injury**
Sprain or strain	7	11%	30%
Bruising	3	5%	13%
Dehydration	3	5%	13%
Burn	2	3%	9%
Fracture	1	2%	4%
Laceration	1	2%	4%
Other type of injury (as specified by member)			
Acute mountain sickness	*1*	2%	4%
Contusion	*1*	2%	4%
Eye irritation	*1*	2%	4%
Fatigue	*1*	2%	4%
Gastro	*1*	2%	4%
Pinch	*1*	2%	4%
Total	**23**		100%
Note: more than one type of injury can be reported for the same incident			

The distribution of body regions injured and types of injury is consistent with handling heavy equipment. Injuries are mainly mechanical in nature. Attention to equipment design and training in manual handling in environments where ground is uneven are likely to reduce risk.

2.4.4 Consequences of Incidents

Table 16 summarises the consequences of the incidents reported in the first year.

Table 16 Consequences of incidents

Lost person hours	208.5
Hospital inpatient days	0
Number of persons with permanent disabilities	0
Number of fatalities	0

Whilst many of the incidents reported had an impact on productivity in terms of lost person hours, none of the incidents resulted in permanent disability or death.

The GGSSA safety reporting system is designed to identify hazards and bring a focus on prevention. It is clear that traditional systems focussing on severe injuries are far less sensitive then the GGSSA system. A comparison between the different systems appears later in this report.

The consultants have found that members are finding it difficult to report how much productivity is lost due to the incidents reported. The estimated number of hours lost in this report is believed to be much lower than the actual impact on productive hours.

This will improve with feedback in reports, but there is a need for members to be better trained. This dealt with under improvements to the system.

3. COMPARISON WITH OTHER WORKPLACE INJURY REPORTING SYSTEMS

3.1 Brief Précis of Workplace Injury Statistics

International data on workplace injuries are based on fatalities. Incompatibilities between data sets between countries on all other measures prevent more detailed worldwide comparisons.

Worksafe Australia publishes data on workplace injuries and diseases on an annual basis. The latest year available is 2013. These data count serious injuries.

"Definition of a serious claim: A serious claim is a workers' compensation claim for an incapacity that results in a total absence from work of one working week or more, lodged in the reference year, and accepted for compensation by the jurisdiction by the date the data are extracted for publication" (*Australian Workers' Compensation Statistics 2012–13)*

The Australian Workers' Compensation Statistics consist of counts of injuries and rates based on the number of workers in the industry during the exposure period. Comparisons based on number of hours worked have not been attempted at national level because of the different number of hours per year worked in different industries.

Western Australia has developed a system of reporting where "rates are based on work-related lost time injuries and diseases of one day/shift lost or more in Western Australia" (*Work Related Lost Time Injuries and Diseases in WA 2010-11 to 2012-13, ANZSIC 2006 Edition).*

The following definitions and formulae are cited from the WA document:

- Frequency Rate: The frequency rate is the number of lost time injuries and diseases for each one million hours worked. The formula used for calculating frequency rates is: frequency rate = number of LTI/Ds ÷ number of hours worked x 1,000,000
- Number of Hours Worked: The number of hours worked is defined as the total number of hours worked by workers covered by the compensation system during this period. The hours worked are usually represented in millions.
- Incidence Rate: The incidence rate is the number of lost time injuries and diseases for each one hundred workers employed. The formula used is: incidence rate = number of LTI/Ds ÷ number of workers x 100
- Number of Workers: The number of workers is defined as the average number of workers covered by the compensation system who worked during the relevant period. As a result of treating casual, seasonal and part and full-time workers equally, incidence rates can give misleading indications of relative risk. This is

relevant to industries with high levels of part-time employment where the number of workers employed may be comparatively high but the actual exposure to hazards (reflected in actual hours worked) may be less.

- Averages: Frequency and incidence rate averages are calculated by averaging the number of LTI/Ds and the number of employees/hours worked over three years, then applying the formulas to the averages.

Data on workplace injury is also published detailing hospital admissions. The most recent publication is *Work-related injuries resulting in hospitalisation July 2006 to June 2009.* These data do not calculate rates of injury, however they are highly informative on the cause of injury and the mechanisms by which injuries occur. The GGSSA safety reporting system bases its nature of injury and body part coding on the systems used within the hospitalisation system.

3.2 Comparison of GGSSA Data with Relevant Workplace Safety Data

Valid comparison with other collections is limited due to the different case base. The following sections detail the comparisons that can be made.

3.2.1 Comparison with WA Mining Data

WA Mining data provides a rate of 14.75 injuries and disease per 1 million hours worked for exploration and other mining support services.

During the first year of operation the GGSSA safety reporting system found 20 cases of injury for 256,000 hours worked. This translates to approximately 80 injuries per million hours. This indicates a sixfold increased risk of injury in the surveying industry. Care should be taken in interpreting this figure. The WA data is based only on “lost day” incidents reported within the worker’s compensation system. The GGSSA system has reported only 6 lost day injuries during the period (equivalent to a rate of 23 per million exposure hours, approximately 1.5 times more than the WA data). The GGSSA safety reporting system is more sensitive and it is possible that much of the difference is due to the threshold of reporting.

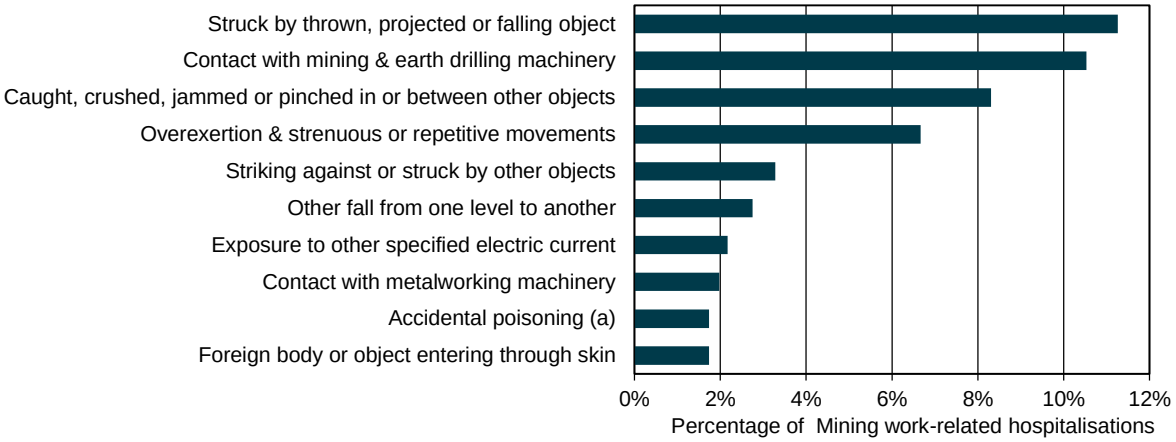
3.2.2 Comparison with Hospitalisation Data

Hospitalisation data does not present information about rates of injury. The only comparison that can be made is a qualitative assessment of the patterns of injury causes.

The details of these causes from the GGSSA safety reporting system are shown in Tables 10, 11 and 12 above. We have selected the cause distribution for the mining industry for comparison. Figure 3 and Table 17 below provide extracts from the hospital

separation system which can be compared with the GGSSA safety reporting system data.

Figure 3 Mining work-related hospitalisations June 2006 to July 2009: percentage of hospitalisations by the most commonly specified causes of injury



Note: These ten specified causes of injury together accounted for a total of 50% of Mining work-related hospitalisations.

Table 17 Mining work-related hospitalisations July 2006 to June 2009: percentage of hospitalisations by cause of injury and sex

Cause of Injury	Males	Females	Total
Exposure to inanimate mechanical forces	51.7%	17.2%	50.2%
Struck by thrown, projected or falling object	11.6%	3.2%	11.3%
Contact with mining & earth drilling machinery	10.9%	3.2%	10.5%
Falls	10.4%	11.8%	10.4%
Other causes of injury	9.3%	7.5%	9.2%
Transport accidents	8.6%	25.8%	9.4%
Caught, crushed, jammed or pinched in or between other objects	8.5%	4.3%	8.3%
Overexertion, travel & privation	6.5%	9.7%	6.7%
Other land transport accidents	4.1%	4.3%	4.1%
Exposure to electric current, radiation & extreme ambient air temperature & pressure	3.9%	2.2%	3.9%
Accidental poisoning by exposure to noxious substances	3.7%	9.7%	4.0%
Striking against or struck by other objects	3.4%	1.1%	3.3%
Other fall from one level to another	2.9%	0.0%	2.8%
Exposure to forces of nature	2.3%	6.5%	2.5%
Exposure to other specified electric current	2.2%	2.2%	2.2%
Contact with metalworking machinery	2.0%	1.1%	2.0%

Cause of Injury	Males	Females	Total
Car occupant injured in transport accident	1.9%	14.0%	2.5%
Foreign body or object entering through skin	1.8%	0.0%	1.7%
Unspecified fall	1.8%	1.1%	1.7%
Contact with lifting & transmission devices, nec.	1.7%	0.0%	1.6%
Contact with heat & hot substances	1.7%	0.0%	1.6%
Contact with other specified machinery	1.6%	2.2%	1.6%
Fall on same level from slipping	1.4%	3.2%	1.5%
Fall on same level from tripping	1.4%	1.1%	1.4%
Occupant of heavy transport vehicle injured in transport accident	1.4%	5.4%	1.6%
Exposure to other & unspecified inanimate mechanical forces.	1.2%	1.1%	1.2%
Contact with non-powered hand tool	1.2%	0.0%	1.1%
Driver of special industrial vehicle injured in non-traffic accident	1.2%	3.2%	1.3%
Exposure to unspecified electric current	1.2%	0.0%	1.2%
Contact with earth-moving, scraping & other excavating machinery	1.1%	0.0%	1.0%
Contact with unspecified machinery	1.1%	0.0%	1.0%
Contact with other powered hand tools & household machinery	1.0%	0.0%	1.0%
Fall on & from ladder	1.0%	0.0%	1.0%
Contact with venomous animals & plants	1.0%	2.2%	1.1%
Exposure to excessive natural heat	0.9%	0.0%	0.8%
Exposure to animate mechanical forces	0.9%	7.5%	1.2%
Victim of cataclysmic storm	0.8%	4.3%	0.9%
Driver of special construction vehicle injured in non-traffic accident	0.7%	0.0%	0.7%
Bitten or crushed by snake, unknown venomous or nonvenomous	0.6%	3.2%	0.7%
Exposure to electric transmission lines	0.5%	0.0%	0.5%
Victim of avalanche, landslide & other earth movements	0.5%	2.2%	0.6%
Total	**100%**	**100%**	**100%**
July 2006 to June 2009 Hospital admissions	**1,980**	**90**	**2,070**

Note: Detailed sub-categories are generally only shown to approximately 1% overall representation so the sub-categories do not sum to the percentage shown at the broad level.

Overall both systems show a similar cause profile. The major important issues are:

- Transport and vehicle related injury
- Injuries associated with manual handling of large and heavy equipment
- Injuries associate with bruising, pinching and minor entrapments
- Injuries associated with maintenance of equipment and equipment failure

One area of possible difference is that the GGSSA system contains more information about risks generated by extreme environments including dehydration, altitude sickness, heat exhaustion and interaction with unpredictable and difficult terrain. This is to be expected because much of the mining industry is conducted in tightly controlled environments and fixed workplaces which are far more predictable.

3.3 Data Quality

Maintaining the quality of data in any collection is a persistent challenge. The data in published work health and safety reports is generated from very detailed information from skilled investigation of each incident for insurance purposes. The GGSSA safety reporting system relies on self-reporting by a range of informants with highly varying exposure to work health and safety information sets. The requirement to ensure confidentiality of each reporting agency in this collection has led to the use of direct coding by informants and the exclusion of incident details which are required for the consultants to verify the categories assigned in the reports.

As noted in several tables, information contained in other categories of human, mechanism and contributing factors indicated that members are not consistent in the way they classify such factors. The lack of detailed incident descriptions makes it difficult and unwise for the consultants to attempt reclassification.

The quality of data received during the first year could be improved. It does not have the advantages of operating within a framework of information supplied for the insurance systems where there is a large highly trained and expensive infrastructure. Our collection has demonstrated that it is possible to obtain information about incidents before they result in insurance claims and from the field and systematically use that information to identify hazards and the contributory processes. While the individual data is of more variable quality than the compensation based systems, it is nevertheless providing useful information for prevention in line with the systems used in the airline industry for some years and emerging in many other industries.

Some opportunities for improving data quality and implementing calculation of risk priority scores are set out below.

4. IMPROVEMENT OF THE GGSSA DATA COLLECTION SYSTEM

4.1 Collection of Detailed Incident Descriptions

More detailed information about each incident would be very valuable in building data quality and coding reliability. Haddon's work and the systems developed from it over the last 30 years show that text descriptions of incidents can be obtained and be of high quality if divided into the pre event, event and post event phases. These phases can be explained to informants by showing simple sentences as examples when asking for an open text description of each incident.

The consultants should take over coding of data in order reduce inter coder variance.

Recommendation 1: It is recommended that, in future, the data collection include a detailed and systematic description of the reported incident, sufficient for the consultants to consistently code data according to consistent coding frameworks.

4.2 Indicators of Risk

The collection has provided information that allows a number of hazards to be identified. In order to prioritise actions in response to these hazards, it is necessary to assess the risk that each hazard represents. A risk assessment measurement tool is available. Once more detailed descriptions of incidents are included and by obtaining a small additional amount of information, namely the probability of occurrence, the frequency of exposure to the hazard and the most serious consequence expected, risk scores can be calculated by the consultants.

Recommendation 2: It is recommended that, in future, three additional items are added to each incident report, namely probability of occurrence, the frequency of exposure to the hazard and the most serious consequence expected, allowing a standard risk score to be calculated by the consultants.

4.3 Data Collection Processes

Some members have reported difficulty in verifying data transmission with the existing computer system. This appears to be related to the way in which the survey software buffers information in the case of a failed internet connection.

To overcome this and to provide members with the ability to keep and print copies of their submitted information, it is proposed to switch to interactive PDF forms which are sent by email.

Recommendation 3: It is recommended that data collection be achieved by using interactive PDF forms, replacing the existing electronic survey instrument.

4.4 Training of Data Providers

The data in this report show a number of inconsistencies in the way in which different member companies report and classify incidents. Given the difficulty and cost of bringing those responsible for providing reports together, it appears that there is a need for a process of online or video training to be developed.

Recommendation 4: It is recommended that the executive of GGSSA and the consultants work with members to design a training package aimed at improving the level of detail and consistency of the data provided.

4.5 Collection of Historical Data

The executive of GGSSA has asked the consultant to present an opinion of the addition of historical data to the database.

We understand that some of the companies participating in the safety reporting system are willing to provide historical data, and that the provision of such data would be voluntary. When referring to 'historical data', we understand that this would include data from the past 5 years or so (ie. back to around 2010).

The safety reporting system is flexible enough to include historical data. However, after considering options for addition of historical data we advise that:

- Historical information is likely to be costly for participating companies to retrieve and present in a form compatible with the current database philosophy.
- Information obtained will be biased toward injury incidents as these are more likely to be fully documents within each company's records.
- It is better to expend resources on developing the current system, improving depth of content and consistency of coding.

Recommendation 5: It is recommended that GGSSA do not proceed with attempting to collect historical data, but focus resources on improving the level of detail and consistency within its contemporary collection.