



CANADIAN MINERAL EXPLORATION HEALTH & SAFETY

Annual Report 2008



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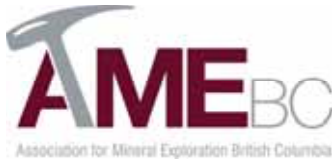
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Message from the AME BC and PDAC Health & Safety Committee Chairs

January 2010

The Association for Mineral Exploration British Columbia (AME BC) and the Prospectors & Developers Association of Canada (PDAC) are pleased to present the fourth *Canadian Mineral Exploration Health & Safety Annual Report*. The objective of the report is to track health and safety trends and lay the foundation for increasing health and safety awareness and improving standards of practice in the mineral exploration industry.

This year, AME BC and PDAC received information on the health and safety practices of 237 mineral exploration and mining companies active throughout Canada. Of these, 94 companies active in mineral exploration in Canada took the time to analyze their health and safety performance and submit their results through a voluntary questionnaire. We congratulate the 72 companies who reported lost workday free records. We also thank all survey participants for their commitment to the health and safety of their workers. Workers in the mineral exploration sector map properties, do line cutting, collect samples, carry out drilling programs, and perform countless other tasks in varied environments throughout Canada.

Sadly, the year 2008 was marked by seven helicopter-related fatalities and one logging-related fatality in the mineral exploration sector. None of these fatalities were reported in the survey, but received nationwide attention.

Survey participants in 2008 reported 45 lost workday incidents resulting in 524 lost workdays, compared to 60 lost workday incidents resulting in 6,504 lost workdays in 2007 (including 6,000 lost workdays in 2007 for a fatality). Injuries that companies reported, in other words, were fewer but generally more severe in 2008 than those reported in 2007.

AME BC and PDAC encourage all companies to set a target of zero incidents, every day. All companies should follow the guidelines contained in this report to help achieve this record.

All field employees and supervisory staff should take note of both the statistics and incidents detailed in this report.

We encourage all companies active in mineral exploration in Canada to participate in the 2009 Canadian Mineral Exploration Health & Safety Survey. A copy of the survey is included in this report and is also available online.

We thank participants for their support and hope that you find the report of interest and value. If you have any suggestions for improvement of future reports please contact Jonathan Buchanan, Manager, Communications & Public Affairs, at AME BC, at 604.630.3923 or jbuchanan@amebc.ca.

Yours truly,

Rob Pease
Chair, Health & Safety Committee
AME BC

Bill Mercer
Chair, Health & Safety Committee
PDAC

Canadian Mineral Exploration Health & Safety Annual Report 2008

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Acknowledgements

Survey Participants

We thank the following companies for participating in the 2008 Canadian Mineral Exploration Health & Safety Survey. Special thanks go to the 101 companies who took the time to respond to all questions in the survey including companies not active in exploration in Canada.

Aberdeen International Inc.	Copper Fox Metals Inc.
Abitex Resources Inc.	Copper Mountain Mining Corporation
Acrex Ventures Ltd.	Copper Reef Mining Corp.
Adex Mining Inc.	Copper Ridge Explorations Inc.
Agnico-Eagle Mines Ltd.	Cream Minerals Ltd.
Alexis Minerals Corporation	Crowflight Minerals Inc.
Altius Resources Inc.	Cypress Development Corp.
Amarc Resources Ltd.	CZM Capital Corp.
Anglo Swiss Resources Inc.	D'Arianne Resources Inc.
Appalaches Resources Inc.	Dajin Resources Corp.
Arctic Star Diamond Corp.	De Beers Canada Inc.
Ascot Resources Ltd.	Delta Uranium Inc.
Astral Mining Corporation	Durango Capital Corp.
Athabasca Minerals Inc.	Eagle Plains Resources Ltd.
Athabasca Potash Inc.	East West Resource Corp.
Augyva Mining Resources Inc.	Ely Gold & Minerals Inc.
Auramex Resource Corp.	Equity Exploration Consultants Ltd.
Avalon Rare Metals Inc.	Escape Gold Inc.
Azimut Exploration Inc.	Fieldex Exploration Inc.
Barrick Gold Corporation	First Metals Inc.
Bayfield Ventures Corp.	First Nickel Inc.
BCGold Corp.	Fjordland Exploration Inc.
Beaufield Resources Inc.	Fladgate Exploration Consulting Corporation
Bell Copper Corporation	Fletcher Nickel Inc.
Benton Resources Corp.	Fortune Minerals Ltd.
Bitterroot Resources Ltd.	Fronteer Development Group Inc.
Black Bear Developments	Geoinformatics Exploration Inc.
Black Panther Mining Corp.	GeoVector Management Inc.
Blue Pearl Mining Inc.	GGL Diamond Corp.
Bootleg Exploration Inc.	Globestar Mining Corp.
Brilliant Mining Corp.	Gold Star Resources Corp.
British Columbia Geological Survey	Goldbrook Ventures Inc.
Cadiscor Resources Inc.	Golden Cariboo Resources Ltd.
Canada Lithium Corp.	Golden Goliath Resources Ltd.
Canadian Royalties Inc.	Golden Hope Mines Ltd.
Canadian Zinc Corporation	GoldQuest Mining Corp.
CanAlaska Uranium Ltd.	Goldsource Mines Inc.
Capella Resources Ltd.	Gossan Resources Limited
Castle Resources Inc.	Grande Cache Coal Corp.
CBR Gold Corp.	Guyana Goldfields Inc.
Christopher James Gold Corp	Happy Creek Minerals Ltd.
Claude Resources Inc.	Hard Creek Nickel Corporation
Colt Resources Inc.	Harvest Gold Corp.
Columbia Yukon Explorations Inc.	Hawthorne Gold Corp.
Consolidated Abaddon Resources Inc.	Highvale Mine
Consolidated Spire Ventures Ltd.	Hinterland Metals Inc.
Constantine Metal Resources Inc.	Huckleberry Mines Ltd.
Copper Canyon Resources Ltd.	Hy-Tech Drilling

Iciena Ventures Inc.	Northern Freegold Resources Ltd.
IMA Exploration Inc.	Northern Superior Resources Inc.
Imperial Metals Corporation	Northern Tiger Resources Inc.
Independent Nickel Corp.	Northgate Minerals Corporation
Indicator Minerals Inc.	NovaGold Resources Inc.
Inlet Resources Ltd.	Nova Scotia Department of Natural Resources
Inmet Mining Corp.	Nuna Group of Companies
InnovExplo Inc.	NXA Inc.
Inspiration Mining Corp.	Ontario Geological Survey
International Bethlehem Mining Corp.	Orbite Exploration V.S.P.A. Inc.
International KRL Resources Corp.	Otish Energy Inc.
International Millennium Mining Corp.	Pacific Booker Minerals Inc.
International Wayside Gold Mines Ltd.	Pancontinental Uranium Corp.
J.A.G. Mines Ltd.	Peace River Coal
James Bay Resources Limited	Peat Resources Ltd.
Jaxon Minerals Inc.	Peregrine Diamonds Ltd.
JNR Resources Inc.	Pershimco Resources Inc.
Kaminak Gold Corp.	Pitchstone Exploration Ltd.
Kettle River Resources Ltd.	Playfair Mining Ltd.
Kirkland Lake Gold Inc.	Premier Gold Mines Ltd.
Klondike Silver Corp.	Pro-Or Mining Resources Inc.
Kodiak Exploration Ltd.	Puma Exploration
Lac Herbin Mine	Pure Diamonds Exploration Inc.
Lake Shore Gold Corp.	Pure Nickel Inc.
Liberty International Mineral Corporation	Quinto Mining Corp.
Liberty Mines Inc.	Rainy River Resources Ltd.
Linear Gold Corp.	Rambler Metals and Mining Canada Ltd.
Linear Metals Corp.	Red Rock Energy Inc.
Lions Gate Metals Inc.	Redcorp Ventures Ltd.
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Lund Gold Ltd.	Richview Resources Inc.
Lysander Minerals Corporation	Rimfire Minerals Corporation
MacDonald Mines Exploration Ltd.	Riverside Resources
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Masuparia Gold Corp.	Romios Gold Resources Inc.
Mazorro Resources Inc.	Roxmark Mines Ltd.
Mega Silver Inc.	Ruby Red Resources Inc.
Melkior Resources Inc.	Running Fox Resource Corp.
Messina Minerals Inc.	Sabina Silver Corp.
MetalCORP Ltd.	Sable Resources Ltd.
Metalex Ventures Ltd.	Sage Gold Inc.
Metanor Resources Inc.	Santoy Resources Ltd.
Milner Consolidated Silver Mines Ltd.	Saturn Minerals Inc.
Ministère des Ressources naturelles et Faune, Québec	Sea Green Capital Corp.
Moss Lake Gold Mines Ltd.	Seabridge Gold Inc.
MPH Ventures Corp.	Selkirk Metals Corp.
Mustang Minerals Corp.	Selwyn Resources Ltd.
Nebu Resources Inc.	Shear Minerals Ltd.
New Millennium Capital Corp.	Sherritt Coal
New Nadina Explorations Ltd	Sirios Resources Inc.
Newfoundland and Labrador Geological Survey	Skygold Ventures Ltd.
Newmac Resources Inc.	Skyharbour Resources Ltd.
Niogold Mining Corp.	SLAM Exploration Ltd.
Noront Resources Ltd.	Snowfield Development Corp.
North American Gem Inc.	Starfield Resources Inc.
North American Tungsten Corporation Ltd.	Strateco Resources Inc.
Northern Abitibi Mining Corp.	Sultan Minerals Inc.

Target Exploration and Mining Corp.
Taseko Mines Ltd.
Teck Resources Limited
Tenajon Resources Corp.
Terrane Metals Corp
Teuton Resources Corp.
Trelawney Resources Inc.
Tres-Or Resources Ltd.
Tri Origin Exploration Ltd.
TTM Resources Inc.
Tyhee NWT Corp.
UNOR Inc.
Vaaldiam Resources Ltd.
ValGold Resources Ltd.

Victory Nickel Inc.
Visible Gold Mines Inc.
Vismand Exploration Inc.
VMS Ventures Inc.
VVC Exploration Corp.
Watts, Griffis and McQuat Limited
Wesdome Gold Mines Ltd.
Western Copper Corporation
Western Potash Corp.
Western Uranium Corporation
Westminster Resources Ltd.
Whitemud Resources Inc.
Xstrata Zinc Canada

AME BC and PDAC thank the following for making the fourth annual *Canadian Mineral Exploration Health & Safety Survey* and *Annual Report* possible. Special thanks go to the late David Barr and the original Safety Committee of AME BC for developing the original *Annual Report: Safety in Mineral Exploration in Western Canada*.

AME BC Health & Safety Committee

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Executive Summary

The Association for Mineral Exploration British Columbia (AME BC) and the Prospectors & Developers Association of Canada (PDAC) have established goals of increased health and safety awareness, zero fatalities, and zero lost workday incidents.

The associations are pleased to report that health and safety awareness among organizations involved in mineral exploration continues to increase. The number of organizations reporting no lost workday incidents increased from 65 in 2007 to a record number of 72 companies in 2008. However, there were eight fatalities in the mineral exploration sector in 2008, all within a three-month period. It is our sincere hope that organizations nationwide learn from these fatalities and the incidents reported by participants in the *Canadian Mineral Exploration Health & Safety Survey*.

A record 237 organizations contributed to the survey in 2008, up from 101 in 2007. However, the number of companies and government geological surveys active in exploration work in Canada – out of approximately 1,100 nationwide – who completed the survey remained low. Only 94 of these companies filled the survey – the same number as in 2007. These organizations reported 401,725 person days of activity, down from 538,868 person days in 2007, and well off the record of 592,112 days reported in 2005. AME BC and PDAC thank the respondents of the survey for taking the time to volunteer this data to make the survey possible.

There has been a gradual increase in the proportion of companies with a health and safety program over the past five years. Currently 78% of respondents declare that they have a health and safety program, showing a steady increase from 73% in 2007, 63% in 2006, 49% in 2005, and 43% in 2004¹. Furthermore, 85% of respondents reported discussing safety issues at staff meetings or holding safety meetings (however, this is lower than 90% in 2007). Finally, 85% reported discussing recent near misses at staff meetings (compared to 87% in 2007). The ultimate objective is a sincere “Yes” in 100% of replies to all three of these questions.

Survey participants in 2008 reported 45 lost workday incidents resulting in 524 lost workdays, compared to 60 lost workday incidents resulting in 6,504 lost workdays in 2007 (including 6,000 lost workdays in 2007 for a fatality). No fatalities were reported in the survey; however, there were eight fatalities in mineral exploration in Canada that were not reported in the survey.

The frequency of lost workday incidents per 200,000 hours was 2.3, the same as in 2007, but up from 2.1 in 2006, and 1.0 in 2005.

There were 72 companies that reported operating without a lost workday incident, a new record. This compares to 65 in 2007, 61 in 2006 and 71 in 2005. The number of days without a lost workday incident reported by some of these companies should serve as an inspiration to others. Northgate Minerals Corporation, who recorded the second highest number of days without a lost workday incident in 2007, achieved top position in 2008, with 24,266 days without a lost workday incident. Northgate was followed by De Beers at 16,229 days, SLAM Exploration Ltd. at 13,930 days, and VMS Ventures Inc. at 13,680 days.

Northgate Minerals Corporation is the 2008 recipient of the Safe Day Everyday Gold Award for recording 195,192 hours without a lost workday incident.

¹ 2004 AME BC survey of companies active in British Columbia and Yukon.

Sommaire

L'Association for Mineral Exploration British Columbia (AME BC) et l'Association canadienne des prospecteurs et entrepreneurs (PDAC) se sont fixé pour objectifs de promouvoir la sensibilisation à la santé et à la sécurité et d'éviter les décès ainsi que les incidents occasionnant la perte de journées de travail.

C'est avec plaisir que les associations déclarent que les organisations intervenant dans l'exploration minérale sont de plus en plus sensibilisées aux questions de santé et de sécurité. Le nombre d'organisations ayant déclaré n'avoir perdu aucune journée de travail est passé de 65 en 2007 à un nombre record de 72 en 2008. Toutefois, huit décès, survenus dans une période de trois mois, ont été déplorés dans le secteur de l'exploration minérale en 2008. Nous espérons sincèrement que les organisations de partout au pays tireront une leçon de ces décès et des incidents déclarés par les participants de la *Canadian Mineral Exploration Health & Safety Survey*.

Un nombre record de 237 organisations ont répondu au sondage en 2008, soit une augmentation de 101 participants par rapport à 2007. Cependant, le nombre de compagnies et de commissions géologiques gouvernementales actives dans le domaine de l'exploration au Canada – environ 1 100 au pays – qui ont répondu au sondage demeure relativement faible. Seulement 94 d'entre elles ont participé au sondage, soit le même nombre qu'en 2007. Ces organisations ont déclaré 401 725 jours-personnes, par rapport à 538 868 jours-personnes en 2007, soit bien moins que le nombre record de 592 112 jours déclarés en 2005. L'AME BC et PDAC remercient les répondants d'avoir pris le temps de communiquer ces données pour assurer la réalisation du sondage.

La proportion de compagnies dotées d'un programme de santé-sécurité a augmenté progressivement au cours des cinq dernières années. Actuellement, 78 % des répondants ont déclaré disposer d'un programme de santé-sécurité, ce qui représente une augmentation croissante par rapport à 73 % en 2007, à 63 % en 2006, à 49 % en 2005 et à 43 % en 2004². De plus, 85 % des répondants ont dit avoir discuté de questions de sécurité lors des réunions du personnel ou avoir tenu des réunions sur la sécurité (cependant, ce nombre est inférieur à celui de 90 % déclaré en 2007). Enfin, 85 % des répondants ont déclaré avoir discuté de récents accidents évités de justesse lors des réunions du personnel (par rapport à 87 % en 2007). Le but ultime est un « oui » franc dans la totalité des réponses à ces trois questions.

Les répondants au sondage de 2008 ont déclaré 45 incidents résultant en 524 jours de travail perdus, en comparaison de 60 incidents pour 6 504 jours de travail perdus en 2007 (dont 6 000 jours perdus en raison d'un décès). Aucun décès n'a été déclaré dans le sondage. Cependant, huit décès non déclarés dans le sondage se sont produits dans le secteur de l'exploration minérale au Canada.

La fréquence des incidents entraînant la perte de jours de travail par tranche de 200 000 heures a été de 2,3, comme en 2007. Cette fréquence est toutefois plus élevée qu'en 2006 (2,1) et en 2005 (1,0).

Soixante-douze compagnies ont déclaré avoir mené leurs activités sans incident occasionnant la perte d'un jour de travail, ce qui établit un nouveau record. Ce nombre était de 65 en 2007, de 61 en 2006 et de 71 en 2005. Le nombre de journées sans incident déclaré par certaines de ces sociétés devrait servir de source d'inspiration pour les autres. Northgate Minerals Corporation, qui s'était classée au deuxième rang des compagnies ayant déclaré le plus grand nombre de jours sans incident occasionnant la perte de jours de travail en 2007, a obtenu la première place en 2008, avec 24 266 jours sans incident. Northgate est suivie par De Beers, avec 16 229 jours, SLAM Exploration Ltd., avec 13 930 jours, et VMS Ventures Inc., 13 680 jours.

Northgate Minerals Corporation a reçu le prix Safe Day Everyday Gold Award de 2008 pour avoir déclaré 195 192 heures sans incident occasionnant la perte d'une journée de travail.

² Sondage mené par AME BC en 2004 auprès de compagnies actives en Colombie-Britannique et au Yukon.

2008 in Review

Surface Exploration and Geological Work: A Summary

Respondents reported 142,022 person days of activity, the lowest number of hours reported in the four-year history of the survey. In 2007, organizations reported 239,639 person days of activity, up from 177,876 person days of activity in 2006, but still down from 337,556 person days of activity in 2005.

There were no fatalities reported through the survey. However, there were fatalities not reported through the survey – see “Fatalities in 2008” on p. 21.

There were 23 lost workday incidents in 2008, compared to 28 lost workday incidents in 2007. These resulted in 255 lost workdays. The frequency rate per 200,000 workdays was 3.3, up from 2.3 in 2007, and the severity rate (lost workdays per 200,000 workdays) was 36.2, down from 523.5 in 2007, due to no fatalities being reported.

As in 2007, lost workdays were centered around the support services required for exploration programs. Only one lost workday was attributed to a geologist. Support staff including cooks (71 days), field assistants (33 days), a heavy duty mechanic (16 days), a line cutter (1 day), a geophysicist (2 days), and others accounted for 254 lost workdays.

Slips and falls returned to being the leading cause of lost workday incidents in 2008. Five of these occurred during field work; two involved steep slopes. The most severe incident was an alcohol-related one where a worker received severe burns from falling on a diesel stove (21 lost workdays). The second most severe incident was when a worker slipped on ice and fell against a concrete barricade (5 lost workdays).

Improper tool use caused three lost workday incidents in 2008, compared to five in 2007. These incidents all required medical evacuation so that the workers could get stitches. Similarly, improper operation of equipment led to three lost workday incidents. A mechanic rubbed grease and a sliver into the eye (16 lost workdays), a labourer received a cut from using a chainsaw without personal protective equipment (4 lost workdays), and a cook received a severe burn from cooking bacon while intoxicated (1 lost workday). ATV and snowmobile misuse, dehydration, stomach pains, a stomach ulcer, drill trailer hitching, and falling objects all led to lost workdays.

The leading preventive measures that could be taken to eliminate these incidents can be summarized as follows:

- 1) Train employees on ATVs if they are used in camp;
- 2) Make sure that employees disclose any pre-existing conditions that may affect their performance, and have the medication required if applicable;
- 3) Have a drug and alcohol policy;
- 4) Check that employees use appropriate personal protective equipment (PPE) and caution in all situations;
- 5) Eliminate unnecessary driving in hazardous conditions (e.g. driving on ice in the early season);
- 6) Use extra caution in slippery environments;
- 7) Do not lift or carry heavy objects without assistance; *and*
- 8) Make sure employees are properly hydrated while in the field.

The lost workday incident frequency rate (number of lost workdays per 200,000 exposure hours) was 3.3 in 2008, up from 2.3 in 2007, 1.7 in 2006, and 0.5 in 2005.

Severity of injury rate was 36.2 in 2008. Although this number is down from 523.5 in 2007 and 1,356.9 in 2006, excluding fatalities in those years, the rate would have been 21.6 and 7.5 in 2007 and 2006 respectively.

Surface Drilling: A Summary

Respondents reported 211,770 person days of activity in 2008, up from 205,431 person days in 2007. A direct comparison with previous years is impossible as surface drilling, underground exploration, and other activities were lumped together.

There were 21 lost workday incidents, an improvement from 31 lost workday incidents in 2007. However, these resulted in 268 lost workdays, compared to 172 workdays in 2007.

The leading cause of lost workday incidents continues to be drilling machinery and equipment related. The use of drilling equipment requires the proper use of equipment and vigilance on the part of the operator. Seven incidents with lost workdays were reported, down from twelve in 2007. However, these incidents resulted in 100 lost workdays, up from 44 in 2007. The most severe incident happened when a driller was improperly holding a chain around the hand when sudden tension ensued, resulting in surgery for a cut.

The second greatest cause was improper lifting, which resulted in five lost workday incidents totaling 50 lost workdays. One resulting back injury led to 30 lost workdays.

Slips and falls also continue to be of great concern and resulted in four lost workday incidents, same as in 2007. However, these incidents resulted in 76 lost workdays, up from 66 in 2007. A helper twisted and dislocated an ankle while stepping out of the drill shack. Slips on drilling platforms and surrounding rock are unfortunately common injuries reported year after year in the survey.

Other causes included ATV and vehicle misuse, tool use, and falling objects.

Preventive measures to eliminate similar incidents in the future are:

- 1) Do not rush any aspect of a program, whether it is drilling or transportation. Train employees fully in all of their duties;
- 2) Check that proper equipment is used in *all* drilling operations; *and*
- 3) Apply all preventive measures for surface exploration (see p. 8) to drilling operations as well.

The lost workday incident frequency rate per 200,000 exposure hours in 2008 was 2.0, a significant improvement from 3.0 in 2007, and the severity rate was 25.4, up from 16.8 in 2007.

Underground Exploration

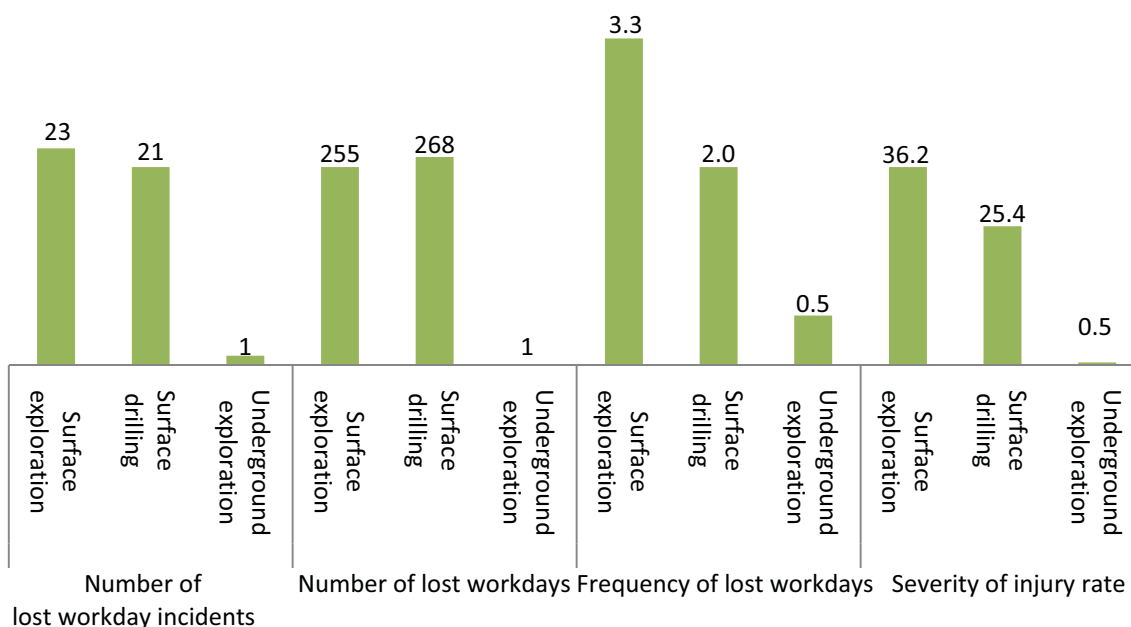
Respondents reported 40,030 person days of activity in 2008, down from 86,202 person days in 2007. A direct comparison with previous years is impossible as surface drilling, underground exploration, and other activities were lumped together.

As in 2008, there was only one lost workday incident. A miner undergoing stress had heart palpitations and thought it was a heart attack. The miner was flown to hospital, resulting in one lost workday.

The lost workday incident frequency rate per 200,000 exposure hours consequently was 0.5, up from was 0.2 in 2007, but an excellent record considering that the survey included multiple underground workplaces in four provinces and one territory. The severity rate was 3.4, down from 18.2 the previous year.

It should be noted, however, that were 14 incidents without lost workdays that involved miners; six of these required medical attention. Two miners were placed on modified duty following separate incidents. In a remote exploration setting, similar incidents may have resulted in lost workdays as medical evacuation would have been required.

Figure 1: Mineral Exploration Safety Statistics Summary 2008



Discussion of Questionnaire Results

WHO WAS SURVEYED?

- Over 1,100 companies and government geological surveys were contacted by phone and/or email regarding the survey.
- 237 organizations were interviewed or volunteered information regarding their safety programs.
- 101 organizations completed the Canadian Mineral Exploration Health & Safety Survey.
- 94 of these 101 companies reported their 2008 safety records for exploration work in Canada. Seven of these companies reported not conducting exploration.

AME BC and PDAC received information on the health and safety practices of 237 mineral exploration and mining companies active throughout Canada. Of these, 94 companies active in mineral exploration in Canada took the time to analyze their health and safety performance and submit their results through a voluntary questionnaire.

This year, we received responses that included every province and territory with active mineral exploration programs in 2008 (i.e. not Prince Edward Island). The 94 companies who provided information on their safety record were exploring for metals (including uranium), coal, and potash. In this respect, this survey is reflective of the mineral exploration sector at large throughout Canada. However, we did have a relatively low response rate from Saskatchewan and Nunavut, and a relatively high response from New Brunswick (compared to no responses in 2007), British Columbia, and the Northwest Territories.

Results of the survey for each province and territory are available in Table 1, and have been summarized in Figure 1.

Table 1: Canadian Mineral Exploration Safety Statistics by Province and Territory 2008

Province	Category	NL	NS	NB	QC	ON	MB	SK	AB	BC	YT	NT	NU	N/A	Canada
Questionnaires returned from active companies		4	2	4	14	17	6	6	3	41	7	5	8	1	93
Person days of activity	Surface exploration	6,435	4,586	6,736	28,398	27,393	1,668	4,428	1,651	31,926	6,184	15,979	6,638	n/s	142,022
	Surface drilling	1,340	0	17,676	16,493	74,504	14,642	21,493	0	41,574	4,744	16,503	2,801	n/s	211,770
	Underground exploration	4,320	0	0	13,872	15,000	0	0	0	5,838	0	1,000	0	n/s	40,030
	Not specified													7,903	7,903
	Total	12,095	4,586	24,412	58,763	116,897	16,310	25,921	1,651	79,338	10,928	33,482	9,439	7,903	401,725
Equivalent no. of exposure hours	Surface exploration	64,350	45,860	67,360	283,980	261,930	16,680	44,280	16,510	319,792	61,840	159,790	66,380	n/s	1,408,752
	Surface drilling	13,400	0	176,760	164,930	739,040	146,420	214,930	0	415,740	47,440	165,030	28,010	n/s	2,111,700
	Underground exploration	43,200	0	0	138,720	120,000	0	0	0	58,380	0	10,000	0	n/s	370,300
	Not specified													79,026	79,026
	Total	120,950	45,860	244,120	587,630	1,120,970	163,100	259,210	16,510	793,912	109,280	334,820	94,390	79,026	3,969,778
Number of Fatalities	Surface exploration	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Surface drilling	0	-	0	0	0	0	0	-	0	0	0	0	0	0
	Underground exploration	0	-	-	0	0	-	-	-	0	-	0	-	0	0
	Total	0	0	-	0	0	0	0	0	0	0	0	0	0	0
Number of Lost Workday Incidents	Surface exploration	4	0	0	1	1	0	1	0	9	4	2	1	0	23
	Surface drilling	0	-	1	1	2	0	3	-	9	4	1	0	0	21
	Underground exploration	0	-	-	0	0	-	-	-	1	-	0	-	0	1
	Total	4	0	1	2	3	0	4	0	19	8	3	1	0	45
Number of Lost Workdays	Surface exploration	10	0	0	70	4	0	2	0	32	95	26	16	0	255
	Surface drilling	0	-	10	4	97	0	9	-	62	23	63	0	0	268
	Underground exploration	0	-	-	0	0	-	-	-	1	-	0	-	0	1
	Total	10	0	10	74	101	0	11	0	95	118	89	16	0	524
Frequency of Lost Workday Incidents	Surface exploration	12.4	0.0	0.0	0.7	0.8	0.0	4.5	0.0	5.6	12.9	2.5	3.0	n/s	3.3
	Surface drilling	0.0	-	1.1	1.2	0.5	0.0	2.8	-	4.3	16.9	1.2	0.0	0.0	2.0
	Underground exploration	0.0	-	-	0.0	0.0	-	-	-	3.4	-	0.0	-	-	0.5
	Total	6.6	0.0	0.8	0.7	0.5	0.0	3.1	0.0	4.8	14.6	1.8	2.1	0.0	2.3
Severity of Injury Rate	Surface exploration	31.1	0.0	0.0	49.3	3.1	0.0	9.0	0.0	20.0	307.2	32.5	48.2	n/s	36.2
	Surface drilling	0.0	-	11.3	4.9	26.3	0.0	8.4	-	29.8	97.0	76.3	0.0	0.0	25.4
	Underground exploration	0.0	-	-	0.0	0.0	-	-	-	3.4	-	0.0	-	-	0.5
	Total	16.5	0.0	8.2	25.2	18.0	0.0	8.5	0.0	23.9	216.0	53.2	33.9	0.0	26.4

Definitions and notes for Table 1:

-**Frequency of lost workday incidents:** Number of lost workday incidents per 200,000 exposure hours.

-**Severity of injury rate:** Number of lost workdays per 200,000 exposure hours.

-Number of hours per day worked is 10 unless otherwise reported by participants.

-Abbreviations: NL – Newfoundland & Labrador; NS – Nova Scotia; NB – New Brunswick; QC – Quebec; ON – Ontario; MB – Manitoba; SK – Saskatchewan; AB – Alberta; BC – British Columbia; YT – Yukon; NT – Northwest Territories; NU – Nunavut; N/A – not available; national data not separated according to province worked.

-Number of questionnaires per province/territory does not add up to Canadian total as many companies worked in multiple jurisdictions.

Figure 2: Canadian Mineral Exploration Expenditures and Exposure Hours Reported to AME BC and PDAC

Figure 2a: 2008 Canadian Mineral Exploration Expenditures by Province and Territory

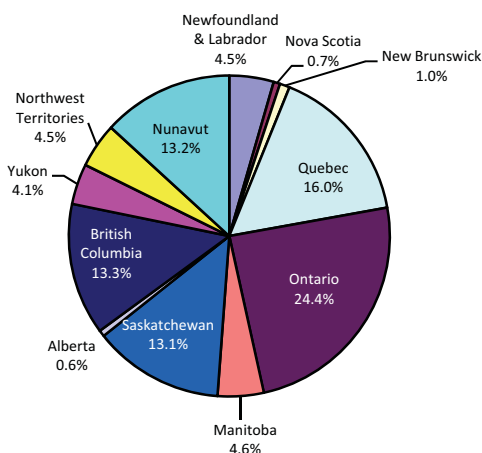
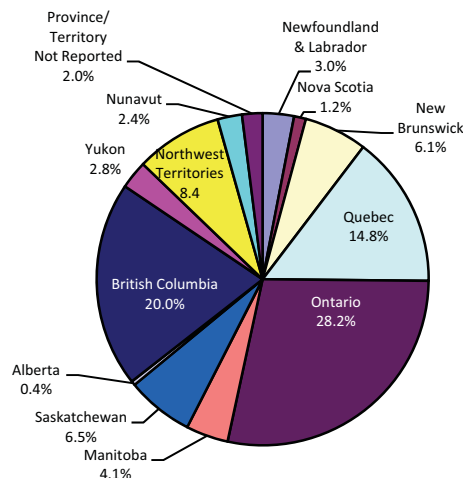


Figure 2b: 2008 Exposure Hours Reported to AME BC/PDAC



There has been a gradual increase in the proportion of companies with a health and safety program over the past five years. Currently 78% of respondents declare that they have a health and safety program up from 73% in 2007, 63% in 2006, 49% in 2005, and 43% in 2004³. Furthermore, 85% of respondents reported discussing safety issues at staff meetings (compared to 90% in 2007). These two questions were answered by 236 companies in 2008, and reflect a higher proportion of companies active in mineral exploration in Canada than in previous years. Out of 100 companies, 85% reported discussing recent near misses at staff meetings (compared to 87% in 2007).⁴

The ultimate objective is a sincere “Yes” in 100% of replies to all three of these questions.

Cause of incidents

The causes of lost workday incidents are illustrated in Figure 3; the causes of all incidents are illustrated in Figure 4.

Slips and falls are consistently the single leading cause of incidents. Mineral exploration activity presents a number of slippery surfaces (e.g. ice, wet drill decks, boulders) and opportunities for falls (e.g. uneven terrain including steep slopes as muskeg). The use of tools and equipment through various causes (drilling machinery, tool use, improper operation, and camp equipment) combined, however, accounted for 72 incidents – nearly half of all incidents. Personnel should always use the required equipment properly – many cuts and other injuries are caused by using improper equipment or by not using caution when handling sharp objects or machinery.

³ 2004 AME BC survey of companies active in British Columbia and Yukon.

⁴ The number of respondents reporting “yes” to these questions were 186 out of 237 companies, 85 out of 101 companies, and 201 out of 237 companies respectively.

Figure 3: Cause of Lost Workday Incidents

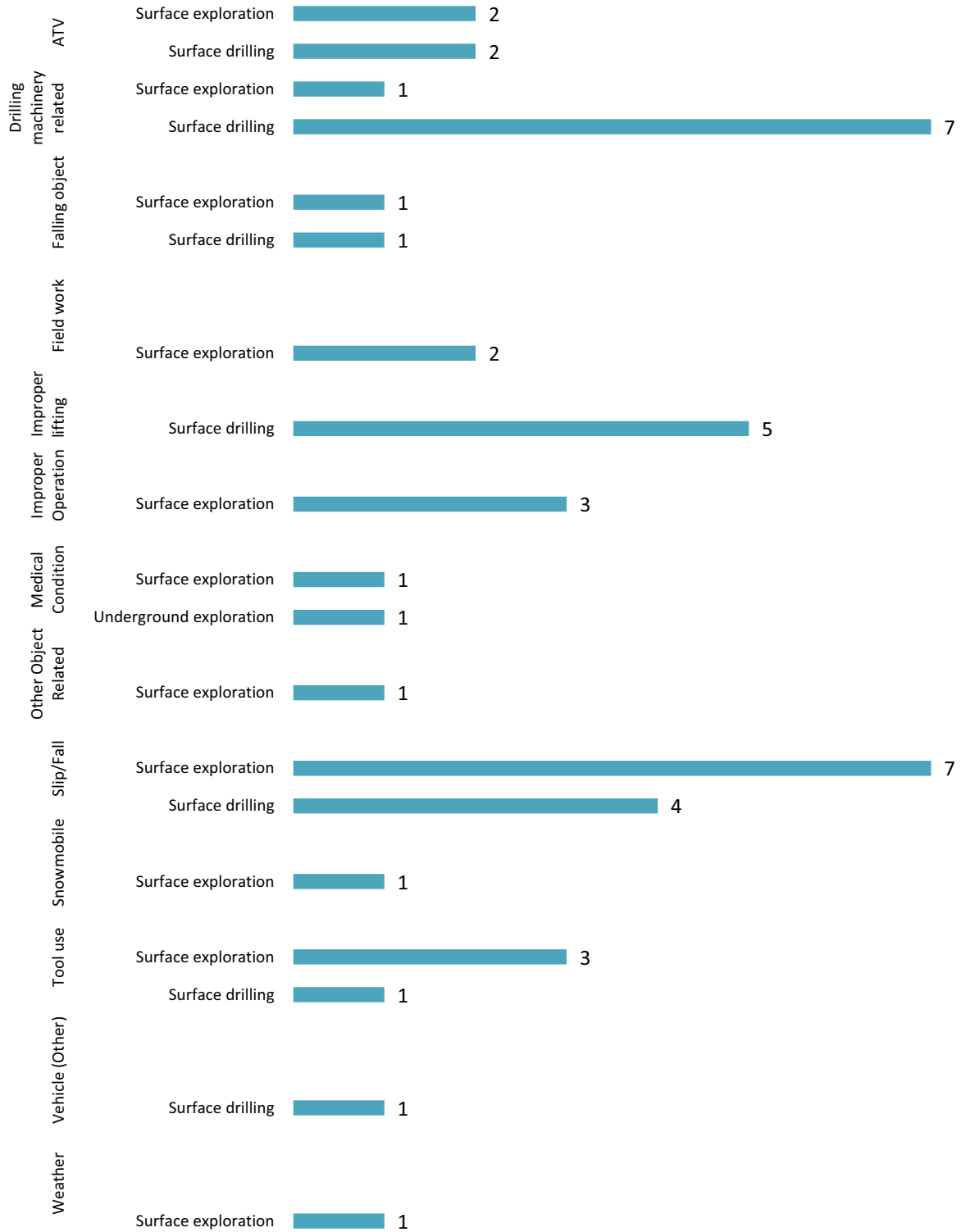
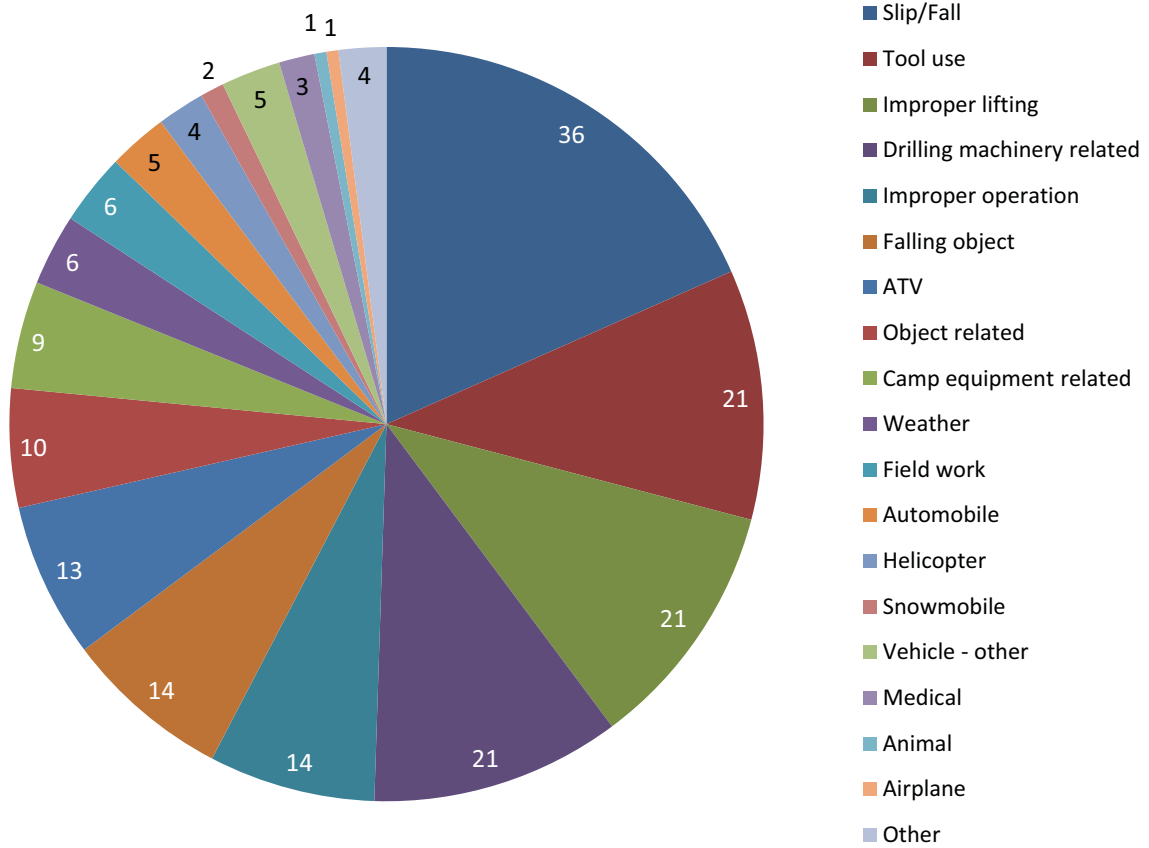


Figure 4: Cause of Incidents



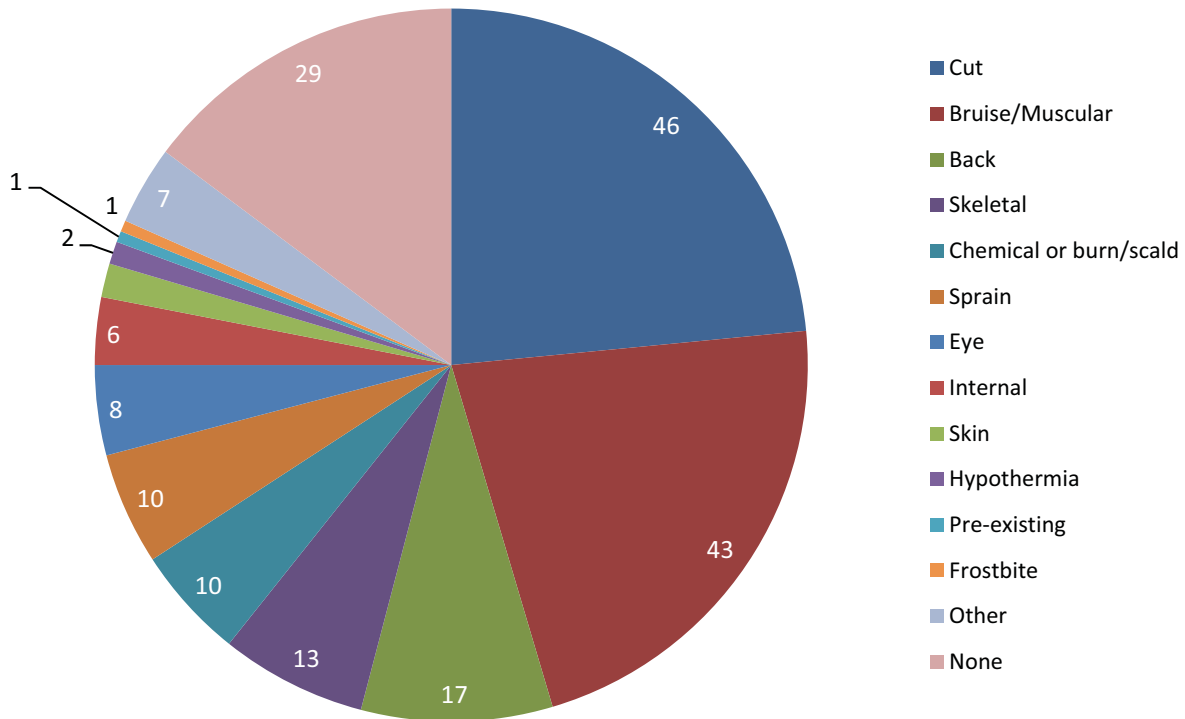
Nature of incidents

The nature of lost workday incidents is illustrated in Figure 5; the nature of all incidents is illustrated in Figure 6.

Figure 5: Nature of Lost Workday Incidents



Figure 6: Nature of Injuries



Cuts were the leading type of injuries in 2008, and are almost always related to several of the leading causes of injuries: slips and falls, and misuse of tools and equipment. Bruises and muscular injuries were the second highest cause, and tend to result from the same causes.

Details of lost workday incidents for surface exploration and geological work are tabulated in Table 2, and details for lost workday incidents for diamond drilling and underground work are tabulated in Table 3. These tables clearly indicate the range of situations in which incidents arise, and provide anecdotal evidence of the importance of personal protective equipment, health and safety training, and due diligence.

**Table 2: Lost Workday Incidents
in Surface Exploration and Geological Work
2008 Summary Report**

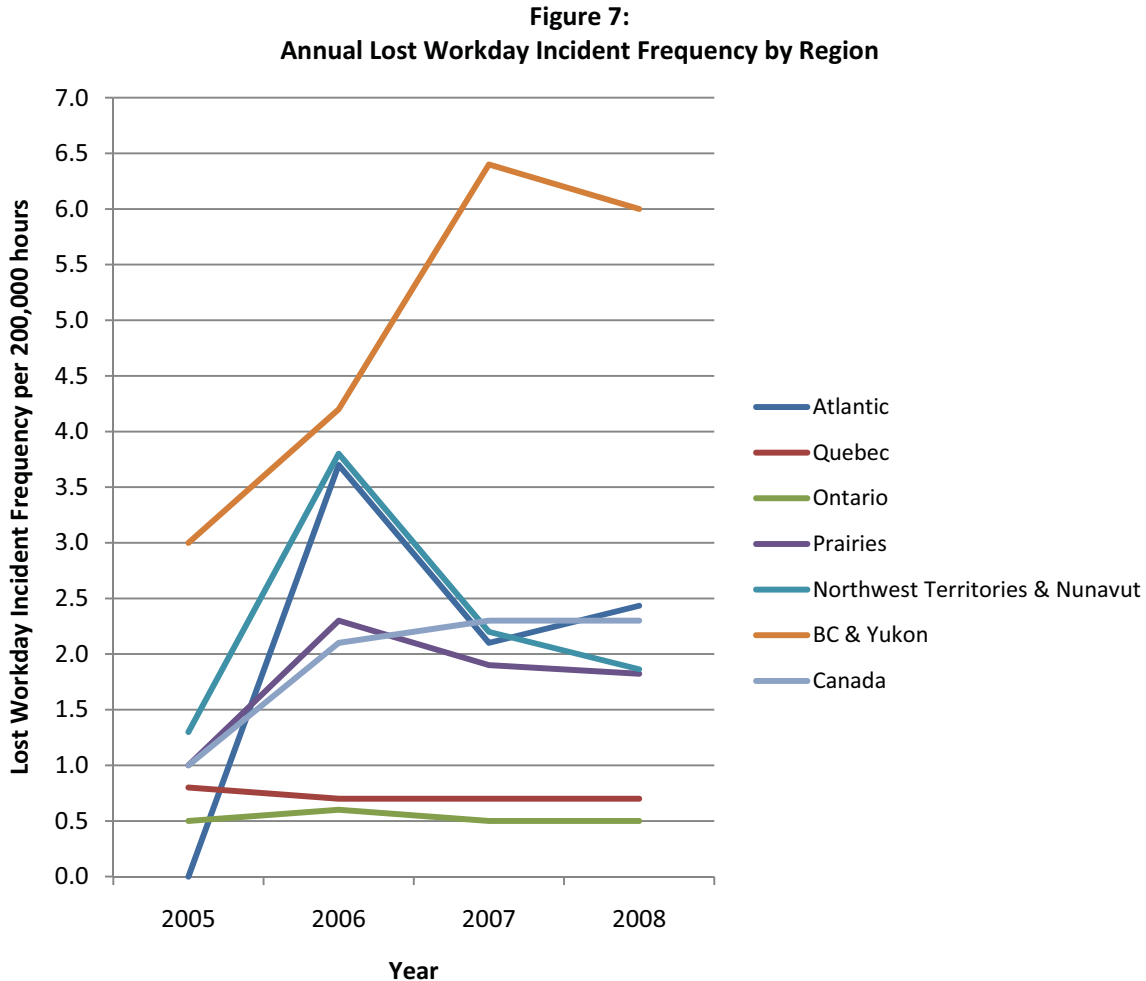
SURFACE EXPLORATION								
Date	Prov /Terr	Occupation	Type	No. of Lost Work-days	Nature of Injury	Cause of Incident	Description	Action Taken/Notes
Aug	YT	Other	MA	90	Back	ATV	Fell off ATV and cracked a vertebra. In cast for 3 months.	Medevac to Whitehorse hospital.
Jun	QC	Cook	MA	70	Internal	Medical Condition	Stomach ulcer	Moved by helicopter to Schefferville and then Sept-Îles hospitals.
Mar	NT	Other	MA	21	Chemical or Burn/Scald	Slip/Fall	Alcohol related. Fell on diesel stove while drunk and received severe burns.	Due to alcohol abuse not hired back
Aug	NU	Heavy Duty Mechanic	MA	16	Eye	Improper Operation	Rubbed eye. Grease and metal sliver entered eye.	Employee to review PPE and cleanup procedure.
Aug	BC	Field Assistant	MA	14	Skeletal	Slip/Fall	Broken small finger on left hand due to a backwards fall down a steep slope while carrying a heavy pack of rock samples. The finger was broken when he used his hand to break the fall.	After returning to camp and having hand examined and put in sling, worker was evacuated to hospital for treatment. After further medical exams it was required for the finger to be pinned. Worker was released from his duties and put on worker compensation through WorkSafeBC.
Nov	BC	Other	MA	5	Cut	Slip/Fall	Slipped on ice and fell against concrete barricade	Area was sanded
Jun	NT	Other	FA	5	Cut	Tool Use	Cut on thumb from carpentry work	Sent out to hospital for stitches
Aug	ON	Other	MA	4	Cut	Improper Operation	Labourer cut leg using chain saw without proper protective equipment	First Aid and Evacuation
Jul	BC	Line Cutter	FA	3	Other	Field Work	Dehydration, fainting, dizzy	Sent to nursing station.
Jul	BC	Field Assistant	MA	3	Bruise/ Muscular	Slip/Fall	Fell down slope and impacted side of torso resulting in sore ribs, pain when breathing and restricted movement. This was caused by slippery conditions in the field.	Field assistant was assisted by co-workers to an area where the helicopter could do a toe in. The helicopter transported her to camp, where she was examined by the Level 3 (advanced) first aid attendant. It was decided X-rays were required, and she was evacuated first to the nearest health centre and then to the nearest hospital for X-rays.
Jul	NL	Field Assistant	MA	3	Cut	Tool Use	Axe cut	First Aid medevac by helicopter. Worker received stitches.
Jul	NL	Field Assistant	MA	3	Cut	Tool Use	The field assistant was a new worker who had received job training. The cut happened at 2 p.m.	Flown to nearest hospital for stitches and rest.
Aug	BC	Millwright	MA	3	Cut	Tool Use	Tool caught in equipment	Sent to hospital
Aug	NL	Field Assistant	MA	2	Internal	ATV	Victim thrown from ATV after hitting a boulder on a woods road. Victim was wearing a helmet.	Victim taken to hospital for check up at hospital in case of concussion as she felt a bit drowsy. No concussion diagnosed but two days were taken to fully recover.
Nov	YT	Field Assistant	MA	2	Bruise/Mu scular	Drilling Machinery Related	Squished finger on drill trailer hitch. Bruise and scrape.	Worker was sent for an X-ray; there were no broken bones. Worker was ready to return to work next day, but project nearing end.
Sep	YT	Field Assistant	MA	2	Bruise/Mu scular	Falling Object	Hit in hand by falling object. Suspected a break, but just a bruise.	Flown to hospital for x-ray, returned to camp next day.
Mar	SK	Geophysicist	MA	2	Eye	Snowmobile	Twig scratched cornea of snowmobile operator, who was not wearing PPE.	Wear PPE
Jul	NL	Field Assistant	MA	2	Other	Weather	Dehydration and electrolyte imbalance	Admitted to hospital; tests done; fluids containing electrolytes (e.g. Gatorade) added to field supplies.
Jul	BC	Line Cutter	FA	1	Internal	Field Work	Severe pain in stomach	Rest
Jun	BC	Cook	FA	1	Chemical or Burn/Scald	Improper Operation	Cook was drunk while cooking bacon.	First aid applied
Aug	BC	Field Assistant	FA	1	Cut	Slip/Fall	Two-inch cut on right hand caused by slipping and landing on a rock while working in the field.	Bandaged
May	YT	Geologist	MA	1	Cut	Slip/Fall	Fell on sharp stick - puncture wound to thigh.	Medevac.
Jul	BC	Field Assistant	MA	1	Skeletal	Slip/Fall	Slipped on frosty boulder, fell, broke rib.	Medevac.
TOTAL LOST WORKDAYS				255				

**Table 3: Lost Workday Incidents in Surface Drilling and Underground Exploration
2008 Summary Report**

SURFACE DRILLING								
Date	Prov/ Terr	Occupation	Type	No. of Lost Work days	Nature of Injury	Cause of Incident	Description	Action Taken
Mar	ON	Driller	MA	90	Cut	Drilling Machinery Related	Driller was holding chain around hand when sudden tension ensued. Improperly holding chain.	Immediately sent to hospital for surgery
Apr	NT	Driller Helper	MA	63	Other	Slip/Fall	Experienced helper dislocated ankle when stepping out of drill shack. Helper twisted ankle.	
May	BC	Driller Helper	MA	30	Back	Improper Lifting	While moving a water hose helper injured his lower and upper back.	
Aug	BC	Driller Helper	MA	21	Skeletal	Falling Object	While helper was removing sling strap from drill, rods fell off the rod rack. Worker jumped out of the way and hit his knee on a rock	
Oct	YT	Driller Helper	MA	14	Skeletal	Vehicle (Other)	Parked vehicle to service the water pump, did not apply parking brake. Vehicle started rolling and ran over helper and pump.	Broken nose, gashes on face. Sent to hospital for stitches.
Feb	NB	Driller	MA	10	Sprain	Improper Lifting	While moving drill rods, felt pain in back.	Increased awareness and procedures on lifting.
Oct	YT	Driller	MA	7	Back	Improper Lifting	Pulled back while breaking the rods apart.	Took ibuprofen, rest. Monitored for 2 days then sent out for rest.
Jan	ON	Driller Helper	MA	7	Bruise/ Muscular	Slip/Fall	From the inside box of the pickup the worker stepped on the side of the truck and slipped on some ice. He fell onto the box rail and struck his arm.	
Jul	BC	Driller	MA	5	Skeletal	Slip/Fall	Slipped and fell onto a pile of rock while on steep terrane causing a fracture or dislocation	Cautioned other crew, helicopter evacuation
Aug	SK	Driller Helper	MA	5	Cut	Tool Use	While swinging a sledge hammer lost balance and fell backward into wall rack, and impaled left arm on a peg.	
Jul	QC	Driller Helper	NM	4	Cut	Drilling Machinery Related	Struck by a blow pipe	Outreach, work, method
Mar	SK	Driller	MA	2	Bruise/ Muscular	Drilling Machinery Related	Swivel seized and dislodged pump. The pump fell and bruised driller.	Maintenance, startup check
Mar	SK	Driller	MA	2	Back	Improper Lifting	Repetitive lifting strain from lifting drill rods.	Report injuries earlier
May	YT	Driller Helper	MA	1	Back	Improper Lifting	Lifting drill rods.	Medevac, rest.
Sep	YT	Driller Helper	MA	1	Bruise / Muscular	Drilling Machinery Related	Hit by overshot - couldn't see it because of sun in his eyes.	Medevac.
Aug	BC	Driller Helper	MA	1	Back	Slip/Fall	Tripped over drill rod while emptying tube. Fell and landed on back.	Medevac. Safety meeting discussion.
Jul	BC	Driller	MA	1	Skeletal	ATV	Driller took hand off handlebars, lost control, flipped quad, dislocated shoulder.	Medevac. Safety meeting discussion.
Oct	BC	Driller	MA	1	Internal	ATV	Driller slipped while mounting quad, engaged throttle, quad rolled on him crushing abdomen.	Medevac. Safety meeting discussion.
Jul	BC	Driller Helper	MA	1	Cut	Drilling Machinery Related	Driller dropped chuck, pinching helpers fingers between chuck and pipe wrench.	Medevac.
Aug	BC	Driller Helper	MA	1	Bruise / Muscular	Drilling Machinery Related	Slipped off pipe wrench and fell on pop-valve of pump. Fractured ribs.	Medevac.
Sep	BC	Driller Helper	MA	1	Other	Drilling Machinery Related	Helper pinched finger between core barrel and drill shack floor.	Medevac. Discussion at safety meeting.
TOTAL LOST WORKDAYS				268				
UNDERGROUND EXPLORATION								
Date	Prov/ Terr	Occupation	Type	No. of Lost Work days	Nature of Injury	Cause	Description	Action Taken
Jun	BC	Miner	FA	1	Internal	Medical Condition	Stress cause heart palpitations. Worker thought it was a heart attack.	Worker flown to hospital.
TOTAL LOST WORKDAYS				1				

Trends

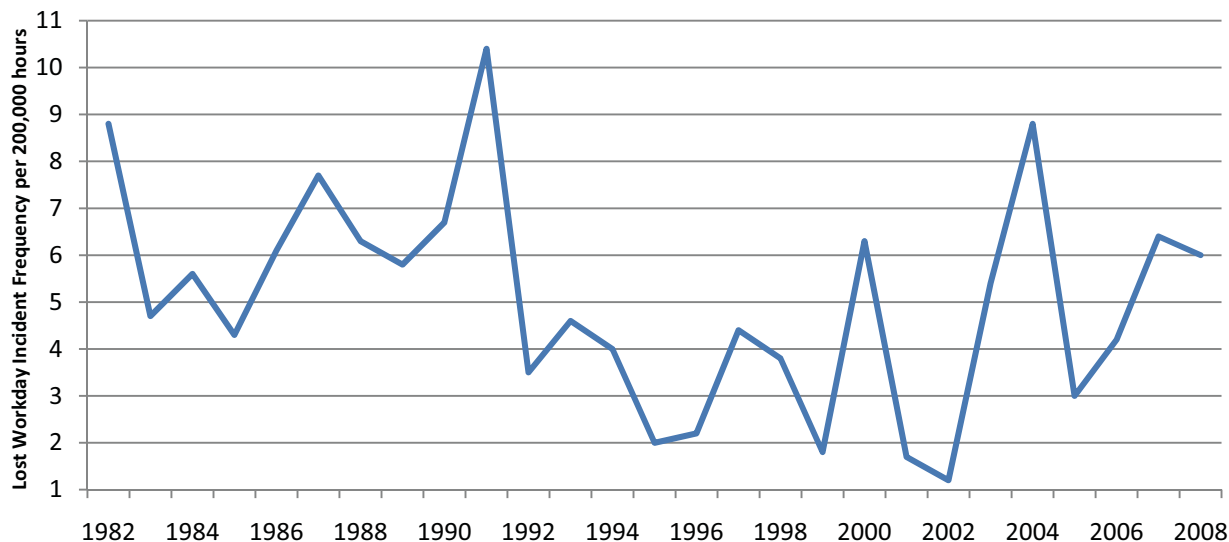
Figure 7 shows trends over the last four years in lost workday incident frequency. Ontario and Quebec have consistently had incident rates of less than one lost workday incident per 200,000 hours. The Prairies and Far North saw their rate continue to decline in 2008. The injury rate in the Atlantic Provinces edged up in 2008. The highest rates consistently belong to the Cordilleran region of British Columbia and Yukon although the rate declined slightly in 2008.



It appears that there are four main factors that can be attributed to the differences between geographic regions. Incident rates are:

- 1) Higher in rugged, remote areas
- 2) Higher when helicopter evacuation is required for medical access
- 3) Lower in areas of brownfield exploration
- 4) Lower as variables are removed (e.g. weather, easily accessible infrastructure)

Figure 8 shows trends in lost workday incident frequency in British Columbia and Yukon since the British Columbia & Yukon Chamber of Mines (now AME BC) began its *Annual Report: Safety in Mineral Exploration in Western Canada*. Generally, incident rates have been higher in times of high activity in the mineral exploration sector, although there is a very subtle downward trend overall. The incident rate peaked at 10.4 in 1991 and hit a low of 1.2 in 2002.

Figure 8: Annual Lost Workday Incident Frequency in BC & Yukon 1982-2008

The overall injury frequency nationwide of 2.3 in 2007 and 2008 is virtually identical to the injury rate for all industries. In June 2009, the Association of Workers' Compensation Boards of Canada reported that the injury rate across all industries, based on 84% of the workforce, was 2.26 in 2007⁵. (This rate is based on 100 person years, which is equivalent to 200,000 hours, the measure used in the mineral exploration survey.) In easily accessible areas, the injury rate for mineral explorers tends to be lower than the rate for industry at large (i.e. Alberta, Manitoba, Nova Scotia, Ontario, Quebec, and Saskatchewan). In areas where helicopter access is common, the rate tends to be higher (i.e. British Columbia, Newfoundland & Labrador, Yukon). An exception is the Northwest Territories and Nunavut, where the injury rate is lower than that of industry-at-large despite remote exploration locations.

Conclusions and Recommendations

- Transportation related incidents continue to be the primary source of fatalities and major injuries in the mineral exploration sector.
 - All forms of transportation – automobiles, trucks, ATVs, other vehicles, and boats – must be used with extreme caution. Employees and contractors must be trained in their use. ATVs must always be used at low speeds. (see *General Safety Guidelines* for more comprehensive guidelines).
 - Helicopter pilots and mineral exploration personnel must work together to ensure that rigorous briefings on helicopter safety procedures take place before commencement of operations and regular refreshers or safety meetings are arranged. When working around helicopters, unceasing vigilance is required by helicopter crew and exploration personnel. Slings operations, although vital to mineral exploration, are particularly hazardous.
 - Companies must ask to see the safety and maintenance records of any helicopter company they are considering for contract work and include this information as an important consideration in the choice of contractor.

⁵ Association of Workers' Compensation Boards of Canada. 2007 Key Statistical Measures.
<http://www.awcbc.org/common/assets/ksms/2007ksms.pdf>

- Employers are legally responsible to ensure that all employees and contractors:
 - have safety programs in place;
 - provide personal protective and safety equipment;
 - adequately train and supervise personnel; *and*
 - ensure employees and contractors follow safe work guidelines.

Employers are criminally liable under the *Criminal Code of Canada* for criminal acts or negligence in the workplace. For further information, visit the Bill C-45 page of the Canadian Centre for Occupational Health and Safety website at www.ccohs.ca/oshanswers/legisl/billc45.html.

- Standardized drilling training such as the Ontario Common Core Training surface drilling training can improve the safety of drilling programs. For more information visit the Canadian Diamond Drilling Association website at www.canadiandrilling.com/training.html.
- Incidents without lost workdays provide opportunities for companies to develop and improve their health and safety programs.

Fatalities in 2008

Eight persons died in the course of mineral exploration activities in Canada in 2008, compared to six in 2007 (in addition to a fatality at a camp after the exploration season), eight in 2006, and three in 2005. None of these fatalities were reported in the survey, but were otherwise reported to AME BC or PDAC, covered by the media, and/or reported through news releases.

Six of the eight fatalities were in British Columbia, one was in Yukon, and one was in the Northwest Territories. Helicopter crashes caused seven of the fatalities, and a logging incident during an exploration program claimed one life. Summaries of the fatalities follow.

Helicopter related fatalities

On May 24, 2008, the employee of a drilling company died when the helicopter he was riding in crashed near Norman Wells, Northwest Territories, outside of an exploration camp. The pilot and another passenger survived the crash.

On August 6, 2008, the pilot, a geological consultant, and two employees of a drilling company died when their Hughes MD500 plunged into the Kitsault River near Alice Arm, British Columbia. The pilot was 60 years old at the time of the incident.

On August 9, 2008, a helicopter pilot was killed when a Bell 206B helicopter heading into a mining camp near Carmacks, Yukon, crashed into the Yukon River. The pilot was 67 years old at the time of the incident.

On August 14, 2008, the pilot of a Bell 206L Longranger died in hospital from injuries sustained the previous day while attempting to land a drill on a long line near Terrace, British Columbia. The load settled into nearby trees, and the helicopter crashed over a hillside into a rock face. The pilot was 53 years old and had accumulated 15,000 hours of flying time by the time of the incident.

Logging fatality

On July 21, 2008, it was announced that a logging contractor was killed while clearing lumber near Sparwood, British Columbia, at a mineral exploration project.

Fatalities 1980-2009: An Overview

AME BC and PDAC have compiled information on fatal incidents in mineral exploration by seeking information from practitioners in the area (see Tables 4 and 5). The data is not complete, and input is sought from members of the industry to update the database. A limited number of cases of fatalities during exploration in other countries is also tabulated.

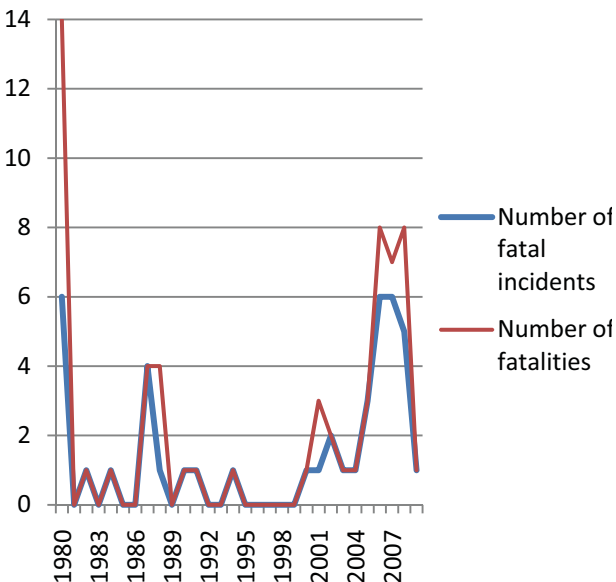
The analysis given below on exploration fatalities in Canada should be taken in the context that the database is not complete; however, the basic trends are still instructive.

The objective of a fatality listing in mineral exploration activities is to highlight the principal events that can result in fatalities. The industry itself can then develop protocols and methodologies to prevent reoccurrence of these events. The reader should note that the data includes various categories of workers who may have been employed by contractors, rather than directly by an exploration company. Thus, pilots of aircraft and employees of drilling companies are included. Aircraft accidents are only included if directly connected with exploration. People are listed as *Geologist* (where the profession is known), *Field* (all employees in field, but not geologist, pilot or driller), *Pilot*, or *Driller* (all drill company employees).

Fatalities in Mineral Exploration in Canada (1980-2009)

Figure 9 illustrates the trend in fatalities in mineral exploration in Canada over time from 1980 to the present. The data prior to 1980 is clearly incomplete and would be misleading. Fatalities to date in 2009 suggest the lowest number of fatalities since 2004. This reduction in fatalities is probably due in part to reduced exploration activities because of the global economic downturn, but we hope also attributable to increased vigilance by mineral exploration companies and helicopter companies in the wake of eight fatalities over less than three months in 2008.

Figure 9: Fatalities in Mineral Exploration in Canada 1980-2009



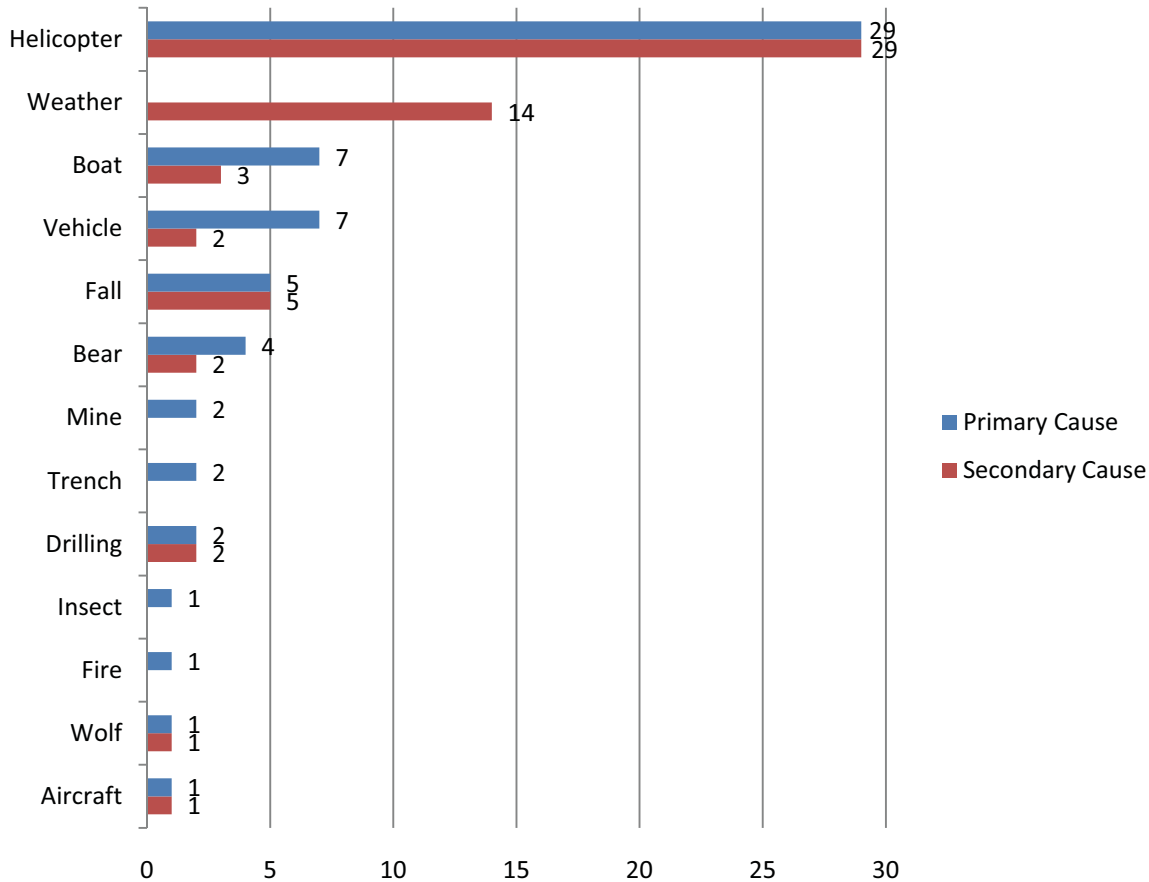
The graph shows the following points:

- There have been 62 fatalities involved in mineral exploration in Canada since 1980. Note that these include fatalities for ancillary activities such as helicopter services, geophysical surveys, and logging.
- There is no clear indication of a trend over time. Years with high exploration activity, however, tend to have higher numbers of fatalities.
- The average number fatal incidents in a year is 1.4 and the average number of fatalities is just over 2.
- Only 11 of the past 30 years (about than one in three) had zero fatalities.
- For the past ten years, there have been no years with zero fatalities.
- The year 2008 tied with 2006 in having the second highest number of fatalities in 30 years.

Despite increased safety awareness over the past 30 years, the data suggests that industry has not managed to make exploration significantly safer in relation to fatalities. This fact is clearly a challenge for all concerned to take action.

The fatalities have been classified by primary and secondary cause as outlined in Figure 10.

Figure 10: Fatalities in Mineral Exploration in Canada by Primary and Secondary Cause



The main cause of each fatality is listed as the primary cause. A different secondary cause is listed in cases where the secondary cause contributed significantly to the fatality. In cases where few details are available, or where there was not secondary aggravating cause, then the secondary cause is listed as the same as the primary. Thus, for a helicopter accident where no details are available then the secondary cause is listed as *Helicopter*. However, for a helicopter accident where the people involved survived the crash, but died due to exposure in poor weather, *Weather* is listed as the secondary cause. Where a vehicle accident related to icy roads, then the secondary cause is listed as *Weather*.

The data shows that helicopters are the prime cause of fatalities in exploration. This is exacerbated by the fact that helicopter accidents often cause multiple fatalities. It is interesting that fixed wing accidents, here noted as *Aircraft*, have only caused one exploration fatality in the period.

For the second highest primary category, boats, it should be observed that all the fatalities occurred in the 1980s, and this likely relates to the fact that boats have since been used less in exploration.

Although weather is not prime cause of any of the fatalities, weather is the most important factor in the secondary category. This indicates that preexisting issues – such as helicopter or vehicle problems – have been aggravated by weather. In Canada this usually relates to winter but also relates to sudden changes in the weather, such as wind that was a contributing factor to four boating fatalities in 1988.

It is suggested that exploration field crews need to be cognizant of these underlying factors and that any exploration safety manuals, training, and protocols take into account these statistics.

If you have any information to add to this database, please contact AME BC or PDAC.

Table 4: Fatalities in Mineral Exploration in Canada 1980-2009

Company	Year	Prov/ Terr	Cause	Category 1	Category 2	No. of Deaths	Personnel
Government	1980	NS	Trench collapse/rainstorm	Trench	Weather	2	Geologist/Field
Major	1980	MB	Geologist drowning trying to swim to shore	Boat	Boat	1	Geologist/Field
Other	1980	ON	Prospector died from carbon monoxide in mine shaft	Mine	Gas	1	Geologist/Field
Other	1980	BC	Walked into tail rotor of helicopter	Helicopter	Helicopter	1	Geologist/Field
Other	1980	BC	Helicopter accidents (2)	Helicopter	Helicopter	9	Pilot/Geologist/Field
Other	1982	BC	Canoe related drownings	Boat	Boat	1	
Major	1984	ON	Truck rolled on ice road	Vehicle	Weather	1	Driller
Major	1987	BC	Bear mauling	Bear	Bear	1	Driller
Other	1987	BC	Fell from box of pick-up truck	Vehicle	Fall	1	Geologist/Field
Other	1987	BC	fall from cliff	Fall	Fall	1	Geologist/Field
Other	1987	BC	fall into crevasse while glissading	Fall	Fall	1	Geologist/Field
Other	1988	BC	Canoe related drownings	Boat	Weather	4	Geologist/Field
Other	1990	BC	ATV turnover	Vehicle	ATV	1	Geologist/Field
Other	1991	BC	Wasp sting, allergic reaction	Insect	Wasp	1	Geologist/Field
Major	1994	ON	Vehicle on ice	Vehicle	Weather	1	Geologist/Field
Major	2000	NT	Tower dropped while slinging	Drilling	Helicopter	1	Driller
Major	2001	NT	Helicopter crash - cause uncertain	Helicopter	Helicopter	3	Pilot/Geologist/Field
Major	2002	ON	Geophysicist killed in fall on cliff/wet weather	Fall	Weather	1	Geologist/Field
Other	2002	BC	Bear mauling/oil drilling site	Bear	Drilling	1	Driller
Other	2003	ON	Small plane crash	Aircraft	Aircraft	1	Geologist/Field
Other	2004	BC	Rock fall at exploration project	Mine	Fall	1	Miner
Major	2005	QC	Driller: bulldozer through ice	Drilling	Weather	1	Driller
Other	2005	BC	Bear mauling	Bear	Vehicle	1	Field
Other	2005	SK	Wolf mauling	Wolf	Wolf	1	Field
Government	2006	YT	Geologist struck by rotor of helicopter during toe-in pickup	Helicopter	Helicopter	1	Geologist
Other	2006	YT	Bear mauling	Bear	Bear	1	Field
Other	2006	BC	Helicopter crash - broken transmission mount	Helicopter	Helicopter	3	Pilot/Driller/Helper
Other	2006	QC	Boat related drowning	Boat	Boat	1	Field
Other	2006	SK	Helicopter crash into lake	Helicopter	Helicopter	1	Field
Other	2006	SK	Helicopter crash during	Helicopter	Helicopter	1	Pilot

			slinging operation				
Other	2007	SK	Helicopter crash into lake	Helicopter	Helicopter	2	Pilot/Geologist/Field
Junior	2007	NL	Helicopter crash during slinging operation	Helicopter	Helicopter	1	Pilot
Other	2007	NU	Drowning	?	Weather	1	Driller
Junior	2007	NT	Worker drowned when truck fell through ice	Vehicle	Weather	1	Field
Junior	2007	BC	Helper died in tent fire at end of season	Fire	Weather	1	Driller
Other	2007	ON	Road builder fell through ice when plowing ice to build winter road	Vehicle	Weather	1	Roadbuilder
Other	2008	BC	Helicopter plunged into river	Helicopter	Helicopter	4	Pilot/Geologist/Field/Driller
Major	2008	BC	Logger killed on exploration project	Fall	Fall	1	Logger
Other	2008	BC	Pilot killed in slinging incident	Helicopter	Drilling	1	Pilot
Other	2008	YT	Helicopter crashed in river	Helicopter	Helicopter	1	Pilot
Other	2008	NT	Helicopter crashed near lake	Helicopter	Helicopter	1	Driller
	2009	QC	Field technician died in crash	Vehicle	Vehicle	1	Field

Table 5: Fatalities Abroad in Mineral Exploration 1990-2009

Company	Year	Country	Cause	Category 1	Category 2	No. of Deaths	Personnel
Major	1990	Chile	Aircraft crash/hypothermia	Aircraft	Weather	4	Pilot/Geologist/Field
Major	1991	Chile	Boat capsized in squall	Boat	Boat	1	Geologist/Field
Other	1992	Australia	Driller was caught between mast and truck when moving drill mast	Drilling	Drilling	1	Driller
Major	1994	Chile	Vehicle accident/sleeping/alcohol	Vehicle	Alcohol	1	Geologist/Field
Other	1994	Ecuador	Helicopter crash - weather/pilot error	Helicopter	Weather	5	Pilot/Geologist/Field
Other	1995	Australia	Driller caught between rotating rods and mast	Drilling	Drilling	1	Driller
Major	1996	Philippines	Shot by guerrillas	Security	Security	1	Geologist
Major	1996	Turkey	Truck rolled	Vehicle	Vehicle	1	Driller
Other	1997	Australia	Helicopter crash, blade hit geologist standing by	Helicopter	Helicopter	1	Geologist/Field
Other	1997	Australia	Vomiting, unconscious due to heat exhaustion	Weather	Weather	1	Geologist/Field
Major	2000	Chile	Snowstorm	Weather	Weather	2	Driller
Major	2000	Argentina	Truck driven off the road	Vehicle	Vehicle	1	Driller
Major	2002	Chile	Murder of two geologists by thieves	Security	Security	2	Geologist
Major	2003	Chile	Vehicle accident/sleeping	Vehicle	Vehicle	1	Geologist
Other	2003	Mexico	Geologist swarmed by bees	Insects	Bees	1	Geologist
Junior	2004	Eritrea	Murdered	Security	Security	1	Geologist/Field
Midsized	2005	Chile	Aircraft crash/hypothermia	Aircraft	Weather	6	Pilot/Geologist/Field
Junior	2008	Chile	Helicopter crash	Helicopter	Helicopter	1	Field
Major	2008	Papua New Guinea	Mudslide onto exploration camp	Weather	Weather	10	Geologist/Field/Other

General Safety Guidelines for Mineral Exploration

Introduction

Safety is prevention of injury when exposed to danger. Most serious incidents are caused by failure to recognize a potentially dangerous situation and to take the necessary preventive measures. Promotion of safe working practices is the responsibility of all workers, management, and contractors in the mineral exploration industry. Employers and supervisors must provide information, instruction, supervision, and enforcement, when necessary, to protect employees' health and safety. It is also the responsibility of each and every employee to do their work in a safe manner and watch out for the safety of co-workers. It is in the best interests of all individuals to become as knowledgeable and self-reliant as possible regarding safety awareness.

Field supervisors, party chiefs, and crew chiefs should be thoroughly familiar with safe working procedures. Particular attention must be directed to workers entering the mineral exploration industry, specifically workers new to the labour force. It must neither be assumed that any hazard is obvious nor that any safety procedure is necessarily self-evident. Appropriate safety and first aid equipment and suitably trained personnel should be available at all worksites. Implementing onsite safety orientation followed by regular safety meetings and training in the safe use of equipment will lead to safe work practices.

Workplace and Workforce

There are few occupations which expose individuals to such a variety of hazards as mineral exploration. Several characteristics of Canadian mineral exploration are probably unique to the industry and affect safety considerations and monitoring. The workplace ranges from alpine to near desert and arctic to temperate environments. It is often located in remote areas, far from hospitals or other medical facilities. The unwary could succumb to any one of 20 or more potentially fatal hazards including falls in crevasses or on rough to precipitous ground, avalanches or falling rock, hypothermia, hyperthermia, asphyxiation, exposure, drowning, lightning strikes, tree falls, animal attacks, wasp stings, and a variety of transportation and travel-related causes including aircraft, vehicles, and boats. Mineral exploration is a global industry, and exploration outside Canada presents additional risks, some of which are covered in "Travel and Transportation" below.

The statistics include a large number of students and other temporary personnel with little previous wilderness experience who often work alone or in small isolated groups. However, recent fatalities include a number of experienced pilots, drillers, and geologists – demonstrating that experience can lead to an increased tolerance of risks associated with mineral exploration, particularly helicopter travel.

Incident Alerts

Travel and Transportation

Many potential hazards are more life-threatening than others, particularly those of a travel-related nature. This relationship, although not widely known, has been recognized by several explorationists and is very evident from questionnaire-related safety statistics. The majority of fatalities have resulted from travel and transportation related incidents, including traverses. Helicopters have resulted in 28 fatalities since 1980, and boat-related incidents have resulted in six fatalities, caused by hypothermia and drowning. Vehicle-related incidents (both automobile and ATV) are often life threatening and account for six fatal incidents.

Helicopter fatalities occur both in Canada and abroad. In 2008, one Canadian was killed in a helicopter crash during reconnaissance work on an exploration project in Chile. Additional risks occur in politically unstable countries; Colin Spence was shot and killed by ground fire while airborne in a helicopter in June 1996 during guerrilla activity in the Philippines.

All explorers have a responsibility not only for their own safety, but for that of their co-workers and those working under their supervision. In travel-related situations, would-be or actual passengers must be prepared to express their concerns in support of aborting any travel by air, land or water, whether planned or in progress, for safety reasons with the expectation that their concerns will be given unbiased consideration by management.

Four falls into crevasses in the last 40 years by exploration personnel not adequately equipped or trained in glacier travel have resulted in four fatalities. By contrast, a well-equipped and trained mountaineering expedition into the Mount McKinley area in Alaska experienced 70 falls into crevasses without loss of life.

Helicopters

Helicopters were involved in four fatal incidents in Canada that killed seven people in 2008. Since 1980, 30 people have been killed in such helicopter incidents throughout Canada including 16 over a three-year period from 2006 to 2008. Four incidents without lost time were reported in the 2008 survey, down from 16 in 2007, and equal to four in 2006.

For detailed safety guidelines, refer to the AME BC *Safety Guidelines for Western Canada*, and the Helicopter safety sticker and card. The guidelines and sticker are available online at www.amebc.ca/policy/health-and-safety/health-and-safety-resources.aspx; hard copies are available from the AME BC office.

A variety of publications including brochures, educational packages, posters, newsletters, and videos for helicopter and floatplane safety is available from Transport Canada at <http://www.tc.gc.ca/civilaviation/systemsafety/pubs/menu.htm>.

Toe-in Pick-up Guidelines

Shortly after a fatality during a toe-in pick-up in July 2006, AME BC issued the following guidelines for toe-in pick-ups:

- Toe-in pick-ups carry a higher degree of risk and should be avoided if at all practical. In the past, especially towards the end of the field season, field crews sometimes became less energetic and as a consequence progressively less consideration is given in looking for flat spots for conventional landings. More and more they expect the pilot to pluck them off almost any slope, regardless of risk. Crews should get in the habit of finding the best possible pick-up spot on flat ground with good approaches throughout the field season.
- The pick-up locations must be approved by the pilot – by radio if you have one. If you are not in radio contact with the pilot and if the helicopter does not land, it is because he or she does not like your choice of pick-up point. The pilot will go and find a good landing spot and you will have to walk.
- Toe-in pick-ups should only be done with experienced crews that have built up a solid working relationship with the pilot. If the pilot expects to do toe-in pick-ups he or she will have talked about it in advance at the safety briefing as well as prior to embarkation and disembarkation. If the pilot doesn't mention any preferences regarding toe-in disciplines then you should ask.
- If there are two or more people expecting to be picked up at a toe-in site, it is important that they are in a cluster in such a position that they can be in eye contact with the pilot. Remember - **“See the pilot see you.”** In most cases of toe-in pick-ups, the crew will be at right angles to the length of the machine and on the opposite side of the pilot. The pilot may prefer that all crew enter and exit on the opposite side from the pilot, to preserve weight balance.
- The crew will be crouched, hats removed, equipment stowed in pack and ready to move slowly and confidently one at a time into the machine with their packsacks when they get the nod from the pilot.
- Never walk upslope at a helicopter landing site – the reason is obvious. You should always be in a position to step up on the skid – never stepping down on the skid.

- A passenger who is present in the aircraft at a toe-in site can help those who are climbing aboard by arranging seat belts at readiness and lifting and stowing packsacks in the cabin.
- All movements around the helicopter should be done slowly and efficiently. Weight transfer onto a skid that is not grounded should not be sudden.
- Sometimes it may be necessary to move around to the other side of the machine to access a cargo door or get in at a door on the other side. This can be awkward and time consuming especially if the machine has an antenna at the front or the terrain is steep. Never duck under the tail boom – you will be well out of sight of the pilot and may get a hot exhaust blast if the machine is a 500D. Avoid going around to the other side of the helicopter if this is possible.
- **THE PILOT IS THE PERSON TO MAKE ALL DECISIONS WHEN IT COMES TO THE HELICOPTER AND ITS CAPABILITIES – NO EXCEPTIONS**

ATVs and Utility Vehicles

All-terrain vehicles continue to be a perennial cause of lost workday incidents. There were four in 2008, down from six in 2007. There was one in 2006, and four in 2005. These 17 incidents accounted for 314 lost workdays. The most severe incident in 2008 was when a worker fell off an ATV and cracked a vertebra; the worker was subsequently in a cast for three months. Another fall led to a two-lost-workday injury, and one driller lost a workday after the throttle started while the driller was starting the ATV. In another incident, a driller lost control after taking a hand off the handlebars and dislocated a shoulder when the ATV flipped. There were also nine incidents without lost workdays. The following guidelines have been adapted from AME BC's *Safety Guidelines*.

- **Use four-wheeled ATVs only.** Three-wheeled ATVs have not been available in Canada and the USA for many years, but are often available in developing countries. Three-wheeled ATVs should not be used under any circumstances, as they have been responsible for many serious incidents. Consider using utility vehicles such as mules, bobcats or argos, as these are more stable, and carry more people and cargo than ATVs.
- If ATVs are used in the field, we highly recommend taking a training program from Canada Safety Council certified instructors. For information and a free CD, see www.safety-council.org/training/ATV/atv.htm.
- Always make a pre-ride inspection before you start the engine.
- Do not ride fast on unfamiliar terrain or when visibility is limited. Never ride headlong past your limit of visibility. It is sometimes impossible to see obstructions, holes, and depressions. Always exercise caution.
- If carrying loads or towing a trailer, follow the manufacturer's rated vehicle capacity for loads and speeds.
- Most ATVs are designed to be ridden only by the operator. Their design does not permit carrying a passenger safely, as attested by the many injuries experienced by passengers.
- In particular, avoid the more obvious pitfalls, i.e. steep, rocky or irregular slopes, unsafe speeds, and exceeding your physical capability in righting an overturned ATV.
- Wear a government-certified crash helmet, scuff-resistant clothing, gloves, and goggles or face shields.
- Insure all ATVs. Check the insurance requirements in each province or territory - \$1,000,000 (minimum) in insurance is recommended.
- Ensure that all ATVs and personnel meet the current provincial or territorial legislation. British Columbia is the only jurisdiction in North America that does not license ATVs.
- No horse play or racing should be permitted – too many incidents have resulted.
- Loading and unloading ATVs from flatbed or pickup trucks can be hazardous. Make sure ramps provide good traction and are securely attached to the truck. ATVs may slide off when ramps are wet, muddy, or icy. Winch them on and off, if possible.
- Special hazards include the following:
 - Sprains or back injuries may occur when picking up a fallen ATV.
 - Burns may result from contact with exposed exhaust pipes.
 - Blind corners on narrow trails or roads may cause collisions with other vehicles or persons unless particular care is exercised – slow down!
 - Unless goggles are worn, overhanging branches may lead to serious eye injuries.

- When crossing small streams, the depth of water and the type and condition of the banks and stream bed should be checked as they can cause spills.
- Be aware of the possibility of fallen trees across your trail.
- Be aware that ATV country is usually bear country – be bear aware.
- The ATV is a valuable aid to the prospector or geologist, and its limitations should be respected.

Bears

On the first day of the field season in 2006, a worker in Yukon was mauled and killed by a grizzly bear as he passed within five metres of two bear cubs. Bears also killed mineral exploration workers in 1987 and 2005.

The principal preventive remedies and recommended procedures in the event of encounters with bears include the following:

- Avoid encounters by awareness of areas where bears are present in large numbers.
- Conceal food odours at camps and incinerate garbage.
- Make noise while traversing (use cans of rocks, air horns, etc.).
- Be alert for bear signs.
- Be prepared for an encounter by taking training courses and reading relevant literature.
- Carry bear bangers or a canister of the bear repellent Counter Assault or an equivalent bear spray in a readily accessible location. (See **CAUTIONARY NOTE** below.)
- Have a firearm available at camp and knowledge where to shoot to kill or disable a bear in the event of an emergency. Experience in the safe use of firearms is essential.
- If an attack is unavoidable, be prepared to follow the recommended procedure to survive mauling. This may involve fighting off an aggressive predatory bear with anything at hand.

The use of bear spray is recommended in the event of an attack by a bear. In both 1993 and 1994, two individuals credited the use of bear spray in saving their lives, one of them being seriously injured during the encounter. Employees must practice with bear spray at the beginning of each season and be conscious of wind direction and the optimum distance for spray use. Also recommended is Gary Shelton's *Bear Encounter Survival Guide*, available in bookstores. Mr. Shelton also advocates the use of a firearm, which federal and provincial government agencies actively discourage field employees from carrying.

Further procedures are included in AME BC's *Safety Guidelines*. Two highly recommended videos entitled "Staying Safe in Bear Country" and "Working in Bear Country" were produced by Magic Lantern and are available through www.yukonbooks.com. The government of Yukon bear safety website at <http://www.environmentyukon.gov.yk.ca/camping/bearsafety.php> and the University of Alberta Earth & Atmospheric Sciences bear safety website at <http://safety.eas.ualberta.ca/node/13> are also excellent sources of information.

CAUTIONARY NOTE: BEAR BANGERS MAY BE DEFECTIVE

Bear bangers, which are devices used to scare away bears, may explode prematurely during use, causing injury to the operator. These are small explosive cartridges which are screwed to the end of a pencil-sized launcher and activated by a trigger. Once activated, the bear banger is launched about 40 metres by a propellant, at which point the main explosive charge explodes with a loud noise.

Failed bear bangers have exploded within several feet of the launch tube, temporarily deafening the operator and presenting dangers of burns and shrapnel.

The bear banger is normally white coloured, sold in packages of six stored inside a clear plastic pouch, and has a shelf life of about two years. **All** of the devices that failed during use and testing had a **grey discolouration**, probably caused by the propellant leaking from within the cartridge. Any bear bangers showing evidence of

discolouration should be safely discarded and replaced with new devices in a sealed package. The devices that failed were only one and a half years old, so it is important to inspect and test-fire all bear bangers.

It is also important to check the compatibility of cartridge and firing mechanism. A rim-firing cartridge will not be fired by a centre firing mechanism or vice versa. Always test fire in a safe place before use.

Please note that bear bangers are considered dangerous goods, and are subject to Transport Canada regulations. See <http://www.tc.gc.ca/CivilAviation/commerce/DangerousGoods/news/notices/15.htm>.

Slips and Falls

Slips and falls have caused over 40% of lost workday incidents reported in the AME BC and AME BC/PDAC safety reports. Two fatalities have occurred over the years, one from a fall on precipitous terrain and the other from a fall into a crevasse. Two other fatalities were directly related to vehicles: one to a fall from the back of a pick-up truck and another from crushing by an overturned ATV. Other fatalities not generally attributed to falls, but directly related, include falls into cold or fast-moving water from boats, which resulted in death from hypothermia and/or drowning. In 2008, slips and falls continued to be the leading cause of lost workday incidents.

The principal preventive strategies are:

- Development and implementation of a safety-awareness attitude with a constant effort to recognize and avoid potentially hazardous conditions.
- Adequate footwear with an emphasis on traction and support for most exploration work and hard-toe cover, as required.
- Special precaution in winter conditions, particularly on drill sites.

West Nile Virus and Sun Protection

Exploration personnel commonly work in environments where sunscreen and insect repellents have to be applied to avoid exposure to sunburn, skin cancer, and West Nile virus. In this type of environment, experienced workers generally wear long pants, long sleeved shirts, and a hat with a big floppy brim. This means that exposure to the sun and mosquito bites is limited to the neck and face and the backs of hands: lotion application is thus minimized.

Recent research (2007) has demonstrated that it is not advisable to apply insect repellent (DEET products) and sunscreen at the same time as, the repellent penetrates the skin in far greater amounts and the sunscreen loses some of its protective ability. High absorption of DEET by the body can lead to toxic effects leading to dizziness, rashes and headaches. If both sunscreen and repellent must be applied, it is recommended that the sunscreen be applied first and the repellent 30 minutes later. Use a product with 35% DEET or less.

Eye Injuries

Eye injuries seldom receive the attention they deserve – they are not fatal, and are not generally reported by the media. However, they are very serious in nature and are easily preventable. One company active in the United States noted that eye injuries and flushes were the most common injury on their drilling team, attributable to improper use of personal protection equipment, mainly using glasses instead of goggles.

The year 2008 was the worst year for eye injuries in the history of the national survey. A heavy duty mechanic rubbed grease and a metal sliver into an eye, resulting in 16 lost workdays. A twig scratched the cornea of a snowmobile operator who was not wearing eye protection. Both these incidents could have been averted by wearing the proper equipment.

In May 2005, a geophysical assistant in Nunavut removed his sunglasses throughout the day, leading to impaired vision resulting in two lost workdays. Also in 2005, a driller helper got a small splinter in the eye by using an improper tool, also resulting in two lost workdays. In 2007, a geophysicist received an eye injury during field work. The cornea was scratched, leading to blurred vision and four lost workdays.

The following are guidelines from AME BC's *Safety Guidelines*. The guidelines can be summarized as, "Always wear the appropriate personal protective equipment."

- Wear safety glasses at all times while breaking or hammering rock, core splitting, blasting, using a chainsaw, or when visiting mining operations.
- Wear goggles or a face shield attached to a hard hat when hooking up helicopter sling loads.
- Wear safety glasses with wide shields or goggles when handling chemicals (e.g. battery acid) or corrosive materials (e.g. grout), boosting batteries, or using ultraviolet lamps for extended periods.
- Wear high quality polarizing sunglasses when working at high altitude, or on glaciers, snowfields, and water.

Wolves

In November 2005, a geological engineering student at the University of Waterloo was killed by wolves while walking near a remote exploration camp at Points North Landing near Wollaston Lake, Saskatchewan. A coroner's inquest in 2007 confirmed that this was the first documented case of a fatal wolf attack in North America.

Like other animals, wolves are attracted to garbage. It is recommended that camps incinerate garbage daily and remove the remains to a legal dump or bury them in a suitable pit that, when full, is at least one metre deep, and is allowed in the land use permit. The British Columbia Ministry of Environment recommends the following measures if a wolf is encountered (available at www.env.gov.bc.ca/bcparks/explore/misc/wolves/wolfsaf.html):

- Do not allow the wolf to approach any closer than 100 metres.
- Raise your arms and wave them in the air to make yourself appear larger.
- When in a group, act in unison to send a clear message to the wolves they are not welcome.
- Back away slowly. Do not turn your back on the wolf.
- Make noise. Throw sticks, rocks, and sand at the wolf.

Wasps

A geologist died suddenly in 1991 from a massive allergic reaction (anaphylactic shock) following a single wasp sting in a remote area. It is possible that the fatality could have been avoided had epinephrine been available for an immediate emergency injection. Other potentially fatal allergic reactions, some of which are extremely rare, can be caused by drugs (penicillin, codeine, aspirin, sulpha antibiotics, etc.), certain foods and plants, or other insect bites.

The principal preventive measure is an awareness of possible susceptibility to specific allergic reactions and the immediate availability of epinephrine (usually available as an auto-injector such as an EpiPen). Concerned individuals should consult a physician to determine whether they are allergic to epinephrine or other antihistamines. People with auto-injectors should carry them at all times and make sure that they have not expired. If they have a very serious allergy, they should carry more than one EpiPen, as one dose may not be sufficient. An EpiPen should also be included in first aid and survival kits. Co-workers should be instructed how to use the EpiPen in case the victim is unable to do so.

Resources

Safety Guidelines and Manuals

A comprehensive source of safety information for mineral exploration is AME BC's *Safety Guidelines for Mineral Exploration in Western Canada*. Although the booklet has a western Canadian focus, it is generally applicable throughout Canada, and copies of the manual have been provided to companies operating in the USA and Latin America. A fourth edition of *Safety Guidelines* was released in 2006, and over 26,000 copies have been distributed over the past 28 years. The guidelines are available online at <http://www.amebc.ca/policy/health-and-safety/safety-guidelines/safety-mineral-exploration-western-canada.aspx> and from the AME BC office. AME BC members are entitled to one free copy. Additional copies can be purchased at a cost of \$5.00 each (plus shipping and GST).

More detailed information is available in the new e3 Plus Health & Safety in Exploration Toolkit developed by the Health & Safety Committee of the PDAC. This toolkit is available online at www.pdac.ca/e3plus/toolkits/hs/index.html.

Safety Checklists, Stickers, and Cards

AME BC has prepared safety checklists, stickers, and cards to assist in preparedness in the field. A general safety checklist, survival kit checklists, and procedures in the event of a serious incident or fatality are on pages 180 to 182 and 184 of the *Safety Guidelines*. Waterproof stickers covering transportation safety, field work and traversing safety, communication, helicopter safety, and environmental considerations for drilling are available from the AME BC office or in Adobe Acrobat .pdf format at <http://www.amebc.ca/policy/health-and-safety/health-and-safety-resources.aspx>.

Workshops & Courses

Introduction to Exploration Safety Workshop

The AME BC Health & Safety Committee holds an annual Introduction to Exploration Safety Workshop in Vancouver. The workshops have been held since 1984, and annually since 2004. Topics covered have included the following:

- | | |
|-----------------------|--|
| Presentations: | <ul style="list-style-type: none">- Introduction, Background, Statistics- Health & Safety Regulatory Environment- Mountain & Glacier Travel- Aircraft Safety- Driving and Vehicle Safety- Bear Hazard Safety- Emergency Response- Hypothermia |
| Interactive Sessions: | <ul style="list-style-type: none">- First Aid Equipment- Traversing Equipment |

The next Introduction to Exploration Safety Workshop is scheduled for March 27, 2010 at the Simon Fraser University Downtown Campus (515 West Hastings Street, Vancouver). Visit www.amebc.ca to register. AME BC is also developing an Exploration Safety for Project Managers workshop.

First Aid Training

All personnel involved in mineral exploration should have current First Aid training that is applicable to their work. This usually includes Level 1 or Standard First Aid and a transportation endorsement. In general, first aid training within a crew or camp must meet, and should exceed, local Workers Compensation Board requirements.

Highly recommended for all exploration personnel is a course on Wilderness First Aid designed to provide participants with the confidence and knowledge required to deal with basic emergencies in wilderness settings.

Wilderness First Aid Training

The PDAC Health & Safety Committee and the Ontario Prospectors Association jointly organize courses in wilderness first aid. A Wilderness First Aid course was held on April 6-7, 2009, at Sunnybrook Park in Toronto. The course was given by The Highlands Wilderness Training Institute. A certification validated for three years, recognized and sanctioned by Provincial and Federal government regulations, the American Academy of Emergency Physician, the American Academy of Orthopedic Surgeons, and the Wilderness Medical Society was provided after the course completion. Please contact Bernarda Elizalde at 416.362.1969 ext 289 or belizalde@pdac.ca if you are interested in a 2010 course – it can be offered in locations throughout Canada depending on demand.

In Vancouver, a 40-hour course is offered by Wilderness Alert (1.800.298.9919; www.wildernessalert.com).

For courses on Occupational Health & Safety, please consult the following websites:

- Mines and Aggregates Safety and Health Association – www.masha.on.ca/links.aspx
- Canadian Centre for Occupational Health and Safety – www.ccohs.ca
- CanOSH – www.canoshweb.org/Training/training.html
- websites of local postsecondary institutions

Information on additional resources is welcome; please contact AME BC or PDAC.

Health & Safety Policy Guidelines for Junior Mineral Exploration Companies

These guidelines are designed to assist boards of junior exploration companies in setting up effective health and safety policies and protocols within the company. The guidelines are not standards and are not exhaustive. AME BC and PDAC have set the targets of zero fatalities and lowered lost time accidents for the exploration industry. Companies that have health and safety programs are more likely to help industry achieve those targets.

1. DUTIES OF BOARD OF DIRECTORS

- The Board of Directors should ensure that a health and safety program is in place.
- It may be preferable to appoint one director who will monitor and report to the Board on health and safety implementation.
- Alternatively the company could strike a health and safety committee of the Board.
- The Chairman of the Board should initiate education for all Directors as to their responsibilities and liabilities with respect to health and safety in the workplace. This would include all of the following:
 - Understanding of federal Bill C-45, which contains Amendments to the Criminal Code affecting the criminal liability of organizations
 - Understanding of regulations for the area(s) in which the company operates, and those specific to mineral exploration and mining
 - Understanding of the policies of appropriate professional associations with respect to health and safety in the workplace
 - Training on response to serious accident at worksite, including emergency response, but also response to media questions
- The Directors of the company should have a high level understanding of the health and safety risks in company workplaces.
- The Board should be notified as soon as possible on all serious accidents in the workplace (medical aids, lost time injuries, fatalities).
- The Board should allot resources towards health and safety program in the company.
- The Board should ensure that the organization has a Health and Safety mission statement, policy, and plan that implements health and safety protocols and checks periodically that they are appropriate. There should be health and safety targets within the plan.
- The policy should be signed at least by the chairman and preferably the whole Board.

- Any mission statement or policy could be incorporated within a general corporate mission statement and/or policy with respect to sustainable development.
- Consider an external review of health and safety policies and procedures.
- Make sure all work places, irrespective of jurisdiction, have the same levels of health and safety standards.

2. REPORTING

- Board meetings should include a report on health and safety performance prior to technical reviews.
- The Board of Directors, the director, or committee appointed to monitor health and safety procedures, should review with the COO or equivalent the records of statistics.
- Statistics should include hours worked, near misses, first aids, medical aids as well as workdays lost, and fatalities.
- Statistics should be maintained with monthly or quarterly reports.
- Accident records should be detailed and signed. Actions taken subsequent to accidents should be recorded.
- The annual report of the company, any interim reports (quarterly reports) and the website should include a summary of health and safety performance, along with the health and safety policy statement.
- In case of serious accident, if the company does not have the capacity to investigate the causes itself, external auditing should be completed.
- Operating groups or project teams should be encouraged to have safety meetings as follows:
 - Prior to project reports;
 - Once a month; **and**
 - Short “Toolbox” or “tailgate” meetings each day at the worksite.
 Minutes should be kept for safety meetings.
- Documentation should exist at three levels – office, management and field.

3. TRAINING

- Train the Board in field health and safety risks and procedures (as well as social, community and environment).
- Put a training plan in place to ensure that all workers have appropriate training for the tasks to be completed.
- Have safety leadership training as well as task specific training.
- Do not allow work to start without training.
- Have workers sign that they have received training and safety manuals. Insist on signatures that manuals have been read.
- All workplaces must comply with federal and provincial regulations with respect to health and safety.

4. DUE DILIGENCE CHECKLIST

Questions the Board of Directors should ask the Chief Operating Officer, Vice President-Exploration, or equivalent.

- ☐ Do you have a corporate health and safety policy?
- ☐ Do you have a corporate health and safety plan?
- ☐ Does the Board understand its responsibilities and liabilities?
- ☐ Does the Board have appropriate insurance in place?
- ☐ Does the Board request a health and safety report from the COO or equivalent prior to other discussions?
- ☐ Does the Board of Directors annually audit the plan with the COO or equivalent?
- ☐ Is the audit documented in writing, signed and dated?
- ☐ Does the Board audit the plan in addition to the annual audit in cases of serious accident?
- ☐ Do all projects have a designated health and safety leader, manager or monitor (not necessarily a job title)? Is the person told to shut down work if it is unacceptably unsafe?
- ☐ Does the designated health and safety leader know who to report to in case of accident?
- ☐ Do all worksites (camps, drills, etc) and regional offices have a valid, tested emergency response plan?
- ☐ Does the response plan include immediate 24/7 communication with COO or equivalent?
- ☐ Are all contractors required to include health and safety to at least the company standards in contracts?
- ☐ Before work starts, has there been an assessment and documentation of the health and safety risks?
- ☐ Are workers inducted for health and safety prior to starting work and supplied with necessary personal protective equipment?
- ☐ Are all employees given the appropriate training for the tasks required?
- ☐ Who documents training, including names, dates and course topics?
- ☐ Are training records kept?
- ☐ Are employees and contractors given an appropriate health and safety manual?
- ☐ Do employees sign that they have read the manual?
- ☐ Is there auditing of the contractor's worksite and action taken if required?
- ☐ Are health and safety statistics kept?
- ☐ Are the statistics publicly released (minimum: annual report)?

Basic Emergency Response Plan Guidelines for British Columbia

AME BC has worked with the British Columbia Ministry of Energy, Mines and Petroleum Resources to develop a set of *Basic Emergency Response Guidelines*. The guidelines were released in May 2007. Please note that these guidelines are designed to complement the standards of the *Health, Safety and Reclamation Code for Mines in British Columbia*. The guidelines are not exhaustive and may require adaptation for use in other jurisdictions.

Introduction:

In developing an Emergency Response Plan for your operation in accordance with the *Health, Safety and Reclamation Code for Mines in British Columbia* (HSRC) some basic factors must be considered. This guide, although not all-inclusive, is designed to assist the Mine Manager or person in charge of the exploration site in developing a workable plan for an operation. Although operations may be similar, each operation is unique, and may have a different plan in place to accommodate the site, the type of operation, the personnel, the level of training available, transportation, climate, and equipment available on site.

The plan once completed must be filed with the Chief Inspector as per the HSRC.

Components of the Plan:

I: Mine/Operation Information:

The following list identifies basic information that should be in the plan as it applies to a mining operation:

Note: A Mine is a place as defined under the Mines Act R.S.B.C. c 1996 (updated to July 16, 2002). Sites where mechanical disturbance of ground and/or exploration drilling occur and any place defined as a mine by the Chief Inspector are included in this definition.

- Name of the Mine and the company with a mailing address and contact telephone numbers; (fax and e-mail if applicable)
- Name of the Mine Manager as appointed under the Mines Act
- Mine number and permit number
- Type of operation, i.e. underground, surface, quarry, exploration, sand and gravel, placer
- Location of the property (UTM or Latitude/Longitude)
- Number of employees on site, including management and contractors
- Accurate mine plans showing and identifying areas should be maintained on site and made available to responding teams, personnel, or agencies.

II: Hazard Analysis of Operation:

This section should identify all potential emergencies that could occur on the site. These emergencies may be broadly broken into five basic types. Each operation may choose to include more detail; others may break the five types into fewer or more than five types.

1. Fire/Explosion
2. Injury to workers
3. Environmental
4. Climate
5. Equipment failure

III: Emergency Equipment

In this section, list the emergency equipment available on site to deal with identified potential emergencies/hazard. Also include other sources of equipment that may be necessary. Some examples are:

- Fire pumps and extinguishers
- First Aid supplies

- Forest fire fighting supplies
- Rescue equipment (e.g. stretcher that can be fitted in helicopter or vehicle)
- Equipment that can be assigned to an emergency task (e.g. a dozer or excavator used to build roads and trails can be pressed into service to dam or dyke a flood).
- Industrial ambulance or emergency transport vehicle.
- Outside sources of specific equipment

IV: Trained Personnel

In this section, list the availability on site of trained personnel capable of dealing with the identified potential emergencies/hazards.

- Contact information for on site First Aid
- Identify other sources of trained personnel (i.e. back-up teams, other agencies such as local fire department, local search and rescue, and provincial ambulance)

V: Implementation of the Plan and Incident Command

Clearly define how persons involved in an emergency are to access and implement the plan: (*Preplan basic response guidelines based on hazard assessment*)

- First steps, including who to call and how to call, and when to call
- Identify who will be responsible for implementing the emergency plan.
- Identify who will be in charge of conducting the emergency operation.
- Define all communication systems to be used (i.e. two-way radio, cell phone, satellite phone).
- Assign tasks by function and how the function will be filled. Examples include:
 - call-outs and communication with other access road users including logging companies
 - arranging assistance from other agencies or operations
 - required notification (e.g. Mines Inspectors (Health and Safety), Provincial Emergency Plan personnel, etc.)
- Include an Emergency Notification and Mobilization Chart.

VI: Directions to Site:

Provide clear written directions to the site; include maps that can be used for navigation. This is particularly important in remote areas. If using a radio controlled logging road, include radio frequencies and call-out procedures.

For exploration sites, marshalling points should be established. Coordinates of such points should be provided, and helicopter landings areas should be identified or established

- Clearly define how these directions will be communicated to those who may not be familiar with the area or roads and are called in to assist.
- Identify who has been given copies of the directions in advance.
- On long road transport of injured workers, identify and mark on the map possible transfer sites for Provincial Ambulance.

VII: Contact Lists:

Set a stand alone page with all contact information for all agencies listed, in addition to Company contacts. The following is not all-inclusive.

- Mine Manager
- Corporate Head Office
- First Aid, phone, or radio channel
- Emergency personnel
- Outside agencies (Federal, Provincial, or Local Government contacts)
- Equipment suppliers
- Transport companies, including air service (float plane or helicopter)
- Back-up rescue team if applicable

VIII: Training

Include a provision for training all persons on site in the application of the plan.

IX: Records:

Supplementary to the plan are all the records associated with it. Therefore, the following records should be maintained on site.

- Training
- Equipment checks
- Implementation if applicable.
- Incident debriefing if applicable.

Conclusion:

This guide is not all inclusive, and must be adapted to each site according to the risk assessment. It is imperative that the Mine Manager update the plan as may be required, from time to time due to changes in personnel, equipment, mine plan changes, or locations. It is also good practice to test the emergency preparedness plan with all affected persons. In some cases, evacuation drills are required, and **if the site requires the evacuation drill, the evacuation procedure must be posted and communicated to all affected personnel.**

References:

Mines Act. http://www.bclaws.ca/Recon/document/freeside/--%20M%20--/Mines%20Act%20%20RSBC%201996%20%20c.%20293/00_96293_01.xml

Health, Safety and Reclamation Code for Mines in British Columbia. *[Revised in 2008]*.
<http://www.empr.gov.bc.ca/Mining/HealthandSafety/Pages/HSRC.aspx>

Canadian Mineral Exploration Health & Safety Awards

The Canadian Mineral Exploration Health & Safety Awards trace their roots to 1983 when the BC & Yukon Chamber of Mines (now AME BC) first recognized the commitment of mineral exploration companies active in British Columbia and Yukon to health and safety. The awards program was expanded nationwide for the year 2005 in cooperation with PDAC.

David Barr Award

In 2005, the AME BC Health & Safety Committee initiated the **David Barr Award in recognition of Excellence in Leadership and Innovation in Mineral Exploration Health and Safety.**

Imperial Metals Corporation was the first recipient in 2006. Imperial Metals had also reported the largest number of lost workday incident free hours in British Columbia in 2005, and had previously won two Five-Year Safety Awards in 1992 and 2002.

Ian Paterson, Chair of the AME BC Health & Safety Committee from 2003 to 2007, received the award in 2007. As an exploration geologist with Cominco, Ian had a reputation as a leader in embracing health and safety awareness and procedures. From 2003 to 2007, while he was Chair of the AME BC Health & Safety Committee, the profile of Health & Safety in the mineral exploration sector in British Columbia increased dramatically through initiatives such as annual safety workshops and the fourth edition of *Safety Guidelines for Mineral Exploration in Western Canada*.

Bill Mercer, Chair of the PDAC Health & Safety Committee from 2006 to the present, received the award in 2008. As Chair of the Health & Safety Committee of the Prospectors & Developers Association of Canada (PDAC), Bill has drawn on over 30 years of experience in Canada and abroad, including his current role as Vice President of Exploration at Avalon Ventures Ltd., and previous ones as Chief Geologist for Noranda-Falconbridge and President of the PDAC. Working closely with the Health & Safety Committee of AME BC, he expanded the regional safety survey and report of mineral exploration in western Canada to a national level and spearheaded the development of the e3 plus Health & Safety Toolkit.

Safe Day Everyday Gold Award

The 2008 winner of the **Safe Day Everyday Gold Award** (formerly the Annual Safety Award) for the highest number of hours worked without a lost workday incident is Northgate Minerals Corporation for attaining 195,192 hours (24,266 days) without a lost workday incident.

Runners up included the Exploration Division of De Beers Canada Inc., which recorded 16,229 days without a lost workday incident, SLAM Exploration Ltd. at 13,930 days, and VMS Ventures Inc. at 13,680 days.

FNX Mining Company Inc. won the inaugural nationwide award in 2005, followed by the Exploration Division of De Beers Canada Inc. in 2006 and 2007.

Safe Day Everyday Award

The **Safe Day Everyday Award** (formerly the Exploration Safety Award) is presented to 72 companies for operating without a lost workday incident throughout the year, compared to 65 companies in 2007, 61 in 2006, and 71 in 2005. There are 27 repeat winners, the same as in 2007, compared to 17 repeat winners in 2006. There are 13 three-year recipients, and 5 four-year recipients. AME BC and PDAC congratulate the winners.

The 2008 Award Recipients are as follows:

Altius Resources Inc.
 Amarc Resources Ltd. (3)
 Astral Mining Corporation
 Athabasca Minerals Inc.
 Azimut Exploration Inc. (4)
 Barrick Gold Corporation
 BCGold Corp.
 Bell Copper Corporation (2)
 Bitterroot Resources Ltd.
 Black Bear Developments
 Blue Pearl Mining Inc. (2)
 Bootleg Exploration Inc. (4)
 British Columbia Geological Survey (3)
 CBR Gold Corp.
 Christopher James Gold Corp
 Columbia Yukon Explorations Inc. (3)
 Copper Mountain Mining Corporation
 Copper Ridge Explorations Inc. (2)
 Dajin Resources Corp. (2)
 De Beers Canada Inc. (3)
 Delta Uranium Inc.
 First Metals Inc. (2)
 Fjordland Exploration Inc. (2)
 Fladgate Exploration Consulting Corporation
 Geoinformatics Exploration Inc. (*)
 GeoVector Management Inc.
 Goldbrook Ventures Inc. (2)
 Gossan Resources Limited (2)
 Happy Creek Minerals Ltd.
 Harvest Gold Corp.
 Hawthorne Gold Corp.
 Huckleberry Mines Ltd.
 Indicator Minerals Inc.
 International Millennium Mining Corp.
 International Wayside Gold Mines Ltd.
 James Bay Resources Limited
 Jaxon Minerals Inc.

Kettle River Resources Ltd.
 Lake Shore Gold Corp.
 Liberty International Mineral Corporation
 Lysander Minerals Corporation
 Majescor Resources Inc.
 Nebu Resources Inc.
 New Millennium Capital Corp. (2)
 Northgate Minerals Corporation (3; Gold Winner)
 Nova Scotia Department of Natural Resources (2)
 Ontario Geological Survey
 Pacific Booker Minerals Inc. (4)
 Peace River Coal Inc. (2)
 Pershimco Resources Inc.
 Pitchstone Exploration Ltd.
 Puma Exploration
 Pure Nickel Inc.
 Quinto Mining Corp.
 Rambler Metals and Mining Canada Ltd. (2)
 Redcorp Ventures Ltd. (2)
 Rimfire Minerals Corporation (4*)
 Santoy Resources Ltd. (+)
 Selwyn Resources Ltd.
 SLAM Exploration Ltd.
 Strateco Resources Inc. (3)
 Target Exploration and Mining Corp. (2#)
 Teck Resources Limited
 Tri Origin Exploration Ltd. (3)
 TTM Resources Inc.
 UNOR Inc.
 Vaaldiam Resources Ltd.
 Vismand Exploration Inc. (4)
 VMS Ventures Inc.
 Watts, Griffis and McOuat Limited (3)
 Western Potash Corporation
 Western Uranium Corporation
 Westminster Resources Ltd.

(2) represents 2 years without a lost workday incident.

(3) represents 3 years without a lost workday incident.

(4) represents 4 years without a lost workday incident.

(*) now combined into Kiska Metals Corporation

(+) now combined into Virginia Energy Resources Inc.

(#) now combined into Crosshair Exploration & Mining Corp.

The following companies reported operating lost workday incident-free in British Columbia and Yukon for at least five years:

Pacific Booker Minerals Inc. (7 years)
 Rimfire Minerals Corporation (5 years)



Canadian Mineral Exploration Health & Safety Survey 2009

In completing this form please note the following:

- The form should be completed by junior companies, major companies, government geological surveys, diamond drilling contractors, geophysical contractors, and any other companies or contractors carrying out exploration related activities in Canada.
- We ask companies to submit in the spaces below a close estimate of the number of person days worked in 2009 by company employees and contractors for the following:

- Surface exploration and geological field work** which includes line-cutting, geophysical, geochemical, trenching, etc.
- Surface drilling**
- Underground exploration** including underground drilling, mining, and geological work

Please include the names of contractors so that we do not duplicate information. These names will not be published.

- Complete all the required fields; (*) indicates required fields.
- If you have any questions about the form please contact Jonathan Buchanan at 604-630-3923 or jbuchanan@amebc.ca.
- All information will be kept confidential, and Personal Information Protection and Electronic Documents Act mandates will be maintained.

Name of Person & Company Responsible for Safety (*Required Fields)

*Name:		
*Title:		
*Company Name:		
E-mail:		
<u>Address Information</u>		
Phone:		
*Street Address:		
Street Address 2:		
*City:		
*Province/Territory:		Postal Code:
*Does your organization have a Health and Safety Program: Yes___ No___ *Does your organization discuss safety at staff meetings or hold safety meetings? Yes___ No___ *Do you discuss recent near misses at staff meetings? Yes___ No___		
*Reporting Period:	2009	

Please complete and return by fax **by May 21, 2010**, to Jonathan Buchanan, AME BC at 604-681-2363 or by mail to AME BC, Suite 800, 889 West Pender Street, Vancouver BC V6C 3B2

2009CMHSSv1-2009-08-20

Company:				
Names of Contractors:				
Provide total Person – Days worked (e.g. number of employees multiplied by number of days worked) in each province or territory for both employees and contractors				
Worksite Location 1:	Prov./Terr.	Days worked:	PERSON DAYS WORKED	
			EMPLOYEES	CONTRACTORS
	_____	a) Surface exploration and geological work:	_____	_____
		b) Surface drilling:	_____	_____
		c) Underground exploration:	_____	_____
Worksite Location 2:	Prov./Terr.	Days worked:	PERSON DAYS WORKED	
			EMPLOYEES	CONTRACTORS
	_____	a) Surface exploration and geological work:	_____	_____
		b) Surface drilling:	_____	_____
		c) Underground exploration:	_____	_____
Worksite Location 3:	Prov./Terr.	Days worked:	PERSON DAYS WORKED	
			EMPLOYEES	CONTRACTORS
	_____	a) Surface exploration and geological work:	_____	_____
		b) Surface drilling:	_____	_____
		c) Underground exploration:	_____	_____
Worksite Location 4:	Prov./Terr.	Days worked:	PERSON DAYS WORKED	
			EMPLOYEES	CONTRACTORS
	_____	a) Surface exploration and geological work:	_____	_____
		b) Surface drilling:	_____	_____
		c) Underground exploration:	_____	_____

If additional space is required attach additional copies

Did you experience any incidents (either lost-time or without lost-time)?

*Yes__ No__

*If YES, please complete the following form.

Corporate and personal information will not be published

If additional space is required attach additional copies.

Date (month-day-year)	Location	Prov/Terr	Occupation	Employee or Contractor (please specify)	Type	Lost Time (in days)	Nature of Injury	Cause of Injury	Description of Incident (include factors such as experience, training, time of day that may have contributed)	Action Taken

Occupation: 1-Driller 2-Driller Helper 3-Miner 4-Geologist 5-Field Assistant 6-Geophysicist 7-Line Cutter 8-Surveyor 9-Cook 10-Other	Type: 1-NM (near miss) 2-FA (first aid) 3-MA (medical aid)	Nature of Injury: 1-Sprain 2-Cut 3-Skeletal 4-Bruise/Muscular 5-Allergies 6-Substance Abuse 7-Frostbite 8-Eye 9-Chemical or Burn/Scald	10-Pre-existing Illness/Seizure 11-Back 12-Fatality 13-Hyperthermia 14-Skin 15-Internal 16-Fatality 17-Other 18-None	Cause of Injury: 1-Slip/Fall 2-Airplane 3-Helicopter 4-Snowmobile 5-Automobile 6-ATV 7-Vehicle (Other) 8-Boat 9-Improper Lifting 10-Falling Object 11-Other Object Related 12-Drilling Machinery Related	13-Camp Equipment Related 14-Tool Use 15-Weather 16-Field Work 17-Animal 18-Chemicals 19-Improper operation (e.g. did not follow procedures) 20-Drowning 21-Medical Condition 22-Other 23-None

Date: _____

Company: _____



“Have a safe day, everyday.”