

STREAM TEAM FIELD MANUAL

PROGRAM OVERVIEW

Information on the hydrology of the dry valley streams is considered essential to a range of research efforts in the McMurdo Dry Valleys. Data is currently being collected on about thirty glacial melt water streams. Nineteen of these streams have instrumentation monitoring them continuously during the flow period. At present, work is conducted mainly in two of the dry valleys – Taylor and Wright, with the emphasis on Taylor. Other valleys where streams have been studied include Victoria, Garwood and Meirs. These streams are generated by glacial melt water during mid-November through mid-February, and typically drain into lakes with no outlets. The names of the lakes involved are Fryxell, Hoare, Bonney, Vanda, and Vida.

This overview is meant to specifically orient stream team members to their seasonal work in the dry valleys. This manual is a helpful resource, but should not take the place of the USAP Participant's Guide which is published by NSF every other year. Please also read that book for complete instructions.

DEPLOYMENT PROCEDURES AND SUGGESTED PERSONAL GEAR

Antarctic Support Associates (ASA) is the logistics contractor for the National Science Foundation's (NSF) United States Antarctic Program (USAP). ASA is in charge of support planning, ordering and coordinating equipment supply, personnel deployment, and field support. In March of every year, ASA sends out Support and Information Plan (SIP) to each group funded by NSF to go "to the ice". These SIP packets are prepared by the scientists on the MCMLTER project and returned to ASA. Each SIP contains the plan for each group for the upcoming season. From personnel to supplies, to communications needs, to laboratory needs, to field training, the SIP is designed to gather as much information as possible.

Transportation from your point of origin (home) to Antarctica is provided free of charge. Once you have been medically cleared by ASA, a final departure date will be determined and your plane tickets will be issued. Generally, your flights to New Zealand are confirmed, but your return flight is left open. When you return to Christchurch from the ice, your return trip will be booked and confirmed, and you will receive your return ticket. You are allowed to stay in New Zealand for as long as the Co-PI, Diane or your supervisor (and your visa) allows. When you arrive in New Zealand, you will receive a special 9-month work visa. As far as the visa is concerned, you are in New Zealand for the duration of your stay on the ice. But, as far as New Zealand customs is concerned, you leave New Zealand when you leave for the ice. You will need a passport valid through your return date to the United States. You are required to take your passport with you to Antarctica, and you WILL need it to get back into New Zealand on your return trip. Once ASA has issued your ticket back to your point of origin, you are free to change the route of return, but you will have to do so through the airlines, and you will be charged any fees involved. ASA will only issue you a ticket from Christchurch to your place of origin.

If you are taking expensive electronic equipment down, you will need to claim it with customs so that you do not have to pay a duty on it on your return. If you are bringing samples back with you from Antarctica, you will need to fill out specific customs forms. Talk to Diane, or whoever is coordinating the SIP.

All flights are routed through Los Angeles, on the way to Auckland, New Zealand. When you arrive in Auckland, you will need to claim your baggage, clear customs, and then re-check your baggage for your domestic flight to Christchurch. Then make the 10-minute walk over to the domestic terminal of the airport. A short flight will take you to Christchurch. Normally, a staff person from the Antarctic program, dressed in a blue blazer will meet you near your gate, or at the baggage claim. They will give you a packet of information telling you where you will be staying that night, when you are scheduled to pick up your field clothing at the Clothing Distribution Center (CDC), and when you are scheduled to fly down to the ice. If you have large scientific cargo items, they may offer to take those over to the CDC for you.

Normally, you will be staying at a bed and breakfast in downtown Christchurch (I suggest the Windsor, it is fabulous). There are 2 cheap ways to get there, either the city bus or a cab or shuttle. The bus is cheap, but it may not drop you off close to where you want to be. The shuttle buses are \$4-\$5 NZ (that's \$2-\$3 US) and they will take you right to your hotel. They may not take US\$, so change some money at the airport if possible. The shuttles do not take credit cards, as far as I know. Be sure to tell them you are with the USAP for the discounted (\$4 or \$5) fare.

You will need to hire a shuttle or take the bus back out to the CDC for your clothing issue. The CDC is very close to the Airport, at the International Antarctic Center. You will also need to take a shuttle or the bus back to your hotel and then back out to the CDC on the day of your flight to the ice. Additional details on where to go and how to do it will be explained to you by ASA support personnel.

You may bring up to two 70-lb. bags plus one 50-lb. carry-on down to New Zealand. As well, you will only be allowed to bring 75 lbs. of personal gear to the ice. If you are bringing scientific gear also, you need to get extra baggage coupons from ASA and permission to bring extra baggage to the ice from New Zealand, also from ASA. Extra gear brought to New Zealand, but not taken to the ice can be stored in Christchurch, free of charge. You will need plenty of gear on the ice, but do not bring more than you need.

When you arrive at the CDC for clothing issue, you will be given a set of gear based on where you will be working, for how long, and your tasks on the ice. You may be able to make a few substitutions to your list. If you explain where you are going, and what you are doing, you may be able to get additional socks, or special other gear (Carhartt clothing, etc.). NSF provides each USAP participant with special cold weather clothing:

1 down parka	2 pair of heavy long underwear	6 pair of wool socks
1 pair of snow bibs	1 warm hat	1 pair of goggles
6 different types of gloves/mittens	1 pair of bunny boots	1 fleece neck gaiter
2 orange duffel bags	1 wind jacket	1 fleece jacket
1 light balaclava	1 pair of pile pants (or union suit - very warm)	

Try to get extra: 4 pair of socks, 1 or 2 pair long underwear

BE SURE TO TRY EVERYTHING ON AND MAKE SURE IT FITS (items should not bind you when you move). Make sure gloves are properly matched, etc. If the people at the CDC hesitate to give you something, point out politely how long you will be out, that you will not be going back to McMurdo to wash things. Also mention that this list has been given to you by a supervisor experienced in the work you will be doing, and is considered a practical minimum. If they still refuse the "extras", accept it. If they refuse to issue an item at all, try to work out some sort of substitute. You might consider bringing one or two extra pairs of long capelene/polypropylene underwear tops and bottoms, as well as thick

wool socks with you. Supposedly, the CDC is no longer being as lenient as they used to be in altering the set of clothing that they will supply you with for the ice. In that even, you may want to bring this extra clothing to the ice.

The stream team is expected to spend most of its time outdoors, hiking and working. So, you need to bring some other items that are not provided by NSF:

1 large personal duffel bag	1 good pair of sunglasses	1 back-up pair of sunglasses
1 digital watch	personal toiletries	1 good pair of hiking boots
foot powder (if needed)	1 pocket knife	1 pr of light shoes (sneakers)
several T-shirts	underwear	extra long underwear
1 long sleeve shirt	1 laundry bag	long pants (jeans, etc.)
camera, film, batteries	letter writing materials & stamps	extra wool socks
good coffee	sunscreen & lip protection	daily vitamin supply
small battery powered alarm clock		

A few comments about the above list:

- ◆ Letters and postcards from McMurdo are standard US postage (currently \$0.33 and \$0.20 respectively). There is a post office in McMurdo, but we won't be near it often.
- ◆ The good pair of sunglasses should be either wrap-arounds or glacier glasses with side-guards. Remember, it is sunny 24-hrs a day, so these will be important. Be sure they fit, and be sure they block UV.
- ◆ **MAKE SURE YOUR BOOTS ARE BROKEN IN ALREADY.** Cuts and bruises don't heal very fast in Antarctica. The best way to cut down on pain is prevention.
- ◆ Along the same lines, we don't get much fresh food down there. We may only see one or two shipments of fresh fruit and vegetables make it out to the valleys. So, supplemental vitamins are important to keeping you healthy.
- ◆ Your own warm hat, extra long underwear (maybe 3 pair), and regular underwear (maybe 8 or 9 pair) are advised. You will likely be more comfortable with a change of clothes more often. We will be in the field for 3 months, doing laundry only once or twice during that time. So, recycling is important.
- ◆ Remember, you are doing work in the field for a long time. Don't trash your own gear, use theirs. On the other hand, if you *are* particular about you hat or gloves or underwear, bring it along.

This is pretty much a minimum list of gear you will need to bring to the ice. If you decide to bring more, be sure it fits into one large duffel bag at most. ASA will provide virtually everything you really need to clothe yourself while on the ice. The extras you bring are to either improve on what they give you, or for personal style/preference. Most people will bring a fair bit more than is listed above, as they get tired of wearing the standard issue gear. Assume you cannot buy more consumables (toothpaste, film, etc.) once you leave the states.

You will need to bring sufficient funds to cover your expenses during your travel. Five hundred to one thousand dollars should be available to you during the field season. Expenses incurred in New Zealand will be reimbursed (through the INSTAAR accounting office) after the field season. Traveler's checks,

personal checks, credit and debit cards, and cash are all possibilities. You will need to pay for taxis, buses, hotels and meals in New Zealand. **BE SURE YOU RETAIN RECEIPTS FOR ALL EXPENSES, OR IT WILL NOT BE POSSIBLE TO REIMBURSE YOU!!** In particular, you will need receipts for lodging, airport departure tax, and any other business-related expense, except food. You should also keep your airline ticket receipt in the back of the booklet of tickets. If you have credit cards, you will get a superior exchange rate. Otherwise, you will probably need to convert some instruments to Kiwi dollars.

In McMurdo, only cash and personal or travelers checks are accepted. You will need funds if you wish to purchase gifts or essentials at the Ship Store (t-shirts, over-priced film, shampoo, etc.). Do not count on any specific items to be there. Also, if you wish to consume liquor, you will have to pay for it. You will have to pay for the alcohol you wish to take to the field, and at the several bars that are in town. There are no required expenses on the ice, only optional ones. There is a Wells Fargo ATM machine in the Galley building, but it is not always a reliable source of money.

All food, shelter and medical procedures are provided free of charge while you are on the ice. In McMurdo it may be possible to obtain over the counter medication from the clinic, however, once you are back in New Zealand, any medical costs incurred are your own. You should look into appropriate insurance before you leave the US.

If you want to drink liquor in the field, you will need to pick up buy beer, wine or liquor in the ship's store, downstairs from the dining rooms. You can only buy so much at a time. But, if you tell them that you will be in a field camp, you should be able to stock up. Beer is about \$20 per case, wine and other liquor are about \$15-\$20 per bottle. The ATM machine is down the hall from the ship's store if you need it. Remember to include the weights of these items (cases of beer are heavy) when making your helo schedule.

GENERAL DUTIES FOR STREAMWORKERS

IN MCMURDO BEFORE DEPLOYING TO THE FIELD

- Establish email communications with Diane McKnight at mcknight@snobear.colorado.edu
- Receive waste management training. You will be told the rules on what to do with your garbage. This is important in the field camps.
- Go to Snow School. This will normally include an overnight course outside of town. Contact Kathy Welch when you get to McMurdo. It is possible you will need to be at Snow School at 9 a.m. the morning after you get to McMurdo.
- Receive field glacier training to be able to assist glacier group if necessary. First talk to the glaciologists about this (Andrew Fountain, or others working with him), to see if it is necessary.
- Get your Antarctic Drivers license. There should be info on when you can get this. You will need it to drive a truck around town and pick up various field supplies.
- Receive training in snowmobile, ATV, and generator operation from MEC. This is especially important for the large generators you may be using at Lake Bonney and Lake Fryxell camps.
- Receive helicopter safety training. This is covered in Snow School, but it is okay to go down to the helo hanger and talk to the techs there. BE SURE they are not busy though. The helo pad can be a dangerous place. Do what you are told when you are there, and do not wander out on to the pad without a tech or pilot.
- Locate all stream-related items ordered on the SIP. Kathy Welch is likely to be in town. Find her in the LTER lab (in the Crary lab building) and coordinate efforts with her. If she is not there, do not panic. You should be able to contact the stream team out in the field. First call the Lake Hoare camp and talk to the camp manager there. Try F6 too.
- Ensure that all stream-related gear is deployed to the proper locations. See further details.

IN THE FIELD, AT START OF SEASON

- Organize stream gear at Lake Hoare Camp. Talk over communication plans with the camp manager. Typically, the camp manager will be in charge of the helo scheduling for the entire LTER team.
- Establish F6 field camp. A carpenter team should have opened it earlier, but you will need to turn on the preway, organize gear, set up tents and radios, etc.
- Open gauge boxes. Undo the cargo straps and put them inside the box for use at the end of the season. Clear snow and ice out of gauge boxes.
- Clear snow and ice away from control structures.
- Re-establish operation of field gages. Check CR10, batteries, date, time, etc.
- Retrieve previous season's field data by swapping out storage modules. Specific details follow.....

DURING FIELD SEASON

- Survey all reference points at gage sites just as flow starts.
- Maintain and calibrate gages.
- Monitor all streams for flow, temperature, conductivity, pH and chemistry.
- Carry out other planned stream research activities for LTER.
- Assist in research activities of other LTER personnel.

AT END OF FIELD SEASON

- Close out gages, winterize gauge boxes.
- Survey all reference points at all gages.
- Survey lake levels at selected sites for the Kiwis.
- Close out F6 camp.
- Put away gear for winter

IN MCMURDO BEFORE RETURNING TO NEW ZEALAND

- retro cargo to the USA
- Bring back field data notesheets and CR10 data

DETAILED PROGRAM FOR SEASONAL ACTIVITIES

IN MCMURDO

When you first arrive in McMurdo, you will need to sign up for the various training sessions you are required to attend. Specific LTER tasks will need to be worked around those sessions.

LTER personnel will advise you where to go to locate equipment or perform various tasks. Many items listed above will be pulled for the entire LTER group at once. Your task is to ensure the stream team portion of equipment is separated out and stored with our other equipment at Lake Hoare or elsewhere as appropriate.

Each year, the project's equipment is requested through a SIP. The SIP is then looked over by ASA and certain items are bought, or set aside for the team. In the SIP for BM-042M, we request specific gauge box gear (batteries, etc.), special equipment for experimental work (chemicals, etc.), and typical equipment from the BFC (Berg Field Center) like tents, sleeping bags, and such. All of this is noted in both the SIP and ASA's response to the SIP, the RSP (Research Support Plan). One member from the stream team should have a copy of both the SIP and the RSP with them.

The main task of the lead team is to move the equipment out to the field, open up the various gauges and field camps, and get ready for the "season"; the period when the flow begins. Most streams will not start flowing significantly until December, though some may start as early as the first of November.

If you have any problems, you should ask Kathy Welch. You will also need to coordinate cleaning and preparing bottles for input/output sets. These are used in the field for collecting water quality samples.

The stream team is responsible for opening up the F6 field camp on Lake Fryxell. ASA will de-winterize the building, and connect the preway (heater) for you. You will need to ensure that adequate fuel, food, and other supplies are sent out there. The camp manager at Lake Hoare may want you to take food supplies to F6 from Hoare; you will have to discuss this with her. Diane McKnight was responsible for ordering most of the F6 equipment on the SIP. You will need to go through the sip, and make sure that equipment is delivered to F6. Consult with other LTER personnel regarding this task.

Fresh nitrogen tanks, and in some cases, batteries, will have to be delivered to all gage locations at some point. Nitrogen tanks need to be dash-2'd (okayed for transport - they are considered hazardous cargo) in McMurdo before they can be sent out. In general, you will want to traverse all the heavy gear to Marble Point (a re-fueling station for helicopters in the Dry Valley vicinity), then have it either all sent out to Lake Hoare, or separate out the items for the Lake Fryxell streams and have them sent over to F6 camp instead, as you think best.

You will definitely need helicopter support to get the tanks to C1, Lake Fryxell, Lake Bonney, and the Onyx River. For individual gauges on Lake Fryxell and Bonney, you may decide to drop them all off in one spot (F6 camp, Bonney camp) and distribute them via banana sled to each gauge. It will probably be most efficient to drop off all the tanks via helo/banana sled first. Then you can visit each gage in due time, removing the spent tanks to a central location on the lake.

In general, the following gear will need to be sent to F6:

3 barrels of JP-8 (fuel for the preway)	1 barrel of Mogas (fuel for the generator)
1 Honda generator (0.65 kW)	1 Honda generator (3.5 kW)
6 bottles of oil for snowmobile	1 banana sled
food	2 U-barrels
2 poly-packs, toilet paper, plastic bags	propane tanks for stove and refrigerator

There is a lot of equipment already stored at F6. Some of the necessities are:

1 bung wrench	broom, dustpan
rags	2 flex spouts
1 - 2 burner Coleman stove	lots of science equipment

Before departing McMurdo, you should contact the officer in charge at Scott Base, and inquire as to the New Zealand Antarctic Program's plans for use of the two huts on the Onyx River, and ask them for permission to use the facility. Be sure to let them know you will be servicing the gauges, and are working with Clive Howard-Williams (he is a kiwi scientist). This is a courtesy mostly. They will let you use the hut, but you will want to coordinate so you are not at the Lower Wright Hut when they are there especially. The Lower Wright hut is really only big enough for two or three.

INITIAL TASKS IN THE FIELD

You will deploy out to Lake Hoare field camp. Here, you will need to set up your personal tent, and arrange your personal gear. It is important to deploy to Lake Hoare first so that you can meet up with the camp manager there and coordinate plans for the season. The camp manager at Lake Hoare will be the main point of contact for the LTER group when dealing with helo ops and other important contacts in town (food room, etc.)

After settling in, the next task will be to store away the new items you brought out with you from town. There is a line of crates in back of the chemistry lab which are dedicated to the stream group. The crates nearest the instrument lab contain the equipment most often used by the stream team. There is also gear stored in marked drawers in the instrument and chemistry labs.

The next thing to do will be to open up your first gauge. The logical choice is H1 at Andersen Creek, because it is at Lake Hoare Camp. You can do everything here you are likely to need to know how to do at all the other gages.

Opening up a gage will consist of the following activities:

- Make field notes every time you visit a gage for any purpose.
See example sheets later in this manual. Try to maintain consistency in note taking. When a flow measurement is made, all notes can be made on a discharge record card, a separate site visit note does not need to be filled out.
- Clear the control of ice and snow, free probes and orifice
The control is the location in the stream channel where the instrumentation samples the water. At many sites, there is likely to be drifted in snow and ice there. If the snow is not too deep and

hard, take a shovel and clear it away in the vicinity of the center of the channel, and for a few yards downstream. This will allow you to access the probes and orifice tube, and let the water pass through the structure. Do not bother to do this if it looks like it is going to be a lot of work. If it is not too difficult, go ahead and open it up, and let the sun then begin to thaw out the probes and orifice line. Some of the sites will have probes and orifice lines hopelessly frozen in (i.e. B4, Lyons Cr.). **DO NOT ATTEMPT TO FREE THEM FROM FROZEN GROUND; YOU WILL DAMAGE THEM.** The control structures consist of the section of stream just below the orifice line. It may be a sandbag wall with a flume, a rock dam, or basically a natural channel. **DO NOT DISTURB OR "REPAIR" THIS STRUCTURE IN ANY WAY. DOING SO WOULD ALTER THE RELATIONSHIP BETWEEN FLOW DEPTH AND DISCHARGE FOR THAT SITE, AND WE WOULD HAVE TO DEVELOP A NEW RATING FOR THAT SITE.**

- Open gauge box, clear of snow

Most of the gage boxes have a cargo strap holding them closed. Remove the strap, unlock the door, and open it up. Some of the gauges will have a lot of snow inside. There should be a dustpan and whiskbroom in each one. You should also have a small shovel. Remove the snow from inside the gauge box. **BE VERY CAREFUL** near the back where the instrumentation is mounted on the wall. There are a number of hoses, pressure lines, and battery connections. If these are damaged, the system will leak or will not operate properly. You could also lose all your nitrogen from your tank. You may want to use the whiskbroom to free them of snow. Coil up the cargo strap, place it in the back of the gauge box out of the way for the rest of the season.

- Retrieve last season's data.

This data will exist on a storage module. You should have brought out a set of storage modules with individual gauge names written on label tape. The storage module with the end of last season's data will be in a velcro holder clip, either mounted on the wall of the gauge box, or inside the CR10 enclosure. Remove the storage module by undoing the velcro straps, and if necessary, unscrewing and removing the blue ribbon cable from the storage module. Replace it with the new storage module, and reconnect it as appropriate. Bring the old storage module back to camp.

- Add second battery, if necessary

Second batteries may need to be added to any of the gauges that presently only have one in them. (Both Onyx sites should be OK right now). Just clip the second battery into the spare pair of leads in the tri-harnesses. If a battery needs to be charged in camp, there is a nice battery charger in the stream team crates (at Lake Hoare) for this purpose.

- Connect solar panels if necessary.

Some gauges may not have the solar panel connected when you get there. The panels should all be mounted on the outside of the gauge box. If not, mount it in the pre-drilled holes. Connect any of the orange electrical connectors necessary to complete the charging circuit. These panels charge the batteries that power the datalogger. They charge at 20 - 23 volts.

- Check battery power, and ensure CR10 is properly recording data.

- Reset datalogger time to exact local McMurdo time.

See instructions later in manual on how to set data logger date and time using the *5 command.

WHENEVER YOU ARE THROUGH WORKING WITH THE KEYPAD, HIT *0. IF YOU DO NOT DO THIS, THE DATA LOGGER WILL NOT RECORD ANY DATA. AFTER YOU HIT *0, YOU SHOULD ALWAYS SEE THE DISPLAY "LOG 1".

- Replace nitrogen tanks.

Most of the tanks will have been drained of their nitrogen. There is a gauge on each one that will show you how much is left. If there is 1000 psi or more, they do not have to be switched. Otherwise, they do.

Onyx River gauges each have a spare in them, but when the first visit is made, a new tank for each should be brought in, and the old one removed back to Lake Hoare. All spent tanks will eventually need to go back to McMurdo in care of Jesse Alcorta, but you should wait to do this until they are all gathered together for one or two shipments. Any extra full tanks can be left at Lake Hoare camp, or at F6. Be sure all tanks are labeled as full or empty by putting some labeling tape on the outside and writing on it when put away.

To replace a tank:

1. Close the valve on the top of the old (empty) tank.
2. Detach the regulator from the tank with a crescent wrench.
3. Put a new tank where the old one was.
4. Put Teflon tape around the threads of the regulator, if required. There should be tape in each gauge box in a small box on a shelf.
5. Attach the regulator to the new tank with the wrench. This should be pretty snug, but not ridiculous.
6. Close all the valves on the conoflow. Do not over-tighten.
7. Close the valve on the regulator. It should be open initially.
8. Carefully open the valve on the top of the tank. Do not look at the pressure dial, in the event it explodes. If everything seems ok, open the tank valve up the rest of the way, then back it off a half turn. The high pressure gauge should read about 2000 psi or so.
9. Slowly open the regulator valve. Continue to open valve until the low pressure gauge reads about 10 psi.
10. Open the valve where the black orifice line exits the conoflow.
11. SLOWLY open the valve where the green pressure hose attaches to the conoflow.
12. SLOWLY open the valve where the thin clear tube attaches to the conoflow. This leads out to the pressure transducer.
13. LISTEN FOR PRESSURE LEAKS. IF YOU HEAR GAS ESCAPING, AND IT IS NO OBVIOUS HOW TO FIX IT, CLOSE THE VAVE TO THE NITROGEN TANK AND LEAVE IT ALONE. IT IS BEST TO CONSULT THE USGS HYDROLOGIST WHEN THEY COME TO THE FIELD. DO NOT LOSE THE NITROGEN.

Opening the Gauges in Taylor Valley:

Once you have opened up the H1 gage, you should then open the H2 gage at the other end of Lake Chad. When Lake Hoare is completed, you may then go to either Lake Bonney or Lake Fryxell. Another option is to work on the gages on Lake Fryxell near the Canada Glacier from the Lake Hoare camp. It is only about an hour walk to F9 from Lake Hoare camp, so you could probably open F9, F10, and F1 at least from Lake Hoare. However, you may prefer to do them all from F6 camp.

Lake Bonney should probably be next, because flow usually starts there first. You will need to schedule one or two nights at Bonney to open the four gages at the lake. These gages will have little if any snow on the controls. B4 is located up from the lake about 200 meters, and is not generally visible from the lake. The same goes for B1.

Lake Fryxell should probably be your next location. The best way to do Fryxell will be to get everything you need together, and take a helo over to F6. This will require a bit of planning. You will probably be at the lake for 3 or four days, and it is best if you not forget too many things. There are ten gages on Lake Fryxell, plus C1 near New Harbor. F11 on the relict channel does not record stage, so it does not need a nitrogen tank.

The stream team will establish a tent at this site, which will be left in place for the season. You should leave some extra sleeping gear there as well. Be sure you know the fuel requirements for each machine you use, and whether the oil is mixed with the fuel, or separate. Be sure you know how to light the preway for heating the building.

Helicopter Flights:

If you feel you need a helicopter, feel free to use it. However, always try to share the flight with other parties, and don't waste the helo time. It is a very long season, and we don't have a lot of hours allotted to us. In general, the best strategy is to use the helo to move heavy gear, or bodies to general areas (F6, Lake Bonney). Once deployed, use snowmobiles or walk. You should not need a helo to service F1 gage, but you should use one to transport you up to C1, especially if you have tanks or batteries. You can probably walk back to F6 from C1 most of the time.

Always coordinate helo scheduling through the Lake Hoare camp manager, no matter where you are in the valleys. He or she will want to know your plans at least 3 days in advance, so you will have to plan ahead.

Do not get too close to the edge of glaciers. When they calve, it usually happens in a matter of seconds, and an amazing amount of things can come down on your head in a hurry.

You should usually give yourself at least a full day and night when returning to Lake Hoare before planning on traveling to another location. There are a lot of logistics involved in a move, and you don't want to forget anything.

The Onyx River:

The last sites you should open up are on the Onyx River. You should have already cleared use of the huts at Vanda and Lower Wright with the Kiwis at Scott Base. When you go to the Onyx, you cannot count on any support at all in case you forget something. If you get weathered in, the helos will not be able to come for you. For this reason, you should bring several days of supplies with you, and spares of critical items (i.e. keypads). Your biggest choice will be whether to spend the night at either location. I would recommend you take supplies on the assumption you will, but schedule a couple hours of ground

time at each site as far as the plan goes. That way, if you run into problems, you can spend the night and figure out how to fix it. You may want to coordinate this flight with other LTER personnel who need to go there, and/or other science parties who may be working in the Wright valley that day, to save helo time. You should be confident you know what you are doing before you go to the Onyx River. Be sure to try out the H.F. radio before you leave for the Onyx River.

The gauge boxes on the Onyx are top-entry. They are warmer as a result, but harder to get into. You can step on the shelves as you enter, but be careful not to step on the instrumentation. Each gage should have two tanks and batteries. You should bring a new tank for each gage when you come over. Bring the spent ones back to Lake Hoare. I want each site to have a backup onsite, since it is so hard to get another one if you are there and something goes wrong.

There should be plenty of time to go for a hike along the Onyx, if you spend a night at one of the sites. The Lower Wright Hut especially is probably the most secluded place you will be during your visit to Antarctica, and you will hopefully come to think of it as one of the great perks of working on the stream program. Later in the season, we will probably overnight at Vanda, and perhaps Lower Wright, once the streams start flowing.

You should be able to finish opening all the gages well before the flow has begun. You can then assist other LTER members in their work. Once the rivers start running, you can begin flow-monitoring activities instead.

PROFESSIONAL CONSIDERATIONS

Other Science Camps

While all facilities owned by the United States Antarctic Research Program are available to any American science party, there none-the-less are customary rules of etiquette and conduct expected when a party other than the one responsible for a station uses a facility. The Lake Bonney Camp, while having LTER connections, is still a camp which has been run by S-025 for many years before the LTER, and still is predominantly governed by that project's activities. At least one day's notice should be given before staying overnight, and visitors should haul water, do dishes, and cook when possible or appropriate. The Lake Vanda and Lower Wright Huts are owned by the NZAP. Permission should be obtained from the New Zealand program before using these facilities. Both of these facilities are quite small, and it is important to ensure that there will be enough room when you need to use one. Do not use any of the supplies in either location unless approved or it is an emergency. You should receive a packet of information on interaction with other groups from Berry Lyons before each season begins. Please read it carefully. It also contains special environmental impact information important to workers in the dry valleys.

Interaction with Antarctic Support Personnel

ASA employs hundreds of tradesmen, administrators, and technicians whose job is to assist science personnel in their activities. As a stream worker, you are considered a scientist or “grantee”, and deserving of their support. Stream workers are expected to treat all ASA employees with respect, and be reasonable in their requests for support. Work with them to achieve your objective, and remember there are other science parties that also need assistance. In most cases, you will be quite pleased with their service if you are reasonable. If you are not, discuss the matter with one of the PI's, never with the ASA employee.

Interaction with Helicopter Support Personnel

1. Be prepared for the helo. The helo can come hours early, and you must be ready for this. The bulk of the gear packing and staging should be done the night before a flight is scheduled. You should always be capable of stepping into a helo as soon as it lands. **NO STREAM TEAM MEMBER HAS EVER BEEN LATE FOR A HELO... DON'T BE THE FIRST.**
2. Do what the pilot and crew tell you to.
3. Assist the helo in landing by standing well upwind of the landing zone at remote sites and pointing downwind at the pad with both arms.

Interaction with Other Scientists

Treat fellow scientists, students and technicians with respect at all times. All field members have their weaknesses, but each also has particular strengths that are critical to the success of the team. Remember, the idea is to support each other toward a common goal, not to compete.

SUPPORT FACILITIES

Support facilities are located at McMurdo Station, Lake Hoare Camp, Lake Fryxell Camp, Lake Bonney Camp, F6 Camp, Lower Wright Hut, and Lake Vanda Hut. In addition, remote tent camps can be located anywhere as required. A brief description of each facility follows:

McMurdo Station: This is the primary research headquarters of the American Antarctic Program. Peak populations in the summer exceed 1000. Stream workers will typically spend about a week here when they first arrive on the ice, while preparing for deployment into the dry valleys. McMurdo serves as a training facility, and logistical support for all field camps in the valleys.

Lake Hoare Camp: The Hoare camp is the headquarters for the Long Term Ecological Research Project (LTER). It acts as the communications hub for the LTER, and the main depository for stream gauging equipment in the field. Population ranges from 4 to 20.

Lake Fryxell Camp: This camp will be primarily used by the limno team of the LTER group. It can be used as a temporary camp by stream workers when working on F1 and F2 sites.

Lake Bonney Camp: This camp is run by John Priscu of the S-025 project, who is also involved with the LTER. Personnel from both projects reside there throughout the season. It is used frequently by the stream workers. Population ranges from 2 to 10.

F6 Camp: Located on Lake Fryxell, this camp is run by LTER personnel. It is used frequently by stream workers. Population ranges from 2 to 6.

Lower Wright Hut: This camp is located on the upper Onyx River. It is owned by the Kiwis, but not usually occupied. It is used periodically by stream workers. Population 2 to 4.

Lake Vanda Hut: This camp is located at the mouth of the Onyx River. It is owned by the Kiwis, and periodically occupied by them. It is used periodically by the stream workers. Population 2 to 8.

Most field camps other than Lake Hoare do not have complete, if any, supplies for stream work. It is therefore necessary to bring what is needed along when moving about the dry valleys.

RECOMMENDATIONS FOR WORKING OUT OF REMOTE CAMPS

If visiting a remote hut, ascertain before you go what will be available for your use. If in doubt, bring what you will need.

If you have scheduled a helo for a certain day, you must either contact helo ops on channel 8 around 8 am, or listen on H.F. 4770 at 8 am for your information on flight times. Use the H.F. if available. If working outside Taylor Valley, you should assume you will need the H.F. radio.

Anytime you make a camp move, you are responsible for checking in with MACC OPS by 9 am each morning. In addition, you are also expected to contact MACC OPS as soon as you make the camp move to let them know you are there, and can communicate with them. This can be done via channel 8 or H.F. 4770. If you fail to do this, they will have to reroute a helo to see if there is something wrong. If there is not, you will get in trouble.

No trash of any sort, or body wastes are allowed to be left in the dry valleys. Plan for it.

Minimize gear on remote work. Use 1 or 2 cooking pots, simplify meals, try to reduce gray water. Take plenty of radio batteries if you know you will not be able to recharge them.

You should bring a first aid kit when working in remote locations, especially if one of the helo survival bags will not be left with you. There should be at least one first aid kit allocated for the stream team on the SIP. The BFC provides these.

FIELD INSTRUCTIONS FOR STREAMWORK

Site Visits

- Make out a separate miscellaneous note sheet or field measurement sheet for every site visit. Mention who was there, condition of control, probes, and orifice.
- Also note the weather (cloudy, windy, cold, etc.).
- ALWAYS NOTE WHETHER FLOW IS PRESENT OR NOT!!!
- If anything is out of order, do not fix it until you have documented it.
- Check tank pressure, and all CR10 readings.
- Make field meter measurements for pH, discharge, water temperature and conductivity, note the time of each. These measurements should be made close to where the gauge is.
- Try to collect stream chemistry samples when possible. The stream team's work in the field is the best way of monitoring stream chemistry.
- If you need to collect stream chemistry, choose a location that is near the control structure, which represents the general flow. Place the sample bottles with the opening facing upstream, completely under water. For the plastic input bottle, rinse the cap and bottle three times before filling. For the brown DOC bottle, just fill the bottle up without rinsing. Do not let water touch your hand or fingers and then go into the bottle. If the water is too shallow to fill the bottle, you can fill the bottle with the cap. Be sure to cap the bottles firmly so they do not leak. At Lake Hoare, in the chemistry lab, there are small (30 mL?) bottles with labels for each stream. These can be used to collect extra sample water for pH measurement back in camp.

Other Activities

You will need to compute the discharges for all meter measurements as the season progresses. See standard USGS methods manual for a description of how to do this, or get instruction from the field hydrologist.

- Lake levels at Fryxell and Bonney need to be shot once every visit to those lakes by stream personnel, at the locations listed in the reference marks, if the lake moat is open in the vicinity of those marks.
- At the beginning and end of the season, the reference points on each gauged site need to be measured. See reference table at end of manual for locations of reference points.

INSTRUCTIONS FOR FILTERING STREAM CHEMISTRY SAMPLES

- Label all the output bottles with the date, time of sample collection, location, and type of sample.
- Group output set empty bottles in clusters, in the order they will be filled. i.e.:

Alkalinity - 15mL in smallest bottle
DOC - 100mL in brown glass bottle
Anions - 25mL in wide mouth bottle with <i>blue</i> tape
Cations - 25mL in wide mouth bottle with <i>white</i> tape
Nutrients - 100mL in <i>narrow</i> mouth bottle

Coordinate with Kathy Welch for actual volumes.

- Using the 5 mL pipetter, insert the instrument directly into the bag of clear pipette tips, without touching the tips with your fingers, attach one of the tips to the pipetter. Pipette 5 mL of raw sample into the small vial three times. Be sure not to draw the sample into the tip so fast it splashes back up into the pipette. Pipette a total of 15 mL into the vial, cap it, and place it aside. Remove the tip and discard it.
- If using the bell jars, place the anion bottle (*blue tape*, plastic bottle) on the stand, and the bell jar over it. Place a clean tower on the bell jar. Place one of the nucleopore filters (the ones in the plastic box) on the tower with forceps, upside down compared to how it comes out of the box. Put the top on the tower, and pour 75 mL of raw sample in the tower. Apply a vacuum with the electric or hand pump of 30 psi on the inside scale on the hand pump. When the sample has been filtered, replace the anion bottle with a cation bottle, (*white tape*, plastic wide mouth bottle), and pour another 75 mL of raw sample in the tower. If the first filter was clogging badly, first replace it with a new one. Cap both output bottles and put them aside.
- Clean the tower with deionized (DI) water. Place the nutrient bottle inside the bell tower. The nutrient bottle is plastic with a narrow mouth. Use one of the filters in the aluminum foil. Pour 75 mL of raw sample in the tower, apply the vacuum, and cap the output bottle.
- Place the DOC bottle inside the bell jar. Change the filter from the nutrient run if necessary. Filter the entire contents of the DOC sample (amber glass bottle) into the output bottle (another amber glass bottle). Open the hydrochloric acid bottle (you may want to use gloves and eye protection for this, as this is concentrated acid). Using the 0.5-mL pipetter, place a blue pipette tip on the pipetter, and pipette 0.5 mL of acid into the DOC bottle. Cap and invert once to mix. You may want to wait until all your DOC samples are filtered before adding acid, so you only have to use one tip for all the work. Discard the tip when finished.
- If using the filter flask/hand pump setup instead of the bell jar, you will need to modify the procedure slightly. The anion/cation samples can all be done in one 150-mL shot, unless the sample has so much sediment the filter will clog before you can do it all. In that case, you may want to do it in 50 or 75 mL sets, changing the filter each time. Once you have 150 mL, divide the output equally between the anion and cation bottles. Rinse the flask and lower part of the filter tower with DI water, then change to the nutrient filter, and do 75 mL of sample for the nutrient bottle. Fill the nutrient bottle, rinse the flask,

change the filter if necessary, and filter the DOC sample for eventual addition to the output bottle.

- Rinse all the filtering equipment that comes in contact with sample with DI water. If items are heavily soiled, you can clean them with kimwipes, and then rinse them. Let the equipment air dry if possible before storing.

- The nutrient samples should be frozen, and the others should not. Preferably, they should be refrigerated. Send them to Kathy Welch, BM-042, Crary Lab in McMurdo for processing.

- Samples should be filtered within 12 hours of collection. If not, note the time of filtering on the output bottle. If you don't have time to filter everything, the anion/cations can wait.

INSTRUCTIONS FOR CALIBRATING CONDUCTIVITY METERS

There should be some conductivity standards in the Lake Hoare chemistry lab for the stream team. If not, contact Kathy Welch to coordinate getting some. Choose a standard that is in the vicinity of the conductivities you will be measuring in the field. For most lakes 200 to 500 μS is adequate, for Lake Bonney's western streams (Blood Falls, Santa Fe, and Lyons) 1000 is better.

1. Connect the meter and probe you will be calibrating.
2. Rinse the probe in DI water and shake dry. Do not allow the tip to touch anything after rinsing.
3. Rinse three small beakers with DI water, and pour the standard solution into each one. You will only need about two inches of depth to take a reading, so do not waste the standard solution.
4. Turn the meter on, turn switch to ATC ON, and select a scale that is appropriate for the solution. Note that three of the scales are in milliseimens (mS), and you will need to multiply the reading by 1000 to convert to microseimens (μS), which is what the standard is in.
5. Place the probe in the first solution for 20 seconds.
6. Remove from solution, shake off, and place in second solution for 20 seconds.
7. Remove from solution, shake off, and place in third solution. Allow meter to equilibrate for a few seconds, then read the number. With a screwdriver, turn the calibration adjustment screw until the reading matches the standard.
8. Repeat process all over again, until the third reading comes within at least 5% of the standard. It should usually be correctly calibrated after the first round.

INSTRUCTIONS FOR CALIBRATING pH METER

1. Connect the pH probe and temperature compensator probe to the meter. Remove the tip guard from the pH probe.
2. Completely rinse both probes with DI water, and shake dry.
3. Place both probes into pH standard 4 (usually a green colored solution). Be sure the standards have reached room temperature.
4. Turn the meter on, and push the calibrate button, and the auto button.
5. Wait until the eye stops flashing, and it locks onto the correct reading. Then remove the probes, rinse with DI water again, and place in the pH 7 solution (usually a red colored solution). Hit the calibration button again, and wait for it to lock onto the pH 7 reading.
6. Instructions are on the back of the meter, and you can ask other LTER limno team members for help if you have problems.

INSTRUCTIONS FOR MAKING A PORTABLE FLUME MEASUREMENT

The portable 8-inch flumes available to the stream team can measure flows up to about 1 cfs (0.5 feet of head). They are therefore suitable for low to moderate flow measurements. Always use the portable flume if possible, as they are quicker and potentially more accurate than the standard current meter measurements at such low flow levels. Keep in mind, however, that though they are relatively quick to use, if the following procedures are not adhered to, the resulting measurements will be erroneous, and there will have been no point in making the measurements at all.

Choose a location that has good "getaway" on the downstream side, if possible, with a fairly narrow section of stream and banks that come up at least a half of a foot. The bottom should consist of either sand or small gravel. There are often locations near each gauge where people have obviously done measurements before, and these should be re-used if they appear to look like good spots for the current flow conditions.

Place the flume in the center of the channel, as level as possible from side to side, and point the wing-walls upstream at about a 45 degree angle. Backfill the flume in by piling sand around the front and sides of the flume with a shovel. Be sure to seal the front bottom edge so water cannot leak under the flume. Sand wing walls will usually have to be extended outward to the stream banks to force all the flow through the flume. The entire set up should be inspected for leaks, and further sealed if they exist.

Once the flume is in place, wait for the flow to fill up the storage capacity of the new reservoir you have created upstream of the flume, and for the stages to then level off. This is very critical, and there is a tendency to think the stages are peaked when they are not. Past experience indicates you will not likely be able to make measurements with over 0.5 feet of depth upstream of the flume be for the sand walls collapse.

The next step is to verify that the flume is not submerged by the downstream backwater. If the water level of the stream downstream of the flume is too high, it will affect how deep flow is at the upstream end of the flume, raising it, and the predicted discharge will therefore be higher than it really is. In order to reduce this possibility, you will need to inspect the flow at the downstream end. Normally, there will be a mini hydraulic jump (wave) at the downstream end where the flow slows down and piles up on itself as it exits the flume. This jump should be entirely downstream of the flume. If it is inside the flume, there is a good chance there is at least partial submergence of the flume, and the reading cannot be used. In this case, you will need to try doing the measurement at another location, probably in a steeper section of the streambed.

INSTRUCTIONS FOR MAKING A DISCHARGE MEASUREMENT WITH A PYGMY OR AA METER

If making a current meter measurement, pick a uniform, non-turbulent section with no eddies or cross-flows, or large rocks in the vicinity of the measurement section. If the bulk of the depths are less than 0.25 feet, do not attempt the measurement, but use a flume or estimate by eye.

Some kind of cross-section distance reference (tagline) needs to be laid out across the stream channel, normal to the direction of flow. For very small streams, a six foot folding ruler will work, for larger streams, 50 foot cloth tapes, and for very large streams, like the Onyx River, one of the yellow tag lines on the yellow spools may be necessary. For the folding ruler or cloth tape, orient the lower numbers to the left looking downstream. Lay the tag line out perpendicular to the direction of flow, if possible. You may need to doctor up the section a bit with a shovel, or remove some stones in the way, etc.

If this is at a gauge site, hook a keypad up to the CR10, and generally set things up so it will be easy to make inside and outside gauge readings quickly.

Fill out the front page of the discharge computation field sheet (who, date, TIME, location, type of meter, etc.). Put together the current meter (pygmy or AA). Be sure to do a spin test before you use it (spin the cups, and watch to see if there is any binding. If there is, readjust the meter until they spin freely.). Connect the meter to the wading rod and headset or electronic counter. If you are using the electronic counter, you will need to be sure there will likely be a strong, reliable signal from the meter throughout the measurement. This is quite likely on the Onyx River when you use the AA, but less likely on some of the smaller, slower streams with high sediment loads. The electronic counter will compute the velocities directly, but we will only use it to count the clicks and the time.

Once everything is ready, you should record the inside and outside gauge readings, and the time to the nearest minute. Go back to the tagline, starting on the left bank (as you face downstream) and note the time at the "LEW" (left edge of water). It is very helpful to have a partner sit on shore next to the tagline to take notes, while the other person is in the water making the measurement. You will not likely be able to measure flow at the edge, but you can note the distance on the tagline, and the depth in tenths of feet (or 5 hundredths, if you think better). Once you get out into the flow, you will need to count clicks in a set amount of time. In general, you will set the rod into the water, note the depth on the rod, and set the meter to 0.6 of the depth. If water is generally over 2 feet deep, you will need to set the meter to 0.2 and 0.8 of the depth instead (consult the field hydrologist for the details of this "2 and 8's" technique). If the water is over 1.5 feet deep, you should use the AA meter instead of a pygmy meter. Listen for the end of a click, start the stopwatch, wait 40 seconds or more, stop the watch at the end of a click, and note the number of complete clicks and corresponding time in tenths of a second. If the flow is changing rapidly, you can reduce the time required to 20 seconds (half-counts).

You will want to space the measurements at least 0.3 feet apart for pygmy meters, and 0.5 feet apart for AA meters. If there will be less than 20 vertical sections, this is the spacing you want. If there will be 30 or more, you can consider spacing them out a bit more. The idea is to distribute the flow measured into each vertical as much as possible, so you do not end up with 20 percent of the flow measured in one vertical, for instance. Thus, if the water is relatively deep and/or fast, you would want to reduce the distance on the tag line between verticals in that vicinity. All things being equal however, I would recommend you choose one interval and use it for the entire section, perhaps lengthening it near the edges where it may be slow and shallow.

Once you have reached the REW, note the time, distance and depth. Go back and read the outside gauge

and time. You can then put the gear away, and finish filling out the field sheet. Be sure to include the following:

- ♣ Condition of control as it might affect flow depth (snow, debris, deterioration of structure).
- ♣ Rating of measurement (excellent or good possible on the Onyx River if at reasonable flow levels; good flows in clear streams on even sections might be "good" in Taylor Valley, otherwise likely "fair". "Poor" if low flow, bad section, high sediment, etc.
- ♣ Point of zero flow (PZF). If at a flow site, not if flow is over low point of weir(s), and if so, how deep it is at the shallowest point on the pzf. If at a non-flume site, note how deep the water is in the shallowest point of the control structure at the upstream edge of the control. Make measurements in tenths of feet.

If you disturbed the stream banks to make the measurement, you should re-level it with a shovel, and attempt to restore it to its original configuration.

PROCEDURE TO DOWNLOAD DATA FROM A STORAGE MODULE

- 1) Load PC208e or other Campbell software on to the pc, if it is not already there.
- 2) Connect the storage module interface to the storage module with the blue ribbon cable, and the interface to the pc with the RS232 cable. Then use the Campbell software to detect the storage module that is connected to the pc via the interface.
- 3) Pull the data from the storage module to the pc
 - enter the "all" option to pull all data
 - enter a written-out name for the site, i.e.: fone for F1
 - enter the write data as ASCII array with ids option
- 4) Let the software execute the download. Make sure you use a unique name for each storage module. Be sure to copy this data onto a disk also.

PROCEDURE TO CLEAR DATA FROM STORAGE MODULE

- 1) Load PC208 software, go into the smcom menu.
- 2) Choose the option to erase data from the storage module
- 3) When all the data is cleared, the program is reloaded into location 8, enter a "y" to confirm.
- 4) Quit the application when finished.

PROCEDURE TO COPY A DLD PROGRAM ONTO A STORAGE MODULE FROM A PC

If you need to copy a DLD program onto a storage module, always do it in location 8. To do this, run the smcom application, set up communications with the storage module and then choose the upload program option. When it asks for the program name, enter "f18" for f18.dld, or browse for it with the browser window.

COMMAND SEQUENCES FOR CR10 AND STORAGE MODULE INTERFACE

Note: All command sequences assume you are at a gauge, and have the keypad connected to the CR10 via the blue ribbon cable. Any storage modules are also connected onto the array vial the ribbon cables. If you have a second storage module that is being used to dump data into from the gauge storage module, the convention used for the storage module addressing is always:

gauge storage module = 1

travelling storage module = 2

Determining Storage Module Addresses:

*9A

9A

(you might see the following display:) 00:0000000011

The "1"s designate a storage module (sm) located at that address number, as sequenced from right to left in the display. Thus, the above display means you are connected to sm 1 and sm 2. If the display does not read this, disconnect the travelling sm, and do the command again. You should see the display for the gauge sm only, sm 1, identified as 00:0000000001.

Changing or Setting the Storage Module Address:

9A

10A

XA

Where "X" is the address number you want to set the storage module to. Be sure the only storage module connected to the ribbon cables is the one you want to change the address for.

Dumping Data from the Gauge Storage Module to the Travelling Storage Module

*91A

8A

A

A

A

2A

You should see the display hesitate for a while, then display a number, which indicates the final storage module address you have dumped to the traveling storage module.

Dump Data from the Traveling Storage Module to a Diskette:

Take the traveling storage module back to camp, and connect it to the pc. Use the PC208 software to transfer all the data in the storage module to the hard drive of the pc. Review the contents of the files to ensure the data was properly dumped. The Julian dates are given every 24 hours, as well as the site ids (see table near the end of this manual). The Julian day should start somewhere around 20 or 30, the end of last January for the end of last season's data. If the data does not appear correct, you will need to go back to the gauge and try it again. Make two separate copies of all files on diskettes, a separate diskette for each gauge. Thus there will be two diskettes marked F1, etc.

Reset Storage Module

If you need to erase the storage module for new data and/or programs, you will need to reset it. Keep in mind that all programs will be lost. So, if you need the program again, you should first save the program to another storage module before you do the reset. Be sure the only module connected to the keypad is the one you want to reset.

*9A
1A
248A

It will take about 1 minute to reset the storage module. When it is done, the display will change.

Changing Memory to Fill and Stop

When a storage module reset is done, the memory is automatically set to ring. This means the datalogger will overwrite data to the storage module once it fills up. We always set our storage modules to "fill and stop", to avoid losing data in this way.

*91A
4A
1A

Checking Storage Module Settings

*91A
5A

Hit the "A" key a few times until the 03:xxxx display comes up. You should see a 0010 displayed. If you do not have a 1 in the third column, you need to try to reset the "fill and stop" again. If you have a 1 in the fourth column, you need to reset the storage module, because it is still full. Every time you reset the storage module, it defaults to the address 1 (that is what we want for gauges), and ring memory. Thus you always need to reset the memory to fill and stop. If it is a travelling storage module, the storage module address is set to 2.

Checking the Battery Power of the Storage Module:

*9A
6A

You should see a 06:01 displayed. If not, the storage module battery is low.

Copying the Program from the CR10 to the Gauge Storage Module

*D71A
18A

After a few seconds, the display should read: 13:0000
To check that the program has been loaded, enter:

*91A
5A
A

You should see: 02:XXX1 where X is any number, and the "1" indicates the number of programs which are stored in the storage module. This will provide a back up program in the event you lose power to the CR10. All you will need to do is re-establish power, and the program will upload on its own.

Copying the Program to Travelling Storage Module:
Same as above, but the first command should be

*D72A

instead.

Setting Datalogger Time:

*5A
A
A
A

As you cycle through this the following will be displayed:

HH:MM:SS
YY (enter two digit year)
DDD (enter Julian day, see cheat sheet at the end of this manual)
HHMM (enter hour/minute, press "A" at the top of the minute)

The first display shows you the real time it is set to. Check your entry by hitting *5 again, and comparing to your watch.

Changing the Scan Rate:

The scan rate is how long the datalogger waits before it reads the probes and puts out a reading to *6. It is normally set to 900 (seconds, 15 minutes). When you are at a gauge, you will need to change it to 10 or 15 seconds while working with the probes, so you can tell what the results of your efforts are without waiting for 15 minutes.

*1A
xxA

This will change the scan rate to xx seconds. You can then hit *6A to see the values registered with the new scan rate. When you are through, change the scan back to 900 seconds again before leaving the gauges.

Viewing the Storage Locations:

You can use the *6 command to see what the datalogger is reading. Each time you hit A, it advances to the next location number, starting with the first. Usually, the first location is stage, then water temperature, and conductivity, but not always. The *6 locations are listed on the inside of the gauge box walls. To advance to a far off location, hit *6XXA, where XX is the location number.

*6A

A

A...

TROUBLESHOOTING IN THE FIELD

The Program Does NOT Run:

- Check that the battery is connected, and has at least 12.0 volts.
- Check that a program is loaded into the CR10 by hitting *1 and advancing down far enough to see that there are instructions stored. If not, load a new program into the datalogger with the *D command.

*There are -99999 or -69999 Values Displayed in *6 Mode:*

- Check if the bad values are being stored in the storage module. If they are, the CR10 is probably not receiving a good signal from the sensor. Check each wire where it connects to the CR10 wiring panel, and be sure they are tight. If you still cannot fix it, it could be a problem with the port to which the sensor is attached, or a problem with the sensor itself.
- If it is not just the wire, check open port by inserting a P20 command, port set to 1, set to 5 volts. Check voltage with a multimeter. Rewire leads to the good port. You can check the old port the same way. Pressure transducers can be talked to with the keypad or pc. Interrogate the SDI signal to ensure it is the stage value before the offset.

*Values Displayed in *6 Appear Unrealistic:*

- If they are probe readings, check the probe to see if it is damaged or buried in sediment. If buried, clean it off and re-deploy it in a better location.
- If probe is bad, replace it. There are spare conductivity/temperature probes at either Lake Hoare or F6.
- If stage readings are high, the line is probably blocked with ice, or maybe dirt. Be sure the line is exposed to the sun as much as possible. You can try purging the line, first isolating the conoflow and transducer at either end. If the weather is cold, leave the line in place until it warms, and check it again. If it is warm, and all else fails, remove the line from the stream, pour hot water on it, especially near the tip. Do not look at the outlet, as ice slivers could shoot out under pressure. Re-deploy after clearing.
- If stage readings are low, you probably have a leak in the system. Check all fittings with snoop, and tighten as required to eliminate the problem.
- Remember, stages will also read high or low to the outside gauge if the orifice has moved relative to the control.

IN GAUGE BOXES OR AT THE CONTROLS:

There are NO Bubbles Coming Out of the Sight Feed Cup:

- The orifice line is probably frozen. If the stage reading in the *6 command is over 20, this is a virtual certainty. Clear the line, or leave it alone until warmer weather arrives.

There are NO Bubbles Coming Out of the Orifice:

- The line is frozen. Clear it, or leave it alone until it thaws.

The Probes are Buried in Frozen Sediment or Ice:

- Leave alone until it thaws, then move if necessary.

Water is Flowing Over the Top of the Flume:

- Contact the field hydrologist. You may need to pull out some sandbags.

The Control is Falling Apart:

- If it can be repaired back to its original form, fix it. If not, shore it up so it will not fail further.
Document when you did it, and contact the field hydrologist.

INSTRUCTIONS FOR CLOSING OUT GAUGES FOR SEASON

1. *Survey all stream gages.* Be very careful with the instrument. You might want to wait until the moat freezes enough to use the snowmobile to transport gear. Be sure to shoot the following points:

- all reference points listed in the field manual
- the tops of orifice nuts if the orifice is not inside a flume
- the tops of the upstream and downstream ends of the flume, opposite corners, one pair is good enough
- the bottom upstream end of the flume
- the low point of the overflow weirs in the cutoff walls (at B2, don't forget there are two sides to shoot)
- the pzf on the control structure for non-flume sites
- use the Reference Points that are "x"d in the reference point list at the initial shots for the survey

2. *Take final stream chemistry* (sample either at gage closeout or near end of flow cycle) at each stream.

3. *Closeout gages* (see detailed instructions later in this manual)

- normally, you should closeout the gages as close to the end of Lake Hoare camp closeout as is practical for each gage.
- Take final calibration measurements, flow measurement if appropriate. Be sure to note condition of probes, control, etc, as in a normal gage visit.
- Retrieve data and reset storage module for winter season.
- Sweep out the box, and close it up with a cargo strap

4. *Survey lake levels.* See specific instructions in the next section. This can be done as part of the close out of the gauges.

5. *Close F6 camp.* Discuss details of this with the Lake Hoare camp manager. Retro appropriate stream gear back to Lake Hoare. Be sure it is in a safe place. Leave the snowmobile sling inside the stream crate outside.

6. *Organize gear.* All stream team gear should be in one of the following locations:

- Bring snowmobile sling back from Lake Bonney, and put into one of the stream crates.
- Designated drawers in the chemistry lab (i.e.: filters, filter equipment, tape, etc.)
- Designated drawers in the instrument lab (i.e.: gage hookups, storage module interfaces, notesheets, light equipment, current meters, etc.)
- In one of the stream crates at Lake Hoare (all remaining stream gear and bottles, with the exception of the raft, electric instruments, storage modules, F6 gear)
- At the F6 camp (some sand bags, sample bottles, and one snowmobile sling)
- In the LTER lab in McMurdo

Water temperature, conductivity meters, storage modules, one storage module interface, ribbon cable, RS232 cable, diskettes with programs and other items; items belonging to ASA should be inventoried and a list given to ASA; do not turn them in to them! Put all items in a box, seal them up, and label them for the Stream Team. Put them away in a safe place in the lab (room 106). Also, extra bottle sets may go here, or in the LTER crate line in McMurdo.

- Turned back into ASA

The pH meters, empty nitrogen tanks, all gear taken from the BFC and other lab equipment taken from Crary Stockroom.

The blue sleeping bag in the small yellow crate belongs to the USGS, and should not be retroed.

Do not mix our gear in with any other project team

7. *Pack your personal gear, and help with general camp closeout (at Lake Hoare).*
8. *Retrieve data from the storage modules.* All the data collected in the storage modules needs to be pulled onto a pc, and then the data needs to be cleared in preparation for next season. The next season, these storage modules must be ready to be switched out with the ones that wintered over in the gauges.
 - a) copy the data from the storage module to the pc (see instructions in this manual)
 - b) ftp raw CR10 data to Mike Gooseff (gooseff@colorado.edu) or to huey database in Boulder (contact him for specific details)
 - c) erase the data from the storage module (see instructions in this manual)
9. *Be sure that at least 200 sets of input/output bottles are made up before you leave the ice, and store them in one of the stream team locations.*
10. *Save all field data for retro back to the USA.* Make copies of all of the site visit and measurement notes and mail them to Diane in Boulder (Diane McKnight, INSTAAR 1560 30th St. Campus Box 450 Boulder, CO 80309). Take original site visit/measurement sheets and disks with copies of the raw CR10 data with you on your person back to the USA.
11. *Help Kathy Welch if she needs it, until she says you can go.*
12. When you get back to the States, you will need to turn in all your receipts, and fill out a travel form for reimbursement. If you are a volunteer for the USGS, you will need to fill out a volunteer time sheet and travel report too.

INSTRUCTIONS FOR SURVEYING LAKE LEVELS

You will need to survey the following lakes, shooting the surface of the moat as the lake level. Please take notes with a good description of the locations so we can provide future surveyors with a better description. You might have the pilots give you an updated lat/long once you locate the benchmarks from their GPS units. You should have your field sheets made out ahead of time, as far as the columns and what you will be shooting. Peter Doran is now in charge of the lake level data, be sure to coordinate efforts with his team.

**Note: for Lakes House, Joyce, and Vida you should use a metric rod for consistency!!*

- Fryxell

The benchmark is a labeled piece of rebar in the ground, about 20' East of Jamesway. It may be covered by rocks. Benchmark IS LABELED! Get the right one. If questions, contact Peter Doran.

Old (not used by Stream Team): The benchmark is a pipe in a rock on the point just east of the SSSI (Site of Special Scientific Interest) at Canada Stream. It is about 10 feet from the lake edge, south of the orange SSSI marker, surrounded by a circle of rocks. There is an orange marker on the point. No elevation is determined at this time.

- Bonney

The benchmark is a bolt in the rock just West of the Bonney Met Station. If unsure, contact Peter Doran.

Old (not used by Stream Team): The benchmark is near the old kiwi camp, which is a bolt in a rock about ten yards from the south shore of the lake, about 2/3 of the way from the main camp to Priscu Stream. There is a ring of rocks around it, and the ground nearby is fairly flat, and not too high above the lake. There is an orange survival box nearby, but it may be moved by the end of the season. The elevation is 63.53 meters (208.43 feet).

-Hoare

the benchmark is on a large, pyramidal black rock on the spit in front of the old Jamesway. Ask around if you don't know. One corner of the rock has been etched, shoot this point.

- Lake House

lat 77 deg, 42.106 min
long 161 deg, 26.924 min

There is a bolt in a rock, close to the lake, on the near left side of the lake as you fly in from down-valley. You can probably do this site with close support in 5 to 10 minutes.

BM LH = 300.00 meters

- Lake Joyce

lat 77 deg, 42.936 min
long 161 deg, 37.87 min (possibly 38.062')

BM LJW = 302.062 meters (not found in recent years)

BM LJE = 301.060 meters (tip of rock, spray painted)

BM LJN = 302.438 meters (bolt on rock)

These three points are very close to the lake, on the right side about halfway down the shore as you come in from down-valley. They are located before you get to the stream channel that comes in the far end on the right side. Shoot all three points, and be sure to describe them. Also shoot the lake level, of course. The BM's are close together. You will probably need about an hour to shoot this.

- Lake Vida

There are two benchmarks.

The first is BM Kiwi. It is located north of a dark dyke in the southern hills, latitude 77 degrees, 22.68 minutes, longitude 161 degrees, 48.84 minutes. It is the top of a metal pipe about 0.3 feet above a rock. There is a 15-inch rod screwed into it that needs to be removed first before shooting the elevation. The elevation is 350.000 meters (1148.29 feet).

The second is BM Borehole. The BM is a bolt in a rock on the north side of the lake, near the west end, about 1/4-mile east of the Victoria Stream inlet. It is about 60 feet from the lake, and there is an orange flag marking an old borehole near it. If you can find it with the helo, you should be able to shoot it with close support. It has an elevation of 349.457 meters.

- Don Juan Pond

The BM is located on the west end of the lake, near latitude 77 degrees 33.839 minutes south, longitude 161 degrees 10.798 minutes east. It is an obvious metal pipe sticking up out of the pond/water near the edge, about 3 inches in diameter. It is called BM Borehole, and the elevation is 200.000 meters (656.17 feet). You can probably shoot this with close support.

- Lake Vanda

The benchmark is a metal tablet set in a big painted rock along the south side of the lake between the gage and old Vanda station. It is probably about 200 to 300 meters away from the mouth of the Onyx River. There is a small cove in the lakeshore below it. The benchmark is named 'Astro A'. The elevation is 94.522 meters (310.11 feet).

FIELD GEAR CHECKLIST

(Note: Not all gear on this list will be required for all trips. You use sandbags to hold related items together inside your pack)

backpack

handheld radio (VHF) and two batteries

wristwatch set to exact McMurdo time

2 pee bottles

tool bag

silicon caulk

small flathead screwdriver

parachute cord

two crescent wrenches, one big enough to tighten nut on tanks

pliers/wire cutter

solder iron

wire stripper (small)

small phillips screwdriver

electric tape

wire

hose clamps

solder

food bag

thermos

hot drink mixes

freeze dry meals

other preferences

spoon

instant soup mixes

candy bars

canvas satchel

field manual

keypad and ribbon cable

clipboard and fresh field sheets

multimeter

pencils

calculator

toilet bag

2 garbage bags

spare socks/clothes

toilet paper

field meter bag

pH meter, filling solution, standards

temperature meter

sample bottles (input sets, 1 - 250mL nalgene bottle and 1 amber DOC bottle)

conductivity meter

folding ruler

discharge bag

stopwatch

spare batteries

small screwdriver

folding ruler

pulse counter

pygmy meter in case

50 foot tape

headphones

stream chemistry bag

input sets as required

sampling gloves if required

stream chemistry cooler

DI water in bottles

phosphoric acid

1 and 5 ml pipetters

pH standards

filter towers

filters (2 kinds)

label tape

squirt bottle

output bottle sets

1 and 5 ml pipette tips

filter hand pumps

filter flasks

marker pen

shovel
wading rod
AA meter and case
tagline
auto-level
tripod
level rod
hip waders
chest waders
rock hammer
instep crampons
ice axe
camping (not usually necessary)

tent, ground cloth
HF radio
thermarest
food
garbage bags
fuel
lighters/matches
scrubby
plastic gray barrel
fry pan
plates

earplugs
sleeping bag
tent stakes
spices
stove
fuel cans
dish soap
plastic u-barrel
cook pots
utensils, cups
bowls

SITE LIST

Stream Name	Site ID field/USGS	Gauged?	Instruments	Latitude	Longitude
Canada Stream	F1/ 00000001	Yes	ps2/wt/sc 9" flume	77-36-50	163-03-14
Huey Creek	F2/ 00000002	Yes	pss1/wt 6" flume	77-36-22	163-07-27
Lost Seal Stream	F3/ 00000003	Yes	pss1/wt/sc 6" flume	77-35-42	163-14-40
Aiken Creek	F5/ 00000004	Yes	ps2/wt/sc 9" flume	77-36-20	163-15-30
Von Guerard Stream	F6/ 00000005	Yes	pss1/wt	77-36-28	163-14-40
Harnish Creek	F7/ 00000017	Yes	ps2	77-36-30	163-14-15
Crescent Stream	F8/ 00000006	Yes	ps2/wt/sc	77-37-10	163-11-00
Green Creek	F9/ 00000008	Yes	ps2/wt/sc	77-37-21	163-03-50