

Project Field Safety Manual

Next-Generation Ecosystem Experiments—NGEE Arctic



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**PROJECT FIELD SAFETY MANUAL
NEXT-GENERATION ECOSYSTEM EXPERIMENTS—NGEE ARCTIC**

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Applicability

This manual is required reading for all NGEA Arctic participants before commencing any fieldwork on the Seward Peninsula or in Barrow, Alaska.

Review the attachments. They contain supplemental information (e.g., directions, maps, contacts, site instructions, emergency information) that should be useful to all NGEA Arctic participants. Be advised that the attachments also include controls pertaining to many other items, such as field clothing/personal protection equipment and first aid kits.

Revision Record

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END			

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Abbreviated Terms

AED	automated external defibrillator
ARM	Atmospheric Radiation Measurement
ATV	all-terrain vehicle
DOE	US Department of Energy
GFCI	ground fault current interrupter
LI-COR	An instrument manufactured by LI-COR to measure soil CO ₂ flux
NGEE Arctic	Next-Generation Ecosystem Experiments
OOTD	officer of the day
ORNL	Oak Ridge National Laboratory
PPE	personal protective equipment
UIC	Ukpeaġvik Iñupiat Corporation
SDS	safety data sheet

Safety Requirement

The fundamentals of safety management must be implemented by each institution with participants working on the Next-Generation Ecosystem Experiments (NGEE Arctic) project to ensure the safety and health of all project participants. Institutional representatives for each institution are responsible for establishing the proper expectations for safety planning and implementation for all participants from their institutions. The science team leads are responsible for ensuring that safety plans are developed and properly reviewed and approved before field and laboratory work begins.

Safety management begins with a clear definition of the scope of work to be performed. Each science team lead is responsible for a scope of work as defined in the proposal presented to the US Department of Energy (DOE). Each science team lead also is responsible for defining tasks and task leaders who are, in turn, responsible for developing a scope of work that defines the work to be performed, the participants working on the task, the hazards that will or may be encountered, and the controls to be used by the participants to mitigate those hazards. Hazard identification must be thorough enough to identify all sources of injury or illness and damage to the environment, equipment, or property that reasonably could be encountered while performing the work. The controls participants should use to avoid or mitigate hazards must be reviewed and approved for adequacy by the safety professionals at the task leader's home institution.

Task leaders must ensure that the participants on their team are briefed on the hazards and controls of their work activities, including additional discussions when changes occur. After safety plan briefings, the task leader and participants perform the scope of work using the identified controls.

All participants have the authority to stop work upon observing imminent danger; work must cease, and the danger must be reported to the project officer of the day (OOTD). Work must not resume until the threat from the hazard is mitigated or removed.

During the preparation and performance of work, all participants must be mindful of known hazards, use defined controls, and be observant of changing conditions. Participants who encounter a new hazard must request additional review before continuing work. The task leader must collect lessons learned and suggestions for improving hazard controls; these lessons and suggestions must be considered for changes to the safety plan and/or communication to other project task teams. Any changes to the safety plan must be reviewed, approved, and communicated to team participants.

Safety Training Requirements

The Core Team of the NGEE Arctic Project has developed the *Project Field Safety Manual* and the *Project Laboratory Safety Manual*, which define the minimum safety expectations and requirements for participation in field or laboratory work in Alaska. All participants must comply with these minimum safety requirements. The hazards and controls contained within the *Project Field Safety Manual* and the *Project Laboratory Safety Manual* do not need to be repeated in the task safety plan unless additional controls are required because of the work being performed.

These documents are available with other project safety information at the project website (<http://ngee-arctic.ornl.gov>) under the Resources/NGEE Team Files/Safety tab. They are reviewed annually for currency and applicability, and significant changes will be communicated to all participants.

A login account is required to access the following required safety materials:

- ✓ **Project Orientation and Safety Video**
- ✓ **Staying Safe in Bear Country Video**
- ✓ **Polar Bear Safety Video**
- ✓ **Project Field Safety Manual**
- ✓ **Project Laboratory Safety Manual**
- ✓ **NGEE Arctic Project Plan**

Overview

Safety at Arctic field sites will be an integral component of the team's research planning and execution. Whereas each partner organization (DOE national laboratories, universities, and subcontractors) must establish safety requirements for its staff, the NGEE Arctic leadership team will promote discussions of hazards and best practices for fieldwork and will recommend personal protective equipment (PPE) that mitigates hazards. As the lead institution for this project, Oak Ridge National Laboratory (ORNL) will establish guidelines for fieldwork that all project participants must review and acknowledge. We expect that specific activities and equipment will require additional training and that such training will be provided on site by subcontractors or qualified staff. This training will be documented, and training materials will be made available for review. Project participants will receive both printed, on-site documentation and electronic resources.

Risk assessment will be a continuous process, closely tied to risk management, training, and management oversight. Because field activities will be performed in isolated areas of northern Alaska, local knowledge is integral to safety. Our conversations with logistics providers and native people have informed us of many local hazards and safeguards, and we expect that those discussions will grow. The NGEE Arctic team also has solicited safety information from the DOE Atmospheric Radiation Measurement (ARM) facility on the North Slope of Alaska (Ivey 2012); National Science Foundation investigators and the logistics provider, Ukpeaġvik Iñupiat Corporation (UIC) (Polar Field Services 2012); US military staff (Roberts and Hamlet 2001); and petroleum exploration companies that operate in the region (BP Exploration 2010).

From these resources, the NGEE Arctic team has identified a series of hazards pertaining to fieldwork in Alaska, as follows:

- Mechanical hazards—drilling equipment, vehicles, snowmobiles, deep cycle marine batteries, portable generators, extension cords, all-terrain vehicles, ergonomics, slips/falls, and cuts/abrasions
- Exposure hazards—electrical shock, hazardous materials, and noise

Each identified hazard will be addressed before field activities begin through work controls, training plans, checklists, safeguards, and PPE provisions. However, it is essential that participants have a mechanism to stop unsafe situations in the field. The NGEE Arctic project is committed to a “stop work authority” policy. Through this mechanism, all workers are empowered to stop activities that may be unsafe to human health or the environment without experiencing negative consequences or retaliation. A stop work action triggers immediate review by knowledgeable personnel until issues are resolved. Although this authority rarely is exercised, it is an essential component of safety plans that enlist individuals and teams to share responsibility for safety. The team also will recognize an individual's decision not to pursue approved activities based on different levels of experience and physical condition.

Working in the Arctic Climate

No matter when or where you travel to conduct field research in Alaska, weather is always a primary consideration. Extremes in both high and low temperatures can occur at any time during the year, and these extremes vary with location in the state (<http://www.infoplease.com/ipa/A0930150.html>). Therefore, appropriate clothing, equipment, and procedures are necessary to ensure outdoor safety under these conditions. The major danger occurs when working outdoors on the tundra or sea ice for sustained periods. Also, wind chill factors can easily drop to double digits below zero for anyone traveling on a snowmobile at 30 mph.

Protective Clothing

The appropriate protective clothing and equipment have been identified through published sources and lengthy conversations with local agencies, contractors, and native communities.

Appropriate Winter Clothing

The under layer of clothing—to keep your skin dry. The under layer of clothing should be of fabrics with good moisture wicking ability, such as polypropylene, wool blends, or silk. Do not use cotton as an under-layer fabric because it has poor wicking and insulating properties when wet. Under layer items include the following:

- thermal underwear
- sock and glove liners

The middle layer fabrics—to provide insulation from the cold. Polar fleece fabrics trap air in their fibers and are particularly well suited for the middle clothing layer. Polar fleece is soft, absorbs little moisture, insulates when wet, and dries very quickly. Useful middle layer garments include the following:

- turtlenecks/sweaters
- polar fleece or other insulating jackets/vests
- polar fleece or other insulated pants
- socks
- hats
- neck gaiters
- gloves

The outer layer—to protect you from rain, snow, and wind. The outer layer of clothing should be constructed of tightly woven fabrics to give protection against the wind. Waterproof qualities are less important on the North Slope in winter because liquid water is seldom present. Outer layer garments include the following:

- hooded parkas
- wind pants
- insulated boots
- goggles
- face masks
- balaclavas

Appropriate Clothing for Other Times of the Year

- Well-fitting rubber boots or waders
- Head nets and/or mosquito jackets (Mosquitoes are particularly persistent and in ample supply during spring and summer months.)
- Rain gear
- Warm cap and gloves, depending on the time of day of the fieldwork

Appropriate clothing often is a judgment call depending upon the prevailing and forecast weather.

Dehydration and Overheating

Ironically, overheating is a significant threat. Overheating caused by overexertion or by keeping outdoor clothing on for too long while indoors leads to perspiration, which in turn degrades the insulating value of clothing. Upon cessation of exertion, overheating easily turns to hypothermia. Consequently, exertion and protective clothing need to be balanced carefully and adjusted as needed to minimize or preferably prevent perspiration.

Frostbite

Frostbite is the major concern. Keep all skin warm, dry, and protected, and, to the extent possible, remain active. Follow the recommendations for wearing multiple layers of clothing provided in the “Appropriate Winter Clothing” section on the previous page. Head and facial coverage also is important in windy and frigid climates. At the first signs of numbness or severe chill, seek warmth and covering and initiate mild joint movements. Upon returning inside to warm shelter, treat mild frostbite or chills with additional coverings or with cool-progressing-to-warm water to alleviate discomfort. Lingering frostbite deserves medical treatment.

Bear Encounter Hazard

No matter how careful you are, the possibility always exists that you may encounter a bear while working in the field. A polar bear hazard is possible while working on the North Slope. Grizzly bears are common throughout many areas of Alaska.

The best defense against bears is staying in a group. Bears are extremely unlikely to attack a group of even two people, but it can happen if a bear is surprised. Once you arrive in Alaska, consider procuring bear spray; this product cannot be transported on airlines. For project participants, carrying and using bear spray may be an option and may require training.

Your work activities may dictate whether you need to have an armed escort for protection. If you are planning to work indoors at a field building, you may choose to travel unarmed in a vehicle to the site. A close watch for bears during arrival and departure from the site may suffice in this case.

Under good visibility conditions, you may be able to spot bears at long range and take evasive action without the need for protection. On the other hand, under low visibility conditions (darkness, blowing snow), the addition of an armed escort is advised.

The Law: Polar bears are protected under the Marine Mammal Protection Act of 1972. The Act prohibits the "taking" of marine mammals. "Take" is defined to mean, "harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal." Polar bears are considered marine mammals because they spend most of their lives hunting seals on Arctic Ocean sea ice. The use of force against polar bears in defense of human life, and even the use of deterrent devices such as cracker shells by unauthorized persons are both technically illegal under the Act.

Negotiating Rough Terrain and Conditions

The terrain you will negotiate in Alaska may be different from the terrain to which you are accustomed, and it changes from one region to another and by season in the permafrost.

Be alert while walking in the field because slippery and uneven surfaces could cause slips, trips, and falls. Always be aware of where your coworkers are and of other activities going on around you. Finally, scout carefully and consult with knowledgeable local personnel about current conditions.

Seasonal Weather Driving

Driving conditions in Alaska can become severe in a short amount of time. Hazards include snow- and ice-covered roads, which can affect the response of the vehicle, and limited visibility.

Field environments may be challenging to keep visual contact with all vehicles traveling together as a team. A vehicle may become stranded and not be able to contact other team members for assistance.

Keep a safe distance from the vehicle in front of you to avoid rock contact with vehicle windshields that could affect driving visibility and require costly replacement.

Some basic tips on planning and preparation should be followed when traveling in Alaska.

Have the following systems on the vehicle routinely checked by a skilled mechanic:

- Battery
- Ignition system
- Heating and cooling systems
- Exhaust system
- Windshield wipers and washers
- Tires
- Tire chains

It is also recommended that the following cold weather equipment be maintained within the vehicle at all times:

- Flashlight
- Brush, broom, or snow scraper for snow removal
- Extra fuses for vehicle systems
- A rag for cleaning headlights or the windshield
- Chains for the tires
- Extra windshield washer fluid
- Insulated gloves
- S small snow shovel
- S small bag of sand or salt
- S blanket and extra heavy clothing for emergencies
- Booster cables or “boost box”
- Nonperishable food for emergencies

NOTE: For additional information, refer to *Winter Weather Driving Tips* from the Alaska Department of Transportation ([http://dps.alaska.gov/PIO/TrooperTimes/ArchiveStories/12.06.07 Winter Driving.pdf](http://dps.alaska.gov/PIO/TrooperTimes/ArchiveStories/12.06.07%20Winter%20Driving.pdf)).

Equipment and Ergonomic Hazards

Excessive Noise

Some site locations or activities (e.g., heavy equipment operation) may produce excessive noise. Participants in this project who use hearing protection devices (ear plugs and/or muffs), either on a mandatory or voluntary basis, must understand why the PPE is required and must review the proper use and fit of hearing protection devices (refer to **Wearing Hearing Protection Properly**) located on the Ngee Arctic website at <http://ngee-arctic.ornl.gov> under Resources/NGEE Team Files/Safety.

Hearing protective devices shall be worn by all individuals operating drilling equipment and by those individuals assisting in operations that put them near any drilling equipment (such as the Big Beaver drill rig and/or the gas-powered hand auger).

If you are unsure whether activities are exceeding 85 dB noise levels and/or a noise survey is not possible, always err on the side of caution and use hearing protection.

Carrying Equipment

Drill rods, core barrels, augers, and other drilling accessories are heavy, and movement associated with drilling and sampling operations could present ergonomic hazards. Carrying, holding, and operating the gas-powered auger can be hazardous to the back, wrists, elbows, and shoulders. Carrying and handling heavy deep-cycle batteries could result in personnel injury if not done correctly.

Participants must be cognizant of the need for proper ergonomic layout of equipment and operations and should make adjustments as appropriate.

To minimize risk of injury, participants should avoid awkward positions when possible during fieldwork and must follow proper lifting and carrying techniques.

Tips for Lifting Heavy Items: Lifting is strenuous, and proper bending and lifting techniques are strongly encouraged to perform it safely. By bending at the knees instead of at the waist and lifting with the large, strong muscles of the legs instead of the small muscles of the back, workers can prevent back injuries and reduce the potential for lower back pain.

For most workers, lifting loads weighing more than 20 kg (44 lb.) can result in an increase in the number and severity of back injuries. Personnel must be cautious and must use proper lifting techniques when lifting any load, especially those loads approaching 40 lb. A team lift is recommended for all loads with weights at or above 40 lb. Individuals should seek assistance, even for lesser weights, depending on their personal capabilities and the bulkiness of the item.

Operating Equipment

Drilling Rig Operation

Project participants may be operating drilling equipment and/or working near drilling operations (e.g., during soil coring/sampling activities).

Special authorization to operate heavy drilling equipment (such as the Big Beaver Power Mast) is required. ORNL has authorized Kenneth Lowe. Kenneth may choose to have other project participants assist during drilling operations but will not allow these individuals to operate the rig. Kenneth will use the PPE and controls guidance in *Drilling Operations in Support of Environmental Sciences Division* (ESD RSS 8532) during operation of the rig. Additionally, instructions within the **Owner/Operator Manual for the Big Beaver Power Mast** and the **Little Beaver Hydraulic Power Unit** will be followed. The manufacturer pre-use Maintenance and Safety Checklist shall be filled out for the Big Beaver Power Mast before each day's use.

Operator manuals and safety checklist are located on the Ngee Arctic website at <http://ngee-arctic.ornl.gov> under Resources/NGEE Team Files/Safety.

You can also find the documentation on the Little Beaver website at <http://www.littlebeaver.com/brochuresmanuals/>.

Other project participants will not be directly engaged in drilling activities; however, if they or any other observers are in the field when heavy equipment is operating, a briefing by the responsible person on hazards and controls shall be performed. Potential topics are (1) an exclusion zone, where observers may not enter around equipment, and (2) hand signals for heavy equipment operators to communicate, if necessary, to the observers. Specific topics are up to the responsible individual, but they must convey the information to observers, who in turn are responsible for abiding by the restrictions.

Gas-Powered Hand-Held Augers

Gas-powered hand-held augers will be used to make ground penetrations and take core samples. Any project participant may operate the gas-powered auger. Unless the available auger is a small, single-person unit, operation of a gas-powered auger shall be a two-person operation. Individuals operating the auger should be physically fit to handle, move, and operate the device. Be aware that, should the auger bit bind, the power head/top of the auger may kick or attempt to spin freely. Follow all instructions within the referenced Owner/Operator Manual for the specific auger used (**One-Man Auger** or **Two-Man Auger**), but additional considerations are as follows:

- Do not carry the auger between drilling sites/holes with the engine running.
- Keep hands, feet, hair, loose clothing, and lanyards away from any moving parts on the engine and auger.
- Always wear safety glasses with side shields and hearing-protective devices (muffs or plugs) when operating the auger.
- Safety-toed work boots or insulated boots with protective caps shall be worn at all times when operating the auger.
- Avoid contact with the exhaust system or any other hot parts of the unit.
- To limit continuous actions by individuals under extended field sampling situations, crews should be rotated or take breaks as needed.
- Operator manuals for both types of augers are located on the NGEE Arctic website at <http://ngee-arctic.ornl.gov> under Resources/NGEE Team Files/Safety.

Only individuals who are physically capable of moving the device (team lifting at all times) and holding the device in place during operation (being able to withstand kickback should the bit bind) will be permitted to operate this equipment.

Gas-Powered Portable Generators

Gas-powered portable generators will be used to power various activities. Any project participant may operate the portable generators.

Operator manuals and safety checklist are located on the NGEE Arctic website at <http://ngee-arctic.ornl.gov> under Resources/NGEE Team Files/Safety.

You can also find the documentation on the Honda EU2000i and EU3000i portable generators at:

EU2000i: <http://powerequipment.honda.com/generators/models/eu2000i>

EU3000i: <http://powerequipment.honda.com/generators/models/eu3000i-handi>

Electrical Hazards

The potential for electrical shock requires participants to inspect equipment cords and battery cords before use for defects (e.g., loose parts; deformed or missing pins; pinched, cut, crushed, or deteriorated outer insulation). Cords must be removed from service if a defect or damage is observed.

Cords subject to pedestrian traffic must be protected to eliminate physical damage and to minimize tripping hazards.

All electrical equipment powered by alternating current that (i.e. portable generators) is used in the field must be protected by a ground fault current interrupter (GFCI), either by an in-line GFCI extension cord, built-in GFCI protection in the generator, or by a standalone GFCI circuit protector.

Electrical field equipment that stays outdoors unattended shall be listed by a nationally recognized testing laboratory (e.g., Underwriters' Laboratories, Inc. [UL]) for such use.

In Barrow, sealed LI-COR batteries must be charged in a designated area at the UIC garage. Batteries must not be charged when frozen because this increases the likelihood of fracturing the battery casing. Batteries that have visible signs of damage must not be connected to the charger and will be taken out of service for proper disposal.

There are no specific sites on the Seward Peninsula to charge batteries.

Note: Deep-cycle batteries may be charged by project participants, but manufacturer's instructions for charging/safety must be followed. Your home institution may require additional electrical safety training.

Snowmobiles and ATVs

Barrow

Use of a snowmobile or an all-terrain vehicle (ATV) by participants to access the site or to transport tools or equipment requires training and qualification before use. Two snowmobile and ATV training videos are required. You must review the following website, including the quizzes, to become trained and qualified:

- Arctic Snowmobile Safety: <http://www.lounsburyinc.com/snowmachinesafety/>
- ATV Safety: <http://www.atvsafety.org/>

Helmets approved by the US Department of Transportation and eye protection (such as goggles or fixed face shield) must be worn at all times when by anyone operating or riding on a snowmobile or an ATV.

Refer to the work-aids located under Resources/NGEE Team Files/Safety on the NGEE website for additional information on snowmobile operation requirements.

Seward Peninsula

Currently, there are no project resources or logistics for snowmobiles or ATVs, but vendors are available if a team requires their use.

Needles and Sharps

Syringes with needles may be used in some field experiments/measurements. Needles shall not be directly recapped using two-handed operations. Instead use safer alternative methods (i.e., foam block technique, etc.) to avoid the potential for puncture/needle sticks. Ensure all needles are recapped before walking around in the fields. Dispose of all sharps in appropriate sharps containers.

Hazardous Materials

HAZCOM

Small amounts of hazardous materials (e.g., inorganic salt solutions, dilute sodium hypochlorite solutions, microsphere beads, acids) may be used in the field. All volumes of solutions taken to the field and/or made in the field must be minimized. Hard copies of the safety data sheets (SDSs) for all chemicals taken to the field must be available to the participants while in the field or in the laboratory.

All participants working with hazardous chemicals in the field must have training on hazardous materials and must be familiar with the materials (i.e., have access to and be aware of the product SDSs). Workers preparing solutions in the field must wear nitrile gloves and safety glasses with side shields.

To meet the project hazardous compound labeling requirements, secondary chemical containers (not used/stored in labs) must be labeled with the identity of the hazardous chemical(s) and appropriate hazard warnings (via words or symbols), which provide at least general information regarding physical and health hazards. This labeling requirement applies unless the hazardous chemical is used only by the person transferring the chemical from the primary container, the person who performed the transfer has constant control of the container, *and* the chemical is used completely within the work shift.

Cryogenic

Use

Liquid nitrogen and/or dry ice may be used in field for sample preservation.

For liquid nitrogen, at minimum, safety glasses with side shields are required at any time cryogenic liquids, exposed to the atmosphere, are present. Goggles provide the best protection for the eyes. A full-face shield shall be used when a cryogenic liquid is transferred to an open container where there is a potential for bubbling. Long sleeves or a lab coat are means for protecting exposed skin of the arms when working with liquid cryogenics in the field.

For hand protection, special gloves made for cryogenic work (i.e. "cryo-gloves") or loose leather gloves without gauntlets that can be tossed off readily shall be used.

Tongs or other tools to lift objects out of the liquid or liquid baths will be used. Only containers specifically designed for holding cryogenic liquids should be used when freezing samples with liquid nitrogen.

For dry ice, never store in an airtight container, use loose fitting lids to prevent pressure build-up.

Do not touch dry ice with your skin! Use tongs, insulated (thick) gloves or an oven mitt and safety glasses with side shields when handling dry ice.

Use in a well-ventilated area and keep the material away from your face/breathing zone.

Transport

If participants must prepare and ship samples and/or materials on dry ice for air transport from offsite locations, additional DOT function-specific training certifications are required to properly declare and placard the package(s). Authorized individuals must possess the "IATA Dry Ice by Air Shipper " role in LRN.

NOTE: Transport of dry ice by vehicle is not DOT regulated, but be cautious if transporting dry ice inside vehicles compartments. One should have adequate ventilation of the vehicle compartment and should not recirculate the air in the vehicle.

Regardless of transportation mode, dry ice should be in closed coolers or other containers, but not sealed air-tight.

Flammable or Combustible

Use

A hand-held auger and portable generators are powered by gasoline.

Gasoline carried to field locations is transported in containers approved for the purpose. Ignition sources are kept at a safe distance (recommend 25 feet) from storage containers and equipment during refueling.

Safety glasses with side shields shall be worn during refueling.

NOTE: Approved METAL or PLASTIC safety cans may be used for the handling and use of flammable liquids in quantities up to 5 gallons. Safety cans must meet the following conditions:

- Be not more than 5 gallons in capacity.
- Be listed by a national testing lab such as UL, Factory Mutual, etc.
- Have a spring closing lid which closes after filling or pouring.
- Be leak tight.
- Have a flame arrestor screen.
- Have a safety valve to relieve internal pressure.

Transport

Transport of gasoline or compressed gases in Alaska falls under the DOT "Materials of Trade" (MOT) exception to the full DOT hazardous shipment requirements. Only ORNL project participants who have completed the ORNL MOT training are permitted to transport hazardous chemicals by vehicle. The controlling subject area procedure requires the containers are physically secure and properly labeled.

NOTE: The MOT volume limits per container for Gasoline (DOT Class 3 flammable liquid, Packing Group II) is 5 gallons or less. Multiple safety cans, however, can be transported at the same time.

Helicopter Use

The NGEE Arctic project has contracted with Bering Air for limited helicopter services to gain access to remote research sites not accessible by vehicles because of snow and ice. Following are safety and etiquette guidelines:

- Approach or leave in the pilot's field of vision, usually from the front of the aircraft.
- Approach or leave the helicopter in a crouching manner (to stay below the main rotor).
- Stay away from the tail rotor.
- Approach or leave on the down slope side.
- Carry tools horizontally and below waist level, never upright or over the shoulder.
- Fasten seat belt after entering the helicopter and leave it buckled until the pilot signals you to get out.
- Never leave the helicopter while it is at a hover.
- Do not touch bubble or any moving parts (tail rotor, exposed linkage, etc.).
- Do not slam the helicopter doors.
- Wear survival clothing in flight, up to the waist, in case of an emergency.
- Keep heliport clear of loose articles (water bags, empty cans, etc.).
- Keep people away from the helicopter during takeoffs and landings.
- Keep cooking and heating fires well clear of the helicopter.

Maintain situational awareness at all times. If something doesn't look right, let your OOTD and flight crew know.

Planning Fieldwork

Permits

Some work will involve penetrating the subsurface and some excavation. Project participants are responsible for ensuring adherence to local, state, and tribal permitting/requirements and avoidance of subsurface utilities or interferences. Contact the project director, Stan Wullschleger, or the technical project manager, Susan Heinz, for information about permits obtained for the project.

Before You Travel

Before you go, collect as much information as possible about the work you will be doing and about the site where you will be working. This information will help with planning.

Be aware that when you reach your destination, work conditions may be different from what you expected. If necessary, call your science team lead or your institutional representative for guidance to prepare properly. The resources of your institution still will be available to you (e.g., your supervisor; subject matter experts; environmental, safety, and health support staff).

Prepare an emergency phone list to bring with you, including your supervisor, project contacts, subject matter experts whom you may need to contact, local emergency numbers, and the ORNL laboratory shift Superintendent at (865) 574-6606.

Verify that your emergency contact information is current at your institution and that your supervisor has your contact information for the off-site location.

Officer of the Day

The project director will assign a participant the role of OOTD on any day that project participants are performing project work in Alaska. The OOTD is responsible for

- planning the daily meeting;
- gathering weather, bear, and other reports relevant to the day's activities;
- ensuring that all participants attend the meeting;
- ensuring that new participants have completed the required reading and acknowledgement;
- ensuring that someone is responsible for carrying the first aid kit, communication equipment, and/or other survival gear (e.g., compass/global positioning system device, whistle, map, emergency survival supplies, lighting, provisions for emergency shelter, fire-starting materials);
- ensuring that all participants have a buddy and are in good physical health; and
- ensuring that any known hazards for the day's work are discussed and that hazard controls are understood.

The OOTD also has the authority to cancel field activities because of weather conditions, bear activities, and other unmanageable hazards. In an emergency, the OOTD is responsible and must act to ensure the safety of the participants.

In the event of an injury or illness, participants must notify the OOTD. If an injury has occurred, the OOTD must ensure that any unsafe conditions are corrected or mitigated to prevent further injury, confirm that appropriate medical care has been received, and record that circumstances and actions leading to the injury. Before the close of business on the day of the injury or illness, the OOTD must report it to the injured or ill participant's institutional lead and to the ORNL laboratory shift superintendent at (865) 574-6606. Additional actions may be assigned after these notifications are made.

Preparing for Fieldwork

Readiness

Plan for communication:

- Bring your emergency phone list with you.
- Make sure that you have some means of communication available in the field. In Barrow, our logistics provider typically provides two-way radios to the field teams. These work well because of proximity to the central base station.
- On the Seward Peninsula, each team working in the field needs to have a satellite telephone or Spot Beacon (DeLorme) with communication capabilities. At the end of each day, OOTDs will communicate to account for each team and person.
- If you are in an unsafe condition while off site, attempt to stop the work and resolve the concern. If that is not possible, you are responsible for removing yourself from the situation and ceasing work until the issue is resolved.

Daily Meeting

Each day, before starting any field or laboratory work in Alaska, the OOTD organizes and leads a meeting with project participants to discuss the day's activities and weather conditions. After assigning participants to job teams and work sites and after gathering expected return times for those performing fieldwork, the OOTD confirms that participants have reviewed the hazards and required PPE. The following questions can be helpful to ensure that new and known hazards are controlled:

- What can go wrong? (What keeps you up at night?)
- What measures or controls are in place to prevent that from happening?
- How do (or which of) the most important controls depend on human actions or behavior?
- Where might an error or omission impair the effectiveness of an important control?
- What change has been made (e.g., to process, equipment) that could inadvertently increase risk in another area?

Error precursors are conditions or attitudes that increase the chances of an error during an individual's performance of a specific task. Participants must consider whether there are precursors that, if reduced or eliminated, would make the controls more likely to be effective.

Specific Hazards

Participants must consider special precautions necessary in unusual environments. Local work control processes and health and safety requirements must be followed when working at other facilities.

Participants must use sharps such as box cutters, scalpels, or razor blades in a manner that keeps the cutting blade away from fingers and the body. Cut-resistant gloves should also be used whenever possible.

In addition, participants should use mosquito repellants and protective netting as seasonal conditions warrant.

Stop Work

EVERYONE HAS STOP WORK AUTHORITY: Anyone who is placed in an unsafe condition while off site must attempt to stop the work and resolve the concern. If that is not possible, participants are responsible for removing themselves from the situation and stopping work until the issue is resolved.

The Buddy System

No one is permitted to work alone at any of the NGEA Arctic field sites. Always have someone with you; at no time shall participants be permitted to be at the field site alone. Each group of buddies must have some means of communication in case of emergency or for notification of changing conditions and hazards. Two-way radios are the preferred method. In Barrow, radios are available from UIC. On the Seward Peninsula, each team will be responsible to obtain its own communication device(s), such as a radio, satellite phone, or Spot Beacon.

Mandatory General Emergency Controls

- 1) When in the field, participants will have access to, and know how to operate, some means for getting timely emergency help (e.g., radio or phone and contact numbers). Personnel must have the emergency services phone numbers for the location and the numbers for the site point of contact immediately available (see Appendix).
- 2) The “buddy system” is required at all times. At no time shall participants be permitted to be at the field site alone.
- 3) An individual involved in a work-related off-site injury or illness must immediately seek the appropriate level of medical care required by the event. As soon as reasonably possible after the event, inform the OOTD for proper follow-up and reporting.
- 4) A first aid kit must be taken to or maintained at the field sites for basic first aid needs. The Red Cross First Aid course is recommended for all participants.
- 5) Participants working in Barrow also can maintain and be trained on the use of an automated external defibrillator (AED). UIC will provide an AED at the field site and/or a centralized location. An AED will not be available at field sites on the Seward Peninsula.
- 6) Because of the remote nature of this work, personnel should consider carrying emergency survival items (e.g., compass/global positioning system device, whistle, map, fire-starting materials) and must be aware of the route from the worksite to the nearest medical facility and/or a method to summon emergency services to the site.

This safety manual and applicable SDSs for chemicals used by participants must be maintained by personnel at the laboratory or field site.

Severe Winter Storms

In case of severe weather or storms, always

- dress for the worst scenario,
- keep extra clothing on hand,
- follow the directions from local hosts,
- proceed directly to a safe structure,
- keep protected and warm, and
- call for help as necessary.

Appendix

Sites of Interest

- Barrow Bulletin: <http://www.barrowbulletin.com/>

Literature Cited

BP Exploration. 2010. *Alaska Safety Handbook*. 251 pp.

Roberts, D. E., and M. P. Hamlet. 2001. "Prevention of cold injuries." In: *Medical Aspects of Harsh Environments*. D. E. Lounsbury, K. B. Pandolf, and R. E. Burr (eds.). Department of the Army, USA, pp. 411–427.

Referenced Documents

All documents are archived under Resources/NGEE Team Files/Safety on the NGEE website at <http://ngee-arctic.ornl.gov>.

ATV Safety

<http://www.atvsafety.org/>

AUTV Training Documentation Owners Manual

Big Beaver Drill Rig Manual

Contact Information for NGEE Team and Sites

Cold Stress Guide

<https://www.osha.gov/SLTC/emergencypreparedness/guides/cold.html>

Drill Rig Manual

Honda EU2000i Companion Generator Owner's Manual

Honda EU3000i Handi Generator Owner's Manual

Little Beaver PS182024-Hydraulic-Power-Unit-Operator Parts-Manual

NGEE Arctic Project Manual

One-Man Auger Manual

Safety Checklist—Little Beaver

Two-Man Auger Manual

Drilling Operations in Support of Environmental Sciences Division (ESD RSS 8532)

(Contact project manager to receive a copy if you do not have access.)

Snowmobile

Wearing Hearing Protection Properly

Winter Weather Driving Tips

Contact Information

See NGEE Arctic Team Contact and Site Information for quick reference numbers and addresses for Barrow and Seward Peninsula. The information is located on the NGEE Arctic website at <http://ngee-arctic.ornl.gov> under Resources/NGEE Team Files/Safety.