Bristol
ENVIRONMENTAL REMEDIATION
SERVICES, LLC

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TECHNICAL MEMORANDUM

DATE: June 20, 2008

TO: Mr. Carey Cossaboom, Project Manager, U.S. Army Corps of Engineers, Alaska District

FROM: Matthew Faust, Project Manager, Bristol Environmental Remediation Services, LLC

RE: Contract No. W911KB-08-P-0074
Monitoring Well Decommissioning
Gambell, Alaska

Bristol Environmental Remediation Services, LLC (Bristol) has prepared this Technical Memorandum (Tech Memo) at the request of the U.S. Army Corps of Engineers (USACE). The Tech Memo presents the work plan for a groundwater monitoring well decommissioning project to be conducted at the Gambell Formerly Used Defense Site (FUDS).

SITE DESCRIPTION

The Gambell FUDS is located on the northwest tip of Saint Lawrence Island, near the village of Gambell. Gambell is located at latitude 63 degrees (°), 46 minutes ('), 49 seconds (") North, and longitude 171° 43' 46" West, approximately 200 miles southwest of Nome, Alaska, and 700 miles northwest of Anchorage, Alaska (Figure 1). The site was operated by the military as a radar and communications facility from 1948 until the late 1950s (USACE, 2005).

The Gambell FUDS encompasses approximately 2.7 square miles. The site includes areas around Troutman Lake and extends from the ocean to the top of Sevuokuk Mountain. Environmental investigation efforts have been conducted at the site from the 1980s through the present (USACE, 2005). Environmental remediation efforts under the FUDS program have been completed at the site, with the exception of final monitoring well abandonment and decommissioning.

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SCOPE OF WORK

The scope of work for this project is to properly abandon and decommission all remaining groundwater monitoring wells currently located at the Gambell FUDS in accordance with applicable Alaska Department of Environmental Conservation (ADEC) guidance (ADEC, 1992). Approximately 21 monitoring wells are currently located at the site. Approximate monitoring well locations are listed on Table 1 and are shown on Figure 2.

PROJECT WORK ACTIVITIES

Alaska Department of Environmental Conservation guidance specifies three acceptable methods for decommissioning monitoring wells (ADEC, 1992). One of the acceptable methods is to withdraw the casing and fill the bore hole with grout or bentonite. This is the method that Bristol will use to decommission the monitoring wells at the Gambell FUDS.

The monitoring wells at the site were constructed using 2-inch diameter schedule 40 polyvinyl chloride (PVC) casing within a steel protective casing. The protective casings of the wells range in diameter from four to 24 inches, and in depth from one to two feet below ground surface (bgs). Two of the wells were completed flush with the ground surface, while the other 19 were completed 1.25 to 3.5 feet above the ground surface. Total well depths range from 6.5 to 22.5 feet bgs. All screens are 0.01-inch slot size and are either five or ten feet in length. Filter packs consist of 20-40 sand. All wells were constructed with bentonite seals from the top of the filter pack to the surface.

Bristol's procedure for decommissioning the wells will be to first pull the protective steel casing from the ground using a chain attached to a loader bucket. Once the protective casing has been removed, the PVC will be removed using the same method. Given the shallow depth of the monitoring wells, Bristol does not foresee difficulties removing the casing in this manner. Once the PVC has been removed, the bore hole will be backfilled with bentonite chips, taking care to minimize void spaces. The bentonite will then be hydrated.

PROJECT SCHEDULE

Fieldwork for the Gambell FUDS monitoring well decommissioning project is anticipated to begin in mid-August 2008, and is expected to last no more than one week. The draft report, documenting the well commissioning, will be submitted within two weeks of the completion of fieldwork.

Schedule Summary

Activity	Month/Year	Tentative Date(s)
Monitoring Well Decommissioning	August 2008	August 18 – 24
Submit Draft Report	September 2008	September 7

PROJECT ORGANIZATION

Mr. Matthew Faust will be the Project Manager and will be responsible for ensuring project tasks are completed on schedule and within budget.

Mr. Llewellyn MacDonald will be the Site Superintendent and will be responsible for execution of Bristol on-site activities in accordance with contract specifications.

Mr. Carey Cossaboom is the Project Manager for USACE and is the point of contact (POC) for the Corps. Ms. Lisa Geist shall serve as the alternate POC.

Bristol will subcontract certain tasks to the Native Village of Gambell (NVG), who will provide a trained field crew and necessary heavy equipment. The field crew and heavy equipment currently serve the Native American Lands Environmental Mitigation Program (NALEMP), but this work is separate from NALEMP. The NVG crew will provide labor and heavy equipment operation, as well as disposal of well materials accumulated during the decommissioning activities.

SITE HEALTH AND SAFETY PLAN

Potential hazards associated with conducting field activities include physical hazards, such as exposure to heavy equipment, noise, slips/trips/falls, and hand tool usage, and potentially hazardous weather.

PHYSICAL HAZARDS

Falls

Workers may encounter fall conditions (slipping and tripping) during field activities. The potential hazards related to slipping, tripping, or falling associated with this site include the following:

- Uneven terrain,
- Buried objects, and
- Slippery surface conditions caused by standing water.

These hazards will be mitigated by using caution at all times.

Exposure to Heavy Equipment

Heavy equipment will be used on this project to pull casing from the bore holes. There is a potential for workers to be struck by these vehicles, or to be injured by contact with exposed mechanical parts. In addition, there is a risk of vehicle accidents and of fire during refueling. To control these hazards, safe distances will be maintained between workers and mechanical equipment.

Noise

High noise levels may occur during heavy equipment operation. Personnel exposed to noise associated with heavy equipment operation will be provided with appropriate hearing protection. A physical agent data sheet (PADS) for noise is included in Attachment 1 and will be available on site during field activities.

Hand Tools

Personnel may be utilizing hand tools during field activities. The potential hazards related to hand tools are pinch points and tools dropped onto body extremities.

These hazards will be mitigated by using tools in a manner proscribed by the tool's manufacturer.

Adverse Weather

In case of adverse weather, Bristol will determine if work can continue without sacrificing the health and safety of field workers. Some of the conditions to be considered prior to determining if work should continue are listed below:

- Extreme cold, and/or wind conditions,
- Heavy precipitation,
- Limited visibility, and
- Electrical storms.

PADS for heat and cold stress are included in Attachment 1 and will be available on site during field activities.

Personal Protection Equipment (PPE)

All site work will initially be conducted in Modified Level D PPE, which includes the following:

- Feet protection – occupational safety boots,
- Eye protection – safety glasses or goggles, and
- Hand protection – latex/neoprene/nitrile gloves.

Emergency Medical Services

In the event of an accidental injury or sudden onset of illness or injury that is beyond the normal scope of first aid, emergency medical services will be available at the Bessie A. Kaningok Health Clinic in Gambell, Alaska. The telephone number for the health clinic is (907) 985-5346.

REFERENCES

U.S. Army Corps of Engineers. 2005 (June). *Decision Document, Gambell Formerly Used Defense Site, F10AK0696, St. Lawrence Island, Alaska.*

Alaska Department of Environmental Conservation. 1992 (April). *Guidance No. 001 – Recommended Practices for Monitoring Well Design, Installation, and Decommissioning.*

FIGURES

Drawing: O:\JOBS\49003 GAMBELL MONITORING WELL DECOM\ACAD-ENVIRO\FIGURES\DWG\49003_FIG1_SVM_JUNE08.DWG - Layout: 49003_FIG1_SVM_JUNE08
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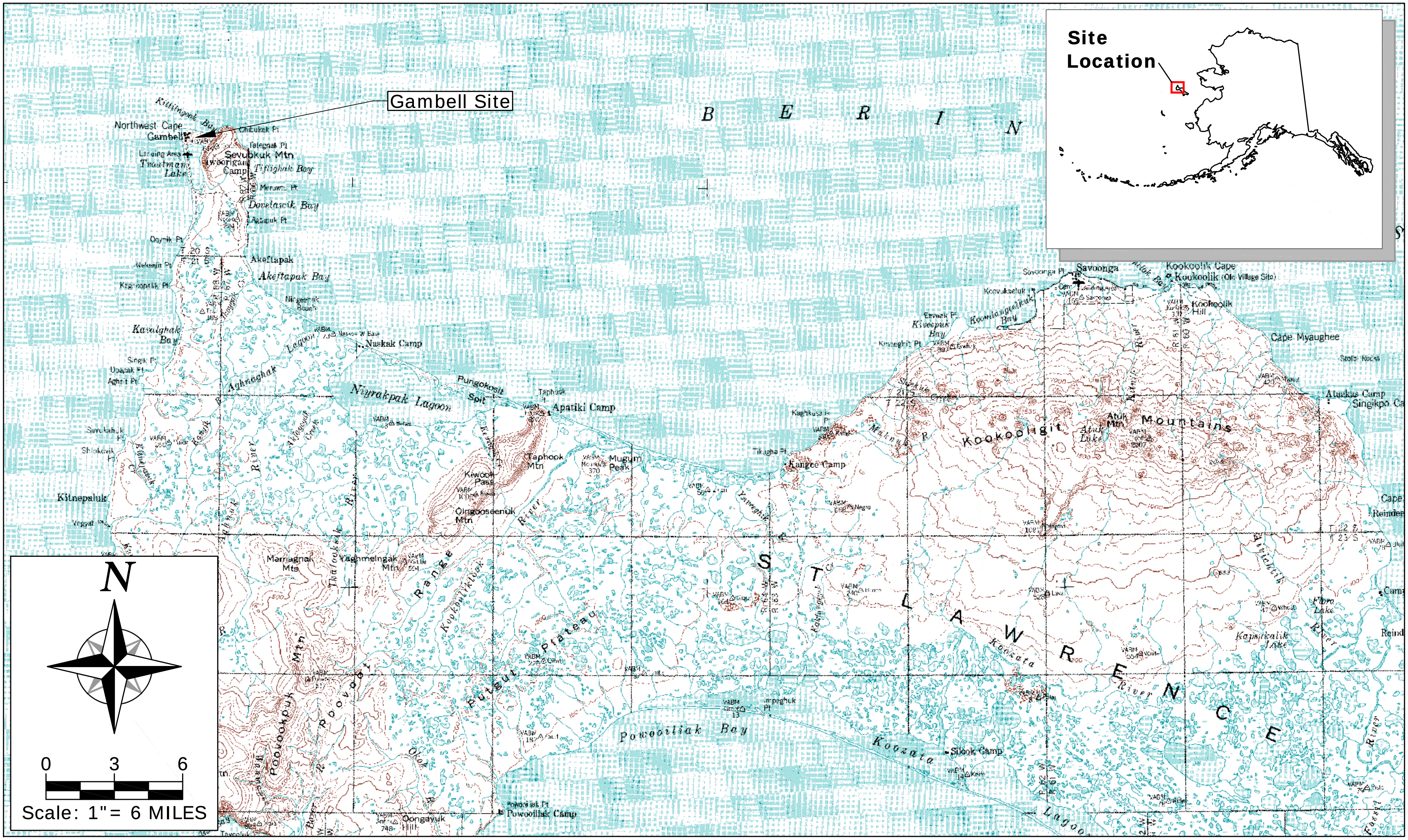


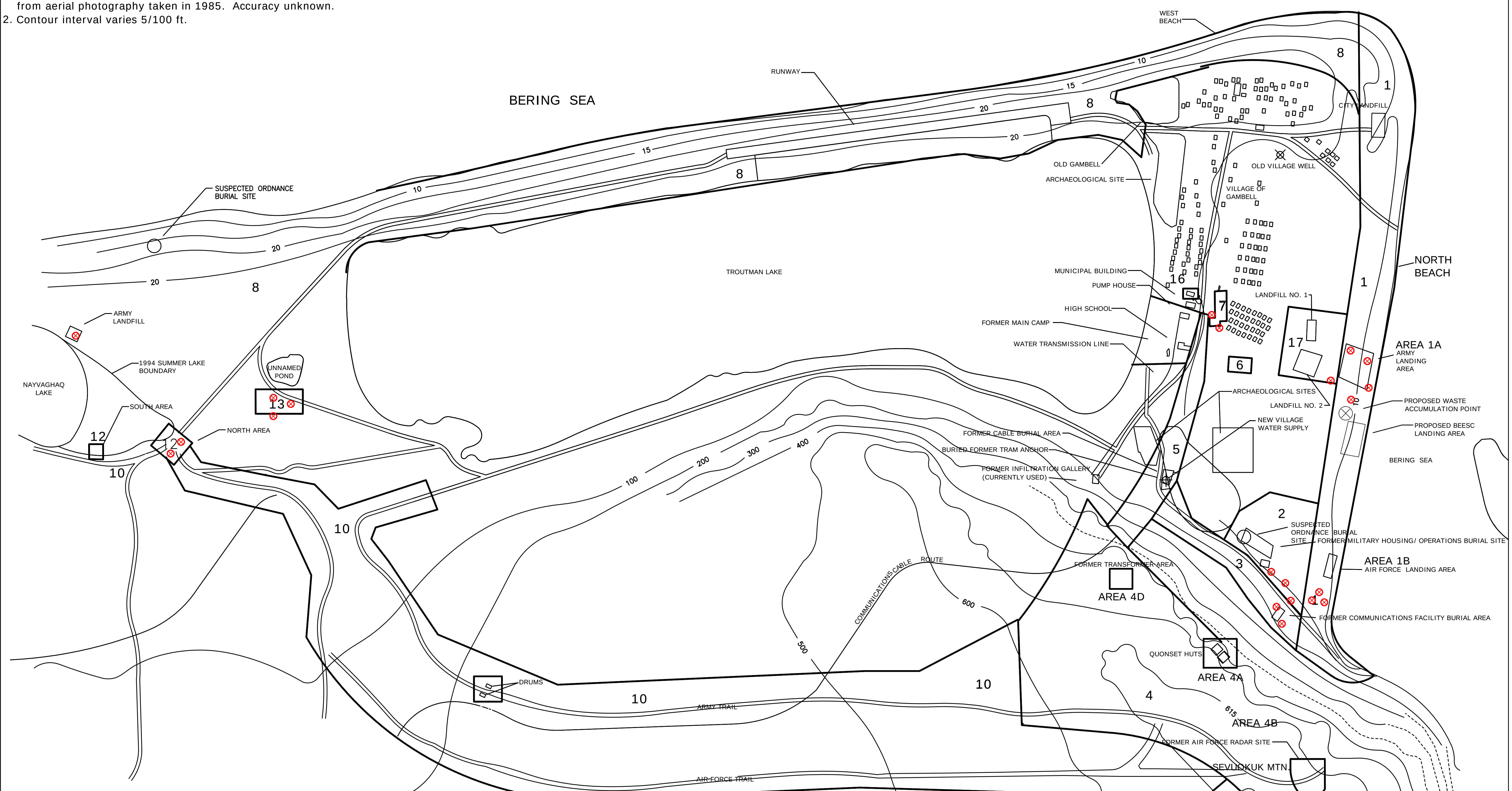
Source: USGS National Atlas Sheet Number 42-43

FIGURE 1
GAMBELL, ST. LAWRENCE ISLAND, ALASKA
MONITORING WELL DECOMMISSIONING
VICINITY MAP

Bristol ENVIRONMENTAL REMEDIATION SERVICES, LLC Phone (907) 563-0013 Fax (907) 563-6713 Project No: 49003	DATUM: NA PROJECTION: NA	DATE 06/20/08 DWN. MTG SCALE NTS APPRVD. SAJ	SHEET 1 of 2

NOTES:

1. Mapping taken from Chemical Data Aquisition Plan by Ecology & Environment (1993). Mapping believed to be sketched from aerial photography taken in 1985. Accuracy unknown.
2. Contour interval varies 5/100 ft.



LEGEND

⊗ APPROXIMATE MONITORING WELL LOCATION

SOURCE: U.S. ARMY ENGINEERING DISTRICT, ALASKA
ST. LAWRENCE ISLAND, AK
FIGURE 1-3, GAMBELL REMEDIAL INVESTIGATION
(SITE 5)-MWH MONTGOMERY WATSON, INC.

1200 0 600 1200

APPROXIMATE SCALE IN FEET

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FIGURE 2
GAMBELL, ST. LAWRENCE ISLAND, ALASKA
MONITORING WELL DECOMMISSIONING
MONITORING WELL LOCATIONS

Bristol
ENVIRONMENTAL REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713
Project No: 49003

DATUM: NA	DATE 06/20/08	SHEET	
PROJECTION: NA	DWN. MTG	2	
	SCALE SHOWN	of	
	APPRVD. SAJ	2	

TABLE

Table 1 - Approximate Monitoring Well Locations

Well ID	North Latitude	West Longitude	Condition
MW-1	63.781356°	171.7149255°	Unknown
MW-2	63.781983°	171.7136754°	Unknown
MW-3	63.782303°	171.7167222°	Unknown
MW-4	63.782614°	171.7157427°	Unknown
MW-5	63.782632°	171.7142623°	Unknown
MW-6	63.781235°	171.6986545°	Unknown
MW-7	63.781432°	171.697668°	Unknown
MW-8	63.781016°	171.6978684°	Bent by ATV accident
MW-9	63.779763°	171.6953778°	Unknown
MW-10	63.779493°	171.696521°	Unknown
MW-11	63.779979°	171.6976435°	Unknown
MW-12	63.780023°	171.6995515°	Unknown
MW-13	63.77942°	171.6999017°	Unknown
MW-17	63.741088°	171.7076646°	Unknown
MW-18	63.741363°	171.7085022°	Unknown
MW-19	63.737655°	171.7164491°	Unknown
MW-20	63.744871°	171.7115767°	Unknown
MW-21	63.745254°	171.7108938°	Unknown
MW-22	63.744751°	171.7100725°	Unknown
MW-25	63.777664°	171.7174244°	Flush mount completion
MW-27	63.777449°	171.7185506°	Flush mount completion

Notes:
° = degrees
ATV = all-terrain vehicle
ID = identification

ATTACHMENT 1

Physical Agent Data Sheets (PADS)

Heat Stress

Cold Stress

Noise

Labor Standards and Safety Division

Physical Agent Data Sheet (PADS) - Heat Stress

Description

Heat stress is caused by working in hot environments like laundries, bakeries, or around boilers or incinerators. Four environmental factors affect the amount of heat stress felt by employees in hot work areas: temperature, humidity, radiant heat (such as from the sun or a furnace), and air velocity. How well or how poorly an individual reacts to heat stress is dependent on personal characteristics such as age, weight, fitness, medical condition, and acclimatization.

The body has several methods of maintaining the proper internal body temperature. When internal body temperature increases, the circulatory system reacts by increasing the amount of blood flow to the skin so the extra heat can by given off.

Sweating is another means the body uses to maintain stable internal temperatures. When sweat evaporates, cooling results. However, sweating is effective only if the humidity level is low enough to permit evaporation and if the fluids and salts lost are replaced.

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Health Effects□Heat Disorders

Heat stroke, the most serious health problem for workers in hot environments is caused by the failure of the body□s internal mechanism to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess heat. Signs include: mental confusion, delirium, loss of consciousness, convulsions or coma; a body temperature of 106 degrees Fahrenheit or higher; and hot dry skin which may be red, mottled or bluish. Victims of heat stroke will die unless treated promptly. While medical help should be called, the victim must be removed immediately to a cool area and his/her clothing soaked with cool water. He/she should be fanned vigorously to increase cooling. Prompt first aid can prevent permanent injury to the brain and other vital organs.

Heat exhaustion develops as a result of loss of fluid through sweating when a worker has failed to drink enough fluids or take in enough salt, or both. The worker with heat exhaustion still sweats, but experiences extreme weakness or fatigue, giddiness, nausea, or headache. The skin is clammy and moist, the complexion pale or flushed, and the body temperature normal or slightly higher. Treatment is usually simple: the victim should rest in a cool place and drink salted liquids. Salt tablets are not recommended. Severe cases involving victims who vomit or lose consciousness may require longer treatment under medical supervision.

Heat cramps, painful spasms of the bone muscles, are caused when workers drink large quantities of water but fail to replace their bodies salt loss. Tired muscles, those used for performing the work, are usually the ones most susceptible to cramps. Cramps may occur during or after working hours and may be relieved by taking salted liqids by mouth or saline solutions intravenously for quicker relief, if medically determined to be required.

Fainting may be a problem for the worker unacclimatized to a hot environment who simply stands still in the heat. Victims usually recover quickly after a brief period of lying down. Moving around, rather that standing still, will usually reduce the possibility of fainting.

Heat rash, also known as prickly heat, may occur in hot and humid environments where sweat is not easily removed from the surface of the skin by evaporation. When extensive or complicated by infection, heat rash can be so uncomfortable that it inhibits sleep and impairs a worker s performance or even results in temporary total disability. It can be prevented by showering, resting in a cool place, and allowing the skin to dry.

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Medical Conditions Aggravated By Exposure to Heat

Persons with heart or circulatory diseases or those who are on "low salt" diets should consult with their physicians prior to working in hot environments.

Preventing Heat Disorders

One of the best ways to reduce heat stress on workers is to minimize heat in the workplace. However, there are some work environments where heat production is difficult to control, such as when furnaces or sources of steam or water are present in the work area, or when the workplace itself is outdoors and exposed to varying warm weather conditions.

Acclimatization

Humans are, to a large extent, capable of adjusting to the heat. This adjustment to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more endurable.

On the first day of work in a hot environment, the body temperature, pulse rate, and general discomfort will be higher. With each succeeding daily exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body becomes acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

Gradual exposure to heat gives the body time to become accustomed to higher environmental temperatures. Heat disorders in general are more likely to occur among workers who have not been given time to adjust to working in the heat or among workers who have been away from hot environments and who have gotten accustomed to lower temperatures. Hot weather conditions of the summer are likely to affect the worker who is not acclimatized to heat. Likewise, workers who return to work after a leisurely vacation or extended illness may be affected by the heat in the work environment. Whenever such circumstances occur, the worker should be gradually reacclimatized to the hot environment.

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Lessening Stressful Conditions

Many industries have attempted to reduce the hazards of heat stress by introducing engineering controls, training workers in the recognition and prevention of heat stress, and implementing work-rest cycles. Heat stress depends, in part, on the amount of heat the worker□s body produces while a job is being performed. The amount of heat produced during hard, steady work is much higher than that produced during intermittent or light work. Therefore, one way of reducing the potential for heat stress is to make the job easier or lessen its duration by providing adequate rest time. Mechanization of work procedures can often make it possible to isolate workers from the heat source (perhaps in an air-conditioned booth) and increase overall productivity by decreasing the time needed for rest. Another approach to reducing the level of heat stress is the use of engineering controls which include ventilation and heat shielding.

Number and Duration of Exposures

Rather than be exposed to heat for extended periods of time during the course of a job, workers should, wherever possible, be permitted to distribute the workload evenly over the day and incorporate work-rest cycles. Work-rest cycles give the body an opportunity to get rid of excess heat, slow down the production of internal body heat, and provide greater blood flow to the skin.

Workers employed outdoors are especially subject to weather changes. A hot spell or a rise in humidity can create overly stressful conditions. The following practices can help to reduce heat stress:

Postponement of nonessential tasks

Permit only those workers acclimatized to heat to perform the more strenuous tasks, or

Provide additional workers to perform the task keeping in mind that all workers should have the physical capacity to perform the task and that they should be accustomed to the heat.

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Thermal Conditions in the Workplace

A variety of engineering controls can be introduced to minimize exposure to heat. For instance, improving the insulation on a furnace wall can reduce its surface temperature and the temperature of the area around it. In a laundry room, exhaust hoods installed over those sources releasing moisture will lower the humidity in the work area. In general, the simplest and least expensive methods of reducing heat and humidity can be accomplished by:

Opening windows in hot work areas,

Using fans, or

Using other methods of creating airflow such as exhaust ventilation or air blowers.

Rest Areas

Providing cool rest areas in hot work environments considerably reduces the stress of working in those environments. There is no conclusive information available on the ideal temperature for a rest area. However, a rest area with a temperature near 76 degrees Fahrenheit appears to be adequate and may even feel chilly to a hot, sweating worker, until acclimated to the cooler environment. The rest area should be as close to the workplace as possible. Individual work periods should not be lengthened in favor of prolonged rest periods. Shorter but frequent work-rest cycles are the greatest benefit to the worker.

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Drinking Water

In the course of a day□s work in the heat, a worker may produce as much as 2 to 3 gallons of sweat. Because so many heat disorders involve excessive dehydration of the body, it is essential that water intake during the workday be about equal to the amount of sweat produced.

Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst drive. A worker, therefore, should not depend on thirst to signal when and how much to drink. Instead, the worker should drink 5 to 7 ounces of fluids every 15 or 20 minutes to replenish the necessary fluids in the body. There is no optimum temperature of drinking water, but most people tend not to drink warm or very cold fluids as readily as they will cool ones. whatever the temperature of the water, it must be palatable and readily available to the worker. Individual drinking cups should be provided, never use a common drinking cup.

Heat acclimatized workers lose much less salt in their sweat than do workers who are not adjusted to the heat. The average American diet contains sufficient salt for acclimatized workers even when sweat production is high. If, for some reason, salt replacement is required, the best way to compensate for the loss is to add a little extra salt to the food. Salt tablets should not be used. CAUTION: PERSONS WITH HEART PROBLEMS OR THOSE ON A "LOW SODIUM" DIET WHO WORK IN HOT ENVIRONMENTS SHOULD CONSULT A PHYSICIAN ABOUT WHAT TO DO UNDER THESE CONDITIONS.

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Protective Clothing

Clothing inhibits the transfer of heat between the body and the surrounding environment. Therefore, in hot jobs where the air temperature is lower than skin temperature, wearing clothing reduces the body□s ability to lose heat into the air.

When air temperature is higher than skin temperature, clothing helps to prevent the transfer of heat from the air to the body. The advantage of wearing clothing, however, may be nullified if the clothes interfere with the evaporation of sweat.

In dry climates, adequate evaporation of sweat is seldom a problem. In a dry work environment with very high air temperatures, the wearing of clothing could be an advantage to the worker. The proper type of clothing depends on the specific circumstance. Certain work in hot environments may require insulated gloves, insulated suits, reflective clothing, or infrared reflecting face shields. For extremely hot conditions, thermally-conditioned clothing is available. One such garment carries a self-contained air conditioner in a backpack, while another is connected to a compressed air source which feeds cool air into the jacket or coveralls through a vortex tube. Another type of garment is a plastic jacket which has pockets that can be filled with dry ice or containers of ice.

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Recommended Exposure Limits

These Threshold Limit Values (TLVS) refer to heat stress conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. The TLVs shown in Table I are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38 degrees Celsius (100.4 degrees Fahrenheit).

Since measurement of deep body temperature is impractical for monitoring the workers□ heat load, the measurement of environmental factors is required which most nearly correlate with deep body temperature and other physiological responses to heat. At the present time, Wet Bulb Globe Temperature Index (WBGT) is the simplest and most suitable technique to measure the environmental factors. WBGT values are calculated by the following equations:

Outdoors with solar load: WBGT = 0.7 NWB + 0.2 GT + 0.1 DB

Indoors or Outdoors with no solar load: WBGT = 0.7 NWB + 0.3 GT

Where: WBGT = Wet Bulb Globe Temperature Index
NWB = Natural Wet Bulb Temperature
DB = Dry Bulb Temperature
GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry bulb thermometer.

Higher heat exposures that shown in Table I are permissible if the workers have been undergoing medical surveillance and it has been established that they are more tolerant at work in heat than the average worker. Workers should not be permitted to continue their work when their deep body temperature exceeds 38.0 degrees Celsius (100.4 degrees Fahrenheit).

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Table 1
Permissible Heat Exposure Threshold Limit Values
(Values are given in degrees Centigrade WBGT (Fahrenheit)]

	Work Load		
Work- Rest Regimen	**Light**	**Moderate**	**Heavy**
Continuous work	30.0 (86.0)	26.7 (80.1)	25.0 (77.0)
75% Work, 25% Rest/Hour	30.6 (87.1)	28.0 (82.4)	25.9 (78.6)
50% Work, 50% Rest/Hour	31.4 (88.5)	29.4 (85.0)	27.9 (82.2)
25% Work, 75% Rest/Hour	32.2 (90.0)	31.1 (88.0)	30.0 (86.0)

References

1. "Working in Hot Environments," US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, 1986.
2. "Threshold Limit Values and Biological Exposure Indices for 1986 - 1987," American Conference of Governmental Industrial, Hygienists, 6500 Glenway Avenue, Building D-7, Cincinnati, OH 45211-4438.

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Alaska Department of Labor and Workforce Development
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PHYSICAL AGENT DATA SHEET

COLD STRESS

HYPOTHERMIA

FROSTBITE

Alaska Department of Labor and Workforce Development
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Physical Agent Data Sheet

HYPOTHERMIA

Hypothermia is a temperature-related disorder. Therefore it is necessary to understand human physiology as it pertains to temperature stress.

Man is considered a tropical animal. Normal functioning of the human animal requires a body temperature of 37 degrees Celsius (98.6 degrees Fahrenheit). The body can self-compensate for small upward or downward variations in temperature through the activation of built-in thermoregulatory system, controlled by temperature sensors in the skin. The response to an upward variation in body temperature is the initiation of perspiration, which moves moisture from the body tissues to the body surface. When the moisture reaches the surface it evaporates, carrying with it a quantity of heat. The response to downward variation in body temperature is shivering, which is the body's attempt to generate heat. Shivering is an involuntary contraction and expansion of muscle tissue occurring on a large scale. This muscle action creates heat through friction.

THE DISORDER

Hypothermia is defined as a core temperature of the body less than 35 degrees Celsius (95 degrees Fahrenheit). Hypothermia is also considered the clinical state of sub-normal temperature when the body is unable to generate sufficient heat to efficiently maintain functions.

Many variables contribute to the development of hypothermia. Age, health, nutrition, body size, exhaustion, exposure, duration of exposure, wind, temperature, and wetness of body or clothes, medication and intoxicants (alcohol) may decrease heat production or increase heat loss.

The healthy individual's compensatory responses to heat loss via conduction, convection, radiation, evaporation and respiration may be overwhelmed by exposure. Medication may also interfere with heat generation or regulation. Children will have different symptoms than adults depending on the severity of the cold.

Definitions:

Conduction: Direct transfer of heat by contact with a cooler object
Convection: Cool air moving across the surface of the body, heat is transferred to the cool air warming the air.
Radiation: Heat radiated outward from the warm body to the cooler environment.
Evaporation: The process of losing heat from the body by vaporization of water from the body surface.
Respiration: Inspired air raised to body temperature that is then exhaled.

Each of these causes of heat loss can play a large or small role in the development of hypothermia, depending on clothing, head cover, wind, weather, etc.

Once hypothermia develops, two body compartments, the shell (skin) and the core (the remainder of the body) share the heat deficit. The skin constitutes about 10% of a 150 pound mass.

Hypothermia can be recognized as impending, mild, moderate and severe. Below is a brief description of the various stages:

> Impending: Person's core temperature has decreased to 96.8 degrees Fahrenheit (36 degrees C). Individual will increase exercise in an attempt to warm up. The skin may become pale, numb and waxy. Muscles can become tense and shivering may begin. Fatigue and weakness may begin to show.
>
> Mild: Core temperature has dropped to 93.2 degrees Fahrenheit (34 degrees C). Intense, uncontrolled shivering has begun. The individual may still be alert and able to help self; however, movements become less coordinated and the coldness is causing some pain and discomfort.
>
> Moderate: Core temperature has dropped to 87.7 degrees Fahrenheit (31 degrees C). Shivering slows or stops completely, mental confusion and apathy set in. Speech is slow and slurred. Breathing becomes slow and shallow followed by with drowsiness.
>
> Severe: Core temperature is below 87.7 degrees Fahrenheit (31 degrees C). Skin may have a blue-gray color; iris of the eyes may be dilated, may appear drunk, denies problems and may refuse help. This leads to a gradual loss of consciousness. There may be little or no breathing, lack of response to verbal or painful stimuli and may appear dead.

(Temperatures used in above descriptions are approximate. Symptoms may start at different temperatures depending on the individual and circumstances.)

Treatment Preface

Always act on the fact that **"no one is dead until warm and dead."**

Think ABCD – Airway, Breathing, Circulation and Degrees.

In sudden exposure to cold water there is a greater chance for resuscitation with sudden submersion and with prolonged exposure to cold water. Quick onset of hypothermia, easy to reverse. Slow onset, the harder to reverse the process.

The sole consensus regarding prehospital treatment is that all patients at some point should be rewarmed. Core first then extremities. The best way to rewarm the core is by warm air and warm IV solutions.

Initial management principles emphasize prevention of further heat loss, rewarnimg as soon as is safely possible at a "successful" rate and rewarming the core before the shell, in an attempt to avoid inducing lethal side effects during rewarming. This treatment goal is important, since hypothermia itself may not be fatal above 77 degrees Fahrenheit (25 degrees C) core temperature.

The person must be handled very carefully and gently and not be allowed to exercise, as muscular action can pump cold blood to the heart.

Cold blood going to the heart can cause ventricular fibrillation

Hypothermia causes several reactions within the body as it tries to protect itself and retain its heat. The most important of these is vasoconstriction, which halts blood flow to the extremities in order to conserve heat in the core of the body.

Treatment of Hypothermia

Be able to recognize the symptoms of hypothermia in yourself and others. The victim may deny he/she is in trouble. Even mild symptoms demand attention:

> Impending: Seek or build a shelter to get the person out of the cold, windy, wet environment.
> Start a fire or get a cookstove going to provide warmth. Provide the person with a hot drink (no alcohol, coffee or tea). Insulate the person with extra clothes.
>
> Mild: Remove or insulate the patient from the cold ground, protect from the wind, eliminate evaporative heat loss with a vapor barrier. Keep the head and neck covered, remove to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through breathing. Provide the person with a warm, sweetened drink (no alcohol, coffee or tea) and some high-energy food. Limited exercise may help to generate some internal heat, but it depletes energy reserves.
>
> Moderate: Remove the person from the cold environment, keeping the head and neck covered. Apply mild heat (comfortable to your elbow) to the head, neck chest, armpits and groin of the patient. Use hot water bottles, wrapped Thermo-pads, or warm moist towels. Do not place the hot water bottles next to the skin, wrap in cloth first. Offer sips of warm, sweetened liquids (no alcohol, coffee or tea) if the patient is fully conscious, beginning to rewarm and is able to swallow. Patient should be seen by a physician ASAP.
>
> Severe: Place person in a prewarmed sleeping bag with one or two other people. Skin to skin contact in the areas of the chest (ribs) and neck is effective. Exhale warm air near the patient's nose and mouth, or introduce steam into the area. Keep the patient awake. Apply mild heat, with the aim of stopping temperature drop, not rewarming. If patient has lost consciousness be very gentle, as the heart is extremely sensitive. Check for pulse at the carotid artery. If there is any breathing or pulse, no matter how faint, do not give CPR but keep a very close watch for changes in breathing and heart beat (vital signs). If no pulse can be found begin CPR immediately, stopping only when the heart begins to beat or the person applying CPR cannot carry on any longer without endangering themselves.

In all of the above, it is imperative that the victim be removed out of the wet and windy weather, remove all wet clothing, and put the victim into dry clothing and a warm sleeping bag.

Recent research has concluded that the safest and most effective method of treating hypothermia is through inhalation rewarming. Equipment is available; however, out in the field, alternative methods which have been described must be used where equipment is lacking.

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Physical Agent Data Sheet

FROSTBITE

GENERAL INFORMATION

Frostbite is the freezing of some part of the body. Fingers, toes, and even whole arms and legs can be lost as a result of frostbite. Injuries can happen at home, in the cities and also in more isolated areas of the State.

In extreme cold it is important to prevent heat loss from as many areas of the body as possible. Exposed limbs and head are major areas of heat loss, but keeping enough blood flowing to the hands and feet is the key to preventing frostbite. The trunk and the head should be warm enough so that the brain is able to command the blood vessels in the hands and feet to open up and keep the extremities warm.

ESSENTIAL CLOTHING

This includes thermal underwear, insulated footwear or mukluks with liners; double mittens and a parka, preferably down-filled with a good ruff. A parka that can be opened at the neck to allow heat to escape will prevent overheating and sweating. Quilted or skin pants are necessary if no warm shelter is immediately available. Tight cloths, especially tight gloves or tight boots should not be worn. The tightness interferes with good circulation in the hands and feet. If there is a reduction in blood flow to these areas, then the possibility of frostbite increases as the extremity cools down.

FACTORS LEADING TO FROSTBITE

Tall thin persons are more likely to get frostbite than those of stocky build.

People in poor physical condition are more susceptible than those in good health.

Certain diseases slow down the blood flow in the hands and feet especially in elderly people.

Heavy smokers often have poor circulation in the vital organs and decreased circulation in the arms and legs.

Children and elderly people who cannot produce large amounts of body heat for long periods of time can experience a lowering of deep body temperature and frostbite.

Alcohol causes the blood vessels to dilate (become larger). This leads to a false sense of warmth. This also leads to faster loss of heat from the body because of dilation of blood vessels. More important, people act with poor judgment after drinking.

Don't touch cold metal with bare or wet hands. You will freeze to the metal and tear the skin if pulled away without proper thawing with warm water, heat or urine.

Be careful when handling gasoline, kerosene or liquids other than water. Contact with bare skin in cold temperatures can cause instant frostbite.

> *Frostbite is more likely to occur when you are injured, frightened or careless*.

HOW TO RECOGNIZE FROSTBITE

Exposed parts of the body should be inspected routinely. This is done best with a partner. Just before freezing, the skin, especially the face with its many blood vessels, becomes bright red. Then small patches of white appear, as freezing actually occurs.

The loss of the sensations of touch, pressure and pain may occur without awareness of any numbness or other sensations. Therefore, it is important to test these sensations often. Wear clothing that is not restrictive but loose.

There may be no pain associated with frostbite if the freezing or temperature change is slow. Only if there is a rapid change in temperature does the body register pain.

The skin becomes less elastic. This is best noted in the finger pads. If touched or squeezed the pads will remain pitted. Any further cooling will result in frostbite.

Serious freezing is most common in the feet, followed by the hands and then the head (nose, ears). This is because of the poorer circulation in the feet and hands. Also with the poorer circulation there is in conjunction less sensation to these areas. Exposed head areas are less likely to freeze because of a better blood supply.

EARLY TREATMENT OF FROSTBITE

Early rewarming.

Thawing and refreezing should always be avoided.

Limbs should be rewarmed in stirred water just above normal body temperature (100 – 105 degrees Fahrenheit). Always use a thermometer to get accurate temperatures. Never try to thaw in cold water or snow. Since feeling is lost, fires, stoves, exhaust pipes, etc., should never be used. Serious damage to the skin could result.

Rewarming is an acutely painful experience and medication to alleviate pain should be given if available. After thawing, a deep aching pain may persist for several days, depending upon severity of the injury. Pain is a good sign; this tells us that the nerves are still alive and functioning.

A dull purple color, swelling and/or blistering of the extremity after thawing indicate a more serious injury and require medical attention.

SUMMARY

Poor circulation and poor production of body heat will lower resistance to frostbite.

Most cases of frostbite occur as a result of lack of knowledge, careless preparation, unavoidable accident, or the effects of alcohol on judgment. Forethought can prevent injury.

If freezing does occur, proper rewarming in warm water will give maximum benefit. The injured limb should be handled gently and a medical judgment made of the extent of injury and the need for further treatment.

Labor Standards and Safety Division

Physical Agent Data Sheet (PADS) - Noise

Other PADS:
Cold Stress
Hand-Arm Vibration
Heat
Ionizing Radiation (PDF)
Lasers
Noise
Radio Waves
Ultraviolet Radiation

Description

Sound is created when a vibrating source (like a bell, motor or a stereo speaker) sends sound waves through the air to your ear. Every sound has two aspects: its pitch (frequency) and its loudness (intensity). On a stereo, frequency is determined by the bass/treble control. Intensity is determined by the volume control. Noise (unwanted sound) is usually made up of many frequencies. The disturbing and harmful effects of noise depend both on the loudness and the frequency of the tones making up noise.

Loudness is measured in units called decibels (dB). A conversational voice is about 65 dB. A shout is 90 dB or greater.

Frequency is measured in units called Hertz (Hz). The frequency of a locomotive horn is about 250 Hz. The frequency of a table saw is about 4,000 Hz.

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Health Effects

Excessive noise can destroy the ability to hear, and may also put stress of other parts of the body, including the heart.

For most effects of noise, there is no cure, so that prevention of excessive noise exposure is the only way to avoid health damage.

Hearing

The damage done by noise depends mainly on how loud it is and on the length of exposure. The frequency or pitch can also have some effect, since high-pitched sounds are more damaging than low-pitched sounds.

Noise may tire out the inner ear, causing temporary hearing loss. After a period of time away from the noise hearing may be restored. Some workers who suffer temporary hearing loss may find that by the time their hearing returns to normal, it is time for another work shift so, in that sense, the problem is "permanent."

With continual noise exposure, the ear will lose its ability to recover from temporary hearing loss, and the damage will become permanent. Permanent hearing loss results from the destruction of cells in the inner ear, cells which can never be replaced or repaired.

Such damage can be caused by long-term exposure to loud noise or, in some cases" by brief exposures to very loud noises.

Normally, workplace noise first affects the ability to hear high frequency (high-pitched) sounds. This means that even though a person can still hear some noise, speech or other sounds may be unclear or distorted.

Workers suffering from noise-induced hearing loss may also experience continual ringing in their ears, called "tinnitus." At this time, there is no cure for tinnitus, although some doctors are experimenting with treatment.

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Other Effects

Although research on the effects of noise is not complete, it appears that noise can cause quickened pulse rate, increased blood pressure and a narrowing of the blood vessels over a long period of time, these may place an added burden on the heart.

Noise may also put stress on other parts of the body by causing the abnormal secretion of hormones and tensing of the muscles.

Workers exposed to noise sometimes complain of nervousness, sleeplessness and fatigue. Excessive noise exposure also can reduce job performance and may cause high rates of absenteeism.

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Permissible Exposure Limit

The Action level for noise is an average noise level of 85 dB for an eight-hour day. When employees are exposed to noise levels, which exceed the Permissible Exposure Limit, the employer must install or use engineering or administrative controls to lower the noise levels. While these controls are being designed or installed employees must wear hearing protection. If the controls still do not reduce noise exposures to below 90 dB, hearing protection must continue to be worn.

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Protective Measures

Suitable hearing protectors (earplugs or muffs) must be made available at no cost to employees who are exposed to an average of 85 dB or greater for an eight-hour day. Employees must be given the opportunity to select from three different types of appropriate hearing protectors.

Hearing tests (audiometric exams) must be given to employees who are exposed to an average of 85 dB or greater for an eight-hour day. Hearing tests will show whether employees are experiencing any hearing losses. Hearing tests are also useful in showing how well the earplugs and earmuffs are working. Hearing tests must be given annually.

Employees should also receive training in the effects of noise on hearing, an explanation of the hearing tests, and instruction on the proper fitting and care of earplugs or muffs.

Noise away from work can also cause hearing loss. Hearing protectors should be worn when operating noisy equipment or tools such as chain saws, brush cutters, power lawn mowers, or when using firearms.

Refer to Alaska Administrative Code, Occupational Health and Environmental Control 04.0104 for specific regulations on Noise Exposure and Hearing Conservation Programs.

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