



PROJECT FIELD SAFETY MANUAL

NEXT-GENERATION ECOSYSTEM EXPERIMENTS

NGEE ARCTIC



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NGEE ARCTIC**

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Applicability

This manual is required reading for all NGEE Arctic participants prior to commencing any field work on the Seward Peninsula or in Barrow, Alaska.

Review the attachments. They contain supplemental information (e.g., directions, maps, contacts, site instructions, emergency information) important for the Barrow Environmental Observatory (BEO), where field research is first expected to occur. Be advised that the attachments also include controls pertaining to many other items, such as field clothing/personal protection equipment, and first-aid kits.

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Abbreviated Terms

ACRF	Atmospheric Radiation Measurement Climate Research Facility
AED	automated external defibrillator
ARM	Atmospheric Radiation Measurement
ATV	all-terrain vehicle
BARC	Barrow Arctic Research Center
BEO	Barrow Experimental Observatory
DOE	US Department of Energy
FACE	Free-Air CO ₂ Enrichment
GFCI	ground fault current interrupter
IFRC	Integrated Field Research Challenge
LI-COR	An instrument manufactured by LI-COR to measure soil CO ₂ flux
NGEE Arctic	Next-Generation Ecosystem Experiments
NSF	National Science Foundation
OOTD	Officer of the day
ORNL	Oak Ridge National Laboratory
PPE	personal protective equipment
SPRUCE	Spruce and Peatland Responses Under Climatic and Environmental Change Experiment
UIC	Ukpeaġvik Iñupiat Corporation
MSDS	material 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. The institutional representative for each institution is 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 is also 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 could reasonably be encountered while performing the work. The controls to be used by the participants to avoid or mitigate the hazards must be reviewed and approved for adequacy by the safety professionals at the task leader's home institution.

The task leader 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 the participants are briefed on the safety plans, 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 project officer of the day (OOTD). Work must not be resumed until the threat from the hazard is mitigated or removed.

During the preparation and performance of work, all participants must be mindful of the known hazards, use the defined controls, and be observant of changing conditions. Additional review is to be requested before continuing work if a new hazard is encountered. Lessons learned and suggestions for improving hazard controls must be collected by the task leader and must be considered for changes to the safety plan and/or communication to other task teams of the project. Any changes to the safety plan must be reviewed, approved, and communicated to the team participants.

Required Reading

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 at the Barrow Experimental Observatory (BEO). All participants must comply with these minimum safety requirements while at BEO. The hazards and controls contained within the *Project Field Safety Manual* and the *Project Laboratory Safety Manual* need not be repeated in the task safety plan unless additional controls are required because of the work being performed.

- This **Project Field Safety Manual** is required reading prior to participation in any field research at Barrow Experimental Observatory (BEO).
- The **Project Laboratory Safety Manual** is required reading prior to participation in any laboratory work in the NGEE Arctic's laboratory at Barrow Arctic Research Center (BARC).
- The **Project Manual** is required reading for all project participants
- The **Project Orientation and Safety Video**.
- The **Polar Bear Safety Video**.

These documents are available at the project website (<http://ngee-arctic.ornl.gov>) under the Safety tab with other project safety information.

- These documents will be reviewed annually for currency and applicability.
- Significant changes to these manuals will be communicated to all participants upon implementation of the change(s).

Overview

Safety at Arctic field sites will be an integral component of the team's research planning and execution. While 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, 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 any training materials will be made available for review. Both printed, on-site documentation and electronic resources will be provided to project participants.

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, including local knowledge is integral to safety. Our conversations with logistics providers and native people have apprised us of many local hazards and safeguards, and we expect that those discussions will grow. The NGEE Arctic team has also solicited safety information from the DOE Atmospheric Radiation Measurement (ARM) facility on the North Slope of Alaska (Ivey 2012), National Science Foundation (NSF) investigators and the logistics provider (UIC) (Polar Field Services 2012), U.S. military staff (Roberts and Hamlet 2001), and petroleum exploration companies that operate in the region (BP Exploration 2010). University collaborators bring great experience in operating in the Arctic, and ORNL staff members have coordinated team safety in large DOE-supported Free-Air CO₂ Enrichment (FACE), Spruce and Peatland Responses Under Climatic and Environmental Change Experiment (SPRUCE) and Integrated Field Research Challenge (IFRC) projects.

From these resources, the NGEE Arctic team has already identified a series of hazards pertaining to fieldwork on the North Slope:

- Mechanical hazards: drilling equipment, vehicles, snowmobiles, all-terrain vehicles, ergonomic, slips/falls, and cuts/abrasions.
- Geographic and weather-related hazards: cold-related injuries (including hypothermia and frostbite), dehydration, storms, wind, flooding, seasonal depression, communication disruptions, disorientation, and bear encounters.
- Exposure hazards: electrical shock, hazardous materials, and noise.

Each identified hazard will be addressed prior to the commencement of field activities 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. Both the national laboratories and Ukpėagvik Iñupiat Corporation (UIC) are 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 negative consequences or retaliation. A stop work action triggers immediate review by knowledgeable personnel until issues are resolved. Although this authority is rarely exercised, it is an essential component of safety plans that enlist individuals and teams to share responsibility for safety. The team will also recognize an individual's decision not to pursue approved activities based on different levels of experience and physical condition.

Working in the Arctic Climate

The North Slope of Alaska is north of the Arctic Circle at latitudes ranging from 69 to 72°. Barrow, the largest town on the North Slope (pop. 4500), is the site of a National Weather Service Station, which has been active for several decades, so the climatology of the Alaska arctic coastal region as represented by Barrow is relatively well known. The North Slope is covered with ice and snow typically eight months of the year (October–May). During part of November, all of December, and most of January, the sun does not come above the horizon; this is what is referred to as the "polar night." Particularly during this period, quite low temperatures routinely occur, although severe winter weather can be encountered anytime between October and May.

The low temperature record at Barrow is 57°F below zero. Lower temperatures very likely occur on the coastal plain farther away from the coast. Temperatures in the range of 25 to 45°F below zero are common in winter. The most notable cold weather safety threat on the Arctic Coastal Plain, however, is that these low temperatures occur in combination with moderate to high winds. Typical wind chill factors are 60 to 80°F below zero. With these wind chills, exposed flesh freezes in one to two minutes. Excursions to triple-digit wind chills on the Alaskan North Slope occasionally occur.

Temperatures in the low thirties (Fahrenheit) can even be experienced in summertime months, and rains can be very cold.

Appropriate clothing, equipment, and procedures are necessary to ensure outdoor safety under these conditions. When people move around within the populated areas of Barrow, these conditions impose surprisingly minor burdens. In such areas, exposure is limited to minutes, and the array of buildings cuts the wind at ground level so that the wind chill is less severe than in the surrounding countryside.

The major danger occurs when working outdoors on the tundra or sea ice for sustained periods. Also remember that wind chill factors can easily drop to triple digits below zero when travelling 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 Barrow agencies, contractors, and hunters, including North Slope Borough Search and Rescue, the North Slope Borough Wildlife Management Department, and the Atmospheric Radiation Measurement Climate Research Facility (ACRF)/North Slope liaison and support contractor (UIC Science Division).

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 as 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. The fabric is soft, absorbs little moisture, insulates when wet, and dries very quickly. Useful middle layer garments include the following:

- turtle necks/sweaters
- polar fleece or other insulating jacket/vest
- polar fleece or other insulated pants
- socks
- hat
- neck gaiter
- 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 since liquid water is seldom present. Outer layer garments include the following:

- hooded parka
- wind pants
- insulated boots
- goggles
- face mask
- balaclava

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 time of day of the field work

Exactly what clothing is needed at any given time 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 caused 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 carefully balanced, and adjusted as needed to minimize or preferably prevent perspiration.

If working away from established sites, additional equipment should include first aid and emergency survival supplies, lighting, radio or cellular telephone communications to summon help, and provisions for emergency shelter. Remember to carry phones and batteries in inside pockets. A frozen battery will not work.

Dehydration can be a risk, particularly during the dry months of winter with low relative humidity, although its effect may be less obvious than the effects of heat or cold. It is important to keep a supply of drinking water available during outdoor activities.

Participants working in the field need to be aware of cold stress signs and symptoms. Additional basic information regarding extreme climates or temperatures is available at the following link:

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

Frostbite

Frostbite is the major concern. Keep all skin warm, dry, and protected, and, to the extent possible, remain active. Multiple layers of clothing are recommended, with the innermost being a wicking layer such as silk or synthetic sportswear wicking fibers. The outermost layer should be rugged and wind resistant or water resistant. Intermediate layers should be insulating. Head and facial coverage 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. Back inside warm shelter, mild frostbite or chills may be treated by additional coverings or with cool-progressing-to-warm water to alleviate discomfort. Lingering frostbite deserves medical treatment. Keep informed of weather conditions by radio and by the local office of the National Weather Service, which is located at 1018 Kiogak Street [phone: (907) 852-6484].

Bear Encounter Hazard

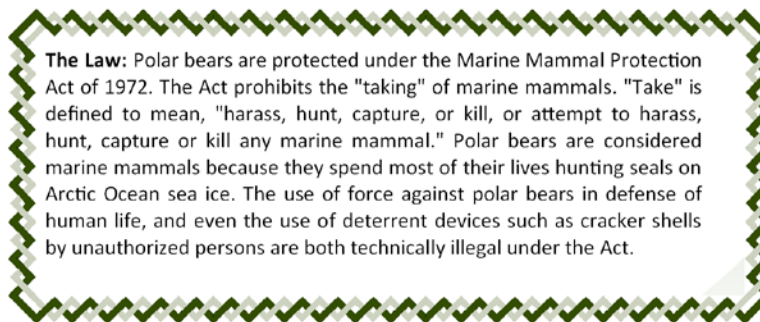
No matter how careful one is, the possibility always exists on the North Slope and on the sea ice off the North Slope of a close bear encounter of the wrong kind. A polar bear hazard is possible in Barrow and in the field at the BEO. Grizzly bear are not found in Barrow, they are prevalent further south in the research areas on the Seward Peninsula.

Barrow locals, in contact with local bear surveillance personnel, and knowledgeable about the local bear threat on any given day, are the best source of information. They should be your first point of contact in assessment of the bear threat. The best defense against bears is a group. It is extremely unlikely for a bear to attack a group of even two people, but it can happen if a bear is surprised. Once in Alaska, the procurement/use of bear spray is also something to consider. Bear spray cannot be transported on airlines. As a project participant, carrying and using bear spray requires training.

Your work activities may dictate whether you need to have an armed escort for protection.

For example, 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 armed escort is advised.



Negotiating Rough Terrain and Conditions

All the terrain to be negotiated 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.

An example of a changing hazard is the Nome-Council Highway, on the Seward Peninsula, which is a seasonally open road with limited service and maintenance. At the end of the Nome-Council Highway lies a ford across the Niukluk River to Council.

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

Winter 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.

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 washer fluid
- insulated gloves
- a small snow shovel
- a small bag of sand or salt
- a blanket and extra heavy clothing for emergencies
- booster cables or "boost box"
- nonperishable food for emergencies

NOTE: For additional information, refer to the attached *Winter Weather Driving Tips* from the Alaska Department of Transportation.

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**).

Hearing protective devices shall be worn by all individuals operating drilling equipment, or 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 A 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. Make adjustments as appropriate.

To minimize risk of injury, participants should avoid awkward positions when possible during field work 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 in order 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, back injuries can be prevented and the potential for lower back pain may be reduced.

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 very 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** will be followed.

The manufacturer pre-use Maintenance and Safety Checklist shall be filled out for the Big Beaver Power Mast prior to each day's use.

Other project participants will not be directly engaged in drilling activities; however, if they or any other observers are in the field when such 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 would be responsible for abiding by the restrictions.

Gas-Powered Hand-Held Auger

A gas-powered hand-held auger 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 the 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.

Only those 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.

Electrical Hazards

The potential for electrical shock requires participants to inspect equipment cords and battery cords prior to 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 is used in the field must be protected by a ground fault current interrupter (GFCI) (either by an in-line GFCI extension cord or by GFCI circuits.)

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

Sealed LI-COR batteries must be charged in a designated area at the UIC garage. Batteries must not be charged when frozen, as 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.

Note: Deep-cycle batteries may be charged by participants of this project, but manufacturer's instructions for charging/safety will be followed. In addition, the work-aid at the following link, <http://ngee-arctic.ornl.gov/sites/ng ee.ornl.gov/files/data/NGEE%20Team/Safety/BatteryCharging-Marine-Auto-ATV.pdf>, must be followed during these activities and must be posted within the battery-charging area.

Snowmobiles and ATVs

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 prior to use. The snowmobile and ATV training that has been recommended by UIC is required. 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) shall be worn at all times when operating or riding a snowmobile or an ATV.

Refer to the work-aids on the NGEE website for additional information on snowmobile operation requirements:

- Snowmobile: <http://ngee-arctic.ornl.gov/sites/ngee.ornl.gov/files/data/NGEE%20Team/Safety/SnowmobileWorkaid.pdf>

Hazardous Materials

Some small amounts of hazardous materials (e.g. inorganic salt solutions, dilute sodium hypochlorite solutions, microsphere beads) may need to be utilized in the field. All volumes of solutions taken to the field and/or made in the field will be minimized. Hard copies of the material safety data sheets (MSDSs) 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 chemicals in the field must have training in on hazardous materials and must be familiar with the materials (i.e., have access to and be aware of the product MSDSs). Any solutions prepared in the field will also be done wearing 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 the physical and health hazards. This labeling requirement applies unless the hazardous chemical is only used 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 completely used within the work shift.

Planning Field Work

Permits

Some of work will involve penetrating the subsurface and some excavation. It is the responsibility of the project participants ensure that any local, state, or tribal permitting/requirements are adhered to and that subsurface utilities or interferences are avoided. Two permits, one from BEO and one from North Slope Borough, are required and will be renewed annually. The permit runs from April 1 through March 30. Contact the Project Director, Stan Wullschleger, or the Technical Project Manager, Kathy Huczko, for information about permits obtained for the project.

Before You Travel to Barrow

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 will still 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.

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 officer of the day (OOTD) on any day that project participants are performing project work in Barrow, 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, radio, 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
- 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 due to weather conditions, bear activities, and other unmanageable hazards for the participants. In the event of an emergency, the OOTD is in responsible charge and must take action 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. Additional actions may be assigned after these notifications are made.

Preparing for Field Work

Readiness

Bring your emergency phone list with you.

Make sure that you have some means of communication available in the field. Radios are typically provided to the field teams by our logistics provider.

If you are placed in an unsafe condition while off site, attempt to stop the work and resolve the concern. If that is not possible, then you are responsible for removing yourself from the situation and not continuing to work until the issue is resolved.

Daily Meeting

Each day, prior to starting any field or laboratory work in Alaska, the project participants present in Barrow must meet to discuss the day's activities and weather conditions. This meeting is organized and led by the OOTD. After establishing who is working where and on what, and after gathering expected return times for those performing field work, 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 the performance of a specific task by a particular individual. 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 any special precautions that may be needed in unusual environments. Local work control processes and health and safety requirements are followed when working at other facilities. If anyone is placed in an unsafe condition while working on the NGEE Arctic Project, participants are to attempt to stop the work and resolve the concern. If that is not possible, then participants are to remove themselves from the situation and to stop work until the issue is resolved.

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

A first aid kit will be maintained and available in the field for basic first aid needs. It is recommended that participants successfully complete the Red Cross First Aid Training or equivalent.

Participants must remain alert while walking in the field since slippery and uneven surfaces could cause slips and falls. Always be aware of where your coworkers are and of other activities going on around you.

Participants who work outside and off the roads must wear appropriate clothing, including long pants, socks, and sturdy shoes.

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

The Buddy System

No one is permitted to work alone in the field at the Barrow research site. 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 the event of an emergency or to be notified of changing conditions and hazards. Two-way radios are the preferred method, and radios are available to participants from UIC.

When Things Go Wrong

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

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). or
- 2) The "buddy system" is required at all times at the Barrow field site. At no time shall participants be permitted to be at the field site alone.

An individual involved in a work-related off-site injury or illness must immediately seek the appropriate level of medical care as required by the event. As soon as reasonably possible after the event, inform the OOTD for proper follow-up and reporting.

Personnel must have the emergency services phone numbers for the location and the numbers for the site point of contact immediately available (see Appendix).

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.

Participants can also maintain and be trained on the use of an automated external defibrillator (AED). UIC will provide an AED. It will be kept at the field site and/or a centralized location.

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 MSDSs for chemicals used by participants must be maintained by personnel at the laboratory or field site. When working in Barrow, participants must also consider any special precautions that may be needed in unusual environments. Work control processes and health and safety requirements of host facilities or sponsors must also be followed.

Severe Winter Storms

In case of severe weather or storms, always

- dress for worst scenario,
- keep extra clothing at 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

Additional Information about the climate and related safety issues may be obtained from the follow site:
<http://www.arm.gov/sites/nsa/visit>

Note: UIC now has an updated web site for researchers planning to work in Barrow:
<http://www.barrowbulletin.com/>

Literature Cited

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

Ivey, M. **2012**. ARM - Visiting the NSA. from <http://www.arm.gov/sites/nsa/visit>.

Polar Field Services. **2012**. Barrow Bulletin. from <http://www.polarfield.com/barrow/>.

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

Arctic Snowmachine Safety <http://www.lounsburyinc.com/snowmachinesafety/>

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

Battery Charging – Marine, Auto, ATV

<http://ngee-arctic.ornl.gov/sites/ngee.ornl.gov/files/data/NGEE%20Team/Safety/BatteryCharging-Marine-Auto-ATV.pdf>

Big Beaver Drill Rig Manual

<http://ngee-arctic.ornl.gov/sites/ngee.ornl.gov/files/data/NGEE%20Team/Safety/DrillRigManual.pdf>

One-Man Auger Manual

<http://ngee-arctic.ornl.gov/sites/ngee.ornl.gov/files/data/NGEE%20Team/Safety/One-manAuger.pdf>

Two-Man Auger Manual

<http://ngee-arctic.ornl.gov/sites/ngee.ornl.gov/files/data/NGEE%20Team/Safety/Two-manAuger.pdf>

Cold Stress, Frostbite, and Hypothermia

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

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

<http://ngee-arctic.ornl.gov/sites/ngee.ornl.gov/files/data/NGEE%20Team/Safety/SnowmobileWorkaid.pdf>

Wearing Hearing Protection Properly

<http://ngee-arctic.ornl.gov/sites/ngee.ornl.gov/files/data/NGEE%20Team/Safety/WearingHearingProtectionProperly.pdf>

Winter Weather Driving Tips

<http://dps.alaska.gov/PIO/TrooperTimes/ArchiveStories/12.06.07%20Winter%20Driving.pdf>

Contact Information

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Information Contacts

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Site contacts










UIC:	24 Hour On-Call UIC Staff	907-367-6020	
Who UIC Facilities Planner		Office: 907-852-7457	Mobile:
Karl Newyear, UIC Chief Scientist		Office: 907-852-0929	Mobile: 907-229-2915
National Weather Service, 1018 Kiogak St. Barrow Alaska,			907-852-6484
Weather within 100 miles of Nome, AK http://nomeweather.com/public.php?radius=100			

Emergency Notification Contacts

Emergency 911 or Hospital/Emergency – (907) 852-4611

ORNL Laboratory Shift Superintendent – (865) 574-6606

Location Information (shown on map with icon)

 Police, 1068 Kiogak St, Barrow, AK 99723	(907) 852-0311
 Fire Department, 4374 Laura Madison St, Barrow	(907) 852-0234
 Hospital, 7000 Uula St, Barrow, Samuel Simmonds Memorial Hospital	(907) 852-4611
 North Slope borough Search and Rescue	(907) 852-2822
 North Slope Borough, 1689 Okpik St., Barrow	(907) 852-0320
 Wiley Post-Will Rogers Memorial Airport	(907) 852-6199
 Barrow Arctic Science Consortium	(907) 852-4881
 Project Laboratory	(907) 229-6567
 Project Sleeping Quarters	

Samuel Simmonds Memorial Hospital 7000 Uula St.

