FCX Department of Occupational Health and Safety		SOP #	FCX-15
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Surface Blasting Policy	**Task Risk**	**X**	**High**
			Medium
			Low
			NA
Approval Date: 10/29/2021	**Original Date: 11/30/2011**		

Contents

1.0 Purpose and Scope

The purpose of this section is to outline the purpose and scope pertaining to the implementation of and adherence to the Policy.

Purpose	This policy outlines minimum requirements for surface blasting at all FCX operations. This document provides a set of standards that will be addressed in site SOPs.
Scope	This policy applies to all FCX employees and contractors involved in blasting activities. Sites have varying levels of interaction with Blasting Contractors; these policies apply regardless of the degree of contractor involvement. Ultimately, a Responsible FCX Employee (exempt) will be accountable for all surface blasts on site including project work.

2.0 General Requirements

The purpose of this section is to outline the general requirements pertaining to the implementation of and adherence to the Policy.

General Requirements	• Each site will clearly designate a Responsible FCX Employee • Blasting ensure locations and expected blast time will be communicated to affected work groups daily • Blast initiation devices will be serviced every 2 years or more frequently if specified by the BSST recommendations. • Each site will have an approved lightning detection system and safety procedures in the event of an approaching electrical storm. This system needs to be able to cover the entire site and provide warnings of potential lightening conditions

- All blasting processes will be carried out in a safe and efficient manner.
- There will be no implied haste
- All blasting incidents need to be reported to OI Blasting representative in a timely manner.

3.0 Responsibilities and Duties

3.1 Responsible FCX Employee

Responsible FCX Employee and Responsible Exempt Employee will:	
Blasting Process	Provide field oversight of the entire blasting process. (Ensure delivery of the blasting plan to the crew and monitors work to ensure SOPs are followed). The exempt responsible employee will be present at the firing point to oversee the blast clearing process. For all of the sections of the blasting process prior to this stage the responsible FCX employee does not have to be an exempt employee.
Blast Design	Ensure the blast design has been reviewed by a qualified person to verify that the initiation plan and hole timing are reasonable. If more than one shot is planned, the initiation plan and delay between shots will be evaluated to ensure that the shots do not interfere with each other. Timing software will be used to design timing.
Compliance	Be knowledgeable in ATF, MSHA and/or other local blasting related regulations. Understand and comply with the policies (this document).
Inventory Control	Verify daily transactions of magazine inventories and conduct monthly reconciliation comparing explosives in magazines with explosives in the SAP system.

3.2 FCX and Contractor Supervisors

Supervisors for both FCX and Contract companies will be in charge of the pre-shift meeting and:	
Allocation of resources	Assess the workload for crewmembers and allocate resources as appropriate to minimize distractions and decision-making errors.
Accountability	Supervisors will ensure that employees comply with this Policy and all site SOPs and procedures.

Contractor Safety Manual	Contractors will also comply with the Health and Safety (H&S) requirements in the BSST Policy and follow all of the Health and Safety policies of each site.

3.3 Mine Managers

Be knowledgeable in and abide by the policies (this document) and champion safe blasting processes.``	
Leadership	Provide leadership that minimizes perceived haste.
Audits	Ensure internal audits are performed and action items are addressed. Audits are required to be posted on the Blasting Safety Steering Team SharePoint Site.
Staffing	Ensure that sufficient and capable staff are available to oversee blasting processes. Ensure that where contract personnel are utilized, an FCX employee is assigned as the FCX representative to oversee blasting operations.
Resources	Ensure that sufficient resources (people, equipment, etc.) are available to safely facilitate blasting processes.

3.4 Blockers and Sweepers

Blockers and Sweepers will be FCX employees (for production blasts and secondary blasts) whose assignment begins at the pre-blast meeting. If required by contract, contractor employees may be used as blockers and sweepers as long as they have been trained to FCX standards and this training is documented. FCX will need to insure that the contractor company will allow their employees to be used as blockers and sweepers. Responsible FCX employee will supervise all blocking and sweeping assignments for FCX and contractor employees.	
Blocker Responsibilities	Blockers are responsible for: • Blocking traffic at the assigned area • Understanding and repeating back the assignment • Following instructions without deviation • Stopping the initiation process if a deviation to the blocking plan is detected
Sweeper Responsibilities	Sweepers are responsible for: • Proceeding from the blast site and clearing the area assigned • Understands and repeats back instructions

	• Help close “back doors” (see section 9.0 for definition) for other sweepers • Clear all equipment of personnel in the assigned area • Ensure there are no people on board, follow site SOP’s for clearing personnel form equipment or buildings. • Best practice for clearing personnel from equipment or buildings for example, during shovel PM’s. If there is concern, about the sweeper not being familiar with the inside of a shovel then the responsible maintenance personnel for that shovel PM will be contacted and he will be held responsible for clearing personnel from shovel and will confirm that all of his people are clear. • To ensure that all benches that have access to main haul roads are physically cleared prior to the blast
Training	All blockers and sweepers must have documented training prior to being assigned these responsibilities.
Contractor Blasters	All sites utilizing contractors for blasting will ensure that contractors understand and comply with this policy.

3.5 FCX Blasting Safety Steering Team (BSST) Requirements

The FCX Blasting Safety Steering Team (BSST) will evaluate existing standards, set new policies, and monitor site performance through audits

Required Members	• Sponsor, GM level or Director Level • Site champions representing all business units • A health and safety representative
Audit Requirements	The BSST will conduct annual audits at mine sites to monitor compliance, look for best practices, and provide feedback for continuous improvement. Audits will include review of compliance with FCX policies, training, site SOPs, and field practices. Follow-up audits may be conducted depending on site performance. A standard format will be used for the audits.
Annual Meeting	An annual meeting will be held with all core members to review practices and make recommendations for change where needed.

3.6 Site Blasting Safety Steering Team (BSST) Requirements

Each site will have a Blasting Safety Steering Team to ensure that the site is following FCX blasting policies and monitor site performance. Internal audits will be posted on the BSST share point.

Required Members	Sites will establish the site BSST consists of these members: • Sponsor-Mine Manager • The site champion

	• A geotechnical engineer • A health and safety representative • A member of the site blasting crew or fragmentation team • Contractor representative (if contractors are utilized)
Blasting Operations	Sites will include blasting operations as part of the risk assessments. Records will be maintained according to the FCX – Records Retention Policy 10 years.
Audit Requirements	Sites will complete regular internal audits of blasting practices to ensure compliance with this Policy. Action items will be tracked to ensure completion and follow-through. A standard question audit form is to be used. This form is found on the DOHS team site in the folder with this policy and on the BSST SharePoint page.
Audit Frequency	Site quarterly audits will be done quarterly and uploaded into BSST SharePoint, Audit Document, Property location, Audit Type : Internal Audit. https://fcx365.sharepoint.com/Sites/NA-MCOpImpr/Mining/Blast/SitePages/Home.aspx

4.0 Procedures

4.1 Identification of Blast holes - Drilling and Sampling

The purpose of this section is to ensure that holes are properly identified.	
Numbered Stakes	Numbered Stakes must be numbered consistently with the SOP of the site. Drillers will place a numbered stake at each cuttings pile and verify that the stakes are numbered correctly.
Extra Holes/Holes Not to be Loaded	Extra holes or holes determined to not be loaded (drilled for maintenance or any other reason) will be properly identified with a stake that reads “Do Not Load” or similar language or instructions that indicate that the hole should not be loaded. These holes will be filled or coned off prior to throwing out accessories (see section 9.0 for definition).
Site Procedures	Each site will develop a Safe Operating Procedure (SOP) to inspect the pattern for unlabeled holes and unsafe conditions and this will include steps to properly notify the responsible FCX employee should something not be completed properly.

4.2 Pre-shift Team Meeting

A pre-shift meeting will be held by blasting crews each shift.

Requirements	The pre-shift meeting shall include the following: • Work locations • Unique or continuing hazards/risks and the controls to mitigate • Equipment and personnel for assigned work • Hole specific loading instructions for a pattern (water, hardness, product, etc.) • List of amount and type of explosive products to be removed from the magazine for each shot based on the blast plan (Daily Explosive Worksheet) given to magazine manager daily • Identification of parties for communication and unique work being done in areas adjacent to the blast site • Preliminary blocking locations • The anticipated time of the blast • Identification of the responsible FCX employee • Other pertinent information

4.3 Pre-loading Work Place Inspection and Blast Site Conditions

The purpose of this section is to ensure that the risks associated with the blast are identified and controlled.

Blast map and area	A responsible FCX employee will verify that the blast plan map accurately represents the blast pattern in the field (i.e. number of holes, hole locations, problem holes). A map with the actual hole locations is to be used. Blast plan map(Clearance map) is to include unusual activities such as contract drilling, equipment, shops and projects taking place in blast area. The responsible FCX employee (exempt) will determine the boundaries of the blast area. The distance for equipment and personnel clearance will be determined by each site based on site blast specifics (an example is 500' for equipment (150mtrs) and 1,500' for personnel (450 meters) are typical horizontal distances but may need to be greater based on blasting practices and fly rock potential). Vertical distance components may reduce the horizontal distance above blast, but increase horizontal distance below blast.
Inspection requirements	Blast site inspections shall be performed before any blasting process starts. This will be documented on the blast summary sheet or other appropriate form. If the blast pattern is in an area where reactive ground "Hot Holes"are suspected to exist, all holes will be checked with a meter and probe to check on the bore hole temperature. These checks will not be done using a temperature gun.

	If the blast pattern is in an area where Low PH are suspected to exist, all holes will be sampled to check PH readings. Low PH will require different loading products and practices. If any holes indicate a temperature of 130 degrees Fahrenheit (54.4 degrees Celsius) or higher, they will not be loaded. Holes indicating a lower temperature will be loaded last, but be cautious of water conditions. During the inspection, blast site access and egress routes will be evaluated and appropriate actions taken to ensure safety prior to blast initiation.
Blasting Notifications	All potentially affected personnel must be informed of blast times and locations. This includes crews and personnel in potentially hazardous situations outside of the blast area. This will be done by an "all channel call" on the radio or other site-specific method approximately 30 minutes before blast.
Determining Boundaries	The following items shall be considered when determining the boundaries of the blast area: • Concussion of the blast • Potential fly rock distance • Fumes, ventilation and prevailing wind conditions • Air blast (see section 9.0) • Subsidence (see section 9.0) • Adjacent infrastructure • Equipment locations including maintenance activities • Noise and vibration • Geological features • Adjacent underground or surface workings • Hazards associated with the loading pattern • Weather conditions
Unlabeled Holes	Unlabeled holes that are discovered will be accurately identified by the responsible FCX employee using the blast plan map, and labeled with a numbered stake before loading.
Unloadable Holes/Holes Not to be Loaded	Blast holes not intended to be loaded will be labeled "Do Not Load", "Bad Order (BO)", or similar language, and filled in as soon as possible. Access to these holes will be restricted until safely backfilled, which will be done before accessory distribution. This is for production holes only, presplit holes may be coned off.
Addressing Questions or Concerns	Questions or concerns that arise from the blast site inspection will be resolved through consultation with the responsible FCX employee before the blasting process starts

4.4 Explosives Storage

The purpose of this section is to ensure that explosives are stored in compliance with all regulations	
Responsible Person	A person or persons will be assigned responsibility for managing the magazines for explosive storage. Written instructions for the operation of the magazine are required (SOPs). Two people are required to confirm ending inventory in each magazine daily. They must both sign and date their verifications of ending inventory on the daily magazine log sheets.
Fire Extinguishers	The location of all fire extinguishers will be clearly marked. Under no conditions should one fight a fire in an area near explosives except as necessary to escape the area. These areas include the magazine, prill and emulsions silos, powder trucks, and the actual blast site. In the event of a fire, all personnel should be kept a safe distance away, as determined by the site and the conditions.
Construction of Magazines	All outdoor magazines will be built to the Bureau of Alcohol, Tobacco, Firearms (ATF) standards and sited to the American Table of Distances. If a country's laws or standards differ from those in the US, the more stringent standard will be enforced. ATF Website MSHA Website
Lightning Protection	All magazines will be fitted with a lightning protection system; a sufficient grounding system will fulfill this requirement. Yearly records of grounding checks are required and must be documented. 25 OHMS of resistance or less is considered satisfactory.
Signage	All magazines will be properly signed from each approach indicating contents and have warnings such as: • "No Smoking" • "Explosives Stored Here" • "Authorized Personnel Only" • "No cell phones inside magazine " • "Radios will be turned off if taken into magazine" Signs will be placed so bullets fired at the signs will not impact the magazines. These signs will be in the primary language of the country. A best practice would be to also have signs in secondary languages that may be spoken in that country.
Sparking Devices and Cell Phones	Smoking, matches, open flames, and spark-producing devices and tools, are not permitted within 50' of a magazine or Blast Site.

	Under no conditions should one fight a fire in an area near explosives except as necessary to escape the area. These areas include the magazine, prill and emulsions silos, powder trucks, and the actual blast site. In the event of a fire, all personnel should be kept a safe distance away, as determined by the site and the conditions. Only essential non-sparking equipment used for the operation of the magazine may be stored with explosives. Smart phones, cellular phones or other transmitting devices are not permitted in the magazines.
Records	All magazines will contain a book or similar method for the recording of all explosives movements in and out of the magazine and current inventories. These books must remain inside the magazines for one year and onsite for 10 years. All magazines will contain an updated copy of authorization, permits, or licenses. All accessories must be inventoried and counted as each or units. Exception is detonator cord, which is counted as spools. When partial boxes are returned to, the Magazine they will be recorded as inventory and kept in the original boxes. A reconciliation of the explosives in the magazine will be done on a daily basis after partials are returned to the magazine and recorded on the Daily Explosives Worksheet. This reconciliation will be done at the end of blasting for that day. A reservation in SAP must be created for used explosive products at the end of the day or first thing next morning. GSC will review and process reservations in SAP system timely, as per GSC Policy.
Magazine Location	All magazines must be: • located outside the corridors of power lines • made secure with either a lockable gate and fence or lockable storage box for explosives, meeting the requirements of the applicable agency • in areas configured to prevent vehicle impact to the magazine • located in a proper manner to control surface drainage • All explosives accessories must be stored safely and in accordance with statutory regulations. • Areas around magazines free of rubbish, brush, dry grass and trees for a minimum of 25’ in all directions
Magazine Locks and Keys	The locks on magazines will be rotated per regulatory standards (once per year). If there is a change of personnel, the locks should be re-keyed within 30 days of their physical departure. Change of personnel is defined as a

	person who has had access to the magazine keys, either through management or as explosives handler and no longer require access to magazine keys. Locks will comply with ATF standards. Locks on magazines must have a minimum of a 3/8 inch shackle, have no less than 5 tumblers and be hooded. Day Boxes need to be locked no hood. Keys must be secured on-site with restricted access by use of a locking storage system. Possession of keys must be tracked by documentation.
Bills of Lading	Bills of Lading (BOL's) and packing lists shall be kept in a secure location for the specified minimum period of 10 years, per the FCX – Records Retention Policy. The Bills of Lading for explosives are to be delivered to GSC on the same day they are received. GSC is responsible for following their GSC policy for receiving and inventorying explosives.
Accurate Case Counts	The contents of all boxes of explosives will be verified for accurate case counts after being opened in the field and before distribution. In other words, the contents of each case will be counted and verified before being placed into the bags for distribution on the pattern. Any boxes that are found to be inaccurate (under or over) will be returned and isolated in the magazine for further investigation.
Partial Boxes of Explosives	If partial boxes are returned to the magazine, they must be re-issued as partials. These partials should be re-issued as soon as possible and taken out of inventory. Partials from different boxes may not be combined. Unused explosives must always be stored in the original packaging. New cases must not be opened in the magazine. They should be moved to the accessory truck as complete boxes and opened at the blast pattern.
Daily Explosive Worksheet	A Daily Explosive Worksheet will be created by the Responsible FCX Employee and given to the magazine manager during the pre-shift meeting. Based on the Daily Explosive Worksheet the magazine manager will remove explosives from the magazine first using remaining partials and then full cases. A reasonable amount of extra explosives should be removed from the magazine to account for contingencies. This amount can be up to 10%, and should normally be one full case per pattern. For large patterns, the 10% limit can require more than one full case. All unused explosives at the end of the day will be returned to the magazine as partials in their original box and recorded in the logbook. Mark quantity of partials, initial, and date on original box.

	Responsible person must verify inventory, any +/- deviation from 10% explosives taken to field and sign off on Daily Explosive Worksheet daily . Any deviations from planned versus actual amount of explosives being returned, must be documented for each blast.
Inventory	Inventory will be reconciled daily by magazine manager and verified by Responsible FCX Employee. Once a month GSC will perform an audit of the magazines. They will reconcile actual inventory on hand versus inventory in GSC SAP system, as per GSC Policy.
Shortages	A responsible FCX employee ("the discoverer") will notify the manufacturer, supplier, ATF, and local law enforcement within 24 hours of the discovery of accessory shortages related to a site issue. If the shortage is due to a manufacturer/supplier issue, only the manufacturer/supplier needs to be notified. All shortages will be documented and reported to supervisor, management and GSC.
Overages	In the case of overages, only the manufacturer and supplier need notification. All overages will be documented and reported to supervisor, management and GSC.

4.5 Explosives Transportation

The purpose of this section is to ensure that explosives are transported safely and in accordance with regulations.	
Transporting Explosives	All explosives, detonators, and accessories will be transported in accordance with statutory regulations ("day boxes", Type 3 magazines). Day boxes with explosives must be locked in transit. Day boxes holding explosives will be used exclusively for explosive material. If other types of material needs to be stored in a box the box must not contain any explosive material. The truck transporting explosives will have a driver and a person to help load and unload only, it is not to be used to transport people.
Signage	Explosives transport vehicles will have the proper placards, visible in all four directions. Explosives trucks will display red or orange flags while transporting explosives.

Fire Extinguishers	Vehicles must be equipped with two multipurpose dry fire extinguishers. Under no conditions should one fight a fire in an area near explosives except as necessary to escape the area. These areas include the magazine, prill and emulsions silos, powder trucks, and the actual blast site. In the event of a fire, all personnel should be kept a safe distance away, as determined by the site and the conditions.
Day Boxes	Day boxes must be securely fastened to the vehicle or confined within the vehicle body to prevent spillage. Must be made of non-sparking materials for container lining and fasteners and must comply with all ATF standards for Type 3 magazines. Detonators and boosters transported on the same vehicle must be stored in separate, compliant day boxes. No other materials will be transported in day boxes with explosives. Day boxes must be locked on the pattern when products are not being loaded or unloaded. Day boxes with explosives must be locked when unattended. This means when there is no one by the truck, it will be considered unattended.
Capacities	The volume and quantity of explosives will not exceed the limits established by regulatory authorities. Vehicle loads must be within the rated vehicle carrying capacity.
Inventory	Means to control of inventory of explosives in the field must be established.
Disposal	Explosives refuse (empty boxes) must be inspected, broken down, and disposed of properly on site.

4.6 Priming

The purpose of this section is to ensure that detonators and primers are handled safely and usage matches blast design. This will allow for proper accounting of detonators and primers prior to loading.	
Preparation	All holes will be measured for depth and water level before priming. The responsible FCX employee will be notified of any significant variance from expected measurements before the hole is primed.

	No blasting accessories are to be laid out on a blast pattern until the blast site is secured, barricaded and all clean up with equipment has been completed. All non-essential vehicles and personnel must be kept off the blast site before blasting accessories are laid out. Small vehicles should have a designated parking area out of the traffic pattern for larger vehicles working in blast site. Each site is responsible for small vehicle/equipment parking procedures for parking inside blast sites. Explosives products will be laid out in a careful, efficient, and well-coordinated manner (between holes, on the outside of the cuttings pile and out of the flow of traffic). Boosters and detonators must be separated with a minimum of 1 foot(.3048m) when laid out at blast hole. Canvas stake bags will be used to carry explosives accessories while laying out the accessories on the blast patterns. Ensure that persons carrying blasting accessories, limit the total weight being carried to a safe limit.
	The blast site will be secured with yellow cones or yellow tape (or a combination of both) and warning signs will be used to block all accesses to the blast pattern to be primed and loaded. Permission for entry must be given by the person in charge of the pattern. Best practice of having everyone sign off on a workplace examination form, HART form, JHA form or etc. is recommended to document anyone who enters a blast site.
Inventory	A physical inventory of boosters and detonators used for the blast will be done in the field at each blast pattern and verified against the blast plan map count. This count must be completed when all blasting accessories have been distributed on blast site. The responsible FCX employee will verify the detonator and booster inventory after the products are laid out to ensure that the amount used matches the blast plan for each pattern. Documentation of this check is required. If there is a discrepancy, it must be resolved before any more activity is conducted on blast site. This inventory will be done before the accessory truck leaves the blast site.
Detonators and Boosters	All detonators will be fully enclosed within the booster according to the manufacturer's recommended procedures. An acceptable, standardized weight system must be used to ensure proper placement of the booster in the explosives column when loading wet hole products (pumped products). The use of rocks tied directly to a booster is not acceptable. A mesh bag containing a rock or other type of (non-sparking)

	weight along with rope or harness wire tied to bag and booster is recommended for wet holes. When down hole detonators are used, a redundant down line will be required. At least one of the detonators will be an electronic type capable of having its integrity verified from the surface. In blast sites(patterns) with hot holes (reactive ground) are to be loaded, (see page 9) these holes will be primed and the booster with down lines lowered into the hole immediately before being loaded and will be loaded last. In blast sites(patterns) with Low PH levels will be primed and loaded differently(see page 9) using blasting accessories or procedures for low PH levels.
Securing Downlines	Downlines must be anchored securely into position at the surface in the cutting piles. Wooden stakes or poles will be used. Best practice of using rubber bands tied on downlines with minimum 1-foot loop and attached to drill stake is recommended.
Primers	Primers will be assembled only at the hole collar and will immediately be carefully lowered into the hole. Priming will be done in a manner to facilitate efficient advancement of the bulk loading trucks.
Issues	Issues to normal procedures must be documented and reported to the Responsible FCX Person.

4.7 Loading

The purpose of this section is to ensure that holes are loaded per the blast design and that problems that arise during loading are dealt with appropriately.	
Before Loading Holes	Loading personnel will know the upper weight limit of product to be loaded and the planned stemming height of each hole. Each hole should be loaded according to the blast loading sheet. Any extra amounts that are loaded will be done with the consent of the responsible FCX employee.
Interruptions	Interruptions in the loading process will be documented and communicated to the responsible FCX employee.
Loading	The powder column rise of each hole will be monitored until the stem height is achieved or the maximum load is reached. Any deviation from expected column rise over a set amount during loading will be immediately brought to the attention of the responsible FCX employee. Each site is required to include this process in operating procedures.
Loading Trucks	Loading trucks will wait to load holes until there are enough holes primed to keep the loading process continuous. If required, guides will be used to maneuver loading trucks around tight spots on the patterns.

	In the event of reactive ground, “hot holes” will be left unloaded and unprimed until all of the other holes have been loaded and stemmed. These patterns should be fired as soon as loading, stemming, and tie-in have been completed. It is highly recommended that buffered emulsion (inhibited) product be used to load these holes. Technical questions about this procedure should be discussed with your explosives supplier. Each site should have an SOP for dealing with reactive ground (hot holes) and know in advance when they are going to be drilling into potentially reactive ground. All loaded holes will be marked with unique color of spray paint, so everyone knows the hole has been loaded. Density checks on loaded product must be done daily or on a regular basis. These density checks must be documented. All loading trucks will be parked off the pattern after loading is finished.
After Loading Holes	After loading, downlines must be checked prior to stemming to ensure that the booster and detonator are properly embedded in the powder column. Upon completion of the loading process, the loaded hole count must be verified against the blast plan and documented by the responsible FCX employee & loading contractor.
Pre-Logging (Continuity Checks)	Pre-logging to determine whether the electronic detonator has continuity, will be done after hole has been loaded with product. If the electronic detonator does not respond, correctly another set of primers should be utilized with enough explosive loaded on top to secure the second booster and detonator. Best Practice - Person doing pre-logging is responsible for checking to make sure downlines catch in powder column then check electrical detonators for continuity and then paint drill/blast stake with unique color of spray paint, so everyone knows the hole has be loaded, pre-logged(continuity checked) and ready to be stemmed. Best Practice - Document pre-logging by using report from logger to confirm it was checked and number of holes match product laid out and loaded by SWE.
Recordkeeping	The required records must be kept for every hole loaded.

4.8 Stemming

The purpose of this section is to ensure that stemming activities are done in such a way to eliminate cut downlines, “bridge overs” (see section 9.0 for definition) and help identify problem holes.

Material and Equipment	Clean material (minimum fines), crushed gravel, as specified in the definition of stemming, and sized for the diameter of the hole being loaded is required; cuttings will not be used.

	A side-dump articulating loader is the recommended equipment to load the material. This loader will be used with the proper side dump bucket.
Stemming Operators	Stemming operators shall: • Safeguard against oversized material being accidentally introduced down blast holes. • Stemming operators must be properly trained in procedures used in case of a lost, cut or damaged down line, stemming operators shall inform the responsible FCX employee of any problem holes
Before Stemming	The stemming process will not begin until after the loading is far enough ahead, so that stemming activities will not interfere with the loading process. Stemming material shall be strategically placed at the blast site using a spotter. Instead of using a downline attendant, rubber bands shall be used to tie onto the downlines and anchor them to the drill stake with a minimum of a 1 foot loop for slack. (Using rubber bands eliminates safety concerns of being in the line of fire of both stemming bucket and dust)
Downlines	Detonator downlines will be positioned to minimize damage. Downlines will be secured prior to explosives loading and stemming. Stemming material shall be carefully poured down blast holes to minimize downline damage and control dust. Stemming piles should be wetted down to prevent dust.
Problem Holes	The responsible FCX employee must address and ensure that any and all "problem holes" are reported on the Blast Summary paperwork. Unloaded or "bad" hole information should be included as well.

4.9 Tie-in

The purpose of this section is to ensure detonation of all holes in the blast pattern and proper timing of all holes.

Before Beginning Tie-In	Tie-in of pattern will begin only if it will not interfere with other blasting unit processes and the blast site is free of distractions to those doing the tying-in. Persons responsible for tie-in and logging should be listed in the blast documentation.

Detonator Count Check	Detonator count will be obtained from the data logger and a check made against the field inventory of detonators and boosters recorded on the Blast Summary Sheet (adjusted for "bad" or extra det's used if necessary). Any discrepancy must be reported to The responsible FCX employee and rectified before moving into the blast initiation stage.
Blocker Notification	A shift supervisor and\or shot blockers and sweepers should be notified at least 30 minutes prior to completing tie-in so that shot blockers and sweepers can prepare for the pre-blast meeting.
Blast hole Diagram	The responsible FCX employee shall generate a tie-in sequence diagram of every blast hole. This diagram will be included with the other blasting documentation required from the daily blasting activities. The responsible FCX employee shall review the sequence diagram with personnel doing the tie-in.
Pre-splits or Secondary Blasting	After tie-in is complete, the pattern must be independently checked by two individuals, verifying completeness and matching to the blast map. Both shall initial the check on the Blast Summary.
Equipment Required	Programmable electronic detonators with accompanying software and hardware are required. Alternate methods may be used for pre-split and secondaries if proper tie-in and timing are assured (see paragraph above: Pre-splits or Secondary Blasting).
Using Programmable delays	When using programmable delays, the blast crew will use the logger tests to verify hook up reliability. If a "bad" detonator is encountered the back-up detonator will be utilized. (See section 4.6 Priming: Detonators and Boosters) Documentation of the situation and extra product usage on the Blast Summary is required.
Final Checks	Non-essential personnel should be removed from blast site prior to final tie-in checks. Personnel performing final checks must be listed on blast summary documentation.

4.10 Pre-blast Meeting

The purpose of this section is to ensure that all personnel involved in the clearing and initiation of a blast are clear about assignments, properly equipped and knowledgeable of responsibilities.	
Prior to Pre-blast Meeting	Prior to the pre-blast meeting uniquely numbered blue cones will be placed to MARK the blocking position.
Attendance	The responsible FCX employee will conduct the meeting. This meeting will be a face-to-face meeting and will include all blockers and sweepers. This meeting must take place at the blast site or in the blast area. **NOTE:** In special cases where equipment operators are used for blockers and they are restricted by long distances from attending, it is permissible for them to be told about assignments on a one-on-one basis by the responsible FCX employee. **Best Practice Recommendation**: Use a detailed guarding map with assignments and routes marked, when assignments are given in advance. All blockers will remain at the meeting until the meeting is over.
Receiving Assignments	Each blocker and sweeper will receive their assignment at the meeting and the responsible FCX employee will ask them to repeat back the assignment, their responsibilities, and ask if they have any further questions.
Document	Blockers\Sweepers and their assignments must be documented.
Equipment	Yellow cones will be provided for each blocking position to block the full width of the road.
Vehicles for Clearing and Blocking	All vehicles used for clearing and blocking will be equipped with a functional two-way radio and functioning beacons and /or flashers. If vehicles are not used for blocking, a person with a flag (or suitable signage), radio, and yellow cones is acceptable.

4.11 Clearing\Sweeping the Blast Area

The purpose of this section is to ensure that the blast is properly cleared and that all affected personnel are notified.	
Employee Requirements	Clearing for a shot will be directed\supervised by a Responsible FCX Employee who is an exempt employee. Those clearing\sweeping for a shot must be qualified FCX employees who have been properly trained. This training must be documented.

	Contractor employees may be used for blockers and sweepers if they have been properly trained and the training is documented.
Direction for Clearing	Clearing an area for a blast will begin at the blast site and proceed outward.
Notification Required	All affected personnel will be notified prior to clearing to allow for orderly preparation and evacuation of the blast area.
Equipment	All affected equipment will be positioned or relocated to a safe position to prevent damage from fly rock or blast vibration. All equipment in the blast area will be cleared of personnel following site-specific procedures or SOPs.
Guarding Entries	During clearing, all entries previously cleared will be guarded to prevent re-entry into the cleared area ("back doors" will be held).

4.12 Securing and Holding Blocking Position

The purpose of this section is to ensure that blocking positions are never compromised and clear, concise communication is maintained between the responsible FCX employee and each blocker.

Duties of Responsible FCX Employee Exempt

Securing and holding of blocking positions will be overseen by the responsible FCX employee (exempt). A responsible FCX employee (non-exempt) may be used to carry out the duties below if directly supervised by the responsible FCX employee (exempt) unless otherwise stated. Duties include:

- Prior to pre-blast meeting, determine blocking locations and place a uniquely numbered blue cone at each location. This is to mark the blocking location NOT to block the road. Best practice is to place these cones out as early in the morning as possible so traffic will know blocking areas when its time to clear blast area.
- The clearance map for each blast will be the responsibility of the responsible FCX Exempt employee.
- Maintain a blocker checklist and use it to verify completion of assignments.
- Complete a redundant check with each blocker prior to the last blast warning.
- Instruct each blocker to hold their position if a delay occurs.
- At the end of the delay, check with each blocker before continuing with the last blast warning.
- Maintain a blocker and sweeper checklist and use it to verify completion of assignments.
- Document any unplanned situation during any part of blocking and securing procedures

Duties for Blockers (also see Section 3.4 Blockers and Sweepers)	Blockers will: • Be trained to FCX standards and the training documented • Drive to assigned blocking location identified by the corresponding uniquely numbered blue cone • Turn vehicles or equipment used for blocking perpendicular to the flow of traffic (if vehicles are used) • Use a minimum of 3 yellow blast cones to block all of the road • Have contact with the responsible FCX employee via radio • Communicate to the responsible FCX employee, in detail, actions taken to clear the area (if sweeping) and that the blocking position is secure • Not permit entry to the secured area by anyone without permission of person in charge of the blast
Duties for Sweepers (also see Section 3.4 Blockers and Sweepers)	Sweepers will: • Sweep and clear equipment and pick up personnel in assigned area • Assist other sweepers with "holding back doors" while benches are cleared • Clear all the way out to the assigned blocking location • Communicate to the responsible FCX employee, in detail, actions taken to clear the area and that the blocking position is secure (if blocking)

4.13 Blast Initiation

The purpose of this section is to ensure all detonators are communicating, the blast area is clear, and that all blocking positions are secure.

Direction/Supervision	Blast initiation will be directed/supervised by a Responsible FCX Employee (Exempt Employee).
Blasting Time	The Responsible FCX Employee will determine if enough time remains before sunset so that, there will be enough light to conduct a post-blast inspection.
Blast Initiation Location	Blast initiation will take place from a location safe from hazards resulting from blasting and where the blast can be viewed. The blast initiation location will be a safe distance from electrical interference (e.g. power lines, power cables, radios). Radios/Drones/Sirens or any equipment that could cause electrical interference with initiation system, must be kept a minimum of 25 feet from blasting equipment during the initiation process.

Firing/Initiation System	The box on the pattern can be armed or turned on and the dongle can be removed and taken to the firing point when the Blast Site has been cleared and the guard has been removed. The firing dongle is not to be put into the firing box unless told to do so by the responsible FCX employee and the blast area has been cleared. The firing/initiation system will be in the possession of the blasters and under control of the responsible FCX employee at all times. The firing/initiation system will be connected by the responsible FCX employee (exempt) or a person under his/her direct control. The responsible FCX employee overseeing the blasting process must be at the firing location.
Radio Communication	Two-way radio communication between the responsible FCX employee and all blockers will be maintained throughout the clearing, blocking and initiation processes.
Communication Devices/Errors	The responsible FCX employee will ensure that all electronic detonators used in a blast continue to "communicate" with the blast initiation device throughout the blast initiation process. The "communicating detonator count" will be checked against the "detonator used count", verified during priming and loading. Shooting "through errors" or "with errors" (see section 9.0 for definitions) is strictly forbidden. All blasts must be videoed if possible.
Failure to Detonate Procedures	Blasting personnel will be competent in safe practices in the event that a blast fails to detonate. If the pattern must be "re-entered", the blasting equipment must be "safed" (dongle removed and in the possession of the person re-entering the pattern). Site procedures or SOPs must address this procedure and be followed. The waiting period for a shot that has been aborted during the arming process, whether it has electronic and/or pyro detonators, is 5 minutes. For misfires, the wait time is 30 minutes for Electronic Detonators and Pyrotechnic Detonators.

4.14 Post-Blast Inspection

The purpose of this section is to ensure that the blast holes have been detonated and the area is safe for re-entry.	
Requirements	A post-blast inspection will be performed under the supervision of a Responsible FCX Employee and documented. After a successful blast, the Blast Area may be entered after a 5 minutes wait period or when the dust clears. Secondaries and pre-split Blast Site will be walked for post-blast inspections. If the inspection involves walking on the blasted material a "spotter" must be in close proximity. The post blast inspection can be done by walking the blast site or by other visual means. This includes using: • binoculars, • looking over the high wall • zoom cameras • drones • other acceptable means
Electrical Storm	In the event of an electrical storm, wait until the warning system has indicated an “all clear” before re-entering the blast site.
Blockers	All blockers will remain in place during the post-blast inspection.
Completing the Inspection	Yellow cones will demarcate the blast site until the post-blast inspection is complete and the responsible FCX employee gives the “all clear”.
Re-Entering Blast Site	A minimum of 5 minutes must elapse before re-entry into the blast area. Do not re-enter if noxious fumes or excessive dust clouds are present. Care should be taken not to endanger personnel.

4.15 Blast Monitoring

The purpose of this section is to ensure that blast vibration data is recorded and utilized to manage slope stability.	
Viewing	Blasts will be viewed from above if possible.
Monitoring system	A blast vibration monitoring system-utilizing seismographs must be instituted and actively managed and utilized by both Blasting and Slope Stability personnel.

	The records of the seismograph readings must be readily available, up to date and shared with appropriate personnel. Information from seismograph readings pertaining to signature holes must be used as recommendation/implementation for timing of blasts.

4.16 Misfired Hole Procedure (CFR 56.6311)

The purpose of this section is to ensure that personnel involved in blasting and operations processes are trained to recognize a misfire and are familiar with the procedures for dealing with a misfire.

Blasting Personnel Duties	Blasting personnel must: • Know the definition of a misfire hole, live hole, bad hole, & problem hole. • Be familiar with the blasting products used. • Be familiar with what a misfire looks like. • Know how to determine if there is a misfire. • Be familiar with the waiting period for a suspected misfire, which is 30 minutes before you can enter Blast Area.
Process for Misfire and Live Holes	If there is a misfire or live hole, blasting personnel will: • Restrict access • Document and handle them properly • Mark in the field in an easily recognizable manner ○ Minimum 30 foot (10m) in diameter with red or appropriate flagging attached to Lathes and signage stating barricading reasons • Enter the hazard into shovel/loader computer GPS systems (if used) to alert shovel and loader operators of the location • Notify all supervision/management who will be affected by the hazard area • Inspect bench floors for evidence of any misfired product remaining after mining through • Safely dispose of misfired (recovered) products following site SOP's • Offset future drilling locations to prevent from drilling into explosives possibly remaining in the bench floor
Training and Annual Refreshers	A safety session on unfired powder, column, and blasting component recognition will be part of all mine personnel, training including annual refreshers.
Reporting Misfires	Misfires/Live, holes occurring during the shift shall be reported to mine management no later than the end of the shift.

	If a misfire is uncovered while loading shot material, the loading equipment should be moved to a safe loading location until the misfire can be properly investigated, during daylight hours.
Investigation/ Documentation	Treat as a serious event and investigate causes for all misfires/live holes. Develop and share action plans.
Barricading	Barricades will be placed a minimum of 30 feet from the center of the misfire. All access points must have signage (blasting, explosives, etc.) restricting access.
Faces & Muck Piles	Faces and muck piles shall be examined for misfires after each blasting operation.
Work in Affected Area	Only work necessary to remove a misfire/live hole and protect the safety of miners engaged in the removal shall be permitted in the affected area until the misfire is disposed of in a safe manner.
No Safe Disposal Possible	When a misfire/live hole cannot be disposed of safely, each approach to the area affected shall be posted with a warning sign at a conspicuous location to prohibit entry, and the condition shall be reported immediately to mine management
Checking for Firing Ability	If it can be safely fired, all equipment and personnel must be moved out further than the normal clearance limits. Clearance limits are site specific and are determined by the responsible FCX employee. In most cases, it is much safer to dig out a misfired powder column following site procedures or SOPs. Also, ensure site procedures are followed when removing any boosters or detonators from a misfire.
Misfire Handling Procedures	Reference site SOP

4.17 Sleeping / Guarding Shots, Lightning Storms

The purpose of this section is to ensure shots slept overnight are safely managed. Each site will have a procedure for sleeping shots.

Overnight	Shots can only be slept overnight for these reasons: • breakdowns rendering equipment immovable • weather • darkness • environmental or social reasons

Physical Guard	Shots slept overnight will be guarded by at least one person and barricaded to prevent unauthorized access to the blast pattern.
Variance signatures	Variance for shots slept will be signed off on by the Mine Manager using the Surface Blasting Exemption Request Form and General Manager will be notified. If after normal operating hours electronic confirmation for signatures will be accepted as sign offs on variance forms.
Longer than 72 hours	If blasting of a loaded hole may be delayed for more than 72 hours, the operator shall notify the appropriate MSHA district office.
Harness wire	If a shot is slept all harness wires will be disconnected, if can be done safely.
Sleeping a shot during red alerts	If a shot, is being slept and a red alert warning is activated, all clearing and blocking procedures for a regular blast must be followed. If there is potential for red alerts occurring during the sleeping of a shot, a detailed guarding plan must be made by the responsible FCX employee and communicated face to face with the oncoming mine operations shift supervisor. The plan must consist of detailed guarding locations (maps) and instructions of what areas need to be cleared to meet all safe distances for a blast zone. All blocking positions must be marked in daylight hours with numbered blue cones and the guarding sheet provided with all numbered blue cones locations. All aspects of the blast must be communicated to the mine operations supervisor, who will be in charge of clearing, blocking and lifting of guards when determined safe to re-enter the area when red alert is lifted.

4.18 Lightning Storms/Red Alerts during Blasting Process

The purpose of this section is to ensure shots are safely managed during electrical storms or red alerts. Each site will have a site-specific procedures for red alerts during blasting process.

Detection system	Each site must have a lightning detection system in operating order. • Have a site specific SOP detailing procedures, settings and how their systems are used and maintained. • The detection system must be capable of measuring potential and actual lightning strikes. • Each site is responsible for determining their boundaries for yellow alerts, and red alert, due to lighting strikes.
Red Alert for lightning strikes	During the approach and progress of an electrical storm that causes a red alert, Surface blasting operations shall be suspended and persons withdrawn from the blast area by responsible FCX employee and blasting crew.

	If the Responsible FCX employee or blasting crew determines at any time that there is the potential for lightning strikes within the blast area (with or without warnings from lightning detection systems), they may suspend operations and withdraw personnel from blast area.
Clearing Procedures	In the event of an approaching electrical storm, the responsible FCX employee (exempt) or a designated shift supervisor will be responsible for clearing the blast area in the same manner as clearing for a blast. People will be cleared to the boundary of the blast area by normal blasting clearing and blocking procedures. Any vehicle carrying explosive products will be left on blast site and all personnel cleared from blast site and blast area.
Initiation of blast during Red Alerts	Initiation of the blast is allowed under a red alert, as long as the following conditions are met. • Supervision has been notified and they have given you the go ahead to initiate blast. • No personnel have to get out of their shelter area to do anything to commence initiation of blast. ➢ This would include such tasks as cable work, having an operator get off piece of equipment, and/or connecting initiation systems. Anything that could put personnel in danger should prevent blasting crew from initiating a blast. • All guards are in place and all equipment have been cleared the proper distances from blast.
Post blast inspections during Red Alerts	Post Blast inspection under red alert • Enter blast site only after 5 minute wait and blasting boxes indicate all detonators have be fired successfully • Do not walk onto pattern if under red alert or visual lightning is taking place. You can drive perimeter of blast zone and make sure remote system shows all detonators or loaded holes have been initiated. • Only then can you declare blast area “Clear”

5.0 Records

The purpose of this section is to ensure accurate records are kept as required by regulation.

The following records must be retained according to the FCX-Records Retention Policy

- Employee training records
- Annual program review
- Equipment inspection records
- Variance documents
- Daily FCX magazine inventories transactions shall be recorded and paperwork stored for each blast. This will include all blasting products inventories, BOL's and consumptions.
- Magazine physical inventories shall be checked for accuracy at least once per month by GSC and verified inventory matches SAP ending inventory. Any discrepancy shall be immediately investigated.
- FCX supervision will conduct a physical inventory count of magazines quarterly and document. Any discrepancy shall be immediately investigated.
- A yearly close out and starting inventory will be conducted and maintained as part of the permanent records required by the regulatory agencies (FCX verification is required).
- Each site shall maintain daily blasting documentation (Blast Summaries) that contain information such as load amounts, blast diagrams, timing configurations, post-blast data uploads, "bad" or "problem" holes, and other "out of the ordinary" or pertinent information.
- Variances from the daily blast sheet with regard to expected explosive usage will be documented and reviewed by the responsible FCX employee for each blast.
- Licensees and permit holders must keep all records pertaining to explosives, in permanent form, for not less than 10 years
- License and permit documentation shall be kept current and displayed in conspicuous areas. Records of Employee Possessors and Responsible Persons must also be maintained and updated quarterly by Blasting Supervision
- Any changes pertaining to new and/or dismissed employees aimed at licensing and permits, must be sustained accordingly to BATF rules and regulations relating to licensing. These deviations are the responsibility of each sites Blasting Supervision.
- Each site is responsible for developing SOPs for training, certification and licensing of employees that handle explosive products. This includes contractors. Copies of these records will be kept by the Drilling and Blasting department.
- Each site is responsible for developing SOPs for reporting explosive procurements, transportation, and usage to the appropriate government agencies on a jurisdiction-specific basis.
  Falsification of explosives records or documentation is a crime and may be punishable by fine and possible jail sentence.

6.0 Recommended Equipment and Software

The purpose of this section is to aid in standardizing the types of stemming equipment, blast timing, and seismic tools used at our various sites.

Stemming Process	For the stemming process, it is recommended to use rubber tired or track loaders equipped with a side-dump bucket, small enough to easily maneuver through the holes on blast patterns. CAT 906 and 908 Loaders fit this category. Oversized buckets should be modified for the hole size(s) used at the site. Larger equipment may be used if wider hole spacing permits.
Blasting	For blasting, an electronic, programmable detonator system is mandatory at all FCX sites. The i-kon III products from Orica are most commonly used.

7.0 Training and Competency (Future Development)

All employees and contractors who participate in drilling, sampling, blasting, or support blasting activities shall be trained to effectively perform expected duties. This training shall be documented.

Required Skills

Sites will develop a list of required skills and evaluate individuals to verify competency prior to participating in or support blasting activities without direct supervision. The skills shall include:

- Staking drill holes
- Duties of Responsible FCX Employee
- Duties of a Lead Blaster and magazine manager
- Duties of a sampler
- Conducting a pre-loading site inspection
- The identification of unique hazards for blast patterns
- Hole loading practices for routine and non-routine holes
- Magazine inventory control
- Safe transport of explosives
- Field inventory control
- Inventory reconciliation
- Guarding a shot overnight
- Establishing evacuation areas for blocking
- Effective blocking for a blast
- Post blast inspections
- Managing misfires or discovered explosives
- Lightning storm precautions \ actions

8.0 Variance

If any part of this policy cannot be followed, an approved Variance is required.	
Variance	It is expected that all sites will follow this FCX policy. However, periodically there may be special circumstances due to site-specific issues that do not allow all aspects of this policy to be completely followed. If any part of this policy cannot be followed, a variance form must be completed per the FCX – Global Significant Risk Exemption Process.

9.0 Definitions

Definitions	
Air Blast	The noise produced by a blast that travels through the air and is scaled by decibels
Back Door	Phrase used to describe access to a bench connected to a haul road. This "Back Door" will be guarded by a sweeper until another sweeper has gone onto the bench and ensured that it is clear of personnel
Blast Area	The area in which concussion, flying material or gases from an explosion may cause injury to persons or damage to property.
Blast Site	The area where explosive materials are handled during loading including the perimeter formed by the loaded blast holes and 50 feet (15.3 meters) in all directions from loaded holes. A minimum distance of 30 feet (9.1 meters) may replace the 50-foot requirement if the perimeter of loaded holes is marked with a barrier.
Clearance Limits	These cannot be standardized for all of the mines, as there are so many variables at each mine it has to be the responsibility of the Responsible FCX Person to decide the distance, as the vertical distances increases the horizontal distance may decrease. Again, this is the responsibility of the Person in charge to determine.
Direct Control	Having face-to-face contact to ensure clear and concise communication.
Explosives Transport Truck	The vehicle that carries blasting accessories (powder truck).
Misfire	The complete or partial failure of explosive material to detonate as planned. The term also is used to describe the explosive material itself that has failed to detonate.
Misfire Hole	• Attempted to fire no evidence of detonation on all or part of the blast patterns • Known or suspected failure to detonate

	• Product found during mining process • Software aborted fire command
Bad hole	A “bad hole” has no product • Bridged over • Too close to crest • Too close to an adjacent hole • Any hole in pattern not loaded • Too short to load or voids present
Problem Hole	A “problem hole” has received product and • May or may not be fired • Has a “bridge over” condition after priming or loading takes too much or too little stemming • Has lost, cut or damaged downlines • Is not identified in the blast plan • Has column subsidence • Has other inconsistencies • No replies
Live Hole	A “Live hole” is a blast hole that: • Has product and will not be fired • Cut downlines, lost downlines • Cannot tie-in by any means
Responsible FCX Employee	Blasting Supervisor, Blasting Engineer, Lead Blaster, or other “qualified” person who is an employee of FCX. The person in charge of the clearing process will in all cases be a qualified exempt employee. Contract personnel may not be the responsible FCX employee.
Stemming	Rock crushed to 80% 1 inch to 1 ¼ inch with a maximum size of 2 inch (based on 10 5/8” hole diameter, varies according to hole size). There should be no fines.
Subsidence	The downward movement of the earth from blasting, earthquakes or other causes
Sweeping/Clearing/ Blocking	The process of ensuring all personnel are removed from the blast area and restricting entry prior to detonation of the blast(s).
Distributing Accessories	The process of distributing Primers, and Detonators to each hole to be loaded and shot
With Errors	This is to continue with the initiation process even though the blasting box presents a message that says “with Errors” the box will also display a code that shows where the error is. It is forbidden to fire with errors.

10.0 PRILL TANKS

Prill Tank silos Inspection	• Conduct yearly inspections • Housekeeping of area including spills and vegetation • Silos in good shape with no visible damage on silo walls and hopper; such as rust, cracks, rusty bolts or missing bolts, welds intact • Access ladders, cages and railing in good condition, barricaded and signed properly • Silos roof sealed properly to prevent water from entering into tanks • Fill pipe in good working order for off loading AN into tanks and vents are working correctly/not plugged on top of tanks • Vibrators secured and in working order • Properly grounded and grounds in good condition • Properly signed and signage in good readable condition • Cross bracing and all tie off points in safe working order and no visible rust or deformation on anchoring points or fall protection cables • Waste barrels with lids; accessible and properly marked • Base foundation system; concrete slab has no major damage • Columns and baseplates are in good condition and mounted correctly • Silos level and ground stucturely solid • Insulation on emulsion tanks in good condition

Significant Risk Assessment – Surface Blasting Policy

Potentially Fatal Risk	Critical Controls to Reduce or Eliminate
Electrical Storm	Lightning Detection System
	Removal of personnel per the DSST Policy
	Communication System (radios)
	Critical Behaviors – Disregard of the alerts
No Blockers in Place	Unauthorized access to blast site
	Critical Behaviors – Disregard of Blockers and signage
No Blast Warning/Notification	Communication System (radios)
	Adherence to procedure
	Zero Tolerance Policy
	Critical Behaviors – Adherence to procedure, Follow-through from personnel if no warning
Sparking Device in Unauthorized Area	Restricted Area (Area is locked)
	No Smoking Area
	Critical Behaviors – No access by unauthorized personnel, explosives removed from magazine, no personnel smoking or using cell phones
Misfire	Restricted access
	BSST Policy requiring spotters
	BSST Policy blocking access to a misfire area
	Possible misfires are marked on CASE

	SOPs for Misfires
	Critical Behaviors -
Incorrect loading/stemming resulting in fly rock issues	Loading according to Plan
	Supervision on pattern
	Pre-loading inspection of blasting
	Critical Behaviors – Adhering to the plan, auditing stemming height, proper timing

Red Flags – Indicate potential unsafe behavior or lack of controls
Access not marked
Blast site is not coned off
Lack of training by blasting personnel
Lack of Supervision
No pre-inspection reports
Field inventory sheets for accessories not filled out or incomplete
No organization on the pattern
No berms around the pattern
Free access to pattern
No pre-blast meeting documentation
No clearance map
Blocking positions not designated or marked
Non-exempt employee acting as the Responsible FCX Employee
No communication of blast
Improper procedure observed with the dongle