Standard Operating Procedure #1

Safety (w/JHA, GAR, Communication examples)

Version 1.01 (May 5, 2021)

Change History

New Version #	Revision Date	Author	Changes Made	Reasons for Change	Previous Version #
1.01	5/5/2021	David Raikow, Amanda McCutcheon	Add JHA, GAR and Communication plan for PUHO. Updated link to safety docs, minor text updates, check other links.	Only KAHO was previously included. Links were out of date.	1.0

Only changes in this specific SOP will be logged here. Version numbers increase incrementally by hundredths (e.g., version 1.01, version 1.02) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0). Record the previous version number, date of revision, author of the revision, changes made, and reason for the change along with the new version number.

Purpose

This SOP outlines safety considerations for conducting any aspect of the Pacific Island Network (PACN) Anchialine Pool Monitoring Protocol. All workers should be familiar with this SOP and the PACN Safety Plan to minimize risk. It is the general policy of PACN that:

- Safety is the primary concern when planning and conducting field work.
- Do not take unreasonable risks; if in doubt as to the safety of an activity in the field, cancel the activity.

Requirements for NPS Employees and Volunteers

At least one crew member must be trained in CPR and first aid, and all employees must understand the principles of operational leadership before starting field work. All NPS field staff and volunteers are encouraged to take the following trainings as soon as possible:

- Operational Leadership Training (OLT, an NPS course)
- CPR and first aid training; wilderness first aid is preferable for field staff

- Though optional, it is preferable that at least one or more members of the crew be trained as a Wilderness First Responder.

PACN Safety Plan

The PACN Safety Plan (latest version signed in 2017) describes the philosophy, roles, process, and resources dedicated to safety within PACN. The document describes an efficient safety program enacted through living documents that are continually updated, available online, and frequently consulted during planning efforts and while undertaking tasks that pose hazards. The PACN Safety Plan should be consulted regularly.

All discrete field or hazardous activities conducted by PACN require the following set of safety documents:

- Job Hazard Analysis (JHA) – requires annual approval by park, example below
- Communication and emergency response protocols – requires annual approval by park, example below
- Green-amber-red analysis (GAR) – requires annual approval by park, example below
- Daily safety checklist/briefing
- Individual staff safety, training, and certification checklist
- Backcountry plan (for field work only)

Consult current-year documents for models of all above safety documents. Safety documents are maintained and accessible by NPS employees at I:\safety\PACN Safety_files (last accessed 5 May 2021).

At the beginning of the fiscal year, and prior to the initiation of field work at any park, a Network Safety Agreement must be signed by the PACN Program Manager and the Superintendent. Refer to the PACN Safety Plan for annual safety agreement materials.

Tailgate Briefings

When conducting field work, safety procedures must be reviewed prior to entering the field each day. The following procedures must be conducted each day at a "tailgate" briefing:

- Review the JHA and communication protocols
    - Although all crew members should read the JHA and communication protocols before starting field work, it is not necessary to literally read the entire JHA each morning; instead translate the JHA into a daily safety briefing and review major points.
- Conduct a GAR

- In particular, the point is to assess any changes in conditions that would increase risk. If risk has increased significantly, cancellation of field work may be required.

- Fill out the daily safety checklist to ensure all supplies and equipment are included in the trip.

Particular Safety Considerations for the Anchialine Pool Protocol

Weather/Vog

Sampling aquatic ecosystems during inclement weather can be dangerous on Pacific islands. Sampling operations must be cancelled immediately when inclement weather is forecast or occurs unexpectedly. Prior to departure, it is the responsibility of all personnel to be aware of the appropriate local weather, tide, and current forecast for the day and to decide whether sampling should commence. Sampling should be conducted only during periods of little or no rain, mild or no wind. If thunder is heard or lightning is seen while in the field, sampling will be immediately suspended. In the event of an intense rainfall event all sampling activity should cease. Always abort a sampling trip if hazardous conditions develop.

Volcanic smog consisting of particulates and sulfur dioxide (vog) conditions and projections should be checked before entering the field. Current monitoring conditions for the entire big island can be found at http://hiso2index.info/ (last accessed 5 May 2021) and projected conditions for the island can be found at http://weather.hawaii.edu/vmap/hysplit/ (last accessed 5 May 2021). Regardless of conditions, a respirator should be carried in case necessary to exit the area if vog conditions unexpectedly increase.

Contaminated Water

Waterborne pathogens that may survive or be transmitted in water include *Enterococci* and *Staphylococci* bacteria. Never consume water from anchialine pools. Aquatic areas being sampled may be contaminated with pathogens. Consuming untreated or unfiltered water may result in the contraction of bacterial diseases or parasites. In particular, keep hands away from nose, ears and mouth and wash hands thoroughly before eating. If no soap and water are available, use of an antibacterial hand cleanser is highly recommended after handling water sampling equipment. Never expose an open wound, even a small cut, to water while sampling. Leptospirosis, a blood-borne bacterial disease, can be transmitted to humans through open-wound contact with infected water. Use of water bodies by livestock or feral animals increases the risk of the presence of Leptospirosis in water.

Accident Reporting

Inform your supervisor of all incidents as soon as possible. The person that sustained the injury, or another team member who was witness to the accident, must fill out accident report forms in the NPS Safety Management Information System (https://www.smis.doi.gov/, last accessed 5 May 2021) as soon as feasibly possible but no later than 24 hours from the time of the accident. Medical attention should always be the first priority.

JOB HAZARD ANALYSIS (JHA)

Pacific Island Network (PACN) - Inventory and Monitoring Program (I&M) - National Park Service (NPS) - Department of the Interior (DOI)

Project: Anchialine pool animal monitoring	Protocol: Anchialine Pools	Location: Kaloko-Honokōhau NHP

Version: 1.1	30 May 2018	Authors:	Danielle Gross, David Raikow
Reviews and Approvals:		Park Resource Manager:	Sallie Beavers
		Park Safety Officer:	
		PACN Program Manager:	Ryan Monello
		PACN Field Supervisor:	David Raikow

Required Safety Training:

- Read the I&M PACN safety documents at least once a year.
- Review the Protocol Safety SOPs prior to beginning the trip.
- Complete Trip Preparation Checklist prior to field work.
- Complete Daily Safety Checklist each day before entering field.
- One field crew member must be certified in CPR and first aid.
- Review NPS Driving Policy.
- Review KAHO RM communications and solo-out policy.
- Review KAHO/PUHO back-country plan.

Recommended Personal Protective Equipment (responsibility of the employee):

- Hat.
- Boots.
- Sunglasses.
- Sunscreen.
- Respirator and cartridges.

Notes: Last reviewed by Ryan Monello on May 30, 2018

Tasks	Hazards	Potential Injuries	Abatement Actions
1. Driving to and from field sites.	1a. Narrow, single-lane, unpaved roads with rutted and uneven surfaces.	• Auto accidents.	1a: • When exiting Kaloko road, DO NOT make a left onto the highway. Proceed right and turn around when safe at a legal intersection. Similarly, if heading north on highway do not make a left hand turn into the park; instead, turn around on side street with streetlight and backtrack to make a right hand turn into the park. • Wear seatbelts at all times when vehicle is moving. • Never use cell phones or other devices when operating a vehicle. • Maintain a safe speed (this is often below the legal speed limit) for the road conditions. • Stay clear to the right, especially on curves. • Drive with headlights on at all times. • When backing up or parking, the passenger should get out of the vehicle to guide the driver. • Park work vehicle in designated lots: the Kaloko parking lot for most sites, and Honokōhau harbor parking lot for access to pools near ʻAiopio (like fixed site Kaloko_084).
	1b. Driving with limited visibility.		1b: • Clean both sides of windows regularly (remember back window). • Slow down. • If blinded by sun or dust, proceed slowly or pullover and wait for hazard to pass; keep to the right-hand side of the road and drive with your lights on.
	1c. Sharp rocks, deep holes or obstacles in the roadway.		1c. • Avoid driving over sharp rocks or in deep pits. • Reduce speed substantially in places with pots/holes, protruding rocks or other obstacles.
	1d. Fatigue.		1d: • Be aware of signs of fatigue. • Pull over and rest. • Eat a snack or have a partner drive.

	1e. Animals crossing or standing in roads.		1e: • Although animal encounters are unlikely at this location, mongoose, feral cats and ground birds may be in the roadway. • Slow down where animals might be present to allow for reaction time. • Do not swerve abruptly to avoid hitting an animal, if necessary, it's better to ride out the impact.
	1f. Storm conditions, e.g., wind, lightning, or slippery roads.		1f: • Keep informed on the current weather. Dial 808-973-5286 to reach the National Weather Service, ex. 237 to speak to a person. Also check the online forecast for Kailua-Kona. • If winds exceed 15 mph, or the excessive wind category on Beaufort scale (treetops swaying, twigs and leaves falling, etc.), do not travel into the field. • Do not go into the field if lightning is present and avoid using radios. • Drive slowly when roads are muddy and slippery.
2. Communicating with dispatch and park Point of Contact (POC).	2. Isolation.	• Unable to reach dispatch to summon aid. • Isolation while injured.	2: • Check with dispatch and your park POC, before going into the field and check out once you return. • Fill in Park status board with names, time back, and phone #s. • Always clear status board when you return. • Follow procedures in KAHO RM Communications and Solo-Out plan. • Provide HAVO dispatch with a map and coordinates of all field sites you plan to visit. • Identify and notify dispatch of EMS meeting points: the Honokōhau Harbor parking lot for pool fixed site Kaloko_084 and temp sites nearby, or Kaloko road parking lot for all other sites. • Always travel in pairs at a minimum. • Make sure radio is charged. • Bring extra batteries and cell phone as backup. • If you are unable to reach dispatch or law enforcement from your location, try other nearby locations. • Try at regular intervals, just meandering around may help in getting a signal.

			• Use cell phone as a backup, as this may be more reliable for communication in remote locations.
3. Hiking.	3a. Rugged lava terrain, cracks and lava tubes.	• Tripping and falling. • Minor physical injury. • Traumatic injury.	3a: • Field crew should carry emergency information (known allergies, medical conditions, etc.) and phone contacts for each member of the team. • The group must have two means of communication (e.g., cell phone and radio). • Assess terrain conditions to find safe route and modify sampling plans to avoid unsafe areas (lava tubes, large cracks, loose rocks). • Proper footwear is very important- wear ankle supportive boots with Vibram or other sturdy soles, broken in before the field season. • Carry supplies in a backpack, make sure pack is comfortable and secure, properly fitted with waist and sternum straps. • Keep hands free for balance-lava tends to be unstable. • Do not move rocks. • Bring GPS with site coordinates uploaded, a compass, and detailed map. • Use established park trails when possible, and when traveling off-trail, choose the most easily navigable path to each site.
	3b. Fissures, holes, and loose rocks obscured by vegetation; sharp lava.	• Tripping and falling. • Minor physical injury. • Traumatic injury.	3b: • Take care when hiking over lava, especially on cinder, unstable rocks, and thin/porous lava that could break under your weight.
	3c. Sharp, rough vegetation. Low hanging branches.	• Tripping and falling. • Minor physical injury.	3c: • Wear long sleeves and pants as well as safety glasses (or other glasses) when hiking in brushy areas to protect eyes and skin from thorns (e.g., Kiawe). • Be aware of low tree trunks and branches near your head when wearing brimmed hats.
	3d. Bees and wasps.	• Allergic reactions.	3d: • Determine in advance if any field crew are allergic to bee stings. • Notify other crew members and the supervisor if you know you are allergic to bee stings, carry your own medication supplies if allergic.

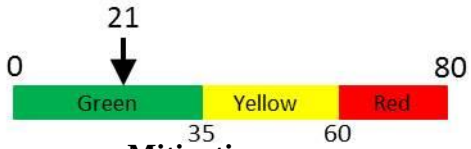
			• Be aware of the ground where you step- some hornets build nests in the ground at the base of trees or shrubs, or in rotten logs- watch for bees buzzing in and out of holes or around ground level. • If possible, flag a nest so others will be forewarned.
	3e. Centipedes, scorpions, and spiders.	• Allergic reactions. • Minor physical injury	3e: • Orb-weaving spiders create webs in fountaingrass and other vegetation and are encountered regularly when accessing anchialine pools at KAHO. • Use a stick to break down the web and avoid contact with spiders. • Inspect items left lying on the ground such as clothing, for scorpions, spiders or centipedes prior to putting them on. • If stung/bitten, wash the site with soap and water and apply a cold compress at intervals of 10 minutes. • Those with insect allergies should monitor themselves closely following a bite and may need to contact emergency medical services in the event of severe symptoms.
	3f. Strangers.	• Assault.	3f: • Remove yourself from the scene of uncomfortable encounters with strangers. • Report uncomfortable encounters to dispatch and law enforcement as soon as possible. • If you can't leave the scene, then call for help where you are. Do not engage with or confront individuals engaged in illegal activities. • Report apparent illegal activity to dispatch.
	3g. Waterbodies.	• Leptospirosis and other water-borne diseases.	3g: • Do not expose open cuts or abrasions to unfiltered water.
	3h. Heat.	• Dehydration, heat exhaustion, hypernatremia, heat stroke.	3h: • Review heat emergencies in the Safety Plan. • Watch for symptoms of heat emergencies including but not limited to nausea, vomiting, headache, and flushed or red skin, confusion, lethargy, fatigue, appetite loss, restlessness, irritability, muscle weakness, spasms or cramps, and seizures. • Drink plenty of water even when you are not thirsty.

			• As heat increases, take frequent breaks in cool locations. • Complete the bulk of work early in the day to avoid peak heat exposure. • Eat salty snacks or consume sports drink with electrolytes when working in hot weather for an extended period.
	3i.Sunlight.	• Sunburn.	3i: • Use of 15+ or greater SPF sunscreen and lip balm is recommended. • Wearing a hat, sunglasses, and UV protective shirt is recommended.
	3j. Vog and volcanic emissions.	• Respiratory irritation.	3j: • Check current monitoring conditions at http://hiso2index.info/ and projected conditions at http://weather.hawaii.edu/vmap/hysplit/. Do not enter field if red conditions (unhealthy) are predicted for the area. • Carry a respirator and cartridges in case necessary to exit the area if vog conditions unexpectedly increase. • Watch for lungs and eye irritation and breathing problems. • Persons with obstructive pulmonary disease (COPD), asthma, or respiratory problems should be advised of hazards before entering the field.
4. Lifting and transporting gear.	4. Heavy, large, or awkward gear.	• Minor physical injury. • Serious physical injury.	• 4: • Anticipate the extra weight that will need to be hiked out with your backpack full of water samples. • Use proper bending and lifting techniques. • Do not bend your back to pick even small or light objects up, lower yourself with your legs. • When lifting, plan your route and clear a path to avoid making awkward movements while holding something heavy. • Lift close to your body with your feet shoulder width apart. • When lifting, bend at the knees and keep your spine straight, tighten your core muscles and lift with your legs. • Never twist or bend while lifting and always share the burden of a heavy load with another person (when lifting water pump, use two people).

			• Secure heavy packs tightly with the sternum strap and waist belt utilized. • Be aware of your clearance wearing large backpacks in areas with Christmas berry and other trees.
5. Collecting water samples and water quality data.	5a. Hard-to-access field sites.	• Slipping and falling. • Minor or serious physical injury. • Becoming lost.	5a: • Utilize the coastal trail as much as possible; only go off trail when you are close to your site. • Secure sunglasses and other loose items when working over a pool, dropping items that you retrieve could cause a slip or fall. • Beware of disorientation when hiking in a'a lava fields, especially if you are inexperienced with the area. • When locating unfamiliar sites, refer to field notes, established pool descriptions and maps to help determine the best access route.
	5b. Rough, sharp or dense vegetation.	• Minor physical injury. • Serious physical injury.	5b: • Accessing any water quality site will likely require navigating through high grass, trees and shrubs (ēkoa). Some temporary sites may require working close to thorns, sharp sticks and/or thick, tangled vegetation (pickleweed). Wear eye and skin protection.
	5c. Steep or slippery surfaces at field sites.	• Slipping and falling. • Minor physical injury. • Serious physical injury.	5c: • Take care with your footing when sampling.
	5d. Field equipment including sondes.	• Minor physical injury.	5d. • Be mindful of pinch points on gear and instruments. • Keep fingers out of the way of the plunger while depressing the syringe and keep your fingers from being pinched between the sonde's metal handle and the cable attachment.

Document: GAR model risk analysis
Project: KAHO Anchialine pool water quality and animals
Participants: David Raikow, Anne Farahi, Amanda McCutcheon

Reviewed: September 9, 2016
Division: Inventory and Monitoring, Pacific Island Network
Final Score:



Element	Description	Initial	Mitigation	Final
Supervision	Experienced technician and a less-experienced technician	4	Science lead present for some trips. Most experienced technician designated as crew leader.	4
Planning	Logistic, equipment, supply, personnel, and task planning required.	4	Protocol, SOPs, JHAs, Trip Preparation Checklist, Daily Safety Checklist, Communication Plan, Backcountry Plan.	1
Team Selection	Experienced technician and less experienced technicians available.	5	New technicians trained by experienced technician.	4
Team Fitness	Tasks require hiking through lava fields.	3	Maintenance of fitness is a personal responsibility.	2
Communication	Cell phone and radio reception is good.	3	Bring park radio, multiple cell phones; check-in plan with PACC, park and I&M POC.	2
Contingency Resources	Good access to emergency services.	3	Park is located near medical services and park has equipment and trained staff to evacuate the injured.	2

Environment	Heat, sun, wind, vog.	4	Wear sunscreen, hat, and appropriate clothing. Bring sun-shading umbrellas. Avoid working at hottest time of the day. Check forecasts and delay work if poor weather or vog. conditions.	3

Task Complexity	Tasks are not complex.	4	Preparation, including Protocol, SOPs, JHAs, Trip Preparation Checklist, Daily Safety Checklist.	3

Communication Procedures Summary

PACN I&M Anchialine Pool Monitoring at KAHO

Prior to conducting fieldwork:

1. The field lead will contact the Resource Chief to schedule the fieldwork dates.
2. The field lead will prepare a Travel Plan detailing the general schedule for the day, the personnel involved (include contact information), and the locations that will be visited. This must be emailed to the Resource Chief prior to the day of sampling.
3. If the Resource Chief will not be available as a Point of Contact (POC) on the day of sampling, the field lead must determine another Park POC. The POC should also receive an email copy of the Travel Plan.
4. The field lead will add the fieldwork to the KAHO calendar on the SharePoint site and send an ALL KAHO Employees email to notify other park staff about the sampling event.

On the day of fieldwork:

1. The field lead will post the Travel Plan on the KAHO Field Status board and fill out the board for all members of the field crew (include contact information for any visiting staff).
2. The field lead will contact the Park POC and I&M POC by voice or text before beginning fieldwork.
3. Upon arrival to the field site, the field lead should perform a radio check with KAHO dispatch.
4. The field team will carry a radio and secondary communication device with them at all times in the field.
5. Upon return to the office, the field lead will erase the field status board and removed the Travel Plan. The field lead will check out by voice or text with the Park POC and I&M POC.

In the event of an injury or incident in the field, the field lead will report it immediately to the Resource Chief and I&M POC.

Primary Points of Contacts:

KAHO – Sallie Beavers, Resource Chief	sallie_beavers@nps.gov	808-989-8619
PACN – David Raikow, Aquatic Ecologist	david_raikow@nps.gov	808-333-6481
PACN – Amanda McCutcheon, Field Lead	amanda_l_mccutcheon@nps.gov	808-388-7004

JOB HAZARD ANALYSIS (JHA)

Pacific Island Network (PACN) - Inventory and Monitoring Program (I&M) - National Park Service (NPS) - Department of the Interior (DOI)

Project: Water quality and animal sampling in anchialine pools	Protocol: Water Quality, Anchialine Pool Animals	Location: Pu‘uhonua O Hōnaunau NHP

Version: 1.6	24 Sep 2019	Authors: Danielle Gross, Anne Farahi, David Raikow.

Review and Approvals:	Park Resource Manager:	Adam Johnson, MaryAnne Maigret
	Park Safety Officer:	
	PACN Program Manager:	Ryan Monello
	PACN Field Supervisor:	David Raikow

Required Safety Training:

- Read the I&M PACN safety documents at least once a year.
- Review the Protocol Safety SOPs prior to beginning the trip.
- Complete Trip Preparation Checklist prior to field work.
- Complete Daily Safety Checklist each day before entering field.
- One field crew member must be certified in CPR and first aid.
- Review NPS Driving Policy.
- Review KAHO/PUHO back-country plan.

Recommended Personal Protective Equipment (responsibility of the employee):

- Hat.
- Boots.
- Sunglasses.
- Sunscreen.

Notes: Last reviewed by David Raikow on 24 September 2019.

Tasks	Hazards	Potential Injuries	Abatement Actions
1. Driving to and from field sites.	1a. Narrow, single-lane, unpaved roads with rutted and uneven surfaces.	Auto accidents.	1a: Wear seatbelts at all times when vehicle is moving. Never use cell phones or other devices when operating a vehicle of any kind. Maintain a safe speed (this is often below the legal speed limit) for the road conditions. Stay clear to the right, especially on curves. Drive with headlights on at all times. When backing up or parking, the passenger should get out of the vehicle to guide the driver. Park work vehicle in designated lots.
	1b. Driving with limited visibility.		1b: Clean both sides of windows regularly (remember back window). Slow down. If blinded by sun or dust, proceed slowly or pullover and wait for hazard to pass; keep to the right hand side of the road and drive with your lights on.
	1c. Sharp rocks, deep holes or obstacles in the roadway.		1c. Avoid driving over sharp rocks or in deep pits. Reduce speed substantially in places with pots/holes, protruding rocks or other obstacles.
	1d. Fatigue.		1d: Be aware of signs of fatigue. Pull over and rest. Eat a snack or have a partner drive
	1e. Animals crossing or standing in roads.		1e: Goat encounters are likely at this location. Mongoose, feral cats and francolins may also be in the roadway.

Tasks	Hazards	Potential Injuries	Abatement Actions
			Slow down where animals might be present to allow for reaction time. Do not swerve abruptly to avoid hitting an animal, if necessary, it's better to ride out the impact.
	1f. Storm conditions, e.g., wind, lightning, or slippery roads.		1f: Keep informed on the current weather. Dial 808-973-5286 to reach the National Weather Service, ex. 237 to speak to a person. Also check the online forecast for Honaunau. If winds exceed 25 mph, or the excessive wind category on Beaufort scale (tree tops swaying, twigs and leaves falling, etc.), do not travel into the field Avoid going to the field if lightning is present and avoid using radios Drive slowly when roads are muddy and slippery.
2. Communicating with dispatch and park Point of Contact (POC).	2. Isolation.	Unable to reach dispatch to summon aid.	2: Identify and notify dispatch of EMS meeting points: the paved parking lot at PUHO. Check-in with park POC before going into the field and check-out once you return. I&M staff may conduct sampling alone. I&M staff will designate a POC that he/she will check in with before and after sampling. Sampling new locations alone is subject to supervisor and park unit approval. If you are unable to reach dispatch or law enforcement from your location, try other nearby locations. Try at regular intervals, just meandering around may help in getting a signal. Use cell phone as this may be more reliable for communication in remote locations.

Tasks	Hazards	Potential Injuries	Abatement Actions
3. Hiking.	3a. Rugged lava terrain, cracks and lava tubes.	Tripping and falling. Minor physical injury. Traumatic injury.	3a: Field crew should carry emergency information (known allergies, medical conditions, etc.) and phone contacts for each member of the team. The group must have two means of communication (e.g., cell phone and radio). Assess terrain conditions to find safe route and modify sampling plans to avoid unsafe areas (lava tubes, large cracks, loose rocks) Proper footwear is very important- wear ankle supportive boots with Vibram or other sturdy soles, broken in before the field season. Carry supplies in a backpack, make sure pack is comfortable and secure, properly fitted with waist and sternum straps. Keep hands free for balance-lava tends to be unstable. Do not move rocks. Bring GPS with site coordinates uploaded, a compass, and detailed map. Use established park trails when possible, and when traveling off-trail, choose the most easily navigable path to each site.
	3b. Fissures, holes, and loose rocks obscured by vegetation; sharp lava.	Tripping and falling. Minor physical injury. Traumatic injury.	3b: Take care when hiking over lava, especially on cinder, unstable rocks, and thin/porous lava that could break under your weight.
	3c. Sharp, rough vegetation. Low hanging branches,	Tripping and falling. Minor physical injury.	3c: Long sleeves and pants as well as safety glasses (or other glasses) are recommended when hiking in brushy areas to protect eyes and skin from thorns (e.g., Kiawe).

Tasks	Hazards	Potential Injuries	Abatement Actions
			Be aware of low tree trunks and branches near your head when wearing brimmed hats.
	3d. Bees and wasps	Allergic reactions	3d: Notify other crew members and the supervisor if you know you are allergic to bee stings. Be aware of the ground where you step- some hornets build nests in the ground at the base of trees or shrubs, or in rotten logs- watch for bees buzzing in and out of holes or around ground level. If possible, flag a nest so others will be forewarned.
	3e. Centipedes, scorpions, and spiders.	Allergic reactions. Minor physical injury	3e: Orb-weaving spiders create webs in fountaingrass and other vegetation and are encountered regularly when accessing anchialine pools. Use a stick to break down the web and avoid contact with spiders. Inspect items left lying on the ground such as clothing, for scorpions, spiders or centipedes prior to putting them on. If stung/bitten, wash the site with soap and water and apply a cold compress at intervals of 10 minutes. Those with insect allergies should monitor themselves closely following a bite and may need to contact emergency medical services in the event of more severe symptoms.
	3f. Hostile people.	Assault.	3f: Do not or confront individuals engaged in illegal activities. Remove yourself from the scene of uncomfortable encounters with hostile people.

Tasks	Hazards	Potential Injuries	Abatement Actions
			Report uncomfortable encounters to dispatch and law enforcement as soon as possible If you can't leave the scene, then call for help where you are. Report apparent illegal activity to dispatch
	3g. Waterbodies.	Leptospirosis and other water-borne diseases.	3g: Do not enter waterbodies while sampling. Do not expose open cuts or abrasions to unfiltered water.
	3h. Heat.	Dehydration, heat exhaustion, hypernatremia, heat stroke.	3h: Review heat emergencies in the Safety Plan. Watch for symptoms of heat emergencies including but not limited to nausea, vomiting, headache, and flushed or red skin, confusion, lethargy, fatigue, appetite loss, restlessness, irritability, muscle weakness, spasms or cramps, and seizures. Drink plenty of water even when you are not thirsty. As heat increases, take frequent breaks in cool locations. Complete the bulk of work early in the day to avoid peak heat exposure. Eat salty snacks or consume sports drink with electrolytes when working in hot weather for an extended period.
	3i.Sunlight.	Sunburn	3i: Use 15+ or greater SPF sunscreen and lip balm. Wear a hat, sunglasses, and UV protective shirt.
	3j. Vog and volcanic emissions.	Respiratory irritation	3j: Watch for lungs and eye irritation and breathing problems.

Tasks	Hazards	Potential Injuries	Abatement Actions
			Persons with obstructive pulmonary disease (COPD), asthma, or respiratory problems should be advised of hazards before entering the field.
	3k. Animal encounters.	Minor physical injury Major physical injury	3k: Goat encounters are likely at this park and encounters have increased significantly recently. Goats sometimes arrive suddenly and in herds. Be aware of your surroundings at all time so that the goats do not startle you causing you to trip or fall. If you hear goats approaching, make noise or throw rocks to warn them of your presence. Goats will generally not be aggressive but may run up unaware of your presence and be startled.
4. Lifting and transporting gear.	4. Heavy, large, or awkward gear.	Minor physical injury. Serious physical injury.	4: Anticipate the extra weight that will need to be hiked out with your backpack full of water samples. Use proper bending and lifting techniques. Do not bend your back to pick even small or light objects up, lower yourself with your legs. When lifting, plan your route and clear a path to avoid making awkward movements while holding something heavy. Lift close to your body with your feet shoulder width apart. When lifting, bend at the knees and keep your spine straight, tighten your core muscles and lift with your legs. Never twist or bend while lifting and always share the burden of a heavy load with another person (when lifting water pump, use two people). Secure heavy packs tightly with the sternum strap and waist belt utilized.

Tasks	Hazards	Potential Injuries	Abatement Actions
			Be aware of your clearance wearing large backpacks in areas with Christmas berry and other trees.
5. Collecting water samples, water quality data, and surveying animals.	5a. Hard-to-access field sites.	Slipping and falling. Minor or serious physical injury. Isolation while injured Becoming lost.	5a: Utilize the coastal trail as much as possible, only go off trail when you are close to your site. Secure sunglasses and other loose items when working over a pool, dropping items that you retrieve could cause a slip or fall. Beware of disorientation when hiking in a'a lava fields, especially if you are inexperienced with the area. When locating unfamiliar sites, refer to field notes, established pool descriptions and maps to help determine the best access route.
	5b. Rough, sharp or dense vegetation	Minor physical injury. Serious physical injury	5b: Accessing any water quality site will likely require navigating through high grass, trees and shrubs (ēkoa). Some sites may require working close to thorns, sharp sticks and/or thick, tangled vegetation (pickleweed). Wear eye and skin protection.
	5c. Steep or slippery surfaces at field sites.	Slipping and falling. Minor physical injury. Serious physical injury	5c: Take care when sampling.
	5d. Field equipment including sondes.	Minor physical injury.	5d. Be mindful of pinch points on gear and instruments. Keep fingers out of the way of the plunger while depressing the syringe and keep your fingers from being pinched between the sonde's metal handle and the cable attachment.

Tasks	Hazards	Potential Injuries	Abatement Actions
	5e. Dangerous aquatic animals	Minor or serious physical injury	It is possible for a dangerous marine fish, such as a barracuda, to become trapped in an anchialine pool at PUHO. Where such fish have been sited work will be confined to shallow areas inaccessible by such fish.
6. FPUHO02_Keokea003			6: Be careful of coconuts and other green waste when accessing this site. The well is covered by a plywood board. Carefully remove it to sample and replace it when finished. This site is relatively far down and not easily accessible. Utilize sample grabber to collect water samples and lower sonde down with cable.

JHA Revision History

New Version	Date	Old Version	Revised by	Changes
0.2	30 Nov 2012	0.1	Anne Farahi	Revised communication paragraph at beginning of document.
0.3	11 Feb 2013	0.2	David Raikow	Removed communication paragraph, required gear, items that belong on preparation checklists, unenforceable bee sting items.
0.4	14 Feb 2013	0.3	David Raikow	Changed Required Safety Training section.
1.0	23 Sept 2013	0.4	David Raikow	Removed “Check with dispatch”, changed wearing long clothes to a recommendation, and removed FPUHO01_Kiilae001.
1.1	25 Nov 2013	1.0	Adam Johnson	Moved abatement actions from section 5 to section 3.
1.2	30 Sept 2015	1.1	David Raikow	Annual Review, removed “if available” from phone.
1.3	7 October 2015	1.2	David Raikow	Modified beginning of document to match formatting of KAHO JHAs.
1.4	9 Sept 2016	1.3	David Raikow	Added language allowing solo sampling at selected locations.
1.5	26 Oct 2017	1.4	David Raikow	Added animal sampling, including the hazard of dangerous marine fish.
1.6	24 September 2019	1.5	Amanda McCutcheon	Added goats. Removed providing a map to HAVO dispatch.

Document: GAR model risk analysis
Project: PUHO Water Quality and Anc. Pool Animal Sampling
Participants: David Raikow, Anne Farahi, Amanda McCutcheon

Last Reviewed: 9 October 2018
Division: Inventory and Monitoring, Pacific Island Network
Final Score: 16

Element	Description	Initial	Mitigation	Final
Supervision	Experienced crew leader required.	5	Multiple experienced technicians are on staff. Science lead present for some trips.	1
Planning	Logistic, equipment, supplies, personnel, and task planning required.	5	Protocol, SOPs, JHAs, Trip Preparation Checklist, Daily Safety Checklist, Communication Plan, Backcountry Plan.	1
Team Selection	Experienced technicians required.	5	Multiple highly experienced technicians are on staff.	1
Team Fitness	Short hiking on trails required.	2	Crew maintains a level of physical fitness greater than minimum requirements.	1
Communication	Cell phone and radio reception is good, cell phone and radio required.	2	Bring park radio, multiple cell phones; communication plan.	1
Contingency Resources	Access to emergency services is good, but some sites are removed from roads.	3	Back country plan has contact information for emergency services.	3
Environment	Heat, sun, wind, vog, potential dangerous marine fish.	7	Wear sunscreen, hat, and appropriate clothing. Use sunshade umbrellas. Avoid working at hottest time of the day.	5
Task Complexity	Tasks are not complex.	5	Protocol, SOPs, JHAs, Trip Preparation Checklist, Daily Safety Checklist, but tasks still require attention to detail.	3

Communication Procedures Summary

PACN I&M Water Quality PUHO

Prior to conducting fieldwork:

1. The field lead will contact the Resource Chief and Biological Technician to schedule the fieldwork dates.
2. The field lead will prepare a Travel Plan detailing the general schedule for the day, the personnel involved (include contact information), and the locations that will be visited. This must be emailed to the Resource Chief and Biological Technician prior to the day of sampling.
3. If the Resource Chief or Biological Technician will not be available as a Point of Contact (POC) on the day of sampling, the field lead must determine another Park POC. The POC should also receive an email copy of the Travel Plan.

On the day of fieldwork:

1. The field lead check in with the Park POC at the PUHO office.
2. The field lead will contact the I&M POC by voice or text before beginning fieldwork.
3. Upon arrival to the field site, the field lead should perform a radio check with PUHO dispatch.
4. The field team will carry a radio and secondary communication device with them at all times in the field.
5. Upon completion of fieldwork, the field lead will check out with the Park POC at the office and contact the I&M POC to check out by voice or text.

In the event of an injury or incident in the field, the field lead will report it immediately to the Resource Chief and I&M POC.

Primary Points of Contacts:

PUHO	MaryAnne Maigret, Resource Chief 808-328-2326 x1104	maryanne_maigret@nps.gov	808-464-3441,
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