National Operational Guidance Programme

Local Government Association | CFOA Chief Fire Officers Association | in partnership with LFB London Fire Brigade

Title:	Water rescue and flooding
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Synopsis:	This guidance describes the hazards, control measures and actions needed for managing water-related emergencies. A significant development in the guidance is the new tri-service model for survivability.
Published:	24/06/2014
Next Review Date:	24/06/2017
Status:	Approved
Version:	First edition version one
Latest Position:	First edition version one published 24/06/2014

National Operational Guidance – Water rescue and flooding first edition version one (ARCHIVED on 01-02-2016)

National Operational Guidance Programme

Water rescue and flooding

Contents

Introduction

Fire and rescue services (FRS) attend a variety of water-related incidents. They may involve the rescue or recovery of people and animals, and protecting infrastructure and the environment. This guidance describes the hazards in water related emergencies, the controls measures required and the actions that can be carried out to implement them.

The emergency services have been criticised in the past for delaying action at incidents with an apparent low risk of harm to personnel. It may not always be necessary to implement extensive control measures before taking action. Collecting the correct and relevant information from the time of the first call to a fire control room will help identify the correct level of initial deployment necessary to deal with the incident. In some situations, such as at low-risk bodies of water, a wading rescue by non-specialist first responders might be entirely appropriate. However, the water environment can be deceptive. There may be hazards that are not obvious and could place firefighters at risk. In deciding which control measures are appropriate to manage an incident safely, incident commanders will need to be mindful of potential hazards and their knowledge of the body of water. They will need to base their decisions on the balance of risks to personnel and members of the public.

Search and rescue responsibilities

The police are responsible for coordinating search and rescue (SAR) on land and on inland waters. The Maritime & Coastguard Agency (MCA), through HM Coastguard (HMCG), responds to rescues at sea, on the coastline, within tidal waters and in certain delegated inland waters.

HMCG's SAR teams have the following capabilities:

- Search
- Water rescue
- Mud rescue
- Rope rescue

HMCG and the police are able to call upon various SAR assets (e.g. fire and rescue services, lifeboats, helicopters, ambulance, cave rescue, mountain rescue, lowland SAR etc). Fire and rescue services will often provide an initial and/or backup response in HMCG's statutory area of responsibility.

The Department for Environment, Food and Rural Affairs (Defra) is the lead government department for major flooding in England and Wales. However, responding agencies report to a range of government departments, requiring coordination in the event of flooding over a wide area:

- Pan-government coordination: Cabinet Office Civil Contingencies Secretariat (CCS)
- Fire and rescue and local government resilience: Department for Communities & Local Government (DCLG)
- HM Coastguard: Department for Transport (DfT), as parent department for the MCA
- Police: Home Office (HO)
- Ambulance service: Department of Health (DoH)
- Forecasting: Department for Business, Innovation & Skills (BIS), as parent department for the Meteorological Office
- Military aid to the civil community: Ministry of Defence (MoD)

The ambulance service is responsible for the clinical care of casualties in the pre-hospital environment. It has a unique legal duty of care towards individual casualties from search and rescue activities that is not shared by other responding agencies. Hazardous area response teams (HART)

have skills and equipment that enable them to work with rescue agencies and gain access to patients within the hazard zone. However, sometimes ensuring the safety of the ambulance crews (including HART) mean it would be safer for the patient to be brought to the ambulance service by other specialist providers. In these circumstances communication between the provider and the HART/ambulance crew should be maintained.

Fire and rescue service responsibilities

A fire and rescue authority's (FRA) statutory duties are set out in the Fire and Rescue Services Act 2004, or equivalent legislation in devolved administrations. These duties are classified as:

Core duties

In England, fire and rescue authorities do not have a statutory duty to respond to water rescue or flooding incidents. The only possible exception is a road traffic incident involving water, which is a specified duty. Each fire and rescue authority has to decide their strategic direction via their Integrated Risk Management Plan (IRMP) and adoptive powers under the Fire and Rescue Services Act 2004 or the equivalents in the devolved administrations (see below). Strategic managers will consider their statutory duties and the foreseeable risk within their area to decide if they need a water rescue and/or flooding capability and the extent of that capability.

Emergencies

Under Section 9 of the Fire and Rescue Services Act the Secretary of State can extend the core duties of FRAs in England to deal with specified emergencies. The term 'emergency' in the act means an event or situation that causes or is likely to cause:

- One or more individuals to die, be injured or become ill
- Serious harm to the environment (including the life and health of plants and animals)

Similar arrangements exist in the devolved administrations of Scotland, Wales and Northern Ireland.

The Fire (Additional Function) (Scotland) Order 2005 has extended the duties of FRAs in Scotland to:

- Rescuing people trapped, or likely to become trapped, by water
- Protecting them from serious harm in the event of serious flooding in its area.

Adoptive powers

FRAs have powers to respond to other eventualities and provide other services under Sections 11 and 12 of the Fire and Rescue Services Act 2004. They can equip for and respond to events beyond their core functions. A FRA can act where it believes there is a foreseeable risk to life or the environment.

FRAs have the general power of competence under the Localism Act 2011. In effect, an FRA can choose to use its resources for any purpose that it sees fit.

Civil Contingencies Act 2004

Fire and rescue services take part in multi-agency planning for, and in response to, all types of civil emergency. They do so as Category 1 responders under the Civil Contingencies Act (CCA) via local resilience forums. These forums also provide the key point of focus for engagement with Category 2 responders and voluntary agencies. [Link to CCA]

Risk management planning

Risk management plans should consider the foreseeable risk of water rescue and flooding incidents occurring. For flooding, this assessment should identify areas where there is a history and knowledge of potential inundation and the location of the most vulnerable people and infrastructure. Using risk mapping techniques from a variety of sources, including local and national resilience community risk profiles and Environment Agency flood maps, can assist the process.

Assessments of flooding risk should include:

- Local flood maps including flash flood areas and surface water mapping
- Specific risks such as fords and flooded roads
- Hydrology
- Geographic and demographic areas of highest need (for example, vulnerable members of the community and critical infrastructure)
- Previous incident data
- Links to weather patterns and historical flood data
- Climate change impact assessments

Assessments of water rescue risks should include the identification of existing bodies of water, particularly those used by the public for recreation, and information about the characteristics of each.

Responders should assess the hazards and risks in their area. Site-specific plans should be considered for locations where these are significant and should include:

- Response levels should be flexible and scaleable to allow for a variety of flood scenarios.
- Reference to relevant standard operating procedures
- Tactical considerations, including rendezvous points, appliance marshalling areas and access points
- The need for teams to be thoroughly familiar with local risk sites through a regular programme of structured training in realistic and testing conditions including poor weather and darkness

Legislation

The main legislation and regulatory guidance for specifically dealing with water response and flooding includes:

- The Fire and Rescue Services Act 2004
- The Fire and Rescue (National Framework) (England) Order 2006
- The Civil Contingencies Act 2004
- The Civil Contingencies Act 2004 (Contingency Planning)(Scotland) Regulations 2005
- The Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005
- The Civil Contingencies Act 2004 (Contingency Planning)(Amendment) Regulations 2011
- The Civil Contingencies Act 2004 (Contingency Planning)(Amendment) Regulations 2012
- The Localism Act 2011
- The Environmental Protection Act 1990
- The Water Act 2003
- The Flood and Water Management Act 2010

Hazard and control statement

Hazard	Control measures
Initial attendance and moral pressure to act	
Time-critical incidents Exposure of crews to hazards Reckless rescue attempts by public Large numbers of onlookers and public expectation	Decision-making for rescue or recovery River search techniques Police attendance Control zones Use of appropriate techniques and equipment Personal protective equipment Control and support of families and the public
Slips, trips and falls (into water and/or from height)	
Unplanned immersion Cold water shock Falls from height Poor/undercut bank conditions Impact injuries, contact with sharp objects Vegetation, undergrowth and tree roots Underwater debris Uneven or slippery surfaces Displaced drain covers Falls through unstable surfaces	Control zones Cold shock response Identify areas where hazards may occur Site specific risk information Pre-determined rescue plans Use of appropriate techniques and equipment Personnel to work in correct zones Provision of suitable lighting Avoid lone working
Drowning	
Respiratory impairment from submersion/ immersion in liquid	Control zones Competent personnel Personal protective equipment Team identification Personal flotation devices Downstream safety teams First aid equipment

Casualty/body handling	
Physical and manual handling of casualties Removing a casualty from a hazardous environment Conscious casualties may panic or offer little or no assistance Sub surface casualty/body Contamination from body fluids	Personnel availability Correct techniques PPE to protect from contamination Decide if performing a rescue or a body recovery Underwater search and recovery
Hydrology	
Water temperature Force of water Current and flow of water Tidal water Hydraulics Physical hazards Water levels Flood water Weirs Waterfalls/rapids	Avoid entry Knowledge of water hazards and features Site specific risk information Control zones Trained personnel Upstream spotters Downstream safety teams
Entrapment	
Hand or foot entrapment Pinned against an immovable object Boat wrapped around an immovable object Line entanglement Strainers Fall through ice/unstable surface	Control zones Trained personnel Wading methods Clean line Floating and clean lines
Impact injuries	
Contact with an immovable object, such as: a boulder, rock or obstacle within the flow Object striking the individual, such as a boat or moving boat part (propeller/motor) Impact from floating debris or falling object	Upstream spotters Downstream safety teams Use of appropriate techniques and equipment Boat strikes and prop guards
Contamination and biological/chemical hazards	
Hazardous materials Waterborne diseases	Good hygiene practices Knowledge of contamination sources Personal protective equipment Correct operational procedures to limit exposure Decontamination of people and equipment Knowledge of medical signs and symptoms Inoculation programme and occupational health monitoring

Vehicles in water	
Sudden uncontrollable movement of the vehicle Vehicle stability Access and egress Entrapment of rescuers inside vehicle Snags and sharp edges Use of specialist tools in the hot zone Casualty handling Hydrology/siphons	Stabilise and anchor the vehicle Trained and equipped personnel in the hot zone Avoid entering the vehicle Knowledge of vehicle behaviour in water
Weather conditions	
Wind High levels of rainfall Rapid rise in water levels Poor visibility Snow and ice Extremes of temperature	Planning and weather reports Provide shelter Personal protective equipment Knowledge of signs, symptoms and treatment Team rotation Upstream spotters
Unstable surfaces	
Ice Mud Contamination	Control zones Minimise personnel in risk area Use of inflatable rescue paths or other rescue platforms Methods of working Correct PPE Good hygiene practices and decontamination
Poor light conditions	
Darkness Becoming lost Slips, trips and falls Falls from height	Regular and frequent training at night Illuminating the scene Personal torches Team working Radio and communication checks
Confined spaces	
Difficult access and egress Entrapment Depth and flow of water Irrespirable atmosphere Falls from height	Use of appropriate techniques and equipment

Noise	
Difficulties in communication between both rescuers and those being rescued Personnel may not hear (or mishear) critical safety information Disorientation	Communications established with regular checks Use of hand and whistle signals Team rotation
Electrical hazards	
Electrocution Overhead power lines Flooding, incidents involving machinery, and electrical installations	Hazard identification and working proximity Isolate electricity Advice from utility provider
Environmental damage	
Cross-contamination of water courses with invasive non-native invertebrates and plants	Check, clean, dry procedure
Access to incident sites	
Remote areas Limited vehicle access Poor light conditions Difficulty identifying the location of an incident Communications Command and control	Site specific risk information Pre-determined rendezvous points Provision of portable lighting and equipment Portable boats All-terrain vehicles
Flooding	
Increased volume and area of water Hazmats and public health Long term events that will exhaust personnel and resources Command and control of personnel and multi agencies Self-presenting volunteers Communications Access and egress Structural damage	Planning and identification of risk Defra Concept of Operations Rescue planning Establish effective communications Area of Operations Search and rescue cell search planning considerations Dealing with pets and animals Managing emergent volunteers
Locks and canals	
Entrapment Remote access Falls from height Cold deep water Strong currents Contamination	Site specific risk information Knowledge of operating systems Cordons Surface rescue/recovery Sub-surface rescue/recovery

Quarries and reservoirs	
Remote access Falls from height Cold, deep water Undercurrents Contamination Landslides Falling debris	Site specific risk information Cordons Personal protective equipment
Docks	
Vessels operating within the dock systems Vehicles, plant and machinery operating on the dockside area Difficult access/egress Falls from height Cold deep water Entrapment hazards Undercurrents Contamination Confined spaces	Site specific risk information and planning Rope rescue equipment and cordons Personal protective equipment

Initial attendance and moral pressure to act

Knowledge

Responders will attend a range of incidents close to or in water. They may be first on the scene, responding alone or as part of a crew. Personnel will face difficult moral situations and may have to make decisions in extremely hazardous, emotionally charged and fast moving environments. They may face an uncontrolled situation where hazards are not yet identified and information is incomplete. The incident commander should assess the risk and take reasonable actions to bring the incident to a safe conclusion.

It is important that as much useful and relevant information is taken by fire control operators as possible and that this information is correctly and accurately passed onto the crews attending the incident.

When attending an incident the safety priorities are the self, the team, the public and then the casualty. Firefighters need to ensure their own safety to be able to carry out a successful rescue.

In this guidance a submerged casualty describes someone who can't breathe because their airway is underwater. An immersed casualty is in the water but whose airway is clear.

Personnel can be confronted with situations outside their experience, or where there is incomplete or inaccurate information. They must also deal with the pressure to save or rescue someone when friends, family or other members of the public are trying to enter the water. This will add to the existing danger.

The first attendance may not be equipped with specialist water personal protective equipment (PPE). Attempting to rescue someone in dangerous circumstances can place the rescuer, the casualty and others in further danger. The first attendance should decide if it is safer to act or to contain the incident and wait for support.

There could be occasions when delay results in a saveable life being lost. Service employers must prepare their first-line managers to be able to make suitable and adequate dynamic risk assessments. This will enable them to make the right decision as the on-scene commander when choosing offensive or defensive tactics. Once that decision has been made, then all reasonably practicable steps must be taken to control the hazard. What is reasonably practicable will depend on the circumstances of the incident.

The police have overall responsibility for missing persons. They will coordinate agencies to provide a suitable response to investigate and conduct search operations.

The Joint Emergency Services Interoperability Programme (JESIP) 'METHANE' concept can be used to help assess and resource incidents:

- **M** Major incident declared
- **E** Exact location
- **T** Type of incident (e.g. rescue or recovery)
- **H** Hazards at scene
- **A** Access and egress routes
- **N** Number of casualties involved
- **E** Emergency services present and requested

Hazard	Control measures
Time-critical incidents Exposure of crews to hazards Reckless rescue attempts Large numbers of onlookers and public expectation	Decision-making for rescue or recovery River search techniques Police attendance Control zones Use of appropriate techniques and equipment Personal protective equipment Control and support of families and the public

Actions

Decision-making for rescue or recovery

One of the most important decisions to be taken at water incidents is whether actions are being taken to rescue or recover casualties. A rescue can be carried out when people are obviously alive or are considered able to survive. A recovery is made when people are known to be dead or not able to survive.

The distinction between rescue and recovery is important because it should influence the incident commander's decision-making. They are likely to accept a higher level of risk to crews performing a rescue rather than a body recovery.

In some circumstances casualties can be seen in the water and may be able to work with rescuers. They can reduce the need for rescuers to enter the water by holding on to thrown lines or buoyancy aids. In other cases the casualty may be in shallow, still water in a known location and entry into the water may present little risk. But once a casualty is submerged, particularly in deep water, the chance of rescuing and resuscitating the casualty will reduce over time. The risk to rescuers will also increase. The simple desire to save life does not justify exposing operational personnel to unnecessary risk. A life must be assessed as being saveable, and without serious injury or death to crews being likely.

Responders are not prohibited from taking reasonable action to save life before specialist resources arrive. But suitable control measures must be considered before any action is taken.

Whether a person is deemed *missing* or *lost* will also influence the response. The following categories apply:

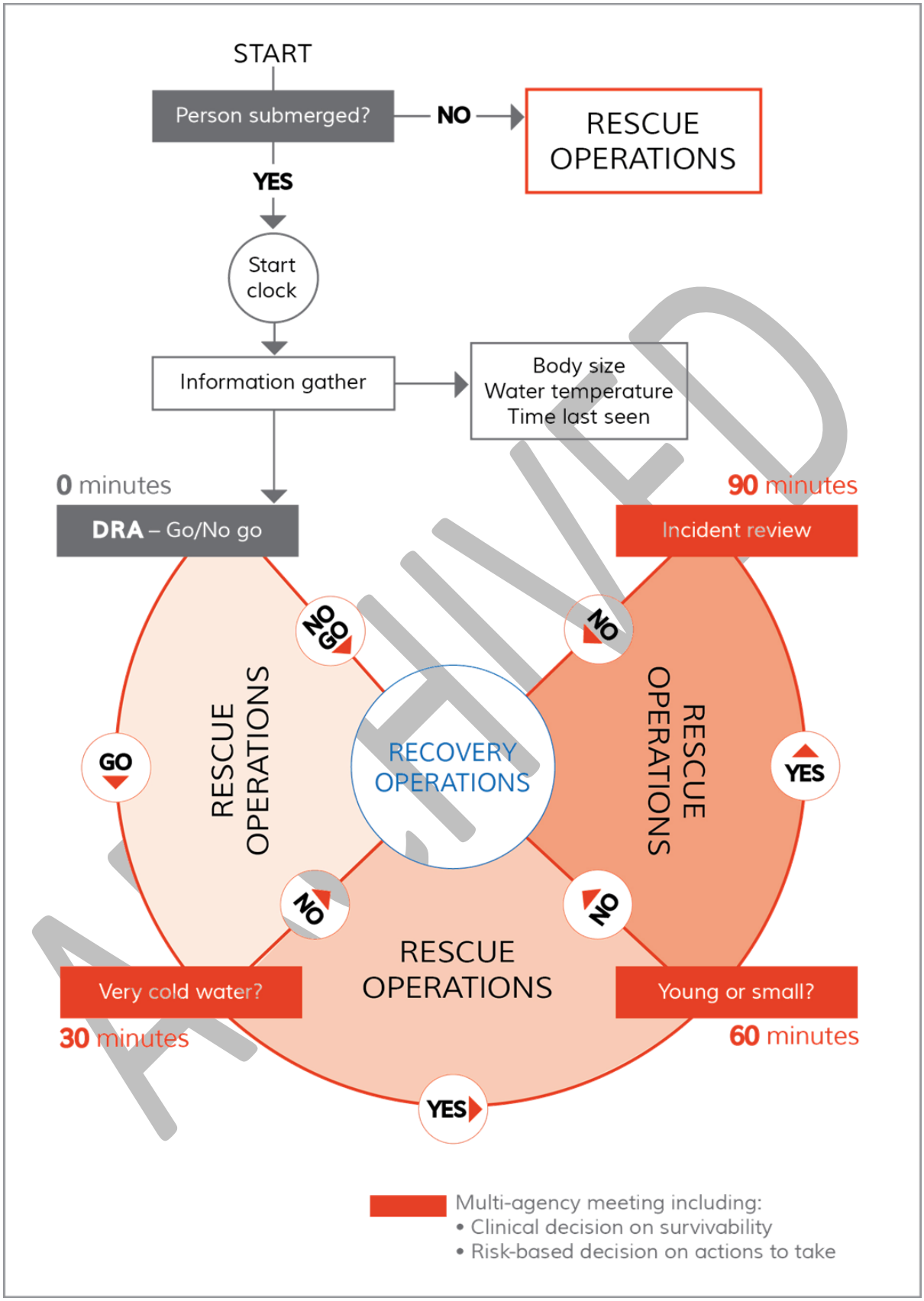
Type	Description
Missing – event witnessed	This category is when a person or people are not seen to reach a point of safety. Typically this would be considered a high-risk event for the missing person (and potentially for any SAR asset). Examples include individuals who are seen being swept away by water flow or a car seen to be washed away when driving through water.
Missing – event not witnessed	This category is when a missing person or people should be found in a particular location, but for some reason they are not there or cannot be confirmed as being there. This may occur because of their own actions, or because of a failure in communications (e.g. telephone signal failure). Considerable effort may be needed to locate the missing person(s). This will normally be undertaken by the police.
Lost	These are people in a location of relative safety but not aware of their precise location or unable to provide it. Some effort is required to find out where they are before carrying out a rescue or evacuation.

Incidents involving rescues from water will fall into four tactical elements. Each element should be considered as a separate entity and be given sufficient attention to detail:

- Locate – define location or place the casualty was last seen. This may be a known static point, a moving incident where they are being washed downstream, or a search where the location is not known
- Access – establish the rescue team's access to the casualty. Consider options. What assets are available or en-route?
- Stabilise – carry out medical and physical actions to secure casualty and stabilise the situation
- Transport – transportation of casualty and rescuers to safety

A model has been developed to help incident commanders decide if a casualty is survivable and involves decision-making with other emergency services and other rescue organisations that might be on scene. Work is underway through United Kingdom Search and Rescue (UKSAR) to agree a shared approach across all emergency services and other search and rescue organisations. UKSAR includes representatives from all the emergency services and other major search and rescue organisations.

The model is designed to give casualties every reasonable chance of rescue and resuscitation and is balanced against the risk of harm to responders when carrying out rescues. The length of time submerged and the temperature of the water are the two main factors determining survivability. Generally, the longer a casualty is submerged and the warmer the water, the lower the chances of survival. Other factors affecting survivability include the salinity of the water, as salt water reduces the survivability time, and the age and/or size of the casualty, as smaller and/or younger people can survive longer than larger people or adults.



[Link to definition of immersion' and submersion]

The model is based on the factors that affect survivability. The main factors are the length of time the casualty has been submerged and the water temperature. It is not possible to know for certain

when a casualty became submerged, so the clock should start when the first attendance arrives on scene. It should not be assumed that the person has been submerged for longer than this.

The incident commander should carry out a risk assessment, balancing the likelihood of casualty survival and the likelihood and severity of harm to rescuers. The first attendance may not have specialist water rescue qualifications or equipment and this should be considered in the decision-making process. The decision will consider whether an immediate rescue can be started or if they should await specialist resources; incident commanders do not have to wait for specialist resources. They will often be able to apply a safe system of work to take immediate action to perform a rescue. Each body of water should be considered individually because hazards will vary.

After 30 minutes all three emergency services will probably be on scene. This might include specialist teams from the ambulance service and other rescue organisations. The incident commander should liaise with officers from the other services to decide how to proceed. The first element to consider is the likelihood of survival. This clinical decision will be taken by the ambulance service based on the criteria above, or in their absence, by the incident commander. If the water is freezing cold the casualty should be considered survivable, although the likelihood of survival reduces as time passes. The risk assessment should be revisited to decide if rescue should continue or if the incident should switch to body recovery.

If a decision is taken to continue the rescue then, at 60 minutes, the incident commander should liaise again with the senior officers from the other services. If the water is cold **and** the casualty is known to be young and/or small they should be considered survivable, although again their chances are further reducing as time passes. The risk assessment should be revisited to decide if rescue should continue or if the incident should switch to body recovery.

After 90 minutes the incident commander should liaise again with the senior officers from the other services when the decision should be taken to switch to body recovery because the casualty is no longer survivable.

Responsibility for body recovery rests with the police. Fire and rescue services will sometimes be involved if there is a need to act on behalf of the police. There is often time to wait for specialist water rescue teams to arrive on scene. Incident commanders should not place non-specialist personnel at unnecessary danger to recover a body. When specialist teams arrive on scene they should work with the police and the incident commander to decide if they should carry out the recovery. If the body is under water or if there are significant hazards a dive team should be requested by the police. The police may treat the incident as a crime scene so personnel should work closely with them to preserve evidence.

Water temperature in the UK averages about 10°C but can range from 0-25°C, depending on the location and the type of water. Fire and rescue services are not recommended to carry water temperature measuring equipment to use at incidents because there are too many variables to expect an accurate reading. Instead, fire and rescue services should use water temperature charts for the particular area to find out the expected temperatures of the different bodies of water and at different times of year. Available medical evidence suggests that water temperatures in the region of 6-7°C or less are required for prolonged survival times in submerged casualties, sometimes described as ‘icy cold’.

River search techniques

Searching can cover large areas with many potential hiding places and difficult or hazardous locations. Searches must be planned and organised to ensure the safety of personnel and maximise

the chance of success. Police search advisors (POLSAs) will take the lead in coordinating search operations.

Personnel should be suitably equipped and trained to operate in the appropriate zones. Searches may be in adverse weather conditions or in darkness over an extended time period. Consideration must be given to rainfall and the likelihood of rising water levels.

Effective communications and knowing the location of search teams is vital. Teams should follow their brief and not self-deploy. Search teams should have a back-up plan in the event of communication breakdown.

Searches will potentially require a large number of personnel from many organisations, and specialist teams and capabilities may be required, such as:

- Volunteer search teams such as mountain or lowland rescue teams
- Search dogs
- Technical rope rescue teams
- Helicopters
- Water rescue trained paramedics (HART)
- HM Coastguard rescue teams
- Technicians operating in the hot zone

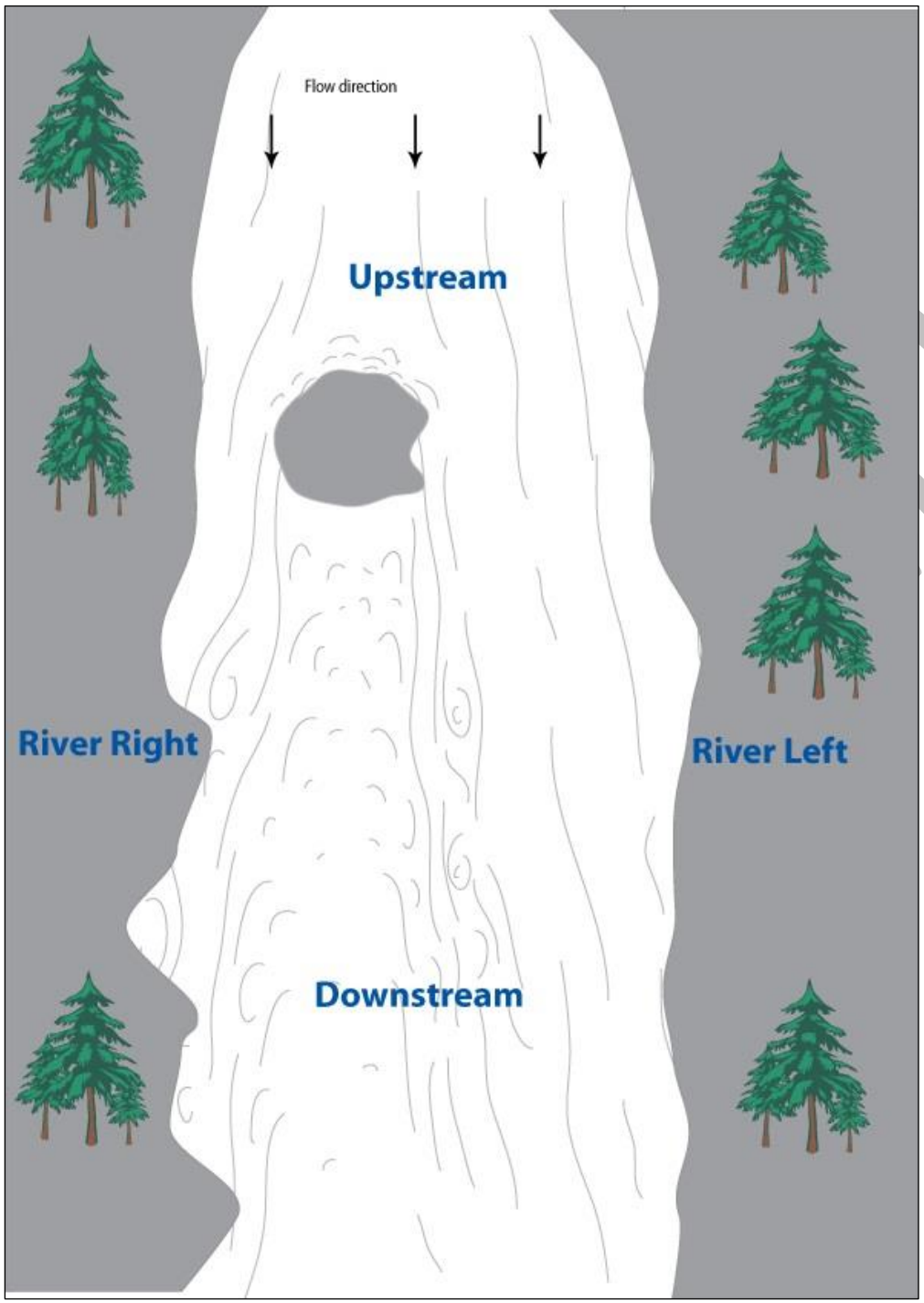
Rescuers should establish casualty details:

- Name
- Clothing
- Experience
- State of mind

Establishing the *Point Last Seen* (PLS) and time will establish the starting point of a search. This is vital to limit the scale of a search in moving water. Once the PLS and time are known a judgement should be made on the average river flow and the time lapse to judge the maximum distance a casualty could have travelled. Resources should be sent to a point beyond this to secure a downstream containment.

An initial search is carried out by crews who can be deployed quickly along a designated search area to look for a survivable casualty. During the search they may identify areas where a casualty may be trapped or where a more detailed search is needed, including strainers, islands and natural egress points from a river. These probable locations need to be identified for a more detailed *effective search*. This information should be communicated to the incident commander and through them to the POLSA so that more resources can be sent.

The terms in the diagram below are used to describe river orientation:



Police attendance

Liaison with the police may be required to manage reckless attempts at rescue by members of the public. The outer perimeter of the control zone will normally be controlled by the police. A traffic cordon will prevent access by members of the public.

Control zones

In simple water rescues from known, low risk waterways and/or shallow, still water, it may not be necessary to establish control zones. They are also unlikely to be appropriate for wide area flooding or where localised flooding has taken place where the activity will be more focused on protecting property

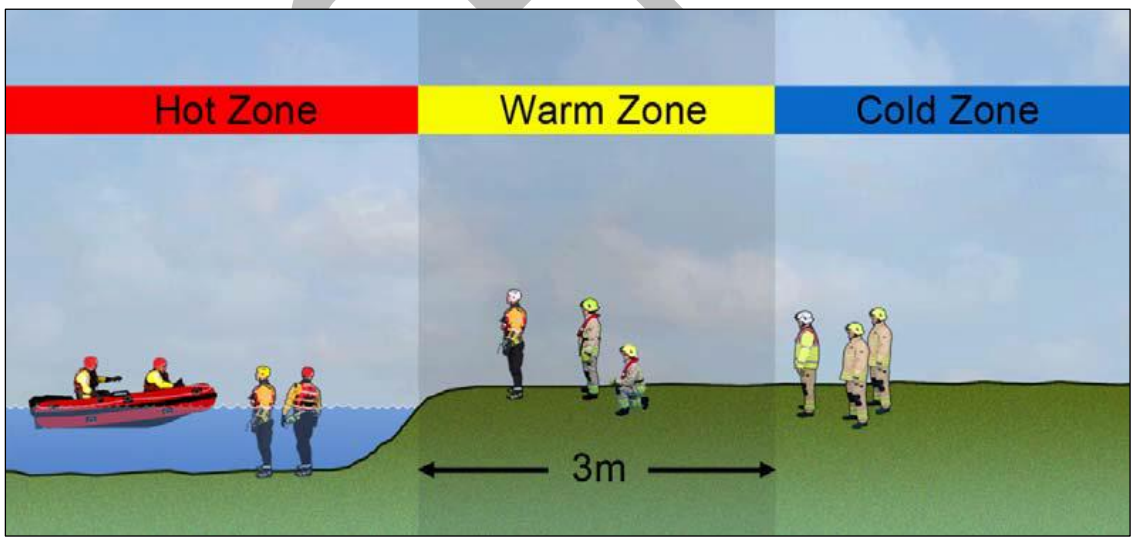
In some circumstances, such as fast moving water, poor visibility and or unstable ground, control zones are employed as an effective method of controlling resources and maintaining safety on the incident ground. There are three zones used when responding to incidents: the hot zone, the warm zone and the cold zone.

The hot zone is the area covered by water. This is a high-hazard zone where rescues will be carried out and should only be entered by people with the appropriate training and PPE.

The warm zone is the working area adjacent to the water. There is still significant risk here from uncontrolled entry into the water. The area is usually three metres across, but may be extended or reduced depending on the level of risk. In low risk situations, such as still, safe and known bodies of water, a warm zone may not be needed. Personnel working in the area must be suitably trained, equipped and briefed to carry out specific tasks.

The cold zone is the safe area located outside the risk zones. Equipment dumps, casualty holding areas and marshalling areas should all be located in this area.

A forward control point (FCP) should be established on land as near to the scene of operations as reasonably practicable.



Use of appropriate techniques and equipment

Personnel must take responsibility for their own actions. They must work within the limits of their training, experience and PPE. Teams need to ensure they can protect each other with safe systems of work before attempting to rescue a casualty.

[Link to DEFRA Concept of Operations, Training Standards and Team Type].

The following should be taken into account:

- Gather all available information about the watercourse, including records from fire and rescue services and other agencies, and from witnesses at the scene
- Carry out a dynamic risk assessment to assess the risk to personnel
- Consider the resources available and the rescue options
- Consider whether appropriate risk control measures have been put in place before acting
- Be prepared to accept a reasonable level of risk that is appropriate to the circumstances
- Be prepared to accept that in some situations the risk is too great to take immediate action
- Always have a backup plan in case the initial actions are unsuccessful.

All operational personnel responding should be trained to Level 1 – Water Awareness.

In addition to understanding the dangers of immersion in cold water, the risk assessment should consider the following when the casualty is submerged:

- Have personnel received specialised training in cold water search and rescue?
- Do they have adequate immersion protective clothing or equipment?
- Are there adequate supporting personnel/facilities?
- Are they competent and is there the necessary support to carry out rescues at night or in water with poor visibility?
- Do the risks considered include potentially dangerous currents or submerged trap hazards?

Personal protective equipment

The Personal Protective Equipment (PPE) at Work Regulations 1992 applies to items of personal equipment used for water and flood response. These regulations require that all PPE is:

- Suitable for purpose
- Compatible with other items of PPE
- Maintained
- Used by personnel who have been given appropriate training

In addition, the regulations require that all PPE:

- Is appropriate to the risk
- Takes account of ergonomic requirements
- Fits correctly

Control and support of families and the public

Crews may be faced with onlookers and family members who may be distressed or attempting a reckless rescue. Police attendance should be requested to control the public and provide support to distressed people. Crew safety must be maintained even when faced with moral pressure to act.

Slips, trips and falls (into water and/or from height)

Knowledge

Personnel should be trained to be aware of the increased danger of slips, trips and falls when working near water. These risks will vary widely and will depend on the nature of the ground surrounding the water's edge and the depth of the water involved. Standard operating procedures should include safe systems of work for working at height and preventing falls from height. Crews must be aware of the danger of an unplanned entry and how to control it. Control zones should be

used and the correct PPE should be worn. As the risk is greater at night, adequate lighting should be required and personnel should not work alone.

Personnel should be aware of the following four stages of immersion in cold water:

Stage	Timescale	Description
Initial immersion	0 – 2 minutes	The initial response is termed the 'cold shock' which results in an increase in heart rate and blood pressure. The shock can produce breathing and heart problems in some individuals. The responses include an uncontrollable 'gasp' and hyperventilation. It can lead to the aspiration of small volumes of water, which could be enough to drown. For the average male this volume is less than one large breath in (1.5 litres of sea water or 3 litres of fresh water). Anyone suspected of having aspirated water should be taken to hospital even if they appear normal when rescued.
Short-term immersion	Less than 30 minutes	Being in water for a short period will result in cooling the body. The limbs are particularly vulnerable, with cooling causes a rapid loss of muscle function. After spending 5-10 minutes in very cold water (5°C), or 10-20 minutes in warmer water (12°C), limb cooling can impair swimming performance. It can also impair actions essential to survival and rescue (e.g. tying lines or deploying rescue straps). Swim failure is a common feature in cold water and occurs in both strong and weak swimmers. No matter how strong and capable an individual may be in the water, cold water can very quickly become disabling. It is vital that individuals do not make decisions based on the belief that they can swim as well in cold water as in warm water.
Long-term immersion	Over 30 minutes	Hypothermia does not normally occur in adults in less than 30 minutes of immersion. However it is important to be able to recognise the signs and symptoms. Casualties in rescue craft who are not wearing appropriate protective clothing in cold conditions, or who have been immersed for long periods will be more vulnerable. The signs of hypothermia include: confusion, disorientation, reduced awareness, amnesia, irregular heartbeat, clouding of consciousness, loss of consciousness, and a severely abnormal heartbeat.

Stage	Timescale	Description
At point of rescue		Following immersion in cold water, it should be remembered that the underlying problem is more likely to be near-drowning than hypothermia. Nearly 20 per cent of immersion deaths occur just before, during, or immediately following rescue. Many deaths are the consequence of the delayed effects of the aspiration of water when immersed. Other accounts suggest that some are caused by casualties 'relaxing' when rescue is imminent. To counter this, rescuers should encourage casualties to keep fighting for their survival and avoid statements like "relax, you are safe now". Another cited cause is the collapse of blood pressure when hypothermic casualties are removed from the water vertically and exposed to the effects of gravity. Semi-conscious or unconscious individuals should be well insulated to reduce heat loss, and should be allowed to re-warm slowly.

Hazard	**Control Measures**
Unplanned immersion	Control zones
Cold water shock	Cold shock response
Falls from height	Identify areas where hazards may occur
Poor/undercut bank conditions	Site-specific risk information
Impact injuries, contact with sharp objects	Pre-determined rescue plans
Vegetation, undergrowth and tree roots	Use of appropriate techniques and equipment
Underwater debris	Personnel to work in correct zones
Uneven or slippery surfaces	Provision of suitable lighting
Displaced drain covers	Avoid lone working
Falls through unstable surfaces	

Actions

Establish control zones

[Link to control zone section in Public and moral pressure]

Cold shock response

Fire and rescue service personnel must be aware of the dangers of cold shock response when falling into water. Airways should be kept clear of the water by using effective PPE (e.g. personal flotation device and dry suit). To minimise the chance of consuming water it is best not to try and swim until breathing is back under control (1-2 minutes on average). Repeated immersions in a short period can reduce the impact of cold shock response.

People that fall into the water should adopt a protective entry posture and in flowing water should adopt the defensive swimming position.

Raising one hand directly above the head is a recognised method for a rescue swimmer to indicate they are in difficulty and/or need removing from the water. All personnel must understand this signal.

Identify areas where hazards may occur

These will include scenarios such as unplanned entry into the water or a rescue swimmer in difficulty when working in the hot zone.

Site-specific risk information

This should include known sites where unplanned entry could occur or where rescue activities would take place in a hot zone.

Predetermined rescue plans

Personnel should be familiar with all self and team rescue techniques they are expected to carry out, including downstream safety. Techniques will range from the use of throw lines and simple wading through to more complex methods.

Use of appropriate techniques and equipment

Work restraint or fall arrest equipment may be used to prevent or limit the impact of a fall from height.

[Link to Fire Service Manual 'Safe Working at Height', 2nd Ed]

The compatibility of equipment and procedures must be confirmed when designing dual-purpose work at height and water rescue systems. For example, work at height systems are normally designed so that they cannot be disconnected under load. But a critical requirement of a water rescue system is that any rescuer entering the water must be secured by a system that can be released one-handed by the wearer whilst under load. Lines used in water rescue should float.

The risks posed to personnel working below any working at height activity must be considered (e.g. bridges, steep embankments or falling material or objects).

Hypothermia can rapidly reduce the performance of poorly protected responders. Fit for purpose PPE will prevent hypothermia in rescuers, but standard fire kit should not be relied on as it is not designed for use at water incidents.

Frequency of relief responders and use of local facilities for re-warming rescuers (such as the nearest fire station) will greatly reduce the potential for rescuers becoming additional casualties themselves. Flood incident managers should pay particular attention to the adequacy of welfare arrangements if they expect responders to continue to function effectively beyond the first few hours of an incident.

Hyperthermia is an induced hazard caused as a side-effect of wearing impermeable PPE such as dry suits which lack breathable panels. Dry suits are invaluable PPE for water entry and should be worn when entering water more than knee deep. . But responders should be alert to the risks of heat build-up inside sealed dry suits when physically active on dry land and should dress-down accordingly whenever safe to do so. Incident managers should make sure that PPE is correctly worn in the hazard zone. Buddy checks at an entry control point will minimise the risk of tired responders forgetting to do the zips back up on their dry suits.

Personnel to work in correct zones

[Link to control zones section in Public and moral pressure]

Consideration should be given to other agency partners and emergency responders who may need to work within the hazard zones. These might include police officers, paramedics, Environment Agency personnel, vets, RSPCA inspectors or utility company personnel.

Responsibility for the safety of employees from other partners rests ultimately with their employers. However, fire and rescue services should anticipate that they will be expected to provide safety management expertise within the hazard zone.

Local resilience forums (LRF) should prepare policy guidance and standard inter-agency operating procedures and establish protocols that clearly identify the responsibility and capability for safety management. The guidance should set out who is expected to do what, and how mutual aid from outside the LRF area will be managed.

Provision of suitable lighting

[Link to Poor light conditions section]

Avoid lone working

Lone working must be strictly controlled. It should not be permitted in all but the most exceptional of cases. The risks of lone working will be higher at night or when there is poor visibility.

Drowning

Knowledge

The World Health Organization defines drowning as “the process of experiencing respiratory impairment from submersion/immersion in liquid". Drowning can result in death, injury, or no resulting injury.

There remains a significant risk to rescued people who may have aspirated even a relatively small amount of water. Water can damage the inside surface of the lung, causing heart irregularities and reducing the ability to exchange air. Survival from drowning but involving unconsciousness or water inhalation can lead to serious secondary complications after the event, including death. This delayed collapse is referred to as secondary drowning, and is a regular cause of death in casualties who had apparently been successfully rescued.

Although it may not always appear obvious that the casualty requires immediate hospitalisation, it is recommended that all casualties that have aspirated any water should be treated with high concentration oxygen and transferred to hospital. This practice should be followed irrespective of how well they may claim to feel at the time. Advice should be sought from medical staff on scene.

Crews should be aware that swimming following a large meal can result in vomiting and choking and should consider this possibility in their risk assessment process.

Hazard	Control measures
Respiratory impairment from submersion/immersion in liquid	Control zones Competent personnel Personal protective equipment Team identification Personal flotation devices Downstream safety teams First aid equipment

Actions

Control zones

[Link to Control zone section in Public and moral pressure]

Competent personnel

Personnel working in water and control zones must be suitably trained, equipped and briefed. They should be allocated specific tasks to undertake.

Personal protective equipment

Appropriate PPE should be provided for the tasks being undertaken.

Entry into cold water without correct PPE and incident management procedures must only be undertaken in the most extreme circumstances. The depth and condition of the water, the availability of other control measures, and cold shock response should be considered when deciding whether to commit crews into water before all resources are available. Cold shock response can be reduced by entering the water slowly and keeping as much of the body surface as dry and warm as possible

[Link to table: four stages of immersion in water].

Team identification

To determine capability on the incident ground it is important that all teams and personnel are identifiable. The following system of helmet colours should be used:

- Water aware: standard fire kit, lifejacket and no fire helmet, or fire helmet worn with chinstrap unfastened
- Water rescue first responder – yellow water rescue helmet
- Water rescue technician – red water rescue helmet
- Rescue boat operator – red water rescue helmet
- Team leader – white water rescue helmet

[Link to Defra Concept of Operations, Training Standards and Team Type]

Personal flotation devices

Where water rescues are taking place and control zones have been established then personnel must wear the appropriate personal flotation devices when working in the warm and hot zones.

[Link to PPE]

Downstream safety teams

Personnel should be positioned at a suitable downstream position to provide additional safety for crews working in the hot zone. They will need to be equipped and trained to carry out a range of rescue options. They may need to include rescue swimmer capabilities. A priority will be to identify downstream bail-out points that rescuers can fall-back to if swept away.

First aid equipment

Sufficient on-site first aid equipment should be provided, including defibrillators and oxygen. The equipment and training should be appropriate to common water related injuries and hazards such as hypothermia.

Casualty/body handling

Knowledge

The range of operational tactics available will depend on the incident, taking account of the circumstances of the incident, the nature of the body of water, the condition of any casualties and their ability to assist.

Some casualties may assist in their rescue, for example by holding on to a throw line. Other casualties will be unable to offer assistance and the rescue is reliant upon the rescuer entering the hot zone.

A drowning person may attempt to climb on top of a rescuer approaching in the water and could submerge them both.

Hazard	Control measures
Physical and manual handling of casualties Removing a casualty from a hazardous environment Conscious casualties may panic or offers little or no assistance Sub surface casualty/body Contamination from body fluids	Personnel availability Correct techniques PPE to protect from contamination Decide if performing a rescue or a body recovery Underwater search and recovery

Actions

Personnel availability

Casualties may require lifting or moving in difficult situations. Personnel should adopt correct manual handling techniques and team lift whilst taking into account the need to use personnel who are trained and equipped to work within a zone. Casualties will be wet, slippery and difficult to grip

or handle. They should be considered contaminated unless recovered from water that is known to be clean.

Correct techniques

A range of rescue techniques can be used:

- Bank-side techniques
- In-water (wading or swimming) techniques
- On-water (boats) techniques
- Over-water (line access or helicopter) techniques

The capabilities of teams should be understood in the context of these rescue techniques. Teams should not operate in a way that they are not equipped or trained for. Bankside teams should not enter the water and wading teams should not attempt offensive swimming in fast moving water.

Underwater operations are not currently identified as a rescue activity in the UK. With the exception of casualties trapped in air pockets, underwater operations are conducted as a recovery task. The guidance set out in the Police Diving Approved Code of Practice should be applied.

The following should not necessarily be seen as a hierarchy, but the appropriate technique should be used based on the circumstances of the incident and the condition of the casualty.

- Talk/shout—this may include shouting and/or signalling. Contact with the casualty should be established quickly and maintained. Communication should be short, to the point and positive. Loudhailers can assist
- Reach — the length of the reaching aid is a limited factor. Inflated fire hose and wading poles can be used. It is important to consider the loads placed on equipment and the rescuer, and the casualty's ability to hold on. Rescuers should use an aid for reaching rather than their hands to avoid being pulled in
- Throw — equipment can include a floating throw line or a personal flotation device. Accuracy is important. It is also important to consider loads placed on equipment and the rescuer, and the casualty's ability to hold on. Lines should terminate in a loop, ring or monkey's fist knot because numb hands cannot grip wet rope
- Row/Boat — a boat or inflatable rescue platform will provide effective buoyancy and safety in the hot zone. Rescuers are working 'on' rather than 'in' water. It may be possible to perform a rescue using lines to manoeuvre the boat or platform to reach the casualty
- Go — swimming rescues will be required where the casualty is unable to assist. Wading rescues can be relatively quick and simple to perform. Wading in shallow slow moving water is not the same as offensive swimming in fast water. These activities represent different levels of risk to rescuers, and require different skill sets
- Helicopter and aerial operations — some situations will be beyond the capability of even well-trained teams. On rare occasions this may require the use of a helicopter winch or rope rescue equipment. The potential need for a helicopter should be considered as early as possible. Non search and rescue helicopter crews should not be used. Vertical access by use of rope rescue equipment is a technically demanding but highly appropriate technique for rescue from specific water hazards, such as weirs. IRMPs and local risk assessments should seek to identify potential requirements for technical rope rescue over water, such that an evidence based decision on resourcing can be taken

Physical contact with a struggling casualty should be avoided whenever possible. Personnel should offer buoyancy aids and lines to tow casualties to safety. If the casualty tries to grab the rescuer, the

rescuer should push them away, splash water in their face, swim away and then try to calm them down. It is important to remember that a drowning person will be unable to speak or shout.

If physical contact must be made, the casualty should be approached from behind. Rescuers should grab the casualty's clothing, and push their knees into their back. They should signal to be pulled back to the side (by raising one hand directly above the head).

Protection against cold shock and hypothermia is primarily provided through PPE and reduced exposure. Casualties should be encouraged to get out of the water whenever possible, even if it feels colder in air.

Casualties who have been in the water for a long time and are hypothermic or semi-conscious should be removed from water in a horizontal rather than vertical position if it won't unduly delay or complicate the rescue. This will avoid rapid drops in blood pressure. When in rescue craft casualties should be positioned to help blood flow back to the heart by placing them in a horizontal position with their legs elevated.

If casualties are alert and not hypothermic or their airways are under threat of being submerged, they should be removed from the water by the fastest, safe method available.

Personal protective equipment to protect from contamination

[Link to PPE section in Drowning]

Incident commanders should consider the risks from contamination associated with recovering bodies from water. This is particularly important where there has been prolonged exposure. Open water can contain contaminants, on in flood situations can be contaminated by raw sewage. Appropriate levels of decontamination should be considered alongside the normal precautions of not eating or placing hands near the mouth until washed. Specialist equipment and PPE should be made available where necessary. Fire and rescue services should also provide effective decontamination and post- incident welfare arrangements (e.g. critical stress debriefing) where necessary. For wide area flooding incidents, national resilience incident response units are equipped to provide appropriate decontamination.

Decide if performing a rescue or a body recovery

The police service has responsibility for recovering dead people from the water. Any incident where a body is discovered should be treated as a crime scene and disturbance should be kept to a minimum.

The police may not have the capability to recover bodies from water and may request assistance from fire and rescue services. Assistance may be required due to the location of the incident, the potential to cause distress to relatives or the public, and to secure the body from being lost in fast flowing waters. The fire and rescue service should provide assistance in close liaison with the police commander at the scene.

Crews may be faced with a number of onlookers and media interest. Wherever possible, police attendance should be requested to deal with crowds. Any media contact should be made through the police or in line with any local pre-arrangement.

Underwater search and recovery

Many hazards are faced at underwater rescues. When an incident is sub-surface a specialist underwater search and recovery dive team should be requested. Recoveries should not to be

undertaken without the provision of specialist dive teams and equipment. Standard fire and rescue service breathing apparatus is not designed for underwater use and should not be used for this purpose. Whilst superficially similar to scuba gear, fire service breathing apparatus lacks a critical drain port in the first stage demand valve, which is vital to underwater use of scuba. Whilst a fire service breathing apparatus set *may* work underwater for a short time, any seepage of water into the first stage can trigger an immediate hydraulic lock with no prior warning, leading to catastrophic failure of air supply.

There may be specific sub-surface situations that can be controlled to allow a rescue attempt. These situations will usually be when the casualty is visible and submerged in shallow water, or when the rescuer is not required to go further than an arm's length into a vehicle. Vehicles in water are inherently unstable. They can roll and trap rescuers if mishandled.

Due to the risk of entrapment, surface diving ('duck-diving') should be avoided. It should only be used in the simplest of rescues where appropriate control measures can be applied to safeguard the rescuer.

Throughout any rescue phase, attempts should be made where practicable to preserve and record evidence for police investigations. The survivability or preservation of evidence must be considered before indiscriminate attempts of recovery are made.

Fire and rescue services may consider the use of specialist camera equipment to help locate underwater casualties. Urban Search and Rescue teams have got 'snake eye' cameras which are well suited for such purposes.

Underwater search and recovery in the UK is managed in accordance with the Police Diving Approved Code of Practice, as agreed by the HSE. Police-led diving operations are managed through a network of regional specialist units. Their advice should be sought via local police search advisors.

Hydrology

Knowledge

The nature of a water body is determined by the amount of water, the speed of the flow and the type of bed, banks and sides. Water can be considered as high energy or low energy. The force of water against an individual is directly related to the speed of the flow. Doubling the water speed will quadruple the force.

The flow of water in the middle of a river is generally the fastest and speeds decreases towards the edges. A casualty in moving water may be swept from the bank into the centre of the river. Water near the surface also moves more quickly than water near the river bed. When a river curves, water on the outside of the curve will travel faster than that on the inside.

Weirs are features designed to regulate the flow of water downstream and present specific hazards. They have fast-flowing water, dangerous currents, changing levels and possible undertows. A person or object in the water may be drawn towards the face of the weir and forced under the surface, to be flushed out further downstream. It is possible to be caught again by the tow back and recirculated in a similar manner. Due to the risks posed, personnel should avoid entering these features unless a well-informed risk assessment identifies that it is safe to do so.

Where water passes over a vertical drop it accelerates and then recirculates downstream of the drop. This can cause a casualty or object to be held by the recirculating water. The strength of the recirculation may vary in different water levels.

Where water flows around an obstacle such as a boulder, the area behind the obstacle is usually calm water. This can be a good area for a swimmer to rest or to bring a casualty ashore. In fast flowing rivers with high water volumes the current in the eddy can be turbulent and difficult to exit.

Tidal conditions are predictable and can be anticipated and prepared for. Incidents which may involve tidal water have additional hazards from currents, tides and waves. Some rivers, inlets and estuaries are also influenced by the tides. The depth of water can change rapidly as the tide turns. Care must be taken to avoid being cut off or isolated from exit points. This may occur over a very short space of time at least twice a day, and will vary from day to day. If teams are made available for mutual aid deployments out of their area, they should be trained and equipped to operate in all foreseeable water environments. Inland teams should at least have a good practical appreciation of tidal waters, understand tidal features and be able to access and use tide timetables.

Flood water is moving water. The principles of operating in moving water apply even when the conditions appear to be still.

The local micro-geography in a water environment can create radically different water movement characteristics over very short distances (less than 1m), and threat levels to responders will need to be constantly reviewed on scene by the teams themselves, with autonomy of decision making devolved to team leaders.

[Link to section on Flooding]

Hazard	**Control measures**
Water temperature	Avoid entry
Force of water	Knowledge of water hazards and features
Current and flow of water	Site specific risk information
Tidal water	Control zones
Hydraulics	Trained personnel
Physical hazards	Upstream spotters
Water levels	Downstream safety teams
Flood water	
Weirs	
Waterfalls/rapids	

Actions

Avoid entry

The water level or hydraulic hazards may be such that entry to the water will be too dangerous. Consideration should be given to whether or not a rescue can be achieved by land-based techniques or if appropriate from a boat or platform.

Knowledge of water hazards and features

Personnel should to be trained to recognise the hydrology and features of the water within their area of operations and be able to work safely in the water environment.

Site specific risk information

Services should assess the water-related risk and features within their area. They should define what activities are to be undertaken, particularly at locations where the public use any water for recreation. Crews should regularly use launch and recovery points and bail-out options in local water courses during all weather and lighting conditions. Risk information should include the organisation responsible for managing the waterway, how they do so, and how to contact them in an emergency.

Control zones

[Link to Control zone section in Public and moral pressure]

Trained personnel

[Link to Competent personnel section in Drowning]

Upstream spotters

Personnel should be positioned upstream of the incident to identify rising water levels and hazards being washed downstream. They need effective means of communicating any information in sufficient time.

Downstream safety teams

[Link to Downstream safety teams section in Drowning]

Entrapment

Knowledge

Entrapment can result from a number of situations in water.

A *strainer* is anything that allows water to pass through but traps objects and includes tree roots, fences, gates, and cars. A person or object may be drawn against the strainer and trapped by the force of water passing through it. Strainers present an extreme danger and should be avoided.

Similar hazards exist where fast-moving water flows against a solid object, such as a bridge pillar. Most objects will tend to be flushed around the obstacle, but a person or boat could be pinned with considerable force.

Rocks or other debris below the water surface may pose entrapment hazards to personnel and entangle lines. This is particularly hazardous in flowing water where the force of water may also cause a loss of balance.

All watercourses may contain debris that is being carried by a river. Debris may be on the surface, suspended in the water or rolling along the bottom. It could include trees, driftwood or it could be man-made. Debris could pose a threat to the casualty and a danger to personnel. It can be difficult to spot, and vessels operating in unknown waters should post lookouts and proceed with caution.

Other areas where entrapment may occur include undercuts (on the outside of a bend where the current has worn it away) and where water is able to siphon under an object (such as a perched boulder or a vehicle). In flooded urban environments other entrapment hazards will exist such as displaced drain covers and street furniture.

Hazard	Control measures
Hand or foot entrapment Pinned against an immovable object Boat wrapped around an immovable object Line entanglement Strainers Falls through ice/unstable surface	Control zones Trained personnel Wading methods Floating and clean lines

Actions

Control zones

[Link to Control zone section in Public and moral pressure]

Trained personnel

[Link to Competent personnel section in Drowning]

Wading methods

Wading should only be used in relatively shallow water and slower currents using crews trained to operate in such environments. Consideration should be given to a casualty's condition if carrying out a wading rescue. What may be safe for a team of well equipped and trained rescuers may not be appropriate for a casualty.

Floating and clean lines

Lines used in water should be highly visible floating lines. They should be used in such a way that they don't become a snag hazard because entanglement can occur (e.g. a knotted end that can float loose in the water).

Impact injuries

Knowledge

Personnel entering water must be aware of the potential for submerged or partially submerged objects. Poor water clarity will make it difficult to identify sub-surface objects.

Personnel working in the hot zone with power boats present need to be aware of being struck by the boat and propeller.

Hazard	Control measures
Contact with an immovable object, such as: a boulder, rock or obstacle within the flow Where an object strikes the individual, such as a boat or moving boat part (propeller/motor) Impact from floating debris or falling object	Upstream spotters Downstream safety team Use of appropriate techniques and equipment Prop guards

Actions

Upstream spotters

[Link to Upstream spotters section in Hydrology]

Downstream safety team

[Link to Downstream safety teams section in Drowning]

Use of appropriate techniques and equipment

Entry into the water should be controlled. Entry by swimming should normally only be attempted by properly trained and equipped swift water rescue technicians. If a snatch rescue is possible, incident commanders should consider the water conditions when deciding if they should wait for properly trained and equipped teams to perform a rescue.

Knowledge of the water being entered should identify water features that may indicate immoveable objects. Whilst operating in the hot zone debris can be washed onto personnel.

Boat strikes and prop guards

Prop guards should be used to protect the propeller from damage by debris and reduce the likelihood of somebody being injured by a strike. Using jet powered boats may remove the prop strike hazard although it is still possible to be struck by the craft itself.

Because flood waters are by definition outside normal water courses, procedures that are suitable for water rescue on known waters may be inappropriate for floods. As an example, Royal Yachting Association guidance on fitting prop guards to safety boats is designed and intended for an audience that primarily operates on known waters, not in flood environments where the ground conditions under the vessel are largely unknown and collision damage is a far greater risk.

Contamination and biological/chemical hazards[1]

Knowledge

Responders may come into contact with contaminated water during either planned or unplanned events. There is a clear link between water infected with microbial hazards and ill-health in humans.

During emergency activities, services will not normally be able to assess the level of water quality. Services should use appropriate control measures including pre-planning knowledge, correct tactics, PPE and levels of decontamination. Responders may also be exposed during non-emergency activities, where water quality can be determined in advance.

[1] Note that there are two broad categories of water – water for human consumption and environmental water quality. This guidance only refers to environmental water quality.

Hazard	Control measures
Hazardous materials Waterborne diseases	Good hygiene practices Knowledge of contamination sources Personal protective equipment Correct operational procedures to limit exposure Decontamination of people and equipment Knowledge of medical signs and symptoms Immunisation programme and occupational health monitoring

Actions

Good hygiene practices

There is a chance of contamination at all water incidents. There should be strict control of personal hygiene. Personnel should avoid eating, drinking and smoking before decontamination.

Post incident health monitoring should be provided in conjunction with occupational health professionals.

Knowledge of contamination sources

At incidents it may not be possible to eliminate exposure to contaminated water. Crews should be aware of the hazard, sources of contamination, how to minimise their exposure and decontamination procedures.

Additional sources of monitoring are available. The Environment Agency may assist the risk assessment of a particular body of water.

Personal protective equipment

[Link to PPE section in Drowning]

Appropriate PPE should be provided for the task being performed to reduce exposure to the water and the risk of contamination. This may range from fire kit with surgical gloves worn underneath firefighting gloves for bank- based activities to full in-water PPE. Any cuts or abrasions should be covered by a waterproof dressing.

Correct operational procedures to limit exposure

Tactics range from bank side operations involving handling of wet and potentially contaminated equipment and people to full body immersion of water rescue technicians. Exposure to contaminated water may be reduced by:

- Bank-based rescue
- Minimising personnel exposed
- Use of boats or platforms
- Wading techniques

Decontamination of people and equipment

Firefighters must be decontaminated following exposure to the water environment. This may range from using hand gel to full body shower unit decontamination. Ideally this should be done at the scene to avoid contamination of vehicles and fire stations. Firefighters should not smoke, eat or drink before decontamination.

Equipment should also be decontaminated and care taken to not contaminate the inside of vehicles.

A more thorough decontamination should be done on return to base station or holding area.

Consideration should be given to the need to decontaminate casualties, either at the scene or at a holding area before they leave an agency's care or enter a welfare centre. Casualty decontamination is the responsibility of the ambulance service, although mass decontamination is managed on their behalf by the fire and rescue service.

Knowledge of medical signs and symptoms

Fire and rescue service personnel should have knowledge of medical signs and symptoms related to potential waterborne diseases. These can include risks from Weils Disease, blue green algae, gastrointestinal infections, Hepatitis A, and man-made pollutants from agriculture and industry.

Further information about waterborne diseases is available through the Public Health England website: http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/

Immunisation programme and occupational health monitoring

Fire and rescue services should consider the type of activities personnel will be engaged in and the potential for contracting a waterborne disease. Firefighters should be immunised against waterborne diseases where appropriate.

Advice should be sought on other waterborne illnesses such as Leptospirosis (also known as Weil's Disease). Personnel should recognise the signs and symptoms, the effects and the actions to be taken. This information is available in HSE document Leptospirosis**:** INDG84. Responders should tell doctors in the event of illness following possible exposure to Weil's Disease.

Procedures should be in place for personnel to report health issues following exposure to the water environment. This should include on-going monitoring.

Vehicles in water

Knowledge

Incidents in water involving vehicles can present significant risks to personnel.

Even with all windows open a car may initially float away from the point of entry. The electrical system and power windows may still work for a time, even if a vehicle is full of water. Once a vehicle is full of water other factors will influence what happens – the underlying surface, water current, and weight and distribution of passengers or load.

If the vehicle is side-on to the current on a solid riverbed in flowing water a roll is almost inevitable. Even in slow currents a vehicle may be rolled a considerable distance. If a vehicle lands on its wheels on a soft bottom river (i.e. mud, sand or small stones), each tyre will create an eddy, scooping out mud and sand so that the vehicle may settle onto its chassis.

If a vehicle comes to rest more or less straight in line with the current, the water pressure will sink the upstream end of the vehicle deeper than the downstream end. However, it is the mass of the vehicle that will determine its position. It is common for a vehicle to pivot around the engine as this is heaviest part.

Incident commanders should work with other emergency services to apply the survivability flowchart when deciding rescue options. The possibility of air pockets should be considered. The assessment should take into account:

- Urgency of rescue
- How the vehicle is positioned (i.e. partly or fully submerged)
- Location of casualty in vehicle
- Accessibility and stability of the vehicle
- The depth and flow of water around the vehicle
- The need for specialist extrication techniques

Hazard	Control measures
Sudden uncontrollable movement of the vehicle	Stabilise and anchor the vehicle
Vehicle stability	Trained and equipped personnel in the hot zone
Access and egress	Avoid entering the vehicle
Entrapment of rescuers inside vehicle	Knowledge of vehicle behaviour in water
Snags and sharp edges	
Use of specialist tools in the hot zone	
Casualty handling	
Hydrology/siphons	

Actions

Stabilise and anchor vehicle

Anchoring a vehicle may be necessary to reduce the likelihood of it moving.

If the vehicle is wedged against an obstacle, the area of eddy may appear a safer area for crews to work from. However, despite being wedged the vehicle may move or change position whilst rescue operations are in progress.

Trained and equipped personnel in the hot zone

Personnel should be trained specifically in dealing with rescues from vehicles in water and fully briefed on the tasks they are to perform. This should include the aims and any control measures that will be in place.

Casualties need to be reassured and instructed on what to do to assist with any rescue attempt. Consideration should be given to using effective methods of communication equipment.

Avoid entering the vehicle

Rescuers should avoid entering a submerged or partially submerged vehicle as this may affect its stability. The risk of entrapment is significant.

An underwater search and recovery team should be requested when an incident involves a submerged vehicle, or where it is not possible to safely assist without sub-surface equipment.

Knowledge of vehicle behaviour in water

It is important to understand how vehicles can behave when in water, and in different types of water. This may influence the tactics considered and adopted.

Weather conditions

Knowledge

Incidents are more likely to occur during poor weather conditions. The safety of firefighters working in these conditions must be taken into account.

High levels of rainfall can result in flash flooding, and high water levels may lead to personnel being trapped or swept away. Objects such as trees and debris may be washed downstream, posing risks to personnel. Strong winds can make it difficult to work and give rise to dangerous conditions. There is a risk of structural damage and falling trees. Snow and ice will make entry and exit difficult and potentially dangerous.

Poor weather is also likely to make communications more difficult. The use of some equipment may be limited or become impossible.

Hazard	Control measures
Wind	Planning and weather reports
High levels of rainfall	Provide shelter
Rapid rise in water levels	Personal protective equipment
Poor visibility	Knowledge of signs, symptoms and treatment
Snow and ice	Team rotation
Extremes of temperature	Upstream spotters

Actions

Planning and weather reports

Planning and responding to flood alerts and severe weather warnings to ensure the correct resources are prepared before an event. The appropriate agencies should be contacted for weather condition reports:

- Environment Agency – issues flood warnings updated every 15 minutes
- Meteorological Office – issues severe weather warnings and provides the 'Hazard Manager' service.

Weather forecasting in the UK is highly developed, reliable and readily available to emergency services. Forecast information should be used to plan in advance for severe weather. Alternative routes due to flooding or windblown trees blocking roads need to be considered, and the suitability of vehicles to operate in challenging conditions.

Provide shelter

Suitable shelter and welfare facilities for crews may need to be provided.

Personal protective equipment

Thermal undergarments should be used with dry suits for working in cold water and will provide protection in cold weather. When worn on dry land, dry suits can cause overheating, leading to heat exhaustion and heat stroke.

[Link to Personal Protective Equipment section in Drowning]

Knowledge of signs, symptoms and treatment

Fire and rescue services should have knowledge of medical signs and symptoms related to extremes of temperature. These include:

- Hyperthermia—an elevated body temperature where the body produces or absorbs more heat than it can dissipate
- Heat exhaustion—caused by dehydration and excessive loss of body fluids
- Heat stroke—caused by prolonged exposure to excessive heat and / or humidity
- Hypothermia—occurs when the body's core temperature falls below 35°C. Cold water dangerously accelerates the onset and progression of hypothermia

Team rotation

Personnel should be rotated to ensure adequate rest and welfare and to reduce the effects of hyperthermia or hypothermia, especially at protected incidents.

Upstream spotters

[Link to Upstream spotters section in Hydrology]

Unstable surfaces

Knowledge

Unstable surfaces can be potentially treacherous to any rescue team. An unstable or soft surface will give way when downward pressure is applied. The surface may be so soft that humans or animals can sink until movement becomes impossible. Alternatively a layer of relatively firm ground may break through into softer ground below.

Ice should never be considered safe to walk on. A thickness of 100mm across an entire surface is required to support the weight of an average person, but this is impossible to measure. Ice may also have flowing water underneath. This is extremely dangerous as entrapment can result. Personnel can fall through ice and travel a significant distance below the ice surface.

It may be difficult to access casualties through deep mud in tidal areas, as walking becomes impossible without specialist equipment such as mud shoes. The distance to the casualty can make the situation more difficult. Incidents can be particularly hazardous at night or during periods of poor visibility, such as dense coastal fog.

HM Coastguard can provide details of specialist mud rescue services in coastal areas. Coastguard rescue teams and some local voluntary rescue associations may have considerable knowledge of the area and the capability to operate on local mud flats. Other emergency services should make use of this knowledge and skills where they exist.

Hazard	Control measures
Ice Mud Contamination	Control zones Minimise personnel in risk area Use of inflatable rescue paths or other rescue platforms Methods of working Personal protective equipment Good hygiene practices and decontamination

Actions

Establish control zones

[Link to Control zone section in Public and moral pressure]

Minimise personnel in risk area

Incident commanders should seek to deploy the minimum number of personnel to high risk areas and work with specially equipped partner agencies.

Use of inflatable rescue paths and other rescue platforms

It is important to avoid walking on unstable surfaces wherever possible. Inflatable rescue paths and other types of rescue platforms may provide a stable platform to work from.

When operating on mud in tidal areas, consideration should be given to mobilising suitable rescue craft. This will reduce the risks to both the casualty and rescuers from rising waters.

Other equipment needs should be considered (e.g. mud lances, shovels, hoses, cylinders, casualty survival bags). Paddles, reach poles and similar devices may be used to work through ice.

There should be suitable methods of transportation (e.g. backpacks to allow hands-free operation). Suitable methods for removing casualties will also be required as the casualty will often be unable to offer any assistance because of hypothermia or unconsciousness.

Appropriate casualty management including thermal protection and treatment for hypothermic casualties may be required.

When working at night or in poor visibility, suitable lighting should be provided.

Methods of working

Mud rescues may take place in tidal areas. Incident commanders should have access to tide timetables to assist decision making.

A mud lance or jet from a hose can be used to loosen the mud around a casualty and break the suction effect. Other crew members should attempt to pull the casualty clear onto a platform or firm ground. When digging close to casualties, considerable care should be taken. The casualty may be numbed by the temperature of the mud and may not feel any contact with the spade or tool being used. Serious injury to the casualty caused by digging may not be immediately obvious.

In all but the most minor cases the casualty should not be allowed to walk out. Advice can be provided by ambulance personnel. Sudden release and attempts to stand may induce post rescue collapse with possible fatal results. The casualty should be evacuated in as near a horizontal position as possible and passed to ambulance personnel for treatment.

Personal protective equipment

[Link to Personal Protective Equipment section in Drowning]

Good hygiene practices and decontamination

[Link to Contamination and biological/chemical hazards section]

Poor light conditions

Knowledge

Poor light conditions can significantly increase the risk of becoming disorientated and increase the risk of slips trips and falls. Poor light conditions can arise not just from darkness, but also fog, mist, heavy rainfall and snow. Incidents that start in daylight may continue into darkness or deterioration in the weather may lead to difficulties. Personnel need to be aware and fully equipped for such occurrences.

Hazard	Control measures
Darkness	Regular and frequent training at night
Becoming lost	Illuminating the scene
Slips trips and falls	Personal torches
Falls from height	Team working
	Radio and communication checks

Actions

Regular and frequent training at night

Personnel should carry out a regular programme of structured training in realistic and testing conditions including poor weather and darkness.

Illuminating the scene

Providing effective lighting is essential in poor light conditions and where daytime operations may continue into night. There should be effective illumination of the scene of operations and downstream safety zones. Position lights to ensure overall illumination but do not ‘blind’ people in or around the water. When searching at night, white lights can significantly affect night vision and cause a problem to searchers.

Personal torches

Helmet mounted torches give hands-free capability and are essential for responders who enter the water.

When working at night all personnel should have a headlamp available to assist with personal task lighting. Powerful handheld torches should be used for searching due to the limited power of head torches.

Team working

Personnel should not work alone. During night and poor visibility teams should be identifiable and locatable using either chemical light sticks or battery operated equivalents in line with the Defra Flood Rescue Concept of Operations. Lights should be fixed to the helmet. This will avoid the light being a distraction if wrongly attached to the rescue buoyancy aid, and it will always be visible if the wearer enters the water and the rescue buoyancy aid is below the water line.

Ropes used as rescue throw lines should have the bag marked with a green light. This will make them easier to locate if deployed in water. Personnel and equipment should be identifiable as follows:

- Water rescue first responder – yellow light
- Water rescue technician – red light
- Rescue boat operator – red light
- Team leader – colour light to match their team skills
- Rescue throw ropes – green light

Radios and communication checks

The means of communication should be established and agreed. Regular checks should be carried out with back up and contingency procedures in the event of lost communications. The use of GPS activated radios can assist in tracking the location of teams.

The Defra Concept of Operations gives detailed information on the 'Operations Normal' communications check-in routine to ensure all assets within the Area of Operations are regularly accounted for.

Confined spaces

Knowledge

Some incidents involving water may involve a confined space. Site specific risk assessments should identify any potential sites that would be deemed a confined space. Access may be difficult and there may be the potential for entrapment.

Hazard	Control measures
Difficult access and egress Entrapment Depth and flow of water Irrespirable atmosphere Falls from height	Use of appropriate techniques and equipment

Actions

Use of appropriate techniques and equipment

A safe system of work must take into account the Confined Space Regulations. Pre planning, site-specific risk information and a standard operating procedure should be adopted.

Noise

Knowledge

Personnel may not hear or may mishear critical safety information if noise is of such intensity that normal speech cannot be heard. This can expose them to additional hazards or increase the level of risk to existing hazards.

Hazard	Control measures
Difficulties in communicating between both rescuers and those being rescued Personnel may not hear (or may mishear) critical safety information Disorientation	Communications established with regular checks Hand and whistle signals Team rotation

Actions

Communications established with regular checks

The means of communication should be established and agreed. Regular checks should be carried out with back up and contingency procedures in the event of lost communications. The use of GPS activated radios can assist in tracking the location of teams.

Loudhailers are an effective and simple aid to communications at water rescue incidents.

Hand and whistle signals

Hand and whistle signals may be needed where effective communication is limited by water noise and distance. It is essential that a standard set of signals for communication are used to ensure interoperability between agency teams. The following hand signals are commonly used, however local procedures may apply:

Hand Signal	Meaning
One hand flat on head	OK
One arm raised above head	Distress
Pointing with one arm outstretched above horizontal. May be preceded by circling of hand vertically in air.	Move in that direction
Pointing with one arm outstretched below horizontal	Attention to or hazard in water
Both arms crossed in front of chest	Need medical help or bring medical kit
One arm outstretched in front of chest showing palm	Stop

Hand Signal	Meaning
Whilst in boat – arm outstretched to one side	Move in that direction
Whilst in boat – both arms raised above head	Stop
Whilst in boat – one arm outstretched at side of body bent upwards at 90°	Holding position

The following whistle signals are commonly used, however local procedures may apply:

Whistle Signal	Meaning
One blast	Stop or attention towards signaller
Two blasts	Attention to upstream or move upstream
Three blasts	Attention to downstream or move downstream
Three blasts repeated	Emergency

Team rotation

Teams or personnel should not be exposed to prolonged periods of excessive noise and consideration should be given to rotating crews to minimise exposure.

Electrical hazards

Knowledge

Electricity has the potential to pose a significant hazard in the water environment.

[Link to Fire Service Manual – Fire Service Operations – Electricity]

Hazard	Control measures
Electrocution Overhead power lines Flooding incidents involving machinery, and electrical installations	Hazard identification and working proximity Isolate electricity Advice from utility provider

Actions

Hazard identification and working proximity

When using reach tools or throw lines care must be taken to check for overhead power lines. Cordons may be required to exclude personnel from hazard areas. Power lines might be taken down by adverse weather and pose a hazard at ground level.

Isolate electricity

Flood incidents may involve electrical installations or machinery which will need to be isolated.

Advice from utility provider

Advice should be sought from the appropriate providers. This will be especially necessary during flooding when electrical installations may be affected. This will assist in identifying key strategic facilities to be protected and if it is safe to work in the vicinity.

Environmental damage

Knowledge

Invasive non-native species can have a damaging impact on British plants, animals and ecosystems by spreading disease, competing for habitat and food and direct predation. Plants that grow profusely can block waterways while some animals can damage riverbanks, affecting economic uses of the environment and adding significant management costs.

Personnel may unknowingly be helping to spread invasive species from one water body to another in equipment, shoes and clothing.

Hazard	Control measures
Cross-contamination of water courses with invasive non-native invertebrates and plants	Check, clean, dry procedure

Actions

Check, clean, dry procedure

All PPE, clothing and equipment should be thoroughly inspected. Any debris (mud, plant or animal matter) should be removed and left at the water body. Particular attention should be paid to the seams and seals of boots and waders. Any pockets of pooled water should be emptied.

Equipment should be hosed down or pressure-washed on site. If facilities are not available equipment should be carefully contained. Washings should be left at the water body where the equipment was used, or contained. Washings must not be allowed to enter any other watercourse or drainage system. Dipping clean equipment in disinfectant solution will kill diseases. This is unlikely to kill non-native species.

The best way to disinfect clothing and equipment is to thoroughly dry it. Equipment should be dried for 48 hours before being used again. The drying process must be thorough as some non-native species can survive for 15 days in damp conditions and two days in dry conditions. At an incident this may not be possible so alternative methods should be considered.

[Link to Contamination section]

[Link to: https://secure.fera.defra.gov.uk/nonnativespecies/checkcleandry/index.cfm]

Access to incident sites

Knowledge

Incidents may occur in remote locations with limited or no vehicle access. The condition of access paths and accessibility needs to be considered. Awareness of locations will be needed by personnel and the best means of access and egress. Communications and identifying the location of an incident need to be considered.

Hazard	Control measures
Remote areas Limited vehicle access Poor light conditions Difficulty identifying the location of an incident Communications Command and control	Site-specific risk information Pre-determined rendezvous points Provision of portable lighting and equipment Portable boats All-terrain vehicles

Actions

Site-specific risk information

Site specific risk information will be required for known risk in remote areas or with difficult access.

Pre-determined rendezvous points

Pre-determined rendezvous points should be identified and use of suitable vehicles that may be able to access the sites.

Provision of portable lighting and equipment

[Link to Poor light conditions]

All-terrain vehicles

Fire and rescue services should consider the provision of an off-road vehicle and towing capability through their own resources or in partnership with other organisations. This will enable them to reach remote sites. Wading capabilities of vehicles should be established in advance, and safe wading procedures should be practiced and applied.

During search operations, continuous tracking of the exact locations of teams will be required. Using suitable maps will assist, and search team members will need to be competent in reading and reporting accurate map locations.

Flooding

Knowledge

A flood is water outside the bounds of normal water courses. The source of flooding may be the sea, overflowing rivers, surface water flash flooding or groundwater. Given the highly developed status of weather and flood forecasting in the UK, no flood event, from whichever source, should ever be a surprise. Flooding is predictable at the strategic resourcing level and at the tactical level for a specific

forecast event. They should be managed as an intelligence-led, planned event. Floods are moving incidents that follow physical rather than administrative boundaries such as areas represented by local resilience forums. They are often long duration, multi-agency events, with knock-on impacts that will degrade and challenge service providers across a wide spectrum, including power, communications, transport, logistics and public health. Effective management of flood incidents requires joint planning and preparation recognising these principles.

Floods and flood waters present significant risks. They are often predictable and fire and rescue services should rely on weather and tide forecasting when planning their incident response.

There are four realities of floods. They are:

- Multi-agency events
- Multi-jurisdictional events
- Hazmat and public health events
- Long term events that can exhaust emergency personnel and community members emotionally, mentally and physically

Flood water can be moving water. The principles of operating in moving water apply even when the conditions appear to be still. In a flood, a river overtops its banks and begins to flow through the surrounding land (the flood plain), or the low areas adjacent to the river. In this process the flood water becomes less predictable and more dangerous. Flood water is also a hazardous substance.

Under flood conditions the following will typically apply:

- The size and power of the river is greatly increased
- Structural features (e.g. weirs, sluices, culverts) become more hazardous
- Bridges may not have enough clearance for boats to go under and may become structurally unsound
- Eddies are wide and can be laced with rapidly moving whirlpools with powerful undertows that may be difficult to escape from
- Floodwaters contain debris which can clog intakes and foul propellers of rescue boats
- Trees and other large and heavy objects may join the river flow. They will often collect against bridges to form strainers or natural dams
- Water flows through features on the flood plain like trees, hedges, fences and debris may form strainers
- In urbanised areas like streets, fields, neighbourhoods and towns the danger of contamination from pesticides, faecal matter, dead livestock and chemicals greatly increases
- Water treatment plants may flood and cease functioning altogether

Services may consider using SEADEPTH, the Charlotte Fire Department, USA model for flood disaster responses as a tool for assessing hazards and sizing up incidents.

S Situation and Strategy. Should the agency be put on alert, should reconnaissance be conducted, or should we be responding?

E Egress. If my team goes in to make the rescue, can we get them out? Are we losing egress because the water is rising?

A Access. Can I still get to the site where the car is trapped, or am I losing it? If we lose access, we lose egress. So being pre-deployed and having evacuation routes already established are essential.

D Development. How developed is the area we are going to? What is the population, how many structures, and how will that affect run-off and hazardous materials?

E Existing Rainfall

P Potential Rainfall. Increasing flooding and water depth.

T Topography. Survey maps of the area are a critical part of the cache for incident command, along with insurance and flood plan maps. Using these tools, incident command should be able to determine where the water will go and what areas are going to be inundated first.

H Hazards. Have all the existing and potential hazards been identified? Has the IC identified a "technical specialist" to assist? Are there storm water management systems that haven't been taken into account as potential hazards? Remember, floods are public health danger events

Flood response tactical advisors also use the SMEAC template as a planning aide for managing flood incidents:

S Situation

M Mission

E Execution

A Administration

C Command

Wide area flooding

A wide area flood is one that crosses local resilience forum boundaries. Multi-agency planning may be needed to deploy limited resources in response to competing requests for assistance

Wide area flooding is predictable. There will be around five days' notice of weather and three days of flood forecasts. The detail in the forecast will increase in the 36 hours before the event. Planning should focus on evacuation from the risk area before the flood rather than rescue after the event

Rescue and recovery planning should be based on the assumption that once the water has breached the defences, it is likely that roads and bridges will be damaged, islands will be formed and land access routes for rescuers may not be available

Damage or failure may occur across utility and transport infrastructure. Affected essential services may be inoperable for up to 14 days. Some critical Infrastructure may be compromised.

Further information is available from the Defra Flood Rescue National Enhancement Project Concept of Operations Guide.

[Link to https://www.gov.uk/government/publications/flood-rescue-concept-of-operations]

Hazard	Control measures
Increased volume and area of water Hazmats and public health Long term events that will exhaust personnel and resources Command and control of personnel and multi agencies Self-presenting volunteers Communications Access and egress Structural damage	Planning and identification of risk Defra Concept of operations Rescue planning Establish effective communications Area of Operations SAR cell search planning considerations Dealing with pets and animals Managing emergent volunteers

Actions

Planning and identification of risk

Work to identify risk and prepare operational plans should be carried out in association with the local resilience forum and the relevant section of the fire and rescue service's IRMP or risk management plan.

Concept of operations

A national mutual aid scheme has been developed by Defra to provide a framework for coordinating a rescue response to major flood events. This includes a concept of operations that provides a model for flood incident management that can be applied to all flood events from local deluge through to catastrophic wide area inundation.

For rescue activity, the coordination of flood response will be managed under the National Coordination and Advisory Framework (NCAF), the established formal governance structure for managing National Resilience assets such as urban search and rescue and mass decontamination. Flood response sits alongside these capabilities, and mobilisation of flood resources will be in line with existing arrangements for those functions.

Rescue planning

Planners need to decide in advance what they will do when they receive a flood warning from the Flood Forecasting Centre. They should be aware of which level of warning will trigger action by their organisation and pre-emptive deployment should be considered at the earliest opportunity. Planners should consider the time needed to mobilise and deploy teams into the affected area before roads and bridges are washed away.

The distinction between rescue and evacuation should be established:

- Rescue is pulling a floating casualty from moving water, or airlifting someone hanging from a tree over a torrent
- Evacuation is transferring people from a temporary refuge, where they may be wet, cold and uncomfortable but are not at immediate risk of death or injury, to a place of safety from which they can be relocated

The tasks given to specialist assets should reflect and respect this distinction, and the highly restricted number of assets able to undertake rescues in the worst environments should not be frittered away on evacuation duties if other responders could do the job instead.

Major flood events will require deployment of a range of national resilience assets, in addition to flood rescue teams, and the response will therefore be managed in a coordinated manner via NCAF.

Establish effective communications

Search often requires teams to operate in locations that will be relatively remote from command and control centres. Good communications is essential to ensure team safety and to enable other resources to be mobilised to support rescue or evacuation operations.

Area of Operations

The Area of Operations is the geographic area that contains all active operations. It can be sub-divided into segments to indicate areas of responsibility or tasks. Intelligence reports will contribute to defining the Area of Operations and the development of a Common Operational Picture (COP).

Segments areas have boundaries which are used to identify smaller parts of the Area of Operations. Segments are about where to conduct tasks.

Sectors are about how to conduct tasks. A sector will have a sector commander who will be responsible for the conduct of any tasks that are assigned.

A segment can contain either multiple sectors or it can contain one sector.

Sectors identified for search-related tasks should be searchable within an operational period for the assigned asset and have clearly identifiable boundaries. There should be a clear plan of action to deal with flood casualties and survivors.

Search and rescue cell search planning considerations

Determining requirements for search resources is difficult to judge. Considering the search asset's speed of advance and the distance required to cover can help planning. This may need to include the duration of any specific tasks that are required.

As a guide, an estimated speed of advance for teams wading through water is from 500m-1km per hour. An estimated time to gain entry into a house and conduct a primary search of easy-to-access rooms is from 10-20 minutes.

Dealing with pets and animals

Flood survivors may have pets and animals that need to be dealt during the follow-on rescue effort. The RSPCA has a flood rescue capability and will be able to provide advice and assistance in dealing with animals.

Small animals can usually be dealt with by using cages. Responders should consider having a supply of animal cages. Dogs may require muzzling before being transported and large animals may require specialist equipment to move them.

Large numbers of dead animals may develop into a public health hazard if not managed.

Managing emergent volunteers

Well-meaning volunteers may self-present or self-deploy at incidents and responders should take into account the best approach to manage them. Management may be required in order to protect them and stop them from obstructing operations.

Some volunteers can help operations. But care is needed to avoid putting members of the public at undue risk. Responders may consider asking such volunteers to assist with lower-risk activities such as welfare provision.

A management system may be needed to help deal with large numbers of volunteers and suitable records should be kept of those who assisted. If volunteers are difficult to manage, incident commanders may, as a final resort, consider using the Police to invoke the Emergency Workers (Obstruction) Act 2006.

Searches in the flood environment

There is an established hierarchy of search activities for wide area disasters, which is applicable to floods. Initial reconnaissance is about developing intelligence to inform where to search, creating a common picture of the situation and directing mobile uninjured survivors to reception centres. No rescue activity would be conducted.

Hasty search:

Quick search; identify location with easy-to-find casualties; very simple rescue or extrication. Call in resources to provide the rescue response.

Primary search:

House to house type activities, typically using shout and listen techniques as well as quick visual sweeps to look for casualties; collection of intelligence such as number of people in building; survivor needs assessment; call in additional rescue support if required.

Secondary search – low coverage:

Movement of debris in buildings; clearing street debris to find casualties; detailed search of debris in areas away from human habitation to find missing people.

Secondary search – high coverage:

Full entry into all parts of building with removal of debris – no further search activity to be conducted on completion. Removal of all debris from areas with human habitation. Extensive search of other debris (move from one location to another) to ensure a high coverage search. This would usually be conducted during the later stages of the response phase or as part of the recovery phase. The nature of these searches would usually be to locate flood casualties and evidence protection/recovery should be a key consideration to support the coroner and police.

Helicopter- based search

Helicopter assets may be an ideal method of searching larger segments, sectors or identifying and transferring search teams to hot spots or lily pads. Lily pads may also be used as a temporary area of relative safety for evacuees. The Aeronautical Rescue Co-ordination Centre (ARCC) based at RAF Kinloss will respond to all requests from the emergency services for helicopter assistance where lives

are at risk. The potential contribution offered by air assets to a flooding event is considerable. The ARCC provides a common tasking procedure for all UK SAR helicopters. No costs are charged to the emergency service in situations where life is at risk. However, for other purposes costs may be charged.

Requests for assistance

Contact the duty officer at the ARCC, with the following information:

- Location of incident (grid reference)
- Description of incident
- Nature of tasking (e.g. rescue, reconnaissance, transport)
- Number and position of casualties
- Hazards (overhead power lines etc.)
- Weather / environmental conditions
- Other resources on scene

Operating with aircraft has a significant number of associated hazards. Where possible personnel should have previous training to work with aircraft and recognise the hazards.

[Link to http://www.raf.mod.uk/rafsearchandrescue/operations/workingwithsarhelicopters.cfm]

Fire and Rescue Service National Coordination Centre (FRSNCC)

Early warning can allow specialist mutual aid teams to be requested early and pre-deploy to the area.

Where reporting a major/wide area event and requesting mutual aid:

- The impacted authority identifies risk of a flood event requiring additional specialist flood rescue assets
- The impacted authority requests assistance via the FRSNCC

Information required from requesting authorities

Affected authorities who request assistance should contact the FRSNCC passing the following information as a minimum:

- Location of incident or expected time/location of impact
- Name of incident commander
- Nature of incident and any specific hazards (i.e. known chemical contamination)
- Prevailing weather and (where known) water conditions
- Estimated number of people requiring rescue
- Local resources already in attendance/available
- Estimate of mutual aid resources required
- Location (grid reference/name and address) of rendezvous point (or strategic holding area)
- Local access issues created by the flooding

Command and Control (Source: Defra)

The arrangements for national coordination of flood rescue teams providing mutual aid do not affect established incident command and control arrangements. Once deployed specialist water rescue teams will always come under the direct control of the requesting authority. They will be managed

through existing strategic, tactical and operational (Gold, Silver and Bronze) incident management systems.

Where major operations are expected, fire and rescue services may establish a strategic holding area (SHA) in or near to an affected area. Incoming teams will be briefed, credentials established, tasks allocated according to their capability and local guides assigned. A flood rescue tactical adviser (TacAd) will review the personnel and equipment to assist in tasking the most suitable team.

Resources deployed from SHAs should be gathered at Forward Operating Bases (FOBs), which will act as the local hubs for tactical operations in the specified flood sector. FOBs will normally be located at the closest accessible fire stations to the flooded area, but must be themselves secure from flooding and have secure access routes and power supplies as well as sufficient space to host incoming resources. Local emergency service personnel should be assigned to FOBs to act as guides to incoming teams, who will need their local knowledge to help them move effectively around the area.

The Lily pad concept is an important operating principle in flood rescue operations. Swiftwater rescue teams capable of working in high hazard environments, and typically operating in small, high powered craft will carry out rescues and transfer casualties to temporary refuges, or Lily pads. From these places of relative safety, casualties can be evacuated in slower time using other resources, and the specialist teams can return to the rescue zone. Air operations apply the same principles, where dedicated SAR helicopters perform short-haul rescues to the lily pad, for transfer to transport helicopters or ground vehicles. Larger vessels may perform an equivalent function to lily pads, acting as mother ships for small rescue craft and SAR helicopters. In all circumstances, it is critically important to focus the limited number of specialist teams on life-saving rescue activity and to strictly limit any tendency to use them for evacuation and transport roles that could be carried out by other means.

A 'Beachmaster' should be appointed at the landing point for each lily pad to log and track casualties as they are brought ashore, and to manage the re-supply and turnaround of rescue teams. Without a clearly nominated beachmaster, landing points will degenerate rapidly into chaos and the tempo of rescue will quickly fall. This is a suitable role for a robust and confident uniformed police or fire junior officer or military NCO.

A dedicated line of communication must be maintained with the appropriate tasking authority. Someone should be allocated to manage calls and record data. A similar line of communication must be maintained with FRSNCC to monitor the despatch and travel details of flood rescue assets.

Radios should be distributed to flood rescue assets as required. The credentialing process will identify the communications used by teams.

Team-typing

The Defra Flood Rescue Concept of Operations (FRCO) sets out a national team-typing system. This describes standard packages of resource (people and equipment) according to their capabilities and the outcome they can safely achieve.

Accreditation of flood rescue agencies

Agencies which declare their resources to the DEFRA Asset Register are expected to maintain their respective teams in accordance with the FRCO. They should pay particular attention to the training, equipment and team typing documents that have been consulted on and agreed.

Tactical Advisors (TacAds) and the national co-ordination centre

TacAds are trained and experienced individuals that can provide a valuable resource, primarily at tactical and operational levels. The TacAds will provide incident commanders with detailed advice on flood rescue capability. TacAds will be mobilised to provide technical advice and not to assume command.

The FRSNCC will only mobilise qualified TacAds who are available for national deployment.

Interoperability with emergency services provided by volunteers

Accredited volunteers belong to organisations that have structures in place to support their volunteers. These organisations will have existing relationships with Category 1 responders.

Emergent volunteers will typically respond from the local community. They will not be part of an organisation that can provide support to them. They will generally not have existing relationships with a Category 1 responder.

The accredited voluntary sector is a vital part of flood and water rescue response in some areas. Effective planning involving all participants is the best way to ensure an efficient operational capability. This includes training, sharing policies and procedures, agreeing incident command structures, and joint planning and exercising. This will help to develop the understanding of what voluntary organisations can provide. The key to success is a clear agreement that is tested through regular training and management systems. There should be arrangements in place for resolving conflict.

The local resilience forum is an important forum to help develop a suitable response with a wide range of voluntary agencies. There is a duty under the Civil Contingencies Act 2004 for Category 1 responders to consider the capabilities of voluntary organisations.

Further information and guidance can be found at [Link to https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/80803/Appendix_E_Engaging_the_voluntary_sector_guidelines.pdf]

Interoperability

Accredited volunteer organisations are usually staffed by dedicated individuals, and they are well trained and equipped. In most cases their training will be similar to that of FRS/other Category 1 responders. However some voluntary capabilities will differ. In some circumstances the capabilities of accredited volunteer organisations may be greater than the FRS and more suitable for dealing with an incident.

The communications capabilities of accredited volunteer organisations may also differ. They may not all have access to AIRWAVE. Where this is the case, working relationships should be based on a memorandum of understanding that takes account of relevant communication capabilities.

Operational capability

Most accredited volunteer organisations will have a broad base of expertise in a specific area and have proven skill levels and capabilities. Accredited volunteer organisations often have close links with Category 1 or Category 2 responders, examples include:

- The Royal National Lifeboat Institution (RNLI) has flood rescue teams that can provide effective flood rescue operations. They have a proven VHF communications system with a strong working relationship with the MCA and local FRSs
- Mountain Rescue and Lowland Rescue have personnel with good knowledge of formal search procedures. They have proven communication capabilities and a strong working relationship with local police. Their capabilities to access remote locations may be operationally useful
- The RSPCA has an animal rescue capability. This includes swift water rescue trained members and a number of boats. They can typically be requested via the police or the FRS.

Other accredited volunteer organisations can provide a range of operation support and would usually be activated by the police or local authority.

Volunteer organisations that are declared on the Defra National Flood Rescue Asset Register will meet the requirements of the team typing models. Their training, skills and equipment will be appropriate and equivalent to those from the statutory services.

Costs and expenses

Most voluntary organisations will deploy in the immediate response phase with no charge being made to the requesting agency. However, volunteer personnel may incur personal expenses, such as the cost of driving to incidents, loss of earnings and personal equipment purchases. Organisations may incur losses such as equipment. Multi-agency agreements may look to reimburse organisations for any cost incurred outside of their normal operations.

Welfare

Arrangements for welfare should be integrated into arrangements for other attending responders. Early communication should be given in terms of:

- Expected duration of deployment
- Numbers and types of resources deployed
- On-site welfare arrangements

This will help to ensure that the impact on resources is minimised by teams being prepared in advance.

Health and safety considerations for accredited volunteers

Although volunteers are not employees of their voluntary organisation, that body will have duties to ensure their health and safety. Emergency services that make use of voluntary organisations must also recognise their own duties of care to those volunteers, and clarify in advance what liabilities they may be entering into when devolving responsibilities to third parties. The development of a mutual agreement on how to work together will help to manage volunteer health and safety. At an incident it is important that volunteers understand the context and framework within which they will be expected to operate. This must be communicated to them.

The principles of risk identification, control and mitigation will be well understood by those meeting the team typing requirements. They will understand this within the context of a water rescue environment. All of the declared assets should understand that they will be operating within a risk managed environment and be prepared for the constraints that this might bring.

Locks and canals

Knowledge

A network of over 2,000 miles of canals and rivers are readily accessible to the public for a variety of leisure activities. Incidents may occur in remote locations with limited or no vehicle access. Incidents may occur with people in difficulty in a lock or a vessel that has capsized with a casualty inside.

Hazard	Control measures
Entrapment	Site specific risk information
Remote access	Knowledge of operating systems
Falls from height	Cordons
Cold deep water	Surface rescue/recovery
Strong currents	Sub-surface rescue/recovery
Contamination	

Actions

Site specific risk information

Fire and rescue services should identify if canals are present within their area and identify specific hazards. Awareness of locations will be required by personnel and the best means of access and egress.

[Link to Access to incident sites]

Site-specific risk assessments should be carried out in conjunction with the Canal and River Trust local office.

[Link to http://canalrivertrust.org.uk/contact-us/contacting-your-local-office]

Knowledge of operating systems

Crews should be familiar with the operating systems of locks and other structures such as lift and swing bridges in their area. Controls to the locks should be secured prior to any rescue attempt.

Cordons

When operating adjacent to locks and canals cordons should be in place to minimise the likelihood of falls from height due to wet, slippery lock edges and trip hazards. Crews need to be aware of the risk of cold deep water, contaminated water and underwater hazards from submerged debris. [

Link to Slips, trips and falls]

[Link to Contamination and biological hazards]

Surface rescue/recovery

All lock gates and paddles must be completely closed before any rescue attempt. Personnel should not attempt to open the lock gates or paddles to empty the lock. When a sluice gate is opened to release water there is a risk of strong currents and turbulence downstream.

Where possible an exclusion zone should be established on the high-pressure side of the lock gates and paddles.

Access to the lock should be via the fixed raking ladder. Mud and silt on canal bottom and lock walls will be present.

Sub-surface rescue/recovery

Any attempt to drain the lock should consider the potential of trapping the casualty or victim; a 50mm gap will create sufficient pressure to pin a person. Where the incident involves a casualty below the surface of the water and it is not possible to assist without subsurface equipment then an underwater team must be requested.

More information on canals can be found:

[Link to http://canalrivertrust.org.uk/about-us/for-businesses]

[Link to http://canalrivertrust.org.uk/boating/navigating-the-waterways/boaters-handbook]

Quarries and reservoirs

Knowledge

Both quarries and reservoirs can be inherently dangerous places and pose a significant risk to members of the public who visit these sites for recreational purposes (e.g. walking, fishing, swimming, climbing and diving).

Quarries can be classified as either working or non-working, and can reach depths of more than 30m. After a quarry is abandoned, it is usually secured to prevent access. However, unauthorised access is a major issue within the UK as well as being used as illegal dumps.

Access and egress for emergency access to non-working quarries can be difficult due to security fencing. Roads or pathways that have been constructed as a temporary fixture may be in a state of disrepair.

Reservoirs may be in remote locations with limited access.

Hazard	Control measures
Remote access Falls from height Cold deep water Undercurrents Contamination Landslides Falling debris Dense weed mats beneath water surface	Site-specific risk information Cordons Personal protective equipment

Actions

Site-specific risk information

Fire and rescue services should identify if quarries are present within their area and identify specific hazards. Awareness of locations will be required by personnel and the best means of access and egress.

[Link to Access to incident sites]

Site-specific risk assessments on working quarries should be carried out in conjunction with the quarry manager, site safety manager or any other responsible worker. Electrical hazards and moving machinery should be identified.

Site specific risk assessments on reservoirs should be carried out in conjunction with the water authority.

Cordons

Cordons should be put in place to limit access to areas of unconsolidated faces in superficial deposits particularly sand or gravel. Access should be limited to steep faces with or without loose rock debris and where falls from height exist.

Personal protective equipment

Entry to water should be controlled and the correct PPE used due to cold deep water with potential undercurrents. Consideration should be given to working from a boat or suitable water rescue platform.

Water in quarries may be contaminated with toxins and chemicals as a result of the extraction process or from illegal dumping. Other hazards may include ice and unstable surfaces such as mud, sludge and slurry.

[Link to Contamination and biological hazards]

Docks

Knowledge

Docks are often busy and hazardous places with large vessel movements, heavy machinery, confined spaces, sluices and subsurface hazards. Docks can also attract unauthorised access from members of the public, particularly during periods of warm weather.

Urban development and regeneration of former dockland areas has led to residential housing and large restaurant, bars and club complexes being built in close proximity to large areas of open water.

HM Coastguard is responsible for co-ordinating search and rescue incidents in docks associated with tidal rivers, unless there is specific local agreement with police or harbourmasters.

Hazard	Control measures
Vessels operating within the dock systems. Vehicles, plant and machinery operating on the dock side area Difficult access/egress Falls from height Cold deep water Entrapment hazards Undercurrents Contamination Confined spaces	Site specific risk information and planning Rope rescue equipment and cordons Personal protective equipment

Actions

Site specific risk information and planning

Site-specific risk assessments should be carried out in liaison with port or dock authorities, and HM Coastguard where docks lie in tidal waters. Areas where moving vehicles, plant and machinery operate should be identified and the means of controlling or isolating their movement included. Launch and recovery sites for boats should be considered. The Harbourmaster should be the primary point of reference for safety management in ports and docks.

Rope rescue equipment and cordons

The use of work at height equipment and rope rescue techniques may be required to access and recover casualties. Cordons should be used to reduce the risk of falls by preventing access to exposed drops, or debris and equipment falling. Consideration should be given to using helicopters with winch capability.

Personal protective equipment

If entry to the water is necessary crews should be equipped with suitable PPE and be aware of the hazards of cold deep water and sub-surface debris. Locks have the potential for sluices and submerged pumps and therefore associated entrapment hazards. Potential contamination exists from fuels, biological waste, litter and general commercial debris.

Hygiene and decontamination procedures should be put in place.

(Link to Contamination and biological hazards)

Watercraft

Service policy defined in the IRMP will determine if powered and / or non-powered watercraft are required. This will be determined by identification of need, role and risk assessment.

Boats and watercraft come in various designs, shapes, and sizes. Each will have certain advantages and disadvantages. FRSs should carefully consider their requirements and outcomes expected from their craft. The use of rescue craft should be seen as one element within a range of capabilities for dealing with water incidents. No single vessel can be suitable for all needs. No single vessel is perfect for every water and flood environment. Organisations providing water rescue **must** carefully

consider their anticipated working environments *before* selecting water craft, and ensure that their choices include whether or not the craft can be brought to the water's edge and launched, rather than just looking at on-water handling characteristics. Particularly in flood scenarios, it is highly unlikely that slipways will be accessible for launching and recovering vessels, and crews should expect that they will have to pick up and carry their water craft.

- The following should be considered:
- What will the boat be used for?
- How will it be transported?
- On what type of water will it be used?
- Where can it be launched?
- How many crew are needed to operate safely?

Powered and non-powered watercraft may be used for the following tasks:

- Rescue of casualties from water
- Unstable surfaces
- Rescues of stranded casualties
- Safety cover
- Searching
- To assist with animal rescue
- Evacuation
- Resupply of cut-off communities

Types of boat

Operational capability

Declared assets need to conform to the Defra team typing model of provision and training. Boat operators (coxswains) must be trained for the tasks and water conditions they will be expected to operate in. It might be necessary for a rescue boat to work beyond its specified operational limit. The following information must be provided to the boat operators:

- Identification of operational limits
- Possible consequences of operating beyond crew and watercraft capabilities
- Appropriate action to take to reduce risk to crew and survivors

Additional considerations may also include:

- Appropriate PPE for use with the type of watercraft
- Man overboard (MOB) prevention and what to do in the event of it occurring
- Capsize prevention and what to do in the event of it occurring
- Cold water entry
- Self-rescue swimming into the watercraft or onto shore
- Numbers of personnel in a vessel and task to be safely carried out
- Rescue techniques from the watercraft
- Tethered swims from a boat
- Casualty recovery/care
- Supporting and working with other rescue boats
- Body recovery
- Working with helicopters
- Basic vessel maintenance and repair to enable self-recovery if disabled

Night working

If crews are expected to work in low light conditions or darkness then training must be provided. The following should be considered:

- Suitable PPE (including personal lighting)
- Statutory navigation lighting requirements (IRPCS)
- Suitable long duration search lights
- Identify suitable areas of water to train on
- Reconnaissance of the water in daylight prior to night training. Launch and recovery sites should be illuminated but allow transition of night vision and not dazzle crews
- Obstacles and other water features and flow
- Other users
- Suitable communications
- Boats to work in pairs for safety cover where necessary
- Operate at a safe speed

Boat-based search

Boat-based operations may be the best method of conducting searches where it is difficult for personnel to operate.

The use of boats for searching at sea is well established. The International Aeronautical and Marine Search and Rescue (IAMSAR) Manual 2008 provides detailed information about the search planning methods and search tactics that can be used:

- Expanding square searches
- Parallel sweep searches
- Sector searches

In addition to standard search methods the following should be considered:

- Identify and search around the point last seen (PLS) or last known position (LKP) of the missing person
- Consider marking the PLS / LKP with a marker to assist with searcher orientation
- Consider environmental factors that will affect the position of a missing person or object:
- Water speed and direction
- Wind speed and drift
- Buoyancy (if an object sinks then tide/current will be the main influencing factors)
- Sanctuary points where people may try and swim to
- Review the area for the search operation in terms of access/egress, hazards and other operating related factors
- Ensure search crews have a method of recording what has/has not been searched
- Effective communication is required between search control and the searchers/search parties
- Tactics may have to be adjusted due to water conditions such as areas of underwater obstructions, strong current flows or heavy bank growth

Meeting statutory requirements

Responders should ensure that their boats comply with regulations in particular on navigable water and at night time. Rescue boats may be exempt in certain situations. When operating on waters

classified as sea, standard MCA requirement apply a code of practice for the safety of small workboats and pilot boats:

http://www.dft.gov.uk/mca/mcga07-home/shipsandcargoes/mcga-shiptype/mcga-pleasurecraftandsmallships/mcga-dqs-cvs-newsletter.htm)

International regulations for prevention of collisions at sea (IRPCS)

[Link to http://www.dft.gov.uk/mca/msn_1781-2.pdf]

SOLAS regulations

[Link to http://www.imo.org/about/conventions/listofconventions/pages/international-convention-for-the-safety-of-life-at-sea-(solas),-1974.aspx]

Categorisation of waters

The MCA categorises water not regarded as sea and use these categorisations to determine vessel specifications and operating requirements:

[Link to https://www.gov.uk/inland-waterways-and-categorisation-of-waters#safety-requirements-for-boats-to-operate-on-inland-waters]

The Code of Practice for open rescue boats of less than 15 metres in length (The Rescue Boat Code)

The Rescue Boat Code provides advice and guidance on safety management systems for selection, use and training for rescue boat operations. It provides a comprehensive reference resource which should be considered as useful guidance, even for organisations exempted from application of the code. The following craft are excluded from the provisions of the code:

- Declared all-weather life boats
- Flood water rescue and fast water rescue (swift water) vessels and other vessels used on non-navigable waters
- Rescue boards, canoes or any other non-mechanically powered floating device
- Workboats on a semi permanent patrol deployed in a rescue capacity

[Link to http://www.dft.gov.uk/mca/mcga07-ome/shipsandcargoes/consultations/mcga-consultations-archive/public_web]