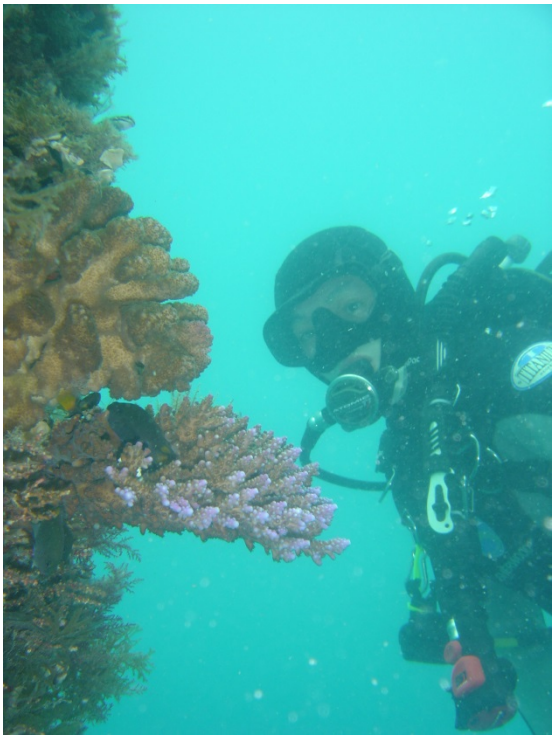
JAMES COOK UNIVERSITY
AUSTRALIA

Scientific Diving Operations Manual



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Feb 2019	Updated section 8 – snorkelling procedures. Updated emergency flowcharts – Missing diver, treatment for injured diver in section 9 – Emergency Procedures Added; Appendix 1 – snorkelling health declaration, Appendix 2 – competency assessment for snorkelling, Appendix 3 – take 5 checklist, Appendix 16 – OIRS emergency evacuation procedure, Appendix 17 – Snorkelling Standard, Form 7 – Snorkel Log	G.Ewels	BDSC
Mar 2020	Rewrite Draft Version 1 (DV3) provided by Professional Diving Services (PDS)	M.Venturoni, K.Clifton-Bligh, F.Zeigler	Reviewed by B&D Unit
Sep 2020	Overhaul of layout and alignment with current Australian Standards, Regulations and Codes of Practice.	Boating & Diving Unit	BDSC

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Contents

1 SCOPE

This document relates to authorised James Cook University SCUBA diving and snorkelling activities which are carried out for research, education and other university purposes, which can be typically classified as 'Scientific Diving'.

This Manual applies to all SCUBA diving and snorkelling activities (i.e. recreational, aquarium, resource management, research and teaching), regardless of the purpose or time, conducted from JCU owned, hired or chartered boats, during an approved field trip, or other land based facilities.

A dive site controlled by a JCU Diving Coordinator will always follow JCU diving procedures, regardless of the dive site location, or the vessel(s) being used, or other external persons involved, and must be authorised prior to commencement through the *Riskware Field Trip Module*.

If a JCU diver is conducting work at a site controlled by another organisation, the activity will only be approved if the procedures in use offer the same or higher level of safety than JCU procedures.

The following activities are ***not*** authorised activities under this Operations Manual:

- diving to depths of greater than 30 meters;
- diving with gas mixtures other than air or enriched air nitrox (EANx) (including in water decompression using oxygen);
- Decompression Stop Diving;
- Surface Supplied Breathing Apparatus (SSBA) Diving Operations; and
- diving with closed circuit, semi-closed circuit or oxygen rebreather equipment.

1.1 OBJECTIVES

The purpose of this Manual is to ensure that scientific diving and snorkelling carried out under the auspices of James Cook University is conducted in such a manner as to:

- ensure compliance with Work Health and Safety Regulations and industry Codes of Practice;
- apply current best practice to eliminate or minimise risk in the work place;
- adopt a uniform approach across JCU sites and activities; and
- set training and certification standards to allow a working reciprocity between scientific institutions.

1.2 DUTY OF CARE AND LEGAL RESPONSIBILITIES

Every person participating in the workplace has a Duty of Care for their own health, safety and wellbeing, as well as for the health, safety and wellbeing of other personnel working in the same environment.

Diving and snorkelling has inherent hazards, however appropriate education, training and following proper procedures will lower risk.

Individuals or groups participating in JCU authorised SCUBA diving or snorkelling activities must operate within the guidelines and intent of all JCU standards and procedures.

Individuals or groups who fail to follow safe diving practices as outlined by this Manual, or as directed by a JCU Boating & Diving Officer (BDO) and Dive Coordinator (DC), may be held personally responsible and liable for their actions in the event of any incident.

The nominated Dive Coordinator for a field trip is responsible for the entire dive team during the period in which that dive team is under his/her control, however it must be noted that minimising risk is the responsibility of all team members.

Any direction given or tasks assigned by the Dive Coordinator must be within the experience, training and capability of the diving personnel concerned.

1.3 RISK ASSESSMENT GUIDELINES

All staff, contractors, adjuncts, volunteers and others of JCU have a responsibility to take reasonable care for the health and safety of themselves and that their acts or omissions do not adversely affect the health and safety of other persons. This includes the implementation of risk control measures within their control to prevent injuries or illnesses. The WHS-PRO-001 WHS Responsibilities Procedure outlines these responsibilities in detail.

Risk Assessments are the primary tool for implementing the risk management process in the workplace. The JCU WHS Risk Management Procedure (HSE-PRO-011) states:

"Risk Owners must become, and maintain competency in, the implementation of risk management processes within the work area to which they have been authorised."

Specific responsibilities include:

- documenting information about how work health and safety risks will be managed in the Risk Register, Riskware;
- consult with all workers and others that may be impacted by the activity to which the risk assessment is being prepared;
- monitor and review risk assessments to ensure the controls that have been applied are effective in minimising the risk to as low as reasonably practicable.

All risk assessments must be recorded in RiskWare. RiskWare is the approved Risk Register of JCU. Activities relating to diving and snorkelling can only be approved once risks specific to the work being undertaken are controlled and registered in RiskWare.

Examples of risks specific to the work being undertaken may not necessarily be included in general training or induction processes, and could include:

- collecting samples;
- transporting equipment underwater;
- light/simple duties being undertaken by breath-hold diving or snorkelling;
- lowering objects from the surface into the water and/or retrieval;
- the use of sometimes cumbersome equipment such as DOVs, pneumatic tools, exclusion cages; and
- installation of star pickets.

A worker is to follow the requirements outlined to effectively manage the health and safety risks that might arise out of the conduct of the University's activities. In practice, this means to:

- report hazards when identified;
- participate in the risk management processes when required; and
- comply with all risk control procedures and policies that have been implemented to prevent or minimise incidents and injuries.

The JCU Risk Matrix is included as *Appendix 6* of this manual.

1.4 REFERENCED MATERIAL AND POLICY INSTRUMENTS

- **AS/NZS 2299.1:2015 Occupational diving operations - Standard operational practice**
- **AS/NZS 2299.2:2002 Occupational diving operations - Scientific diving**
- **AS 2815.1:2008 Training and certification of occupational divers - Occupational SCUBA diver**
- **AS/NZS 2815.5:2013 Training and certification of occupational divers – Dive Coordinators**
- **AS/NZS 2815.6:2013 Training and certification of occupational divers – Restricted Occupational Scuba Diver**
- **AS 4005.1:2000 Training and certification of recreational divers - Minimum entry-level SCUBA diving**
- **AS 4005.2:2000 Training and certification of recreational divers - Recreational SCUBA Dive Coordinator**
- **AS/NZS 2299.3:2003 Occupational diving operations - Recreational industry diving and snorkeling operations**
- **AHCLPW305 Perform Diving for Scientific Purposes – Dept. Education, Employment and Workplace Relations**

- **SISOSCB306 Perform Diver Rescues – Dept. Education, Employment and Workplace Relations**
- **Work Health and Safety Act 2011 (Commonwealth)**
- **Work Health and Safety Regulations 2011 (Commonwealth)**
- **Work Health and Safety Act 2011 (QLD)**
- **Work Health and Safety Regulations 2011 (QLD)**
- **Model Work Health and Safety Regulations (Safe Work Australia) 2019 update**
- **Recreational Diving, Recreational Technical Diving and Snorkelling Code of Practice 2018 – Workplace Health and Safety Queensland**
- **Occupational Diving Work - Code of Practice 2005 – 2018 update (QLD)**
- **DCIEM Diving Manual Part 1, Air Decompression Procedures and Tables**
- **NOAA Manual 5th Edition 2013**
- **WorkSafe Queensland website & publications**
- **SafeWork Australia website & publications**
- **Training.gov.au website**

JCU Procedures

- **HSE PRO 007 Field Trip Procedure**
- **HSE-PRO-001 Boating Procedure**
- **HSE-PRO-002 Diving Procedure**
- **WHS-PRO-005 WHS Incident and Hazard Management**
- **HSE-PRO-011 Work Health and Safety Risk Management Procedure**
- **WHS-PRO-004 WHS Training and Competency Procedure**
- **WHS-PRO-001 WHS Responsibilities Procedure**

Regulatory Authorities

- **Workplace Health and Safety QLD**

Legislation

- **Work Health and Safety Act 2011 (QLD)**
- **Work Health and Safety Regulations 2011 (QLD)**

Codes of Practice

- **Recreational Diving, Recreational Technical Diving and Snorkelling Code of Practice 2018 – Workplace Health and Safety Queensland**
- **Occupational Diving Work - Code of Practice 2005 – 2018 update (QLD)**

Certain words are used in instances where instructions are given, and these must be interpreted as described.

MUST / WILL / SHALL	-	there are no circumstances under which this recommendation may be ignored.
SHOULD / RECOMMENDED	-	normal diving practice requires this recommendation be followed, but there may be circumstances in which it is appropriate for a variation.
CAN / MAY	-	the diver/diving operation may well benefit from following this instruction.

2 JCU DIVING OPERATIONS

2.1 JAMES COOK UNIVERSITY DIVING and SNORKELLING

This Manual contains approved procedures for SCUBA diving and snorkelling, which provides information and advice for all employees, students, volunteers and visitors involved in underwater research and education activities for James Cook University.

2.1.1 Scientific Diving Definition

In Australia: diving performed for the purpose of professional scientific research, natural resource management, or scientific research as an educational activity.

2.2 GENERAL REQUIREMENTS

2.2.1 Boating & Diving Register

The James Cook University ***Boating & Diving Register*** is the planning and management system for boating and diving components of JCU field work, and also provides a repository for recording the competencies of personnel, training, inductions, and boating and diving equipment.

All JCU staff, students and volunteers seeking to participate in diving and boating activities must create a profile in the *Boating & Diving Register* and upload all relevant qualifications, training, certificates and other documented competency, which is then assessed and validated by the Boating & Diving Officer. It is the responsibility of the diver/boater/snorkeler to maintain their profile, ensuring all documents are uploaded and current.

All field trips involving boating, diving or snorkelling, must be lodged in the *Boating & Diving Register*, which are then reviewed by the Boating & Diving Officer, and approved through the RiskWare Field Trip system.

2.2.2 Mandatory Knowledge

All divers must undergo a Diving Induction to ensure they are familiar with the diving procedures as detailed in this Manual, and all persons participating in a dive team must be aware of the roles and responsibilities that they have in a dive team.

Before any diving takes place, the Dive Coordinator must ensure all team members are fully aware of their duties and are capable of performing them.

It is the responsibility of all divers to maintain a high level of knowledge and competence with regard to the type/s of diving they undertake, as well as knowledge of diving equipment and techniques in use.

2.3 OPERATIONAL CONTROL

2.3.1 James Cook University Auspices Defined

For the purposes of these standards the auspices of James Cook University includes any workplace controlled by James Cook University because of ownership of any equipment or vessels used, locations selected or relationship with the individual(s) concerned.

2.3.2 Joint Operations and Use of Procedures

When diving operations are taking place involving persons external to JCU, a project leader or the Field Trip Leader will determine, in consultation with the JCU Work, Health and Safety unit (WHS) and the BDO, who is in control of the dive site, and which organisational procedures should be followed.

For joint operations, these rules shall apply:

- When external persons are invited to participate in a JCU diving operation, the JCU Dive Coordinator shall assume responsibility for those persons and all activities shall be followed in accordance with JCU diving procedures.
- When JCU divers are working in collaboration with external persons who are present to achieve their own objectives, the JCU divers will continue to operate in accordance with JCU diving procedures, but there must be clear understanding to all participants that JCU bears no responsibility for the external persons.
    - In this case the external persons shall be diving under their own organisation's procedures and requirements.
    - Any collaborative work must not compromise the core requirements of forming an approved JCU dive team.
- When JCU divers are participating in an activity that is controlled by an external organisation, the BDO will determine, through the Dive Plan, if the JCU diver can dive safely under the organisation's procedures.

- In this case, the organisations' procedures may need to be provided to the BDO
- Any departure from, or variation to JCU diving procedures must be specified in the dive plan.

In all cases, all approved JCU divers who are doing authorised JCU activities shall follow JCU procedures, unless through agreement with the BDO, it can be demonstrated that following another organisation's procedures will provide the same, or higher level of risk control.

3 DIVING PERSONNEL – CLASSIFICATIONS, RESPONSIBILITIES & TRAINING

3.1 BOATING & DIVING OFFICER (BDO)

University Boating and Diving Officers are suitably qualified and experienced boating and diving personnel who have University-wide oversight of boating and diving activities. University Boating and Diving Officers (BDO) are responsible for ensuring all University divers are adequately qualified, trained, equipped and supervised.

More specifically, he/she is responsible for the following:

- maintaining the University Boating and Diving Register to ensure currency of qualifications for all divers listed thereon;
- approving new divers and boat operators and ensuring they are given an induction in diving and/or boating procedures with the University;
- ensuring all divers and boat operators are trained and qualified for the tasks they intend to participate in;
- appointing competent Dive Coordinators, and ensuring the Dive Coordinator is aware of their role and responsibilities;
- ensuring all diving and boating equipment is maintained to required standards;
- ensuring a dive plan and risk assessment is completed for each diving project prior to commencement, and reviewing it to ensure it meets the requirements of this dive manual;
- ensure, through monitoring and oversight, that activities are being conducted in a safe and compliant manner;
- attending relevant committee meetings and / or advisory groups; and
- assisting JCU WHS with reviewing diving incidents / hazards and communicating any corrective actions.

3.2 MANAGER (OIRS)

The Manager is responsible for the day to day operations of OIRS, including liaising extensively with JCU staff and students, visitors and other stakeholders.

The OIRS Manager shall:

- develop and implement compliant WHS procedures for the station's activities including boating, diving and snorkelling;
- liaise with station users and provide information to facilitate and plan their visit;
- enable and support research and education activities on the station by ensuring the provision of fit-for-purpose infrastructure and logistical support;
- appoint appropriately qualified and experienced persons as OIRS Boating & Diving Officers;
- ensure risk assessments and operating and emergency procedures are developed, documented and implemented for diving, snorkelling and boating activities which are relevant to OIRS operations; and
- identify needs and organise ongoing training and development for staff to ensure they are competent and equipped to perform their duties.

3.3 FIELD TRIP LEADER

A Field Trip Leader is appointed for every diving operation and is responsible for the conduct and health and safety of all participants for the duration of the field trip. The Field Trip Leader is approved through the JCU RiskWare system and must abide by the conditions set out in **HSE PRO 007 Field Trip Procedure.**

The Field Trip Leader will ensure an approved Dive Coordinator is present at the surface of the dive site at all times diving operations are taking place.

The Field Trip Leader may undertake the role of Dive Coordinator provided they are approved to act as a Dive Coordinator.

3.4 VESSEL MASTER

The Dive Coordinator shall ensure all Vessel Masters are briefed on the diving activity(s) to be undertaken. If the diving is being conducted from a JCU vessel, the Master must have a thorough knowledge of the JCU vessel **Safety Management System (SMS)**, and must follow all procedures therein.

The Master of a vessel involved in diving operations shall:

- cancel diving operations if they consider that weather conditions would prevent the rendering of assistance or would endanger the vessel, crew or dive team;
- maintain lookout, hoist signals, warn approaching vessels and maintain radio communications;
- ensure that no work is carried out on-board the vessel when diving is in progress if there is any possibility that it could hinder the vessel from rendering assistance in an emergency;
- ensure that propeller guards are fitted or propellers are disengaged whilst divers are near the vessel;
- ensure that fishing is not undertaken and food scraps or any waste is not thrown overboard while diving operations are taking place;
- ensure that when diving operations are being carried out that personnel trained in first-aid, oxygen therapy and emergency management are immediately available in the event of a diving accident;
- ensure that sufficient medical oxygen is available for treatment of a diving accident; and
- shall in the event of a diving emergency, assist the Dive Coordinator in accessing all outside assistance required.

Minimum Requirements:

- ❒ Meet all requirements of Maritime Safety Queensland (or equivalent regulatory body if in another State) and the National Standard for Commercial Vessels (NSCV);
- ❒ Possess the appropriate boat license or certificate of competency for the vessel being used -
  In QLD the minimum license requirement for vessels under 7.5m in length is a **QLD Recreational Marine Driver's License** (or interstate equivalent) – **Refer to EX15**, NSCV. For vessels larger than 7.5m in length, the appropriate competencies in accordance with the NSCV will be required;
- ❒ Hold, as a minimum, a **Short Range Operators Certificate of Proficiency** (SROCP - VHF radio);
- ❒ Hold current **Provide First Aid and CPR certifications**;
- ❒ Complete a **boat induction** for the vessel being used;
- ❒ Have a working familiarity with the JCU Diving Procedures; and
- ❒ Have a complete understanding of the Dive Plan and emergency procedures.

If the vessel is operating in inland waters, or where marine radio is not an effective form of communications, the SROCP may not be required.

3.5 DIVE COORDINATOR (DC)

A Dive Coordinator is appointed for every diving operation and is responsible for the safety of the dive team, and the conduct of diving operations in accordance with this Manual and all relevant policies and procedures. The Dive Coordinator shall be present at the surface of the dive site and will direct the operation of dive teams.

The Dive Coordinator will be approved through the Boating & Diving Register and must adhere to the approved Dive Plan, however, variations to activities may be allowed providing they are within the diving procedures, and the risk level has not increased. Any variations from the approved dive plan which may increase risk must be re-assessed by the BDO, and noted as amendments to the dive plan.

The role of Dive Coordinator involves significant responsibilities. In order to fulfil these responsibilities they must have comprehensive knowledge of the requirements of their position. At a minimum, the Dive Coordinator will have equivalent qualifications, competencies and inductions as prescribed for a Scientific Diver, and meet the detailed competencies, role and responsibilities of Dive Coordinators as described in AS2299.2, Section 2; and relevant elements of competency from AS2815.6, Section 6. Also see *Appendix 7 – Dive Coordinator Statement of Understanding*.

A Dive Coordinator may also act as a Diver's Attendant or enter the water as a Diver during a diving operation, provided that another suitably competent person is appointed to be the acting Dive Coordinator at the surface. The ***overall responsibility for the dive operation still rests with the Dive Coordinator as designated in the trip Dive Plan***, previously described. Other divers who are suitably qualified to **act** in the role of surface Dive Coordinator shall have been approved by the BDO and/or delegate to undertake such a role. The Dive Coordinator with overall control of the diving activities will be noted as such in the Boating & Diving Register.

Qualifications and Competencies for Dive Coordinators include:

The Dive Coordinator shall take responsibility for the safe conduct of the diving operations.

Minimum Requirements:

A Dive Coordinator shall –

- ❒ Be a Scientific Diver in accordance with Section 3.7 of this manual, who has qualifications and experience in the diving techniques which may be required for the proposed work, and in the use of equipment and procedures used in the diving operation to be performed;
- ❒ Have detailed knowledge of these procedures and other relevant JCU policies and procedures;
- ❒ Be able to recognise and manage diving medical emergencies;
- ❒ Have knowledge and understanding of dive planning and management;
- ❒ Be able to assess risks and apply appropriate control measures to the diving operation; and
- ❒ Have logged at least 60 hours diving using standard SCUBA since completion of an Open-Water dive course, of which at least 20 hours shall be occupational diving.

NOTE: the Dive Coordinator does not need to hold a current occupational diving medical if they are not scuba diving.

The detailed competencies, role and responsibilities of Dive Coordinators may be found in Appendix 7.

3.6 DIVE LEADER

For every dive operation, the Dive Coordinator shall nominate one person as the Dive Leader. This person would typically be the most experienced diver and / or the person with the highest knowledge / skills for the tasks being performed.

The Dive Leader is responsible for directing the divers while underwater and making appropriate decisions to manage the risks of the dive, and at a minimum, will be an approved Scientific Diver.

3.7 SCIENTIFIC DIVER

All JCU Divers must have training and experience in accordance with the requirements of this Manual, and also with the operation of any equipment being used and any work being carried out during diving.

Every diver must have acute awareness of the limitations of their own experience and capabilities, and should exercise common sense when considering their participation in any dive.

As well as the duties listed elsewhere in this Manual, JCU divers must ensure they maintain a comprehensive knowledge of the requirements of their role as listed at *Appendix 8 – Diver Statement of Understanding*.

If any diver is concerned about participating on a particular dive for any reason, or about any aspects of that dive, they have a responsibility to refuse to take part in the dive – and this shall occur without prejudice from any individual.

Qualifications and Competencies for Scientific Divers include:

Able to dive on SCUBA using any method for which they are approved to depths of less than 30m on an approved JCU diving operation.

Minimum Requirements:

- ❒ Hold an Australian recognised **Occupational Diver** qualification (AS2815) **or** internationally recognised dive qualification of **Divemaster** or higher, ***or*** a minimum of AQF certification relevant to the type of work being undertaken with an accredited diver training organisation;
- ❒ Have been trained in workplace **First Aid within the previous 3 years**, and trained in **CPR and the administration of oxygen within 12 months**. Maintaining skills in CPR and oxygen provision shall be *undertaken annually*;
- ❒ Hold an **occupational diving medical** certifying medical fitness to dive in accordance with the requirements of **AS/NZS2299.1** by a medical practitioner appropriately trained in underwater medicine undertaken within 12 months prior to diving;
- ❒ Undertake a Diving Induction and Evaluation, see *Appendix 1*; and
- ❒ Have logged **at least 60 hours** diving using standard SCUBA since completion of an Open-Water dive course.

To **maintain** currency as a Scientific Diver, an individual should log at least one dive with the University in any six month period. Should the diver become a Restricted Diver, log book evidence of recent diving relevant to the depth ranges described in AS2815.6, shall be required for evaluation by the BDO. Logged recreational dives may be accepted as equivalent at the BDO's discretion.

To be registered to use any equipment or technique other than standard SCUBA (e.g. Nitrox diving), a diver must hold the appropriate certifications for and have logged dives with that equipment/technique to the satisfaction of the BDO. Regardless of qualifications held, the BDO may require demonstration of competency in both practical and theory elements.

3.8 RESTRICTED DIVER

Qualifications and Competencies Restricted Divers include:

Able to dive ***Supervised*** on SCUBA (as approved by the DO) **to depths of less than 15m in 'Low Risk Conditions'** (see *Section 6.1*), on an approved JCU diving operation where direct in-water supervision can be provided by an approved Scientific Diver.

Minimum Requirements:

- ❒ Hold a minimum of an internationally recognised Rescue Diver (from a recognised Training Agency) with the AQF certification **SISOSCB306A "Performs Diver Rescues",** or higher;
- ❒ Have been trained in workplace **First Aid within the previous 3 years**, and trained in **CPR and the administration of oxygen within 12 months**. Maintaining skills in CPR and oxygen provision shall be undertaken annually;
- ❒ Hold an **occupational diving medical** certifying as medically fit to dive in accordance with the requirements of **AS/NZS2299.1** by a medical practitioner appropriately trained in underwater medicine within 12 months prior to diving;
- ❒ Undertake a Diving Induction and Evaluation, see *Appendix 1*; and
- ❒ Have logged **at least 40 hours** diving using standard SCUBA since completion of an Open-Water dive course.

3.9 VISITING SCIENTIFIC DIVER

Qualifications and Competencies for Visiting Scientific Divers include:

May be permitted to dive on a limited term as part of a JCU diving operation, and engage in diving work for which they are deemed competent at the discretion of the BDO. A visiting diver may be classified as a Scientific or Restricted Diver.

Minimum Requirements:

- ❒ Submit to the BDO an official **Letter of Reciprocity**, from an organisation which undertakes similar diving and boating activities to that of JCU, highlighting their experience and qualifications;
- ❒ Hold current Rescue Diver (from an internationally recognised Training Agency);
- ❒ Have been trained in workplace **First Aid within the previous 3 years**, and trained in **CPR and the administration of oxygen within 12 months**. Maintaining skills in CPR and oxygen provision shall be undertaken annually;
- ❒ Hold a current **occupational diving medical** to Australian Standard **AS2299.1-2015** or equivalent;
- ❒ Undertake a Diving Induction and Evaluation, see *Appendix 1*;
- ❒ Have logged at least **60 hours** diving using standard SCUBA since completion of an Open-Water dive course;
- ❒ The visitor must notify the BDO of any medical condition/injury that may have commenced/occurred to them since date of last medical, and which may affect their diving fitness in any way; and
- ❒ Must have a working familiarity with sections of the JCU Scientific Diving Operations Manual that are relevant to the diving work.

A Visiting Scientific Diver is restricted to a maximum of 28 days diving in a 6 month period.

The BDO may waive the requirement to complete the Diving Practical Assessment if the person holds higher diving qualifications and/or experience (i.e. Divemaster or higher). However, if the person lacks recent diving experience, the diver must complete the Diving Practical Assessment, and may also be classified as **Restricted** until diving competency is demonstrated.

3.10 STANDBY DIVER

A standby diver shall be present whenever a diver is underwater in free swimming SCUBA mode or tethered mode.

In most JCU scientific diving, the Standby Diver will be in-water assuming the role as 'buddy' diver, and shall be:

- an approved JCU diver who is medically fit to dive in accordance with the requirements of AS/NZS 2299.1; and
- (if located on the surface) be a Scientific Diver, dressed and equipped to enable **immediate entry** into the water for the purpose of providing aid or assistance to a distressed diver.

3.11 DIVER'S ATTENDANT

The role of a Diver's Attendant is to provide assistance to the Dive Coordinator at the surface of the dive site for the safe conduct of the diving operation.

For higher risk diving, or other circumstances as determined by the BDO, the presence of a Diver's Attendant at the dive site may be mandatory (see *Section 6.4 Dive Team Composition*).

Specifically, the Diver's Attendant shall:

- Have been trained in workplace **First Aid within the previous 3 years**, and trained in **CPR and the administration of oxygen within 12 months**;
- Assist divers with dressing, water entry and exit, including handling and deploying equipment;
- Ensure the dive site is marked with a dive flag(s) or other signals and keep watch for boating traffic hazards;
- Monitor divers descent and surfacing;
- Maintain continual watch for divers who may surface away from the vessel;
- Assist with any communication protocols and emergency management;

- Be fit to undertake the required tasks, and have a working knowledge of the following:
    - requirements of the underwater work and tasks being undertaken;
    - signals in use (see *Appendix 3*)
    - decompression procedures; and
    - diving plant and equipment in use, including ancillary fittings such as gauges, dive computers and masks.

Where the diver is on a lifeline the Diver's Attendant shall not be engaged on any task other than that of Diver's Attendant while the diver is in the water.

4 MEDICAL and FITNESS REQUIREMENTS

4.1 MEDICAL REQUIREMENTS

Any person intending to dive with JCU shall undertake an occupational dive medical assessment, performed by a doctor trained in diving medicine (see *Appendix 13*), to the criteria set out in the current version of Australian Standard AS/NZ 2299.1. The Australian Standard provides the requirements for occupational diver medical assessment and suggests a minimum curriculum of courses that provide appropriate training in underwater medicine and guidance for medical practitioners.

The record of examination shall be retained by the medical practitioner who will issue the diver with an **Occupational Diver Medical Fitness Certificate** stating the diver's fitness, unfitness or temporary unfitness pending further examination.

The certificate must show the following -

- the name of the person (the diver's name) who holds the certificate;
- the name and address of the medical practitioner who issued the certificate;
- the date it was issued;
- that the diver has been assessed against the criteria in AS/NZS 2299.1:2015;
- the person has been assessed as medically fit to dive; and
- any limitations on diving imposed by the doctor.

4.1.1 Frequency of Medical Evaluations

Medical evaluation must be completed:

- the medical examination shall be carried out before a diver first uses compressed gas under water and subsequently at intervals not exceeding 12 months (unless it has been revoked, superseded or has a time or other limitation specified on the certificate to preclude the holder from participating in the proposed diving operation);
- after any major injury or illness, or any condition requiring hospitalisation for more than 24 hours, or
- after any diving accident requiring treatment in a hyperbaric chamber, or after a pressure injury sustained from diving.

FORM 1 provides an example of an **Occupational Diver Medical Fitness Certificate** from AS/NZS 2299.1:2015.

4.2 FITNESS TO DIVE

It is every diver's responsibility to ensure they are fit to dive. SCUBA diving can be physically demanding and requires a reasonable degree of physical stamina, mental focus and skill, especially when environmental conditions create arduous conditions, or complex work is being performed. Fitness for diving means that an individual is in a state (mentally, physically and psychologically) to perform the tasks assigned to them competently and in a manner which does not compromise the safety or health of themselves or others.

Being cleared to dive by a medical practitioner is only one aspect of diving fitness. All divers must be aware of, and take into consideration the following:

- All persons intending to dive should maintain an acceptable standard of physical fitness, preferably by engaging in regular exercise;
- The physical ability of an individual to act in a role, or perform any task, can only be determined by that individual on the day of a dive;

- If a diver has reservations about their health or ability to perform any dive, they must inform the Dive Coordinator, who must take appropriate actions to ensure the safety of the diver and other members of the team.

It is the responsibility of every diver to notify the BDO, should any medical condition or injury have commenced/occurred to them since their last medical, which may increase their level of risk if they dive. If an individual decides they are fit to dive, then their fitness may be further assessed **by the Dive Coordinator on site,** or by the BDO at any time, with either of those individuals able to veto any dive if they see fit.

The Dive Coordinator MUST prohibit diving for any individual if that person's physiological or psychological state has been altered, or appears to have been altered, by illness, fatigue, injury, intoxication, or loss of coordination from the effects of prescription drugs or other substances.

All SCUBA divers will be asked by the Dive Coordinator to confirm if they are fully fit prior to diving as part of the ***Pre-dive Risk Checklist***. (*FORM 5*)

5 RECORD KEEPING RESPONSIBILITIES

The Boating & Diving Officer shall maintain records as per the University's record retainment procedures and for a minimum of a least 12 months since completion of any dive operation. This includes:

- details of all divers involved in JCU diving operations and records of evidence used to assess the diver's diving competencies and fitness;
- all approved Dive Plans and associated risk assessments;
- records of dives performed (Dive Logs);
- service records of all equipment used for JCU diving operations (including private equipment);
- any incidents and accidents they have been notified of; and
- any other relevant details.

5.1.2 Diver's Responsibilities

All divers should keep and maintain a permanent log of all diving undertaken for the University, which should include:

- the diver's photograph;
- next of kin information;
- the diver's name, address, DOB and signature;
- a record of medical examinations conducted for the purpose of occupational diving;
- a record of JCU diving activity undertaken; and
- a record of any relevant accidents and incidents including decompression treatment/s.

5.1.3 Proof of Diving Experience

Divers who cannot produce a logbook demonstrating the required experience for listing on the JCU Diver Register may, at the discretion of the BDO, provide a certified statement outlining their diving experience (i.e. Statutory Declaration) or by supplying a letter or training record, signed by a Diving Officer, that verifies the person's experience (i.e. reciprocity).

At the discretion of the BDO, divers who have not dived for an extended period of time (>6 months), or those who wish to dive to increased depths, may be required to perform a series of 'work up' dives.
Evidence of such diving shall be recorded in the diver's personal log book and made available to the BDO upon request.

6 DIVING PROCEDURES FOR SCUBA (OPEN CIRCUIT, COMPRESSED AIR)

6.1 INTRODUCTION

All diving work conducted under the auspices of JCU, and all persons participating in the work shall be recorded in the *Boating & Diving Register* in accordance with Section 2.2.1 of this manual.

As described in Section 3, when undertaking diving operations on behalf of JCU, divers are categorised into either Scientific, Restricted, or Visiting Scientific Divers.

Under specified conditions, Restricted Divers can partake in lower risk diving activities, as long as they are directly accompanied by an unrestricted, approved JCU Scientific Diver.

For JCU diving operations to be considered as lower risk diving, conditions shall not exceed the following:

LOWER RISK Conditions include:

- maximum depth **does not exceed 15m**;
- conditions are such that diving is not strenuous or difficult (e.g. nil to slight currents);
- no operational plant/machinery is used as part of the dive;
- no entrapment hazards & direct access maintained;
- simple & low risk tasks are performed;
- divers form buddy pairs;
- dives are during **daylight hours only**;
- in low visibility conditions, divers are tethered to each other or use float lines to the surface; and
- the site is located away from other vessels operating in the area.

N.B. 2 Restricted Divers cannot dive together, unless they are accompanied by a 3rd diver who is an unrestricted Scientific Diver (i.e. 3 person dive team).

Diving that may require staged decompression, or is conducted in restricted overhead environments (cavern, cave, tunnel, ice, or shipwreck penetration), conducted in blue-water (open ocean), incorporates breathing gas mixtures other than air or EANx <40%, involves breathing gas delivery systems other than open-circuit SCUBA, or is conducted in any other particularly hazardous environments, shall be considered Specialised Diving. **Specialised Diving** is covered in **Section 7**, which also includes **High Risk Diving**.

6.2 DIVE PLANNING AND ORGANISATION

6.2.1 Dive Plans

Any JCU work involving diving or snorkelling must be submitted through the *Boating & Diving Register*. All information asked for in the system must be supplied. A detailed instruction sheet titled '**Submit Field Trip Guide**' can be found on your 'Home Page' in the Register.

Before developing a dive plan, the project coordinator or Field Trip Leader should consult the BDO to ensure:

- the objectives can be achieved within the scope of scientific diving and the provisions in this Manual;
- the Dive Coordinator is competent to assess site specific risks and supervise the work;
- a registered and competent dive team can be assembled to perform the work;
- appropriate vessels and equipment will be used in the work;
- where joint operations are occurring with another organisation, operational control, roles and responsibilities of all persons can established; and
- the overall risk/hazard nature of the work can be managed appropriately.

The Dive Coordinator must ensure the Field Trip has been approved via RiskWare and the Dive Plan reviewed/endorsed by the BDO, and that all conditions, limitations or amendments made to the Dive Plan are fully understood and complied with.

6.2.2 Risk Assessment

A risk assessment must be completed and risk controls measures implemented for all diving work. The risk assessment, which must be developed by the Field Trip Leader and Dive Coordinator, in consultation with the dive team, is an essential part of every Dive Plan. The risk assessment must be created in **Riskware**, and then submitted with the dive plan for review.

The risk assessment must not be treated merely as an administrative exercise. Once a risk assessment has been reviewed and is deemed appropriate to mitigate the risks of the activity, it must be implemented in a practical and effective way at the dive site. Failure to properly implement the proposed risk control measures may lead to serious consequences for all persons involved, particularly the DC. Once on site, the Take 5 Checklist shall be completed as part of the Dive Briefing, and to ensure that since the initial risk assessment was undertaken, any conditions that have altered can be controlled appropriately.

Travel, *especially* flying or ascending to altitude *before* or after diving must be considered and is described in **Section 8.7** of this manual.

Guidance for creating a risk assessment is in Section 1.3, *Appendix 6*, and advice on specific risks associated with diving may be found in **Section 14**.

6.3 DIVING WITH OTHER GROUPS

Due to the nature of University research, situations often arise where James Cook University divers need to work with divers from other groups/organisations. The following sections outline the requirements to be met by JCU divers when operating under these circumstances, as previously defined in Section 2.3 – Operational Control.

6.3.1 Research Diving in Conjunction with another Organisation

When diving operations are taking place involving persons external to JCU, the Field Trip Leader will determine, in consultation with the JCU Work, Health and Safety (WHS) unit and the BDO, who is in control of the dive site, and which organisational procedures should be followed.

For joint operations, these rules shall apply:

- When external persons are invited to participate in a JCU diving operation, the JCU Dive Coordinator shall assume responsibility for those persons and all activities shall be followed in accordance with JCU diving procedures.
- When JCU divers are working in collaboration with external persons who are present to achieve their own objectives, the JCU divers will continue to operate in accordance with JCU diving procedures, but there must be clear understanding to all participants that JCU bears no responsibility for the external persons.
    - In this case the external persons shall be diving under their own organisation's procedures and requirements.
- When JCU divers are participating in an activity that is controlled by an external organisation, the BDO will determine, through the Dive Plan, if the JCU diver can dive safely under the organisation's procedures.
    - In this case, the organisations' procedures may need to be provided to the BDO.
    - Any departure from, or variation to JCU diving procedures must be specified in the dive plan.

In all cases, all approved JCU divers who are doing authorised JCU activities shall follow JCU procedures, unless through agreement with the BDO, it can be demonstrated that following another organisation's procedures will provide the same or greater level of risk control.

In all cases, regardless of who controls the dive site, any JCU person taking part in a dive operation shall meet all the competency requirements in this Manual, and shall follow the usual dive planning requirements.

6.4 DIVE TEAM COMPOSITION

6.4.1 Normal Dive Teams

A normal dive team comprises a group of individuals, who function as a unit under the control of a Dive Coordinator, and may consist of other Dive Coordinators, Divers, Diver's Attendant(s), and vessel Master(s) where required.

A normal dive team for 'lower risk diving' (see Appendix 15 Definition of Terms) may be made up of:

- two divers diving as a buddy pair (within proximity as to be able to render assistance in an emergency at all times) and a Dive Coordinator; or
- three divers diving in a buddy group and a Dive Coordinator; or
- four divers grouped into two buddy pairs and a Dive Coordinator; and
- each buddy group will have a designated Dive Leader.

When the Dive Coordinator is the only surface-support person present, they shall also be fulfilling the role of Diver's Attendant according to Section 3.11.

A dive team operating outside of 'lower risk diving' conditions may comprise:

- two divers diving as a buddy pair (within proximity as to be able to render assistance in an emergency at all times), a Dive Coordinator and a Diver's Attendant; or
- three divers diving in a buddy group, a Dive Coordinator and a Diver's Attendant; or
- four divers grouped into two buddy pairs, a Dive Coordinator and a Diver's Attendant; or
- one tethered diver, a Standby Diver, a Dive Coordinator and a Diver's Attendant.

In all cases, where more than one Dive Team is in the water operating from a single vessel, dive teams must work in close proximity to each other (within 30m).

Regardless of specific roles, all members of the Dive Team should be competent and capable of responding to any emergency that may arise, and executing the Emergency Management Plan.

6.4.2 Exceptions to Normal Dive Teams

Two-Person Dive Teams and Diving Without a Surface-Support Person

The use of a two-person dive team may be approved by the BDO in exceptional circumstances where the diving work is deemed very low risk and occurs in shallow sheltered waters in accordance with AS/NZS 2299.2, section 5.2.3.

A two-person dive team may be made of:

- two divers diving as a buddy pair, or
- one tethered diver and one Standby Diver/Diver's Attendant, who takes the role of Dive Coordinator.

Before approval is given for any two-person diving operation, the BDO shall consider the experience and competency of the divers involved, and the dive plan and risk assessments submitted for the dive - with particular reference to all identifiable potential risk factors (see *Section 14 – Factors Known to Increase Diving Risk,* and *Appendix 6*).

In all cases the following will apply:

- the diving work must be deemed to be very low risk (see Section 6.1);
- a specific emergency management procedure must be developed for the activity;
- third party assistance must be nearby, immediately contactable, and form part of the emergency management plan (i.e. – research station staff, other technical staff with appropriate qualifications/training);
- both divers must ensure that they can, in an emergency, recover the other into the boat (or onto shore, out of the water) without assistance, and have successfully practiced the recovery of each diver involved;
- both divers must continually monitor conditions during the dive, and must agree to abort the dive at a signal from the other diver if either feels that conditions cease to be safe;
- any boat used must be moored as close to the dive site as possible, and all divers must stay within 50m of the vessel;
- immediately upon starting the dive, a check must be made that the anchor of the boat being used is secure;
- when a single tethered diver is operating, both divers will have received training in line signals (Appendix 3);
- a tethered diver must carry a knife that is suitable for cutting the lifeline; and

- when diving without a surface attendant, the Dive Coordinator should consider the deployment of a current line from the stern of the boat, and also using a towed diver float to alert other boats as to the exact location of the divers.

6.5 DIVING PROCEDURES ON-SITE

6.5.1 Dive Briefing and TAKE 5

It is the responsibility of the Dive Coordinator to ensure that a Dive Briefing and Pre-Dive Safety Check (TAKE 5) is conducted before every dive.

The **Dive Plan** and diving **Risk Assessment**, which have been developed specifically for this activity, must form the basis of the Dive Briefing, the contents of which shall include:

- the objectives of the operation;
- the diver's fitness and condition to carry out the dive;
- the roles and responsibilities of each member of the team;
- dive profiles – residual inert gas status, maximum depth and maximum time;
- breathing gas supply appropriate for the dive;
- any risk control measures which have been identified to mitigate risk;
- the environmental conditions in the operating area and the potential for them to change (sea conditions, visibility, currents, water temperature etc.);
- review of underwater communications (including any special hand signals, use of slates etc.);
- equipment checks and use of any special equipment; and
- review of emergency procedures including – diver recall procedure, lost buddy procedures, exceed maximum depth or maximum time, conditions to abort or terminate the dive, emergency response plan and surface communications.

The DC uses the **TAKE 5 Pre-Dive Safety Checklist** (*Form 5*) to ensure that the essential risk mitigation strategies are implemented at the site ***before*** the divers enter the water. A guide for Dive Briefings is in *Appendix 2*.

6.5.2 Diver's Responsibility:

It is every diver's responsibility, before commencing any dive, to:

- ensure they have understood and are able to follow all instructions given by the DC and Dive Leader;
- inform the DC of any concerns they have regarding the safe conduct of the dive, or their ability to carry out their specified role;
- inform the DC of any personal physical health issue that may increase risk;
- conduct an equipment check (buddy check) to ensure all scuba equipment is fully functional and each diver is familiar with the other's equipment configuration; and
- **not dive within 12 hours of consuming any alcohol or other intoxicants**.

Further detail of all diver's responsibilities are in *Appendix 8.*

6.5.3 Pre-Dive Equipment Check.

The DC must ensure that for all dives, a complete pre-dive check shall be performed on both the diver's and stand-by diver's equipment. The pre-dive checks should include but are not limited to:

- check zeroing of contents gauge before turning on air supply;
- air supply turned fully on;
- check for regulator function (both primary and alternate second stage regulators) - uninterrupted air flow from tank;
- contents of tank;

- leaking hoses and or gauges, operation of contents gauge;
- depth gauge reads zero, maximum depth indicator is zeroed;
- inflator hose connected, inflator operation, dump valve operation, security of tank in BCD harness; and
- quick release of weights.

6.5.4 Dive Site Set-up and Supervision

The DC must ensure they can maximise their ability to direct and supervise the dive teams and implement all risk control measures. In achieving this, the following shall apply:

- if diving from a vessel, ensure the anchor or mooring is secure;
- if diving from a vessel, the vessel should be positioned as close as possible to the dive site, or if diving from a shore-based position, the supervising position should be a close as possible to the site while maintaining uninterrupted view of the diver's location;
- a dive flag (flag alpha) must be displayed in the most visible manner (consideration should be given to the need for towed diver floats);
- consideration should be given for deploying a float line, shot line, or other aids;
- any aids for diver egress should be deployed (e.g. dive ladder)
- surface communication devices should be checked, including diver recall signal;
- divers to conduct buoyancy check before descent;
- immediately upon descent, the DC / Diver's Attendant will record the time on the Dive Log
- the DC / Diver's Attendant will maintain a constant watch on the diver's location and be prepared at all times to respond if a diver surfaces and gives a signal for assistance;
- the DC / Diver's Attendant will maintain a constant watch for any changes in conditions, or unforeseen hazards which may manifest at the dive, and be ready to recall the divers if necessary;
- upon surfacing, the DC / Diver's Attendant will record the bottom time on the Dive Log, and all assistance must be given to the divers to aid in egress;
- the Dive Log entry must be completed by the diver supplying depth and other profile information; and
- all assistance must be given to the divers in removing and handling equipment.

6.5.5 Surface Watch and Scanning

All surface support personnel should be aware that most accidents, diver distress and panic situations are noticed at the surface, not underwater. If a diver surfaces away from the work site, well within the planned dive time, he/she may not be immediately missed, and there will be less search effort than if he/she is overdue.

The DC and Diver's Attendant must:

- be solely engaged in being an effective lookout, continually scanning the area where the divers are operating;
- maintain a constant visual of the diver's bubbles or surface float, to keep track of their whereabouts;
- be ready to respond immediately if a diver surfaces, or a diver emergency marker or signal is seen or heard (i.e. Surface marker buoy or audible sound); and
- be continually aware of the diver's time underwater, and be ready to respond with appropriate measures if divers are overtime.

6.5.6 Termination of the Dive

It is the responsibility of the diver to terminate the dive, without fear of reprisal, whenever he/she feels it is unsafe to continue the dive, unless it compromises the safety of another diver already in the water.

The dive shall be terminated while there is still sufficient cylinder pressure to permit the diver to safely reach the surface, including safety stop time with an absolute minimum reserve of **50 bar** of air remaining. ***There is one exception to this rule:*** for dives operating in depths less than 6m, where there is no risk of entanglement, and the divers are unrestricted divers, a minimum reserve of 30bar

may be allowed **with prior approval from the BDO**. See **Section 15 Definition of Terms – Reserve Air Supply**, for specific requirements on air reserves.

6.5.7 Emergencies and Deviations from Regulations

Any diver may deviate from the requirements of this manual to the extent necessary to prevent or minimise a situation that is likely to cause death or serious physical harm. A written report of such actions must be provided to the BDO explaining the circumstances and justifications.

6.6 SHORE DIVING

In addition to normal dive procedures the following procedures shall be followed for diving from the shore:

- Diving should be restricted to 50 metres from the shore;
- A highly visible dive flag must be displayed at the surface supervising position;
- If the dive site is subject to possible boating traffic, the dive team shall use a towed diver float to indicate their position;
- When shore diving is being conducted in an environment of strong currents, strong surge, limited visibility, or otherwise increased risk, a rescue vessel shall be immediately available and on standby;
- The pre-dive risk assessment must consider;
    - increased risks posed by access/egress at the site (i.e. rocks, man-made structures, surf, effect of tides), including with an injured diver;
    - making the egress point highly visible to the divers;
    - each diver's physical capability to rescue and tow another diver over the intended distance back to shore;
    - the ability of the DC to effectively communicate with the divers (considering the use of audible and visible signalling devices); and
    - implementing an effective diver recall method.

7 SPECIALISED DIVING MODES

7.1 GENERAL

Any dive requiring staged decompression, conducted in restricted overhead environments (cavern, cave, tunnel, ice, or shipwreck penetration), conducted in blue-water (open ocean), incorporating breathing gas mixtures other than air or EANx <40%, involving breathing gas delivery systems other than open-circuit SCUBA, or conducted in any other particularly hazardous environments, shall be considered Specialised Diving.

For each of these modes, this section defines specific considerations regarding the following issues:

- special Medical Examination requirements, if any;
- training and/or experience verification requirements for University authorisation;
- equipment requirements; and
- operational requirements or additional safety protocols to be used.

For dives that involve more than one specialised diving mode, all requirements for each diving mode shall be met.

Decompression diving shall be defined as any diving during which the diver cannot perform a direct return to the surface without performing a mandatory decompression stop to allow the release of inert gas from the diver's body.

7.2 NIGHT DIVING

In addition to normal dive procedures, the following procedures shall be followed for night diving:

- dives are limited to a maximum 18 metres;
- a minimum of two surface-support personnel are required at the surface (DC and Diver's Attendant);
- the site entry and exit points shall be marked with an activated light source, and a 5m shot line should be deployed with a strobe or other highly visible light source, underwater at the end of the shot;

- a current line should be deployed with a light source at the end furthest from the vessel;
- all divers shall have a personal marker light (chemical activated or electronic) attached in a prominent position to their equipment;
- divers must carry a primary and backup light/torch;
- the dive site must be marked with night signals to indicate that divers are operating (red over white over red); and
- along with normal pre-dive briefing considerations, the briefing must also include:
    - special signalling, communications and emergency management techniques; and
    - underwater navigation and dive site boundaries.

7.3 RESTRICTED OVERHEAD ENVIRONMENTS

Restricted overhead environments include any diving environment in which a direct ascent to the surface is impeded by a physical barrier, including cave, cavern, ice and shipwreck penetration. It does not include underwater arches, lava tubes, opened shipwrecks or kelp forests, in which:

- two divers can easily swim abreast;
- there is no significant danger of entrapment or entanglement;
- loss of visibility due to siltation is unlikely; and
- direct sunlight is always available for illumination.

7.3.1 Minimum Certification and Experience

Divers shall document training in restricted overhead environment diving appropriate for the conditions in which dive operations are to be conducted. Such documentation shall be to the satisfaction of the BDO and/or BDSC. Training shall be conducted by agencies and instructors approved by the BDO.

Divers shall demonstrate to the BDO, proficiency in planning and executing dives in a restricted overhead environment appropriate to conditions in which diving operations are to be conducted.

7.3.2 Minimum Equipment Requirements

a) Divers shall employ a continuous line from a point outside the overhead environment to their position.

b) A minimum of three lights shall be carried by each diver except in environments in which direct sunlight is visible, where each diver shall carry a minimum of two lights.

c) Redundant breathing gas delivery systems shall be designed such that no single component failure can prevent access by the diver to an appropriate breathing gas supply.

d) An alternate second stage shall be included with a hose of adequate length to facilitate emergency gas sharing while swimming in a single file formation.

e) The BDO may require redundancy in other equipment systems to ensure dive team safety, including:
    - Submersible Cylinder Pressure Gauges;
    - Dive Computers or Decompression Calculation Devices;
    - Dive Timing Devices;
    - Depth Gauges; and
    - Buoyancy Control Devices.

7.3.3 Minimum Operational Requirements

a) Divers shall immediately begin exiting from a restricted overhead environment when a light source or a piece of equipment fails or malfunctions.

b) Divers shall begin exiting the overhead environment as soon as any member of the dive team reaches one-third of his/her starting air supply.

c) Where an enclosed or confined space is not large enough for two divers, a diver shall be stationed at the underwater point of entry, an orientation line shall be used, and an emergency breathing gas supply will be available at the point of entry.

d) Emergency procedures for loss of gas supply, equipment malfunction, team separation, unexpected diving conditions and loss of visibility shall be developed. All participating divers must review emergency procedures prior to commencement of each day of diving.

7.4 AQUARIUM DIVING

Specialised procedures must be developed for diving in aquariums at JCU. The diving operates under a JCU Safe Work Procedure (SWP), **which all dive team members must have read, understood, and signed** prior to any diving activities commencing. The SWP template is available through the JCU Workplace Health and Safety Unit.

At a minimum, diving within aquarium systems will consist of the following:

- one Dive Coordinator;
- one Scientific Diver; and
- an appropriately trained team member who can provide immediate assistance, if required.

The Dive Coordinator may act as the Diver's Attendant, provided:

- the diver is tethered at all times;
- the diver is in clear view of the Dive Coordinator;
- there is no risk of entrapment of the diver or entanglement in his/her equipment;
- third party assistance is immediately available in an emergency; and
- means of diver recover/extraction is in place and tested with the dive team and third party assistance personnel.

7.5 BLUE-WATER DIVING

Bluewater diving is defined as diving conducted in any body of water in which there is no physical bottom within diving depth ranges. The following regulations are derived from the publication*, Bluewater Diving Guidelines*. Exceptions to this may be made on a case-by-case basis, if a risk of entanglement with other structures exists, or there are other means of physical control. Procedures for diver control and communication must be developed to the satisfaction of the BDO and/or BDSC.

7.5.1 Minimum Certification and Experience

The diver shall have completed practical training in blue-water diving techniques, and demonstrate proficiency to the satisfaction of the BDO. This training shall include:

- Bluewater diving equipment deployment;
- out of air procedures;
- entry Procedures;
- response to dangerous marine creatures;
- exit procedures; and
- scientific techniques/procedures.

7.5.2 Equipment Requirements

- Divers shall employ a down-line and counterweighted trapeze line system in order to maintain diver contact and depth control.
- The total weight in water of the down-line and tether array shall be no greater than 5 kg.
- All diver tether attachments shall use connectors that can be quickly released by the diver while the line is under a tension at least equivalent to the weight of the entire array. Attachments shall be to either the diver's BCD, or to a separate harness, but not to the diver's weight belt.

7.5.3 Operational Requirements

- A safety diver shall be stationed at the trapeze attachment point. This diver's sole function is to monitor and control the dive team, and monitor the diving environment for potential hazards. This diver shall be authorised to terminate diving operations for any or all members of the dive team.
- A Diver's Attendant shall be stationed aboard any small craft from which blue-water diving is conducted as long as divers are in the water.

7.6 HIGH RISK DIVING OPERATIONS

The Queensland ***Occupational diving work Code of Practice (2005)*** defines High Risk Diving as:

high risk diving work means work—

(a) carried out in or under water or any other liquid while breathing compressed gas; and

(b) involving one or more of the following—

(i) construction work

(ii) testing, maintenance or repair work of a minor nature carried out in connection with a structure

(iii) inspection work carried out in order to determine whether or not work described in subparagraph (i) or (ii) is necessary

(iv) the recovery or salvage of a large structure or large item of plant for commercial purposes but does not include minor work carried out in the sea or the waters of a bay or inlet or a marina that involves cleaning, inspecting, maintaining or searching for a vessel or mooring.

It describes that a person must not carry out high risk diving work unless the person has the qualifications, knowledge, skills, fitness and experience required by AS/NZS 2299.1 (Occupational diving operations—Standard operational practice).

Specific conditions for High Risk Diving Work are also defined in the ***Work Health and Safety Regulation 2011*** **– Schedule 19 Dictionary, and Chapter 4 - Part 4.8 Diving Work- Division 4 High Risk Diving Work.**

JCU will ensure that where high risk diving is to occur, it shall be done in accordance with **AS/NZS 2299.1:2015**.

7.7 CLASS FIELD TRIPS INVOLVING DIVING

Where diving is conducted as part of a class field trip, low risk conditions shall exist and the DC of the group must be trained or experienced in supervising less experienced divers.

The DC must ensure that:

- dive teams are buddied less experienced with experienced diver;
- each dive team carries a towed diver float;
- a depth limit of 9 metres is imposed;
- sufficient lookouts are posted to maintain continuous, uninterrupted scanning of all persons in the water;
- consideration is given to both in and out of water supervision;
- there is a means to go to the assistance of a person or persons who are in trouble;
- when larger numbers of divers are diving at the same time (more than two buddy groups) the emergency management plan must consider the number of surface support personnel and vessels, and the availability of 3rd party assistance; and
- as a general rule, when more than two buddy groups are diving at the same time, a Standby Diver and secondary rescue vessel must be available.

Special consideration shall be given to enforcing a maximum depth and area limitation, and ensuring a means for recall of divers is practiced and effective. This shall be recorded in the diving log.

Students diving on Class Field Trips shall meet the following conditions:

Able to dive on SCUBA **to depths of less than 9m**, on approved JCU class field excursions ***only***.

Minimum Requirements:

- ❒ Meet the requirements listed in the Diving Induction and Evaluation (student version) at *Appendix 1*;
- ❒ Agree to follow all instructions given by the Dive Coordinator(s) during the excursion;
- ❒ Hold at least a **Rescue Diver** certification from an internationally recognised diver training agency;
- ❒ Fulfil all responsibilities and obligations listed in this Manual for JCU divers;
- ❒ Hold an **occupational diving medical** certifying as medically fit to dive in accordance with the requirements of AS/NZS2299.1 by a medical practitioner appropriately trained in underwater medicine within 12 months prior to diving; and
- ❒ Has logged **at least 15 hours** of diving experience since completion of Open-Water dive course.

NOTE: *the DO may waive the requirement to complete the Diving Practical Assessment if the person holds higher diving qualifications and/or experience (i.e. Divemaster or higher).*

7.8 COMMUNICATIONS

7.8.1 Lifelines

In situations where JCU divers are required to operate with lifelines tethering them to the boat, attended by a Diver's Attendant, all divers must be familiar with the standard communication signals listed at *Appendix 3*.

7.8.2 Voice Communications

Where divers are intending to use voice communication systems, they must be familiar with, and have received training in the use of the particular equipment to be used, prior to attempting any dive. It should be noted that familiarisation with equipment is especially important where full-face masks are being used. In such cases, consideration should be given to performing a familiarisation dive or dives with the equipment to be used, in sheltered waters, prior to undertaking field operations.

7.9 RECORD OF DIVES

For every University dive, the Dive Coordinator must ensure that an entry on the '**FORM 9 - JCU Record of Dive**' is completed for each diver, listing all requested details of that dive.

The record of dive shall include at least the following:

- location, date and time;
- name of the diver;
- maximum depth, no-decompression limit, actual and effective bottom time, repetitive factor/group, and surface interval;
- cylinder contents in and remaining upon completion of dive;
- signatures of both diver and Dive Coordinator; and
- if using a vessel, diver head counts prior to departure from the site.

On completion of the diving operation, the Dive Coordinator must ensure that all Dive Logs, noting any incident, difficulty, discomfort or injury that occurs or is experienced during the diving, are uploaded to the Boating & Diving Register within 1 week from completion of the work.

8 DECOMPRESSION SCHEDULES AND DIVE COMPUTERS

The use of a conservative decompression table is essential for safe scientific diving, however no decompression schedule is guaranteed to prevent a diver from suffering DCS.

The overall health, condition and fitness of an individual, which can vary over both the longer term and from day to day, can affect the person's susceptibility to DCS.

These factors include, but are not limited to:

- age;
- obesity;
- dehydration;
- fatigue;
- physical condition;
- recent illnesses/injuries;
- medications or alcohol taken; and
- presence of a Patent Foramen Ovale (PFO).

Other operational factors which can increase the risk of DCS include:

- deeper diving;
- repetitive diving;
- rate of ascent, and **multiple ascents**;
- physically demanding work during and **after diving**;
- cold (both in water, and **at the surface**); and
- reverse profile diving.

Dehydration

Dehydration is a major predisposing factor for diving related illnesses. The real key to preventing dehydration is to stay ahead of the game. The recommended consumption of water is 200ml per hour. More if it's hot or if you are participating in multiple dives. The drinks should be spaced out over the course of the day rather than consumed in a short period of time and use of an electrolyte replacement supplements can be beneficial in achieving fluid volume requirements. Avoid caffeinated and carbonated beverages, and ensure an ample amount of fresh drinking water is available on the boat. This will help ensure that you have sufficient hydration levels.

Exercise

Divers should not participate in activities involving vigorous physical exertion before, during (if avoidable) **or after diving**, as exercise of this nature will predispose a diver to DCS. Where exercise is unavoidable before, during or after a dive (e.g. diving in strong currents, or walking in to a dive site), extra allowance must be made to take account of this factor when calculating permissible dive times.

See Section 14 for more detailed information.

8.1 DECOMPRESSION TABLES

The DCIEM (Canadian Defence and Civil Institute for Environmental Medicine) Short Standard Air decompression tables must be used for all JCU air diving operations.

The DCIEM tables are generally more conservative than other commonly used tables, especially in the deeper depth or longer bottom time profiles. DCIEM tables are widely established and accepted for use in Australia and New Zealand and all occupational divers and dive coordinators have been trained in their use. This means Dive Coordinators, in particular, must have a sound understanding of the associated procedures contained in the DCIEM Manual and be competent in its use.

If using EANx, either the Equivalent Air Depth method, or a BDO approved EANx decompression table must be used for controlling the dive profiles. Any method/table used must be specified in the dive planning phase, and approved by the BDO prior to diving.

The DC must have a complete working familiarity with the use of the DCIEM tables (and any other approved schedule in use), and shall ensure that all divers strictly adhere to the approved dive profiles.

8.2 SAFETY STOPS

The performance of safety stops by divers, even after short dives to shallow depths, has been proven to reduce the incidence of DCI in divers.

Where multiple dives are undertaken on one day, residual nitrogen times from previous dives shall be taken into account in calculating the time allowable for a subsequent dive. Any significant risk-increasing factor (e.g. cold stress, hard work, multiple

ascents, dive times close to NDL) should lead to further shortening of dive times or extra safety time. Divers should carry out a safety stop at the end of each dive.

A dive computer may be followed to allow accurate tracking of safety stops, but the minimum safety stop should be performed between **3 to 5m depth, for a period of 3 minutes**.

8.3 ASCENT RATES

The recommended ascent rate for JCU diving activities is **9m/minute (30ft/min)**.

If a diver is using a dive computer, they should observe the maximum ascent rate and safety stop information prescribed by the computer.

8.3.1 Multiple Ascents

Research has shown that the more ascents performed during a day's diving, the greater the DCS risk. Multiple ascents during a dive increase the DCS risk by increasing bubble formation during the extra ascents.

Once bubbles have formed, rates of gas up-take and elimination are altered for all subsequent dives until there has been a long enough surface interval (SI) to allow complete off-gassing. This SI cannot be accurately determined through the use of dive tables, so dives must be planned carefully to ensure the number of ascents during a dive is kept to a minimum.

8.4 RECOMPRESSION CHAMBER SUPPORT OF DIVING

Planning for JCU dives must consider availability of emergency recompression chamber support, which may or may not be dedicated to supporting the diving operation, and may involve an on-site, or remote chamber.

8.4.1 Diving Without a Recompression Chamber on Site

If a dedicated recompression chamber is not located at the dive site, the DC must establish the location and availability of the nearest recompression chamber facility, and factor in the risks of not being able to provide immediate recompression treatment for an injured diver. The planned dive profiles and emergency management planning shall take into account the travel time and logistics likely to affect access to a suitable recompression chamber facility in the event of an emergency. Further guidance is found in AS/NZS 2299.2, section 3.15.

When completing a dive plan, it is the responsibility of the Dive Coordinator (with advice from the BDO if required) to set out a procedure for transporting divers to the nearest acceptable and available recompression facility, and to communicate this Emergency Plan to all other divers on the dive team. They must also realistically estimate the time necessary for the transportation of a diver to the recompression facility in the event of an accident (with such time taken as the time from when the diver leaves bottom and commences their final ascent to arriving at depth in the chamber).

In the event that one or more significant identifiable risk factor/s are present before, during or after a dive (e.g. cold water, fatigue, hard work, post dive exercise), the Dive Coordinator must ensure that allowance is made for these and that if possible, details of such are communicated to all divers BEFORE the dive.

Depending upon the availability of emergency recompression, diving shall be limited as follows:

1. **Dive duration limits where recompression is available within two hours**

   Where recompression is available within two hours of the dive site, the maximum bottom time for any single dive shall be the no-decompression limit (NDL) times for the decompression tables and procedures in use, provided that the maximum time in the water for any one dive does not exceed the maximum dive time listed in Table 5.1 for the appropriate depth.

2. **Dive duration limits where recompression availability exceeds two hours**

   Where recompression availability exceeds two hours travel from the dive site, the maximum bottom time for any single dive shall be 80% of the NDL times for the decompression tables and procedures in use, provided that the maximum time in the water for any one dive does not exceed the maximum dive time listed in Table 5.2 for the appropriate depth.

Table 5.1 (AS/NZS 2299.1:2015)

Maximum Time Limits for Dives Undertaken Where Recompression Chamber Support is Available within 2 hours

Maximum Dive Depth (m)	Maximum Dive Time, minutes	
	Single Dive (per day)	Multiple Dives (per day)
6	480	360
9	240	190
>9	150	120

Table 5.2 (AS/NZS 2299.1:2015)

Maximum Time limits for Dives Undertaken where Recompression Chamber Support exceeds 2 hours

Maximum Dive Depth (m)	Maximum Dive Time, minutes	
	Single Dive (per day)	Multiple Dives (per day)
6	300	240
9	180	150
>9	120	90

Where a diving operation is conducted in an area with greater than 2 hours travelling time from the nearest recompression facility, a safety margin must be added to dives by reducing the maximum bottom time permitted by the dive tables.

During dive planning, when determining the amount of time required to evacuate a patient from the dive site to a recompression chamber, the following points should be taken into account:

a) *the time commences from when the diver is removed from the water or shows any signs of DCI, and ends when they can be placed inside the recompression chamber;*

b) *the only form of transport that can reliably be counted on to be available for patient evacuation is the means by which the dive site was initially accessed (i.e. car/boat). The assumption must not be made that air or road ambulance will be available, contactable, and able to reach the site within a reasonable time period; and*

c) *as mentioned above, where identifiable factors are present, or likely to be present, that may increase the risk of DCI during a dive, the Dive Coordinator must build an extra safety margin into any dive plan. This is particularly important if diving in areas greater than 2 hrs away from the nearest recompression facility.*

Notwithstanding the above, the table in Appendix 4 shall be used to derive maximum repetitive group limits for diving each day, depending on the level of recompression chamber support available.

If the permitted **Effective Bottom Time (EBT)** is exceeded during any dive, the diver concerned must not re-enter the water for **at least 24 hrs**.

8.4.2 Omitted Decompression

The DCIEM omitted decompression procedures must be used where a diver has omitted decompression, but remains asymptomatic. The procedure is dependent on the availability of a recompression chamber.

Appendix 12 presents a decision based flowchart which will assist in determining the appropriate course of action when using DCIEM protocols.

After conducting this procedure, the diver's condition must be monitored for at least 24 hours after the dive for symptoms of DCI, and the diver must not enter the water again until at least 24 hours after the dive. As well, the diver must not expose him/herself to anything likely to increase the risk of DCI (e.g. exercise, altitude, alcohol etc), or which could mask the symptoms of DCI (e.g. alcohol, drugs). If symptoms of DCI occur, the diver should be transported to the nearest recompression facility as soon as possible.

8.5 MULTI-DAY REPETITIVE DIVING

Divers performing successive multi-day repetitive dives must use the DCIEM dive tables for calculating their no decompression limits on each dive. The effects of nitrogen build-up during this type of diving operation are well documented with regard to increased incidences of DCS, and the risk of this must be considered even when all dives are shallow (current information indicates that long shallow dives may have an elevated incidence of DCI).

Divers performing repetitive dives over multiple days must have a 24 hr break from diving after every third day, except where using repetitive dive profiles involving less than three dives per day, in which case a 24 hr break must be taken on the fifth day.

The guidelines listed at Section 8.7 of this procedures manual, for travel after diving must be followed.

8.6 MULTI-LEVEL DIVING

Details regarding use of any tables or dive computers for multi-level diving must be noted on the Dive Plan and approved by the BDO prior to departure. Such details must include WHY such use is requested, as well as measures that will be taken to ensure such multi-level diving is safe.

For this reason, where any JCU diving operation is conducted in an area that is greater than 2 hours travelling time from the nearest recompression facility, great care must be taken during planning for the diving operation to allow for all risk factors that may increase a diver's susceptibility to DCI. During such diving operations a safety margin must be added to dives by reducing the maximum bottom time permitted by the dive tables, and the amended bottom times used from Tables 5.1 & 5.2 listed above.

8.7 FLYING OR ASCENDING TO ALTITUDE BEFORE OR AFTER DIVING

Due to increased risk of DCI by ascending to altitude after diving, restrictions on road and air travel apply. Ascending to altitude means greater than 150m above sea level. ***Road travel over mountain ranges can easily exceed this level.***

These restrictions shall apply to all divers and must be followed, except in the event of an extreme emergency where no other option is available. In any such case, these rules should only be breached on the advice of medical personnel trained in hyperbaric medicine, and with the consent of all diving personnel involved.

To minimise the risk of developing DCS whilst travelling after diving, a diver should have a **minimum surface interval of 24 hours before ascending to altitude or flying**.

Table G1 below from AS/NZS 2299.1:2015 provides recommendations regarding the period which should elapse after diving and before a diver ascends to altitude or is otherwise exposed to reduced atmospheric pressure. These recommendations are intended to provide guidance for operations where no specific alternative protocol has been established.

Table G1 (AS/NZS 2299.1:2015) RECOMMENDED DELAY BEFORE EXPOSURE TO ALTITUDE

Altitude (meters)	Minimum delay from last dive before travel to altitude (hours)		
	Category 1	Category 2	Category 3
0-150	Nil	Nil	2
150-600	Nil	2	12
600-2400	12	24	48
Greater than 2400	24	48	72

Category 1 = Single dive to < 50% of the DCIEM no-decompression limit or two short dives within 18 hours with a total, combined bottom time of < 50% of the no-decompression for the depth of the deeper dive. No decompression diving or repetitive dives in previous few days.

Category 2 = Dives exceeding Category 1 but not included in Category 3 e.g. one or more dives to > 50% of the no decompression limits or a single decompression dive a day.

Category 3 = Repetitive deep diving over multiple days, multiple decompression dive on one day, extreme exposures; omitted decompression, or other adverse events.

After incurring any form of decompression illness, a diver should not be exposed to greater than 300m effective altitude for seven days.

Divers should also allow suitable recovery times from long flights/travel **prior** to diving. Conditions such as jet lag, general tiredness and dehydration can greatly effect safe diving operations and enhance the effects of sea-sickness.

8.8 DIVE COMPUTERS

All air diving conducted at JCU shall use the DCIEM air diving tables (metric) for determining safe diving profiles. A computer may only be used to keep track of, simulate, or assist with the conduct of any dive i.e. track elapsed time and maximum depth.

Dive computers and dive tables are guides that attempt to take into account the physiological processes involved with the breathing of compressed gases at depths. They are not definitive, and do not take into account many other factors that can affect an individual's susceptibility to decompression sickness i.e. age, gender, obesity, physical condition, hydration levels, cold water, work rate, ascent rate, recent illnesses/injuries. A Dive Coordinator can more readily apply corrections to cater for a broader extent of these factors using DCIEM tables.

Divers using computers must be familiar with their use, including any peculiarities specific to the type being used.

Rules for dive computer use:

- the user must have a thorough understanding of the manufacturer's instructions for use;
- a dive computer should not be the sole source of information to monitor a dive – the diver should have secondary devices to monitor depth and time;
- a diver must not begin using a dive computer if they have had an exposure to ambient pressures of greater than 1 ATA during the previous 24 hours (e.g. from diving, or time spent in a recompression chamber) - unless the computer was also exposed at the same time, to the same pressure (i.e. it was being worn at the time);
- the user must ensure that, before any diving takes place, the initial settings of the computer are correct for the dive (i.e. gas mixture, altitude, alarms, conservancy level etc);
- wherever possible, the deepest dive in a series must be performed first, and each repetitive dive should be at a shallower depth than the last;
- computers must not be shared between divers during any diving operation. Each diver must have their own computer for the duration of any diving trip;
- **do not 'push the limits'** of any computer - they are fallible. When planning your dive using the tables, allow for relevant risk factors that are known to increase the risk of DCI, such as cold stress, hard work, altitude, diving near the NDL, fatigue; and
- **dive computers will be checked for accuracy in accordance with section 11.5 of this manual.**

Any diver wishing to use a dive computer other than one of those supplied by the University must notify the BDO, providing information on the type of computer including its serial number, permitted ascent rate/s, and any other relevant factors.

9 SNORKELLING OPERATIONS

Snorkelling by JCU personnel should only be used as an observation and/or a light recovery or collection technique, and no difficult or strenuous work of any kind should be attempted while snorkelling.

Any JCU staff, students or volunteers intending to snorkel shall follow all the relevant procedures in this Manual, including creating a profile in the *Boating & Diving Register*, uploading any relevant qualifications and certificates, and completing the Snorkelling & Swimming Health Declaration. (*Form 7*)

The Boating and Diving Office will determine if further competency assessment of individuals is required in accordance with the criteria as set out in *Appendix 9*.

All trips involving snorkelling must be lodged in the *Boating & Diving Register*, which are then reviewed by the Boating and Diving Office or Orpheus Island Research Station (OIRS) as appropriate.

9.1 FITNESS FOR SNORKELERS

Snorkelling in open waters can be physically demanding and require a reasonable degree of physical stamina, mental focus and skill, especially when environmental conditions are less than ideal. Fitness for snorkelling means that an individual is in a state (medically, physically and psychologically) to perform work tasks assigned to them competently and in a manner which does not compromise the safety or health of themselves or others.

An individual's fitness for work may be impaired by a variety of factors including level of medical and physical fitness specifically cardiac related with age, weight, pre-existing conditions, fatigue, psychological factors or impairment due to alcohol and drugs (including prescription, non-prescription and illicit drugs).

All persons engaged in field work shall be fit for work and ensure any illness, injury or impairment is reported to the Field Trip Leader and Snorkelling Supervisor before the commencement of any activity.

All persons intending to snorkel must, as a minimum, complete the *Snorkelling & Swimming Health Declaration (Form 7).* If you are a current registered JCU diver holding a current occupational dive medical, you already meet these requirements and completion of the form is not required unless your health conditions have changed since your last dive medical.

All snorkelers will be asked by the Snorkelling Supervisor to confirm if they are fully fit to snorkel pre-dive as part of the *Take 5 Pre-dive Risk Checklist (Form 5).*

9.2 SIZE AND SUPERVISION OF SNORKEL TEAMS

The size of a normal snorkelling team is three; two snorkelers operating as a buddy pair and a Snorkelling Supervisor at the surface of the dive site. Under very low risk conditions, a team of two may be approved, which could comprise either a snorkeler and a surface supervisor, or two buddy snorkelers, one of whom will be an approved Snorkelling Supervisor.

A Snorkelling Supervisor shall assume the same role and responsibility as Dive Coordinator (see Section 3.5). Specifically, a Snorkelling Supervisor shall:

- have a thorough working knowledge of the operating and emergency procedures and risk assessments which have been developed to safely manage the activities at the site;
- have reasonable experience of the site, and/or has experience in supervising snorkelling / diving activities at similar locations;
- be able to recognise hazards and risks in the marine environment;
- be able to recognise changes to risks due to snorkeler's abilities and behaviour;
- be able to respond quickly to changes in risk and alter or abort activities as necessary;
- be a capable swimmer and experienced snorkeler;
- be competent to carry out a rescue of a snorkeler;
- be competent to provide first aid, oxygen resuscitation, operate an AED;
- be capable of coordinating the Emergency Management Plan; and
- be experienced in equipment sanitising techniques.

It is highly recommended that all snorkelers should possess current first aid, CPR and oxygen resuscitation certificates.

9.3 SUPERVISION OF LARGE GROUPS

Where snorkelling is planned for large groups, further guidance is provided in *APPENDIX 9 – Snorkelling (Large Group) Responsibilities* and *FORM 6 – Snorkelling Team Induction*.

Snorkelling activities of this nature would typically include:

- JCU undergraduate and post-graduate classes on field excursions (operating at OIRS or other locations);
- external organisations and secondary school groups based at OIRS; or
- other special interest groups or functions based at OIRS.

9.3.1 For JCU research and teaching snorkelling activities

Prior to the commencement of the trip:

- the **Field Trip Leader** must lodge a field trip activity proposal through the Riskware Field Trip Module and the Boating & Diving Register;
- the **Field Trip Leader** must demonstrate a thorough understanding of the risk assessments and/or procedures which have been developed to eliminate or minimise the risks associated with the trip;
- evidence must be provided that the minimum requirements for supervision, lookout, rescue and snorkeler guidance are met using *FORM 6 – Snorkelling Team Induction;* and
- the **Field Trip Leader** must ensure that all participants intending to snorkel have completed the *Snorkelling & Swimming Health Declaration (FORM 7)* as part of the field trip proposal.

9.3.2 For external groups (non-JCU) based at OIRS

At the time of confirming a booking:

- a Field Trip Activity Plan should be provided to the **OIRS Manager**;
- any procedures and/or risk assessments which the external organisation has developed to manage risk for the activities should also be provided;
- if possible, all participants intending to snorkel should complete the **Snorkelling & Swimming Health Declaration (FORM 7**) in advance, and forward to the **OIRS Manager** (otherwise this must be done before any in-water activity commences); and
- field trips must be reviewed and endorsed by the **BDO** and/or **OIRS delegate** in the Boating & Diving Register prior to the commencement of the trip.

Inductions, briefings and planning:

- before arrival at OIRS, visiting groups will be provided with sufficient information to plan their visit and activities;
- upon arrival at OIRS, groups will receive operational and safety inductions to the OIRS site and specific activities;
  - special attention must be given to non-English speaking persons – the use of interpreters with instruction feedback is mandatory;
- the BDO or approved delegate will conduct assessment of Supervisors and snorkelers (FORM 6);
- Supervisors and support staff will receive an induction and operational briefing (refer to Roles and Responsibilities, EMP's and Risk Assessments);
- activities and schedules will be planned around tides, conditions, staffing and availability of vessels and equipment;
- The BDO will decide on the appropriate level of supervision for groups (ratios). As a general rule:
  - a **minimum of 2 supervisory staff** shall be present at the snorkelling site when the number of snorkelers in the water is **between 2 and 10**;
  - there shall be present at all times a minimum of one staff who is competent to be ***Snorkelling Supervisor***, ***Lookout, Rescuer*** and ***First Aid Provider***; and
  - **one extra staff** should be added when the number of snorkelers is **between 10 and 20**, and there should be at least 2 staff competent as ***Rescuers*** and ***First Aid Providers***.
- When ***'at risk'*** snorkelers are involved:
  - **one extra staff** should be added to the above-mentioned ratios; and
  - the extra staff can act either as a ***Snorkel Guide***, or extra ***Lookout*** and ***Rescuer***, who provides extra attention to '***at risk***' snorkelers.

NOTE: it is important for school groups that any persons intending to enter the water have the FORM 7 countersigned by a Parent or Guardian PRIOR to attending the trip or they will not participate in water.

9.4 SNORKELLING PROCEDURES

9.4.1 Site Setup, Control and Supervision

One or more dive flags must be raised centrally at the site (consider also using extra dive flag buoys at the site boundaries).

Emergency communications systems must be tested *before* the commencement of activities.

A rescue vessel or craft should be positioned and ready for rapid deployment, **ensuring there is capability to handle multiple, simultaneous rescues** if required.

A pre-dive briefing (FORM 5 – Take 5 Pre-dive Risk Checklist) must be given by the Supervisor to re-inforce:

- snorkelling techniques, equipment instruction and task limitations (if any);
- the formation of buddy pairs and importance of remaining in close visual contact;
- allocation of supervisory team members, positions around the site, and identification to snorkelers;
- equipment sanitising techniques and the requirement of not sharing masks and snorkels between users;
- site boundaries, which should be marked using buoys and/or floating ropes when large snorkel groups are involved;
- hazards present and control measures that are being used to minimise risk;
- entry and egress methods;
- emergency assistance signals; and
- the recall signal(s).

For duck-diving:

- reinforce the risks of hyperventilation and shallow water blackout;
- reinforce the risks of ear and sinus barotrauma when doing multiple duck-dives;
- **duck-diving should not exceed depths greater than 2m**;
- ensure no snorkeler is negatively weighted; and
- ensure buddy pairs operate one up / one down, and maintain constant visual contact with each other.

If a mothership is present:

- a long mermaid line should be deployed;
- special attention should be given to the movement of currents which may sweep snorkelers away from the vessel;
- snorkeler numbers must be counted into and out of the water; and
- a means of rescue must be readily available.

For shore-based snorkelling:

- the Supervisor shall be positioned to maintain full unobstructed vision of the snorkelers;
- the First Aid Kit, Oxygen Resuscitation Kit and AED should be positioned at the egress point (unless the EMP provides for rapid communication and delivery of equipment from a nearby location);
- a large, visible Dive Flag (Code A) should be in place at the shoreline access/egress point and snorkelers recorded in/out from this point using the ***Snorkel Log Sheet – FORM 8***;
- it is highly recommended that towed dive floats be used to identify each buddy pair; and
- an emergency communications protocol must be developed by the Snorkelling Supervisor, and understood by all participants before the commencement of activities.

When a two-person snorkelling team is operating from a vessel without a surface attendant:

- the work will only occur under benign conditions, in shallow, protected waters;
- the security of anchoring must be thoroughly checked;
- the snorkelers should not be working more than 50 metres from the vessel;
- the successful rescue of an unconscious snorkeler must be tested prior to commencing activities;
- the use of towed dive floats is mandatory – it is important that snorkelers provide maximum visibility of their location to any passing vessel; and
- it is also highly recommended that a reliable communications device is carried (such as a hand-held VHF radio, mobile phone in waterproof case, nautilus lifeline or PLB).

When ***'at risk'*** snorkelers are involved:

- ensure floatation devices are provided and fitted correctly;
- ensure they can be easily identified by the ***Lookout*** when they are in the water (if PFD's are not used, then a coloured vest or hood is preferred); and
- re-inforce the buddy system and signalling for help.

9.4.2 Breath-Hold Diving

Breath-hold diving is a technique that involves a diver going to depths greater than 2m on a single breath-hold. Breath-hold diving is considered to increase risk due to the following factors:

- the competence of a person to conduct breath-hold diving;
- the risk of shallow-water blackout;
- the possibility of buddy separation and rescue capability;
- the potential for ear and sinus barotrauma; and
- the increased exertion of the activity.

In managing the added risks associated with breath-hold diving, the **Supervisors must inform snorkelers** of the following guidance provided from the *Recreational Diving, Recreational Technical Diving and Snorkelling Code of Practice 2018*:

- breath-hold divers carry increased risk of hypoxic blackout, which if undetected will lead to serious injury, unconsciousness and death;
- the risk of hypoxic blackout is increased significantly for breath-hold divers who hyperventilate by taking repeated deep breaths before descending, or who do deep dives. Consequently divers are strongly advised **not** to hyperventilate in this manner;
- experienced breath-hold divers are at particular risk in that they do longer and deeper dives;
- breath-hold divers should always dive in buddy pairs where one buddy remains on the surface and observes the other buddy whilst they are diving (one up / one down);
- breath-hold divers using weight belts should be carefully weighted to ensure that they are neutrally or positively buoyant while at the surface; and
- weight belts should have a quick release mechanism and divers should be familiar with its operation.

When snorkelling activities are planned which involve repetitive breath-hold diving, the Snorkelling Supervisor must ensure that added risks are being managed appropriately, taking into account:

- the competence, fitness and physical condition of divers on the day;
- environmental conditions and underwater visibility;
- hazards posed by boating traffic in the area;
- the viability of using float / life lines for each diver;
- the overall number of dives to be conducted daily;
- the remoteness of the dive site for access to emergency services; and

- the need to develop a specific **Safe Work Procedure** for the planned activities.

9.4.3 Emergency Response and Aborting Activities

An Emergency Management Plan (EMP) must be developed for field work with particular focus on the accessibility of emergency service providers in the local area, and the facilities that are available.

Particular care must be taken when snorkelling in areas of high boating traffic (e.g. around boat ramps, shipping channels or in popular boating areas). It is recommended that snorkelling occurs directly adjacent to the work vessel, and/or there is a means to make snorkelers highly visible to passing vessels, for example using towed dive floats and high visibility suits/vests/hoods.

Special consideration for aborting activities and recalling snorkelers from the water should account for:

- significant, unforeseen hazards become evident at the site;
- deterioration of weather or environmental conditions;
- one or more members of the supervisory team need to leave the site;
- it becomes impossible to constrain snorkelers in an area; or
- if any risks are suddenly elevated (e.g. tide changes incur high/difficult currents).

Recalling snorkelers and aborting activities must occur if:

- a crocodile or large dangerous shark is sighted in the immediate area;
- a snorkeler goes missing;
- a person requires first aid treatment or medical attention; or
- dangerous marine stingers are present.

The procedure for treating a drowning or diving incident is in *Appendix 11.*

The procedure for responding to a missing person is in *Appendix 10.*

9.5 EQUIPMENT

All **First Aid** equipment listed below, and at least one form of reliable **Communications** equipment capable of contacting emergency services is mandatory and must be at the site and immediately accessible for use if required. Both visual and audible signalling devices which can be used to communicate between snorkelers and the surface supervisor should be carried.

All **Rescue, First Aid** and **Communications** equipment must be at the site, tested, and immediately accessible for use if required.

Types and specifications of equipment that are recommended for use are as follows.

Standard snorkeler's equipment should include:

- appropriate exposure protection for cold, sun burn and stinger protection (wetsuit or lycra suit);
  - *protection from stingers includes full length steamer, gloves, boots and hood (see section 9.5.1)*;
- mask, snorkel and fins; and
- a divers knife, unless only duck-diving less than 2m where there is no risk of entanglement (e.g. school groups).

Extra floatation devices:

- Personal Floatation Devices (PFD) AS4758.1 Level 50 minimum;
- devices should be of high visibility to enhance surface watch of less experienced snorkelers;
- the Snorkelling Supervisor shall decide if floatation devices are to be used based on the competency of snorkelers and the risk nature of the activities.

Rescue devices and aids:

The Snorkelling Supervisor shall determine the necessity or advantage of using the following types of equipment when planning the activities:

- binoculars;
- buoyant ropes;
- throw lines;
- mermaid lines;
- life buoys;
- kayak / rescue boards; or
- lifesaver buoys / tubes.

First Aid equipment and supplies:

- First Aid Kit – NSCV Scale G minimum (see *Appendix 5*, or risk assess to closest equivalent) is mandatory at the site;
- Vinegar – 4 litres minimum;
- Oxygen Resuscitation Kit –
  - DAN kit or Bag Valve Mask (BVM) capable of delivering ANAP 100% oxygen to a breathing or non-breathing person;
  - Oxygen supply cylinder(s) as defined in the EMP or at a minimum, for remote sites:
    - within 2hrs of professional medical assistance: minimum 1 x C-size;
    - 2-6hrs: minimum 1 x D-size;
    - >6hrs: minimum 2 x D-size;

NOTE - It is recommended to have access to an Automated External Defibrillator (AED) at the site, although it may be impractical to store and use on small vessels.

Communications and signalling devices:

- dive flag **CODE A** (flag Alpha) – mandatory for dive site marking: minimum size **750 x 600mm**, and if displayed from a diver's float, the flag must not be less than **300 x 200mm**;
- VHF and/or 2-way radio – mandatory for vessel-based operations;
- loudspeaker;
- air horn;
- mobile phone;
- whistle / siren; or
- Nautilus life-line.

9.5.1 Exposure Protection

Snorkelers, as with scuba divers shall wear suitable clothing to protect themselves from environmental conditions such as cold, sun, marine animals, abrasions etc. A full-length wetsuit or stinger-proof suit is recommended at all times. Special consideration should be given to time spent at the surface upon completion of in-water activities and the comfort of snorkelers due to possible exposure to wind and other elements.

During periods of the year when there is increased risk of marine stingers, full body cover is mandatory. Full body cover must be worn when working in inshore areas where there is higher risk of *Chironex* sp. (box jelly fish) presence.

9.6 SNORKELLING & SCUBA DIVING COMBINED ACTIVITIES

Undertaking snorkelling work following a SCUBA dive is discouraged, as is any strenuous exercise post-diving.

No breath-hold diving is to be undertaken by any diver who has a repetitive factor (RF) of greater than 1.0 from a previous dive, including recompression chamber dives.

10 EMERGENCY PROCEDURES

Proper emergency management planning requires that emergency procedures are developed for every diving operation, taking into account the risk-nature of the operation, location, personnel involved and emergency service facilities available.

The fundamental procedures must include:

- the rescue of an injured person;
- responding to a missing person;
- providing life support and first aid to a casualty;
- contacting emergency services; and
- arranging for evacuation and transport to advanced medical care and a recompression chamber if required.

10.1 INJURED DIVER or SNORKELER

The following actions must be taken during a diving emergency:

- assist the injured person(s) immediately by providing first aid;
- recall all divers immediately;
- ensure that other members of the diving team are not at risk and that all divers are present;
- provide emergency life support and first aid as required;
- establish contact with emergency services;
- when the immediate emergency has passed, recover as much of the injured diver's equipment as possible - **keep separate from other equipment prior to expert examination, do not disassemble equipment** (The Dive Coordinator may decide not to recover items if to do so would be unsafe or cause undue delay);
- ensure that no equipment has been left in a dangerous condition; and
- if possible, make records of the incident, ensuring that the Diver's Log is available for the doctor, particularly if recompression is required.

NOTE: The buddy of a diver who develops symptoms of decompression illness, even on a dive apparently carried out according to the DCIEM tables, may also develop symptoms later and require treatment.

A flowchart for treating an injured diver/snorkeler can be found in *Appendix 11.*

10.1.1 Incident Reporting

In the case of a fatality or serious accident requiring recompression and/or hospitalisation, as soon as is possible, the University must be informed by contacting JCU Security Control – (07) 4781 5555 or 1800 675 559, who will then inform the Dean of Research, and the JCU Chief of Staff.

When the immediate emergency has passed, and all necessary steps have been taken to assist the casualty, a full record of the incident must be compiled. While details are still fresh in everyone's mind, the DC or another member of the team shall start making notes, obtain details from other divers, record exact times, etc. (see *Diver Injury Report - Form 2*)

The JCU WHS Unit must be notified as soon as possible and the incident recorded on **RiskWare**, as per the University's guidelines.

10.1.2 Providing First Aid

For every JCU diving operation, a substantial first aid kit adequate for treating any injuries that may be reasonably foreseen must be available on site. An acceptable first aid kit should be, as a minimum, equivalent to a Scale G - AMSA (see *Appendix 5*). When diving in areas known for the presence of dangerous marine stingers, at least 2 litres of vinegar should be available.

Consideration must also be given to the need for extra supplies when working in remote areas (> 6 hours from access to advanced medical care).

All JCU Dive Coordinators, divers and Diver's Attendants shall maintain currency in first aid and CPR training, and shall be prepared to work as a team in providing necessary life support and first aid to a casualty, until an advanced medical care professional can intervene.

10.1.3 Provision of Oxygen / Advanced Resuscitation

The provision of oxygen to either a breathing or non-breathing casualty is an important emergency first aid measure for the treatment diving-related injuries. It shall be administered as necessary during life support treatment and transfer to hospital or recompression facilities, or on advice from a diving medical doctor by a qualified operator.

Any diver who appears to be suffering symptoms which could indicate mild decompression sickness must:

- remain at rest;
- breath 100% oxygen;
- drink non-alcoholic fluids;
- seek the advice of a hyperbaric doctor; and
- the person must remain on oxygen until advice has been received by a doctor, even if symptoms abate.

Oxygen resuscitation equipment will be immediately available at all JCU dive sites, with a sufficient supply of medical grade oxygen available to transport a patient to the nearest medical treatment facility. This equipment shall be capable of delivering as close as practicable to 100% oxygen concentration to a spontaneous breathing patient and a concentration exceeding 50% to a non-breathing patient. All JCU Dive Coordinators, divers and Diver's Attendants shall maintain current training in the use of the oxygen equipment.

All oxygen resuscitation equipment shall be kept clean and dry in a waterproof case, checked prior to each trip, and maintained in accordance with the manufacturer's guidelines.

10.2 MISSING DIVER

10.2.1 Lost Buddy Procedures

Where divers are paired together on a dive, and lose contact with each other during that dive, the 'lost buddy' procedure is as follows:

- immediately on noticing contact has been lost with their buddy, each diver should circle 360˚, looking for the buddy, or their exhaust bubble trail (often easier to see if looking up slightly);
- if visual contact is not made after the above procedure, each diver should ascend 3 - 5 metres, and repeat the procedure;
- the first two steps should take no longer than one minute;
- if contact is still not re-established, each diver should surface at a rate of no more than 18 m/minute (the maximum controlled ascent rate);
- if the divers regain contact at the surface, the dive may be recommenced or terminated, at the discretion of the Dive Coordinator or Dive Leader; or
- if a diver is still missing more than 5 minutes after his/her buddy surfaces, the procedure for responding to a missing diver must be followed (below and see missing diver flowchart in *Appendix 10*).

Lost buddy procedures must be discussed in every pre-dive briefing.

10.2.2 Procedure for a Missing Diver

When divers cannot be located after a 5 minute search, the following process should be used:

- immediately upon recognising a diver is missing, the DS activates their emergency response plan by requesting assistance. This may include notifying research station management or ships master.
- mark with GPS and marker buoy the last known position of the lost diver.

If at any time, a person sights the missing diver, they should maintain visual focus on that position.

- if divers are still in the water, recall immediately using the pre-arranged recall signal.
- establish contact with emergency service providers according to the emergency management plan (ie. via the Station emergency plan, or directly contacting police/search and rescue, or local search & rescue organisations);
  - the emergency management plan must be mapped out and communicated to all team members before any diving takes place.

- all available persons must be on lookout for a diver at the surface, or signs of a diver's bubbles, or a diver's visual or audible emergency signal;
  - use binoculars if available
  - look downwind and down-current
- if divers are available to safely conduct a search, deploy the dive team to begin search where diver was last seen using the emergency marker buoy as reference;
  - ensure the search team has the capability and necessary experience to conduct an appropriate search pattern;
  - ensure that the search team can be recalled if/when necessary;
  - sink (do not swim) to the bottom to determine effect of current.
  - divers involved in search must not subject themselves to risks such as decompression illness.
- if the diver is located proceed with appropriate actions and notify appropriate persons;
- if the diver is not recovered, continue searching as long as possible until relieved by emergency search and rescue services;
- maintain continual communications with authorities.

As soon as possible, the DC shall complete an incident report in accordance with Section 10.1.1 of this manual.

Response to a missing diver / snorkeler flowchart is in *Appendix 10*.

11 DIVING EQUIPMENT

11.1 GENERAL POLICY

All diving equipment used on JCU diving projects must be of a type, quality, function and condition that is compliant with the requirements in this Manual, relevant diving standards, and also suitable for the tasks intended.

All equipment must be maintained in accordance with the manufacturer's instructions, unless a more stringent degree of maintenance and testing is required by this Manual, and/or relevant diving standards.

All equipment shall be regularly examined by the person using it. Any defects in the operation of the equipment will require the item to be isolated so it cannot be used, and tagged with the details of the problem and the owners of the equipment notified. See Section 6.5.3 of this manual.

It is the responsibility of the Dive Coordinator to ensure that all required equipment is carried by each diver on every dive, unless special dispensation has been granted by the BDO.

11.1.1 Compulsory Equipment for All Divers

The following equipment must be used or carried by each diver unless dispensation has been granted by the BDO:

- exposure protection (stinger suit, wetsuit or drysuit) appropriate to the prevailing environmental conditions, including other components for full body cover if necessary (see Section 14);
- mask, fins, snorkel and a sharp diver's knife - the knife shall be worn in such a way that it will not foul any discarded equipment such as released weights; and
- if a weight belt or BCD integrated weights are required to be worn, they shall be a quick-release design.

11.1.2 Compulsory Equipment for SCUBA, and Breathing Gas Supply

As well as the equipment listed in 11.1.1, the following equipment must be used or carried by each diver on every SCUBA dive unless special dispensation has been granted by their BDO or delegate:

- a SCUBA cylinder and valve designed in accordance with AS 2030;
- a breathing regulator with both a primary and alternative air source, or in the absence of an alternative air source – an independent air supply and regulator;
- a Buoyancy Compensator Device/Jacket to hold scuba cylinder(s) and provide the means to adjust buoyancy during the dive, and provide adequate floatation at the surface during an emergency;
- a submersible pressure gauge, depth gauge and timing device, e.g. watch or dive computer;

- sufficient quantity of breathing gas to complete the planned dive plus a reserve amount providing a minimum safety margin of 25% for dives shallower than 21m, and 30% for dives to deeper than 21m;
- a high visibility, inflatable surface signalling device (e.g. 'safety sausage™'); and
- an audible signalling device (whistle or air buzzer).

Exposure Protection

Divers shall protect themselves by the use of wetsuits, dry suits, stinger suits, overalls etc, from environmental conditions such as cold, sun, marine animals and abrasions.

During periods of the year when there is increased risk of marine stingers, full body cover is highly recommended. Full body cover must be worn when working in inshore areas where there is higher risk of *Chironex* sp. (box jellyfish) presence.

11.1.3 Other Equipment which may be Required

Additional equipment, which may be required for safe conduct of a dive, includes:

- emergency independent air supplies;
- further exposure protection, such as gloves and hood;
- a compressed air powered signalling device;
- submersible dive tables;
- a lifeline or float-line; and
- night diving equipment as appropriate, including primary and backup torch, and cyalume (glow) stick/s.

The BDO, together with the DC shall determine the need for additional diving equipment requirements during the development of the Dive Plan.

11.1.4 Additional Equipment which may be used by Scientific Divers

JCU Divers may, through the conduct of underwater work, use a variety of equipment such as photographic equipment, slates, measuring tapes, lightweight grids, frames, collection bags, traps, small hammers, stakes and pickets, small hand tools such as screw drivers, pliers, and small hand held pneumatic tools as approved.

When using tools or equipment, the following shall apply:

- any tools or other equipment used on a dive must be easily manageable by the diver and not increase risk beyond an acceptable level by their use;
- divers shall not use tools or equipment underwater unless they have received appropriate training and are familiar with the operation that item of equipment;
- the Dive Plan shall detail the use of equipment and the risk-nature of the tasks, the risk assessment shall outline control measures to mitigate risk; and
- the BDO shall decide if further specific Safe Work Procedures may be required for the operation of specialised equipment.

Examples of emergency signaling devices which may be used for diving:

- Diver Recall Device – underwater speaker able to emit a variety of unique tones;
- Air Buzzer - a pneumatic device useful for signaling above and below water;
- Surface Signaling Device - an inflatable orange plastic tube;
- Whistle;
- Heliograph - a mirrored surface used to reflect light (sun, search light) towards search aircraft or vessels; and
- Nautilus Life-Line unit – emergency messaging beacon.

11.2 AIR COMPRESSOR SYSTEMS

11.2.1 Design and Location of Compressors

Any power driven compressor systems used to provide compressed breathing air for University diving operations must comply with the guidelines set out in AS/NZS 2299.1:2015 for such systems.

The following features should be considered in the design and location of compressor systems:

- fill station controls located in a remote position, shielded from cylinders being filled, to minimise risk of injury in the event of a cylinder failure;
- pressurised gas bank cylinders secured to prevent falling;
- all high pressure lines and fittings of appropriate rated working pressures and security;
- if a portable installation, the area is suitably cordoned off to prevent people, other than the operator, getting too close;
- if a petrol engine driven portable installation, suitable firefighting facilities; and
- all air compressor intakes located away from areas containing engine exhaust or other contaminants.

The operation of any compressor and cylinder filling system should be detailed in an individual Safe Work Procedure (SWP) that is specific to the equipment in use.

11.2.2 Compressor Operation and Air Test Records

Personnel filling scuba cylinders from any air compressor or fill station shall be trained in the operation of that equipment. It is illegal to fill a SCUBA tank if the annual hydrostatic test has expired or the tank has signs of damage. It is the responsibility of the person filling the tank to inspect the cylinder appropriately before filling.

Where a power driven compressor is driven by an internal combustion engine, particular care must be taken to prevent the compressor from sucking in exhaust gases from the engine, either by extending the exhaust of the engine, the inlet of the compressor, or both. If either of these modifications is made, care must be taken to ensure that any such extensions meet the compressor manufacturer's recommendations/specifications.

A JCU-owned compressor should be checked for oil and hydrocarbon contamination at least every 100 hours or 3 months (whichever comes first). Air compressor filters shall be changed in accordance with the manufacturer's instructions, or if air tests indicate that renewal of filters and/or other maintenance is necessary.

The results of these tests shall be entered in a formal log maintained by the BDO, and copies of the results shall be kept on file by the BDO. This log shall also record hours of operation, repair, overhaul, filter maintenance, and temperature adjustment for each compressor.

Any power driven compressor systems used to provide compressed breathing air for University diving operations must produce air to the standard specified in AS/NZS 2299.1:2015.

Table 11A - Breathing Gas Standards

Component	Maximum
Oxygen	21% by volume (+/- 1%)
Carbon Monoxide	not more than 5 ppm
Carbon Dioxide	not more than 600 ppm
Oil	not more than 0.5 mg/m^3
Water Vapour (in 225 Bar fill)	not more than 50 mg/m3 at 20 ° C
Objectionable Odours or taste	nil

11.2.3 Enriched Air Nitrox Compressors

In addition to the above, any compressor/filtration system used for production of EAN must produce oil-free air as per AS/NZS 2299.1:2015. Extra filtration and/or an oil-free or oil-less compressor is highly recommended when blending or mixing Nitrox using O_2 concentrations greater than 40%, to reduce the presence of oil mist and reduce the possibility for oxygen ignition of hydrocarbons.

11.3 SCUBA CYLINDERS

All SCUBA cylinders and cylinder valves used for JCU operations must meet specifications outlined in AS2030.1:2009 Gas cylinders General requirements or AS3848.2:1999 Filling of portable gas cylinders Filling of portable cylinders for self-contained underwater breathing apparatus (SCUBA) and non-underwater self-contained breathing apparatus (SCBA) - Safe procedures, as appropriate.

11.3.1 Testing of SCUBA Cylinders

All SCUBA cylinders must be tested and inspected at least annually, and any cylinder used on a JCU dive must be in test at the time of the dive. If any cylinder is found to be totally drained of air at the time of filling, it must be inspected and tested prior to being used again.

11.3.2 Filling of SCUBA Cylinders

JCU SCUBA cylinders may only be filled at a filling station, or by a compressor approved by the BDO. The procedure for filling a cylinder should be detailed in a Safe Work Procedure (SWP) specific to the equipment in use.

It is the responsibility of the DC to ensure that any air being used to fill a SCUBA cylinder meets the air purity standards as outlined in this Manual.

After filling, cylinders should have their valves taped or capped to prevent contamination and allow easy identification of full cylinders.

The amount of air pressure left in returned cylinders must be checked prior to filling, and **cylinders must contain at least 30 BAR of pressure**. *N.B the minimum reserve for any diver returning to the surface from a dive remains at **50 BAR**, this 30 BAR content is to allow minor use of air for post-dive equipment care. Section 15 Definition of Terms*, defines minimum air reserves.

If, at the time of filling, any cylinder is found to be totally drained of air, it must be inspected and tested prior to being used again. Costs for this testing may be charged to the user.

It is illegal to fill a SCUBA tank if the annual hydrostatic test has expired or the tank has signs of damage. It is the responsibility of the person filling the tank to inspect the cylinder appropriately before filling. Cylinders with any defects (e.g. air leaks from valves) must be tagged OUT OF SERVICE and the BDO notified.

SCUBA cylinders should always be stored partially filled to prevent the ingress of moisture.

Users who have not previously used the University's cylinder filling compressors must not do so until they have been given detailed operational and safety instructions by the BDO or their delegate, and received permission.

11.4 USE OF PERSONAL DIVING EQUIPMENT BY JCU DIVERS/PERSONNEL

Personal diving equipment may be used by JCU divers/personnel provided the following conditions are met:

- equipment must be approved for use by the BDO by inclusion in the Dive Plan;
- equipment must be maintained in service as per Section 11.5 below; and
- a image of the equipment and copies of all relevant and current service certificates for the equipment must be uploaded to the Boating & Diving Register and kept on file for a minimum of seven years.

11.5 EQUIPMENT MAINTENANCE/RECORD KEEPING

All diving/safety equipment used on University diving operations (***including personal equipment***) must be maintained and serviced **at least to the manufacturer's specifications**, or more often if in regular use. Details of such servicing/maintenance must be recorded and scanned copies of all documentation entered into *Boating & Diving Register*. Evidence of purchase is required for new equipment, otherwise a record of inspection and testing by a qualified technician shall be provided.

As a minimum, the following service schedules must be observed for the equipment listed below:

Table 11B - Equipment Service Intervals

SCUBA Cylinder	Annual inspection and test required at qualified test station.
Air Storage Cylinder (HP Banks)	Inspection and test required every 5 years at qualified test station.
Regulator/Contents Gauge	Annual service required by a qualified technician.
Depth Gauge (mechanical)	Must be checked for accuracy every 12 months.
Depth Gauge (electronic)	Must be checked for accuracy every 12 months.
Dive Computer	Depth sensor must be checked for accuracy every 12 months.
BCD (including inflator unit/valves)	Annual check required, maximum 2 year service interval. ***NOTE**: If the BCD contains the diver's secondary air supply (octopus regulator) as part of the inflator mechanism, the unit requires annual service (at a minimum) by a qualified technician.*
Air Compressor Systems	Air purity - every 3 months or 100hrs, whichever comes first - to AS/NZS 2299.1:2015 breathing air standard. Mechanical systems - as per manufacturer's instructions.
HP Air Delivery Hoses	Annual pressure test.

Any equipment in high use, or subjected to harsh conditions may require more frequent service intervals.

All equipment in use should be washed and/or flushed with fresh water at the end of every working day and hung to dry, and any faults or defects shall be noted. **Defective equipment must be tagged 'OUT OF SERVICE'** to prevent accidental use, and all defects reported to the DC or BDO. Equipment known to be faulty in any way MUST NOT be used for any JCU diving operation.

While connected to a pressurised scuba cylinder to prevent water ingress, SCUBA regulators should ideally be soaked in freshwater, with primary and octopus regulators purged, and all levers/adjustment knobs worked/turned. At a minimum, BCDs should be flushed twice internally with freshwater, and the inflator soaked in freshwater.

11.6 EQUIPMENT HYGIENE

To help prevent possible transmission of infectious diseases between divers, sharing of masks, snorkels and regulators between divers is discouraged if an appropriate disinfection/sanitation schedule has not been completed. Where JCU divers are issued with equipment, they are responsible for equipment hygiene whilst it is in their care.

Personnel must ensure that oil, petrol lubricants, chemicals or preserving solutions (such as formalin) do not come into contact with diving equipment, as these will destroy the equipment or otherwise render it unusable**. Such products must not be stored or transported in close proximity to JCU diving equipment at any time.**

If equipment is contaminated, the affected item/s must not be used, and the following steps must be taken:

- The equipment should be rinsed thoroughly with water to remove as much of the contaminant as possible;
- The equipment must be clearly tagged 'OUT OF SERVICE', indicating that it must not be used, and detailing the type of contaminant with which it has been in contact; and
- The equipment must be forwarded to the BDO for cleaning, with a report detailing the circumstances under which the contamination occurred.

11.7 DIVER'S FLAG

The international dive flag (code alpha - white with blue swallow tail) must be flown from any boat used as a platform for a JCU diving operations. As well, a dive flag **must** be used in the following situations:

- When diving in water of less than 3 m depth, a large dive flag must be positioned immediately above the dive site, either in a boat, or through use of a float supported flag - particularly in areas where there is a high level of danger from boat traffic;

- When diving from shore, **either** a large dive flag must be placed on the shore to indicate the position of the dive site, and one diver from each buddy group involved on the dive should tow a smaller dive flag on a surface float to indicate the position of that buddy group at all times, **or** a large floating flag must be towed by the divers; and
- Where a diving operation involves two or more buddy groups, and those groups are not intending to dive together, one diver from each buddy group involved on the dive must tow a smaller dive flag on a surface float to display the position of that buddy group to the Dive Attendant at all times if;
- The buddy teams are working more than 30m apart; or
- The surface conditions make it difficult to track the location of the dive teams.

When displayed from a vessel, the flag shall be a minimum size of **750 x 600mm**, and if displayed from a diver's float, the flag must not be less than **300 x 200mm**.

12 NITROX DIVING GUIDELINES

The following guidelines address the use of Enriched Air Nitrox (see glossary) by JCU divers.

12.1 PREREQUISITES

Any diver wishing to use Nitrox for a JCU dive must hold at least an approved Nitrox Diver certification.

Application to use Nitrox must be made to the BDO (accompanied by proof of qualifications/experience), and written permission received, before a diver may use Nitrox on any JCU dive.

12.2 REQUIREMENTS FOR PERMISSION TO USE NITROX

Submission of the required documents will not automatically result in authorisation to use Nitrox. The applicant must demonstrate that he/she is skilled and proficient in its use. Even after completion of training and evaluation, authorisation to use Nitrox may be denied to a diver who cannot demonstrate to the satisfaction of the BDO the appropriate judgment or proficiency to ensure the safety of the diver and any dive buddy.

Prior to authorisation to use Nitrox, the following minimum requirements should be met.

12.2.1 Training

Hold an approved Nitrox Diver certification from a recognised diver training organisation; and have logged at least five dives using Nitrox during or post-training.

12.2.2 Theory and Practical knowledge

Each diver should demonstrate knowledge proficiency in:

- calculating suitable dive profiles using a variety of EANx mixtures including pO_2 limits and maximum operating depth of mixtures; and
- practical demonstration of checking gas mixtures.

12.2.3 Minimum Activity to Maintain JCU Nitrox Diver classification

The diver should log at least one Nitrox dive per year.

12.3 JCU NITROX DIVING REGULATIONS

12.3.1 Dive Personnel Requirements

An unrestricted JCU diver, who has met the training and practical requirements of these guidelines, may be authorised by the BDO to use Nitrox.

On any dive during which Nitrox will be used, the Dive Coordinator must be an authorised JCU Nitrox Diver, and hold appropriate authorisations required for the dive as specified above.

Authorisation by the BDO for Nitrox dives must occur as part of the Dive Plan approval process, and any proposed Nitrox dive must be flagged clearly as such by the Dive Coordinator.

In addition to the responsibilities listed at Section 3.5, for any dive operation the Dive Coordinator must:

- verify that all divers intending to use Nitrox on a dive are properly qualified and authorised;
- as part of the pre-dive procedures, confirm with each diver the Nitrox mixture being used, and establish dive team maximum depth/time limits, according to the shortest time limit or shallowest depth limit among the team members; and
- if using computers, check that each diver has correctly entered their breathing mixture, fO_2.

The Dive Coordinator or Dive Leader should also give consideration to reducing the maximum allowable pO_2 exposure limit for the dive team if on-site conditions so indicate.

12.3.2 Dive Parameters

a) Oxygen Exposure Limits

The inspired oxygen partial pressure experienced at depth should not exceed 1.4 ATA. EANx dives should comply with the current NOAA Oxygen Exposure Limits.

The maximum allowable exposure limit should be reduced in cases where cold, strenuous dive conditions or extended exposure times are expected, and the BDO should consider this in the review of any dive plan application, which proposes to use Nitrox. The Dive Coordinator should also review on-site conditions and reduce the allowable pO_2 exposure limits if conditions indicate this would reasonably be warranted.

If using the equivalent air depth (EAD) method, the maximum depth of a dive should be based on the oxygen partial pressure for the specific Nitrox breathing mix to be used.

b) Bottom Time Limits

Maximum bottom time should be based on the depth of the dive and Nitrox mixture being used.

Bottom time for a single dive must not exceed the NOAA maximum allowable "Single Exposure Limit" for any O_2 partial pressure, as listed by the NOAA O_2 Exposure Limits.

c) Decompression Tables and Gases

A set of JCU approved Nitrox decompression tables must be available at the dive site for all Nitrox dives unless using the equivalent air depth (EAD) method, in which case dives should be conducted using the DCIEM air decompression tables.

If Nitrox is used to increase the safety margin of air-based dive tables, the Maximum Operating Depth (MOD) and oxygen exposure and time limits for the Nitrox mixture being dived must not be exceeded.

Breathing mixtures used for in-water decompression, or for bail-out purposes, should contain the same or greater oxygen content as that being used during the dive, within the confines of any applicable depth limitations and the oxygen partial pressure limits outlined above.

d) Nitrox Dive Computers

With the written approval of the BDO a dive computer may be used to compute decompression status during Nitrox dives. This will only be permitted subject to the following:

- any computer used must be set to a personal adjustment level determined by the BDO before use;
- the diver must read and follow all manufacturers' guidelines and operating instructions;
- any dive computer use must comply with the guidelines listed at Section 8.8 of this Manual, where these are more conservative than those applied by the computer operating instructions;
- any JCU diver applying for permission to use a computer to monitor Nitrox diving must demonstrate a clear understanding of the display operations of the unit being used, to the satisfaction of the BDO or his/her delegate, prior to diving with the computer;
- where Nitrox is used to increase the safety margin of an air-based dive computer, the MOD and oxygen exposure and time limits for the Nitrox mixture being dived must not be exceeded;
- prior to each dive, the diver MUST check any dive computer capable of pO2 limit and fO2 adjustment, to ensure compatibility with the mix being used; and

- decompression requirements must be calculated for the dive, for the maximum depths/times to be dived, using an approved Nitrox decompression table or DCIEM tables and equivalent air depths. These requirements are to be written down and carried by each diver during the dive in case of computer failure.

e) Repetitive Diving

When performing repetitive dives using Nitrox gas mixtures, the following shall apply:

- repetitive dives using Nitrox mixtures must be performed in compliance with all procedures required by the specific dive tables used;
- residual nitrogen time should be based on the EAD for the specific Nitrox mixture to be used on the repetitive dive, and not that of the previous dive;
- the total cumulative exposure (bottom time) to a partial pressure of oxygen in a given 24 hour period should not exceed the current NOAA Diving Manual 24-hour Oxygen Partial Pressure Limits for "Normal" Exposures; and
- when repetitive dives expose divers to different oxygen partial pressures from dive to dive, divers should account for accumulated oxygen exposure from previous dives when determining acceptable exposures for repetitive dives. Both acute (CNS) and chronic (pulmonary) oxygen toxicity concerns should be addressed.

f) Oxygen Parameters

Authorised mixtures - Only gas mixtures that are approved by the BDO may be used for Nitrox diving. These would most commonly be EAN32 and EAN36.

Purity - Oxygen used for mixing any breathing gases for use on JCU dives must meet the standards specified at Section 11.2 of this document.

g) Gas Analysis

Personnel Requirements

Individuals responsible for analysing EAN mixtures must be trained and experienced in the technique; and only those individuals approved by the BDO may analyse Nitrox mixtures.

Analysis Verification by User

Prior to any dive it is the responsibility of each diver to analyse the oxygen content of his/her scuba cylinder, and acknowledge in writing the following information for each cylinder: fO_2, MOD, cylinder pressure, date of analysis, and user's name.

h) Gas Mixing

Personnel Requirements

Individuals responsible for producing Nitrox mixtures must be trained and experienced in all aspects of the technique, and only those individuals approved by the BDO may mix Nitrox mixtures.

Production Methods

The specific Nitrox production method used for JCU diving must be approved by the BDO.

12.4 NITROX DIVING EQUIPMENT

All of the designated equipment and stated requirements regarding scuba equipment required by the AS/NZS 2299.2:2002 Scientific Diving Standard shall apply to JCU Nitrox diving operations.

Additional equipment necessary for Nitrox diving operations is described below.

12.4.1 Oxygen Cleaning and Maintenance Requirements

Equipment which may be exposed to concentrations of greater than 40% oxygen at pressures above 10 ATA during a dive or the cylinder filling process **must** be cleaned and maintained for oxygen service.

Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be designed and maintained for oxygen service.

Oxygen systems operating at greater than 8 ATA shall have slow-opening shut-off valves.

This should include the following equipment:

Scuba cylinders	Hoses
Cylinder valves	Diver support equipment
Scuba and other regulators	Compressors
Cylinder pressure gauges	Fill station components and plumbing

12.4.2 SCUBA Cylinder Identification Marking

SCUBA cylinders to be used with Nitrox mixtures should display the following identification/documentation:

- cylinder markings indicating “NITROX”, or “EANx”, or “Enriched Air”;
- Nitrox identification colour coding should include a 10 cm wide green band around the cylinder, starting immediately below the shoulder curvature. If the cylinder is not yellow, the green band should be bordered above and below by a 2.5 cm yellow band;
- the alternate marking of a yellow cylinder by painting the cylinder crown green and printing the word “NITROX” parallel to the length of the cylinder in green print is acceptable;
- a contents label - detailing the current fO_2, MOD/pO_2, date of analysis and name of analyser; and
- a label indicating whether the cylinder is prepared for O_2 or mixtures containing greater than 40% O_2.

12.4.3 Regulators

Regulators to be used with Nitrox mixtures containing greater than 40% oxygen must be cleaned and maintained for oxygen service, and marked in an identifying manner as such.

12.4.4 Other Support Equipment

Oxygen Analysers

An oxygen analyser is required which is capable of determining the oxygen content in the SCUBA cylinder. Two analysers are recommended to reduce the likelihood of errors due to a faulty analyser. The analyser should be capable of reading a scale of 0 to 100% oxygen, within (one) 1% accuracy.

All diver and support equipment should be suitable for the fO_2 being used.

Compressor Systems

Any compressor system used for production of Nitrox for JCU operations must meet the requirements detailed at Section 11.2 of this document.

Fill Station Components

All components of a Nitrox fill station that will contact Nitrox mixtures containing greater than 40% oxygen must be cleaned and maintained for oxygen service. This includes cylinders, whips, gauges, valves, and connecting lines.

13 RECORD KEEPING AND REQUIREMENTS

13.1 RECORD KEEPING

All official University records shall be kept in accordance with JCU Records Management Policy and QLD regulatory requirements.

13.2 DIVING SAFETY LOGS

13.2.1 Dive Log

All dives conducted by JCU divers shall be recorded using the JCU dive log sheet (***Form 9 – Record of Dive***), and uploaded to the *Boating & Diving Register* after every trip.

For normal dive operations, every diver shall have an entry on the dive log listing all the relevant details and calculations about the divers (time in and out, cylinder contents in and out, surface intervals, depth).

All dive log records should be made in real time as the dives are happening, and dive profile information finalised at the completion of each dive.

13.2.2 Personal Diving Log

Each diver shall maintain a personal dive log for every dive made under the auspices of the University's dive program, and all divers are encouraged to log all other working dives.

The BDO at any time may require a diver to verify their recent and relevant experience by producing an up to date personal dive log.

14 FACTORS KNOWN TO INCREASE DIVING RISKS

A Risk Assessment (see Section 6.2) must be carried out for all JCU diving operations.

It is the responsibility of the Dive Coordinator for any particular diving operation, to ensure as far as is practicable that all hazards are identified for that operation through the Risk Assessment process. Following this assessment, the Field Trip Leader and BDO must ensure that suitable measures to control any risks have been determined. In addition, they must be sure that any Dive Coordinator responsible for implementing the control measures is capable of doing so.

Once on site, ***continual risk assessment is the responsibility of the Dive Coordinator for each operation***. The **TAKE 5 Pre-Dive Risk Checklist** should be used to assist this process (FORM 5).

The Dive Coordinator must give special consideration to any factors which elevate risk. It is the responsibility of the BDO to ensure the Dive Coordinator has considered such hazards, and to ensure that control measures are in place to minimise such hazards.

The following are known diving risk factors and should be carefully considered during risk assessment preparation:

AGE

Due to the decrease in efficiency of the respiratory and circulator systems as the body ages older divers tend to be more susceptible to DCI than younger ones. Therefore as a diver ages they should dive more conservatively.

PHYSICAL FITNESS

It is generally believed, though not proven, that being physically fit may reduce the risk of DCI. Diving involves exercise and being fit means that the heart works more efficiently. Possibly the real advantage of being fit is the ability to better cope with the physical demands of diving and snorkelling.

A rough guide to physical fitness would be:

Low - if you exercise to a minimum of 70% of your maximum heart rate greater than three times a week for a total of 90 minutes;

Average – if you exercise to a minimum of 70% of your maximum heart rate greater than three times a week for a total of 90 to 180 minutes;

Good - if you exercise to a minimum of 70% of your maximum heart rate greater than three times a week for a total of > 180 minutes.

INJURY & ILLNESS

Are also maladies that effect the circulatory systems which may alter blood perfusion and associated gas exchange. Tests have shown that even a corked muscle can influence bubble formation. Therefore, divers having suffered major illness or injury shall have medical clearance prior to return to diving. If suffering a minor illness, injury or lacking fitness, the diver should refrain from diving or, if not debilitating dive very conservatively.

DEHYDRATION

Dehydration is a major predisposing factor for diving related illnesses. The real key to preventing dehydration is to stay ahead of the game. The recommended consumption of **water is 200ml per hour; more if it's hot or if you're diving multiple dives.** The drinks should be spaced out over the course of the day rather than consumed in a short period of time and use of an **electrolyte replacement** supplement can be beneficial in achieving fluid volume requirements. Avoid caffeinated and carbonated beverages, and ensure an ample amount of fresh drinking water is available on the boat. This will ensure that you have sufficient fluid to drink between dives.

FATIGUE

Fatigue can be extremely dangerous during diving operations, and is also a potent predisposing factor for DCI. A tired diver should not be permitted to dive, and Dive Coordinators should monitor this. During diving operations it is the responsibility of each diver to ensure they get adequate sleep to avoid becoming unduly fatigued.

ALCOHOL

Alcohol should not be consumed within 12 hours prior to diving, and must not be taken until after any diving for the day is over. At all times, especially when diving over multiple days, alcohol should only be consumed in moderation, if at all. All personnel shall maintain a blood alcohol content of 0.0% while undertaking work on diving or boating operations and always remain under 0.05% while in the field.

Alcohol consumption will increase a diver's susceptibility to DCI, enhance the effects of inert gas narcosis, and increase a diver's rate of heat loss in cold water.

DRUGS/MEDICATION

If at all possible, divers should avoid taking any drugs or medications whilst diving.

At this time little or no change has been observed in the toxicity of most of the common drugs in use under hyperbaric conditions, however drugs can influence diving safety in other ways, such as by impairing judgement and concentration, or by affecting a diver's susceptibility to narcosis and/or DCI. To that end, if any JCU Diver is required to take medication for either short or long term prescription, they should contact their diving doctor or the BDO for advice on any potential problems this may cause.

In particular, divers should take care to check on potential complications with some seasickness medications, and some drugs used to assist people to stop smoking.

COLD

From the data available it would appear that if divers start out warm and get cold during a dive or are exposed to excessive cold after a dive increase the risk of DCI.

A diver should cease diving operations if they become more than uncomfortably cold.

To minimise the effects of cold, all divers should take care to keep warm before the dive, and must wear appropriate exposure protection during the dive. In particularly cold water, dives should be planned to minimise the amount of time in the water and the number of entries and exits made during the day. Sufficient time between dives must be allowed for a diver to rewarm adequately, prior to the next dive.

It should be noted that divers will continue to lose heat from their bodies for some time after exiting the water, and this 'after-drop' in body core temperature can reach dangerous limits even if the diver was in a reasonable state on exiting the water. For this reason, Dive Attendants should monitor all divers for signs of hypothermia after any dive in cold water.

EXERCISE

Divers should not participate in activities involving vigorous physical exertion before, during (if avoidable) or after diving, as exercise of this nature will predispose a diver to DCI. Where exercise is unavoidable before, during or after a dive (e.g. diving in strong currents, or walking in to a dive site), extra allowance must be made to take account of this factor when calculating permissible dive times.

CURRENTS

Diving in currents stronger than a diver can easily swim against is strongly discouraged. If permitted, all divers involved must be experienced in diving in currents and be tethered to the boat or use a surface float, so that their location is always visible. An experienced boat handler with knowledge of local conditions must be in the vessel. Where an anchored boat is being used for untethered SCUBA operations in such conditions, a current line of > 50m length and minimum 10mm diameter must be streamed behind the vessel, and the divers must work 'up-current' of the vessel.

STRONG WIND WARNINGS and ADVERSE WEATHER CONDITIONS

No diving is permitted away from a location e.g. ship/station while a strong wind warning is current. Diving around protected island groups may be allowed, depending on the site. Dive operations during adverse weather conditions should only be undertaken after thorough consideration of the safety of the operation and consultation with the Site Controlling Officer or BDO has taken place.

Rainsquall for example can not only drop visibility to zero but it is not uncommon for them to produce wind gusts of 50+ knots and rapidly drop atmospheric air temperature.

DANGEROUS MARINE ANIMALS

Divers working with dangerous marine animals must indicate this on their Dive Permission application. As well, they must brief the BDO and any persons in their dive team of the most appropriate first aid procedures for injuries associated with such animals. This is especially important for marine injuries requiring specialised treatment.

Divers whose tasks may attract dangerous marine animals, or who are diving at sites where they may reasonably be expected to be found on occasion, must explicitly flag this on the Dive Permission proposal, and must implement procedures to minimise risks to divers, and to deal with any emergency that may occur.

Estuarine crocodiles (*Crocodylus porosus*) are common on the North Queensland mainland and some adjacent Islands they are able to swim long distances at sea. Divers and snorkelers should leave the area immediately if a crocodile is sighted, report the sighting BDSC, and not return to that area for at least 48 hours.

CROCODILES

If a diver encounters a crocodile while undertaking scientific operations the following actions should be taken.

- remain calm **do not** rush to the surface;
- attract the attention of your buddy if they are not aware of the crocodile;
- both divers should face each other to keep a watch behind the other diver;
- if possible move towards the support vessel before ascent;
- if using towed buoys the emergency signal should be given, this should consist of rapid up and down deployment of the buoy to attract the attention of the surface vessel. On seeing the signal, the vessel should immediately be positioned over the divers buoy/s and prepare for the retrieval of the divers;
- during ascent divers should prepare for quick entry into the vessel by undoing all harness attachments to facilitate this;
- the ascent should be made in a calm manner being aware of your breathing and ascent rate; and
- approaching the surface your BCD should be removed and weight belt dropped so as a quick assisted entry into the vessel can be achieved.

JELLYFISH

Box jellyfish (*Chironex fleckeri*) can be lethal, these animals are usually found close to the mainland.

Irukandji syndrome is a very painful and potentially deadly reaction to stings from a range of jellyfish species. The small, transparent jellyfishes that cause irukandji syndrome can be found in offshore waters. There has been an increase in the number of reported irukandji stings in Queensland in recent years, including two deaths. The following conditions shall be observed when diving or snorkelling where the risk of marine stinger encounters is increased:

- full body protection required during jellyfish season;
- suspension of diving operations in the event of a sting;
- vinegar, oxygen and first aid available on site; and
- JCU jellyfish protocol to be followed for persons working in jellyfish hot spots or working with jellyfish.

SHARKS

During any dives in areas where sharks have been regularly sighted, divers should avoid snorkel diving and extended surface/mid-water exposures wherever possible, e.g. avoid doing safety stops, but decrease bottom time where this is required to maintain safety margins from 'no-deco' limits.

In addition, where a higher than normal risk of diver/shark interaction has been identified by a project risk assessment, divers involved in the project must be made aware of and agree to follow the procedures outlined below:

- the protocols outlined here do not detract from the responsibility for individual divers, Dive Coordinators and Field Trip Leaders to careful assess the risks of shark interaction before undertaking any dive operation;
- the use of individual electronic shark shields is strongly recommended for all JCU divers where there is a greater than normal risk of shark 'interactions', as detailed above;

- emergency recall systems must be established for all marine diving operations undertaken by JCU, with detail provided on use of these by the Dive Coordinator during their pre-dive briefings;
- in areas where a higher than normal risk of shark interaction has been identified, divers must operate in pairs to provide a better opportunity of detecting sharks at a distance before they become a threat; and
- an injured or bleeding diver should leave the water immediately, other divers should also exit the water.

DECOMPRESSION DIVING

Air dives requiring mandatory decompression are not permitted during any JCU diving operations unless in case of emergency, and will only be allowed in exceptional circumstances if prior written approval has been obtained from the BDO, and the dives are conducted as per the Australian Standard for Occupational diving, AS/NZS 2299.1:2015.

DIVE PROFILES

Some dive profiles are acknowledged to be associated with higher risks of decompression sickness than others. A dive profile which attains maximum depth early in the dive and gradually ascends to shallower depths is recommended. Dives that incorporate "rectangular", "reverse" or “saw tooth" profiles are known to expose divers to a higher risks of decompression sickness and should be avoided.

DIVING WHILE THE DIVE BOAT IS UNDER WAY

Where a dive boat is kept under way whilst divers are in the water is commonly known as ‘working live’. Although there are several advantages to working in this manner, depending on the situation, the main danger of the practice is the potential for injury to divers from the hull and/or propeller/s of the boat.

Except in cases of emergency, this practice is not permitted during a JCU diving operation unless the Dive Coordinator expressly receives approval from the BDO or delegate, and the following conditions are met:

- the vessel Master must be suitably qualified to drive the boat being used, according to this manual, and must also have considerable experience in small vessel handling (as determined by the BDO);
- a separate Dive Attendant must always be present in situations where the Boat Operator may not be able to clearly see the location of the divers at all times from the boat’s control position;
- the vessel must be fitted with a propeller guard/s;
- a dive flag must be flown at all times; and
- all divers involved in the operation must agree to the use of this practice.

FRESH WATER DIVING

Diving in freshwater presents its own special risk considerations, such as changes in buoyancy, increase in turbidity, underwater obstructions, and fine silt. Extra equipment like torches and reference lines may be required. Freshwater areas with direct access to the ocean should be suspected of having dangerous marine animals transiting, e.g. sharks, crocodiles, marine stingers.

Where freshwater systems are of **higher altitude** than sea level, decompression schedules must also be accounted for (see DCIEM Diving Manual, Table 5).

HIGH RISK SHALLOW DIVES

Shallow dives in areas of heavy boat traffic expose divers to risk of injury from such traffic. If diving in such an area, divers must fly a dive flag on a float immediately above their work site to indicate their position.

Precautions should be taken to account for wave surge, restrictions in substrates creating unexpected currents, and flooding/ebbing tides. Divers have suffered embolisms in water as shallow as 1.7m.

Dive Coordinators should also note that cases of DCI have been reported as a result of long shallow dives (in less than 6-7m depth), and should try to minimise the effect of other predisposing factors in the event that such a dive is approved. Where such a dive is planned, Table 2A at Appendix 4 of this Manual must be used to obtain maximum allowable dive times for the dive.

LACK OF LOCAL KNOWLEDGE

Divers with little 'local' knowledge of a proposed dive site, or of the diving conditions to be encountered for the diving operation, shall not be permitted to dive unless accompanied by a JCU Dive Coordinator familiar with the proposed dive environment.

LONG DIVE TIMES

Excessive dive duration is a potent predisposing factor to decompression illness, particularly when coupled with multiple ascents and multi-day diving operations. For this reason, all JCU dive plans should keep the amount of time divers spend in the water on any given day to a minimum. Dive Coordinators should plan all diving operations with this aim in mind.

Without prior approval from the BDO, no diver is to spend more than 6 hours total time in the water in any 24 hour period, whether the tables allow this or not.

MEDICAL ASSISTANCE

It is the responsibility of the Dive Coordinator for any dive or set of dives to determine the most efficient means of obtaining medical assistance in the event of an accident during the dive. The various appendices to this manual dealing with medical matters should be consulted when determining medical requirements for any diving operation. An appropriate first aid kit must always be carried during JCU diving operations.

For any SCUBA dive conducted more than 5 minutes away from the University, a research station, or a mother ship, medical oxygen must be carried in the boat, along with a regulator capable of delivering such oxygen to a conscious or unconscious diver. Adequate supplies of medical oxygen must be carried in the boat and/or vehicle to keep at least two individuals on oxygen until such time as the patient can be 'handed over' to secondary care (i.e. ambulance officers), or until further supplies of oxygen can be accessed.

For all JCU dives, approved resuscitation equipment must be carried in the boat and a person trained in the use of such equipment should be present as the Dive Attendant.

TIME SINCE LAST DIVE

The BDO or any Dive Coordinator may require that a diver undergo an initial supervised dive or pool session if the diver has not dived during the previous 6 months (as per 'New Diver Evaluation' – at Appendix 1). This dive is to allow the diver to regain familiarity with equipment and the underwater environment in a supervised situation, and to ascertain the diver's level of competence. This can also be especially useful for assessing suitability of tasks for divers. Additional supervised dives may be required until it is judged that the diver can dive safely and competently.

NB: A supervised dive for those who have not been diving for 6 months is not mandatory, particularly where the diver is highly experienced and his/her first dive is under Low Risk conditions.

EMERGENCY EVACUATION

The University insurer manages large numbers of diving related cases and have done so for many years, servicing commercial divers working on offshore facilities and supply vessels, as well as many recreational divers needing assistance in PNG, Fiji and the wider pacific region. They have a large database of medical facilities in the region including where hyperbaric chambers exist. Their medical team of registered nurses and highly trained medical consultants are able to advise any staff or students regarding diving incidents including monitoring their treatment and devising the best way to get them home should retrieval be necessary.

When undertaking a JCU diving activity in a remote area, divers are advised to inform the insurer prior to the activity taking place, at least within 48hrs if possible. Details of the dates/location/dive plan/field trip can be submitted to insurance@jcu.edu.au . This allows our insurers to have ready knowledge of the facilities in the vicinity ahead of time, and ensures there are no delays should anybody require assistance.

DIVERS ALERT NETWORK

Staff or students undertaking recreational diving are strongly encouraged to consider taking out DAN insurance if diving outside of JCU course requirements, fieldwork or research. There are various levels of cover available and which level would be most appropriate would be determined in part by the location to which a person would be evacuated in the event emergency evacuation becomes necessary.

Further information relating to DAN is accessed through the DAN South-east Asia Pacific website at Diver's Alert Network (DAN) .

15 DEFINITION OF TERMS

Accident
Any unplanned event that results in damage, loss or injury to personnel and/or equipment and machinery.

Active Diver
A JCU Diver who completes at least twelve dives annually, AND maintains currency of all required qualifications.

Bailout System
An independent air supply worn and activated by a diver to counter an out of air, low on air or contaminated air situation. Also referred to as an 'emergency air supply'.

BDO
Boating and Diving Officer

BDSC
Boating and Diving safety Committee

BCD
Buoyancy Control Device. Also known as a 'Jacket'.

Blackwater: see Visibility - Zero

Boating & Diving Register
The management system for recording the competencies of personnel, training and inductions, and boating and diving field trips.

Bottle Bank
Two or more high pressure breathing air cylinders yoked together and used in conjunction with a regulator to deliver air to a diver.

Bottom Time (BT)
The total elapsed time from when a diver leaves the surface to the time (next whole minute) at which ascent is commenced, measured in minutes.

Breath-Hold Diving – see Section 9.4.2, and 'Free-Diving'.

Breathing Hoses
Hoses attached to a regulator that is designed to supply air to the diver, carry away expired air and operates at near ambient pressure.

Buddy Diver
A member of a group of two or three divers.

Buddy Line
A line used to connect two or more divers, allowing them to maintain contact. It should be approx. 2 - 3 m in length, and is usually only used in conditions of low in-water visibility.

Combined Dive
The bottom times of more than one dive added together and treated as bottom time for a single dive for the purposes of determining decompression requirements.

Commercial Diver
A commercial diver is the most common type of professional diver that works for pay (https://cdiver.net/resources/commercial-diver/). There are a number of different types of commercial divers but the most common is the offshore diver working in the oil and gas industry. Some scientific divers can be considered as Commercial Divers. Most commercial diving falls into the 'High-Risk Diving' category.

Communication Person
Monitors the communication plan in accordance with the Field Trip Leader's instructions, and carries out the 'no response' plan if contact with the field trip team is unable to be made.

Competent Person
A person who has acquired, through training, qualifications or experience (or combination of these) the knowledge and skills to enable that person to safely perform a specified task.

Compression (recompression) Chamber

A surface chamber in which persons may be subject to pressures equivalent to or greater than those experienced underwater, or which simulate those experienced on an actual dive.

Compromised Visibility
States of visibility: Visibility Low, Visibility Restricted, Visibility Zero depending on water turbidity/disturbance.

Current Line
Line deployed behind boat to facilitate recovery of divers from the water, particularly in conditions of strong current. Also called a 'Mermaid Catcher', "Jesus Line'.

DAN
Diver's Alert Network. An organisation dedicated to improving diving safety.

Diver's Attendant (DA)
The Diver's Attendant is usually at the surface, is trained in first aid, fit to undertake the required tasks, has knowledge/experience in the work being undertaken, the signals in use, decompression procedures, diving plant and equipment in use.

Diver Recall Device
Specialised device used by Dive Coordinator to recall divers to the surface.

Decompression Illness (DCI)
A generic term for acute illness resulting when pathological consequences arise from decompression. The term covers the conditions known as decompression sickness (DCS, or the bends) and arterial gas embolism (AGE), but does not include barotraumas of ascent.

Decompression Schedule
A specific decompression procedure for a given combination of depth and bottom time as listed in a decompression table. Normally described in terms of maximum depth of seawater (msw) and bottom time (minutes).

Decompression Stop
The specified length of time which a diver must spend at a specified depth to allow for the elimination of sufficient inert gas from the body to allow safe ascent to the next decompression stop or the surface.

DCIEM
Was Canadian Defence and Civil Institute of Environmental Medicine. The organisation is now called **DRDC** (Defence Research and Development Canada).

DCIEM Tables
Decompression tables developed by DCIEM. To be used to manage all JCU air diving operations unless otherwise approved.

Delegate (of BDO)
An individual appointed by the BDO in writing to perform nominated duties.

Divemaster (DM)
A Divemaster is an individual who has received training to a high level from one of the recreational diver training organisations (also called Dive Coordinator or Dive Controller).

Dive Coordinator (DC)
The Dive Coordinator is responsible for the overall conduct of the dive, including any necessary pre/post dive activities, including planning, risk assessment and reporting. See section 3.5 of this manual.

Dive Leader (DL)
The nominated 'in-water' leader of a dive team. Usually the most experienced person in the tasks being undertaken, and may sometimes be the Dive Coordinator.

Dive Plan
An operational plan prepared by the Dive Coordinator for a dive, or a series of dives. A dive plan must be prepared, submitted and approved by the BDO or their delegate before any JCU dive can take place.

Dive Program
One or more dives that are related by purpose place or time to form a series.

Dive Log (Record of Dive – Form 9)

A designated JCU form, used to record details of each dive for every diver on a diving operation. Full completion by all members of a dive team who partake in an operation is a requirement under legislative regulations.

Diver Register (Boating & Diving Register)
A listing of all divers permitted to dive on JCU operations according to these procedures – maintained by the Boating & Diving Office.

Dive Team
All personnel directly involved in a diving operation.

Diving Officer (Boating & Diving Officer - BDO)
See 'BDO'.

Diving Operation
Where personnel from James Cook University undertake a trip for the purpose of scientific or related underwater diving. The operation includes all time devoted to the trip, including preparation before departure, and the subsequent reporting phase on return.

DRDC
Defence Research and Development Canada. Formerly DCIEM.

Duty of Care
See *Work Health and Safety Act 2011* – Part 1, Division 2 Primary duty of care.

Effective Bottom Time (EBT): DCIEM Tables
The product of a diver's actual bottom time (ABT) for a dive, multiplied by their Repetitive Factor (RF) at the start of the dive (from any previous exposure to greater than ambient pressure).

Effective Bottom Time (EBT): SSI EANx Tables
The product of a diver's actual bottom time (ABT) for a dive, added to their Residual Nitrogen Time (RNT) at the start of the dive (from any previous exposure to greater than ambient pressure).

Effective Depth
For a dive at altitude, the depth of an equivalent dive at sea level.

Emergency Air Supply
See 'bailout system'.

Enriched Air Nitrox (EANx)
Air with a greater-than-normal concentration of oxygen (the *x* stands for the O2 concentration).

Equivalent Air Depth (EAD)
Equates a depth using a given concentration of Nitrox to an 'Air' depth, based on equivalent exposure to nitrogen.

Exceptional Exposure Dive
A dive on which maximum recommended dive time for a given depth (shown by the limiting line in the decompression tables being used) is exceeded by a diver at that depth.

Field Trip Leader (FTL)
The JCU staff member with overall responsibility for conduct of a field research team. The Field Trip Leader has no authority over decisions made by a Dive Coordinator during the conduct of any diving operation unless the FTL is also assuming the role of designated Dive Coordinator. During the planning stages of a project and in collaboration with the FTL, a Project Leader or Project Coordinator may organise team members, logistics, training, submission of trip proposals and risk assessments, but may not necessarily undertake any field work themselves.

Float Line
A line attached to a diver, with a highly visible float on the surface.

Free-Diving or Breath-Hold Diving
'Free swimming' diving, where fins and a mask and snorkel are used and the diver has approval from the BDO (usually based on a diver assessment) to descend to an approved depth. *Also see Snorkel Diving.*

Free Flow Primary Air Supply

A surface supplied breathing method in which air enters the helmet/mask in a continuous flow, and is not controlled by a demand regulator.

General Diving Work
A term introduced by the QLD Regulator to describe diving work that is not considered as High Risk Diving Work.

Hazard
A situation, activity or task with the potential to cause injury or damage.

High Risk Diving Work - See Section 7.6 of this manual, High Risk Diving Operations.

Hypoxic Blackout
Has been defined as a loss of consciousness during a breath-hold submersion **preceded by hyperventilation** where alternative causes of blackout have been excluded.

Hypoxic Blackout can be caused by repetitive, and/or continuous breath holding or by taking several very deep breaths (hyperventilating), just before diving underwater. Snorkelers pass out due to the lack of oxygen (O2) and lower than normal carbon dioxide (CO2) levels. The CO2 levels do not increase high enough to trigger the urgent need to breathe, resulting in unconsciousness. After this occurs the delayed trigger to breathe can result in water quickly filling the lungs while unconscious. Death or brain damage occurs much sooner than the usual form of drowning.

Incident
Any unplanned event with potential for damage, loss or injury to personnel and/or equipment and machinery.

JCU Diver

Any individual listed on the JCU Diver Register, who is undertaking a dive on behalf of the University.

JCU Dive Plan
An operational plan prepared by the Dive Coordinator for a dive, or a series of dives. A dive plan must be prepared and submitted for every JCU dive.

JCU BDSC
James Cook University Boating and Diving Safety Sub-Committee. See details in this Manual, and WHS-PRO-001 WHS Responsibilities Procedure, Appendix 1. Also known as the '*University Boating & Diving Safety Sub-Committee of the Work Health and Safety Advisory Committee*'.

Lazy Shot

A rope running vertically from the surface (dive control position) to an attached weight, hanging free and positioned off the bottom or worksite. The rope is marked with depth graduations to facilitate decompression stops at the correct depth. See also 'shot line'.

Lifeline
A line of not less than 8 mm diameter, attached to the diver at one end and tended from the surface at the other, which is capable of being used to haul the diver to the surface.

Limiting Line
A line shown in some decompression tables, indicating time limits (bottom times) beyond which the decompression tables shown are less safe.

Live Boating – see Working Live.

Lower Risk Diving Conditions

- maximum depth **does not exceed 15m**;
- conditions are such that diving is not strenuous or difficult (e.g. nil to slight currents);
- no operational plant/machinery is used as part of the dive;
- no entrapment hazards & direct access maintained;
- simple & low risk tasks are performed;
- divers form buddy pairs;
- dives are during **daylight hours only**;
- in low visibility conditions, divers are tethered to each other or use float lines to the surface; and
- site is located away from other vessels operating in the area.

Low Visibility
See 'Visibility – Low', and 'Visibility – Zero'.

Main Air Supply
The main supply of any diver's breathing air, including air delivery from SCUBA cylinders, low pressure compressors or 'bottle banks'.

Mermaid Catcher
See Current Line.

Mother Ship
A vessel (generally large) used as a base in remote areas, from which smaller vessels are used to conduct field or diving operations.

Night Diving
Any diving activity conducted in the hours of darkness, including 30 minutes hour prior to sunset and 30 minutes after sunrise.

Nitrox
Any breathing mixture composed of nitrogen and oxygen, most commonly produced by the addition of O_2 or the removal of nitrogen from air.

Occupational Diving
All diving carried out as part of a business; as a service; for research; or for profit. All diving conducted under the auspices of James Cook University is occupational diving, including diving performed by volunteers.

Post Dive Report
A designated JCU form (may be web based), used to describe actual details of any diving operations. The Post Dive Report may sometimes only require submission of Form 9 – Record of Dive.

Project Leader or Project Coordinator (see Field Trip Leader)

Quick Release
Able to be immediately released from closed position by the single operation of one hand.

Record of Dive – FORM 9
A designated JCU form, used to record details of each dive for every diver on a diving operation.

Remote Dive Site
Any area of diving operation greater than 30 minutes from medical assistance.

Repetitive Dive
Any dive conducted after a surface interval from a previous dive of more than 15 min, and less than 18 hours, or that has a repetitive factor at the start of the dive of greater than 1.0.

Repetitive Factor (RF): DCIEM dive tables
A figure determined by the repetitive dive group (RG), and the length of the surface interval after a dive, and used for repetitive diving.

Repetitive Group (RG)
After a dive conducted using many dive tables, every diver will fall into a Repetitive Group category - determined by the depth and time of any dives they have completed in the previous 18 hrs. Gives an indication of nitrogen loading.

Reserve Air Supply
The quantity of air that will enable a diver to return safely to the surface from the planned depth of the dive, completing all planned decompression stops. As described in **Section 11.1.2**, the minimum reserve air supply shall be calculated as having a sufficient quantity of breathing gas to complete the planned dive plus a reserve amount providing a minimum safety margin of 25% for dives shallower than 21m, and 30% for dives to deeper than 21m. For dives operating in depths less than 6m, where there is no risk of entanglement, and the divers are unrestricted divers, a minimum reserve of 30bar may be allowed with prior approval from the BDO.

For example:

- For a dive to 8m - a diver using a cylinder that holds 200 bar shall return to the surface with **at least 50 BAR** remaining.
- For a dive to 24m – a diver using a cylinder that holds 200 bar shall return to the surface with **at least 60 BAR** remaining.
- For a dive to 5m – a diver may return with **at least 30 BAR**, provided they and their buddy are classified as unrestricted divers, and there is no risk of entanglement.

Residual Nitrogen
Extra Nitrogen that remains dissolved in a diver's tissues after surfacing. Decreases over time on the surface.

Risk Assessment
A formal process of identifying and implementing mechanisms for dealing with the risks involved in a particular task. A Risk Assessment must have been completed and approved for every JCU diving operation.

Safety Line
Lifeline, Buddy Line, Float Line or Current Line.

Safety Stop
A precautionary decompression stop (i.e. not specified as mandatory by a decompression schedule) - usually completed for 3 to 5 minutes duration, at 3-5 metres depth.

Saturation
That condition where a person's body tissues are totally saturated with the particular inert gas element of the breathing medium in use.

Scientific Diving
In Australia: diving performed for the purpose of professional scientific research, natural resource management, or scientific research as an educational activity.

SCUBA
Acronym for Self Contained Underwater Breathing Apparatus. Equipment designed to deliver air to a diver, using an open or closed circuit system - independent of the surface.

Serious Personal Injury
An injury or disease caused in the course of work and for which the person requires one of:

- emergency treatment by a registered medical practitioner;
- treatment in a hospital as a casualty without admission; or
- admission to a hospital.

Site Safety Officer (SSO)
Research station managers, masters of vessels, workplace control officers.

Shallow Water Blackout
Refers to loss of consciousness during a dive associated with blackout at a shallow depth. The mechanism for this type of shallow water blackout is hypoxia expedited by hypocapnia **caused by voluntary hyperventilation** before the dive. Shallow water blackout may occur in dives undertaken in less than 1m of water, but may also occur in dives deeper than 10m.

Shot Rope / Shot Line
A rope running vertically from the surface (dive control position) and fixed to the worksite or bottom with a weight or attachment. The rope should be marked with depth graduations to facilitate decompression stops at the correct depth. See also 'lazy shot'.

SI / Surface Interval
Surface interval. The time between surfacing from one dive and commencing another. Under DCIEM tables if the SI is less than 15 minutes the second 'dive' is deemed a continuation of the first dive. NB: This time varies with different decompression tables.

Snorkel Diving
'Free swimming' diving, where fins and a mask and snorkel are used and the diver is in shallow water and is limited to depths of no more than 2 metres depth. *See also 'Free-diving'.*

SPUMS
South Pacific Underwater Medicine Society. Australasian diving medicine medical professionals organisation.

SSBA (Surface Supplied Breathing Apparatus)
Equipment delivering air to diver from the surface. SSBA diving is not covered under this manual.

Standby Diver
A Diver who is fully dressed and equipped and ready to enter the water to render emergency assistance to a diver in the water. *NB*. For scientific diving operations (as per AS/NZS 2299.2:2002) the standby diver may be in the water, acting as a dive buddy, but ***cannot*** be a Restricted Diver.

Surface Attendant (SA)
An assistant at the surface of a dive site, who may not necessarily be a diver but has knowledge of the tasks being undertaken. Can take the form of Diver's Attendant, who does not enter the water (*also see Diver's Attendant*).

Team Leader (see Field Trip Leader)

Tethered Mode (in relation to SCUBA diving)
SCUBA diving when a diver is secured by a lifeline tended by a Diver's Attendant, or secured to a tended float line.

BDO (Boating and Diving Officer)
University Diving Officer. See definition in this Manual, section 3.1.

Visibility - Low
A diving environment where a diver cannot see or distinguish objects outside their physical reach. *See also Compromised Visibility.*

Visibility – Restricted or Zero
A diving environment where a diver cannot see their gauges at the mask/water interface. *See also Compromised Visibility.*

Visiting Scientific Diver
A trained, certified visiting diver from another country who performs tasks relevant to scientific diving in his/her own country, who has a current diving medical certification and who is allowed to dive with the University by the BDO during his/her visit.

Volunteer Diver
A person not otherwise associated with JCU, who has volunteered to assist with JCU diving, and meets all requirements necessary to be listed on the Diver Register.

Worker
A person who carries out work in any capacity for JCU, and includes working as:

(a) an **employee**; or
(b) a volunteer; or
(c) an apprentice or trainee; or
(d) a **student gaining work experience (paid or unpaid)**; or
(e) a contractor or subcontractor and their employees; or
(f) a labour hire company; or
(g) employees assigned to work for JCU.

Working 'Live'
Where a vessel being used in the conduct of a diving operation is under power whilst divers are in the water. Not permitted for any diving operation unless specifically approved by the BDO, or an emergency.

Work Line
Rope/line attached to the worksite to allow for easy transit to/from when visibility is compromised.

Workplace
From the *Work Health and Safety Act 2011*: Meaning of ***workplace***

(1) A ***workplace*** is a place where work is carried out for a business or undertaking and includes any place where a worker goes, or is likely to be, while at work.
(2) In this section, ***place*** includes—
    (a) a vehicle, vessel, aircraft or other mobile structure; and
    (b) any waters and any installation on land, on the bed of any waters or floating on any waters.

Zero visibility
See 'Visibility – Zero', and 'Visibility – Low'.

APPENDIX 1 – DIVING INDUCTION AND EVALUATION

CONTENTS OF DIVING INDUCTION

JCU Diving Procedures Induction

Structure of Diving and Boating Management

Dive Register mandatory requirements

Classification of divers

Acceptable qualifications of divers

Roles and responsibilities within dive teams

Administrative procedures for diving field trips

Dive planning and supervision

Use of DCIEM tables

Personnel requirements for dive teams

Emergency planning and management

Risk management and Risk assessments

Diving equipment and ancillary equipment

Record keeping and dive logs

DCI risk mitigation

Injury and incident reporting

On-site document

Theory exam covering the above topics along with physics, physiology and equipment

Practical Assessment – see FORM 4 JCU Basic Scuba Diving Skills Statement of Achievement

APPENDIX 2 – DIVE BRIEFING

The Dive Coordinator must ensure that **all persons** associated with the dive operation are thoroughly briefed prior to every dive. All persons in control of the dive site (for example Masters of vessels associated with the diving, site managers, contractors, controllers of plant such as cranes or sluices) must be briefed about intended dive operations prior to each dive. This will include:

- the times of any dives;
- the location of the dive;
- the tasks being undertaken;
- the numbers of divers in the water; and
- any potential hazards noted in the risk assessment over which the person has control.

The Dive Coordinator must also advise other relevant persons, such as the vessel Master, when the dive has finished.

Divers:

The Dive Coordinator must brief every JCU Diver and Dive Leader before each dive. The Diving Risk Assessment, Dive Proposal, Dive Plan and JCU Dive Logs must all be used to assist in the briefing. For a series of dives in similar conditions conducting similar tasks, a single briefing may be given for the dive sequence dealing with issues pertinent to the whole sequence. However, a briefing must be given prior to every dive to reinforce key safety considerations.

Topics that must be covered in every briefing include:

- objectives of the operation;
- responsibilities of dive team members, including buddy pair allocation;
- review of specific underwater tasks and use of specialised tools;
- maximum depths and bottom times for the dive;
- boundaries and features of the dive site;
- review of communications (hand / line signals);
- the presence and location of emergency equipment, first aid kit contents complete, **check O2 cylinder contents**;
- diver recall procedures;
- lost buddy contact procedures;
- diver rescue procedures **including practical simulation of retrieving an unconscious diver from the water**;
- procedures to be followed if conditions become unfavourable;
- any new or unseen hazards at the dive site; and
- any other safety issues identified in the risk assessment.

Other topics that may need to be covered in the briefing:

- safe methods of entry and exit into the water;
- use of emergency signalling equipment;
- procedures for reducing the risk of developing decompression illness; and
- any other features of the Diving Proposal.

The Dive Coordinator should utilise Form 5 – Take 5 Pre-Dive Scuba & Snorkelling Risk Checklist at the commencement of each dive, to confirm all hazards are still effectively managed and ensure complacency is avoided throughout the complete dive operation.

APPENDIX 3 - SINGLE LIFE-LINE CODE

Signals comprise of either pulls or bells or a combination of both. A pull is a single heave on the line. A bell is a sharp quick tug as if striking a ships bell. **All signals from attendant to diver need to be preceded by one pull to attract attention; the signal is then made after the diver has answered with one pull.**

ATTENDANT TO DIVER **- General Signals**

1 pull	To call attention Are you OK?
2 pulls	Am sending down a rope's end (or carrying out another action as pre-arranged)
3 pulls	You have come up too far Go down slowly till we stop you
4 pulls	Come up
4 pulls + 2 bells	Come up, hurry up, or Come up, surface decompression
4 pulls + 5 bells	Come up on your safety float

ATTENDANT TO DIVER **- Direction Signals**

1 pull	Stop, search where you are
2 bells	Go out or go to the end of distance line or jackstay
3 bells	Face shot then go right
4 bells	Face shot then go left
5 bells	Come into your shot, or turn back if on a jackstay

DIVER TO ATTENDANT **- General Signals**

1 pull	To call attention Made Bottom Reached end of jackstay I am OK
2 pulls	Send me down a rope's end (or as pre-arranged)
3 pulls	I am going down
4 pulls	May I come up?
4 pulls + 2 bells	I want to come up / Assist me up
4 pulls + 5 bells	May I come up on my safety float?

DIVER TO ATTENDANT **-** ***Emergency Signals***

More than 4 pulls	**EMERGENCY SIGNAL / Pull me up IMMEDIATELY** (need not be answered)
Succession of 2 bells	Am fouled & need the assistance of another diver
Succession of 3 bells	Am fouled but can clear myself if left alone

DIVER TO ATTENDANT **- Working Signals**

1 pull	Hold on or stop
2 bells	Pull up
3 bells	Lower
4 bells	Take up slack lifeline, or you are holding me too tight
5 bells	Have found, started, or completed work

Acknowledgements: All signals received by either diver or attendant **must** be acknowledged by repeating the signal, but **not** unless the signal was clearly and unambiguously received. If a signal is not acknowledged, or is repeated incorrectly, the signaller should repeat until proper acknowledgement is received.

Delays: A diver at work may not always be able to acknowledge immediately, and the attendant should wait a few moments before repeating the signal.

APPENDIX 4 - MODIFIED DCIEM AIR DIVING TABLES

Introduction. These tables and procedures have been developed from the Canadian Defence and Civil Institute for Environmental Medicine's 1983 decompression model. This model is the result of over 20 years of decompression research, and the tables have been extensively tested. They were chosen for inclusion in this Standard as they are generally more conservative than previous commonly used tables, especially in the deeper depth or longer bottom time profiles.

Application of DCIEM tables-General

The DCIEM tables are applied as follows:

(a) **Depth** (Columns 2-11 of Table A2) These columns have depth increments of 3m (10 ft), and the value to be used is the one immediately exceeding the deepest depth to which the diver descended in the dive.

(b) **Bottom Time** (Column 1 of Table A2) The bottom time of the dive is the interval, in minutes, between the diver leaving the surface at the start of the dive and leaving the bottom to commence the ascent. The value to be used is the one immediately exceeding the actual bottom time.

(c) **Rate of ascent** The rate of ascent ***shall not exceed*** 18 m/min (60 ft/min). Divers should obey computer ascent rate warnings and the JCU recommended ascent rate of **9m/min (30ft/min)**.

(d) **Rate of descent** The rate of descent shall not exceed 18 m/min (60 ft/min).

(e) **Hyperbaric Chamber availability (level 1 and level 2)** These shaded areas in Table A2 represent time limits for depth of dives with respect to the availability of the nearest functional hyperbaric chamber. Access time to a chamber, is the time taken to transport a diver exiting the water to compression in the chamber.

(f) **Repetitive Dive** Any dive conducted within 18 h of a previous dive or any dive that has a repetitive factor greater than 1.0.

(g) **Repetitive Dive Groups (RG)** The repetitive dive group letter is directly related to the amount of residual nitrogen in a diver's body immediately on surfacing from a dive. The repetitive dive groups shown are different from and incompatible with repetitive dive groups in other tables, eg. US Navy. Where bottom times appear without repetitive groups, repetitive diving is not recommended.

(h) **Repetitive Factor (RF)** A figure determined by the repetitive dive group and the length of the surface interval after a dive and used for repetitive diving.

(i) **Effective Bottom Time (EBT)** For repetitive diving, the bottom time is calculated to take into consideration the residual nitrogen from previous dives.

(j) **Effective Depth** For a dive at altitude, the depth of an equivalent dive at sea level.

Table A3-Repetitive diving Procedures relevant to Table A3a and A3(b) are as follows:

(a) Repetitive diving is permitted only in the normal air diving range. For surface intervals of less than 15 min, the 'combined dive' procedure is used. The combined dive procedure can also be used as an alternative to the repetitive dive procedure outlined below. This will result in shorter bottom times for any second or subsequent dive and thus usually more conservative dives.

(b) The repetitive dive group letters (A-J) shown beside each dive profile in the normal air range of the DCIEM tables are used in conjunction with the repetitive factors table. These correction factors are based on the first dive and surface interval (to determine the 'residual' nitrogen) in conjunction with any possible depth (within the normal air diving range) for the second dive.

Table A3(a) is used with the repetitive group and the surface interval to find the repetitive factor and A3(b) for the **maximum allowable bottom time** for the next dive.

(c) To use Tables A3(a) & A3(b)-

(i) take the repetitive dive group (RG) letter of the first dive and enter the repetitive factor table (Table A3(a));

(ii) find the repetitive factor (RF) corresponding to that letter and the applicable surface interval column;

(iii) enter table A3(b) using the corresponding RF column cross reference with the appropriate depth row to obtain the maximum bottom time allowed for the next dive.

(iv) If a subsequent dive is planned, by multiplying the planned bottom time by the RF the EBT can be obtained. This calculation can then be used to re-enter Table A2.

Important The RG for a repetitive dive must be higher than the RG of the preceding dive when they are undertaken within 6 hours of each other.

Example:

First dive 15 m (50 ft) for 60 min. RG = F (Table A2).

The surface interval is 2 h, and the repetitive dive depth is 12 m (40 ft). From Table A3(a), the RF is 1.4 and from Table A3(b) the maximum bottom time allowed is 71 min.

The actual bottom time planned is only 60 min. Therefore, the EBT = 60 x 1.4 (RF after first dive) = 84 min, with an RG of G (Table A2). SI before third dive I h 35 min. RF = 1.6.

Third dive depth is 9 m (30 ft). Maximum allowable bottom time Table A3(b) = 81 min

If the actual bottom time of the third dive was 40 min then EBT = 40 min x 1.6 (RF) = 64min. re-enter Table A2 to find RG = C. The surface interval is not greater than 6 hours and this RG is not greater than the preceding RG therefore the correct answer is RG = H.

NOTE: For repetitive bottom times just exceeding the allowable no-decompression limits, a minimum 5 min decompression stop at 3 m (10 ft) is mandatory.

CARE MUST BE EXERCISED WHEN PLANNING MULTIPLE DIVES NOT TO EXCEED HYPERBARIC CHAMBER AVAILABILITY LIMITS.

(d) The repetitive factors have been cut off arbitrarily, at 2.0. It is felt that after a strenuous first dive, the surface interval should be sufficient in length to reduce the 'residual' nitrogen level of the diver to that degree. (This, in effect, defined the limits of the printed tables.)

NOTE: If a second dive is required before 30 min or before the surface interval reduces the repetitive factor to 2.0, add the two bottom times to obtain the effective bottom time and use the deeper depth of the two dives and the EBT for determining the decompression schedule (combined dive procedure). Alternatively, if the repetitive dive is to a different depth, enter the tables for the depth of the repetitive dive. Using the RG from the first dive, read back to the bottom time noted for that group. Add that bottom time to the intended bottom time to obtain the EBT for the repetitive dive.

TABLE A2 MODIFIED DCIEM NO-DECOMPRESSION LIMITS AND REPETITIVE DIVE GROUPS

	Depth in meters (depth in feet)								
Time	6m (20)	9m (30)	12m (40)	15m (50)	18m (60)	21m (70)	24m (80)	27m (90)	30m (100)
5	A	A	A	A	A	A	A	A	A
8	A	A	A	A	A	A	A	A	B
10	A	A	A	A	A	A	A	A	B
15	A	A	A	A	B	C	C	C	D
20	A	A	A	A	B	C	D	D	
25	A	A	B	C	D	D	E		
30	A	A	B	C	D	D			
35	B	C	D	D	E	E			
40	B	C	D	D	E				
50	B	C	D	E	F				
60	B	C	D	F					
70	C	D	G	G					
75	C	D	G	G					
90	C	D	G						
100	D	F	G						
110	D	F	H						
120	D	F	H						
130	E	G	I						
150	E	G	J						
175	F	H							
180	F	H							
240	G	K							
240	G	K							
300	H								
Level 1	For dives not exceeding level 1, hyperbaric chamber access shall not exceed 6 hrs								
Level 2	Hyperbaric chamber access shall not exceed 2 hrs for dives equivalent to level 1 or between levels 1 and 2								

TABLE A3a REPETITIVE FACTORS

	S.I. in h:min									
R.G.	0:15-0:29	0:30-0:59	1:00-1:29	1:30-1:59	2:00-2:59	3:00-3:59	4:00-5:59	6:00-8:59	9:00-11:59	12:00-18:00
A	1.4	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1	1
B	1.5	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1
C	1.6	1.4	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1
D	1.8	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1
E	1.9	1.6	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1
F	2	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.1
G		1.9	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1
H			1.9	1.7	1.6	1.5	1.4	1.3	1.1	1.1
I			2	1.8	1.7	1.5	1.4	1.3	1.1	1.1
J				1.9	1.8	1.6	1.5	1.3	1.2	1.1

TABLE A3b LIMITS FOR REPETITIVE DIVES

Maximum allowable bottom time in minutes - (Level 1 access to chamber)

	R.F.									
Depth (ft)	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2
6m (20)	215	200	184	171	160	150	141	133	126	120
9m (30)	115	105	100	92	86	81	76	72	68	65
12m (40)	60	55	52	50	46	43	41	38	36	35
15m (50)	54	50	46	42	40	37	35	33	31	30
18m (60)	35	30	30	28	26	24	23	22	21	20
21m (70)	20	20	19	17	16	15	14	13	13	12
24m (80)	13	12	11	10	10	9	8	8	7	7
27m (90)	10	9	8	7	7	6	6	5	5	5
30m (100)	7	6	6	5	5	5	4	4	4	4

Note: To find the new RG after repetitive dive, multiply BT x RF to get **E**ffective **B**ottom **T**ime and re-enter Table A2 using EBT and depth.

The RG for a repetitive dive must be greater that the RG of the proceeding dive if the surface interval between the dives is less than 6 hours.

APPENDIX 5 - FIRST AID EQUIPMENT FOR DIVING OPERATIONS

First aid provisions for diving operations shall allow for the treatment of specific conditions or injuries that can result from diving or exposure to the marine environment.

General Equipment

- A method of providing protection or shelter from the environment, e.g. blankets, towels, dry clothes, roofing.
- ***Extra*** drinking water available for the prevention of dehydration and the management of decompression illness.
- Vinegar for the treatment of marine stings, 2 litres minimum (4 litres for large group snorkelling activities)
- Phone card or coins if required, suitable for the country of operation.
- Note pad and pencil.

Oxygen Equipment

At all dive locations there shall be access to adequate supplies of oxygen and suitable equipment for its administration.

There should be a capacity to allow the provision of oxygen to at least 2 divers until advanced medical care is available.

First Aid Kit

Suggested contents of first aid kit are those of equipment required for Australian Domestic Commercial Vessels.

As the distance from medical assistance increases, so may the contents of the kit need to increase.

Standard Items

Adhesive fabric strip dressings (assorted sizes)	Non-allergenic adhesive tape (large & small)
Conforming bandages (assorted sizes)	Adhesive roll, non-woven fabric (5cm x 10m)
Heavy crepe bandages (various 7.5cm & 10cm)	Wound closure strips x 3
Combined wound dressings (various 10cm & 20cm)	Gloves, disposable x 5 pairs
Triangular bandages x 4	Resuscitation mask, disposable & pocket mask
Non-adherent dressings (numerous e.g. 10 x 10cmx10cm)	Blanket, emergency thermal
Eye pads (sterile) x 4	Ice pack, instant
Gauze swabs (sterile) x 9	Scissors and Shears
Towels, disposable x 6	Safety pins x 10
Plastic bags, for waste disposal and amputated parts (assorted sizes)	Splinter probes
Sterile saline water, 0.9% for wound irrigation and eye wash	Forceps
Antibiotic ointment (e.g. iodine swabs)	Splints, universal, malleable x 2
Antiseptic/anaesthetic cream (for bites, stings etc)	Diving First Aid Manual & basic First Aid Manual

Items which may be useful in the first aid kit

Sunscreen	Kidney dish
Ear drops	Soft brush for cleaning wounds
Sharps disposal container	Eye wash bottle
Tourniquet	Diagnostic penlight

Items which may be useful but not to be administered by the first aider

Sea-sickness tablets	Loperimide (diarrhea assist)
Analgesics (paracetamol, aspirin, ibuprofen etc)	Antacid tablets (Calcium or $MgCO_3$)

APPENDIX 6 - RISK MATRIX

			Likelihood →				
			May occur within every 10 year period or more	Could occur within a 5-10 year period	Could occur within a 1 to 5 year period	Could occur within a 3 to 12 month period	Likely to occur within a 3 month period or during the performance of an actual task
			Rare	Unlikely	Possible	Likely	Almost Certain
Consequence	Fatality, prosecution or legislative non-compliance impacts a substantial part or whole of University with significant works > $100k	Catastrophic	**Medium**	**High**	**High**	**High**	**High**
	Significant lost time injury (>6 months), notifiable event, finding, notice, suspension of work impacts a substantial part or whole of University with major works between $50-$100k	Major	**Medium**	**Medium**	**High**	**High**	**High**
	Lost time injury (<6 months), finding, ISOS combined extreme / high risk, impacts a moderate to substantial part of University with moderate works between $10-50k	Moderate	**Low**	**Medium**	**Medium**	**High**	**High**
	Incident including medical treatment, near miss, safety finding resolved in 3 days, impacts a minor part of University with minor works <$10k	Minor	**Low**	**Low**	**Medium**	**Medium**	**Medium**
	Incident including first aid, workplace hazard contained immediately and no ongoing safety risk impact. No known similar risk with University	Insignificant	**Low**	**Low**	**Low**	**Low**	**Medium**

WH&S risks are placed in one of three risk rating categories: HIGH, MEDIUM and LOW.

High	Unacceptable level of risk which is required to be controlled immediately. Access and exposure to the hazard should be restricted until the risk can be lowered to an acceptable level. Control measures would involve designing out the source of the risk from the task or activity.
Medium	An acceptable level of risk. Low cost control measures (such as provision of information and training) should be undertaken to control these types of risks. If these controls already exist and are deemed to be effective, no further investment is necessary.
Low	These risks are considered acceptable. Accordingly, no further action is necessary. However, if there are controls which can be initiated that are easy and inexpensive they can still be administered.

Sometimes a combination of controls will be necessary.

Priority 1 – Elimination

The best way to eliminate the risk is to remove the hazardous equipment or discontinue the hazardous process.

Don't use the equipment. Don't use the process.

Priority 2 - Substitution

Substitute the hazardous part of the equipment or hazardous part of the process with a safer option.

Find a safer piece of equipment or better way to perform the process.

Priority 3 – Isolation

Isolate the people from the equipment or process. For example, put the equipment or perform the process in a booth or a separate room. Provide remote activation / control of the equipment or process.

Keep the hazard away from people.

Priority 4 - Engineering Controls

Engineering controls involve the use of measures to change the equipment or the environment in which the process is undertaken. Control measures may include:

- Modifying the design of a piece of equipment;
- Modifying the workplace layout in which a process is carried out;
- Installing guarding to prevent exposure to the hazardous parts of a piece of equipment or process;
- Providing enclosures, fume cupboards, local exhaust ventilation or automation.

Engineer a better way to do the job

Priority 5 - Procedures and Training

Systems of work or safe work procedures can often help to reduce risk associated with equipment and processes. All workers must be trained in the safe systems of work or safe work procedures. Periodic inspections and audits should be conducted to ensure that the systems or procedures are being followed.

Examples include:

- Performing the task out of normal hours or restricting access to a certain area;
- Reducing the duration or frequency workers perform a specific task;
- Good housekeeping.

Ensure you have adequate training to safely do the job

Priority 6 – Personal Protective Equipment (PPE)

PPE can include clothing, such as overalls, aprons, footwear, gloves, as well as items such as wetsuits, safety glasses, face shields and respirators. PPE can often be used in combination with other risk controls to further reduce exposures to hazardous parts of equipment and processes. However, if PPE are used as the only control measure they should be generally regarded as a short-term solution or a last resort.

Staff and students must be trained in correct fit, use and maintenance of the PPE. In addition, you should ensure that any equipment used is appropriate for the job, readily available, and that a sanitisation process exists between users if the PPE is shared.

APPENDIX 7 - DIVE COORDINATOR STATEMENT OF UNDERSTANDING

The overall and specific responsibilities of a Dive Coordinator include at least the following:

On Appointment

Ensuring they have a working familiarity with the Queensland Occupational Diving Code of Practice, the Australian Standard AS/NZS 2299.2:2002 for Scientific Diving, Queensland Work Health and Safety Regulations, and any other relevant JCU policies and procedures;

Ensuring they have a **comprehensive knowledge** of the workings of the DCIEM decompression tables, and any other decompression tables that may be approved for use from time to time;

Completing and forwarding a signed copy of this Statement of Understanding (SoU), to the BDO.

Pre Dive

Ensuring that the diving operation, Risk Assessment, and all dive sites have been registered with and approved by the BDO;

Ensuring suitable measures to control any identified risks have been determined, and ensuring that any individual delegated as responsible for implementing these is capable of doing so, and does them;

Including in the Risk Assessment an **Emergency Evacuation Plan**, detailing intended procedures for transporting divers to the nearest usable and available recompression facility, and including a realistic estimate of the time necessary for this in the event of an accident (such time is to be taken as the time from when the diver leaves the bottom and commences their final ascent to arriving at depth in the chamber);

Ensuring all divers on the dive team are listed as current on the JCU Boating & Diving Register;

Communicating all identified issues from the Risk Assessment to all persons involved in the dive operation;

Ensuring that a Dive Plan has been completed, REVIEWED by the BDO, for the diving operation, prior to departure for the trip. A Dive Plan must be completed and approved through RiskWare for every diving trip;

Notifying a Communication Person of details of the diving operation and ensuring the Communication Person is aware of their responsibilities in the event personnel from the trip do not report by the designated time;

Conducting a pre-trip briefing with the Master of any mother ship being used for a JCU diving operation, before the ship leaves port, detailing the diving activities to be undertaken;

Ensuring that all required diving and safety equipment is in good working order, has been packed (including adequate oxygen supplies), and is transported to the dive site;

Determining whether or not travel after the dive will exceed an altitude threshold, and ensuring that the correct delay before travelling after diving is observed taking into account the type of diving done, and risk factors that may require an extension to the delay period;

Restricting or suspending any operation considered unsafe, whilst in the field, with particular attention to weather forecasts and prevailing conditions;

Ensuring there are adequate means of communication at every dive site in case of emergency;

Conducting a pre-dive briefing (see Appendix 2) in the presence of the entire Dive Team (including Diver's Attendants, Boat Handlers and Divers) and discussing all necessary control measures with the Dive Team, in particular where any dive operation contains one or more of the high risk factors listed in various sections and appendices of this Diving Procedures Manual;

Ensuring every diver is fully aware of their particular tasks for the dive, including knowing which other divers that they are to act as a buddy for;

Assessing the fitness of all team divers on site immediately before the dive, and vetoing any dive as required, where there is some uncertainty that a diver could safely complete it;

Nominating a Dive Leader to control the underwater part of the diving operation for each dive team, where there are multiple teams or when the Dive Coordinator is staying at the surface during the dive;

in the event that the trip's appointed Dive Coordinator intends to dive, they must delegate full responsibility for monitoring the diving operation, including diver recall, emergency management and operational safety, to another suitably qualified and experienced Dive Coordinator who is capable of responding to any diving related emergency;

Ensuring all divers conduct a pre-dive equipment check of their own and buddy diver's equipment, including, for any diver wearing 'bailout' equipment, performance of a 'bailout' contents check (with details to be recorded by Diver's Attendant) & a bailout activation drill; and

Ensuring all required pre-dive information is accurately recorded on the **Record of Dive** Form;

Ensuring all divers are aware of their current nitrogen loading status (Repetitive Factor) before entering the water, as well the permitted maximum bottom time for the intended maximum dive depth and bottom time available in the next deepest depth group on the decompression tables;

Ensuring that all divers are aware of dive termination procedures in the event of unforeseen circumstances that may reduce diver safety, and that the diver recall system in place is suitable for the prevailing conditions.

During Dive

Ensuring a qualified and capable Dive Coordinator is present at the surface during every dive, and that the diver recall method has been tested with all dive team members and removal of an unconscious diver from the water has been trailed and proven successful;

Ensuring that the dive is conducted according to the Dive Plan, and within the no-decompression limits of the decompression table approved for the dive;

Ensuring all dive details for dives conducted on the trip are recorded by a Diver's Attendant on a JCU **Record of Dive** form (Form 9) DURING the dive, listing requested details of that dive.

Post Dive

Ensuring no divers have exceeded permissible bottom times, or experienced any risk factors during the dive that could decrease the safety of their dive;

Ensuring all divers are well after the dive, and not suffering any signs or symptoms of illness;

Conducting a post-dive debrief with all divers to discuss issues arising before, during or after the dive, including notifying every diver of their current nitrogen loading status;

Ensuring all equipment is cleaned/flushed with fresh water at the end of each working day;

Ensuring any defective equipment is tagged **OUT OF SERVICE** to prevent further use, and is reported to the BDO or Field Trip Leader as soon as possible. Equipment known to be faulty in any way must not be used for any JCU diving operation, and shall be sent for repair immediately on return from the field trip;

Ensuring all **Record of Dive** forms are fully and accurately completed, with regard to the dives listed thereon, including signing off on each form themselves and requiring each diver listed on each Record of Dive form to sign off on that form, attesting that the information is a true and accurate record of their dive(s);

Checking in with the Communication Person by the designated time each day, as arranged;

Notifying the BDO as soon as possible of any injury that occurs to a member of the Dive Team (particularly if diving-related), and completing the **Diver Injury Report (FORM 2)**, which is required for submission of formal incident reporting in RiskWare by the Field Trip Leader.

Post Trip

Ensuring the Field Trip Leader, or Communication Person is notified of the safe return of the dive team in a timely manner;

Ensuring on completion of the diving operation that all required Post Dive details, including all data from each Record of Dive form (fully completed and signed), is uploaded to the Boating & Diving Register within 7 days or before their next trip whichever comes first;

Ensuring defective equipment is sent for repair, and notifying the BDO of the problem;

Notifying the BDO of any unforeseen hazards that may have resulted in accident or injury.

I, …….. have read and understood the responsibilities and obligations of Divers and Dive Coordinators and agree to abide by all rules and regulations in accordance with the latest version of the JCU Scientific Diving Operations Manual.

Signed …….. Date ……..

APPENDIX 8 - DIVER STATEMENT OF UNDERSTANDING

All individuals seeking to participate in diving activities with JCU must:

GENERAL RESPONSIBILITIES

Apply to the JCU Boating and Diving Unit for listing on the JCU Boating & Diving Register;

Undertake an induction with the Boating & Diving Officer (BDO) or delegate, including at least the items listed in the **JCU Diving Induction and Evaluation** at Appendix 1;

Comply with the directions of the BDO and any JCU Dive Coordinator (DC);

Read, understand and agree to comply with the current version of the JCU Scientific Diving Operations Manual;

Submit certificates and up to date information as required, including new qualifications, dive medicals, oxygen resuscitation and first aid certificates;

Submit current service records for any diving equipment used for JCU diving operations (see **Sections 11.4 & 11.5**);

Read, understand and comply with the requirements of any approved JCU Dive Plans, Risk Assessments and Emergency Response Plans for all work they undertake, and introduce no deviation from those plans (NB. actions to ensure the wellbeing of the diver or others are exempted);

Maintain an accurate and permanent record of all JCU dives in their personal Dive Logbook;

Be approved for the level of diving they wish to undertake, and ***never*** undertake dives outside that approval;

Maintain a high level of knowledge and competence with regard to their responsibilities, the type(s) of diving they undertake, and the diving equipment in use;

Maintain a level of physical fitness commensurate with the type of diving operation(s) in which they are likely to be involved whilst working with JCU. As a MINIMUM, all JCU divers should ensure they are able to meet the requirements of the swim and practical tests at FORM 4 – JCU Basic Scuba Diving Skills Statement of Achievement.

If the individual is a volunteer, they shall also ensure they have undertaken broader WHS induction using the JCU **Volunteer Induction Checklist** and completed the **Authorisation of a Volunteer** form and returned the form to insurance@jcu.edu.au.

SAFETY RESPONSIBILITIES

All JCU divers **must**:

Be able to maintain their own safety and lend assistance to others within the limits of their training. Divers have a responsibility to be familiar with, and abide by, safe diving practices at all times, so as not to compromise their own safety or the safety of others;

Ensure they are medically, mentally and physically fit for each dive;

Inform the BDO or their Dive Coordinator if they feel they do not have the required level of training, expertise or confidence to perform any diving operation;

Be present at all dive briefings relating to diving operations with which they are associated;

Only use equipment that is approved and they are qualified/competent and comfortable with its use;

Check all dive equipment prior to use, not dive with faulty equipment, and report faults to the DC and/or BDO;

Take responsibility for proper handling, care and maintenance of equipment issued to them;

Adhere to the buddy system when diving, maintaining contact with assigned buddy(s), monitoring their own air supply, and **informing their buddy at regular intervals of air supply status**;

Identify hazards and risks, and act to avoid these, informing the Dive Coordinator when safe to do so;

Surface from a dive with no less than 50 Bar of air remaining in their cylinder (unless approved otherwise by the BDO); and

Notify the Dive Coordinator as soon as possible of any incident or accident that occurs to them or a buddy.

I, …….. have read and understood the responsibilities and obligations of Divers and Dive Coordinators and agree to abide by all rules and regulations in accordance with the latest version of the JCU Scientific Diving Operations Manual.

Signed …….. Date ……..

APPENDIX 9 – SNORKELLING (LARGE GROUP) RESPONSIBILITIES

The following information categorises **Statements of Understanding** for each role required when undertaking snorkelling procedures involving large groups, as defined in the Section 9 - Snorkelling Operations, of the JCU Scientific Diving Operations Manual.

Snorkelling Supervisor

The Snorkelling Supervisor is responsible for the safe conduct of snorkelling at the site and shall coordinate and direct the activities of all persons involved.

The ***Snorkelling Supervisor*** shall:

- ensure that all activities are conducted in accordance with JCU procedures, and all appropriate risk control measures are implemented at the site;
- implement methods to ensure that no person is left behind at the site;
- use the **Snorkelling Log** (FORM 8) to count persons before departure to the site, if anyone leaves the site, and before departing the site;
- before any in-water activity, and in consultation with the BDO, assess snorkelers to determine if their skill level, age/health/fitness, and/or experience places them in the category of an 'at risk' snorkeler;
- ensure buddy pairs have been assigned;
- ensure 'at risk' snorkelers can be easily identified in the water and extra attention can be directed to them;
- ensure other staff members (lookouts, rescuers and first aid providers) have been appointed and positioned appropriately at the site;
- ensure emergency management plans are well communicated to other supervisory staff, and can be enacted quickly and effectively;
- ensure emergency equipment is immediately available at the site – communications, first aid kit, oxygen resuscitation kit, sufficient oxygen supply, AED, floatation aids, rescue devices and rescue craft/vessel (if applicable);
- the condition and function of first aid equipment should be checked daily;
- ensure the snorkelling site is clearly marked with use of dive flags, buoys, floating lines or other devices which make the boundaries of the site obvious to passing vessels;
- provide pre-activity briefings and instruction to snorkelers to enhance understanding and increase the likelihood of directions being followed;
- act as ***Lookout*** (unless the role of Lookout has been delegated to other staff at the site);
- act as ***Rescuer*** (unless the role of Rescuer has been delegated to other staff at the site);
- if required, provide first aid to a casualty, or direct a competent person to provide first aid, and assist as necessary; and
- provide help and advice to snorkelers about the use of equipment and as they enter and exit the water.

Competence of Snorkelling Supervisor

The ***Snorkelling Supervisor*** shall:

- have a thorough working knowledge of the operating and emergency procedures and risk assessments which have been developed to safely manage the activities at the site;
- have reasonable experience of the site, and/or has experience in supervising snorkelling / diving activities at similar locations;
- be able to recognise hazards and risks in the marine environment;
- be able to recognise changes to risks due to snorkeler's abilities and behaviour;
- be able to respond quickly to changes in risk and alter or abort activities as necessary;
- be a capable swimmer and experienced snorkeler;
- be competent to carry out a rescue of a snorkeler (unless the role of rescuer has been delegated to other persons at the site);

- be competent to provide first aid, oxygen resuscitation, and operation of an AED (unless the role of first aid provider has been delegated to other persons at the site); and
- be capable of directing a rescue and coordinating the Emergency Management Plan (EMP).

I understand the roles and responsibilities that have been delegated to me as a Snorkelling Supervisor under the JCU Snorkelling Standard and state that I am competent to perform these duties.		
NAME	**SIGN**	**DATE**

Lookout

At all times while snorkelers are in the water, one or more ***Lookouts*** shall be present at the surface of the site.

The ***Lookout*** shall:

- be positioned to achieve full and un-obstructed vision of the area where snorkelers are at all times;
- continually scan and observe the whole area and snorkelers effectively;
- act appropriately to keep people within boundaries;
- observe and help persons with entry and egress;
- if required, either rescues a person or directs a person to conduct a rescue;
- if necessary, have access to binoculars and polarized sunglasses;
- wear a brightly colored shirt (or other) so is easily recognised by snorkelers;
- be part of an effective and pre-planned communication system for the transfer of information between snorkelers, supervisors and other staff; and
- be aware of breath-hold diving taking place and apply additional supervision.

Competence of Lookout

The ***Lookout*** shall:

- be able to recognise hazards or changes which may lead to problems, identifies problems that require adjustments on the operation (tides, currents, marine animals, behavior, fatigue etc.); and
- be able to detect when a snorkeler is in trouble or needs assistance.

I understand the roles and responsibilities that have been delegated to me as a Lookout under the JCU Snorkelling Standard and state that I am competent to perform these duties.		
NAME	**SIGN**	**DATE**

Rescuer

At all times while snorkelers are in the water, one or more ***Rescuers*** shall be present at the surface of the site.

A ***Rescuer*** shall:

- be positioned so as to minimise the distance between themselves and the snorkelers;
- be in a state of readiness to immediately enter the water and rescue a snorkeler;
- have rescue devices and floatation aids readily accessible; and
- be part of an effective and pre-planned communication system for the transfer of information between snorkelers, supervisors and other staff.

Competence of a Rescuer

A ***Rescuer*** shall:

- have a thorough working knowledge of the operating and emergency procedures which have been developed to safely manage the activities at the site;
- be a strong swimmer, experienced snorkeler and have an acceptable level of fitness;
- possess qualifications and/or skills and/or experience for in-water rescue of a person, and also knowledge in the management of snorkelling related injuries and illnesses;
- be qualified and competent to operate vessels and other rescue craft as necessary.

I understand the roles and responsibilities that have been delegated to me as a Rescuer under the JCU Snorkelling Standard and state that I am competent to perform these duties.		
NAME	**SIGN**	**DATE**

Snorkelling Guide

A ***Snorkelling Guide*** accompanies a snorkeler in the water and remains with them as both a buddy and in-water supervisor.

The ***Snorkelling Guide*** shall:

- be a capable swimmer and experienced snorkeler and be able to rescue a snorkeler;
- have a good understanding of the snorkeler's abilities and potential problems that may occur;
- stay with snorkelers at all times unless they are deemed competent to snorkel with another buddy;
- be able to recognise relevant hazards and snorkelers in difficulty;
- be able to respond quickly to changes in risk and alter or abort activities as necessary;
- be aware of breath-hold diving and apply additional supervision; and
- be part of an effective and pre-planned communication system for the transfer of information between snorkelers, supervisors and other staff.

I understand the roles and responsibilities that have been delegated to me as a Snorkelling Guide under the JCU Snorkelling Standard and state that I am competent to perform these duties.		
NAME	**SIGN**	**DATE**

First Aid Provider

At all times while snorkelers are in the water, one or more ***First Aid Providers*** shall be present at the surface of the site.

The ***First Aid Provider*** shall:

- be in a state of readiness to assist in the rescue of a person and provide first aid if required;
- have checked first aid equipment is suitable for the operation, is functional and readily accessible; and
- be part of an effective and pre-planned communication system for the transfer of information between snorkelers, supervisors and other staff.

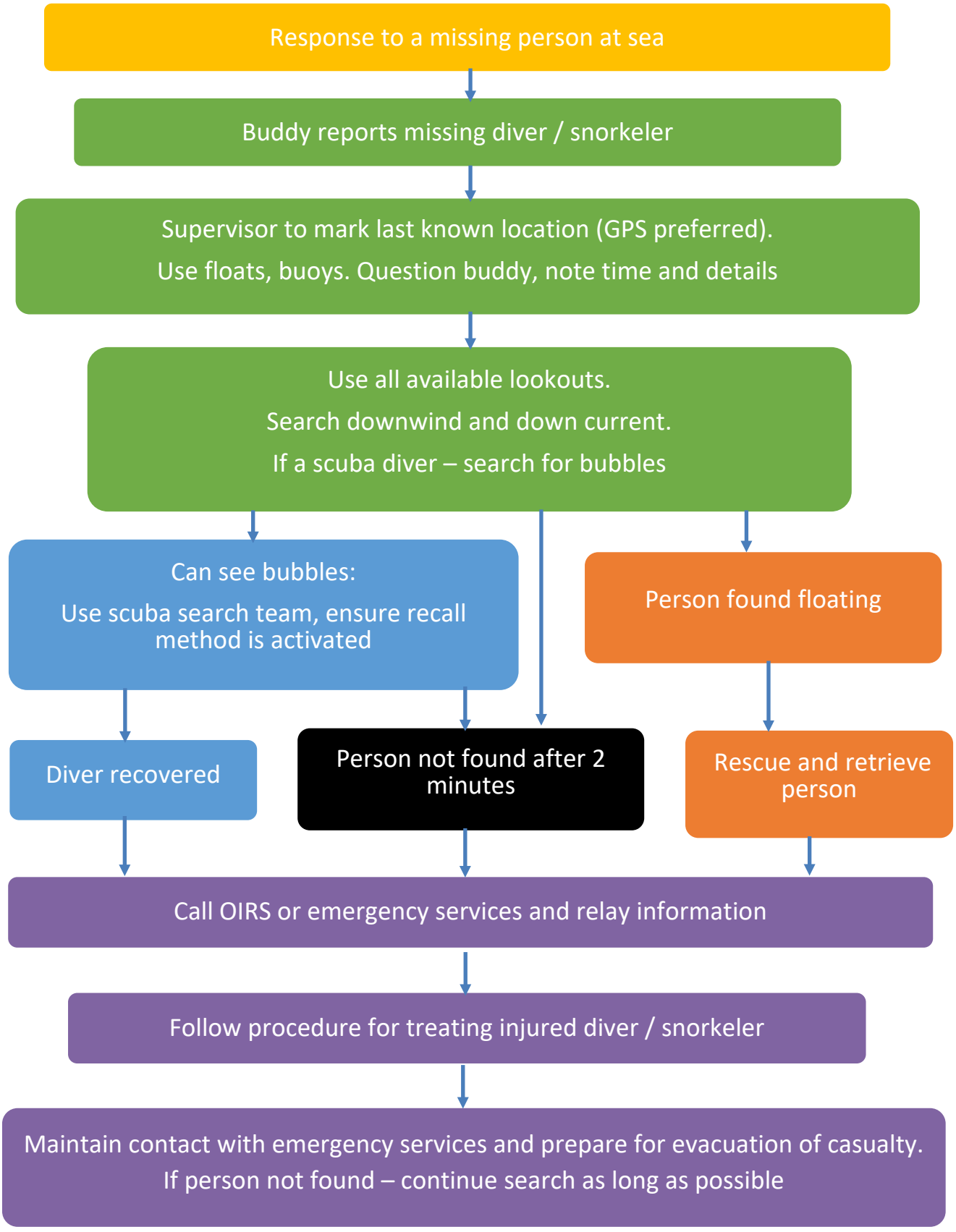
Competence of First Aid Provider

The ***First Aid Provider*** shall:

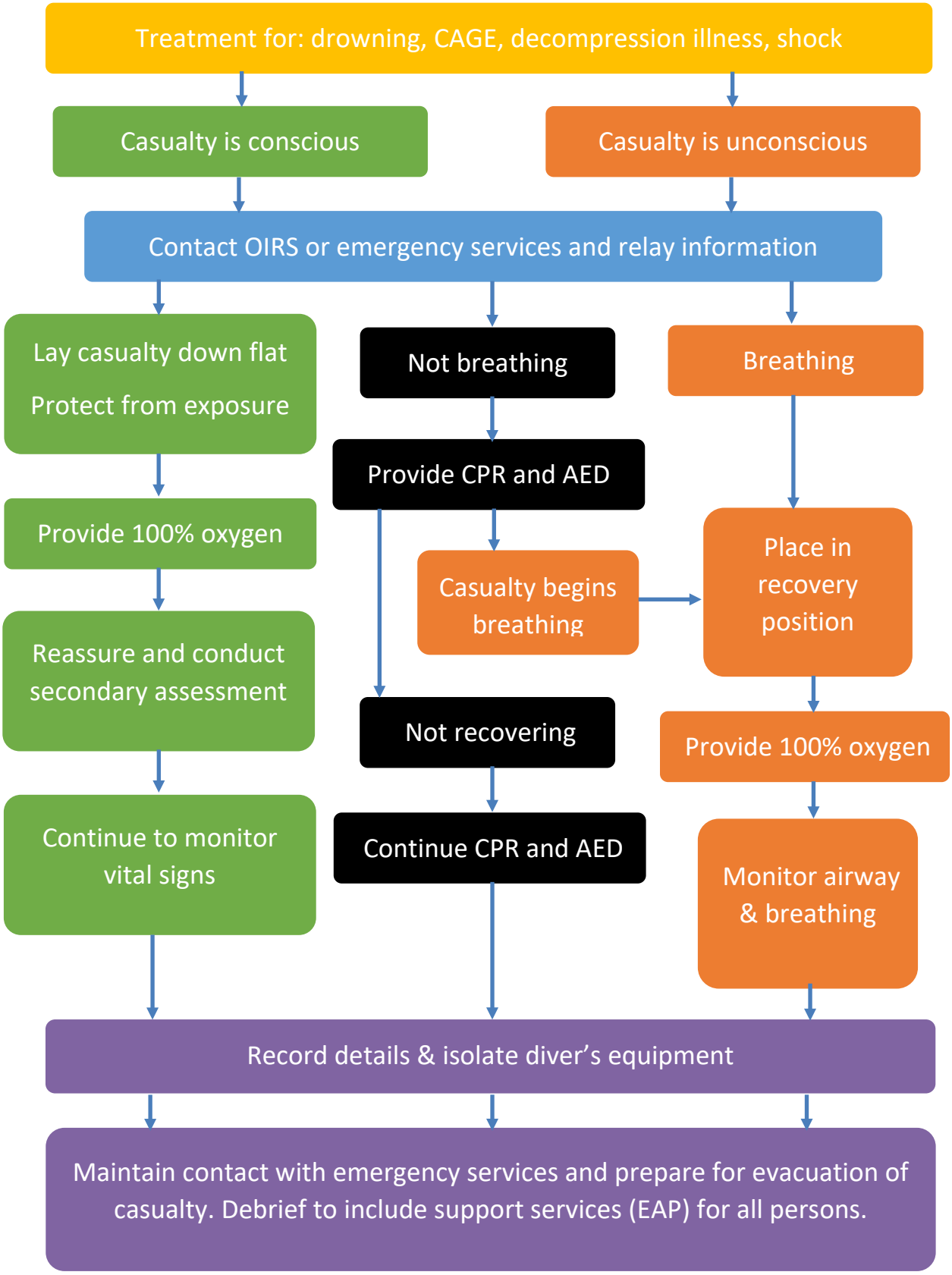
- possess current qualifications in First Aid, CPR, and administration of oxygen (Advanced Resuscitation) and operation of an AED; and
- be familiar with the type and use of the oxygen equipment and AED's at the site, and confirmed oxygen storage supply and function of all parts of the equipment.

I understand the roles and responsibilities that have been delegated to me as a First Aid Provider under the JCU Snorkelling Standard and state that I am competent to perform these duties.		
NAME	**SIGN**	**DATE**

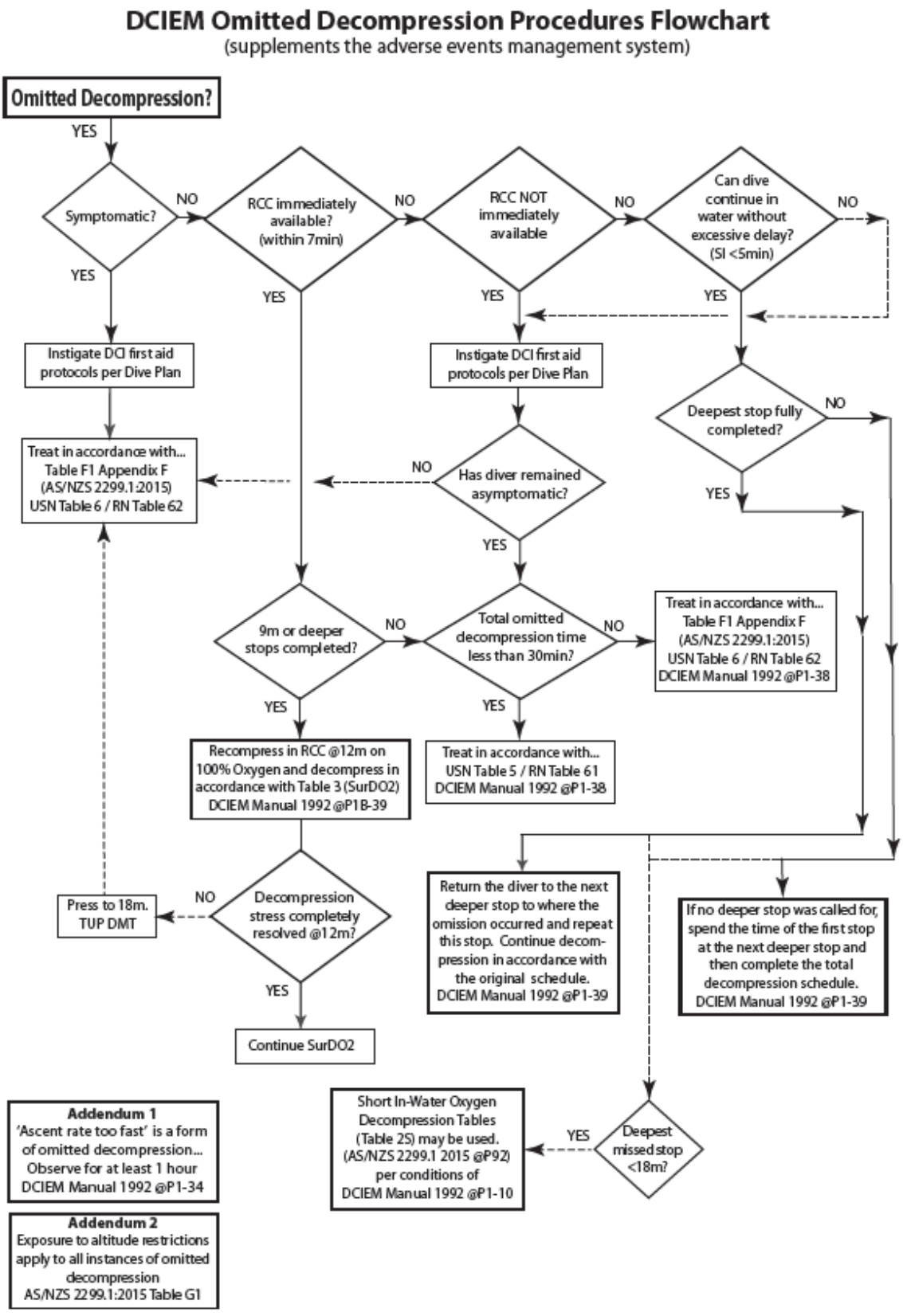
APPENDIX 10 – PROCEDURE FOR MISSING DIVER or SNORKELER



APPENDIX 11 – PROCEDURE FOR TREATING AN INJURED DIVER or SNORKELER



APPENDIX 12 – DCIEM Omitted Decompression Procedures Flowchart



APPENDIX 13 – RECOMMENDED PHYSICIANS WITH EXPERTISE IN DIVING MEDICINE

Any Life Threatening Emergency should be conducted through a '000' call to QAS.

Advice on suspected diver injury can be made directly to the Townsville Hospital Hyperbaric Unit via the **Townsville University Hospital Switch on (07) 4433 1111**, who will transfer the call to the On-Call Hyperbaric Physician. (International +61 7 4433 1111)

Townsville

Dr Chris Ball	**Sports Clinic NQ** Level 5, Stanton Centre 31 Leichhardt Street North Ward QLD 4810	**(07) 4772 2344**
Dr Evan Nicholls	**Townsville GP SuperClinic** 87 Charters Towers Road Townsville QLD 4810	**(07) 4753 0888**
Dr Robert Teunisse	**SunSeaHealth @** **North Shore General Practice** 1/50 North Shore Boulevard Burdell QLD 4818	**(07) 4758 7000**
Dr Conway Savis	**Mundingburra Medical Centre** 128 Ross River Road Townsville QLD 4810	**(07) 4779 0622**
Dr Csongor Oltvolgyi	**LiveWell Healthcare** 5-7 Bayswater Road Hyde Park Townsville QLD 4818	**(07) 4724 2592**
Dr Prasani Ketheesan	**JCU Health** Clinical Practice Building, Level 1 1 James Cook Drive James Cook University QLD 4811	**(07) 4781 4495**

Cairns

Dr Gavin Le Sueur	**Cairns 24 Hour Medical Centre** 156 Grafton Street Cairns QLD 4870	**(07) 4052 1119**
Dr Catherine Meehan	**McLeod St Medical** 67 McLeod St Cairns City QLD 4870	**(07) 4052 1583**
Dr Graham Simpson	**Flecker House** 5 Upward Street Cairns QLD 4870	**(07) 4031 4095**

The above physician list was relevant at June 2020. Clarification must be sought with the practitioner to ensure currency for occupational medical assessments.

Other Physicians as per current occupational diving doctors listing on the **South Pacific Underwater Medicine Society (SPUMS)** web page: **https://www.spums.org.au/dive-doctors-list/**

FORM 1 – OCCUPATIONAL DIVER MEDICAL FITNESS CERTIFICATE

AS/NZS 2299.1 Occupational Diver Medical Fitness Certificate

I, _____, certify that

(Doctor's name)

_____

(Candidate's name)

has been assessed for medical fitness to dive in accordance with AS/NZS 2299.1:2015 and has been found—

- ☐ **Fit to dive/work under pressure**
- ☐ **Permanently unfit**
- ☐ **Temporarily unfit—Review date……**
- ☐ **Decision pending……**

Categories of occupational diving for which fitness was assessed:

- ☐ **All occupational diving**
- ☐ **All occupational diving except saturation**
- ☐ **Other ……**

Advice provided:

Comments:

I confirm that I have received formal training in the conduct of occupational diving medical examinations.

Signed ……

Doctor's name (print) ……

Date ……

Candidate's signature ……

Page 1 of 1

FORM 2 – DIVER INJURY REPORT

If diver unconscious, extremely short of breath or severely injured then position in stable side position / horizontally, maintain airway and breathing and pulse, administer oxygen and contact Emergency Services (phone 000 or 112 in Australia) immediately.

If diver co-operative, position horizontally, complete questionnaire, administer oxygen and contact Emergency Services.

Your Name: ..... **Position:**.....

Qualifications Held:.....

Your Location: ..... **Diver's Location:** .....

Contact Telephone No: .....

BACKGROUND *Information about the patient*

Name: ..... **Age:**..... **Sex:** Male / Female

Certification Level: OWD / ADV / RESCUE / DM / INSTRUCTOR / OCCUPATIONAL / SCIENTIFIC

Approx. No of Dives: .....

The total number of dives since certification

Recent Dive History:.....

Has been diving for a week / First dive in 3 months, etc.

Medical Problems: .....

.....

Past Medical History: .....

.....

.....

Include previous injuries / DCI / etc.

Medications: .....

Did the diver suffer from or have: Seasickness Dehydration Cold Rapid Ascent Tiredness

Other (e.g. stress).....

Dive Profile: Information sourced from a computer? YES / NO Dive Log YES / NO

Length of dive trip:.....days **Number of dives:**..... **Tables Used:** .....

Type of Dive(s): Square Profile / Reverse / Multi-level / Saw Tooth / High Exertion / Repetitive etc.

.....

.....

Victim's dives for at least the 24 hour period prior to incident (note the dive on which the incident occurred)

Date	S I (hh:mm)	RF	Time In	Time Out	BT	EBT	Depth	RG	No of Ascents

Safety Stops? Depth: ..... Duration: .....

Associated Problems: Equipment Problem / Malfunction / Heavy Surge / Current / Panic etc.

Details: .....

.....

DESCRIPTION OF PROBLEM

Was the diver completely well prior to diving? YES / NO

Time and description of 1st symptom? .....

(e.g. on ascent / two hours later / on reaching altitude, numbness and tingling in left arm)

SIGNS AND SYMPTOMS *(Tick appropriate)*

Dizziness	Headache	Blurred vision	Nausea / Vomiting
Personality change	Extreme fatigue	Shock	Slurred speech
Disorientation (see below)	Limb weakness (see below)	Visual changes (see below)	Poor balance (see below)
Sensory change (see below)	Poor co-ordination (see below)	Unconsciousness	Vertigo

Is the patient suffering from:

Pain in ?
Pins & needles in ?
Numbness where ?
Paralysis of ?

FIRST AID

Lay the patient down horizontally. A patient who is nauseated, vomiting or not fully conscious should be placed in a stable position on the side.

Monitor consciousness, airway, breathing and pulse and resuscitate if necessary.

Medical / First Aid facilities available?.....

Has the patient received Oxygen? YES / NO Time Oxygen Provision Commenced: ……

Type of Mask: Simple Facemask / Non-Rebreather / Bag-Valve Mask / Resuscitation Mask / Mouthpiece / Intraoral (NuMask)

Duration of Oxygen? ……hrs:mins **Flow rate? ……** (litres/min) **Delivery System:** Demand Valve / Constant Flow

Has the delivery of Oxygen made a difference? YES / NO

Useful if patient is on oxygen for 15 - 20 mins before contacting DES

Have fluids been given?.....

(what and how much, see note)

Note: I.V. fluids are preferable. Oral fluids (e.g. water, isotonic/electrolyte fluids) are given if the patient is conscious, stable and not suffering from stomach pain, nausea, or vomiting. Record the amount and type of fluid given. Record urinary output and check for bladder distension.

Brief description of incident and final status of patient while in your care.

.....

.....

.....

.....

.....

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.....

.....

.....

.....

A copy of this form when completed shall be submitted with (appended to) a completed James Cook University *Accident, Incident and Injury Report submitted through the RiskWare system.*

FORM 3 - FIELD NEUROLOGICAL ASSESSMENT TEST

Five-Minute Neurological Exam

Examination of an injured diver's central nervous system soon after an accident may provide valuable information to the physician responsible for treatment. The Five-Minute Neuro exam is easy to learn and can be performed by individuals with no medical experience. The examination can be done whilst reading from this manual. Perform the following steps in order, and record the time, and the results for each test

1. Orientation

- Does the diver know his/her name and age?
- Does the diver know the present location?
- Does the diver know what time, day, year it is?

*Even though an individual may appear alert, answers to these questions can reveal confusion. Do **not** omit them.*

2. Eyes: Have the diver count the number of fingers you display, using 2 or 3 different numbers of fingers. Check each eye separately and then together. Have the diver identify a distant object. Tell the diver to hold head still - or you gently hold it still - while placing your other hand approximately half meter in front of the face. Ask the diver to follow your hand. Now move your hand up and down, then side to side. Diver's eyes should follow your hand and should not jerk to one side and return (called nystagmus). Check that the pupils are equal in size.

3. Face: Ask the diver to whistle or purse their lips. Look carefully to ensure both sides of the face have the same expression whilst whistling. Ask them to grit their teeth & feel their jaw muscles to confirm they are contracted equally. Instruct the diver to close his/her eyes while you lightly touch your fingertips across their forehead and face. Confirm that sensation is present, and feels the same everywhere.

4. Hearing: Evaluate the diver's hearing by holding your hand about 60cm from the individual's ear and rubbing your thumb and finger together. Check both ears by moving your hand closer until the diver hears it. Check several times and compare with your own hearing. NB. If the surroundings are noisy, this test is difficult to evaluate. If necessary, ask any bystanders to be quiet and turn off unneeded machinery.

5. Swallowing Reflex: Instruct diver to swallow while you watch their "Adam's apple". Ensure it moves up/down.

6. Tongue: Instruct diver to stick out their tongue. It should come out straight in the middle of the mouth without deviating to either side.

7. Muscle Strength: Instruct the diver to shrug their shoulders while you bear down on them, to observe for equal muscle strength. Check diver's arms by bringing their elbows up level with their shoulders, hands level with the arms, and touching their chest. Instruct the diver to resist while you pull their arms away, push them back, and move them up and down. The strength should be approximately equal in both arms in each any direction. Check leg strength by having the diver lie flat and raise and lower their legs while you resist the movement.

8. Sensory Perception: Check on both sides by touching lightly as was done on the face. Start at the top of the body and compare sides while moving downwards to cover the entire body. The diver's eyes should be closed during this procedure. The diver should confirm the sensation in each area before you move to another area.

9. Balance and Coordination: Be prepared to protect the diver from injury when performing this test.

DO NOT STAND DIVER UP IF SUSPECTED CAGE, otherwise, have diver stand up with feet together, close their eyes and stretch out their arms. The individual should be able to maintain balance if the platform is stable. Your arms should be around, but not touching the individual, in case they fall. ***Be prepared to catch the diver who starts to fall.***

Check coordination by having the diver move an index finger back and forth rapidly between their nose and your finger - held approximately half meter from their face. In another test of coordination, instruct the diver to slide the heel of one foot down the shin of the other leg while lying down.

Conduct these tests on both right and left sides, and observe carefully for differences between the two sides. Tests 1,7, and 9 are the most important, and should be given priority if not all tests can be performed.

The diver's condition may prevent the performance of one or more of these tests. Record any omitted test, and the reason. If any of the tests appear abnormal, injury to the central nervous system should be suspected. The tests should be repeated at frequent intervals while awaiting assistance, to determine if any change occurs. Report the results to the emergency medical personnel responding to the call.

Good diving safety habits would include practicing this examination on normal uninjured divers, to gain proficiency in use.

FIELD NEURO EXAM RECORD FORM

Diver's Name: ..... Examiner's Name: ..... Date:.....

Initial Complaint: .....

.....

TIME	:	:	:	:	:	:	:	:	:	:
	YES	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
Mental Status: Does he/she know										
1. His/her name?										
2. Where he/she is?										
3. Time of day?										
4. Most recent activity?										
5.. Speech is clear/correct										
Sight:										
1. Correctly counts fingers?										
2. Vision clear?										
Eye movements:										
1. Move in all four directions?										
2. Nystagmus absent?										
Facial Movements:										
1. Teeth clench OK?										
2. Able to wrinkle forehead										
3. Tongue moves in all directions										
4. Smile is symmetrical?										
Head & Shoulder Movements:										
1. Adam's apple movement?										
2. Shoulder shrug normal, equal?										
3. Head movement normal, equal?										
Hearing:										
1. Normal for that diver?										
2. Equal in both ears?										
Sensations: Present, normal and symmetrical across:										
1. Face										
2. Chest										

3. Abdomen										
4. Arms (front)										
5. Hands										
6. Legs (front)										
7. Feet										
8. Back										
9. Arms (back)										
10. Buttocks										
11. Legs (back)										
Muscle Tone: Present, normal and symmetrical for:										
1. Arms										
2. Legs										
3. Hand grips										
4. Feet										
Balance and Coordination:										
1. Romberg OK?										
2. Pulse										
3. Respiration										

Nystagmus – involuntary oscillation of the eyeball. Usually lateral, but sometimes rotary or vertical.

Romberg – Patient stands bare footed with feet heel to toe, arms crossed over chest, eyes closed and attempts to remain upright.

FORM 4 - JCU BASIC SCUBA DIVING SKILLS STATEMENT OF ACHIEVEMENT

Following are listed the practical assessment results relating to Fitness, Scuba and Rescue skills for:

..... *(please enter name in full)*

FITNESS		
Element	**Achieved**	**Minimum Requirement**
300m swim		Less than 12min
800m snorkel		Less than 20min
10min tread water, or, 2min hands in air		completion
SCUBA SKILLS		
Element	**Achieved**	**Minimum Requirement**
Equipment set-up		
Buddy checks		
Water entry		
Mask removal and replacement		
Regulator removal and replacement		
Weights removal and replacement		
Scuba unit removal and replacement		
Neutral buoyancy		
Out of air & share air		
RESCUE SKILLS		
Element	**Achieved**	**Minimum Requirement**
Retrieve unconscious diver from depth		
Establish buoyancy for unconscious diver		
Use signalling devices		
Tow unconscious diver 100m		Less than 5min
Demonstrate egress of unconscious diver from the water		

- ❑ Underpinning skills achieved satisfactory results.
- ❑ Not satisfactory.

Applicant signature: _____ Date: _____

Assessor signature: _____ Date: _____

NOTES: .....

.....

.....

FORM 5 – TAKE 5 PRE-DIVE SCUBA & SNORKELLING RISK CHECKLIST

'TAKE 5' PRE-DIVE SCUBA & SNORKELLING RISK CHECKLIST

To be completed by the Dive Coordinator / Snorkel Supervisor prior to in-water activities.

Is this activity in accordance with your Dive Plan *and* JCU Diving & Snorkelling Procedures?	**Y / N**
Are all divers / snorkelers FIT for work and well hydrated?	**Y / N**
Have divers / snorkelers been informed of working within their ability?	**Y / N**
Divers / Snorkelers have been properly briefed about:	
Diver profiles, especially planned depth, RF and maximum allowed Bottom Time.	**Y / N**
That NO hyperventilation is allowed due to risks of hypoxic blackout.	**Y / N**
The tasks being performed and risk control measures being applied.	**Y / N**
Emergency Procedures – lost buddy, injured diver, rescue, recall, first aid & evacuation.	**Y / N**
Review of communications (diver-to-diver & surface-to-diver/snorkeler).	**Y / N**
All SCUBA equipment is checked and functional.	**Y / N**
All emergency equipment is checked and functional – O2 contents checked.	**Y / N**
All communications equipment is checked and functional.	**Y / N**
Are there unforeseen risks present at the site?	**Y / N**
Is there a risk from boat traffic at the site? Is the Dive Flag raised?	**Y / N**
Have you considered the presence of sharks, jellyfish or crocodiles?	**Y / N**
Do the current environmental conditions elevate risk?	**Y / N**
Do you have adequate control of the dive site?	**Y / N**

Extra control measures / actions implemented ……

……

Notes: ……

……

FORM 6 – SNORKELLING TEAM INDUCTION

COMPETENCY ASSESSMENT CRITERIA FOR SNORKELLING	
Snorkelling Supervisor *Acceptable qualifications may include:* SIS30413 – Certificate III in Outdoor Recreation, SISOSNK201A – demonstrate snorkelling activities SISOSNK403A – Instruct snorkelling skills, SISOSNK302A – Guide snorkelling SCUBA Dive Leader, Dive Master, Dive Instructor	
Theory (induction content)	**Practical**
Knowledge of operating procedures, emergency procedures, and risk assessments for the site. Knowledge of site risks and control measures. Knowledge of recognising problems in snorkelers. Knowledge of equipment sanitising techniques.	Can swim 200m in less than 5min Can fin 400m in less than 10min Use of communications equipment
Lookout *There is no requirement for specific qualifications.*	
Knowledge of changes in site conditions and risks. Knowledge of recognising problems in snorkelers.	Use of communications equipment
Rescuer *Acceptable qualifications may include:* Recognised Rescue Diver Certification SISCAQU002 – perform basic water rescues Bronze Medallion – Royal Life Saving	
Knowledge of operating and emergency procedures for the site. Knowledge of snorkelling related illness, injury and treatment.	Can swim 200m in less than 5min Can fin 400m in less than 8min Can tow a person (or proxy) 100m in less than 4min
First Aid Provider *Acceptable **up-to-date** qualifications **must** include:* HLTAID003 – Provide First Aid (or minimum equivalent); and HLTAID001 – Provide Cardiopulmonary Resuscitation; and HLTAID002 – Provide Basic Emergency Life Support; and HLTAID007 – Provide Advanced Resuscitation, or VU21763 – Apply Basic Oxygen Resuscitation Therapy	
Knowledge of operating and emergency procedures for the site. Knowledge of snorkelling related illness, injury and treatment. Knowledge of first aid and emergency equipment at the site.	n/a
Snorkelling Guide *Acceptable qualifications may include:* SISOSNK302A – Guide snorkelling	
Knowledge of site risks and control measures. Knowledge of recognising problems in snorkelers.	Can swim 200m in less than 5min Can fin 400m in less than 8min Can tow a person (or proxy) 100m in less than 4min

Team Member Onsite Assessment Conducted (if required):	Achieved	Time (mins)	Notes
200m Swim	Y / N		
400m Fin	Y / N		
100m Person Tow	Y / N		
Use of Communications Equipment	Y / N	n/a	
Equipment Sanitising Techniques	Y / N	n/a	

Assessment of Snorkelers

Instructions for using the Snorkelling & Swimming Health Declaration and Competency Assessment

The primary purpose of assessing snorkelers is to determine which persons may be ***'at risk'***.
All snorkelers must complete the ***Snorkelling & Swimming Health Declaration*** form.

Direct observations which are also part of the assessment include:

- is the person either very young or older;
- are overweight;
- appear in bad health;
- exhibit stressed behaviour;
- have mobility issues; and
- have difficulties understanding instructions.

If a person declares existing health / medical conditions, or the above-mentioned observations have identified concerns, the Manager and Supervisor may, at their discretion:

- request the person to seek written advice from a medical practitioner, or
- allow the person to snorkel, but treat the person as ***'at risk'*** and apply additional controls at the site as required, or
- prohibit the person from snorkelling.

If a person declares poor swimming ability, or zero snorkelling experience, the person should be treated as ***'at risk'*** until the Manager and Supervisor are satisfied they are not 'at risk'.

- It may be decided that a practical assessment of the person's swimming / snorkelling ability can be done before the person is allowed to snorkel in a group, or
- A snorkelling guide may be appointed to have direct control of one or more 'at risk' persons.

Snorkeler Onsite Assessment Conducted (if required):	**Achieved**	**Notes**
Adjustment of mask, snorkel, fins	Y / N	
Successfully clear water from mask and snorkel	Y / N	
Correct fining technique	Y / N	
Use of weight belts and achieving positive buoyancy	Y / N n/a	
How to deal with problems (e.g. cramp, water ingestion)	Y / N	

Name: ..... Sign: ..... Date: .....

Qualifications held: .....

Has been assessed to fulfil the role(s) of .....

by BDO or delegate (approved JCU staff):

Assessor Name: ..... Sign: ..... Date: .....

Notes: .....

FORM 7 – SNORKELLING & SWIMMING HEALTH DECLARATION

Surname		Preferred Title (Mr. Ms. Dr. etc)	
First Name(s)		Date of Birth	
Department		Staff/Student ID	
Position at JCU		Phone	
What year did you start snorkelling?		Snorkelling experience in open waters: ☐ Less than 10 hours ☐ 10-50 hours ☐ More than 50 hours	

SWIMMING PROFICIENCY AND FITNESS			
Are you able to swim or tread water for 10 minutes non-stop? ☐ **YES** ☐ **NO**	Are you able to swim 200m without stopping? ☐ **YES** ☐ **NO**	Do you have more than 15 hours experience in breath-hold diving? ☐ **YES** ☐ **NO**	
FITNESS (circle one)	**Low**	**Average**	**Good**
Minutes of vigorous exercise per week:	0 – 30min total	30 – 180min total	More than 180min

DO YOU HAVE ANY OF THE FOLLOWING CONDITIONS? (please circle)		
Heart disease	YES	NO
High blood pressure	YES	NO
Low blood pressure	YES	NO
Shortness of breath (especially when exercising)	YES	NO
Asthma	YES	NO
Emphysema or other chronic lung disease	YES	NO
Epilepsy	YES	NO
Fits or faints	YES	NO
Recent head injury or concussion	YES	NO
Diabetes (type……)	YES	NO
Do you smoke cigarettes?	YES	NO
Are you pregnant?	YES	NO
Are you taking prescribed medication?	YES	NO

Signature:	**Date:**
Signature for Parent/Guardian:	**Date:**

FORM 8 – SNORKEL LOG SHEET

Snorkelling Log Sheet	Date:	Group:
Location:		Supervisor:
Person count BEFORE going to site:		Person count BEFORE leaving site:

Surname	First Name	Gr	Time In	Time Out	Initial	Time In	Time Out	Initial
		1						
		1						
		2						
		2						
		3						
		3						
		4						
		4						
		5						
		5						
		6						
		6						
		7						
		7						
		8						
		8						
		9						
		9						
		10						
		10						
		11						
		11						
		12						
		12						

FORM 9 - JAMES COOK UNIVERSITY – **RECORD OF DIVE**

Location:	**Site(s):**	**Dive Coordinator:**	**Name:**	**Sign:**
RiskWare Field Trip # **Dive Plan #** *(both numbers are mandatory)*	**Vessel Name :** Arrival # Divers In: Departure # Divers Out:	**Incidents/Accidents/Comments (refer to dive date/name/s) :** **O2 Cylinder contents:**		

DIVER'S FULL NAME	*DATE*	*SURFACE INTERVAL*	*RF*	*DEPTH OF DIVE (m)*	*NDL (mins)*	*AIR IN (bars)*	*LEFT SURFACE*	*BOTTOM TIME*	*ARRIVED SURFACE*	*AIR OUT (bars)*	*EBT (mins)*	*RG*	*Comments, Site #*
		:					:		:				
		:					:		:				
		:					:		:				
		:					:		:				
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		:					:		:				

For use with DCIEM AIR Diving tables. *(for the purpose of this diving, Bottom Time can be considered equivalent to Dive Time)* *Please note **any** adjustments required to dive **R**epetitive **G**roup*