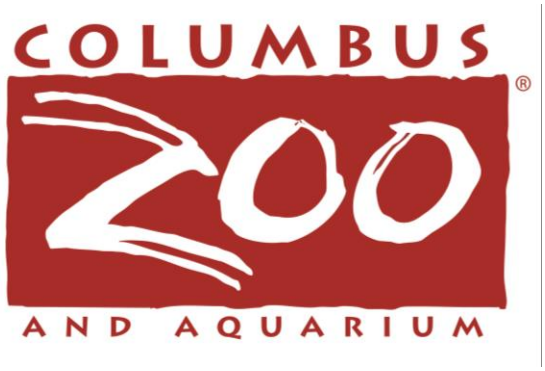

DIVE SAFETY MANUAL

Dive Safety Officer: Ramon Villaverde

Columbus Zoo and Aquarium Dive Safety Manual – Table of Contents

Contents

The Diving Safety Program

The purpose of the diving safety program is to ensure that all diving at the Columbus Zoo and Aquarium (CZA) and off site for CZA projects is conducted in a safe manner to minimize accidental injury and set forth rules, regulations and standards for training and certification. This manual has been created to establish protocol to ensure a productive and safe working environment while using Self Contained Under Water Breathing Apparatus (SCUBA). The guidelines contained within this manual help protect the zoo's collection and employees from injury or illness while using SCUBA. Snorkeling, Breath Hold/Free Diving or any work that involves head submersion underwater falls under the same guidelines as SCUBA. The Dive Manual will be revised annually or as needed.

It is very important that all divers follow the rules and guidelines dictated in this manual to ensure the safest possible environment. Any mistakes or deviations from the rules in this manual can cost you or another diver great bodily harm. Faulty equipment, lack of communication, preparedness, safety procedures knowledge, and diving skills can be detrimental to oneself or another staff member. If a diver fails to follow all the rules and guidelines established for diving at the Columbus Zoo and Aquarium, that person will lose his or hers diving privileges.

Program Management

The Zoo diver program is managed by the Shores Department and is under direct supervision of the Dive Safety Officer. To efficiently manage the program, divers are responsible for reading memos, letters, etc. that are sent to them. The Dive Safety Officer and Curator of Shores will supervise the program on a daily basis. The Curator/Director of Pinnipeds and the primary keeper of each area are responsible for the care of the exhibits and the Curator/Director of Pinnipeds will take action necessary to ensure that the animal collection and exhibit is properly cared for.

All active divers are to follow all rules and regulations set forth in the Dive Safety Manual.

Columbus Zoo and Aquarium Dive Control Board

The Dive Control Board consists of experienced divers including management staff, department and volunteer representatives. The Control Board has the authority to recommend the issue, reissue or revocation of CZA diver privileges. It shall have the authority to suspend operations or programs that it considers unsafe.

The Dive Control Board has the responsibility to:

1. Recommend changes in policy to the CZA Diving Safety Manual as the need arise
2. Establish and/or approve training programs through which applicants for active CZA dive status can satisfy the requirements of this manual.
3. Approve locations where diving may be conducted
4. Establish and/or approve facilities for inspection and maintenance of diving equipment.
5. Approve new equipment for CZA use.
6. The Dive Control Board members shall meet once per year and/or as deemed needed.

Current Dive Control Board Members (04.01.22)

Ramon Villaverde: Dive Safety Officer, Aquatic Programs Keeper

Doug Warmolts: Animal Care Vice President

Becky Ellsworth: Shores Curator

Nick Way: Safety Manager

Richard Placek: LSS Manager

Dave Ackerman: Shores Keeper

Ginger Early: Volunteer Supervisor

Carman Wirtz, SVP Human Resources

Aaron Jeskie: Shores Keeper

Jim Clarke: Volunteer Diver

Michael Grumney: LSS

Stephen Frey: North America

Dr. Mark Flint: Program Head-Zoo & Wildlife Conservation Medicine &Ecosystem Health OSU

Dive Safety Officer

The Dive Safety Officer (DSO) is a hired employee. The DSO must be a qualified scuba instructor, be proficient in equipment usage, familiar with all diving techniques, and have knowledge of applicable regulations.

The Dive Safety Officer shall have the authority to restrict or suspend any diving activity considered unsafe.

Dive Safety Officer Responsibilities:

1. Coordinating and monitoring all diving programs to assure the implementation of all CZA policies and standards.
2. Evaluation of scuba/dive equipment and equipment maintenance programs.
3. Supervision of instruction and evaluation of all training programs.
4. Preparations of recommendations for consideration by the Dive Control Board such as changes in policy, standards and regulations, changes in training programs, and new equipment.
5. Suspension of diving activities considered unsafe.
6. Ensure all required diving records and logs are properly completed and maintained.
7. Keep and maintain current rosters of full time staff, volunteer and contract divers.

Active Diver Status Requirements:

Each applicant for CZA active diver status is required to meet all of the below:

- Submit emergency contact/medical information (Appendix A)
- Provide a copy of their highest certification card for SCUBA
- Annually complete a dive/swim evaluation (Appendix B)
- Annually complete a medical evaluation (Appendix C) in accordance with the requirements set forth from the Dive Safety Board. Any health condition may be reason to temporarily or permanently prevent an employee from diving, including but not limited to: respiratory infection, flu symptoms, COVID like symptoms, ear infection, dental problems, external or internal injury. Diving is not permitted when pregnant. Diving is not permitted for divers undergoing any medical treatment in which diving could increase injury or cause longer recovery.
- Each full time staff diver shall stay current with CPR and First Aid certification. N/A to seasonal staff, interns, volunteers, and contract divers.
- Each diver must be trained in CZA diver extraction protocol and current with ERP standards.
- To remain in an active diver status, divers must complete a minimum of 8 exhibit dives per year. (preferably two per quarter, with minimum of one in every quarter). The remaining 4 required dives can be any time within the calendar year. REV.- 04.20.22
- Each diver must be trained in Cylinder Hazmat FSO Compliance. Every 3 years. N/A to seasonal staff, interns, volunteers, and contract divers.

LAPSE IN ACTIVE DIVER STATUS

INTRODUCTION

This SOP is written to address when a diver (Staff and Volunteers) who was previously classified as an “Active Diver” and is now classified as “Inactive Diver”, who wishes to become an “Active Diver” at Columbus Zoo and Aquarium. This procedure applies to divers who were previously in the dive program and who are no longer considered “Active Status” due to the following conditions:

1. Expiration of Dive Physical

2. Expiration of First Aid, CPR, AED and O2 certifications. Applicable to full time staff only.

3. Expiration of Swim Evaluation Requalification

4. Full time staff not meeting the minimum 8 dives per year

5. Volunteer divers who have left the program in good standing and wishing to return to the dive program.

This procedure does not apply to the following conditions. Divers wishing to reenter the dive program under the following conditions must seek approval from the Dive Control Board and the Dive Safety Officer before being reinstated.

1. Divers who have been suspended/terminated from the dive program due to violations of the Dive Safety Manual or insubordination from DSO

2. Divers who have the left the program not in good standing when leaving.

The procedures below outline the timeframe of being inactive as well as the steps during each time frame that the diver must complete to become “Active Status” in the dive program.

PROCEDURE

1. < 30 Days

a. The diver shall complete steps necessary to what caused them to become inactive

2. 2-12 Months

a. Must be current or become current in Dive Physical, CPR, First Aid AED and O2 Certification, Dive / Swim Evaluation

b. Complete Checkout Dive with DSO

Exceptions

This SOP does not cover the following conditions. Below are the steps to become an “Active Diver” in the event the special conditions happen.

1. Pregnancy and Child Birth

a. Dive Physicals, CPR, First Aid O2 certification must be current. In the event these expire, the diver shall complete the necessary steps to become current in order to be considered “Active Status.” If all the above are current, the diver in question is not required to redo the above until the date of expiration(s).

b. Dr. Note on file stating that diver is cleared to return to diving

2. Major Sickness or Surgery requiring Hospitalization >24 hours.

a. Dive Physicals, CPR, First Aid O2 certification must be current. In the event these expire, the diver shall complete the necessary steps to become current in order to be considered “Active Status”

b. Dr. Note on file stating that diver is cleared to return to diving

Corrective Actions for Program Violations and Failure to meet Requirements

Individual department supervisors in accordance with the employee handbook will address corrective actions for program violations. DSO and or Department Supervisor will document documentation of violations and corrective actions for the violation.

Failure to meet requirements is covered in laps in active diver status.

Swim Test (Appendix B)

Any dive team member applying to the Columbus Zoo and Aquarium Dive Program (CZAMDP) will be required to pass a standard swim test. This test will include the following:

1. Must be able to swim 100 yards.
2. Swim test participant must not be wearing any buoyancy devices (neoprene wetsuit), and must do the test wearing normal swimming attire.
3. Must be able to comfortably tread water for 10 minutes without the use of any buoyant device(s).
4. Must be able to free dive and retrieve a 10lb weight belt from a minimum depth of 12ft.
5. Must be able to get in and out of pool unassisted.

Divers must be able to demonstrate the following scuba skills to be considered an active diver.

1. Demonstrate a good working knowledge of scuba equipment.
2. Able to properly set-up and break-down scuba equipment.
3. Able to do a safety check.
4. Able to remove and clear mask.
5. Able to do a regulator removal and recovery.
6. Demonstrate safe ascents and descents.
7. Able to enter and exit the exhibit unassisted.
8. Demonstrate neutral buoyancy.
9. Able to safely bring up an unconscious diver.
10. Able to tow an unconscious diver 25 yards
11. Able to self-rescue using a redundant air system (Ex: spare air, extra cylinder with an independent regulator).
12. Full face mask training and competent removal, replacement and clearing of mask (if applicable).
13. BCD removal and replace.

Equipment Requirements

The CZA will provide the minimum diving equipment required for dive operations at the CZA including but not limited to:

- BCD
- Regulator
- SCUBA cylinder
- Redundant Air System
- Solid lead weights. Soft dive weights/ lead shot is not permitted.
- Dive wet suits and masks (purchased for full-time staff only)

Personal Equipment

The Columbus Zoo and Aquarium is not responsible for any personal diving equipment used by its divers.

Documentation of preventative maintenance on personal regulators is required to be submitted to CZA prior to use for diving on Zoo grounds or for fieldwork under the auspicious of CZA. Personal dive equipment is subject for denial of use by CZA staff or Dive Safety Officer if deemed not in compliance with CZA standards.

Prior to use in CZA exhibits, wetsuits and equipment brought in by volunteer divers needs to be properly sterilized and is subject to approval by CZA staff or DSO.

All provided dive equipment will be maintained in accordance with industry standards:

- Regulators are serviced annually
- Scuba cylinders will be inspected according to Department of Transportation (DOT) regulations.
- Scuba cylinders are visually inspected annually (VIP)
- Scuba cylinders are hydrostatic tested every 5 years
- Equipment will be properly cleaned and inspected after use by the divers that use it.
- Buoyancy Compensation devices “BCD’s” should be properly rinsed after use and will be serviced as needed. Remove water from internal bladder and partially inflate BCD prior to hanging to dry.
- The Bauer Air Breathing Compressor(s) will be maintained according to the manufacturers and Breathing Air specifications. Breathing Air Systems will service the compressor.

  Only the certified operators trained in its use will operate the Bauer Compressors.

  Breathing Air Systems will perform the air quality testing twice a year with documentation of compressor given to dive safety officer.

CZA will keep and maintain current and accurate records of all equipment damage and all modifications, repairs, tests or maintenance performed on the equipment.

All CZA furnished equipment should be stored in designated areas when not in use.

The CZA dive equipment may not be checked out for personal use and may only be used off CZA premises for CZA related projects.

Equipment use and cross contamination

All equipment should be used for its manufactured intended purpose.

Equipment should only be used in its designated area. If equipment must be used in another location/exhibit, it must be properly cleaned/sterilized and dry before and after use.

Common methods of cleaning/sterilizing are:

10 min freshwater soak

Dual-Quat soak and rinse

Sink the stink soak and rinse

3M quat

Sterisol (regulator sterilization)

Bleach soak (regulator sterilization)

Steramine (regulator sterilization)

Equipment and COVID

DAN.org recommendation for sterilization

CDC recommends:

1/3rd cup bleach per 1 gallon of water (+/- 2:100 or 2%)

25mls bleach to per 1 liter water

1 minute soak time

Do not use hot water, this will decompose the active ingredient

Never mix with other chemicals

Mix fresh solution in well-ventilated area with proper PPE

Rinse disinfected equipment thoroughly: allow to dry completely

Alternate CZA Approved sterilization for regulators is the use of Steramine

Steramine for sterilization against COVID 19 at 469ppm

1 steramine tablet in 1 gallon of water = 200ppm concentration

2.5 tablet in 1 gallon of water for a 10 minute soak time.

A new solution of steramine should be made daily.

Scuba Equipment Tag Out Procedure

Dive Gear\2020 Scuba Gear Service Tag Out Procedure.docx

Any dive gear that is malfunctioning should not be used. The equipment that needs repaired should be tagged out and placed outside of the Discovery Reef Office. Ramon Villaverde should be notified of the equipment issue by email or in person.

Manila tags with strings are on the shelf next to the refrigerator in the Discovery Reef Diver Prep Room. Use tags to label faulty equipment.

Information on the tag should include:

1. Date
2. Discovery Reef, Manatee, Polar Frontier or Adventure Cove Equipment
3. Serial # of the equipment
4. Repair that is needed

Logbooks

All dive operations are electronically logged for each area. After each dive, take time to thoroughly complete an entry. All information is important.

It is the responsibility of the designated Lead Diver to enter the dive information into the designated electronic dive log for all divers.

Operational Use of Scuba Tanks

- Visual inspection should be conducted before use
- Damaged O-rings should be replaced before use
- Minimum air pressure remaining in SCUBA tanks should be 500 psi.
- Rinse all used tanks with freshwater after a dive.
- All used tanks should be left uncapped to indicate that it has been used.

Equipment and Dive Area Maintenance

- All CZA-owned equipment must be rinsed thoroughly with fresh water and stored after each dive.
- Personal swimsuits must be hung to dry in the appropriate location.
- BCDs should be filled and flushed with freshwater after each dive.
- Wetsuits are not to be left hanging over the guardrails or over exhibits
- The CZA is not responsible for any lost or stolen personal items.
- The catwalks, diver prep areas, and bathrooms should not have standing water after diving and showering.
- The shower stall walls should be wiped down after use. All toiletry items must be removed from the bathroom and properly stored.

Bauer Air Breathing Compressor Protocol

There are three air compressor systems located throughout the zoo. The compressors should only be used by trained staff due to their potential danger during operation. These compressors are utilized to fill SCUBA air tanks. The locations of the three compressor units are: 1) Shores: Manatee electrical room on the east side of the building 2) North America: Polar life support room 3) Adventure Cove: sea lion locker room.

The compressors will be utilized in this capacity under normal filling operation. Scuba bottles will be filled directly from the operating compressor. Air in the cascade/storage cylinders (manatee only) should only be used for emergencies like power outages or quick fill situations. Cascade system will be utilized periodically to exchange air from those bottles.

Fill Procedure for Shores Compressor:

Operator must always be present at the compressor while filling tanks to avoid contamination from outside/indoor sources

1. Check the oil level, the oil level should be between the two groove marks on the dipstick. If low can top off but don't overfill. The unit holds only 54 ounces of oil. We should not have to do this at all; the service contract will cover this.

   Note: Use only the approved oil for the compressor, which is located below the compressor in the storage cabinet. Oil will be changed after every 250 hours of use or 6 months.

2. Check to make sure all the petcocks and valves are in the desired positions.
3. Check to make sure the fill hose lines are closed including the bleed valve(s).
4. Make sure the cascade bottles are closed in the off position.
5. Log the hour meter start:
6. Log the Securus cartridge hour meter start.

   Note: Replace the cartridge when the system tells you to do this. A warning light comes on within 4-10 hrs of running out. When the cartridge is completely spent it will "**red light" and shut down** and will be inoperable until the cartridges are replaced. There is no bypass switch. Change the cartridge. This will have to be done every 80-100 hours.

   Note: The service contract should take care of this for us. If not there are more detailed instructions on the process available in the keeper office of the Manatee exhibit.

7. Make sure that excessive exhaust fumes are not present; if needed or desired open doors in the room that lead to the outside for fresh air.
8. Hook up the scuba tank to the fill hose. Recheck the fill hose lines to make sure they are closed including bleed valve.
9. Open scuba tank valve to check air pressure. Turn knob all the way open and ¼ of turn back.
10. Turn compressor on. Wait for the pressure on the 3rd stage to build up to 3000 psi.

11. Log down the 1st, 2nd, and 3rd stage readings on log sheet at 3000 psi.
12. Set regulator to 3000 psi. The 3rd stage reading will drop off at this point.
13. Open the fill hose line (black knob) slowly.
14. Wait for tank to fill to 3000 psi. You will notice that as the tank gets closer to 3000 psi, so does the 3rd stage. Then the 3rd stage will increase to 4500 psi and shut off the unit
15. The moment the tank is at 3000 psi it stops sending air to the tank. At this point you can wait for the machine to shut off automatically or go ahead and hook up another scuba bottle to be filled.
16. To do this: turn off the fill hose line (black knob closed) and shut the tank valve. Bleed the air from the fill hose line. Disconnect hose from tank.
17. Connect another empty bottle to the hose. Recheck the fill hose lines to make sure they are closed including bleed valve.
18. Open tank valve all the way and ¼ turn back. Take note of air pressure. Open fill hose line slowly.
19. Repeat. Procedure above.
20. When done filling tanks. Let unit shut off by itself at 4500 psi.
21. Turn off compressor. Turn regulator back to 0.
22. Log hours end on log sheet.

Note: During operation of this machine listen for any unusual noises. Trace the source of any unusual sounds before continuing operation. You may want to call Breathing Air Systems at 864-1235 and discuss the noise with a technician. For emergencies call the distributor at 1-800-937-2479.

Note: Every 15-17 minutes for 4-7 seconds the compressor will automatically open the condensate draining valve. A test purge switch is provided, so the system could be operated in the event that the automatic system should fail.

Note: Be sure to check tanks for condition of <u>O-rings and hydrostatic and visual inspections dates</u> before each fill. If a tank needs a visual or hydrostatic inspection, do not fill the tank, until the tank(s) has been inspected.

<u>Do not allow divers to take tank pressures below 500 psi</u>. There is a risk of getting moisture or contaminants in the tank if there is not positive air pressure in the tanks.

Fill Procedures for Polar Compressor

Operator must always be present at the compressor while filling tanks to avoid contamination from outside/indoor sources

1. First make sure the o ring on the valve of the scuba tank is still in place
2. Then connect the yoke from the compressor to the scuba tank valve, do not over tighten and shut the bleed off valve on the yoke.
3. Now open the valve on the scuba tank and the valve on the yoke.
4. Now push the start button on the electrical box on the compressor. The compressor is pre-set and will shut off when it reaches 2800psi and shut off.
5. To remove the full tank shut the valve on the yoke and the valve on the scuba tank, then open the bleed off valve on the side of the yoke to relieve the pressure.
6. Now you can remove the yoke from the scuba tank
7. You can now repeat 1-6 to fill another tank or shut the compressor off with the off button located on the top of the electrical box on the compressor

Fill Procedures for Adventure Cove Compressor

Operator must always be present at the compressor while filling tanks to avoid contamination from outside/indoor sources

1. First make sure the o ring on the valve of the scuba tank is still in place
2. Then connect the yoke from the compressor to the scuba tank valve, do not over tighten and shut the bleed off valve on the yoke.
3. Now open the valve on the scuba tank and the valve on the yoke.
4. Now push the start button on the electrical box on the compressor. The compressor is pre-set and will shut off when it reaches 2800psi and shut off.
5. To remove the full tank shut the valve on the yoke and the valve on the scuba tank, then open the bleed off valve on the side of the yoke to relieve the pressure.
6. Now you can remove the yoke from the scuba tank
7. You can now repeat 1-6 to fill another tank or shut the compressor off with the off button located on the top of the electrical box on the compressor

General Policy

No person shall engage in diving under the auspices of CZA diving program unless he/she is currently qualified to the provisions of this manual. All feeding and general maintenance dives will be conducted in accordance to OSHA scientific diving exemption to Commercial Diving Regulations 29 CFR 1910.402

Exceptions to Zoo Dive Policy

If something is thrown into the water that risks the health and safety of the animals, and the item needs to be retrieved as quickly as possible, we are allowing a one-time exemption for a Staff Diver to go into the water with a DPIC standing by with a radio. In most cases, snorkeling or free diving can be used to retrieve the object.

Glossary

Dive Team

Dive team consist of one or more divers and support employees in a diving operation. Diver(s), buddy diver, designated-person-in-charge (DPIC)

Diver:

A diver is a staff member, volunteer or contract diver who holds a nationally recognized scuba certification. A diver performs various underwater tasks either by scuba, surface-supplied air diving (hooka), snorkeling or breath hold diving/freediving.

Lead Diver/Standby Diver:

A lead diver needs to be a full-time Year-Round Columbus Zoo Employee who has a nationally/international recognized scuba certification and is in active diver status. Lead diver shall be at the dive site in charge of all aspects of the diving operation affecting the safety and health of dive team members. Lead Diver will be responsible for recording all diver information in the zoos electronic dive log. The scuba certified personnel shall be designated as the standby diver when surface tending a diver or divers from the surface. The scuba certified personnel is designated as the buddy diver when diving with another certified diver in a body of water. NOTE: Although we designate the lead diver in change of all aspects of the diving operation affecting the safety and health of dive team members, all divers in the water are responsible for the safety of each other while in the water.

DPIC- Designated person-in-charge:

DPIC will consist of a designated Columbus Zoo and Aquarium staff from the departments of Security, EMS, Shores, North America and Curatorial staff. The DPIC will be responsible for making sure the proper chain of the emergency response plan is implemented after the Buddy/Standby Diver initiates an emergency situation. The DPIC should be familiar with the dive location and must visit the location on a quarterly basis. This means that DPIC does not need to physically check in at the dive location before the actual dive operation as long as he/ she has done a site walk through on a quarterly basis and is familiar with dive operations at the location requested to be designated DPIC. DPIC must be able to leave whatever situation they are in immediately after an emergency call from a lead diver/standby diver is initiated. The DPIC must be able to be physically on the dive site within 2 minutes of the emergency call. The DPIC shall have experience in, and knowledge of, all phases of the diving operation for which he/she is responsible. The DPIC must be at the dive location if they are designated as the Surface Tender for the entirety of the dive operation.

Surface Tender:

Surface tender may be lead diver designated as the standby diver or DPIC if the lead diver is in the water. The surface tender is responsible to initiate the Zoo's Emergency Response Plan if an emergency occurs during a diving event.

Diving/Scuba Diving:

Type of underwater diving whereby divers use breathing equipment that is completely independent of a surface air supply. SCUBA is defined as Self Contained Underwater Breathing Apparatus

Surface-supplied air diving:

A diving mode in which the diver in the water is supplied compressed air for breathing from the surface.

Redundant Air Sources (RAS)

Redundant air source is a fully functional underwater breathing system, independent of a divers primary scuba equipment.

Snorkeling:

Snorkeling is the practice of swimming in a body of water while equipped with a diving mask and breathing tube called a snorkel. A snorkeler usually has swim fins on their feet as well.

Breath hold diving/Freediving:

Breath hold diving or freediving or skin diving is a form of underwater diving that relies on breath-holding underwater until resurfacing rather than the use of breathing apparatus such as scuba gear.

Line-Tended/Tethered Diver:

A diver is physically attached to the surface with a rope for emergency extraction from the water. A tether is required for a solo diver in the water. There are exceptions noted in the manual for safety/entanglement exceptions.

Dive Location/Dive Site:

Area in which diving is being conducted. Dive locations are but not limited to: Shores, Polar Frontier and Sea Lions. If there are multiple dives being conducted in a location (example Manatee and Discovery Reef) there must be a separate DPIC for each dive. Other areas on CZA grounds may need to be dove. The DSO or Curator (in the absence of the DSO) must give authorization for the dive. If the dive site is not considered a regular dive site the DPIC must visit the site before any dive is conducted. The DPIC must also stay within the general location to be able to respond to an emergency according to CZA standards.

Emergency Dive Procedure - All Dive Locations

In the event of an Emergency Response call heard over the radio in another location, Surface Tender need to remove all divers from water and respond to the emergency after all divers are out of the water. End of dive radio procedure should be followed according to the standards within this manual.

Scuba related Emergency Dive Procedure – All Locations

Two or more divers with dive buddy, Surface Tender is DPIC

1. One of the two or more divers will identify that a problem or potential problem exists.

2. The diver initiate help to the distressed diver.

NOTE: If you feel that rescuing the down diver can be potentially life threatening to yourself, do

not attempt to rescue the down diver by yourself. Rather, surface and call for help. Wait for

assistance to arrive before attempting to rescue the down or distressed diver.

3. Diver notifies DPIC of a distressed or down diver

4. DPIC responds and initiates emergency response plan

6. DPIC notifies Security and a down diver emergency response is initiated.

7. Security will initiate Down Diver protocol as outlined in the Zoo's Emergency Response Plan.

8. The DPIC will assess the situation and make sure emergency people get to site and that staff are assisting to help get people where they need to go.

NOTE: When calling on the radio, speak clearly and calmly as possible. All radio communication switches to channel 16 during an emergency event.

a. Begin to assist the diver in need.

b. Is diver conscious or unconscious? Does the diver need help?

c. If diver is conscious and needs help, offer assistance. Use a throw rope to help pull the diver in. You can also throw a flotation device out to the diver, if needed.

d. If diver is unconscious, follow the Emergency Dive Procedure. Send someone to bring the Oxygen tank, pocket mask and rescue board.

e. DPIC/Security need to make sure that someone is covering appropriate gate to direct traffic/assist the ambulance.

f. DPIC- Have someone taking notes: If victim is not breathing, how long not breathing? Note when CPR is started and by whom.

g. Administer care (CPR, rescue breathing, oxygen or first aid as needed). If needed can have someone call:

Divers Alert Network (DAN) at (919) 684-4326.

State that you have a dive emergency.

DAN can help advise the best way to handle a dive emergency if questions arise.

h. When emergency personnel arrive, the DPIC will talk to the medics and hand over all notes taken and Emergency Medical Form for the downed diver.

NOTE: Once a diver has been rescued, do not touch, turn valves, or breakdown the injured diver's equipment. Leave equipment in secure location until further examination is done by responsible parties investigating the cause of the emergency.

Two or more non-staff divers, Surface Tender is Standby Diver

1. One of the two or more divers will identify that a problem or potential problem exists.

2. The diver initiate help to the distressed diver.

NOTE: If you feel that rescuing the down diver can be potentially life threatening to yourself, do

not attempt to rescue the down diver by yourself. Rather, surface and call for help. Wait for

assistance to arrive before attempting to rescue the down or distressed diver.

3. Diver notifies Surface Tender of a distressed or down diver

4. Surface Tender radios DPIC and assist divers in rescue response.

4. DPIC responds and initiates emergency response plan

6. DPIC notifies Security and a security alert is initiated.

7. Security will initiate Down Diver protocol as outlined in the Zoo's Emergency Response Plan.

8. The DPIC will assess the situation and make sure emergency people get to site and that staff are assisting to help get people where they need to go.

NOTE: When calling on the radio, speak clearly and calmly as possible. All radio communication switches to channel 16 during an emergency event.

a. Begin to assist the diver in need.

b. Is diver conscious or unconscious? Does the diver need help?

c. If diver is conscious and needs help, offer assistance. Use a throw rope to help pull the diver in. You can also throw a flotation device out to the diver, if needed.

d. If diver is unconscious, follow the Emergency Dive Procedure. Send someone to bring the Oxygen tank, pocket mask and rescue board.

e. DPIC/Security need to make sure that someone is covering appropriate gate to direct traffic/assist the ambulance.

f. DPIC- Have someone taking notes: If victim is not breathing, how long not breathing? Note when CPR is started and by whom.

g. Administer care (CPR, rescue breathing, oxygen or first aid as needed). If needed can have someone call:

Divers Alert Network (DAN) at (919) 684-4326.

State that you have a dive emergency.

DAN can help advise the best way to handle a dive emergency if questions arise.

h. When emergency personnel arrive, the DPIC will talk to the medics and hand over all notes taken and Emergency Medical Form for the downed diver.

NOTE: Once a diver has been rescued, do not touch, turn valves, or breakdown the injured diver's equipment. Leave equipment in secure location until further examination is done by responsible parties investigating the cause of the emergency.

1 diver(untethered), 1 surface tender/standby diver

1. Standby diver will identify that a problem or potential problem exists.

2. Standby diver will call DPIC over the radio for help. DPIC responds and initiates emergency response plan

3. Standby diver dons dive gear and rescues down diver.

NOTE: If you feel that rescuing the down diver can be potentially life threatening to yourself, do not attempt to rescue the down diver by yourself. Wait for assistance to arrive before attempting to rescue the down diver.

4. DPIC notifies Security and a security alert is initiated. DPIC goes to the scene immediately to assist.

5. Security will initiate Down Diver protocol as outlined in the Zoo's Emergency Response Plan.

6. The DPIC will assess the situation and make sure emergency people get to site and that staff are assisting to help get people where they need to go.

NOTE: The Standby Diver on the scene of a diving accident is in charge until a more qualified staff member arrives. The DPIC is responsible for radio communication during the incident.

NOTE: If you are unsure of illness and symptoms or if the diver is unconscious or in possible need of a recompression chamber, call Diver's Alert Network (DAN) 24HR Diving Emergency Hotline at (919) 648-8111.

NOTE: Once a diver has been rescued, do not touch, turn valves, or breakdown the injured diver's equipment. Leave equipment in secure location until further examination is done by responsible parties investigating the cause of the emergency.

1 diver(tethered), 1 surface tender/standby diver

1. Standby diver will identify that a problem or potential problem exists.

2. Standby diver will call DPIC over the radio for help. DPIC responds and initiates emergency response plan

3. Standby pulls up down diver by tether.

4. DPIC notifies Security and a security alert is initiated. DPIC goes to the scene immediately to assist.

5. Security will initiate Down Diver protocol as outlined in the Zoo's Emergency Response Plan.

6. The DPIC will assess the situation and make sure emergency people get to site and that staff are assisting to help get people where they need to go.

NOTE: The Standby Diver on the scene of a diving accident is in charge until a more qualified staff member arrives. The DPIC is responsible for radio communication during the incident.

NOTE: If you are unsure of illness and symptoms or if the diver is unconscious or in possible need of a recompression chamber, call Diver's Alert Network (DAN) 24HR Diving Emergency Hotline at (919) 648-8111.

NOTE: Once a diver has been rescued, do not touch, turn valves, or breakdown the injured diver's equipment. Leave equipment in secure location until further examination is done by responsible parties investigating the cause of the emergency.

SOP for radio communication for all dive operations.

Please be aware that there could be multiple departments involved with dive operations. These procedures are to streamline the process of communications and conduct dive operations in the safest manner. Departments that could be active in dive operations include LSS, Animal Care and Security.

Note: No matter what department is functioning as the standby diver the standby diver should switch to the radio channel of the designated DPIC. The standby should remain on that channel for the duration of the dive operation. After completion of the dive operation and DPIC notified that all divers are clear of the water, the standby diver may return to their normal radio channel.

Examples of standby diver and DPIC:

LSS DPIC: standby diver and DPIC on channel 4

Animal care DPIC: standby diver and DPIC on channel 2

Security DPIC: standby diver and DPIC on channel 1

LSS is standby and Animal Care is DPIC. The LSS standby diver switches and remains on channel 2 for the duration of the dive.

LSS is standby and security is DPIC. The LSS standby diver switches and remains on channel 1 for the duration of the dive.

Animal care staff is the standby diver with LSS as the DPIC. Animal care standby diver switches and remains on channel 4 for the duration of the dive.

Start of Dive Operations:

1) Standby diver switches to designated DPIC radio channel before diver/divers get into the water.
2) Standby diver radios DPIC that diver/divers are getting into the water. Standby diver must tell the DPIC the number of divers and location of the dive operation.
3) If needed (due to dangerous animal area, polar, brown bear) the standby diver radios animal care staff that diver/divers are going into the water. Standby diver must tell animal care the number of divers and location of dive.

End of Dive Operations:

1) Standby diver radios DPIC to notify that diver/divers are out of the water.
2) If needed (due to dangerous animal area, polar, brown bear) the standby diver radios animal care staff that diver/divers are out of the water and that they are clear of the area.

Water Hygiene Protocol

Whenever diving in an exhibit, the diver should follow these steps to minimize the spread of pathogens. Each exhibit area has dive gear designated specifically for that exhibit. Please do not move gear from area to area unless need and it has been properly sterilized.

Preparation to Diving:

1. Make sure that you wear a full body wetsuit, gloves (optional in some locations and dive situations) and booties.

2. If you have any open wounds on your body it is recommended you refrain from diving activities.

3. After hooking up your regulator and BCD purge the air through your regulator to make sure there is no moisture trapped in the line. If you notice moisture or a nasty smell come out, do not use that regulator wait till its dry. Notify the dive officer for the department. If it is fine check the air by breathing it prior to dive.

Breakdown of dive equipment and disinfections of wetsuit, gloves, and booties:

1. Rinse off dive gear thoroughly. Use the hose on low spray setting (not high velocity), or submerged in tub. Be sure to rinse around the mouthpiece, pressure gauge, BCD and the neck of the scuba tank. Inflate your BCD to 1/2 air it will hold.

2. Soak the 2nd stage regulator and pressure gauge in the fresh water for a few minutes. Make sure the air to the tank is still turned on and there is positive pressure in the regulator 2nd stage and high-pressure lines. Free flow the submerged regulator for 5-10 seconds to eliminate any salt residue trapped inside the regulator 2nd stage and pressure gauge.

   Never press purge button under water if regulator is not hooked up to a tank and has positive pressure in the line. This may allow moisture to accumulate in the regulator airline. If this occurs purge the air out of regulator to remove moisture. This will hopefully prevent the growth of bacteria in the air hose line on regulator

3. Rinse the mouthpiece off with running fresh water. Purge the regulator for 5-10 seconds to eliminate any excess moisture that may be trapped in the 2nd stage line.

4. Turn off the tank, disassemble equipment.

5. CDC recommends for COVID sterilization of regulators:

   •⅓rd cup bleach per 1 gallon of water (±2:100 or 2%)

   •25 ml bleach to per 1 liter water

   •1 minute soaking time Do not use hot water, this will decompose the active ingredient

   Never mix with other chemicals

   Mix fresh solutions in well-ventilated areas with proper PPE Rinse disinfected equipment thoroughly; allow to dry completely

   Optional Regulator sterilization

   steramine for sterilization against COVID 19 at 469ppm

   1 steramine tablet in 1 gallon of water = 200ppm concentration

   2.5 tablet in 1 gallon of water for a 10 minute soak time.

   A new solution of steramine should be made daily.

6. Rinse inside of BCD with freshwater, inflate BCD and then turn the inflated BCD upside down and purge the air out to expel any water in the BCD. Orally inflate BCD rinse with freshwater and repeat if necessary.

7. Hang up to dry.

8. Rinse out mask with fresh water and hang to dry.

9. Rinse wetsuit, gloves and booties in shower with warm water or soak in freshwater vat for 10 minutes and hang dry

Discovery Reef Dive Operations

Building Safety

Back area access doors must be locked at all times. In the event of an Emergency Response Plan call from another area/region (contained or not contained) it is required to remove divers from water. Response to the site of the emergency may proceed after all divers are out of the water.

The life support room is off limits to all volunteer divers unless accompanied by or with Shores staff permission.

Visitors should not have access to dive equipment, the diver prep room, or the exhibit. If you see a person whose purpose in the keeper aisle is questionable, contact the Reef staff or ask that person his or her purpose.

If the fire alarm or ozone alarm is set off or if there is a need to evacuate the building, proceed to the teal door located in the back of the building near the large tank. Do not attempt the exit by way of the public aisle.

Full time Shores Staff will handle animal escape emergencies and drills. Volunteer Divers should remain in the building unless told otherwise by Shores Staff.

The diver prep rooms include the shower, toilet facilities, and changing room. The Zoo is not responsible for any lost or stolen personal items left in Discovery Reef.

Diving Safety

The most important action a diver can take is to never dive alone. When diving with a partner, know where each other are in the exhibit at all times. A standby diver or tender must keep eyes on diver(s) at all times. Feeding demonstrations will be done with one diver in the tank and another liner tender for the diver, a DPIC will be notified that you are diving. See the following for procedures for detailed information.

Do not wear jewelry, or hair items that could potentially pose a risk to the animals.

Keep all straps, hoses, etc. tucked or placed close to the body to avoid entanglement.

Redundant Air Sources (RAS)

A diver-carried reserve breathing gas supply shall be provided for each diver consisting of an independent reserve cylinder. This is required for all divers. Current RAS consist of either a .44L or .23L Spare Air bottle and regulator. Contract divers may use a second scuba cylinder but it must have its own regulator not tied in with main gas supply.

Exemption of redundant air source is applied to any dive in the Coral Exhibit due to confine space with live animals.

Exemption of the redundant air source is applied to the Standby diver gear.

Diving Procedures Personnel

Surface-Supplied Air (SSA) Diving with one diver in the water requires a minimum of three dive team members:

1. Designated person in charge (DPIC)
2. Qualified diver
3. Lead Diver/Standby diver as the Surface Tender, other than the DPIC. This person shall be zoo staff who is a qualified diver and has been trained in site specific emergency procedures.

SCUBA Diving with one or more divers in the water requires a minimum of three dive team members:

1. DPIC
2. Qualified diver
3. Lead Diver/Standby diver. This person shall be a Zoo qualified diver who has been trained in site specific emergency procedures.

Single SCUBA diver is required to be line tended/tethered.

Two or more divers shall be in continuous visual contact with each other during the dive operations.

The DPIC will remain within 2 minutes of the dive location.

Pre-dive Procedures

Planning and Assessment

Lead Diver will assess planning of a diving operation and shall include an assessment of the safety and health aspects of the following:

1. Diving mode (SCUBA or SSA)
2. Diving conditions and hazards
3. Breathing gas supply sufficient to support divers for the duration of the planned dive
4. Thermal protection and other personal protective equipment (PPE)
5. Diving equipment and systems
6. Dive team assignments and physical fitness of dive team members (including any impairment known to DSO)

Diver Briefing

Lead diver will conduct Diver Briefing.

Dive team members briefing should include but not limited to:

1. The tasks to be undertaken
2. Safety procedures for the diving mode

3. Any unusual hazards or conditions likely to affect safety

4. Any modifications to operating procedures necessitated by the specific diving operation.

Procedures During the Dive

Water Entry and Exit

A means capable of supporting the diver shall be provided for entering and exiting the water.

The means of egress shall extend below the surface of the water.

A means shall be provided to assist an injured diver from the water.

Communications

Methods of communication should be reviewed between diver, lead diver and/or surface tender prior to diver(s) entering the water. Hand signals, audible recall device or dive slate

Enclosed or Physically Confining Spaces – Coral Display Exception- REV. 04.2016

A standby diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

- SCUBA divers shall not enter enclosed or physically confining spaces unless line-tended.
- Diver has the option to use full mask or surface supplied air, or hooka second stage regulator (both methods are surface supplied air)
- Diver not required to carry RAS.

Termination of the Dive

The working interval of a dive shall be terminated when:

1. A diver requests termination.
2. Allotted bottom time has been reached
3. A diver fails to respond correctly to communications or signals from a dive team member.
4. Communications are lost and cannot be quickly re-established, or
5. A diver begins to use any air source other than the primary air source (except for demonstration purposes).

Snorkeling/Breath Hold Diving

Snorkeling/Breath Hold diving may be conducted in shallow water environments in which compressed air diving is deemed inappropriate for a task. If snorkeling is to take place, a lead diver must be present with a DPIC on radio. Pre-dive procedures and diver briefing prior to snorkeler entering must be done. Record of snorkeling to be electronically documented in the current format approved by DCB.

Record of Dive

It is the responsibility of Lead Diver to record all dive operation information.

The following information shall be recorded and maintained for each diving operation:

1. Names of dive team members including lead diver and DPIC
2. Pre-dive safety briefing for all divers
3. Date, time, and location
4. Diving mode(s) used
5. Start and end air pressure for each diver
6. Start and end time of dive
7. Gear used
8. Maximum depth and bottom time for each diver
9. Animal status observations: can include but not limited to general appearance, body condition, now or old wounds, and or current algal condition in the exhibit

Buddy System

There are no exceptions to the buddy system. There must be a minimum of three (3) people conducting any diving activity.

This equipment should be present before the start of any diving activity:

1. Two-way radio
2. Standby diver equipment: Tank, BCD, Regulator, Mask, Weight. Equipment should be set up and turned on. Standby diver equipment is not required if lead diver is in the water.
3. Extraction Board on location
4. Access to an Oxygen bottle for dive emergencies.
5. Retrieving pole, throw bag or life ring on location.

Any accidents, regardless of how minor, must be reported to the DSO or Curator (in the absence of DSO) and Security immediately.

A phone is located on the main floor office (3566)

Non-emergency numbers:

3436 (Curator)

3580 (Dive Safety Officer)

3405 (front desk to page staff on radio)

In Discovery Reef there is a throw bag and shepherd's hook hanging on the west wall of the exhibit catwalk. Either may be used to bring a distressed diver to the surface or assist a diver at the surface. The handle of the shepherd's hook telescopes to 24 feet. A throw bag and life-ring is also positioned near the shepherd's hook storage on the north wall and may be used.

The guardrails along the edge of the tank have strategically placed access openings, which can be unchained to move a diver. These access openings should remained chained when not in use.

There is a first aid room located at the front gate (3434) staffed by Security.

There is a portable oxygen unit in the diver prep room and a small first aid kit located in the diver bathroom and on the table located in the diver prep room.

Surger and Diver

Do not attempt to dive with the surger in operation. Divers will use more energy working against the surge than doing their job. If the surger is not off before entering the exhibit, notify staff. No diver should attempt to turn off the surger alone without prior training from a Discovery Reef full-time staff member.

Exhibitry and Diver

All exhibitry within the Discovery Reef exhibit is artificial. The coral and other invertebrate exhibitry are extremely fragile and will easily crush and break. Avoid touching, brushing, or hanging on exhibitry. At no time should the exhibitry be used as a ladder, hand-hold, or brace.

Be aware of any loose lines or gauges on diving equipment while in the water. Being aware of diving equipment will prevent exhibit destruction and prolong the life of the dive equipment.

Acrylic and Diver

The viewing panels of the exhibit are constructed of solid acrylic panels measuring 5 ½ inches thick. While the panels reduce visual distortion and are very strong, they are easily scratched and marred.

Diver will clean acrylic with soft clean cloth to prevent buildup. At all other times, please allow two feet distance from the acrylic panels while in the exhibit. When near the panels never turn your back to the panels. This will prevent tanks from accidentally knocking against the acrylic.

Watch gauges, feet, tanks, ankle weights, and finger rings when near the viewing panels.

Gravel Bed and Diver

The gravel bed of the exhibit is composed of a variety of gravel types. It is approximately 18 inches thick. The surface of the bed can be silty in places. When moving along the tank bottom, avoid shuffling steps. Cover mesh if possible.

Underwater Communication System

The Shore's department has installed a communication system, which allows the public and the diver to communicate during use of OTS full face mask. Operation and maintenance of this equipment is discussed during diver orientation sessions.

Feeding Demonstration Suggested Schedule

Feeding demonstrations take place once a day at a pre-arranged, publicized time. Proposed schedule is for 1:00 p.m. feeding demonstration, Memorial Day through Labor Day and 7:00 p.m. during the Zoo's *Wildlight* season.

Divers are responsible for being on time and ready to dive at the scheduled feeding times..

Dive gloves are required for all feeding dives.

Manatee Coast Dive Operations

Manatee interactions are prohibited during all dives unless authorized by Curatorial or Animal Health staff.

In the event of an Emergency Response Plan call (contained or not contained) please remove divers from water. Lead diver should respond to the emergency only when all divers are out of the water.

Redundant Air Sources (RAS)

All divers need to carry a redundant air source for all dives.

Diving Procedures Personnel

Surface-Supplied Air (SSA) Diving with one diver in the water **requires a minimum of three dive team members:**

1). Designated person in charge (DPIC) The DPIC will remain within 2 minutes of the dive location

2) Qualified diver

3). Lead Diver/Standby diver, other than the DPIC. This person shall be a qualified diver who has been trained in site specific emergency procedures.

SCUBA Diving with one or more divers in the water requires a minimum of three dive team members:

1) DPIC. The DPIC will remain within 2 minutes of the dive location

2) Qualified diver

3) Lead Diver/Standby diver, other than the DPIC. This person shall be a qualified diver who has been trained in site specific emergency procedures.

Manatee Single Scuba Dive Exception – rev. 10.2016

Current dive protocol requires moving manatees to the back pool prior to dive operations. Manatees must be trained to move to the back pool, which could take several months. In the event that new manatees are brought in for rehabilitation, that are not trained to move to the back pool, a single diver protocol exception will be authorized, in the event that a single diver operation is required.

The single diver will not be tethered while diving when untrained manatees are in the exhibit. Manatees are curious by nature. That curiosity could cause the manatee to become entangled in the tether, risking injury to the diver and manatee. All other dive protocols will remain in effect, including a lead diver and DPIC for all dive operations.

Pre-dive Procedures

Planning and Assessment

Lead diver will assess planning of a diving operation shall include an assessment of the safety and health aspects of the following:

1. Diving mode (SCUBA or SSA)
2. Diving conditions and hazards
3. Breathing gas supply sufficient to support divers for the duration of the planned dive
4. Thermal protection and other personal protective equipment (PPE)
5. Diving equipment and systems
6. Dive team assignments and physical fitness of dive team members (including any impairment known to DSO)

Diver Briefing

Lead diver will conduct dive briefing.

Dive team members briefing should include but not limited to:

1. The tasks to be undertaken
2. Safety procedures for the diving mode
3. Any unusual hazards or conditions likely to affect safety
4. Any modifications to operating procedures necessitated by the specific diving operation.

Procedures During the Dive

Water Entry and Exit

A means capable of supporting the diver shall be provided for entering and exiting the water.

A means shall be provided to assist an injured diver from the water.

Communications

Methods of communication should be reviewed between diver, lead diver and/or surface tender prior to diver(s) entering the water. Hand signals, audible recall device or dive slate

Enclosed or Physically Confining Spaces

A standby diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

Scuba divers shall not enter enclosed or physically confining spaces unless line-tended.

Termination of the Dive

The working interval of a dive should be terminated when:

1. A diver requests termination.
2. Allotted bottom time has been reached.
3. A diver fails to respond correctly to communications or signals from a dive team member.
4. Communications are lost and cannot be quickly re-established.
5. A diver begins to use any air source other than the primary air source (except for demonstration purposes).

Snorkeling/Breath Hold Diving/Free Diving

Snorkeling/Breath Hold diving may be conducted in shallow water environments in which compressed air diving is deemed inappropriate for a task. If snorkeling is to take place, a lead diver must be present with a DPIC on radio. Pre-dive procedures and diver briefing prior to snorkeler entering must be done. Record of snorkeling to be electronically documented in the current format approved by DCB.

Record of Dive

It is the responsibility of the Lead Diver to record all dive operation information.

The following information shall be recorded and maintained for each diving operation:

1. Names of dive team members including lead diver and DPIC
2. Pre-dive safety briefing for all divers
3. Date, time, and location
4. Diving mode(s) used
5. Start and end air pressure for each diver
6. Start and end time of dive
7. Gear used
8. Animal status observations: can include but not limited to general appearance, body condition, now or old wounds, and or current algal condition in the exhibit

Do not wear jewelry, or hair items that could potentially pose a risk to the animals.

Keep all straps, hoses, etc. tucked or placed close to the body to avoid entanglement with the manatees.

Always be aware of the manatees' proximity to you. Avoid situations where you might be cornered by an animal. Always leave an escape route. If for any reason, you feel uncomfortable with the animals, exit the pool. Never turn your back to the manatees. Always maintain contact with dive buddy or surface tender. If a manatee makes physical contact with you, slowly back away and maintain an arm's length safe distance from the animal.

Avoid startling the animals which could result in potential injuries by contacting divers or structures. Enter the pool slowly; avoid high energy fast movements and noises.

When cleaning the acrylic or while in close proximity, be aware of gear and its potential to cause damage to the panels.

Algae growth can make areas of exhibit very slippery, use caution when working around rocks and skimmers.

After every diving activity make sure you don't leave anything around the pool ledge where the manatees could possible get a hold of it.

It is each diver's responsibility to assess the situation and determine whether or not the objective of the dive can be safely accomplished.

Dives should be conducted with full scuba tanks near or at 3000 psi, and divers should finish the dive with no less than 500 psi remaining in the tank.

Any diver should decline to dive if he or she is uncomfortable with the diving conditions.

Always put adequate amounts of lettuce in the pool before beginning acrylic cleaning to keep the manatees from potentially dangerous interactions with the diver(s).

Injuries (no matter how minor) must be reported to the DSO or Curator (in the absence of the DSO) and security.

The Emergency Extraction Points is the 2nd skimmer at mid pool on exhibit, at the skimmer in the rehab pool.

Buddy System

All diving performed at the Columbus Zoo and Aquarium must be conducted with at least three or more people. Diver(s), lead diver/standby diver and DPIC.

This equipment should be present before the start of any diving activity:

1. Two-way radio
2. Standby diver equipment: Tank, BCD, Regulator, Mask, Weight. Equipment should be set up and turned on. Standby equipment is not necessary if lead diver is in the water and DPIC is the surface tender.
3. Extraction Board
4. Access to an Oxygen bottle for dive emergencies.
5. Retrieving pole, throw bag or life ring.

Sea Lion/Adventure Cove Dive Operations

Sea Lion interactions are prohibited during underwater maintenance dives. All pools should be confirmed cleared of animals before entering.

In the event of an Emergency Response Plan call (contained or not contained) lead diver or DPIC should remove divers from water.

Redundant Air Sources(RAS)

All divers need to carry a redundant air source for all dives.

Diving Procedures Personnel

Surface-Supplied Air (SSA) Diving with one diver in the water requires a minimum of three dive team members:

1). Designated person in charge (DPIC). The DPIC will remain within 2 minutes of the dive location

2) Qualified diver

3). Lead Diver/Standby diver, other than the DPIC. This person shall be a qualified diver who has been trained in site specific emergency procedures.

SCUBA Diving with one or more divers in the water requires a minimum of three dive team members:

1) DPIC. The DPIC will remain within 2 minutes of the dive location

2) Qualified diver

3) Lead Diver/Standby diver, other than the DPIC. This person shall be a qualified diver who has been trained in site specific emergency procedures.

Sea Lion Single Scuba Dive Exception – rev. 10.28.20

A single diver protocol exception will be authorized, in the event that a single diver operation is required.

The single diver will not be tethered while diving in sea lion exhibits. Due to structures within the exhibits, potential for line entanglement of a tether, risks injury to the diver. All other dive protocols will remain in effect, including a lead diver and Designated Person in Charge (DPIC) for all dive operations.

Pre-dive Procedures

Planning and Assessment

Lead diver will assess planning of a diving operation shall include an assessment of the safety and health aspects of the following:

1. Diving mode (SCUBA or SSA)
2. Diving conditions and hazards
3. Breathing gas supply sufficient to support divers for the duration of the planned dive
4. Thermal protection and other personal protective equipment (PPE)
5. Diving equipment and systems
6. Dive team assignments and physical fitness of dive team members (including any impairment known to DSO)

Diver Briefing

Lead diver will conduct Diver Briefing.

Dive team members briefing should include but not limited to:

1. The tasks to be undertaken
2. Safety procedures for the diving mode
3. Any unusual hazards or conditions likely to affect safety
4. Any modifications to operating procedures necessitated by the specific diving operation.

Procedures During the Dive

Water Entry and Exit

A means capable of supporting the diver shall be provided for entering and exiting the water.

The means of egress shall extend below the surface of the water.

A means shall be provided to assist an injured diver from the water.

Communications

Methods of communication should be reviewed between diver, lead diver and/or surface tender prior to diver(s) entering the water. Hand signals, audible recall device or dive slate

Termination of the Dive

The working interval of a dive shall be terminated when:

1. A diver requests termination.
2. Allotted bottom time has been reached
3. A diver fails to respond correctly to communications or signals from a dive team member.
4. Communications are lost and cannot be quickly re-established,
5. A diver begins to use any air source other than the primary air source (except for demonstration purposes).

Snorkeling/Breath Hold Diving

Snorkeling/Breath Hold diving may be conducted in shallow water environments in which compressed air diving is deemed inappropriate for a task. If snorkeling is to take place, a lead diver/standby diver must be present with a DPIC on radio. Pre-dive procedures and diver briefing prior to snorkeler entering must be done. Record of snorkeling to be electronically documented in the current format approved by DCB.

Record of Dive

It is the responsibility of the Lead Diver to record all dive operation information.

The following information shall be recorded and maintained for each diving operation:

1. Names of dive team members including lead diver and DPIC
2. Pre-dive safety briefing for all divers
3. Date, time, and location
4. Diving mode(s) used
5. Start and end air pressure for each diver
6. Start and end time of dive
7. Gear used
8. Animal status observations: can include but not limited to general appearance, body condition, now or old wounds, and or current algal condition in the exhibit

Keep all straps, hoses, etc. tucked or placed close to the body to avoid entanglement with the exhibit structure.

When cleaning the acrylic or while in close proximity, be aware of gear and its potential to cause damage to the panels.

Algae growth can make areas of exhibit very slippery, use caution when working around rocks and skimmers.

After every diving activity make sure you don’t leave anything around the pool ledge where the sea lion could possible get a hold of it.

It is each diver’s responsibility to assess the situation and determine whether or not the objective of the dive can be safely accomplished.

Dives are to be conducted with full scuba tanks near or at 3000 psi, and divers should finish the dive with no less than 500 psi remaining in the tank.

Any diver should decline to dive if he or she is uncomfortable with the diving conditions.

Injuries (no matter how minor) must be reported to the DSO or Curator (in the absence of the DSO) and security.

The Emergency Extraction Points.

North Pool:

Dock on the north corner of the Sea Lion building

Main Pool:

Any area of the back Dock. Currently the easiest is the underwater step out on the north end of the pool. Note that the emergency response team will be entering from the south end of the back dock next to the south show pool.

South Show Pool:

Any area of the back dock of the pool.

Buddy System

All diving performed at the Columbus Zoo and Aquarium must be conducted with at least three (3) or more people. Diver(s), lead diver/standby diver and DPIC.

This equipment should be present before the start of any diving activity:

1. Two-way radio
2. Standby diver equipment: Tank, BCD, Regulator, Mask, Weight. Equipment should be set up and turned on. Standby diver equipment
3. Rescue Extraction Board.
4. Access to an oxygen bottle for dive emergencies.
5. Retrieving pole, throw bag or life ring.

Foreign Object Retrieval from Exhibit Pools

In order to retrieve anything from sea lion pools that requires staff to get into the water the following criteria and procedures must be followed:

1. Said person and tender must be on the CZA active status diver roster or must have a nationally recognized current lifeguard/ water rescue certification.
2. Anyone getting into the pool must follow CZA buddy system

Procedure must follow current Sea Lion animal procedures before object/item can be retrieved.

Program Management

To efficiently manage the program, divers are responsible for reading memos, letters, etc. that are sent to them via email or other method of communication. Such correspondence may be posted in the LSS diver prep room board.

Lightning

In the event of lightning, dive will be postponed or terminated until storm has passed and cleared by security. If lighting strikes is seen in the area, divers shall be pulled and dive terminated.

Building Safety

- Back area access doors must be locked at all times.
- All routine diving must be completed by 8:30AM.
- The life support room is off limits to all contract divers unless accompanied by or with Zoo Staff permission.
- Upon arrival at the Zoo, contractors will call security for access behind Sea Lions building. LSS staff will notify contractors when access to the pools is granted.
- Full time Sea Lion staff will handle animal escape emergencies and drills. During an animal escape emergency contractors should remain in the dive locker room until staff notifies them it is safe to leave.

Equipment Safety

- The Columbus Zoo and Aquarium will provide thermal protection, regulator, tank, BCD, mask, and weights for staff divers to use. Each diver must provide his or her own undergarments or utilize one of those provided. The Columbus Zoo is not responsible for any broken or damaged personal items used while diving. If a diver requires specialized equipment other than that furnished by the Zoo, the diver must personally supply it under authorization of the DSO. Weight must be removed from pockets of BCD after a dive and all gear must be washed off with fresh water.
- ***Dry suits*** or **Semi-dry suits** may be used to keep you warm and to keep you covered. Wet suits may also be used in the warmer months.
- **All zoo furnished equipment** is stored in the diver prep room when not in use. Any equipment malfunctions or breakage should be tagged using the tags provided as well as listing in the Dive log.
- **The diver prep room** includes a shower, toilet facilities, and changing room. The Zoo is not responsible for any lost or stolen personal items left in LSS.
- **When not in the water**, divers must present themselves accordingly. Appearances should be neat and conservative. Remember, you are representing the Columbus Zoo.

Diving Safety

- The most important action a diver can take is to never dive alone. When diving with a partner, know where each other are in the exhibit at all times.
- Any accidents, regardless of how minor, ***must*** be reported to Zoo DSO or Curator (in absence of DSO) and Security immediately.
- A phone is located in the diver locker room
- There is a shepherd's hook in the dive prep room. There are four throw bags available on the walls just inside the doorway from the main dock. They may be used to bring a distressed diver to the surface or provide assistance to a diver at the surface. A throw life-bag is also diver prep room along with a life ring for any north pool emergencies.
- There is a first aid room located at the front gate (3434) staffed by Security.
- There is a portable oxygen unit and small first aid kit in the diver prep room.

All diving performed at the Columbus Zoo and Aquarium must be conducted with at least three (3) or more people. Diver(s), lead diver/standby diver and DPIC.

Polar Frontier Dive Operations Brown Bear and Polar Bear Exhibit

Program Management

To efficiently manage the program, divers are responsible for reading memos, letters, etc. that are sent to them. Such correspondence may be posted in the LSS diver prep room board. Urgent messages can be read on the white board above the sink in the LSS diver area.
Divers may not enter exhibit area until North America Staff clears the exhibit.

Lightning

In the event of lightning, diving shall be postponed or terminated until storm has passed and cleared by secruity. If lighting strikes are seen in the area, divers shall be pulled and dive terminated.

Building Safety

- All back area access doors must be locked at all times.
- All routine diving must be completed by the time deemed by NA Curator.
- The life support room is off limits to all contract divers unless accompanied by or with Zoo Staff permission.
- Upon arrival at the Zoo, contractors will call the North America staff by phone or drive to trailer. North America staff will notify contractors when the bears are locked in and secured from exhibit. Contractors will be allowed access by staff. NA staff will open diver prep room door to bear yard for divers to enter.
- If the fire alarm or ozone alarms are set off or if there is a need to evacuate the building, proceed to man door located in the LSS room. The garage door located in the life support room may be used also.
- Full time NA staff will handle animal escape emergencies and drills.

Equipment Safety

- The Columbus Zoo and Aquarium will provide thermal protection, regulator, tank, BCD, mask, and weights for staff divers to use. Each diver must provide his or her own undergarments or utilize one of those provided. The Columbus Zoo is not responsible for any broken or damaged personal items used while diving. If a diver requires specialized equipment other than that furnished by the Zoo, the diver must personally supply it under authorization of the DSO. Weight must be removed from pockets of BCD after a dive and all gear must be washed off with fresh water.
- **Dry suits** or **Semi-dry suits** may be used to keep you warm and to keep you covered. Wet suits may also be used in the warmer months.
- **All zoo furnished equipment** is stored in the diver prep room when not in use. Any equipment malfunctions or breakage should be tagged using the tags provided as well as listing in Dive log.
- **The diver prep room** includes a shower, toilet facilities, and changing room. The Zoo is not responsible for any lost or stolen personal items left in LSS.
- **When not in the water**, divers must present themselves accordingly. Appearances should be neat and conservative. Remember, you are representing the Columbus Zoo.

Diving Safety

The most important action a diver can take is to ***never dive alone***. When diving with a dive buddy, know where each other are in the exhibit at all times. A full-time staff person must be surface tending during the dives, with a working radio, if there is a need for assistance.

Any accidents, regardless of how minor, ***must*** be reported to Zoo DSO (Dive Safety Officer) and Security immediately.

A phone is located in the electrical room of Polar LSS 614 724-3404

Non-emergency numbers:
724-3665 (Curator North America)
724-3675 (Assistant Curator NA)
724-3638(Polar Frontier staff)
724-3580 (DSO)
724-3436 (Curator shores)
724-3400 (front desk to page staff on radio)
724-3434 (Zoo security)
582-1844 and 563-8608 (security cell phones)

911: 9-1-740-368-1911

In the LSS room there is a shepherd's hook hanging on the wall. It may be used to bring a distressed diver to the surface or provide assistance to a diver at the surface. A throw life-bag is also positioned near the shepherd's hook as well as life ring

There is a first aid room located at the front gate (3434) staffed by Security.

There is a portable oxygen unit and small first aid kit in the diver prep room.

All diving performed at the Columbus Zoo and Aquarium must be conducted with at least three (3) or more people. Diver(s), lead diver/standby diver and DPIC.

Redundant Air Sources(RAS)

All divers are required to carry an independent reserve breathing gas supply during all dive operations. The redundant air systems will be provided by CZA.

Diving Procedures Personnel

Surface-Supplied Air (SSA) Diving with one diver in the water requires a minimum of three dive team members**:**

1. Designated person in charge (DPIC)
2. Qualified diver
3. Lead Diver/Standby diver, other than the DPIC. This person shall be a qualified diver who has been trained in site specific emergency procedures.

SCUBA Diving with one or more divers in the water requires a minimum of three dive team members:

1. DPIC. DPIC must remain within 2 minutes of the dive location
2. Qualified diver(s)
3. Lead Diver/Standby diver, other than the DPIC. This person shall be a qualified diver who has been trained in site specific emergency procedures.

Single scuba divers shall be line-tended from the surface

Two or more divers shall be in continuous visual contact with each other during the dive operations.

Pre-dive Procedures

Planning and Assessment

Standby diver will assess planning of a diving operation shall include an assessment of the safety and health aspects of the following:

1. Diving mode (SCUBA or SSA)
2. Diving conditions and hazards
3. Breathing gas supply sufficient to support divers for the duration of the planned dive
4. Thermal protection and other personal protective equipment (PPE)
5. Diving equipment and systems
6. Dive team assignments and physical fitness of dive team members (including any impairment known to DSO)

Lead diver will conduct Diver Briefing.

Dive team members briefing should include but not limited to:

1. The tasks to be undertaken
2. Safety procedures for the diving mode
3. Any unusual hazards or conditions likely to affect safety
4. Any modifications to operating procedures necessitated by the specific diving operation.

Procedures During the Dive

Water Entry and Exit

A means capable of supporting the diver shall be provided for entering and exiting the water.
The means of egress shall extend below the surface of the water.
A means shall be provided to assist an injured diver from the water.

Communications

Methods of communication should be reviewed between diver, lead diver/standby diver prior to diver entering the water. Hand signals, audible recall device or dive slate

Enclosed or Physically Confining Spaces

A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

SCUBA divers shall not enter enclosed or physically confining spaces unless line-tended

Termination of the Dive

The working interval of a dive shall be terminated when:

1. A diver requests termination.
2. Allotted bottom time has been reached
3. A diver fails to respond correctly to communications or signals from a dive team member.
4. Communications are lost and cannot be quickly re-established, or
5. A diver begins to use any air source other than the primary air source (except for demonstration purposes).
6. In the event of lightning, dive operations shall be terminated

Snorkeling

Snorkeling may be conducted in shallow water environments in which compressed air diving is deemed inappropriate for a task. If snorkeling is to take place a lead diver must be present with a radio. Pre-dive procedures and diver briefing prior to snorkeler entering must be done. Record of snorkeling to be electronically documented in the current format approved by DCB.

Record of Dive

It is the responsibility of the Lead Diver to record all dive operation information.

The following information shall be recorded and maintained for each diving operation:

1. Names of dive team members including lead diver and DPIC
2. Pre-dive safety briefing for all divers
3. Date, time, and location
4. Diving mode(s) used
5. Start and end air pressure for each diver
6. Start and end time of dive
7. Gear used
8. Animal status observations: can include but not limited to general appearance, body condition, now or old wounds, and or current algal condition in the exhibit

Do not wear jewelry, or hair items that could potentially pose a risk to the animals.

Keep all straps, hoses, etc. tucked or placed close to the body to avoid entanglement with the exhibit structure.

When cleaning the acrylic or while in close proximity, be aware of gear and its potential to cause damage to the panels.

Algae growth can make areas of exhibit very slippery, use caution when working around rocks and skimmers.

After every diving activity make sure all equipment is removed from the exhibit.

Equipment that must be present before the start of any diving activity:

1. Two-way radio, Dive Slate (optional) for communication.
2. Standby Diver: Tank or Spare Air, BCD, Mask, Weight. Equipment should be set up and ready for use.
3. Extraction board. Standby diver gear does not need set up if the lead diver is in the water.
4. Access to and oxygen bottle for dive emergencies.
5. Retrieving pole or throw bag

Equipment and Dive Area Maintenance

The Columbus Zoo and Aquarium is not responsible for any personal diving equipment used by its divers. The Zoo staff must approve personal diving equipment before it's used in the exhibit. The Zoo staff has a right to refuse the use of personal equipment. The diving owned by CZA and should only be used in the Polar Frontiers Exhibit. The CZA dive equipment may not be checked out for personal use to be taken off grounds.
Wet suits and or Drysuits may be hung to dry. They must be hung in the appropriate areas prior to leaving diver area. Wetsuits are not to be left hanging over the guardrails. The Zoo is not responsible for any lost or stolen personal items.

All zoo-owned equipment must be rinsed thoroughly with fresh water and stored after each dive. Wet swimsuits and personal towels must be taken home with divers. Only dive equipment may be stored in the diver prep room. The diver prep room and bathroom must be squeegeed after diving and showering. The bathroom should be left as clean as before it was used. The shower stall walls should be wiped down after use. All toiletry items must be removed from the bathroom and properly stored.

Single scuba divers shall be line-tended from the surface.

Two or more divers shall be in continuous visual contact with each other during the dive operations.

The DPIC will remain within 2 minutes of the dive location

Miscellaneous Dive Operations

Other locations around the zoo or off property for projects may need to be dove. Examples but not limited to, penguin pool, coral project, animal releases, manatee, hellbender.

These dive operations must follow CZA dive manual guidelines.

In the event of an Emergency Response Plan call (contained or not contained) please remove divers from water.

Redundant Air Sources(RAS)

All divers need to carry a redundant air source for all dives.

Diving Procedures Personnel

Surface-Supplied Air (SSA) Diving with one diver in the water requires a minimum of three dive team members:

1). Designated person in charge (DPIC). The DPIC will remain within 2 minutes of the dive location.

2) Qualified diver

3). Lead Diver/Standby diver, other than the DPIC. This person shall be a qualified diver who has been trained in site specific emergency procedures.

SCUBA Diving with one or more divers in the water requires a minimum of three dive team members:

1) DPIC. The DPIC will remain within 2 minutes of the dive location.

2) Qualified diver(s)

3) Lead Diver/Standby diver, other than the DPIC. This person shall be a qualified diver who has been trained in site specific emergency procedures.

Pre-dive Procedures

Planning and Assessment

Lead diver will assess planning of a diving operation including an assessment of the safety and health aspects of the following:

1. Diving mode (SCUBA or SSA)
2. Diving conditions and hazards
3. Breathing gas supply sufficient to support divers for the duration of the planned dive
4. Thermal protection and other personal protective equipment (PPE)
5. Diving equipment and systems
6. Dive team assignments and physical fitness of dive team members (including any impairment known to DSO)

Lead diver will conduct Diver Briefing.

Dive team members briefing should include but not limited to:

1. The tasks to be undertaken
2. Safety procedures for the diving mode
3. Any unusual hazards or conditions likely to affect safety
4. Any modifications to operating procedures necessitated by the specific diving operation.

Procedures During the Dive

Water Entry and Exit

A means capable of supporting the diver shall be provided for entering and exiting the water.

The means of egress shall extend below the surface of the water.

A means shall be provided to assist an injured diver from the water.

Communications

Methods of communication should be reviewed between diver(s) and lead diver/standby diver prior to diver entering the water. Hand signals, audible recall device or dive slate

Termination of the Dive

The working interval of a dive shall be terminated when:

1. A diver requests termination.
2. Allotted bottom time has been reached
3. A diver fails to respond correctly to communications or signals from a dive team member.
4. Communications are lost and cannot be quickly re-established,
5. A diver begins to use any air source other than the primary air source (except for demonstration purposes).

Snorkeling/Breath Hold Diving

Snorkeling/Breath Hold diving may be conducted in shallow water environments in which compressed air diving is deemed inappropriate for a task. If snorkeling is to take place, alead diver must be present with a DPIC on radio. Pre-dive procedures and diver briefing prior to snorkeler entering must be done. Record of snorkeling to be electronically documented in the current format approved by DCB.

Record of Dive

It is the responsibility of the Lead Diver to record all dive operation information.

The following information shall be recorded and maintained for each diving operation:

1. Names of dive team members including standby diver and DPIC
2. Pre-dive safety briefing for all divers
3. Date, time, and location
4. Diving mode(s) used
5. Start and end air pressure for each diver
6. Start and end time of dive
7. Gear used
8. Animal status observations: can include but not limited to general appearance, body condition, now or old wounds, and or current algal condition in the exhibit

It is each diver's responsibility to assess the situation and determine whether or not the objective of the dive can be safely accomplished.

Dives must be started with full scuba tanks near or at 3000 psi, and divers should finish the dive with no less than 500 psi remaining in the tank.

Any diver should decline to dive if he or she is uncomfortable with the diving conditions.

Injuries (no matter how minor) must be reported to the DSO or Curator (in the absence of the DSO) Security and DSO.

Dive Operation Exercises/Training

Diver Down Exercise Surface Tender is Lead Diver

Purpose: The purpose of the exercise is to make sure that the Lead Diver/Standby Diver, DPIC and support staff is able to respond properly to an emergency. The Diver Down Exercise will evaluate all parties involved response to an emergency.

People needed for the Exercise:

1. Lead Diver/Standby Diver
2. Diver one or more may be involved
3. DPIC (designated person in charge)
4. Security
5. Zoo EMS
6. Liberty Township Fire Department
7. Observer Dive Safety Officer (DSO) and/or other supervising staff

Start of the Diver Down Exercise

The Lead Diver should radio the DPIC as follows:

Exercise, Exercise **Dive Site Location DPIC** this is a Diver Down Exercise. This is a Diver Down Exercise.

DPIC should respond on the radio acknowledging the exercise.

DPIC should radio security on channel 1 as follows:

Exercise, Exercise **Dive Site Location DPIC** to Security this is a Diver Down Exercise. Please respond this is a Diver Down Exercise.

Security should acknowledge the Diver Down Exercise and follow emergency radio procedure. Security will also respond to the dive location.

All Animal Care Staff within the region in which the dive operation is being conducted should respond to down diver location for assistance.

DPIC needs to respond to the dive location within 2minutes of the call.

When the DPIC arrives on location they should 1st check in with the Lead Diver of the current situation with the diver/divers. Name of down diver, buddy diver, status.

They should then proceed to grab the rescue equipment (AED if present on location, O2 Kit, Rescue Board) if the items haven't already been acquired by the standby diver.

DPIC is responsible for making sure the Emergency Contact Form for the down diver is given to EMS.

The Exercise will continue with one or several scenarios. Some of the responses to the exercise may or may not use radio communications or physically do the steps but verbally talk through the steps with the Observer(s).

Examples of scenarios:

1. Diver needs recalled due to dangerous animal escape in another area.
2. Solo tethered diver has not moved for a few minutes and has shallow or slow breathing
3. Solo tethered diver has not moved for a few minutes and has shallow or slow breathing. Tether has become entangled or unclipped from the diver.
4. Solo untethered diver has not moved for a few minutes and has shallow or slow breathing
5. Two divers in the water. One diver has not moved for a few minutes and has shallow or slow breathing.

Proper responses to example scenarios:

1. Lead Diver/Standby diver uses recall devise to bring diver/ divers to the surface.
   Divers exit the water.
   Standby diver radios DPIC diver/divers are out of the water.
   Lead Diver/Standby diver responds to the escaped animal location.
   End of Exercise
2. Lead Diver/Standby Diver radios DPIC of down diver.
   Lead Diver/Standby Diver brings the down diver to the surface using the tether.
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented.
   End of Exercise
3. Lead Diver/Standby Diver radios DPIC of down diver.
   Lead Diver/Standby Diver attempts to bring the down diver to the surface using the tether.
   Lead Diver/Standby Diver may don gear but must wait for DPIC and or other responding staff before entering the water and bring the down diver to the surface.
   The down diver is extracted from the water using the extraction board or other means
   The down diver is accessed and first aid implemented
   End of Exercise
4. Lead Diver/Standby Diver radios DPIC of down diver.
   Lead Diver/Standby Diver may don equipment but must wait for DPIC and or other responding staff before entering the water and bring the down diver to the surface.
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented
   End of Exercise
5. Lead Diver/Standby Diver radios DPIC of down diver.
   Lead Diver/Standby Diver uses the recall device to start the response of the other diver if the buddy diver has not already noticed the distressed diver.
   After hearing the recall, the competent diver should start rescue response to bring the unconscious diver to the surface.
   If necessary, the lead diver/standby diver may don rescue gear but must wait for DPIC and or other responding staff before entering the water to assist the down diver to the surface.
   The down diver is extracted from the water using the extraction board or by other means.
   The down diver is accessed and first aid implemented
   End of Exercise

End of Diver Down Exercise:

Security will follow their radio communication procedure for completion of a diver down exercise.

Diver Down Exercise Surface Tender is DPIC

Purpose: The purpose of the exercise is to make sure that the Lead Diver, DPIC and support staff is able to respond properly to an emergency. The Diver Down Exercise will evaluate all parties involved response to an emergency.

People needed for the Exercise:

1. Lead Diver
2. Diver(s) one or more may be involved
3. DPIC (designated person in charge)
4. Security
5. Zoo EMS
6. Liberty Township Fire Department
7. Observer Dive Safety Officer (DSO) and/or other supervising staff

Start of the Diver Down Exercise

DPIC radios diver down exercise:

Exercise, Exercise **Dive Site Location Channel 2** this is a Diver Down Exercise. This is a Diver Down Exercise.

DPIC should radio security on channel 1 as follows:

Exercise, Exercise **Dive Site Location DPIC** to Security this is a Diver Down Exercise. Please respond this is a Diver Down Exercise.

Security should acknowledge the Diver Down Exercise and follow emergency radio procedure. Security will also respond to the dive location.

All Animal Care Staff within the region in which the dive operation is being conducted should respond to down diver location for assistance.

DPIC should assist the rescue diver by any possible means (throw rope, shepherd hook, etc).

They should then proceed to grab the rescue equipment (AED if present on location, O2 Kit, Rescue Board) if the items have not already been acquired by responding support staff.

DPIC is responsible for making sure the Emergency Contact Form for the down diver is given to EMS.

The Exercise will continue with one or several scenarios. Some of the responses to the exercise may or may not use radio communications or physically do the steps but verbally talk through the steps with the Observer(s).

Examples of scenarios:

1. Divers needs recalled due to dangerous animal escape in another area.
2. Two divers in the water. One diver has not moved for a few minutes and has shallow or slow breathing.

Proper responses to example scenarios:

1. Surface Tender/DPIC uses recall devise to check on buddy diver and then surface.
   Divers exit the water.
   DPIC responds to the escaped animal location.
   End of Exercise
2. DPIC uses recall device to notify all divers to check on each other and then surface.
   Buddy Diver brings the down dive to the surface
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented
   End of exercise.

End of Diver Down Exercise:

Security will follow their radio communication procedure for completion of a diver down exercise.

DPIC Response Exercise, Lead Diver is Surface Tender

Purpose: The purpose of the exercise is to make sure that the DPIC is able to respond properly to an emergency. The Lead Diver may or may not also be evaluated on their response to an emergency in this exercise.

People needed for the Exercise:

1. Lead Diver/Standby Diver
2. Diver(s), one or more may be involved
3. DPIC (designated person in charge)
4. Observer Dive Safety Officer (DSO) or other supervising staff

Start of the DPIC Exercise

The Lead Diver/Standby Diver should radio the DPIC as follows:

Exercise, Exercise **Dive Site Location DPIC** this is a DPIC Exercise. This is a DPIC Exercise.

DPIC should respond on the radio acknowledging the exercise.

The DPIC should radio channel 2 as follows:

Exercise, Exercise **Dive Site Location DPIC** this is a DPIC Exercise. This is a DPIC Exercise. No response is needed for this exercise.

DPIC should radio security on channel 1 as follows:

Exercise, Exercise **Dive Site Location DPIC** to Security this is a DPIC Exercise. No response is needed for this exercise. This is a DPIC exercise.

Security should acknowledge of the DPIC Exercise and no further response is needed from Security.

DPIC needs to respond to the dive location within 2minutes of the call.

When the DPIC arrives on location they should 1st check in with the Standby Diver of the current situation with the diver(s). Name of down diver, buddy diver, status.

They should then proceed to grab the rescue equipment (AED if present on location, O2 Kit, Rescue Board) if the items haven't already been acquired by the standby diver.

DPIC is responsible for making sure the Emergency Contact Form for the down diver is given to EMS.

The Exercise will continue with one or several scenarios. Some of the responses to the exercise may or may not use radio communications or physically do the steps but verbally talk through the steps with the Observer.

Examples of scenarios:

1. Diver needs recalled due to dangerous animal escape in another area.
2. Solo tethered diver has not moved for a few minutes and has shallow or slow breathing
3. Solo tethered diver has not moved for a few minutes and has shallow or slow breathing. Tether has become entangled or unclipped from the diver.
4. Solo untethered diver has not moved for a few minutes and has shallow or slow breathing
5. Two divers in the water. One diver has not moved for a few minutes and has shallow or slow breathing.

Proper responses to example scenarios:

1. Standby Diver/Surface Tender uses recall device to alert diver to check on dive buddy (if applicable), then surface
   Divers exit the water.
2. Standby Diver radios DPIC of down diver.
   Standby Diver brings the down diver to the surface using the tether
   The down diver is extracted from the water using the extraction board or by other means.
   The down diver is accessed and first aid implemented.
   End of exercise.
3. Standby diver radios DPIC of down diver.
   Standby diver attempts to bring the down diver to the service using the tether.
   Standby diver may don their rescue gear but must wait for for DPIC and or other responding staff before Entering the water to bring the down diver to the surface.
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented.
   End of exercise
4. Standby diver radios DPIC of down diver.
   Standby diver may don their rescue gear but must wait for DPIC and or other responding staff before entering the water to bring the down diver to the surface.
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented.
   End of Exercise
5. Standby diver radios DPIC of down diver.
   Standby diver uses the recall device to notify all divers to check on each other and then surface.
   The competent diver should start the rescue response to bring the distress diver to the surface.
   If necessary the standby diver can don their rescue gear but must wait for DPIC and or other responding staff before entering the water to assist the down diver to the surface.
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented.
   End of exercise.

End of DPIC Exercise:

DPIC should radio Security as follows:

Exercise, Exercise **Dive Site Location DPIC** to Security, the DPIC Exercise is completed.

DPIC should radio Channel 2 as follows:

Exercise, Exercise **Dive Site Location DPIC** to Channel 2, the DPIC Exercise is completed.

DPIC Response Exercise, DPIC is Surface Tender

Purpose: The purpose of the exercise is to make sure that the DPIC is able to respond properly to an emergency. The Lead Diver may or may not also be evaluated on their response to an emergency in this exercise.

People needed for the Exercise:

5. Lead Diver
6. Diver(s), one or more may be involved
7. DPIC (designated person in charge)
8. Observer Dive Safety Officer (DSO) or other supervising staff

Start of the DPIC Exercise

The DPIC should radio channel 2 as follows:

Exercise, Exercise **Dive Site Location DPIC** this is a DPIC Exercise. This is a DPIC Exercise. No response is needed for this exercise.

DPIC should radio security on channel 1 as follows:

Exercise, Exercise **Dive Site Location DPIC** to Security this is a DPIC Exercise. No response is needed for this exercise. This is a DPIC exercise.

Security should acknowledge of the DPIC Exercise and no further response is needed from Security.

DPIC should then proceed to grab the rescue equipment (AED if present on location, O2 Kit, Rescue Board).

DPIC is responsible for making sure the Emergency Contact Form for the down diver is given to EMS.

The Exercise will continue with one or several scenarios. Some of the responses to the exercise may or may not use radio communications or physically do the steps but verbally talk through the steps with the Observer.

Examples of scenarios:

1. Diver needs recalled due to dangerous animal escape in another area.
2. Two divers in the water. One diver has not moved for a few minutes and has shallow or slow breathing.

Proper responses to example scenarios:

1. DPIC uses recall device to alert divers to check on their dive buddy, then surface.
   Diver exits the water
   DPIC responds to animal escape.
2. DPIC uses the recall device to notify all divers to check on each other and then surface.
   The competent diver should start the rescue response to bring the distress diver to the surface.
   DPIC may assist competent diver with shepherd hook , throw rope or other means.
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented.
   End of exercise.

End of DPIC Exercise:

DPIC should radio Security as follows:

Exercise, Exercise **Dive Site Location DPIC** to Security, the DPIC Exercise is completed.

DPIC should radio Channel 2 as follows:

Exercise, Exercise **Dive Site Location DPIC** to Channel 2, the DPIC Exercise is completed.

Lead Diver/ Standby Diver Exercise

Purpose: The purpose of the exercise is to make sure that the Lead Diver/Standby Diver is able to respond properly to an emergency.

People needed for the Exercise:

1. Lead Diver/Standby Diver
2. Diver one or more may be involved
3. DPIC (DPIC may or may not be radioed for the exercise)
4. Observer Dive Safety Officer (DSO) or other supervising staff

Some of the responses to the exercise may or may not use radio communications or physically do the steps but verbally talk through the steps with the Observer.

Start of Lead Diver Exercise

The Lead Diver should radio the DPIC as follows:

Exercise, Exercise **Dive Site Location** **DPIC** this is a Lead Diver Exercise no response is needed. This is a Lead Diver Exercise no response is needed.

DPIC does not need to respond to the dive location but must acknowledge the exercise.

The Exercise will continue with one or several scenarios.

Examples of scenarios:

1. Diver needs recalled due to dangerous animal escape in another area.
2. Solo tethered diver has not moved for a few minutes and has shallow or slow breathing
3. Solo tethered diver has not moved for a few minutes and has shallow or slow breathing. Tether has become entangled or unclipped from the diver.
4. Solo untethered diver has not moved for a few minutes and has shallow or slow breathing
5. Two divers in the water. One diver has not moved for a few minutes and has shallow or slow breathing.

Proper responses to example scenarios:

1. Lead Diver/Standby Diver uses recall device to alert divers to check on their dive buddy, then surface. Divers exit the water.
   Lead Diver/Standby Diver radios DPIC diver/divers are out of the water.
   Lead Diver/Standby Diver responds to the escaped animal location.
   End of Exercise
2. Lead Diver/Standby Diver radios DPIC of down diver.
   Lead Diver/Standby Diver brings the down diver to the service using the tether.
   The down diver is extracted from the water using the extraction board or other means.
   End of Exercise
3. Lead Diver/Standby Diver radios DPIC of down diver.
   Lead Diver/Standby Diver attempts to bring the down diver to the service using the tether.
   Lead Diver/Standby Diver may don rescue gear but must wait for DPIC and or other responding staff before entering the water to bring the down diver to the surface.
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented.
   End of Exercise

4. Lead Diver/Standby Diver radios DPIC of down diver.
   Lead Diver/Standby Diver may don on rescue gear but must wait for DPIC and or other responding staff before entering the water to bring the down diver to the surface.
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented
   End of Exercise
5. Lead Diver/Standby Diver radios DPIC of down diver.
   Lead Diver/Standby Diver uses the recall device to alert divers to check on their dive buddy, then surface.
   The competent diver should start rescue response to bring the unconscious diver to the surface.
   If necessary, the standby diver may don rescue gear but must wait for DPIC and or other responding staff before entering the water to assist the down diver to the surface.
   The down diver is extracted from the water using the extraction board or other means.
   The down diver is accessed and first aid implemented
   End of Exercise

End of Lead Diver Exercise

The Lead Diver should radio the DPIC as follows:

Exercise, Exercise **Dive Site Location DPIC** the Lead Diver Exercise is completed.

. The DPIC must also acknowledge the end of the exercise.

Sources/References Consulted

-PADI, Open Water Diver Manual

-PADI, Advanced Open Water Diver Manual

-PADI, Rescue Diver Manual

-PADI, Divemaster manual

-PADI Encyclopedia of Recreational Diving

-Red Cross, Lifesaving and Water Safety Manual

-Divers Alert Network (DAN), Underwater Diving Accident Manual

-John G. Shedd Aquarium, Diving Safety Manual

-Aquarium of Americas (AOA), Diving Safety Manual

-National Aquarium in Baltimore (NAIB), Diving Safety Manual

-Tennessee Aquarium, Volunteer Diving Manual

-OSHA, Diving Regulations/ Guidelines

-Ronald K. Andrews, M.D, D.M.O, Family Practice and Diving Medicine

-Clayton H. Atkins, M.D. Family Practice

-Jim Daugherty, PADI Master Instructor

-Randi Wilder, PADI Instructor, Diving Officer at Monterey Bay

-Lifeline Flight Nurses, Methodist Hospital

-U.S. Department of Transportation (Title of Guidelines)

-Indianapolis Zoo and Aquarium, Diving Safety Program

Swimming protocol – Pinnipeds

This SOP document covers staff requirements, tasks and procedures to follow for in-water work/free swim*.

Staff requirements:

- Staff must have current Water Safety Plus certification. Valid for 1 year from date issued
- Staff must have a current CPR certification. Valid for 2 years from date issued

Tasks for in-water/free swim work:

- Remove trash from the surface of a pool
- Clean island rocks
- Put/remove enrichment on island and surface of a pool

Requirements and Procedures:

- Any time there is one or more staff in the water there must be a staff member with the same qualifications on the deck as a Spotter
- Spotter must have a working radio and be on channel 2 during any in-water work/free swim
- Spotter must read and know Columbus Zoos and Aquarium emergency response procedures
- All in water work should be discussed between the in-water personnel(s) and Spotter before beginning tasks
- All staff working under the swimming protocol described are not allowed to snorkel, breath hold diving/freediving or submerge their heads underwater at any point in time of their work while in the water.
- The use of any type of compressed gas (air, nitrox, oxygen) is not allowed while performing the tasks described above for in water work.
- All staff should be aware of the location of the emergency equipment around the pools (rope bags, life rings, etc…).
- No animals may be in the enclosure staff is working in.

*in-water work/free swim means that head cannot be submerged under the water and staff must remain at the surface

June 2022

Appendix A

Emergency Contact/Medical Information

Employee Information Date: _____

Name: _____ Department: _____

Home Address: (Street) _____

(City) _____ (State) _____ (Zip) _____

Home Phone #: _____ Cell #: _____

Home Email Address: _____ Date of Birth _____

Emergency Contact Information

1st Choice Name: _____ Relationship: _____

Phone #1: _____ Phone #2: _____

2nd Choice Name: _____ Relationship: _____

Phone #1: _____ Phone #2: _____

Personal Information (Voluntary)

Preferred Hospital: _____

Preferred Physician: _____ Phone #: _____

Allergies to Medications: _____

Special Instructions: _____

Revised HR 8/03/06

Appendix B

Dive Program Swim/Dive Test with Full Face Mask

General Information:			
Last Name:		**Department:**	
First Name:			

Guidelines:
Any staff member applying to the Columbus Zoo and Aquarium Dive Program (CZAMDP) will be required to pass this standardized swim test. The participant must complete all the requirements below without buoyancy devices and only wearing a swimsuit (no wetsuits).

Performance Requirements:

- ☐ Able to Swim 100 yards (5 laps manatee rehab pool)
- ☐ Able to comfortably tread water for 10 minutes without buoyant device(s)
- ☐ Able to free dive and retrieve a 10lb weight belt from the bottom pool
- ☐ Able to get in and out of pool unassisted
- ☐ Able to demonstrate a good working knowledge of SCUBA equipment
- ☐ Able to properly set-up and break-down SCUBA equipment
- ☐ Able to do a safety check
- ☐ Able to comfortably clear mask
- ☐ Able to do a regulator recovery comfortably
- ☐ Able to demonstrate safe ascents and descents
- ☐ Able to rescue an unconscious diver from the bottom of the pool
- ☐ Able to surface tow unconscious diver 25 yards (2.5 lengths of manatee rehab pool)
- ☐ Able to enter and exit the exhibit safely
- ☐ Able to demonstrate neutral buoyancy
- ☐ Able to perform an out of air self-rescue with a spare air/ alternate air source.
- ☐ Full face mask check out dive and training
- ☐ BCD removal and replace

Authorization:			
☐ **Passed**	The candidate successfully completed all the Performance Requirements listed above without any unreasonable difficulties.		
☐ **Failed**	The candidate DID NOT successfully complete all the Performance Requirements above and/or had unreasonable difficulties.		
Dive Safety Officer Signature:		**Date Signed:** (MM/DD/YYYY)	

Updated 6/2020

Appendix B (continued)

Dive Program Swim/Dive Test without Full Face Mask

General Information:			
Last Name:		**Department:**	
First Name:			

Guidelines:
Any staff member applying to the Columbus Zoo and Aquarium Dive Program (CZAMDP) will be required to pass this standardized swim test. The participant must complete all the requirements below without buoyancy devices and only wearing a swimsuit (no wetsuits).

Performance Requirements:

- ☐ Able to Swim 100 yards (5 laps manatee rehab pool)
- ☐ Able to comfortably tread water for 10 minutes without buoyant device(s)
- ☐ Able to free dive and retrieve a 10lb weight belt from the bottom pool
- ☐ Able to get in and out of pool unassisted
- ☐ Able to demonstrate a good working knowledge of SCUBA equipment
- ☐ Able to properly set-up and break-down SCUBA equipment
- ☐ Able to do a safety check
- ☐ Able to comfortably clear mask
- ☐ Able to do a regulator recovery comfortably
- ☐ Able to demonstrate safe ascents and descents
- ☐ Able to rescue an unconscious diver from the bottom of the pool
- ☐ Able to surface tow unconscious diver 25 yards (2.5 lengths of manatee rehab pool)
- ☐ Able to enter and exit the exhibit safely
- ☐ Able to demonstrate neutral buoyancy
- ☐ Able to perform an out of air self-rescue with a spare air/ alternate air source.
- ☐ N/A Full face mask check out dive and training
- ☐ BCD removal and replace

Authorization:			
☐ **Passed**	The candidate successfully completed all the Performance Requirements listed above without any unreasonable difficulties.		
☐ **Failed**	The candidate DID NOT successfully complete all the Performance Requirements above and/or had unreasonable difficulties.		
Dive Safety Officer Signature:		**Date Signed:** (MM/DD/YYYY)	

Updated 6/2020

Appendix C

Physician's Authorization for Diving

DIVER

Please print legibly.

Name_____

Birth Date _____ Age _____

Mailing Address

_____

_____

Home Phone (_____)_____

Mobile Phone (_____)_____

Email _____

PHYSICIAN

This person applying is presently certified to engage in scuba (self-contained underwater breathing apparatus) diving. Your opinion of the applicant's medical fitness for scuba diving is requested. There are guidelines attached for your information and reference.

Physician's Impression

☐ I find no medical conditions that I consider incompatible with diving.

☐ I am unable to recommend this individual for diving.

Remarks

_____

_____

_____ Date _____

Physician's Signature or Legal Representative of Medical Practitioner

Physician_____

Clinic/Hospital_____

Address_____

Phone (_____)_____ Updated 5/2015

Guidelines for Recreational Scuba Diver's Physical Examination

Instructions to the Physician:

Recreational **SCUBA** (Self-Contained Underwater Breathing Apparatus) can provide recreational divers with an enjoyable sport safer than many other activities. The risk of diving is increased by certain physical conditions, which the relationship to diving may not be readily obvious. Thus, it is important to screen divers for such conditions.

The **RECREATIONAL SCUBA DIVER'S PHYSICAL EXAMINATION** focuses on conditions that may put a diver at increased risk for decompression sickness, pulmonary overinflation syndrome with subsequent arterial gas embolization and other conditions such as loss of consciousness, which could lead to drowning. Additionally, the diver must be able to withstand some degree of cold stress, the physiological effects of immersion and the optical effects of water and have sufficient physical and mental reserves to deal with possible emergencies.

The history, review of systems and physical examination should include as a minimum the points listed below. The list of conditions that might adversely affect the diver is not all-inclusive, but contains the most commonly encountered medical problems. The brief introductions should serve as an alert to the nature of the risk posed by each medical problem.

The potential diver and his or her physician must weigh the pleasures to be had by diving against an increased risk of death or injury due to the individual's medical condition. As with any recreational activity, there are no data for diving enabling the calculation of an accurate mathematical probability of injury. Experience and physiological principles only permit a qualitative assessment of relative risk.

For the purposes of this document, **Severe Risk** implies that an individual is believed to be at substantially elevated risk of decompression sickness, pulmonary or otic barotrauma or altered consciousness with subsequent drowning, compared with the general population. The consultants involved in drafting this document would generally discourage a student with such medical problems from diving. **Relative Risk** refers to a moderate increase in risk, which in some instances may be acceptable. To make a decision as to whether diving is contraindicated for this category of medical problems, physicians must base their judgement on an assessment of the individual patient. Some medical problems which may preclude diving are **temporary** in nature or responsive to treatment, allowing the student to dive safely after they have resolved.

Diagnostic studies and specialty consultations should be obtained as indicated to determine the diver's status. A list of references is included to aid in clarifying issues that arise. Physicians and other medical professionals of the Divers Alert Network (DAN) associated with Duke University Health System are available for consultation by phone +1 919 684 2948 during normal business hours. For emergency calls, 24 hours 7 days a week, call +1 919 684 8111 or +1 919 684 4DAN (collect). Related organizations exist in other parts of the world – DAN Europe in Italy +39 039 605 7858, DAN S.E.A.P. in Australia +61 3 9886 9166 and Divers Emergency Service (DES) in Australia +61 8 8212 9242, DAN Japan +81 33590 6501 and DAN Southern Africa +27 11 242 0380. There are also a number of informative websites offering similar advice.

NEUROLOGICAL

Neurological abnormalities affecting a diver's ability to perform exercise should be assessed according to the degree of compromise. Some diving physicians feel that conditions in which there can be a waxing and waning of neurological symptoms and signs, such as migraine or demyelinating disease, contraindicate diving because an exacerbation or attack of the preexisting disease (e.g.: a migraine with aura) may be difficult to distinguish from neurological decompression sickness. A history of head injury resulting in unconsciousness should be evaluated for risk of seizure.

Relative Risk Conditions

- **Complicated Migraine Headaches whose symptoms or severity impair motor or cognitive function, neurologic manifestations**
- **History of Head Injury with sequelae other than seizure**
- **Herniated Nucleus Pulposus**
- **Intracranial Tumor or Aneurysm**
- **Peripheral Neuropathy**
- **Multiple Sclerosis**
- **Trigeminal Neuralgia**
- **History of spinal cord or brain injury**

Temporary Risk Condition

History of cerebral gas embolism without residual where pulmonary air trapping has been excluded and for which there is a satisfactory explanation and some reason to believe that the probability of recurrence is low.

Severe Risk Conditions

Any abnormalities where there is a significant probability of unconsciousness, hence putting the diver at increased risk of drowning. Divers with spinal cord or brain abnormalities where perfusion is impaired may be at increased risk of decompression sickness.

Some conditions are as follows:

- **History of seizures other than childhood febrile seizures**
- **History of Transient Ischemic Attack (TIA) or Cerebrovascular Accident (CVA)**
- **History of Serious (Central Nervous System, Cerebral or Inner Ear) Decompression Sickness with residual deficits**

CARDIOVASCULAR SYSTEMS

Relative Risk Conditions

The diagnoses listed below potentially render the diver unable to meet the exertional performance requirements likely to be encountered in recreational diving. These conditions may lead the diver to experience cardiac ischemia and its consequences. Formalized stress testing is encouraged if there is any doubt regarding physical performance capability. The suggested minimum criteria for stress testing in such cases is at least 13 METS.* Failure to meet the exercise criteria would be of significant concern. Conditioning and retesting may make later qualification possible. Immersion in water causes a redistribution of blood from the periphery into the central compartment, an effect that is greatest in cold water. The marked increase in cardiac preload during immersion can precipitate pulmonary edema in patients with impaired left ventricular function or significant valvular disease. The effects of immersion can mostly be gauged by an assessment of the diver's performance while swimming on the surface. A large proportion of scuba diving deaths in North America are due to coronary artery disease. Before being approved to scuba dive, individuals older than 40 years are recommended to undergo risk assessment for coronary artery disease. Formal exercise testing may be needed to assess the risk.

* METS is a term used to describe the metabolic cost. The MET at rest is one, two METS is two times the resting level, three METS is three times the resting level, and so on. The resting energy cost (net oxygen requirement) is thus standardized. (Exercise Physiology; Clark, Prentice Hall, 1975.)

Relative Risk Conditions

- **History of Coronary Artery Bypass Grafting (CABG)**
- **Percutaneous Balloon Angioplasty (PCTA) or Coronary Artery Disease (CAD)**
- **History of Myocardial Infarction**
- **Congestive Heart Failure**
- **Hypertension**
- **History of dysrythmias requiring medication for suppression**
- **Valvular Regurgitation**

Pacemakers

The pathologic process that necessitated should be addressed regarding the diver's fitness to dive. In those instances where the problem necessitating pacing does not preclude diving, will the diver be able to meet the performance criteria?

*** NOTE: Pacemakers must be certified by the manufacturer as able to withstand the pressure changes involved in recreational diving.**

Severe Risks

Venous emboli, commonly produced during decompression, may cross major intracardiac right-to-left shunts and enter the cerebral or spinal cord circulations causing neurological decompression illness. Hypertrophic cardiomyopathy and valvular stenosis may lead to the sudden onset of unconsciousness during exercise.

PULMONARY

Any process or lesion that impedes airflow from the lungs places the diver at risk for pulmonary overinflation with alveolar rupture and the possibility of cerebral air embolization. Many interstitial diseases predispose to spontaneous pneumothorax: Asthma (reactive airway disease), Chronic Obstructive Pulmonary Disease (COPD), cystic or cavitating lung diseases may all cause air trapping. The 1996 Undersea and Hyperbaric Medical Society (UHMS) consensus on diving and asthma indicates that for the risk of pulmonary barotrauma and decompression illness to be acceptably low, the asthmatic diver should be asymptomatic and have normal spirometry before and after an exercise test. Inhalation challenge tests (e.g.: using histamine, hypertonic saline or methacholine) are not sufficiently standardized to be interpreted in the context of scuba diving.

A pneumothorax that occurs or reoccurs while diving may be catastrophic. As the diver ascends, air trapped in the cavity expands and could produce a tension pneumothorax.

In addition to the risk of pulmonary barotrauma, respiratory disease due to either structural disorders of the lung or chest wall or neuromuscular disease may impair exercise performance. Structural disorders of the chest or abdominal wall (e.g.: prune belly), or neuromuscular disorders, may impair cough, which could be life threatening if water is aspirated. Respiratory limitation due to disease is compounded by the combined effects of immersion (causing a restrictive deficit) and the increase in gas density, which increases in proportion to the ambient pressure (causing increased airway resistance). Formal exercise testing may be helpful.

Relative Risk Conditions

- **History of Asthma or Reactive Airway Disease (RAD)***
- **History of Exercise Induced Bronchospasm (EIB)***
- **History of solid, cystic or cavitating lesion***
- **Pneumothorax secondary to:**
  - **-Thoracic Surgery**
  - **-Trauma or Pleural Penetration***
  - **-Previous Overinflation Injury***
- **Obesity**
- **History of Immersion Pulmonary Edema Restrictive Disease***
- **Interstitial lung disease: May increase the risk of pneumothorax**

* Spirometry should be normal before and after exercise

Active Reactive Airway Disease, Active Asthma, Exercise Induced Bronchospasm, Chronic Obstructive Pulmonary Disease or history of same with abnormal PFTs or a positive exercise challenge are concerns for diving.

Severe Risk Conditions

- **History of spontaneous pneumothorax.** Individuals who have experienced spontaneous pneumothorax should avoid diving, even after a surgical procedure designed to prevent recurrence (such as pleurodesis). Surgical procedures either do not correct the underlying lung abnormality (e.g.: pleurodesis, apical pleurectomy) or may not totally correct it (e.g.: resection of blebs or bullae).
- **Impaired exercise performance due to respiratory disease.**

GASTROINTESTINAL

Temporary Risks

As with other organ systems and disease states, a process which chronically debilitates the diver may impair exercise performance. Additionally, dive activities may take place in areas remote from medical care. The possibility of acute recurrences of disability or lethal symptoms must be considered.

Temporary Risk Conditions

- **Peptic Ulcer Disease associated with pyloric obstruction or severe reflux**
- **Unrepaired hernias of the abdominal wall large enough to contain bowel within the hernia sac could incarcerate.**

Relative Risk Conditions

- **Inflammatory Bowel Disease**
- **Functional Bowel Disorders**

Severe Risks

Altered anatomical relationships secondary to surgery or malformations that lead to gas trapping may cause serious problems. Gas trapped in a hollow viscous expands as the divers surfaces and can lead to rupture or, in the case of the upper GI tract, emesis. Emesis underwater may lead to drowning.

Severe Risk Conditions

- **Gastric outlet obstruction of a degree sufficient to produce recurrent vomiting**
- **Chronic or recurrent small bowel obstruction**
- **Severe gastroesophageal reflux**
- **Achalasia**
- **Paraesophageal Hernia**

ORTHOPAEDIC

Relative impairment of mobility, particularly in a boat or ashore with equipment weighing up to 18 kgs/40 pounds must be assessed. Orthopaedic conditions of a degree sufficient to impair exercise performance may increase the risk.

Relative Risk Conditions

- **Amputation**
- **Scoliosis must also assess impact on respiratory function and exercise performance.**
- **Aseptic Necrosis possible risk of progression due to effects of decompression (evaluate the underlying medical**

cause of decompression may accelerate/escalate the progression).

Temporary Risk Conditions

- **Back pain**

HEMATOLOGICAL

Abnormalities resulting in altered rheological properties may theoretically increase the risk of decompression sickness. Bleeding disorders could worsen the effects of otic or sinus barotrauma, and exacerbate the injury associated with inner ear or spinal cord decompression sickness. Spontaneous bleeding into the joints (e.g.: in hemophilia) may be difficult to distinguish from decompression illness.

Relative Risk Conditions

- **Sickle Cell Disease**
- **Polycythemia Vera**
- **Leukemia**
- **Hemophilia/Impaired Coagulation**

METABOLIC AND ENDOCRINOLOGICAL

With the exception of diabetes mellitus, states of altered hormonal or metabolic function should be assessed according to their impact on the individual's ability to tolerate the moderate exercise requirement and environmental stress of sport diving. Obesity may predispose the individual to decompression sickness, can impair exercise tolerance and is a risk factor for coronary artery disease.

Relative Risk Conditions

- **Hormonal Excess or Deficiency**
- **Obesity**
- **Renal Insufficiency**

Severe Risk Conditions

The potentially rapid change in level of consciousness associated with hypoglycemia in diabetics on insulin therapy or certain oral hypoglycemic medications can result in drowning. Diving is therefore generally contraindicated, unless associated with a specialized program that addresses these issues. [See "Guidelines for Recreational Diving with Diabetes" at www/wrstc.com and www.diversalertnetwork.org.]

Pregnancy: The effect of venous emboli formed during decompression on the fetus has not been thoroughly investigated. Diving is therefore not recommended during any stage of pregnancy or for women actively seeking to become pregnant.

BEHAVIORAL HEALTH

Behavioral: The diver's mental capacity and emotional make-up are important to safe diving. The student diver must have sufficient learning abilities to grasp information presented to him by his instructors, be able to safely plan and execute his own dives and react to changes around him in the underwater environment. The student's motivation to learn and his ability to deal with potentially dangerous situations are also crucial to safe scuba diving.

Relative Risk Conditions

- **Developmental delay**
- **History of drug or alcohol abuse**
- **History of previous psychotic episodes**
- **Use of psychotropic medications**

Severe Risk Conditions

- **Inappropriate motivation to dive – solely to please spouse, partner or family member, to prove oneself in the face of personal fears**
- **Claustrophobia and agoraphobia**
- **Active psychosis**
- **History of untreated panic disorder**
- **Drug or alcohol abuse**

OTOLARYNGOLOGICAL

Equalisation of pressure must take place during ascent and descent between ambient water pressure and the external auditory canal, middle ear and paranasal sinuses. Failure of this to occur results at least in pain and in the worst case rupture of the occluded space with disabling and possible lethal consequences.

The inner ear is fluid filled and therefore noncompressible. The flexible interfaces between the middle and inner ear, the round and oval windows are, however, subject to pressure changes. Previously ruptured but healed round or oval window membranes are at increased risk of rupture due to failure to equalise pressure or due to marked overpressurisation during vigorous or explosive Valsalva manoeuvres.

The larynx and pharynx must be free of an obstruction to airflow. The laryngeal and epiglotic structure must function normally to prevent aspiration.

Mandibular and maxillary function must be capable of allowing the patient to hold a scuba mouthpiece. Individuals who have had mid-face fractures may be prone to barotrauma and rupture of the air filled cavities involved.

Relative Risk Conditions

- **Recurrent otitis externa**
- **Significant obstruction of external auditory canal**
- **History of significant cold injury to pinna**
- **Eustachian tube dysfunction**
- **Recurrent otitis media or sinusitis**
- **History of TM perforation**
- **History of tympanoplasty**
- **History of mastoidectomy**
- **Significant conductive or sensorineural hearing impairment**
- **Facial nerve paralysis not associated with barotrauma**
- **Full prosthedontic devices**
- **History of mid-face fracture**
- **Unhealed oral surgery sites**
- **History of head and/or neck therapeutic radiation**
- **History of temperomandibular joint dysfunction**
- **History of round window rupture**

Severe Risk Conditions

- **Monomeric TM**
- **Open TM perforation**
- **Tube myringotomy**
- **History of stapedectomy**
- **History of ossicular chain surgery**
- **History of inner ear surgery**
- **Facial nerve paralysis secondary to barotrauma**
- **Inner ear disease other than presbycusis**
- **Uncorrected upper airway obstruction**
- **Laryngectomy or status post partial laryngectomy**
- **Tracheostomy**
- **Uncorrected laryngocele**
- **History of vestibular decompression sickness**

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10. Undersea and Hyperbaric Medical Society (UHMS) www.UHMS.org
11. Divers Alert Network (DAN) United States, 6 West Colony Place, Durham, NC www.DiversAlertNetwork.org
12. Divers Alert Network Europe, P.O. Box 64026 Roseto, Italy, telephone non-emergency line: weekdays office hours +39-085-893-0333, emergency line 24 hours: +39-039-605-7858
13. Divers Alert Network S.E.A.P., P. O. Box 384, Ashburton, Australia, telephone 61-3-9886-9166
14. Divers Emergency Service, Australia, www.rah.sa.gov.au/hyperbaric, telephone 61-8-8212-9242
15. South Pacific Underwater Medicine Society (SPUMS), P.O. Box 190, Red Hill South, Victoria, Australia, www.spums.org.au
16. European Underwater and Baromedical Society, www.eubs.org

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6 West Colony Place
Durham, NC 27705

Appendix D: CZA Dive Safety Board Diving Accident/Incident Report

CZA Dive Safety Board Diving Accident/Incident Report

Date: _____

Name of Diver: _____

Location of Incident: _____

Equipment: _____

Serial Numbers: _____

Exhibit: _____

Bottom Time: _____

Circumstances:

Appendix E: CZA Dive Safety Board Diving Violation and Corrective Action Form

Date: _____

Name Staff or Volunteer incurring the violation:

Violation :

Corrective Action:

Appendix F: Volunteer Diver Application and Waiver

Volunteer Diver Application & Waiver

Volunteer Diver Program Basic Requirements

Volunteer diver must fulfill the following requirements to participate in the Volunteer Diver Program:

- Documentation that participant is at least 18 years of age;
- Documentation of SCUBA certification to the level of open water from a recognized agency such as SDI, PADI or NAUI.
- Submission of photocopy of last two dive log entries.
- Proof of completion of 10 open water dives (certification dives are not considered open water dives) and/or proof of completion of an in-water skills test administered by Dive Safety Officer.
- Completed and signed Columbus Zoo Volunteer Diver Application.
- Submission of a physician's statement certifying that participant is physically and mentally capable of diving (Appendix C Physician Authorization for Diving). Medical documentation must be submitted to Zoo annually.
- Successful completion of volunteer diver training class.
- Successful completion of diving orientation requirements established by Shores Department.
- Completion of CZA annual Dive Swim Evaluation (Appendix B)
- Completion of CZA Volunteer Waiver
- Completion of CZA background check
- Completion of CZA Emergency Contact Form
- Completion of reading CZA Dive Safety Manual
- Recognition and acceptance that dives will only be completed while under the direct supervision of a member of CZA dive staff

ACKNOWLEDGEMENT

I have read and understand the Volunteer Diver Program Basic Requirements and my signature indicates that I agree to these terms and conditions. I understand that each of the requirements for the program must be completed prior to participation. I further recognize that the information contained in this document is subject to change without notification.

Signature: _____ Date: _____

Appendix F (continued)

Volunteer Diver Application

Name: _____

Address: _____

_____

Phone: (cell) _____

(work) _____

E-mail:_____

Dive History Information

SCUBA certifying agency: _____ Date of Certification: _____

Circle highest SCUBA certification: OW AOW Rescue Divemaster other:

Number of logged open water dives (not including certification dives):

Other special SCUBA skills or training useful for Discovery Reef diving:

PLEASE ATTACH A COPY OF FRONT AND BACK OF C-CARD AND LAST TWO LOGGED DIVES

Educational Information

Circle highest degree completed: H.S. Associate Bachelor Master PhD MD Other_____

Do you have any special training/knowledge in marine biology or ecology, ichthyology, animal behavior, etc? (circle) Yes No If yes, please describe:

_____

_____

Are you comfortable speaking to large groups (>200)? (circle) Yes No

List experience/training you have in public speaking: _____

Volunteer Commitments and Availability

Do you agree to attend three training sessions Yes No

Appendix F (continued)

Once you have completed the volunteer diver training program, do you agree to schedule a minimum of eight dives (noon – 2, which includes prep, during summer months and/or between 6 - 8pm during Wildlights).

Note: Actual number of dives may vary due to zoo needs. Yes No

For the Zoo's special events, including but not limited to Boo at the Zoo, Eggs Paws 'n Claws, and Wildlights, divers are required to wear special, themed dive costumes. Do you agree to wear costumes during these dives?

Yes No

There may be times where you could be asked to wear a full face mask with a U/W communication system. Do you agree to wearing a full facemask with communication system during dives as well as do an annual skills evaluation with the full face mask? Skill evaluation involves complete removal of mask underwater and replacement and clearing mask of water. Yes No

Appendix F (continued)

Please attach the following:

___ Photocopy of driver license

___ Photocopy of highest level SCUBA certification card (both sides)

___ Photocopy of last two dive log book entries

___ Submission of a physician's statement certifying that participant is physically and mentally capable of diving (Appendix C Physician Authorization for Diving). Medical documentation must be submitted to Zoo annually.

___ Signed Volunteer Diver Program Basic Requirements

___ Signed Volunteer Participant Waiver

___ Volunteer Diver Emergency Contact/Medical Information

To complete this application each of the foregoing must be attached to the application. The application will not be processed without this information.

Please list any other pertinent skills or training:

_____

_____

_____

PLEASE RETURN APPLICATION FORM TO:

GINGER EARLEY/VOLUNTEER COORDINATOR AND RAMON VILLAVERDE/DSO

GINGER.EARLEY@COLUMBUSZOO.ORG AND RAMON.VILLAVERDE@COLUMBUSZOO.ORG

COLUMBUS ZOO AND AQUARIUM

P.O. BOX 400

POWELL, OH 43065

Appendix F (continued)

Volunteer Diver/ Participant Waiver

Must be completed in full and signed

This agreement is made and entered into by and between The Columbus Zoo and Aquarium and:

Participant Name_____

Address_____

City/State/Zip_____

Home Phone_____ Cell Phone _____

Email Address_____

(The "Participant"), and the Participant acknowledges an understanding of, consent to, and receipt of, a copy of this agreement.

AGREEMENT

The parties to this agreement recognize that there are certain risks of injury and damage to health or property inherent in the activity to be performed by the Participant. Accordingly, the Participant does hereby knowingly waive his or her any cause of action against the Columbus Zoo, and its funders, Franklin County and the City of Columbus, Ohio, the officers, directors, employees and insurers of the foregoing and does hereby release and hold harmless all the foregoing from any and all causes of action, claims, damages, liabilities, obligations, loss, personal loss and expenses, in whatever nature, including reasonable attorney fees and expenses in connection with or arising out of injury, accident, illness or property damage sustained by the Participant while acting in such capacity.

The Participant agrees to abide by all laws, rules, regulations, policies and procedures governing the safety of the Columbus Zoo, its property, employees, volunteers and guests.

The Participant acknowledges that he or she has been encouraged to consult with his or her personal insurance agent regarding insurance and health coverage for injuries and losses sustained during activities at the

Non-zoo employees (such as the Participant) are generally not permitted access to non-public areas of the Zoo. With prior approval of the general curator, volunteers may work in animal food preparation areas and offices, however, all exceptions (other than emergency animal watches) that would occur have to be outlined in writing and approved, in advance, by the volunteer, the curator of the department and forwarded to the Vice President of Animal Care. This is for the protection of the volunteers as well as the animals. Any variation from this procedure will result in the loss of access privileges in this department.

Columbus Zoo.

Participant Signature_____Date_____

THE COLUMBUS ZOO AND AQUARIUM

By:_____Date_____
Columbus Zoo Representative

Appendix G

Emergency Response Plan for Down Diver

Steps when Lead Diver is the Surface Tender

1. Lead Diver calls DPIC of down diver emergency
2. DPIC responds to acknowledge down diver call
3. DPIC calls Security of down diver
4. DPIC responds to location of down diver
5. Lead Diver assist extraction of down diver
6. Security announces down diver on all channels using the following procedures:
   (TONE) “Safety Threat, Safety Threat: Diver Down location. All responding personnel switch to Channel 16
7. Dispatch Zoo EMS and Rangers with AED to location
8. Security contact DELCOM on the 800 radio and direct first responders to appropriate location
9. Security sends text alert to all staff
10. Once all clear, announce on all channels

Steps when DPIC is the Surface Tender

1. DPIC calls Security on channel 1 of down diver emergency
2. DPIC assist down diver extraction
3. Security announces down diver on all channels using the following procedures:
   (TONE) “Safety Threat, Safety Threat: Diver Down location. All responding personnel switch to Channel 16
4. Dispatch Zoo EMS and Rangers with AED to location
5. Security contact DELCOM on the 800 radio and direct first responders to appropriate location
6. Security sends text alert to all staff
7. Once all clear, announce on all channels

Appendix H ENTERING DANGEROUS ANIMAL HABIATS

Keeping our animal habitats in proper working order for the animals, guests, and animal care staff requires upkeep from multiple departments. The zoo has identified a potential risk due to the dangerous nature of some of the animals occupying these enclosures combined with obstructed views that create visibility issues in the yards. To help ensure safety zoo wide, animal care has developed a standardized protocol to help account for all individuals who have permission to enter the enclosures. The zoo has identified the following habitats where this protocol will be followed:

- Orangutan
- Bonobo
- Tiger
- Tiger Hut
- Sloth Bear
- Elephant
- Rhino and Elephant South Yards
- Lion
- Polar Bear
- Brown Bear

Any staff member not regularly scheduled to be working in the area who needs to enter one of the habitats listed above should follow the protocols listed below:

Any staff member entering one of the habitats listed above should follow the protocols listed below:

1. Radio the appropriate department and ask for permission to enter the yard. Receive confirmation prior to entering. This protocol must be followed even if the yard is currently open (i.e. never enter an open yard looking for a keeper to speak to)
2. Each individual should take a habitat access tag (see pictures below). Please write your name along the top of the tag holder and take the corresponding carabineer tag with you as you enter the habitat. Keeper staff will direct you to the location of the tags when answering your request to enter.
    - Keep the tag with you the entire time you are working in the area. It is okay to return to your vehicle to get supplies without radioing the staff; however if you need to return to your "shop"/office for any reason, please notify the keepers of your departure and update them on your timeline for return.
3. When you are leaving the habitat for an extended period of time or you are finished, please return the tag to the holder.
4. Radio the departmental staff to let them know you have completed your work and that you are out of the habitat.
5. Keeper staff should check the access tag holder to ensure all personal are out of the habitat prior to securing the habitat and shifting animals out.
6. Divers and Standby divers are a part of the regularly scheduled team working in the area and do not pick up tags as they check in/check out with the staff shifting animals.

Habitat Access Tags

Habitat Access Tags when a person is in one of the ha