#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
1	Occupational Disease	**Silica**	•No committee to control •Systems don't handle the dust levels •Training ,systems , company has no money •Lack of commitment to fix equipment, production •No responsibility	•Regulations •PPE regulations •JHSC •Testing •Scrubber systems	•Silicosis •Training commitment •Claims •Regulation •Ventilation •Ongoing to find ways to eliminate dust	
2	Occupational Disease	**Excessive dust from crushing and screening operations**	•Inadequate dust suppression systems in place •Lack of hazard recognition •Lack of proper equipment •Lack of training/ability •lack of appropriate dust masks •Refusal of workers to wear dust masks •No dust suppression systems on crushing, screening or conveying equipment	•PPE, procedures, fit testing •Regulations	•Hard Data •Knowledge •Field visits	
3	Mobile Equipment	**Distracted Driving** (Heavy equipment, company light vehicle, personal vehicle, cell phones)	•Momentary non attentive •Slow to no response time •Low concentration level •Feeling the need to always be in touch •Social media •Unaware of surrounding hazards •Putting lives at risk •Loss of property •Damage •Injury •Loss of life	•MOL Adds •Drivers training •SOP hand held •Fines •Highway Traffic Act •Safety committee controls	• Number one cause of collisions today and vehicle caused injuries •Cell phone accidents are growing at a higher rate than alcohol related ones	
4	Slips, Trips and falls	**Slips, trips and falls from different elevations**	•Poor housekeeping •Hand rails •Ice and Snow; wet or ice-covered walkways •Oils spills and grease on floors •Inadequate footwear/PPE being worn in winter months •No effort devoted to removal of tripping hazards •Environmental conditions	•Continuous cleanups •Repairs to handrails •Ice and snow tracks •Oil-floor dry •Sanding •Anti-slip foots, training	•Experience •Hard Data, stats support •Knowledge •Hazard data	
5	Fatigue	**Fatigue** (seasonal)	•Working long hours due to increased production at certain times of the year, overtime •Operating heavy equipment while fatigued resulting in incidents •Driving home after long shifts resulting in incidents	•Tailgate Talks or Safety Meetings with "information" on how to sleep better •Controlled hours	•Incident reports •Employee reports (complaints) •Personal observations	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
6	Maintenance	**Lack of maintenance of equipment** (resulting in Falls, entrapment, electrocution, fires)	•Inadequate policy / procedures •Complacency •Lack of training •Improper tools used for the job, lack of proper equipment •Employees not asking for help •Employees feeling a need to rush to get jobs done •Awkward work areas •Fall arrest systems not utilized; •Faulty fire suppression systems •Lack of hazard recognition •Production demands	•Training •OHSA Regulations •Procedures	•Hard Data •Knowledge •Field visits	
7	Crushing and Screening	**Freeing jammed material from crusher**	•Hazardous energy •Unique circumstances	•Rock hammers but they do not fit for all situations	•Knowledge	
8	IRS	**Dysfunctional IRS**	•Mean workers have to get involved •Don't want to get into trouble •Supervisor don't get back to workers	•Many systems •5 point safety cards •Safety meetings	•Incidents •Injuries •Ongoing	
9	Mobile Equipment	**Lack of Tire safety**	•Many different unusual situations •Welding on tire rims •Excessively worn tires •Improperly inflated tires •Haulage roads not regularly graded	•Lock and tag legislation •SMT module	•Knowledge •Hard Data	
10	Electrical	**Electrical Contact**	•Certified electrician not required/Unqualified to perform the work •Lack of hazard recognition •Inadequate guarding •Confusing interpretation of legislation •Exposed or worn equipment circuitry •Failure to lock and tag energized equipment •Risk taking •Poor equipment maintenance •No inspection	•OHSA Regulations •Legislation •Company Procedures	•Field Visits •Gut Instinct •Hard Data •Knowledge •Observation	
11	Mobile Equipment	**Injury due to Haulage vehicles**	•Poor visibility and blind spots for mobile equipment operators •Lack of site training for haul truck drivers •Inadequate policy / procedures •Traffic congestion •Language barriers between employees and haul truck drivers •Constantly changing work sites (stockpiles moving, plants moving, haul roads changing, maps not updated)	•A formal traffic management program in place •The application of proximity detection devices	•	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
12	Fatigue	**Shift work causing fatigue**	•Extended shifts and driving home •Fatigue, tired, no focus •Increase high potential •Different rotations •Absenteeism/not showing up for work •Lack of sleep/sleeping patterns •Production •No breaks •Not eating right	•Training •Education •Different jobs •Supplements, energy drinks •Studies on shift work •Stats on when workers get hurt	•Studies show fatigue is as bad as impaired driving •Time studies •Sleeping disorders •Hooked on pills •Not eating right •Ongoing	
13	Training	**Spare supervisor not making the right decisions**	•No experience •Knowledge of supervisor •Not organized large group •Not knowing policies •No experience to supervise •Intimidating •Production •Not recognized	•Training: Not as much as front line •Experience •Shadow with supervision until competent to supervise	•Not making the right calls •Field training •All Common core training before supervising •Assessment done on worker	
14	Working Alone	**Working Alone**	•Lack of hazard recognition •Remote Location •Inadequate staffing levels •Absence of working alone protocols, policies or procedures •Poor attendance issues •Age of worker •Work on job being done	•OHSA Regulations •Procedures •Communication Systems •Man down alarm, procedures •Cell phone contact every 20 mins	•Gut Instinct •Hard Data •Knowledge •Intuition •Experience	
15	Falls from Heights	**Working at heights on equipment**	•Human error •Time lines •" Done this way for years"	•Training •Supervision	•Gut Instinct	
16	Psychosocial	**Stress**	•Job pressure •Family pressure	•Employee assistance programs •Wellness and stress management programs available to employees •A respectful workplace culture	•Stress is the cause of more additional health concerns, and abuse of drugs and alcohol	
17	Occupational Disease	**Exposure to dust** (resulting in respiratory issues)	•Inadequate or non-existent policies or procedures (e.g.. Wearing dust mask or respirators, fit testing etc.)	•PPE, procedures, fit testing	•Knowledge	
18	Falls from Heights	**Working from heights from crushing, screening or conveying equipment**	•Requirements for workers to access high locations on crushing, screening and conveying equipment •Poor design of crushing, screening or conveying equipment necessitating the use ladders	•Fall arrest systems •Training for working at heights •Design of crushing, screening and conveying equipment to eliminate the need to work at heights	•Hard Data •Knowledge	
19	Fatigue	**Sleep deprivation**	•Stress •Long hours •Heat •Family surroundings	•Access to sleep counselling	•More accidents are from the result of sleepy drivers, or from not being totally with it to perform the job	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
20	Mobile Equipment	**Poor visibility and blind spots for mobile equipment operators**	•Poor equipment design •Large mobile equipment not equipped with cameras •Large mobile equipment not compatible with mine roadway and infrastructure designs •Lack of visibility •Pedestrians, small vehicles and large equipment	•Traffic control programs	•Hard Data •Knowledge •Gut Instinct	
21	Training	**New Worker injuries**	•Lack of hazard recognition •Lack of ability/training	•OHSA Regulations	•Accident stats •Events	
22	Training	**Inability of contractors to recognize hazards**	•Lack of proper training	•OHSA Regulations •Contractor Company Procedures	•Field Visits •Gut Instinct	
23	MSD	**Overexertion**	•Manual labour requirements of work that needs to be performed	•Hand and power tool SMT module •Manual Handling skill in working safely in the job environment module	•Gut feeling	
24	Fatigue	**Mobile equipment operator fatigue**	•Piece work •Productivity- employer pressure •Long days/hours •Night life after work •Heat •Excessively long shift durations •Insufficient number of breaks during shifts •Irregular shift schedules •Poor operator sleep habits •Monotony associated with tasks	•Job share •Operator judgement to switch off •Awareness training	•Experience •Hard Data •Knowledge	
25	Slips, Trips and falls	**Improper mounting and dismounting from vehicles**	•Poorly designed vehicles •Lack of training on how to mount and dismount from vehicles	•Vehicle designs allowing fro three-point contact while mounting and dismounting vehicles •Formal vehicle mounting and dismounting procedures	•Hard Data •Knowledge	
26	Stockpiles	**Stock pile collapse** (frozen top material and then undercutting. Unstable due to blasting, erosion, thawing or drying out)	•No inspections •Lack of hazard awareness/company safe practices •Lack of supervision •Risk taking	•Best practices •Legislation •Employer discipline	•Observation	
27	Training	**Supervisors making the wrong decisions**	•No surface common core (supervisors) supervisor not in the same field •No proper training •Blames workers for errors/ Seems to think it's the workers fault •No training on MOL act/regulations •Young workers •no follow up on issues •no follow up on safety issues •No Experience in the environment they are Supervising, (Ex Surface Mechanic to Mill Process)	•Due-Diligent courses •First aid •Should by law have some sort of common core (Mill , pit Surface)MASHA or other organized training centers •Act on their job •Hire Supervisors with experience in the environment that they are Supervising	•	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
28	Water	**Open water in pits**	•	•	•	
29	Crushing and Screening	**Crusher or conveyor blockages** (leading to M.S.D.'s, entrapment, being struck, or falls)	•Production demands •Lack of knowledge •Poor design •Inadequate operation of crusher or conveyor •Inadequate crusher or conveyor procedures	•Training •Lock and Tag •Redesign	•Field visit observations •Hard Data •Knowledge	
30	Falls from Heights	**Working at Heights**	•Lack of training/ability •Lack of hazard recognition •Guard rails missing/Lack of adequate equipment •Improper training •Includes inspections of equipment prior to use •Improper equipment or lack of •I've done this job a hundred times without •Awkward work areas not "legally" required to use fall arrest or restraint •Rushing and fatigue can lead to loss of balance when working on conveyors or small walkways etc. •Different application than construction standard •Risk taking •Lack of supervision •Lack of safe work practice	•CSA Standards •OHSA Regulation/legislation •Training (Common Core) •Construction Working at Heights training standard •MOL •Individual company policies •Inspections of guardrails and walkways •Identify adequate anchor points for tying off •Fall arrest	•Accident Stats •WSIB data •Field Visit •Personal observations •Research •Jump in amount of accidents resulting in death or injury •Knowledge	
31	Mobile Equipment	**Vehicle roll-overs (or going over edge of embankment)**	•	•	•	
32	Slips, Trips and falls	**Slips, trips and falls from the same surface**	•House keeping •Lack of supervision/enforcement •Time constraints •Poor attitudes •Grease, oil, ice, snow water and mud/muck	•Company safe work practices •Legislation	•Observation	
33	Training	**Young Worker injuries**	•Lack of training •Afraid of the repercussions of reporting hazards on the job •Lack of experience in situations at the time of hire	•Worker 4 Step Awareness Training	•MOL Website Training provided	
34	Mobile Equipment	**Lack of traffic control systems**	•Lack of a traffic management program •Trucks in area as well as equipment movement	•Site circulation plan, policies, PPE and back up alarms •At present we have no TCP for our pits and quarries	•Hard Data •Knowledge •Gut Instinct	
35	Occupational Disease	**Exposure to dust when recycling concrete**	•Lack of health hazard knowledge •Complacency/attitudes •No effective dust control •PPE not adequate, no fit training •PPE too restrictive	•Watering down of site •Enclosed operator cabs •Dust respirators	•Observation	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
36	Falls from Heights	**Working from heights off of mobile equipment**	•Requirements for workers to access high locations on haulage vehicles	•Fall arrest systems •Training for working at heights •Design of mobile equipment to eliminate the need to work at heights	•Hard Data •Knowledge	
37	Crushing and Screening	**Lack of adequate lock and tag procedures**	•Failure to recognize the need to have lock and tag procedures for energized crushing, screening and conveying equipment •Failure to understand when lock and tag procedures for energized crushing, screening and conveying equipment are required	•Formal lock and tag procedures for crushing and screening equipment •Training on hazard recognition for crushing, screening and conveying equipment	•Hard Data •Knowledge	
38	Crushing and Screening	**Structural collapse of equipment**	•Lack of inspection •Heavy machinery i.e.: screen decks, crushers in structures	•MOL •Safety committees	•	
39	Occupational Disease	**Exposure to noise during crushing, screening and conveying**	•Lack of available hearing protection •Equipment operators in close proximity to operating crushing, screening and conveying equipment	•A formal hearing testing program •The mandatory use of hearing protection for certain tasks	•Hard Data •Knowledge	
40	MSD	**Lack of Ergonomics** (lifting, sitting at work station, having the proper tools for the task**)**	•No training on the issue, even to recognize the injury •Not top priority •Reporting workers are scared •No training for supervisor or workers •Its workers fault •No risk assessment on MSD •At the worker to make their jobs easier •Company tries to link their injuries to home	•Procedures, training •Company files claims •Stats •A report on how not to let it happen again. Information given as to why claim was denied	•Hazard data •Once a year in review •No training with workers and supervisors •WSIB claims •Assessment	
41	Mobile Equipment	**Non-haulage vehicle incidents**	•Poor vehicle maintenance •Lack of training/ability •Equipment configuration	•Regulations •Highway Traffic Act •Driver's License	•Field Visit Report	
42	Stockpiles	**Working in and around stockpiles** (possible if hazards are not recognized)	•Lack of training •Inadequate policy / procedures •Complacency	•Policies, training	•Knowledge	
43	Mobile Equipment	**Lack of procedure to deal with hydraulic energy on equipment**	•Many different unusual situations	•Lock and tag legislation •SMT module	•Knowledge	
44	Mobile Equipment	**Struck by vehicle incidents** (vehicle or pedestrians)	•Inadequate traffic control system/lack of traffic control plan •Poor visibility •Blind spots for vehicle operators/Lack of blind spot awareness •Workers not wearing high visibility attire •Poor road conditions •Worker visibility •Vehicle design •Communication issues •Not following rules	•High vis clothing •High vis on hard hats •Radios and flashing •Light on mobile equipment •New PPE and improved traffic control through legislation •Company rules for limiting pedestrians •Safety talks	•Hard Data •Knowledge •Observation	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
45	Training	**Lack of proper training**	•Time restrictions •Proper instructors •Needing to get the job done •Manpower shortage •Inadequate training programs for workers •Existing training programs not current •Existing training programs not properly delivered	•MOL •Highway Traffic Act	•Hard Data •Knowledge	
46	Crushing and Screening	**Removing oversize rocks from the various types of crushers**	•Many different unusual situations	•Lock and tag legislation •SMT module	•Knowledge	
47	Mobile Equipment	**Vehicle roll-overs**	•Inadequate vehicle maintenance/inspection •Poor roadway conditions/slippery surfaces •Improperly trained or inexperienced mobile equipment operators •Lack of a traffic management program •Brake roll-over •No daily brake test •Speeding •Berms not adequate	•Legislation •Daily inspection and testing •Haul road ramps to be treated for slippery conditions	•Hard Data •Knowledge •Observation	
48	Stockpiles	**Loose or unconsolidated stockpiles - winter**	•Unexpected thawing of consolidated muck piles •The freezing of stockpile contents	•A formal stockpile management program	•Hard Data •Knowledge	
49	Training	**Mobilizing or de-mobilizing stationary equipment**	•Insufficient planning of the re-location of large mobile or stationary equipment •Lack of formal procedures for re-locating large mobile or stationary equipment	•Formal procedures for moving equipment from site to site	•Hard Data •Knowledge	
50	Water	**Water hazards around sludge ponds**	•Lack of legislation and standards	•Reg 213 s 28	•Gut instinct	
51	Emergency Preparedness	**Lack of Emergency Showers**	•	•	•	
52	Guarding	**Unguarded conveyor belts**	•Guards off for maintenance •Existing guards not to specification •Equipment not amenable to guarding	•Policies and Lock and Tag, training	•Hard Data •Knowledge	
53	WHIMIS	**Chemical burns**	•No respect from workers on what it can do to you •No non-routine •No training •No SDS provided to the workers •Not everybody knows how to get WHIMIS information	•PPE •Stop the jobs •Force the supervisor to do non-routines •Provide WHIMIS training course and SDS before job begins, training with materials •Regulations	•Incidents: death •Worker may not know where to get access •Ongoing •Regulations	
54	Water	**Water hazards for dragline operators**	•Lack of legislation and standards	•Reg 213 s 29	•Gut instinct	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
55	Psychosocial	**Drug abuse** (prescribed, over the counter and recreationa)	•Pain relief •Cold and flu relief •Habitual drug use • Dulls the senses • Reducing reaction time • Impedes concentration	•Random testing	•More operators are self medicating for pain relief and using whatever relieves the pain •Cold and flu relief •Not willing to take time off	
56	Blasting	**Explosives in the muck pile**	•Poor blasting practices resulting in incomplete detonation of explosives •Wrong types of explosives in use	•Training for loader operators to be able to recognize explosives in muck piles •Formal procedures for dealing with explosives in muck piles	•Hard Data •Knowledge	
57	Stockpiles	**Workers buried in stockpiles**	•Poor hazard awareness •Lack of training •Lack of common sense	•Training •Safety meetings •Tailgate talks	•	
58	Falls from Heights	**Inadequate ladders, walkways, platforms on crushing, screening, and conveying equipment**	•Poorly designed crushing, screening and conveying equipment •Crushing, screening and conveying equipment modified from original design	•A formal management of change program to identify the hazards and risks associated with modified designs	•Hard Data •Knowledge	
59	Water	**The effects of spring run-off water**	•Lack of historical data on local spring water run-off conditions	•	•Hard Data •Knowledge	
60	Mobile Equipment	**Overloaded and/or insecured loads in haulage vehicles**	•Inexperienced truck loader operators •No truck loading limits specified •The absence of truck payload weighing or measuring systems •Overloaded vehicles •Vehicle box design incompatible with material being hauled	•The use of weigh scales for loaded haulage vehicles •Maximum load identification markers on haulage vehicle boxes •Provisions for dealing with wet or saturated material loaded into haulage truck boxes	•Hard Data •Knowledge	
61	Mobile Equipment	**Improperly maintained haulage roads**	•Spillage from improperly loaded haulage trucks •Grading equipment not available •Excessive quantities of snow, ice and water on haulage roads •Inadequate road maintenance program •Excess water, snow or ice on haulage roads	•A formal haulage road maintenance program and schedule •A formal snow and ice removal protocol	•Hard Data •Knowledge	
62	Psychosocial	**Alcohol abuse**	•Stress on the job, at home and personal life in general	•Highway Traffic Act •Individual company policies	•Thirsty Thursday's employees getting together for more than a few drinks •Employees drinking at home or even on the job	
63	Water	**Water hazards around fresh water ponds**	•Lack of legislation and standards	•Reg 213 s 27 •Procedures, PPE	•Gut instinct •Knowledge	
64	Electrical	**Electrical installation standards for labelling not followed**	•Inadequate personnel •Inadequate standard	•"Good electrical practice"	•Knowledge	

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65	Maintenance	**Improperly maintained haulage vehicles**	•Lack of vehicle maintenance schedule •Lack of properly trained mechanics •Lack of proper service from vehicle suppliers •Insufficient inventory of spare parts	•Access to qualified maintenance staff for haulage equipment •A formal maintenance plan and schedule for haulage equipment	•Hard Data •Knowledge	
66	Blasting	**Flyrock**	•Poor communication between blasting company and mining company •Lack of training on procedure (employees) •Geology – unpredictability •Drill hole collar locations not surveyed in •Drill holes too closely spaced •Drill hole diameters too large •Insufficient burden •Poorly executed blasts	•Face profiling for under cuts •Blast design legislation •Training programs •Proper blast design with respect to hole diameter, burden and spacing •Surveyed hole collar locations •Proper hole detonation sequence •Proper explosive type utilized •Drill monitoring to ensure proper hole alignment	•Hard Data •Knowledge	
67	Stockpiles	**Insufficient edge protection**	•Lack of berm •Time taken to form berm	•A formal stockpile management program	•Hard Data •Knowledge	
68	Environmental	**Wildlife hazards** (e.g. Bears, geese etc.)	•	•	•	
69	Occupational Disease	**Inadequate ventilation in shops and garages**	•Improperly designed ventilation systems in shops and garages •Malfunctioning ventilation systems in shops and garages	•Extraction fans •Exposure standards •Properly designed exhaust systems in garages and shops •Regular air quality monitoring in shops and garages	•Hard Data •Knowledge	
70	Crushing and Screening	**Improperly maintained equipment**	•Lack of trained personnel to maintain crushing, screening and conveying equipment •Pour inventory of spare parts for crushing, screening and conveying equipment	•Formal maintenance programs and schedules for crushing, screening and conveying equipment •Access to properly trained heavy duty mechanics, welders and millrights for crushing, screening and conveying equipment	•Hard Data •Knowledge	
71	Occupational Disease	**Excessive dust from drilling**	•Drilling dry •Inadequate dust suppression systems in place	•Regulation •The use of dust masks •The use of formal dust collection systems •A formal dust monitoring program •A medical surveillance program	•Hard Data •Knowledge	
72	Occupational Disease	**Lack of dust control during haulage of materials**	•No hydration treatment available for haulage roads	•The use of dust masks and respirators •Haulage road watering programs	•Hard Data •Knowledge	
73	Maintenance	**Inadequate or compromised Lockout**	•Lockout equipment not available •Lockout procedures not followed	•CSA Standard •OHSA Regulations •Training (Common Core)	•Accident Stats •Field Visits	

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74	Mobile Equipment	**Brake failures**	•Poor maintenance •Overloaded truck •Lack of knowledge •Excessive grades	•	•	
75	Stockpiles	**Workers buried in material in hoppers or bins**	•Lack of procedures for working around hoppers stockpiles or bins •Fall arrest systems not utilized •Poor stockpile locations or configurations	•Formal protocols for working around stockpiles	•Hard Data •Knowledge	
76	Emergency Preparedness	**Lack of Backup power supply during power failures**	•	•	•	
77	Falls from Heights	**Working in and around high walls (beneath and on top) & cliff edges**	•	•Procedures, training	•Intuition	
78	Confined Spaces	**Inability to recognize a confined space (confined space at a height)**	•Lack of training, improper tools •Inadequate policy / procedure •Improper emergency rescue procedures	•MOL Regulations	•	
79	Ground Stability	**Dealing with scaling and overhangs**	•No clarity on standards	•Formal procedures for scaling overhangs •Limits imposed on maximum bench heights •Proper blasting techniques to minimize the need for scaling	•	
80	Mobile Equipment	**Loss of control of mobile equipment**	•Inadequate vehicle maintenance •Poor roadway conditions; •Improperly trained or inexperienced mobile equipment operators; •Lack of a traffic management program.	•	•Hard Data •Knowledge	
81	Maintenance	**Electrical explosion**	•Lack of knowledge (hazard assessment) •Production demands •Lack of maintenance to electrical	•Yearly high voltage check and maintenance	•Data •Experience	
82	Ground Stability	**The adverse effects of underground mining on ground stability in surface mines**	•Inadequate mine design practices •Incorrect or incomplete mine plans and drawings •Insufficient backfilling of mined out underground excavations beneath pit floor •Seismicity induced by underground mining	•Stability analysis to confirm the stability of crown pillars separating underground openings from the pit floor •Microseismic monitoring capability to source locate microseismic events induced by underground mining which could affect pit wall stability	•Hard Data •Knowledge	
83	Training	**Lack of appropriate operating procedures for crushing, screening and conveying**	•Existing procedures out-of-date due the acquisition of crushing, screening and conveying equipment	•Formal procedures and training	•Hard Data •Knowledge	
84	Environmental	**Biological hazards** (e.g. West Nile, Lyme's)	•	•	•	
85	Mucking	**Uncontrolled movement of muck pile while mucking**	•Poor blasting practices resulting undesirable muck pile configuration •Poor blasting practices resulting in variability in muck size	•Blast design provisions for optimizing muck pile profile and configuration	•Hard Data •Knowledge	

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86	Mine Design	**Excessively steep or narrow roads**	•Inadequate mine design •Modified mine design resulting in roads not being constructed according to specification	•An imposed limit for haulage road grades	•Hard Data •Knowledge	
87	Mucking	**Oversize muck**	•Heterogeneous nature of sand or gravel being mined in sand and gravel pits •Poor blasting practices in open pit mines and quarries resulting in insufficient fragmentation	•A protocol for secondary blasting for dealing with large muck	•Hard Data •Knowledge	
88	Occupational Disease	**Exposure to vibration during crushing, screening and conveying**	•Poor design of crushing, screening or conveying equipment causing excessive vibration levels •Lack of available vibration dampening systems •Old or improperly maintained equipment prone of generating vibrations	•Maintenance program •The use of vibration dampening gloves and boots for certain tasks •Regular maintenance on equipment to prevent unnecessary vibration	•Hard Data •Knowledge	
89	Guarding	**Lack of machinery guarding** (e.g. leading to entrapment or accidental start up)	•Guards removed or not replaced •Guard Maintenance •Guarding Standards different •Lack of Hazard identification •Inadequate, improper or ineffective guarding •Confusing interpretation of legislation	•CSA Standards •OHSA Regulations •Updated legislation •Training •Lock & Tag Regulations •Check guarding before start-up •Std. guarding	•Accident Stats •Field Visit •Knowledge •Safety violation •Gut Instinct •Internal inspections	
90	Electrical	**Electrical installation standards for running wire not followed**	•Inadequate personnel •Inadequate standard	•"Good electrical practice"	•	
91	Mine Design	**Compromised crown pillar separating surface from underground mining**	•Inadequate mine design practices •Incorrect or incomplete mine plans and drawings •Insufficient backfilling of mined out underground excavations beneath pit floor •Unexpected caving from the underside of crown pillars	•Stability analysis to confirm the stability of crown pillars separating underground openings from the pit floor •A formal backfilling plan and schedule for mined out underground openings beneath pit floors	•Hard Data •Knowledge	
92	Electrical	**Electrical panel boxes that malfunction**	•Inadequate personnel •Inadequate standard •Panel box maintenance	•"Good electrical practice"	•Knowledge	
93	Water	**Excessive accumulation of water on pit or quarry floor**	•Insufficient pumping capacity •Excessive amount of process water being utilized •Excessive amount of naturally occurring water entering mine •Unsuccessful efforts to lower water table levels •Inadvertent conduits to streams, ponds, rivers or lakes •Unexpected severe weather •Excessive accumulation of water on pit or quarry floor – poor drainage •Wash plants leaking, old equipment, water settles – no where for it to go	•A formal mine pumping program •A sufficient number of well maintained pumps •Limits imposed on the amount of process water that can be used	•Hard Data •Knowledge	
94	Training	**Lack of adequate lock and tag procedures**	•Failure to recognize all sources of harmful energy in energized equipment	•Formal procedures and training	•Hard Data •Knowledge	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
95	Guarding	**Lack of appropriate guarding and working pull cords in crushing, screening and conveying**	•Guards off for maintenance •Existing guards not to specification •Equipment not amenable to guarding	•Appropriate guarding and pull cords for crushing, screening and conveying equipment •Barricades or fencing preventing access conveyors	•Hard Data •Knowledge	
96	Mobile Equipment	**Mobile equipment contact with overhead power line**	•Lines not marked •Poor signage •Lack of knowledge •Driver error •Poor locations chosen for dumping relative to transmission line positions •Blind spots for vehicle operators •Lack of spotting procedure	•Signage •Line balls + tightened •Move stockpiles •Training •Ongoing reminders	•Knowledge •Actual contact •Intuition •Hard Data	
97	Blasting	**Inadvertent remote detonation of blasts**	•Stray detonation signals from neighboring quarries or open pit mines •Lack of communication and coordination of blasting initiatives amongst neighboring quarries or open pit mines	•Protocols between neighboring surface mining operations to ensure coordination of blasting to confirm that remote blasting signals are on different frequencies	•Hard Data •Knowledge	
98	Training	**Lack of proper loading and dumping procedures**	•Failure to recognize the need for loading and dumping procedures •Existing loading and dumping procedures are out-of-date (i.e. due to the acquisition of new equipment)	•Formal procedures and training	•Hard Data •Knowledge	
99	Occupational Disease	**Exposure to drill noise**	•Lack of available hearing protection •Drill unit operators in close proximity to operating drills	•Noise regulations •A formal hearing testing program •The mandatory use of hearing protection for certain tasks •The use of sound muffling systems	•Hard Data •Knowledge	
100	Blasting	**Undetonated holes resulting in irregular bench walls**	•Improperly loaded or wired blasts •Improperly designed blasts •Severed detonation wires or cables •Incorrect detonation sequence applied •Faulty explosives	•Legislation •Manufacturing standards •Proper training on blasting procedures •Procedures for dealing with frozen blasts	•Hard Data •Knowledge	
101	Falls from Heights	**Working from heights from a drill unit**	•Requirements for workers to access high locations on drill units •Requirements for drill operators to be positioned close to edge of benches	•Fall arrest systems •Training for working at heights •Design of drill units to eliminate the need to work at heights	•Hard Data •Knowledge	
102	Blasting	**Improper blast guarding, signage and sirens**	•Absence of protocols, policies and procedures for blast notifications and warnings	•Regulations •Procedures	•Hard Data •Knowledge	
103	Mine Design	**Starting up a pit without proper checks & balances**	•	•	•	
104	Mine Design	**Pit wall angle too steep or too high**	•Lack of pre-mining stability analysis •Adverse local structural geology	•Formal pre-mining stability analyses to identify the maximum pit wall angle for the specified factor of safety	•Hard Data •Knowledge	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
105	Mobile Equipment	**Lack of high visability clothing**	•	•	•	
106	Emergency Preparedness	**Lack of fire procedures in shops and garages**	•Failure to recognize the need for fire procedures •Lack of understanding of fire hazard risks in shops and garages	•A formal emergency preparedness program •Formal fire procedures for shops and garages •Good housekeeping practices in shops and garages •Proper storage facilities for flammable maintenance supplies	•Hard Data •Knowledge	
107	Blasting	**Premature detonation by lightening or stray currents**	•No access to reliable weather reports	•Regulation •A formal repository for blasting records	•Hard Data •Knowledge	
108	Training	**Regulation 854 S- 11 MTCU mandatory module training not being followed**	•Not being followed •No compliance (specialties) •High variability in signing authority	• Companies not complying • Weakly enforced • Rarely monitored	•Companies do not audit their training program for Reg. 854 Section 11	
109	Ground Stability	**Fall of ground or uncontrolled soil collapses (due to local rock and/or soil conditions)**	•Sand and gravel pit walls excavated at too steep an angle •Elevated water table level in sand and gravel pit walls •Adverse structural geology in open pit or quarry walls •Open pit or quarry walls excavated at too steep and angle •Poor open pit or quarry blasting practices resulting in ragged walls •Excessively high open pit or quarry bench heights	•Pre-mining stability analyses for open pit mines and quarries to enable the design of stable pit and quarry walls •Pumping programs to water table levels •Limits imposed on maximum bench heights •Limits imposed on maximum wall slope •Ground monitoring to detect wall movement	•Hard Data •Knowledge	
110	Stockpiles	**Loose or unconsolidated stockpiles - summer**	•Fine material piled when wet (i.e. having apparent cohesion) •Fine material stockpiled when wet (i.e. having apparent cohesion)	•A formal stockpile management program	•Hard Data •Knowledge	
111	Ground Stability	**Gound instability while mucking**	•Adverse structural geology in open pit or quarry walls •Open pit or quarry walls excavated at too steep and angle •Poor open pit or quarry blasting practices resulting in ragged walls •Excessively high open pit or quarry bench heights	•Access to geological expertise to enable an understanding to effect of geologic structure on wall stability •Remotely operated mucking units	•Hard Data •Knowledge	
112	Water	**An inrush of fluidized overburden**	•The presence of low strength and fine overburden •Elevated water table levels •Soil liquefaction due to local seismicity	•A formal overburden management program	•Hard Data •Knowledge	
113	Emergency Preparedness	**No valid emergency preparedness plan in place**	•Failure to recognize the need for an emergency preparedness plan •No qualified staff available to develop a proper emergency response plan •Existing emergency response plan does not take into consideration all possible emergencies	•A formal emergency preparedness program	•Hard Data •Knowledge	
114	Falls from Heights	**Condoning working at heights from the bucket of a front end loader**	•Lack of desire in Ontario to stop this practice •Not designed for this type of work •Manufacturers do not condone this procedure •Illegal in neighbouring provinces •The lack of will to use other designed equipment for lifting and lower people	•S.O.P •Anti-dump valves on the cylinders	•Loss of life •Critical injuries •Lost time injuries •Potential with Extremely high severity	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
115	Environmental	**Injuries due to lightning strikes**	•No access to reliable weather reports •The presence of equipment or infrastructure having a significant vertical profile (i.e. high masts)	•	•Hard Data •Knowledge	
116	Electrical	**Genset safety**	•Inadequate personnel •Inadequate standard	•"Good electrical practice"	•Knowledge	
117	Maintenance	**Improperly maintained mucking equipment**	•Inadequate maintenance programs for mucking equipment •Unavailable replacement parts for mucking	•Access to qualified maintenance staff for mucking equipment •A formal maintenance plan and schedule for mucking equipment	•Hard Data •Knowledge	
118	Maintenance	**Improperly maintained drilling equipment**	•Inadequate maintenance programs for drill units •Unavailable replacement parts for drill units	•Access to qualified maintenance staff for drilling equipment •A formal maintenance plan and schedule for drilling equipment	•Hard Data •Knowledge	
119	Emergency Preparedness	**Lack of appropriate eye wash stations**	•Showers and eye-wash stations not properly maintained	•	•Hard Data •Knowledge	
120	Blasting	**Inadequate or no pre-blast design**	•Lack of appropriate technical resources •Inexperienced blast designers •No technical support available from explosives suppliers	•Blast design regulations •Designated blast design staff with appropriate credentials •Access to consultants with blast design expertise	•Hard Data •Knowledge	
121	Emergency Preparedness	**Lack of Rescue and First Aid training**	•Lack of training •Wont be needed •Wont happen to us •The fire department is just down the road	•MOL	•	
122	Blasting	**Premature detonation as a result of drilling into explosives**	•Lack of drilling procedures, protocols or policies for drilling into hole remnants •Improper blasting techniques applied on previous shifts •Remnants of un-blasted or partially blasted holes not visible •Inaccurate drill hole alignment •Wrong explosive types used in pervious blasts	•Drill monitoring to ensure proper hole alignment •Procedures for dealing with frozen blasts •Hole clean procedures •Procedures for dealing with bootlegs	•Hard Data •Knowledge	
123	Guarding	**Struck by material falling from conveyor**	•Lack of safe practice •Working too close to machinery	•Cordon area off where there is the risk	•Observation	
124	Blasting	**Improperly stored explosives and detonators**	•Detonators and explosives not stored separately •Poor house-keeping in magazines •Magazines capacity limits exceeded •Lack of knowledge of magazine requirements	•Explosives Regulatory Division (ERD) standards •Inspections •Proper magazine design and construction practices •Magazine inspection procedures •Inventory practices for explosives and detonators to keep track of consumption •Proper magazine maintenance and housekeeping practices	•Hard Data •Knowledge	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
125	Maintenance	**Improper use of Torches/Welding**	•Lack of industry wide document or standard	•SMT Flame Cutting Equipment module	•Intuition	
126	Guarding	**Caught in conveyor or any moving equipment**	•Guards missing •Age of equipment – doesn't meet current standards for guarding •Improvised guards – not adequate •Knowledge of law and best practices •Supervisor condones unsafe act •No internal enforcement •Risk taking •Stop cords missing or not working	•Legislation •Lock and tag •Communication – start up horns •Inspections and corrections •Internal discipline	•Data •Observation	
127	Ground Stability	**Gound instability while drilling**	•Adverse structural geology present in benches •Excessive bench heights •Bench walls too steep •Cavitation having occurred in bench face	•Access to geological expertise to enable an understanding to effect of geologic structure on wall stability •Remotely operated drill units	•Hard Data •Knowledge	
128	Occupational Disease	**Exposure to blast gases**	•Premature access allowed to mines following blasts •Too many holes blasted at once	•A formal protocol for mine re-entry following blasts •A blast gas monitoring program	•Hard Data •Knowledge	
129	Mine Design	**Poor infrastructure planning**	•Failure to follow plan •Not having the proper plan •Inability to predict operational needs	•A formal mine design and implementation plan and schedule		
130	Guarding	**Entanglement around rotating drill steel**	•Unguarded drill steel •Driller in close proximity to drill unit	•Appropriate guarding for rotating drill steel •Remotely operated drill units •Barricades or fencing preventing access to drill steel	•Hard Data •Knowledge	
131	Training	**Movement of drill unit mast while drilling**	•Improper positioning or setting up of drill unit prior to drilling	•Formal procedures and training	•Hard Data •Knowledge	
132	Emergency Preparedness	**Lack of functional fire extinguishers in shops and garages**	•Failure to replace expired fire extinguishers	•	•Hard Data •Knowledge	
133	Blasting	**Incomplete blasting records**	•Lack of appropriate technical resources •No back-up files maintained to compensate for lost records	•Regulation	•Hard Data •Knowledge	
134	Illumination	**Insufficient lighting while drilling or blasting**	•Requirement to drill outside of daylight hours •Supplemental lighting unavailable	•The provision of supplemental lighting when drilling and loading holes outside of daylight hours •Imposing restrictions on when drilling and loading of holes can occur	•Hard Data •Knowledge	
135	Mine Design	**Close proximity to overburden while drilling**	•Inadequate stripping of overburden •Fluidized overburden have flowed close to active benches	•A formal protocol for overburden removal	•Hard Data •Knowledge	

#	Category	Event (Situation/Condition) that could result in Injury or Illness OR What could keep you up at night?	Contributing Factors	Current Controls	Evidence	Risk
136	Illumination	**Insufficient lighting while mucking**	•Requirement to muck outside of daylight hours •Supplemental lighting unavailable	•The provision of supplemental lighting when mucking outside of daylight hours •Imposing restrictions on when drilling and loading of holes can occur	•Hard Data •Knowledge	
137	Mine Design	**Improperly stored diesel fuel**	•Fuel storage facilities improperly designed or not built to specification •Poor planning towards estimating fuel requirements •No procedure or protocol in place for disposing of contaminated fuel	•Adequate designs for fuels storage facilities •Regular inspections of fuels storage facilities •A formal process for updating fuel inventories	•Hard Data •Knowledge	
138	Occupational Disease	**Exposure to blast concussion or vibrations**	•Improperly designed blasts (i.e. too many pounds of explosives per delay blasted) •Workers and mine infrastructure located in close proximity to blasting locations	•A blast vibration monitoring program	•Hard Data •Knowledge	
139	Mine Design	**Opening of Pit without proper design**	•Lack of information •No risk assessment done on the area •Dig now and act later •No non-routine done till after incidents happens •Production •Lack of supervisory experience and knowledge dealing with open pits •Lack of information to workers •Unstable ground	•Regulations •Training resource	•Assessments •Field visits •Supervision with knowledge of surface pits •Events	
140	Mine Design	**Falling trees during production**	•Inadequate procedures, protocols or policies for tree removal practices •Tree removal crews improperly trained	•Procedures for tree removal	•Hard Data •Knowledge	