6.0 Site Management

The primary goal of a site management system is to ensure every person entering the site completes their business in a safe, environmentally sensitive and effective manner. This includes: contractors; visitors; inspectors; and senior company management.

For the purposes of this e-toolkit, a site is any area where exploration and related activities are conducted by the company, its employees, contractors, and subcontractors, whether or not the company has land tenure. The following two examples would both be considered sites worthy of inclusion in a site management system:

The location of a contracted prospector's parked truck on the shoulder of a highway, while the prospector is on a reconnaissance traverse. The boat or floatplane loading area of a public dock

As described in the 2.2 Management Essentials section of this e-toolkit, site selection planning is an important factor in the safe and successful completion of any exploration program. Although access to water for consumption, hygiene, overburden stripping, sluicing, drilling, and transportation is an important factor in the site selection process, also consider the effects that the selection will have on soil erosion, local and regional water resources, ecosystem health, and future exploration programs.

Mining operations often take advantage of infrastructure established by exploration crews, so planning (especially roads and camps) should consider potential long-term effects. In addition, be aware that water management and soil erosion control forms the bulk of environmental control activities at operating and closed mine sites.

A site management system designed to effectively control safety, health, and environmental risks includes procedures, training, checklists and documentation, and inspection of the following elements:

- Emergencies, accidents, spills and incidents
- Notification and reporting
- Noise, dust, and other air emissions
- Water resources
- Aquatic life resources
- Wildlife resources
- Archaeological and cultural resources
- Materials management
- Waste management
- Traffic management

This section offers guidelines for dealing with all aspects of site management, from large programs to small ones. Much of the information will be too detailed for a small program, but what is applicable can be extracted from the material presented here.

6.1 Health and Safety

Health and safety management systems are intended to ensure that every person leaves the site, or completes a shift, healthy and safe. Everyone on-site must be aware of, and familiar with the:

- Specific hazards associated with the site
- System used to identify hazards
- System for notifying the supervisor of an unsafe condition
- System for reporting an incident
- Emergency (notification and evacuation) plan
- Daily safety topic, including hazardous activities and materials
- System for participating in improvements to the site's health and safety performance
- Forms and checklists required to document and assess the above

Health and safety legislation, and the corresponding management system, is typically based on every person's:

- Right to know
- Right to refuse entry or work
- Responsibility to report unsafe conditions

6.1.1 Health and Safety Management Systems

There are several elements of the site health and safety management system which are required to ensure that all field personnel will:

- Know about, refuse to work under, and report hazardous conditions
- Communicate new hazards and safety performance
- Continually improve the system

These elements include:

- Updated site and workplace hazard information, labelling and controls
- Updated hazardous material information references
- Regular documented meetings, with posted minutes, to communicate hazards and discuss improvements
- Regular documented workplace inspections
- Documented worker and protective equipment audits
- Documented planned inspections
- Incident reports with root-cause analysis
- Regular safety statistics reporting to site personnel and management

In the case of a worker injury, report promptly to the appropriate authority (e.g. in Canada, a Workers' Compensation Board).

6.2 Housekeeping

Good housekeeping and an orderly site often reflect an effective management system. Good housekeeping is an important element of safety, especially relative to:

- Tripping hazards
- Hazardous material storage and handling
- Hazard labelling and identification

Good housekeeping is also an important element covered in any safety and environmental induction and training program. Ensure that the field crew practices good housekeeping in field camps and exploration operations.

For most sites, housekeeping can be included as an element of a workplace safety audit, or a planned inspection focused on safety and environmental compliance with site programs and procedures. It is important to clearly mark, and properly manage, such potential tripping and rupture/spill hazards as:

- Extension cords and electrical cables
- Oxyacetylene hoses, water hoses, and air hoses
- Temporary pipelines

Other hazards can include:

- Hand tools and power tools
- Office boxes and files
- Samples, backpacks, grub hoes, and shovels
- Radio antennae and clotheslines
- Paddles, boat motors, gas cans, and boating equipment
- Work boots, rain gear, and work clothes that have been set aside to dry

Orderly handling and storage of these items forms part of a good housekeeping program; ensure that regular and diligent documented inspection and follow-up are carried out.

6.2.1 Housekeeping and Hazardous Materials

In some instances, housekeeping will have to be expanded into a management system for hazardous and controlled material handling. The storage and handling of the following materials are regulated by legislation, or are known to require systems to control their use. For more detailed procedures and guidance, please refer to the 10.0 Hazardous Material portions of this manual.

Develop and implement storage and handling systems for the following materials:

- Fuels
- Solvents
- Lubricants
- Flammables
- Explosives and detonators
- Compressed gas cylinders
- Batteries
- Bear spray
- Ammunition and firearms
- Acids
- Certain rock, soil, and water samples

Store fuels, solvents, lubricants and flammables in clearly marked areas that are:

- Separate or protected from traffic
- Away from ignition sources

- In well ventilated areas

Store barrels or tanks that will be used to dispense smaller volumes of these materials within secondary containment vessels that can accommodate 110% of the primary storage container.

Store, handle, and transport explosives and their detonators separately in secure, grounded, storage containers, free from any ignition source and 500 m from frequently used workplaces. More detailed requirements can be found in the 10.0 Hazardous Material section of this e-toolkit.

Store, handle, and transport compressed gas cylinders in an upright position, with the cap secured, and chained to a rack of appropriate strength and size to accommodate the cylinders.

Store batteries, bear sprays, acids, ammunition, and samples away from high traffic areas, in secure, clearly labelled containers, free from any ignition sources, and well ventilated as required.

Store firearms in secure containers, with trigger locks, separate from the keys/combinations and ammunition.

Unlabeled, unmarked, or unsecured, controlled or hazardous materials or hazardous waste cannot be left in high traffic areas, under any circumstances.

6.3 Monitoring and Inspections

It is important that monitoring and inspections be designed to:

- Ensure programs and procedures are effective
- Ensure persons on-site are effectively using the programs and procedures
- Ensure that site activities are compliant with programs and procedures
- Document the status of the site
- Ensure hazards and risks are identified, assessed, and communicated
- Help complete reports on safety and environmental performance
- Help improve the safety and environmental performance by aiding in the review and revising the programs and procedures

The following tools can be used to help manage monitoring and inspection programs:

- Checklists
- Action plans
- Regular schedules
- Proper tools and equipment
- Databases

Checklists are an excellent method of documenting inspections and monitoring. Checklists help to ensure that the information collected is consistent, and they act as a reminder to the inspector or sampler.

Action plans with schedules, and responsible persons regularly assigned to the monitoring and inspection tasks, are important tools. They act as reminders to site personnel, and ensure that information and samples are collected at the right time.
Regularly scheduled inspections are the easiest to remember. For example, most people will find it easy to remember to check the generator fuel tank level every morning after coffee break.

As noted above, monitoring and inspections are most successful when completed regularly, using the proper tools and equipment for the task at hand.

Using databases or spreadsheets is an excellent method of tracking the information collected. It is best if the databases and spreadsheets are updated by the company or the field operators, immediately upon collecting the information. Make sure that this is done by the person who collected the information. Inevitably, there will be data integrity problems if an employee tries to enter data a month or two after it is collected.

6.4 Site Clearing

Initiate site clearing only after obtaining appropriate authorization and approval from local and regional regulators or communities. The site-clearing plan should include:

- Vegetation removal, stockpiling, and end-use procedures
- Overburden stockpile handling, storage, and reuse procedures
- Sand, till and gravel removal, storage, and use procedures
- Water resource impact control procedures
- Resource, artifact, fossil, and environment value protection procedures

Refer to the 5.0 Land Disturbance section of this e-toolkit for more detailed guidance about on-site clearing issues.

It is important to account for all materials moved during the clearing and to stockpile these materials to facilitate future use. In particular, save overburden and existing soil for revegetation.

Do not excavate sand, till, or gravel below the water table without obtaining approval for water pump-down and materials extraction plans. Stack trees for future use or use by others. Approve any alternatives to these general procedures prior to proceeding with site clearing.

6.5 Drainage Control

If a small exploration program is planned, it may not require much in the way of drainage control. However, larger camps and associated activities will often require diverting fresh water, referred to here as run-on, and collection of contaminated run-off.

In these cases, ensure that all ditches and berms are constructed to withstand the hydraulic energy of extreme precipitation and run-off events. Typically, ditches and berms are constructed with slopes of 2H:1V (2 horizontal to 1 vertical).

Revegetate and protect ditches with rip-rap (loose rock), or appropriate engineered material, to control erosion and siltation. If revegetation berms, remove shrubs and trees to prevent destabilization of the berm core by extensive, water-seeking root systems. Form berms and ditches into impervious or well-prepared foundations.

6.5.1 Run-on

You need to control run-on in order to minimize the volume of fresh water exposed to contaminants associated with exploration activities. Diversion berms and ditches prevent run-on and re-route it to nearby receiver creeks, rivers, wetlands, lakes and oceans. You should consult

geotechnical experts for the design and construction of berms that retain water or divert existing rivers. However, you can construct small check dams with bales of hay to divert intermittent brooks running across a drill site, for example, which can easily improve the problems associated with managing contaminated water.

As with most of the management systems described in this manual, you should develop run-on plans prior to the start of the exploration program by determining the basic hydrology of the area to be worked. A topography map will provide you with the basis of a simple and effective run-on plan. As far as possible you should plan camps, drill sites, and extensive excavations off the line-of-fall of water draining to nearby valleys and low areas.

6.5.2 Runoff

Silt, spilled fuel, and leaked oil are contaminants that, once in water, require proper management in order to protect the local watersheds and their ecosystems. Once run-on hits your site, the runoff, or water that drains from the site toward a downstream water resource, may require management.

The contaminants noted above are common to most exploration sites, and you can manage them easily. Other contaminants, such as those resulting from spills, will require you to give them special handling as described in more detail in the 10.0 Hazardous Material and 11.0 Spill Management sections of this manual.

The more difficult contaminants for you to manage are those that cannot be seen and those that may, or may not, be released. For example, metals and radioisotopes from rock and soil samples, drill dust and muds, core shack dust, or channel and chip sampling programs can contaminate nearby water resources and go undetected.

You should conduct a baseline water quality sampling program to help you to measure if, and to what extent, metal contamination has occurred. However, the most conservative approach is for you to ensure that these products do not enter the receiving watershed by managing their production, handling and disposal. You should refer to the Sample Handling section below for more details.

You will find that silt fences, made of fabric or hay staked in the path of solids contaminated runoff, and settling ponds can help reduce the release of cloudy, suspended solids-laden runoff to the receiver watershed. You should use absorbents to clean up leaked and spilled fuels and oils before they are released to water. In the event of release to water, you can use oil booms and pads to ensure these contaminants are not released to the environment.

Water treatment for metals control is complicated by the combination of metals in water and the characteristics of the water itself. Most heavy metals are not dissolved in water at neutral pH. Metals such as nickel and zinc, once dissolved in water, do not precipitate until the pH of the contaminated wastewater is brought up to 9.5 to 9.8. If water is acidified by exploration activities, or natural features, then other heavy metals such as copper, lead and cadmium can be dissolved as well.

To avoid treatment of acid-and metal-bearing wastewater, you should prevent pulverized, crushed sulphides and iron-rich exploration by-products from being released to the environment, from subsequent exposure of them to air and water and their consequent oxidation to form acid wastewater. The following subsection discusses sulphide waste.

Sulphide Waste

In the early stages of exploration the most likely sources of sulphide-bearing waste will be trench samples and drill core. You should characterize, handle and manage sulphide-bearing waste separate from other waste materials, in order to avoid costly, and long-term, treatment requirements.

You should ensure that, wherever possible, you minimize the exposure of sulphide waste to surface water, since sulphides readily oxidize and form sulphuric acids that dissolve metals into site run-off. You should therefore make every effort to avoid acid generation at source by dealing properly with the sulphides before they have an opportunity to oxidize.

You should refer to the 12.0 Waste Management section of this activity, in Waste Rock Disposal under On-site 12.0 Waste Management for further details of the handling of sulpide-bearing waste.

6.6 Maintenance

Maintenance of equipment typically involves handling and disposal of hazardous materials such as: lubricants; hydraulic oil; fuels; coolants; paints; solvents; compressed gas cylinders; flammables; and acids. Each of these substances poses safety and environmental hazards that need to be controlled with an appropriate management system. For more detail on the storage, handling and disposal of maintenance consumables, refer to the sections in this e-toolkit on 10.0 Hazardous Material**,** 11.0 Spill Management, and 12.0 Waste Management.

In general, maintenance is best performed on a schedule prior to problems and repairs being required. A preventative maintenance program includes:

- A schedule
- A proper inventory of consumables and spare parts
- A designated location for maintenance
- The proper tools to complete the job
- Trained personnel who can ensure the maintenance is completed safely and effectively

Bear in mind that improper maintenance and the use of improper parts or tools can be more hazardous than no maintenance, and can lead to injury or spills. When maintenance is required, ensure that it is performed:

- In well-ventilated areas
- With a floor or drop cloth that can be thoroughly cleaned
- At a safe distance from ignition sources
- At a safe distance from water resources, including groundwater resources

6.7 Security

Secure exploration sites from entry by the public, as this is the only method of protecting the public from the hazards associated with exploration activities. The site owner is ultimately responsible for the safety of everyone on the site, especially in the event of an emergency or debilitating injury. Properly securing a site from acts of vandalism also helps to prevent safety and environmental incidents.

Site security can be as simple as identifying site boundaries, or as elaborate as the use of fences, gates, surveillance, full-time security personnel, vehicle inspections, random searches, and detection equipment. The requirements will have to be determined at each site, based on access, hazards, and overall risk. Access typically relates to the likelihood of an incident, while hazards relate to the consequence associated with the occurrence of an incident.

Where public access to the site is possible, implement an appropriate security system.

At the most basic level, post signs at the site boundary at its point of access, noting:

- Company and property name
- Access restrictions or conditions ("must report to")
- Contact personnel and information
- Authority under which access is restricted
- Hazard warnings
- Emergency notification, reporting, and response procedures

In more advanced projects, and in order of increasing project risk, other security options include:

- Signs restricting access or identifying hazards along site boundaries adjacent to access routes
- Gates and appropriate lights and reflectors, restricting vehicle access
- Gates and fences, restricting any access
- Lights
- Surveillance equipment
- Security personnel

6.7.1 Induction and Orientations

Regardless of the method of entry onto the site, you should ensure that your site security management systems include safety and environmental inductions. You should complete these with all persons entering a site, including

- Visitors, inspectors, officers, managers, executives, and shareholders.
- Contractors and subcontractors.
- New employees.
- Existing employees on an annual basis.

In your safety and environmental inductions you should include documentation of the visitors' emergency contact information, and a documented and signed/dated review of

- Company safety, health and environment policy.
- Site safety, health and environment programs and procedures, including
- Emergency notification and response procedures.
- Spill and incident reporting and response procedures.
- Personal protective equipment requirements.
- Hazardous materials information programs (such as WHMIS, MSDS).
- Hazard identification and communication procedures.
- Right to refuse work and responsibility to report hazards procedure.

- Site-specific hazards

Your site orientation should include a tour that highlights hazards and high hazard areas or activities. During the tour you should ensure that you introduce new recruits, contractors and other visitors to other people on the site. Try to note those people with security, emergency response, safety, environmental or supervisory responsibilities. During the tour you should take every opportunity to ensure new employees and contractors are reminded of their roles and responsibilities.

6.7.2 Log Book and Emergency Response

You should ensure that all visitors and contractors sign in a log book prior to entering the site, and sign out upon leaving the site. The sign in and sign out should include date and time and company contact. Tracking on-site persons in the event of an emergency requires an accurate tally of non-employees.

If security personnel are required at the point of entry to your site, you should make sure that they are trained in first aid and emergency response. You should also ensure that all employees are trained in emergency response policies and procedures.

The security shack, office or trailer should include an inventory of first aid and emergency response supplies and equipment. You should locate the security shack at, or very near, the main point of entry to the property. In addition, you should ensure that it is at a safe distance from ignition sources and hazardous areas and activities, such as maintenance areas, kitchens, and hazardous materials storage areas.

6.7.3 Theft and Vandalism

Theft is not usually a widespread problem at an exploration site unless small, highly valuable or widely used materials and supplies, such as visible gold, diamonds and precision hand tools, are readily available to site personnel. In such cases, you should develop a theft prevention program prior to incidents of theft occurring.

You can prevent theft of widely used materials and supplies by maintaining a secure storage area operated by a responsible person in the corresponding department if your project is large enough to have responsibilities assigned to separate individuals. For example, these could include

- Administration for office supplies
- Maintenance or warehouseman for tools and consumables
- Information Technology for computer hardware and software
- The foreman/supervisor/manager/crew chief for all equipment and supplies

If the project is relatively small, then you as project manager will have responsibility for these aspects of your program.

You should also support your efforts at prevention by a consistently implemented system of enforcement. Theft and vandalism are serious matters that require your immediate, thoughtful and appropriate action. Therefore you should develop and communicate a company-wide policy as part of the induction process.

6.8 Baseline Studies

Baseline studies are typically developed by experts and consultants, once an economic deposit has been discovered. However, the risks and capital involved in developing mines in the 21st century require a high degree of confidence and extensive exploration that, on its own, can affect local communities and environment.

Develop exploration programs with plans for basic baseline studies, including documentation of empirical information (e.g., wildlife sightings near camp, drill sites, and on traverses). Carry out vegetation mapping during soil sampling and geological mapping programs.

In temperate and wet climates, one of the most important components of even the simplest of baseline studies is information on water bodies. In arid and semi-arid climates, soil erosion by wind and flash run-off events is one of the most important components to identify and manage. As an exploration program develops and baseline studies are designed, ensure that they are well complemented by detailed and accurate maps, clear and concise descriptions, and documented colour photographs with scales.

Although the initial survey stages of exploration may have very little environmental or socioeconomic impact, successful results from these surveys may lead to accelerated exploration work in the area. Give sufficient thought to the need for baseline studies at the early stages, in order to initiate them promptly as the surface exploration work commences.
For example, contact any local communities as early as possible to identify issues that could be included in baseline studies as exploration proceeds. If not considered early enough, the impetus of an aggressive exploration program may divert attention from the need to perform baseline studies.

Every exploration project anticipates the possibility of a significant discovery. There have been many cases where natural contamination could have been well documented before a discovery was developed through use of quality base line data. Once development begins, there is no way to satisfactorily demonstrate that exploration activity and subsequent mine development have not caused the contamination. Collect baseline data early and often.

6.8.1 Water Resources

Several simple baseline activities can help ensure that an expanding exploration program includes enough resource information to determine whether or not site conditions are natural or anthropogenic (resulting from human influence). At the preliminary survey stage, whether that be geological, geophysical or geochemical, there is little need for baseline studies on water quality to be carried out. Before any physical work is commenced, however, collect some of the information required by conducting literature searches, and contacting local and regional regulators, as well as academic institutions. Government resource literature can often characterize the region selected for exploration and can form a good outline for a baseline study.

Water resources and aquatic ecosystems are fiercely protected throughout the world. Many jurisdictions have layers of water resource protection legislation that overlap jurisdictions as well as covering both industrial and recreational activity. You must be aware of these layers of regulation. Several simple baseline activities can help you ensure that an expanding exploration program includes enough resource information to determine whether or not site conditions are natural or anthropogenic (man-made).

You should collect the following information during an exploration program that includes drilling, trenching, bulk sampling or exploration programs of more than two months duration, or from individual trenching, open cuts or drill holes that take longer than two weeks to complete:

- Water quality data,
- Bathymetry,
- River classification,
- Fisheries,
- Spawning areas, and
- Benthos and sediment quality.

You should collect as much as possible of the information prior to the start of your program by conducting literature searches and contacting local and regional regulators and academic institutions. State and federal resource literature often characterizes the region selected for exploration and forms a good outline for a baseline study.

Your program should include sampling for water quality and benthos. You will find that biological experts at local colleges, universities, provincial and central government offices or consulting companies can supply guidance, rental equipment, and even assistance at reasonable rates, or even free if the information is shared.

You can complete bathymetry with the use of a depth sounder (fish finder) and GPS. You can obtain spawning areas and fisheries data from any anglers in your crew, guided again by local or regional experts regarding assessment details required to document spawning bed and fisheries' characteristics.
You should design water quality monitoring taking into account the potential contaminants contained in the local and regional rocks and soils and the hazardous materials used on site. You should, however, recognize that some common elements and ions may not be considered contaminants until years after an effect has been identified. Road salt and dust, for example, can be considered contaminants depending on the receiving environment's character and assimilative capacity.

You should take complete water quality analyses of samples using proper procedures and containers. Most commercial, certified laboratories will provide the procedures and sampling equipment required to complete this part of the program.

6.8.2 Cultural and Archaeological Resources

In some instances, baseline studies may also have to include documentation and characterization of any cultural and archaeological features. Contact local communities and experts prior to any programs, to determine the likelihood of finding such features. Unless the program includes a staff expert, any such finds should be left untouched, mapped in, located, and marked off, until the proper procedures are developed and implemented to characterize and document the find. Invariably, artifact removal will require authorization and approval from regulators or nearby communities, after developing an extraction plan with the company's management.

6.8.3 Exemplary Natural Resources

Upon finding exemplary natural resources (e.g., unmapped waterfalls; geothermal features; unusual or "type" outcrops; fossils; other geomorphological features), photograph them with scales and in colour, describing them to the extent possible. Do not damage or remove such

features until approval and protection requirements and conditions are determined and considered in a revised sampling and extraction plan.

6.9 Sample Handling

The information in this section is presented as **a guideline only**. It is not an exhaustive description of all the requirements and protocols associated with sampling programs. For detailed sampling protocol and procedure legislation and guidelines, always refer to local and regional authorities, commercial laboratories, or other experts.

6.9.1 Collection

Ensure that rock, soil, and water sample collection is consistent among locations and samplers. Conduct a brief training program for all the samplers to ensure that the samples, and the data derived from them, consistently represent the character of the rock, soil, and water at the collection sites.
Never reuse sample containers. Make sure that sample bags, bottles, labels, Chain of Custody forms, and appropriate shipping containers are supplied by the laboratory that is analyzing the samples. Always complete sample logs with the date, sampler, location, unique name or number, and location description (rock type, vegetation, weather).

Where possible, choose rock samples for trace metal and whole rock analyses that are fresh, with oxidized and mossy surface material removed from the sample. The sample should be approximately 1 kg in weight, and represent the same layer – either the surface detritus, the dark brown to black humus layer or the mineral soil beneath. Document all sample station locations with their respective latitude and longitude coordinates, obtained with a Global Positioning System (GPS).

You may require extensive blasting in order to obtain fresh sample in sulphide sampling. You should be aware that blasting will fracture the rock and increase water infiltration and oxidation leading to acid generation and metal leaching. Before you initiate a blasting program, therefore, you should carefully consider the sampling site's hydrology, and assess runoff control and water resource protection alternatives. You can refer to the Drainage Control portion of this section for more details.

Your soil samples should represent the same layer, either the surface detritus, the dark brown to black humus layer or the mineral soil beneath. You should recognize that soils with a high oxidized rock component may also create acid generation and metal leaching problems. Again, you should consider runoff control and water protection alternatives prior to large-scale sampling.

Water sampling protocols vary depending on the parameter being analyzed. You should satisfy yourself that personnel involved in field sampling exercise care to ensure that samples are collected from a consistently repeatable location.

All of your sample station locations should be specified on a plan map of all monitoring sites and should be marked in the field with a (permanent) sign designating the location as a monitoring or sampling station. You should document all sample station locations with their respective latitude and longitude coordinates obtained with a Global Positioning System (GPS).

You should use permanent signs at piped inlet and discharge locations. You can use buoys or a set of onshore markers to ensure that the same site is sampled throughout the season. You should keep a log of all sampling, or ensure that your environmental personnel or designates do

so. The logs should describe exactly where individual samples are collected (for example; mid-stream, 2 metres from end of pipe) and supply the associated GPS coordinates.

Water Quality Sampling

- You should use the following sampling containers and preservation containers for water quality samples:
- Plastic Drums: For bioassay analyses requiring large volumes of sample.
- Plastic Bottles: For analyses of metals; preserved and unpreserved nutrients; routine; biological oxygen demand (BOD) analyses; and for bioassay analyses requiring less than 1.0 litre of sample.
- Sterilized Glass Bottles: For analysis of bacteriological parameters.
- Amber Glass Bottles: For Oil and Grease, and Polycyclic Aromatic Hydrocarbons (PAH).

You should use Teflon lined caps with glass bottles, although aluminium lined caps are acceptable where contents are not corrosive. You should ensure that all glass and plastic sampling containers are new and pre-cleaned by the manufacturer to United States Environmental Protection Agency (USEPA) standards, protocol C, or its equivalent.
You should perform sample preservation in order to minimize natural chemical alterations that may occur within collected samples during transport to the laboratory. As soon as practicable after collection, you should preserve the samples following the guidelines providing by your certified laboratory or with reference to the 19th Edition of the Standard Methods for the Examination of Water and Wastewater, *1995, American Public Health Association (APHA).*
You should use the following sampling methods for water quality:

- With the exception of samples for analysis of Bacteriology, Oil and Grease and PAH, containers will be rinsed three times using sample water prior to collection of the sample.
- Samples collected for the analysis of Bacteriology, Oil and Grease and PAH will be collected during the first immersion into sample water.

You should be aware that sample collection from different media requires different treatment. The following section outlines these treatment procedures.

For Lake Stations, you should:

- Collect the water using a Go-Flo or equivalent sampler
- Rinse the sampler thoroughly with sample water between use at each sampling station to minimize the potential for cross-contamination.
- Take discrete samples at near-surface, mid-depth, and near the bottom where possible.

For River, Stream and Piped Stations, you should:

- Plunge sample containers toward the current and allow them to fill.
- Collect samples from just below the water surface.

For Seepage Samples, you should collect samples:

- In streams running away from constructed stockpiles and dumps with care to ensure that inclusion of sediments, vegetation or other natural contaminants is minimized to the greatest extent possible.
- By placing the sample container towards the seepage current and allowing it to fill.
- From just below the water surface.

You should ensure that the collection of field parameters at the time of sampling is complete. For all samples at all locations, you should record the following parameters:

- pH
- Temperature
- Conductivity.

You should measure field pH and temperature using a suitable portable meter. In cases of severe winter weather conditions, you should measure pH at an in-house laboratory at the soonest practicable time after sample collection.

It is critical that you record sampling information as the samples are collected. You should use a Standard Field Log to record field measurements and other critical information for each sample. Information recorded on the Standard Field Log should include:

- Date and time of collection.
- Sample location.
- Depth of sample.
- Sampling methodology.
- Name of sampler.

You should take sufficient quality control (QC) samples to ensure that adequate cross contamination control has been accomplished. To demonstrate this, your field QC samples should consist of the following three types:

- Transportation Blank -to ensure that contamination does not occur during transportation and subsequent storage of samples. Transportation blanks will consist of a sample container that contains distilled/de-ionized water and appropriate preservative and is prepared by the laboratory. This control sample will accompany the sample containers shipped to the field and will be returned to the laboratory unopened.
- Field Blank -to quantify casual contamination that might occur through container handling, sample preservation, or due to ambient air quality at sampling sites. Field blank containers will be filled with distilled/de-ionized water by the laboratory, and will be preserved in the same manner as the samples being collected in the field. The field blank will be opened at each sampling station and then re-sealed before moving to the next sampling location.
- Field Replicate -to measure the overall precision of the sampling methods used. A duplicate sample will be collected from pre-assigned sampling locations at the same time as the original sample is collected and in exactly the same manner.

For each sampling batch, you should prepare transportation blanks, field blanks and field replicates in sufficient quantities such that for each analytical method field QC samples will equate to 10-20% of the batch. Transportation blanks need only be shipped periodically throughout the year.

A sampling batch is defined as a group of samples shipped at the same time to the laboratory for analysis. A sampling batch may encompass several shipping containers.

6.9.2 Handling

You should ensure that you adhere to the following procedures for handling all samples:

- Sampling containers should be labelled by marking them with a water resistant felt pen.
- Sample labels should include the sample location, and date of sampling.

You should note that water resistant felt pens are not recommended for marking core boxes, because they fade quickly. "Dymo"-type tape ribbons are the most practical labelling for core boxes, and you should staple them to the boxes.

In addition, for water samples you should adopt the following procedures:

- Blank labels should be supplied by the laboratory.
- Labelling of sample containers should be completed prior to sample collection to avoid potential misidentification of samples in the field.
- Samples should be securely stored upright in sealed coolers containing ice packs and shipped to the laboratory by air transport.

Whatever the sample type, you should include a laboratory Chain of Custody (CoC) form with each sampling batch.

As discussed in more detail in the Hazardous Materials section, you should consider the following additional measures for samples containing hazardous materials:

- Labels and identifiers must communicate the hazard (flammable, corrosive, poisonous, carcinogenic, and radioactive) to the sampler.
- Labels and identifiers should communicate special handling requirements to the handler.
- Special handling requirements should be planned and organized with the handler prior to conducting the shipping/storage or other handling.
- Documentation of the sample container, its samples, its hazards and handling procedures should be retained by the shipper (the person relinquishing the sample), retained by the handler/shipper, and retained by the receiver.

6.9.3 Transport

You must properly identify any sample that contains, or may contain, a hazardous substance. To accomplish this, you must ensure that:

- The outside of the shipping container is labelled to communicate the hazard to the shipper and receiver.
- Your shipping forms identify the hazardous material contained within the shipping container.

You should file a copy of the shipping form with:

- The shipper,
- The transporter, and
- The receiver.

You may have to arrange transport prior to sampling in order to fulfill all time-limited protocols for the samples. This may involve:

- Air transport and overnight courier delivery in some cases.
- Conducting time-sensitive sampling just prior to regular supply shipments.
- Using special containers and separate transport from personnel and supplies in the case of samples that are sources of radioisotopes.

6.9.4 Drilling Sample Handling

You should consider the information set out below as guidelines and not an exhaustive description of all the requirements and protocols associated with core splitting and storage, and percussion/rotary/reverse circulation drill cuttings storage. For detailed protocols and procedures legislation and guidelines you should always refer to local and regional authorities, commercial laboratories, or other experts.

Core and Chip Sampling

You should ensure that eye protection is used at all times while splitting core. Face shields or goggles provide better protection than safety glasses. Dust masks may also be required, particularly if you are splitting core with a diamond saw or recovering chips from a percussion, rotary or reverse circulation drill program.
To avoid injury and contamination, you should inspect hammer and core splitters prior to their use to ensure there are no cracks, splinters or burrs in the equipment.

You should collect rock detritus and dust daily and dispose of it according to the site waste management plan. In particular, sulphide waste and other potentially acid generating (PAG) waste rock should not be allowed to oxidize, so you should dispose of all PAG under water, preferably in an approved sulphides tailings pond, or keep it completely dry. In some cases waste may have to be stored for transport to an appropriate disposal facility. You should collect and treat drainage with dissolved or suspended oxidation products (acids or metal salts).

Storage

You should always store rock samples in a dry area to prevent oxidation and potential acid generation. In the case of core samples, secure covered rack storage is preferable, but the size of your drill program will dictate to you what your specific storage should be. The principle is that you should be able to retrieve any core samples that you may require for further examination or analysis.

You should ensure that your core trays are properly labelled with marker or stapled on "Dymo-type" tape, so that you can identify them for further work if that is required. You should also label properly bagged drill chips from percussion/rotary/reverse circulation drilling, and store them in a dry, secure area.

Final Sample Disposition

Most commercial and CAEAL certified laboratories offer a storage and final disposal service for any samples which you have sent to them. When your exploration program has finished you should either recover your drill core or cuttings or secure them for potential future use on site.

6.10 Concurrent Reclamation

View concurrent reclamation, or rehabilitation, as an integral part of each exploration activity, and the exploration program as a whole. To understand the difference between reclamation programs and rehabilitation programs:

Reclamation programs are intended to return land and natural resources to a beneficial use from a waste condition.

Rehabilitation programs are intended to restore land and natural resources to former or proper conditions.

Establish and develop reclamation and rehabilitation performance criteria and plans, prior to the start of exploration activities. Each of the measures set out in the guidelines in the following subsections is to be viewed as an integral part of an exploration program, its goals, objectives and contract agreements, rather than as a separate or additional activity.

Continuing Exploration

Although drilling, stripping, trenching, bulk sampling, and mining may continue for several years, upon completion of that work, it is important to reclaim and rehabilitate each area affected by their related activities. For example, reclaim each drill site during or immediately after demobilizing the drill crews and equipment, while the resources are available to complete the reclamation, unless crews and equipment will be returning to that specific site.

Proper procedures established with the drillers will avoid the need to pack out:

- Garbage
- Drill grease pails
- Haywire
- Spent drill bits

Although later cleanup may be effective, it may not address larger scale activities, such as:

- Overburden replacement
- Revegetation
- Erosion control structure dismantling
- Upgrading or maintenance
- Slope stabilization

Terminated Operations

Prior to completing an exploration program, reclaim:

- Drill sites
- Trench, and
- Campsites

Remove any and all imported materials and wastes, and dispose of them properly. Replace previously stockpiled overburden and organic soil, as applicable, and revegetate with native plants. For more details of these procedures, refer to the 5.0 Land Disturbance section of this e-toolkit.

Prior to abandoning the site, assess and properly secure the stability of:

- Open pits
- Open cuts
- Waste rock stockpiles
- Open holes (raises, adits, shafts, portals)
- Crown pillars

Many of the items included in the list above are more normally encountered in relatively advanced exploration programs, which are beyond the scope of this version of EES. However, for early stage exploration in a previously explored site, or even a previously producing one, many of these elements may be present.

Remove or reconstruct run-off control structures to endure for their designed lifespan. Develop and implement inspection and maintenance programs for structures that are required for more than one year after completion of the exploration activities. To restrict access, secure core racks and sample storage containers that will be required for future reference and have not been removed to a central depot. Also establish an inspection and maintenance program that documents and ensures the continued integrity and security of core racks and sample storage.

Documentation

Ensure that all reclamation and rehabilitation measures are well documented and accompanied by:

- A detailed plan
- A quantity survey
- As-built drawings (the original design drawings revised to reflect any changes made in the field)

It is also important to provide well-documented colour photographs that include a scale or scale object, such as any of the following:

- Pocketknife
- Compass
- Clipboard
- Pick hammer
- Core box
- Drill rod

To assist in future land use planning, submit reports to local or regional authorities on:

- Assessment
- Rehabilitation design
- Rehabilitation as-built

6.11 Further Considerations

To ensure the responsible maintenance of a site, depending upon the size of the operation, checklists can be developed to include the following:

- Contractor/visitor induction
- Daily safety check
- Weekly or three times weekly protective equipment audit
- Monthly safety audit
- Safety meeting form
- Hazard Alert form
- Pre-op checklist for mobile equipment
- Burning permit
- Spill and Release form
- Incident Investigation forms
- Employee site safety tests/reviews

In addition, consider establishing:

- Personnel training records
- Roles and responsibilities
- Organization charts
- Document retention procedures
- Surface blasting procedure