Disaster and Emergency Management for Environmental Health Practitioners

A guide for environmental health practitioners in managing disasters and emergencies in Australian settings

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Foreword

Environmental Health Practitioners play an important role in protecting and supporting public health during emergencies and disasters in Australian settings.

Quite often, the work of Environmental Health Practitioners continues from response into the recovery efforts long after other response groups have completed their work and the spotlight is taken off dealing with the devastating effects of cyclones, floods, bushfires and other emergencies and disaster events on communities.

This guide is both an introduction and a refresher for Environmental Health Practitioners involved in disaster and emergency management machinations. As each event will be different in each Australian setting, this guide is in no way an exhaustive list of what to do.

This guide also provides prompts to other relevant references and Environmental Health Practitioners are urged to further explore documents relevant to the types of events likely to befall their own local setting(s).

I commend this document for use by Environmental Health Practitioners across Australia.

PROFESSOR BRENDAN MURPHY

Australian Government Chief Medical Officer
Chair, Australian Health Protection Principal Committee

Glossary of terms

Term	Definition
ADWG	Australian Drinking Water Guidelines
AEMC	Australian Emergency Management Committee
ARC	Australian Red Cross
AUSVETPLAN	Australian Veterinary Emergency Plan
COAG	Council of Australian Governments
Disaster command control centre	Central point for disaster response structure
Disaster coordinator	Person responsible for the response to a declared emergency or disaster. Title may depend upon jurisdiction and include incident controller and emergency coordinator
EH	Environmental Health
EHO	Environmental Health Officer
EHP	Environmental Health Practitioner includes EHOs and other people (scientists, engineers etc) who work in environmental health or public health
EM	Emergency management
EMA	Emergency Management Australia
ICRC	International Committee of the Red Cross
NGO	Non-governmental organisation
PPE	Personal protective equipment
PPRR	Prevention, preparedness, response and recovery - a way of classifying risk reduction options
SaWFISH	Safety, Water and Sanitation, Food safety, Insects, Shelter, Hygiene promotion and disease control
ULV	Ultra-Low Volume
WHS	Workplace Health and Safety
WWTP	Wastewater treatment plant

Introduction

With the frequency and magnitude of disasters intensifying, in part due to the impact of climate change, disasters such as bushfires, floods and cyclones are an increasingly major public health problem for Australia. The systems utilised for emergency management are also becoming progressively more complex, with greater emphasis upon planning and developing community resilience.

In this context environmental health (EH) plays a role in disaster and emergency management by being both strategic and practical, bringing together a multi-disciplinary skill set that is consistent with the preventative nature of the all hazards approach. Critical aspects of environmental health management during a disaster include the provision of safe drinking water, emergency sanitation, waste disposal, food safety, vector and pest control and the assessment of the risk of epidemics.

Although EH involvement is based upon the same principles applied to routine professional practice, in order to work effectively, environmental health practitioners (EHPs) need to be cognisant of emergency management systems. It is therefore essential that EHPs are equipped with the necessary skills and training to work in a disaster setting and have the ability to work cooperatively with other government and non-government agencies.

Providing a standardised and focussed approach is crucial for developing the capacity of EHPs in the field of disaster management. Structuring EH capacity around existing resources strengthens existing protocols and develops professionals with a transferable skill set with the expertise to support a response to any disaster.

Purpose

This guide is a resource that has been produced to assist a range of EHPs including Environmental Health Officers (EHOs); Directors and Managers of environmental health; environmental health technicians; environmental health scientists; and policy and support staff in planning for and responding to disasters and emergencies. Although it is impossible to cover all scenarios, the guide will enable EHPs to develop their skill set to engage with other professionals working in disaster planning and response.

EHPs with limited exposure to disaster management will find this guide useful in gaining an overview and appreciation of planning and response efforts. Conversely, disaster management planners using this guide will gain a better appreciation of EH and how this can be incorporated within systems and local planning.

The aim of this guide is to connect the fields of emergency management and environmental health; and provide a base line for EHPs in developing disaster response competencies. Users of this guide should be aware of the context in which they are likely to apply it. It is most relevant for responses to those events capable of being managed within local resource limits or supplemented by external resources to maintain the response. Although material presented is aimed at addressing disasters within an Australian setting, some information will also be helpful to personnel seeking to employ EH skills in an international context.

How to use this guide

The guide is presented under two broad headings:

- PART 1: Environmental health within the context of disaster and emergency management
- PART 2: Key operational areas for environmental health.

The first part of the document introduces common disaster and emergency management arrangements with a framework for including an EH response. The second part of the document builds upon the knowledge EHPs should have to provide contextualised information that is relevant to disaster and emergency management.

Both parts of the documents attempt to include information that is relevant at both the individual and organisational level to broaden the perspective of responders. Given the multidisciplinary nature of EH, users may find it valuable to consider this guide as one part of the tool kit available for developing disaster management capacity. Although technical knowledge is at times presented, the often fluid nature of disaster and emergency response requires responders to apply a systems approach.

Each section lists a number of key points to consider and concludes with a checklist. The checklist is not only relevant for disaster and emergency planning; these points are also intended to be thought-provoking and provide an insight into disaster preparedness. EHPs likely to become involved in disaster and emergency management can use the checklists for discussion and strengthening risk assessment.

EHPs are also encouraged to use the appendices at the end of this guide and tailor them to suit their own organisation and the specific event being managed.

PART 1: Environmental health within the context of disaster and emergency management

1 Disaster and emergency management arrangements in Australia

Key points

- **Disasters and emergencies are defined in legislation and are declared events.**

- **Initiating a disaster response is a conscious decision that involves specific personnel stages. Each State/Territory in Australia has a peak emergency management body for coordinating disaster efforts.**

- **EH disaster and emergency planning works best when integrated with established frameworks for counter disaster planning.**

1.1 Australian disaster and emergency management systems

Australia's emergency management arrangements are established through partnerships between the Australian, state and local governments.

The Australian Government is predominantly involved in emergency management through national policy work and funding.

Emergency Management Australia (EMA) is a division of the Australian Department of Home Affairs and delivers programs, policies and services that strengthen Australia's national security and emergency management capability. EMA is also home to the Australian Government Crisis Coordination Centre. The all-hazards, 24/7 centre provides whole-of-government situational awareness to inform national decision-making during a crisis.

State and territory governments manage emergency responses in their jurisdictions, while EMA coordinates the Australian Government physical and financial support for disasters and emergencies.

Upon formal request, the Australian Government may provide and coordinate physical assistance to the states in the event of a major natural, technological or civil defence emergency. Such physical assistance will be provided when state and territory resources are exhausted or unavailable.

The states and territories are recognised as having a crucial role in emergency management. In line with their constitutional responsibility, each jurisdiction has enacted legislation to define emergency management structures and funding. This also provides for formation of a state level emergency management body to coordinate planning and response activities.

State emergency legislation also typically defines how local government fulfils their emergency management obligations as far as ensuring that they have the necessary plans, structures and processes in place to effectively respond to a range of emergencies.

In the case of disasters of national significance, cross jurisdictional collaboration will usually be required. Cooperation between jurisdictions may be guided by formal standing agreements or assistance may be requested on an ad hoc basis when an emergency occurs. National bodies such as the Council of Australian Governments (COAG) and the Australian Emergency Management Committee (AEMC) help to support mutual aid arrangements between the states and territories and the Australian Government.

1.2 Declaration of a disaster or emergency

Disasters and emergencies are declared events with responsibilities and powers provided through state government legislation.

Although powers to declare are usually vested at the ministerial level, most states allow the police or hazard management agencies (as defined in each state) to determine this and trigger special emergency powers to be used to control the hazards in that area.

It is therefore important for EHPs to be familiar with the specific disaster management arrangements in their area of operation that describe when a declaration can be made and what powers can be enacted.

Understanding the distinction between the terms disasters and emergency becomes complicated because, although these may be defined as separate events, the two words are often used interchangeably. Legislation and management systems in some states recognises both terms whereas others may focus on the use of only one term.

The approach to declaring emergencies and disasters may also differ with some states incorporating a hierarchical response and other using a single trigger mechanism. For example, some states may utilise a 'state of alert' to proceed to a 'state of emergency' whereas other may recognise a single 'declaration of disaster'. The declaration of a disaster may also be confined to a geographical area.

Due to the variation in the speed of onset times, it is usual for agencies to incorporate a graded response into plans to pre-empt the likelihood of a disaster being declared.

This is usually coordinated through a dedicated disaster management agency, similar to the below in the following table.

Table 1 Declaration of a disaster or emergency

Step	Definition
Alert	There is a *possible* emergency, make final preparations
Stand By	The emergency is *imminent*, ensure resources are ready to be mobilised
Response	The emergency *exists* and a response is required, enact the emergency management plan
Stand Down	The emergency has *abated,* deactivate the plan and begin recovery activities

1.3 Prevention, preparedness, response and recovery model

Disaster and emergency management is comprised of four phases or stages: prevention, preparedness, response and recovery (PPRR). The four stages of PPRR can be defined as follows:

i.   **Prevention:** to eliminate or reduce the level of the risk or severity of emergencies.

It includes identifying hazards, assessing threats to the community and taking measures to reduce potential loss to life or property. Prevention measures may range from initiatives to build the resilience of communities to the construction of infrastructure such as sea walls or levee banks to prevent flooding

ii. **Preparedness:** to build the capacity of communities to cope with the consequences of emergencies.

It includes arrangements or plans to deal with an emergency or the effects of an emergency. Raising community awareness about the need to plan for disasters is a critical component of disaster preparation.

Onset periods for disaster events vary in time and therefore affect the ability to prepare beforehand. The seasonal nature of some disaster events such as cyclones or bushfires may allow for an enhanced state of readiness which may include updating contact details and placing key resources (including human resources) on standby. EHPs working in small or stand-alone units should consider the possibility that additional EH resources may be needed during these key periods.

iii. **Response:** to ensure the immediate consequences of emergencies for communities are minimised.

It includes the process of combating an emergency and providing immediate relief for persons affected by an emergency.

iv.   Recovery: to support individuals and communities affected by emergencies in reconstructing physical infrastructure and restoring physical, emotional, environmental and economic wellbeing.

The PPRR model aims to provide a comprehensive approach towards emergency planning by assessing the risks posed by each disaster management stage and selecting risk reduction measures for each.

Checklist

- **Is there a local/regional disaster planning committee?**

- **Do regional counter disaster plans specify the circumstances under which the plan can be activated?**

- **Do regional plans stipulate who has the authority to activate/deactivate the plan including nights, weekends and holidays?**

- **Have activation stages been established and roles outlined with each stage?**

- **Are there established emergency management plans covering geographical regions and/or disaster scenarios?**

- **Is the plan widely distributed and readily available throughout the service/region?**

- **Does the plan detail how it links with the local emergency management agencies?**

2   Operations during a disaster or emergency

Key points

- **Lines of reporting and communication can vary depending on the counter disaster structure and underline the need for EHPs to understand local plans.**

- **During non-disaster periods training is a key consideration for EHPs.**

- **It is important that risk management processes are in place for workplace health and safety issues.**

- **EHPs must be able to work with a wide range of groups including NGOs and the military.**

- **Disasters and traumatised communities require a high level of communication and management that necessitates all staff involved to be in regular contact with disaster coordination.**

Environmental health has an important role to play in all stages of disaster management ranging from prevention through to recovery.

Involvement should be proactive and EHPs should initially contribute to the development of their local or regional disaster and emergency management plans, as it is during this planning period that roles and responsibilities are negotiated and defined. Representation at regional and local counter disaster coordination meetings will help to highlight the importance of public health and the need for it to be considered within the context of emergency management plans.

EHPs are well equipped to conduct rapid needs assessments in the early response phase and identify any significant public health impacts of the disaster or emergency and possible mitigation strategies. As the transition to disaster or emergency recovery takes place, EH teams will need to work closely with the community and businesses to assist them to re-establish and operate in a way that minimises risk to public health.

2.1   Lines of reporting and communication

Disaster and emergency response frameworks in Australia are organised in structured command systems that report upwards to a single point of coordination (see Figure 1).

The highest point is the disaster coordinator who assumes overall responsibility for relief efforts in the disaster zone, including any requests for additional resources through disaster relief budgets. Under the disaster coordinator there are a number of functional groups which assist him/her to address core responsibilities. A public health group or similar is generally included as one of the functional groups.

The disaster command control centre coordinates group meetings to disseminate information to the functional groups and gain feedback from field operations.
It is common that outcomes of meetings and tasking of groups are captured in an online disaster management database.
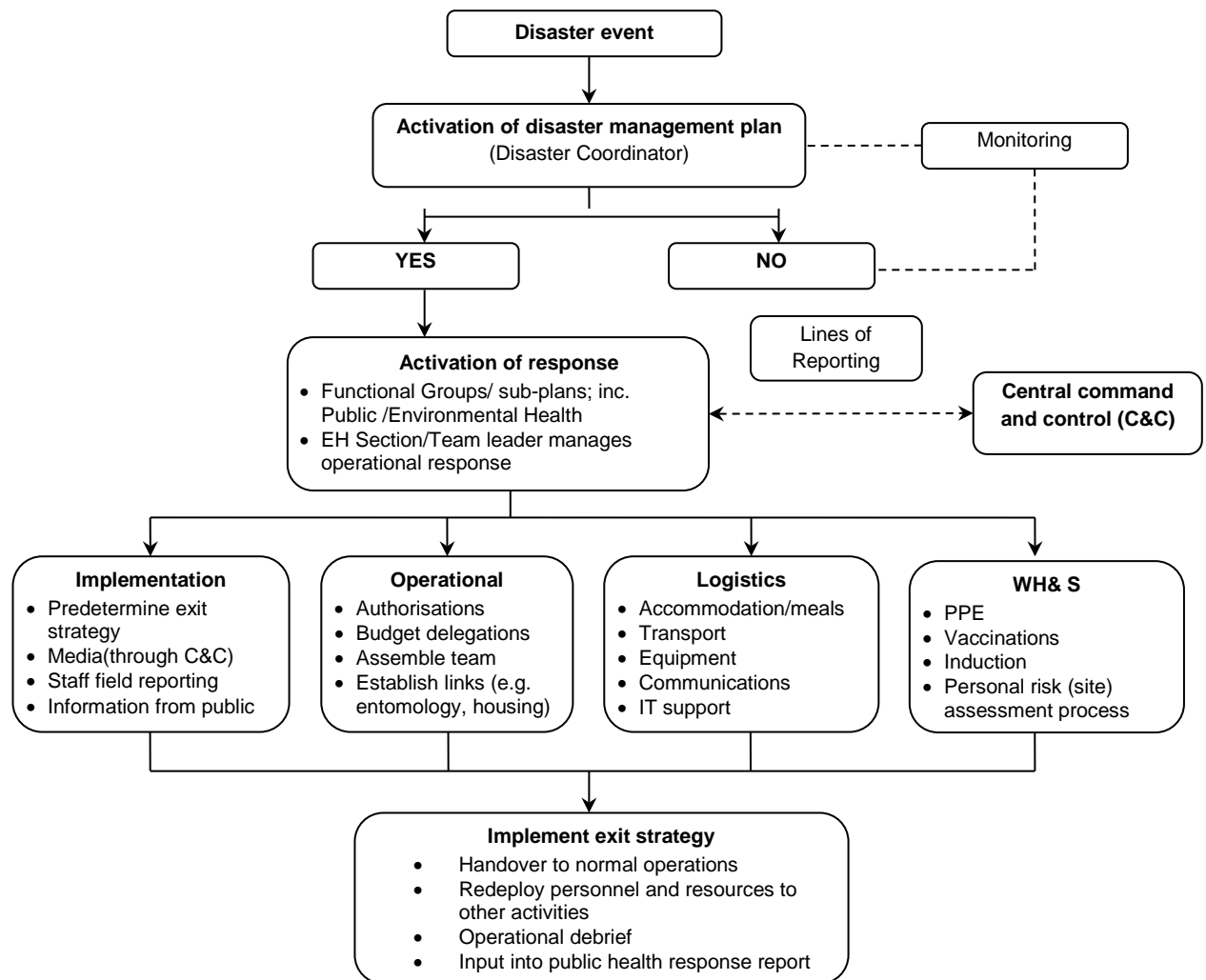
Figure 1 - Planning schedule of an environmental health response

The environmental health team will often be placed under a public health group. Under this arrangement EH team tasking will come from the disaster coordinator through the public health group leader to an EH section leader. Conversely EH field staff will direct assessments and requests through the public health group leader to the disaster coordinator. Regular staff meetings should be held to ensure that isolated teams are kept abreast of developments in other areas of the disaster zone.

2.2 Preparation and training of staff

Ideally EHPs who are expected to respond to disasters should have well developed skills, the necessary (and up to date) instrument of appointments (delegated authority by Council) and be experienced and confident in monitoring and enforcing the legislation they are required to administer. It also recommended that EHPs complete a recognised public health disaster and emergency management training

course. Such training will help EHPs to understand the emergency management framework in which they are expected to operate as well as helping to clarify roles and responsibilities.

Often overlooked, but possibly the most important point to consider is the profile of the individuals (personal characteristics and professional capacity) to be deployed into the disaster zone. Personnel working in a disaster situation will need to be able to operate effectively under stressful conditions, think on their feet and have adequate personal protective equipment (PPE). Staff will need to have the ability to both work independently and respond to instructions as necessary.

2.2.1 Environmental health support staff

In some situations, ancillary staff with specific skills may work with, or take on, some of the functions of EHPs. Ancillary staff includes environmental health workers located in indigenous communities, vector control officers and local by-laws officers.

Administration staff members who have been inducted in the disaster response process may assist with communications, logging tasks and logistical support. Organising the information collected by field staff for actioning through the central disaster control centre can be labour-intensive, and administrative staff can play an important role in managing data and ensuring records are maintained and kept up to date.

2.3 Undertaking rapid assessments

The period immediately following a disaster usually involves rapid utilisation of resources to assess damage and determine the risk of situations further deteriorating. Experienced environmental health staff may undertake assessments as a part of multi-disciplinary teams with specialists in related professions, such as infrastructure, health and social welfare. A field assessment requires information to be collected in a timely manner so as to determine priority areas and allow key public health issues to be actioned quickly.

To ensure that all necessary information is collected the scope of the assessment should be well defined and preferably collected using an agreed template negotiated in the disaster planning phase. An example of a rapid assessment form which may be modified for a range of disasters is provided in Appendix A (ICRC, the International Federation of Red Cross and the Red Crescent Societies are acknowledged for their original 'First 72 Hours' disaster assessment tool).

Checklist
- **Are rapid assessment tools available which can be quickly modified to meet the needs of evolving situations?**
- **Are hardcopies printed and available if internet connection or power supply is interrupted during disaster event?**

2.4 Workplace health and safety

The risks inherent in working in a disaster or emergency setting should be considered during the disaster/emergency planning stage as once an emergency or disaster has been declared there will be insufficient time to develop appropriate protocols and ensure that staff have appropriate PPE, immunisations and are adequately equipped to manage possible hazards.

Consideration should be given to the training needs of responders and the skills they are likely to require to work in a disaster setting (such as first aid accreditation, four wheel drive vehicle competency etc.). Likewise, it is good practice for responders to be competent with undertaking job safety analysis and personal risk assessments for both their own work and the direction of others. In addition to the normal Workplace Health and Safety (WHS) legislative requirements, persons in the disaster zone should be aware of stress indications and trauma indicators.

2.4.1 Managing stress

In addition to the normal WHS legislative requirements, persons working in a disaster or emergency setting should be aware of the physical, cognitive and emotional indications of stress and trauma such as:

- elevated blood pressure
- difficulty concentrating
- feeling overwhelmed.

During a disaster or emergency, the working and possibly also the living environment of staff may be arduous. It is therefore important that team members are of sound physical and mental health. Staff should be aware of the need to take care of themselves and ensure that they are eating healthily and having adequate sleep.

2.5 Working with other groups

The multi-disciplinary nature of EH work will require close cooperation with other groups involved in the disaster and emergency response. A range of community groups may be involved with aspects of the disaster response, and they may provide significant contribution to relief efforts. In large disasters this may include governmental and non-governmental groups, such as the Australian Red Cross (ARC) and Salvation Army.

2.5.1 Engaging with the Australian Defence Force

In some disaster response situations, particularly those that require a large amount of resources or immediate operational assets, the military may be called upon to

assist and provide support. The decision to deploy the military to a disaster zone will be made at the federal level.

In the event that the military is deployed, the disaster command and control centre will be responsible for coordinating all involved parties to ensure the limited resources are targeted at the immediate priority areas and that all command and control is filtered through a central location. The military is able to focus assets on the ground at short notice including mobile water treatment systems, field kitchens, evacuation centres and field hospitals.

2.5.2 Working with community groups and NGOs

Community volunteer groups and non-governmental organisations often play a significant part in any response and recovery operation such as helping to operate evacuation and emergency shelters, providing welfare assistance and counselling services.

Non-government organisations (NGOs) can have varying levels of integration with disaster management structures and may also offer their own services independent of the efforts of local, state, and federal government agencies. At times they may work outside of the official emergency response structure entirely and not coordinate their efforts with those of other organisations.

The level of involvement that EH will have with community groups will vary according to the type of activities NGOs are involved in and their level of integration with the disaster management structure. EHPs may find themselves working directly with NGOs, for example such as providing advice to operators of kitchens supplying food to emergency response personnel and displaced persons. In other situations, input may be required into services contracted with nongovernmental organisations that may not be available through public agencies, such as waste management services.

2.6 Dealing with people affected by a disaster or emergency

During the early stages of a disaster, EHPs will be required to deal with a wide range of people who have been affected by the emergency, be it within an evacuation setting or during an inspection of affected properties.

It should be expected that people's response to a disaster or emergency will vary. Some people may be upset, others frustrated or even angry. It is important that EHPs behave professionally at all times and communicate respectfully and sensitively with people being mindful of the impact of the disaster on the lives and livelihoods of community members.

Some general considerations for EHPs when communicating in a disaster include:

- only provide or send necessary, relevant information
- keep information consistent, accurate, short and sharp
- use clear language and uncomplicated sentences
- use positive or value-neutral language wherever possible, e.g. use 'survivor' or 'affected person' rather than 'victim'

- provide information in various formats, including printed material that people can read later
- repeat information frequently
- ask people if they want regular communication times (such as group email updates or regular community meetings)
- Should people want more information, provide a contact point (website, hotline, contact details) rather than provide too much information at the one time.

2.7 Contract management

The EH response to a disaster or emergency may often extend beyond provision of advice and fulfilment of statutory obligations. It may include direct procurement and management of resources required for vector control, waste management and water sampling. This is a complex area that ideally should be considered within existing contract arrangements – as part of the disaster planning process.

If a situation arises that requires the provision of contract services, the advice of a contract and tendering service should be sought. Although declaration of emergencies and disasters may allow dispensation of some procurement processes, this cannot be guaranteed.

To avoid contract disputes, the requirements of direct procurement should be confirmed during pre-disaster planning.

2.8 Media

All disaster related media activity is managed by an information management functional group or similar and approved by the disaster coordinator.

Should the EH team need to provide input into media releases, the public health group leader should advise the disaster coordinator, who would then liaise with information management group leader.

EHPs should never make statements directly to the media in response to any queries related to professional matters.

To facilitate rapid dissemination of public health messages through the media, it is sound practice to develop standard media releases which can be quickly tailored to the specific disaster event. An example of this would be advice to the public in relation to boiling water, where water quality may have been compromised, or handling and cooking of potentially hazardous foodstuffs in areas that have experienced electrical power outages.

Government websites and social media channels such as Facebook and Twitter are also an excellent means of communicating with the public. However sufficient resources need to be available to ensure that information is both accurate and regularly updated.

Checklist

- **Is there currently a collaborative relationship with local emergency management agencies and EHPs?**
- **Is there EH representation on the Local, District and/or Regional Emergency Management Committee?**
- **Is there a regional level public health disaster (sub)-plan? Is the plan tested and updated regularly?**
- **Does the plan detail the EH response for both internal (local) and external (cross jurisdiction) disasters?**
- **Does the public health plan provide clear direction on what powers are available during a disaster and are these linked to standard operating procedures?**
- **Does the public health plan include methods for ramp up and impromptu training for new and altered roles?**
- **Is there recognised ongoing, mandatory disaster management training available for EH staff?**
- **Is it clear who is responsible for providing disaster management training?**
- **Is disaster education material available at staff orientation to facilitate staff awareness?**
- **Is there ongoing disaster education to facilitate staff awareness and currency of procedures?**
- **Does the regional public health program have inter-organisation joint training sessions that deal with common aspects of disaster response?**

3   Returning to Regular Operations

Key points

- **An exit strategy is a defined step in a disaster response that provides a mechanism for activities to return to routine operation.**

- **Debriefings and evaluation of EH inputs are the basis of improving response to future disasters.**

3.1   Environmental health exit strategy

Although the cessation of disaster relief activities may not be consistent across all areas, in time there will be a transition back to normal operational arrangements.

One of the most important considerations is an exit strategy which will ensure a clear relationship exists between how external staff are involved in the disaster and provide a pathway to transfer operations to local staff. Exit strategies are also an essential component for consideration during disaster activation, especially if additional resources are brought into the disaster zone.

An exit strategy should be agreed with the disaster coordinator and should be a clear signal to participating groups that involvement can be scaled back to normal operational levels.

There will be less need for intensive environmental health support once essential services have been reinstated; evacuation centres have been closed; and the need for public health information and advice has declined.

The release of specific disaster funding can also facilitate engagement of the private sector that can offer environmental health services. This might include, for example, third party food auditors or independent vector-borne disease advice from experts.

3.2   Debriefing

Every disaster or emergency response, whether large or small, should include some form of debriefing process which should include aspects related to operational performance and individual psychological impact.

The inclination at the end of a disaster or emergency response is to move resources rapidly back to their normal field of operation. As a result the opportunity to learn and document valuable lessons from the experience may be lost. For this reason, operational debriefings to allow staff to feedback on the disaster response should be undertaken as quickly as possible after the deactivation of the EM plan.

Severe disasters or emergencies may expose personnel to traumatic situations and this should be identified early on so assistance for officers involved people can be arranged. This may be achieved through various employee assistance programs.

Where possible, facilitators who are independent of the organisation and the disaster itself should be utilised to maintain a neutral perspective. The lessons learnt from the operational debrief should be documented and the results of these circulated to relevant people. It is crucial that lessons learnt from a disaster or emergency are taken into account when undertaking future disaster or emergency planning.

3.3   Evaluation of environmental health input

After an emergency management plan is deactivated, it is usual for a report to be prepared outlining what action was taken.

For large disaster or emergency responses, a general report is likely to be prepared with functional groups including public health contributing to the document. The EH response may also be detailed separately. The report should reflect the continual improvement process and provide feedback in order to improve subsequent disaster/emergency responses.

Reports should include:

- the nature and extent of the incident, including the impact on the local community (such as loss of infrastructure – water supply, power, sewerage system, refuse disposal, food spoilage etc.)
- the nature of the involvement of the EH team
- breakdown of expenditure indicating recipients of funding and usage of such
- an inventory of resources that require replacement to enable a future response
- lessons learnt from the activation of the EM plan.

Checklist

- **Is the process of deactivating the disaster/emergency plan defined and strategies in place for transitioning efforts from response to regular operations?**

- **Does the EH sub-plan address the following?**

  - **Critical incident stress debriefing program**

  - **Employee assistance program**

  - **Group/individual counselling services**

  - **Family support program**

- **Is it clear who or which organisation will be responsible for evaluation of the response?**

PART 2: Key operational areas of environmental health

The multidisciplinary nature of environmental health can be daunting when faced with the amount of specialised knowledge available for each operational area. Accordingly, when considering level of involvement, EHPs should make decisions based upon risk to public health and their obligations to meet legislative requirements.

The essential aspects of environmental health disaster and emergency management can be summarised within the **SaWFISH** framework. This acronym captures a number of interrelated areas EHPs are likely to encounter working in a disaster management scenario and stands for the following:

- **Sa** Safety (community)
- **W** Water and sanitation
- **F** Food safety
- **I** Insects
- **S** Shelter
- **H** Hygiene promotion and disease control.

The concept of SaWFISH groups these areas together to encourage EHPs to consider the greatest potential impacts upon public health within a holistic context.

Community safety and hygiene promotion are central to all areas of operation and encapsulates the preventative nature of EH.

Table 2 – SaWFISH Framework

Symbol	Key Word	Description	Operational area of documents
Sa	**Sa**fety	Safety of communities – public health advice to be considered in broader context of risk	**Section 4** Safety (community level)
W	**W**ater and sanitation	Ensure that an adequate supply of water is available that meets minimum standards. Ability to safely dispose of human waste, dead stock and animals and ensure that critical community infrastructure poses minimal risk to public health	**Section 5** Water supply **Section 6** Human waste disposal **Section 7** Solid waste management **Section 8** Disposal of dead stock/animals **Section 9** Premises of public health significance
F	**F**ood safety	Providing advice and ensuring minimum standards are met for food quality and security	**Section 10** Food supply and distribution

I	**I**nsects	Vector control and pest management	**Section 11** Insects (vector and vermin control)
S	**S**helter	Minimum accommodation standards for affected people	**Section 12** Evacuation and emergency Shelter **Section 13** Re-establishment of housing and communities
H	**H**ygiene promotion and disease control	Appropriate public health messaging Ensure that groups responsible for managing other aspects of disaster and emergency management understand public health consequences	**Section 17** Control of communicable disease **Section 18** Deceased persons **Section 19** Hygiene promotion

Safety (community level)

Key points

- **Disasters can produce situations that require hazard assessment and contingency planning additional to operational planning to minimise risk to the community.**

- **A hazard analysis can provide objective information to decision-makers to guide prevention, mitigation and response.**

The level of EH input provided during the response and recovery phase of a disaster or emergency should be based upon an evaluation of the 'all-hazards' approach and risk of these occurring, and consequence to community safety.

Contrary to the common belief that all-hazards means planning for every possible eventuality, the simple fact is that this is impossible. No organisation or jurisdiction has sufficient resources to do this, even if it were possible to foresee every hazard. Instead of wasting limited resources on all possible hazards, this approach is rather founded in risk analysis and focuses on community vulnerability to specific hazards. This allows planning resources to be dedicated to those risks (not hazards) that are most likely to affect the community.

Essentially the risk analysis approach provides a process for EHPs to focus their efforts to ensure differentiation between a public health incident and disaster or emergency management response. Likewise, the concept of safety and hazard analysis should receive particular emphasis where normal operating standards cannot be achieved and alternative measures are necessary to protect public health. For this reason, assessing community safety during a disaster is a major priority, not just for resource management but to ensure that the highest risks are prioritised accordingly.

3.4 Hazard Analysis

Hazard analysis is a valuable tool that involves identifying potential hazards and determining the most effective treatment method. The generally accepted measures of treating hazards, in order of preference, are eliminating the hazard; containing the hazard; or reducing exposure. As part of the disaster planning process a number of hazards will have been identified along with possible strategies to avoid or mitigate their effect. As a disaster evolves, other hazards may become apparent requiring further evaluation and treatment.

3.5 Asbestos

A common hazard following many types of disaster, particularly bushfires, is that of the public being exposed to friable asbestos. In areas where the presence of asbestos containing material in the community is likely to pose a significant risk to public health and safety, sub plans may have been adopted detailing the specific arrangements for the coordinated management of asbestos debris during and following an emergency. In relation to hazardous materials such as asbestos it is important that EHPs have a good understanding of the potential risks to public health, how they may be mitigated and what licenced waste facilities are in the area to accept both minor and significant amounts of asbestos waste.

The safe removal and disposal of asbestos from a damaged property is a critical action. EHPs may be requested to provide advice to affected communities on actions to be taken to remove asbestos safely. States and Territories may have requirements for a building or demolition licences to be obtained. Some jurisdictions have detailed fact sheets and guidelines on how asbestos can be safely removed, as well as the Australian Government Asbestos Safety and Eradication Agency. EHPs should check directly with State and Territory authorities on asbestos removal requirements and additional asbestos awareness information.

Checklist

- **Is contingency planning a part of developing local disaster or emergency management plans?**

- **Are EHPs trained in hazard analysis techniques or familiar with similar processes from occupational health and safety training?**

- **Check Australian Government Asbestos Safety and Eradication Agency and State and Territory fact sheets and guidelines for safe removal of asbestos.**

4 Water supply

The primary aim of a public health response involving water supplies, following a disaster or emergency, is to ensure that a sufficient and safe quantity of potable water is available to the community. The level of involvement by EHPs in water supply management may vary and is likely to focus upon activities that mitigate risk or respond to water quality failures, including:

- undertaking assessments of water supply safety
- determining whether a public health intervention is required to be implemented for a community water supply
- organising or monitoring of water supply quality and safety
- providing input into securing and monitoring alternative water supplies
- issuing public advice in response to water quality issues.

4.1 Assessing water supply safety

Water supply assessment involves determining whether the quality of the water supply poses an unacceptable risk to public health.

This process can be complex and it is therefore useful to distinguish between:

- the scale of the water distribution system (such as urban reticulated supplies and small-scale individual supplies)
- complexity of treatment processes
- arrangements for management, maintenance, and protection.

The level of EH involvement will likely depend on these factors, particularly if these impact upon the integrity of the water supply. For complex water supplies or large distribution networks, EHP contribution is more likely to be involved with strategies aimed at safeguarding public health rather than management of water supply.

The NHMRC Australian Drinking Water Guidelines (ADWG) provide guidance as to bacteriological, physical and chemical condition of water considered appropriate for human consumption. The ADWG outlines that the greatest risks to consumers of drinking water are pathogenic microorganisms and therefore protection of water sources and treatment must not be compromised in this regard.

Although adherence to ADWG values should be sought wherever possible, there may be occasions where the normal supply is compromised and a viable alternative water supply cannot be sourced. In these situations the level of risk needs to be determined and may require the collaborative effort of health professionals and water engineers to determine the level of risk.

4.1.1 Sanitary survey of water supply

Should water supply safety be considered potentially compromised, then a sanitary survey may be useful for determining the level of risk.

The undertaking of a sanitary survey is more likely to be employed by EHPs involved with supplies providing drinking water to smaller communities and where the water supply relies upon supply and distribution technology that is consistent with their training.

It may be the case that the EHP is a part of team undertaking a sanitary survey and may be responsible for certain tasks such as organising water sampling or providing local knowledge rather than completing the survey in isolation.

The two principal activities involved are:

i. sanitary inspection
ii. water quality analysis.

These are complementary activities. Inspection identifies potential hazards, while analysis indicates whether contamination is occurring.

4.1.2 Private water supplies

Private water supplies are generally located in remote or rural areas to service businesses or facilities (such as a mining camps, resorts or caravan parks etc.).

Although ground water supplies from bores are the most common source for private water supplies in Australia, surface water bodies such as rivers or dams may also be used. In some cases shallow bores or spears are utilised to access water where there is a high water table overlain with a porous medium (such as sand). Rainwater tanks are also common in domestic settings.

Private water supplies may be affected by a disaster or emergency, such as floodwaters inundating the bore head or surface water body, the inability to operate equipment such as pumps and UV disinfection because of loss of electrical supply, or potential contamination by fire retardants.

Header and ground tanks and associated pipes and fittings are vulnerable to damage caused by a range of disasters including cyclones, earthquakes and bushfires.

Water supplies can also be polluted by sewage, seepage from septic tanks, animal and bird faeces, intensive farming practices (fertiliser, manure and pesticide), blue-green algae and industrial waste. These conditions can occur in the absence of a

disaster or emergency event; however the nature of these incidents can rapidly exacerbate conditions beyond design capacity.

EH involvement in private water supplies will depend upon local legislation. Where drinking water quality cannot be guaranteed, an alternative source must be made available (such as packaged bottled water). Potable water must be used by commercial food premises for cleaning or cooking activities. The re-establishment of the water supply will affect when a food business will be safe to operate.

4.2   Public health intervention

In some situations, even if drinking water supply safety has been compromised, it might still be allowed to be utilised, providing safeguards are followed. In this event a public health advice must be issued regarding appropriate precautions to be taken for specific water supplies. Examples include the issuance of precautionary drinking water advice to boil water prior to drinking or to continue using water for household purposes other than for drinking purposes.

Information indicating that a water supply may be compromised can come from a number of sources including directly from the water provider or water quality laboratory. This could include advice that a water treatment plant is unable to sufficiently remove pathogens from source water; the water reticulation system has been compromised; or a water quality laboratory failure report has been received indicating contamination.

It may be necessary for the water provider to rectify the water supply system and undertake water testing before the precautionary advice can be cancelled. If not achieved, the precautionary advice should remain in place and remedial action continued until sampling results demonstrate drinking water quality is acceptable. See the ADWG for further guidance.

4.2.1   Water safety monitoring

In relation to water supply quality monitoring, the responsibilities of EHPs may include sampling supplies; organising testing; making reports; and providing direction on the basis of the results of a water test. In many cases, sampling of a municipal water supply may already be routinely undertaken by an EHP.

The logistical factors ensuring for example that microbiological samples can be transported and received by the water laboratory within 24 hours for testing should be considered within the risk planning process. The amount of time required to undertake sampling and to transport the samples to an appropriate laboratory may increase considerably if an alternative laboratory is further away or means of transport have been affected.

4.2.2   Alternative water supplies

An alternative water supply may be considered if the risk of continuing to use the reticulated water supply cannot meet acceptable health guidelines. In an Australian disaster management context, sourcing of an alternative municipal supply would be

through high-level disaster response management. In this context, the advice of an EHP may be sought, particularly where local knowledge, coupled with technical understanding, can assist with evaluation of alternatives.

In many short term scenarios it may be sufficient to provide a safe drinking water supply through intermediary measures such as packaged bottle water. However, in some situations water may need to be brought in. Water tankers may be obtained locally from commercial water delivery companies or appropriate industry such as dairies, breweries or bottling plants.

The role of the EHP in this scenario may include inspecting tankers and water producing facilities to determine their fitness and ensuring safety of water supply through monitoring of quality parameters such as residual chlorine levels at point of delivery.

4.2.3   Quantity of water

When designing a water supply emergency response, it is important to consider the quantity of water required.

There are a number of international standards (for example Sphere, United Nations High Commissioner for Refugees) which have set minimum quantity standards. However, these standards are concerned with the most basic requirements for sustaining lives and provide a starting reference for water needs.

It should be noted that in most situations in Australia there will be a greater demand for water during a disaster or emergency. See appendices for further information.

4.2.4   Securing water supplies

Where potable water may be limited, supplies should be identified and secured in the early stages of the disaster or emergency and distribution controlled.

Availability of this potable water may be crucial during the early stages for drinking and food preparation, rather than for cleaning. Water sources (including catchment areas) are typically assessed for various risks including contamination brought about by disasters through processes initiated by a water utility or group responsible for the water source. This should be considered within the disaster planning process and whether input is required by EHPs.

The impact of the disaster or emergency upon the ability to supply safe drinking water should be considered from a risk perspective rather than relying on verification or results of water testing.

4.3 Human waste disposal

Both onsite and centralised wastewater treatment systems can be affected in a disaster or emergency, either directly through damage to the system, or indirectly through loss of power to operate pumps and equipment or disruption of the water supply used to charge the system.

Hazards to onsite methods of treatment and/or disposal (such as bushfires, flood etc.), sewerage treatment plants (earthquake, flood, explosion etc.), and pumping

stations (flood, earthquake, fire, explosion etc.), as well as to the collection systems (e.g. earthquake, flooding etc.), should be taken into account during response, risk management and contingency planning. EH input towards alternative human waste disposal systems should be evaluated at the planning stage to determine how resources will be utilised. Onsite wastewater treatment systems pose particular problems, particularly where the disaster area has significant numbers of these that could be affected across a large area.

Although management of large wastewater infrastructure is an engineering role, disaster planning strategies for EH may include risk assessment of system failure and evaluation of capacity requirements to provide alternative means of wastewater disposal. In any case, if failure of a wastewater treatment system is likely to pose a public health hazard, a response should be considered through either public advice or providing direction to minimise the likelihood of the public coming into contact with wastewater.

4.3.1 Centralised wastewater disposal systems

Although the management of centralised wastewater systems is generally outside the role of most EHPs, involvement may still be required when responding to public health risks such as a ruptured sewer main. This includes knowing the extent of damage and the length of time wastewater collection services have been and/or will be disrupted.

Public health risk will be dependent upon the extent of damage to the system. There are situations when disruption to the waste water disposal system rapidly poses a risk in places such as hospitals, residential care, multi-level apartment buildings, emergency shelters and for people in transit.

Work to repair wastewater systems may continue for months following a major disaster (particularly an earthquake), and will involve the gradual restoration of services across a network and to restore damaged private connections (household and commercial). It is unlikely that EHPs will be directly involved with management of remedial work to a municipal wastewater collection and treatment system in a disaster response situation.

4.3.2 Onsite and decentralised wastewater disposal

A range of disasters may affect onsite wastewater treatment systems, for example a high water table associated with cyclones and flooding can limit the capacity to dispose of effluent and bushfires can burn above-ground fittings and structures. In cases where significant damage has occurred to onsite and septic wastewater disposal systems, securing or decommissioning of a system may be required to protect public health. EHPs may be required to provide practical advice to assist landholders or contractors to meet obligations.

EH involvement with onsite and decentralised wastewater disposal may vary according to local legislation. There may also be times when EHPs are directly involved with the management of some onsite wastewater treatment systems,

especially where these are being used as part of the relief effort (such as evacuation centres or hospitals). EHPs may also be required to assess the general condition of onsite methods of wastewater disposal systems located within the affected area.

The assessment will indicate the likely impact of the disaster or emergency upon wastewater services and should be upwardly reported through the disaster coordination centre. It may also determine whether it is appropriate for people to return to their properties and when premises (such as schools and government offices), which rely upon decentralised wastewater treatment, are fit to reopen. Although conventional onsite wastewater treatment systems may be straightforward, more complex systems such as packaged treatment plants may require EHPs to have experience and be familiar with the systems they are assessing.

4.3.3 Alternative system of collection and disposal

In some disasters, the provision of alternative ablution facilities may be required. This may include latrines, chemical toilets and pit toilets. Temporary facilities may also be required where short or long term temporary evacuation sites have been established. When temporary toilets are utilised, hand washing facilities such as soap, running water and paper towels must be provided.

Where an alternative system is utilised, the design will be dependent upon a range of factors, including the number of people using the system, the height of the water table and the surrounding terrain. Cultural factors may also need to be considered, such as providing separation between male and female facilities. The design and construction of pit toilets has been commonly used in remote situations, such as Indigenous communities. Dependent upon the situation, pit toilets should be employed before considering latrine systems.

If chemical or portable toilets are used, arrangements for the regular collection, storage and disposal of waste must be made. These facilities will also need regular cleaning. Chemical or portable toilets may be the only viable option for the disposal of human waste where the water table prevents the option of trenches or latrines.

Checklist

- **Is the role clear for EHPs responding to situations where there has been disruption to wastewater treatment services?**

- **Can information be quickly prepared that links with hygiene promotion as it relates to the risks from disruption of wastewater treatment services?**

- **Is technical capacity available to identify and provide solutions to risks from onsite wastewater management systems?**

- **Is there current information available of the locations and management of onsite wastewater treatment systems, particularly those utilised by premises of public health significance?**

- **Is there good local knowledge within the environmental health team of contractors and service provides for onsite wastewater treatment systems?**

- **Has the legal authority and delegations to enter and act on public health risks from wastewater been assured?**

5 Solid waste management

Key points

- **The waste management consideration for disaster and emergency planning can be significant and often contained in a dedicated sub-plan.**
- **The need for alternative landfill sites and transfer stations should be recognised during planning exercises.**
- **Waste management presents a number of risks to public health including fly breeding from putrescible waste and exposure to hazardous waste.**

The management of solid waste in the aftermath of a disaster or emergency may present various challenges, such as evaluating waste type and volumes, re-establishing collection routes and providing a positive psychological impact on an affected population. Although there may be a need undertake waste assessments or assist with waste management coordination, EHPs who directly manage waste collection or landfill management contracts are likely to have a greater involvement.

In the event of a disaster or emergency, assessment of waste management needs should begin early in the response phase to determine likely quantities and potential hazards. A systematic approach towards waste assessment and collection involving segregation of waste should be adopted. Maintaining good records of waste management actions is required to monitor contracts and recoup potential funding.

5.1 Emergency planning for solid waste management

Coordination of solid waste management services must be considered prior to a disaster or an emergency and included in the risk management planning process. As natural disasters can generate tremendous quantities of debris, communities should plan for the 'worst case scenario'.

The contractual and legislative framework governing waste management operations is extensive and also requires consideration in the planning process. Any plan should include a detailed strategy for:

- debris collection
- temporary storage/transfer areas
- hazardous waste identification and handling
- administration and dissemination of information to the public.

The waste management plan should also include strategies to mitigate the disruption that disasters cause to regular waste management services, such as collection of recyclable materials.

The preparation of a communication strategy should also be considered as part of the planning process and incorporated into a coordinated recovery communications strategy. Community members need to know when, where and how solid waste

collection will resume, as well as any special instructions for reporting and sorting disaster debris.

Disaster contingency planning should be considered when applying or reviewing landfill licences, as management practices are likely to be modified during a disaster response. If, for example, the need arises to stockpile waste on site, extend hours of landfill operation or modify vehicular access, the potential exposure of the landfill operator to breach licence conditions is minimised, if they were previously considered.

5.2   Segregation of waste

Many disasters, such as floods or cyclones, will produce large volumes of green waste and segregation should be considered to reduce excessive volumes of waste going to landfill. Large cyclones have produced as much green waste in a 24-hour period as may normally be produced over several years. Large volumes of debris have potential for reuse (for example as fill), but issues, such as the likelihood of asbestos-containing products, need to be considered.

A key planning decision for segregation is whether this should be undertaken at the source or at the landfill. Management decisions in relation to segregation of waste should be promoted through clear, simple and consistent messages to the public, taking into account the major means of waste collection.

5.3   Waste and debris collection

Waste collection issues during the response phase are not likely to remain constant. In the immediate aftermath, the overriding requirement may be for situation assessments and management of potential public health issues. As the response moves to the recovery phase it is more likely to include management of large volumes of putrescible matter and green waste.

Following severe disasters the removal of putrescible matter and debris from private properties may be required for public health protection. EHPs must be familiar with legislative responsibility when entering private properties including any provision for special powers under declared emergencies or disasters.

Most states and territories have enacted public health legislation which contains emergency powers to authorise officers, usually Environmental Health Officers (EHO), to enter or instruct contractors to enter properties. However, the use of these powers should have the agreement of senior management as entering private properties has the potential to generate a high level of publicity.

The scope of waste removal also requires consideration as debris from damaged structures usually contains reclaimable property, valuables, and mementos of disaster affected people.

5.4 Waste transfer sites

A useful strategy, in preparing for a disaster that potentially produces a large quantity of debris or green waste, is to predetermine debris collection sites for temporary storage and processing. Convenient local sites allow collection crews to reduce travel time when transferring debris to processing or disposal facilities and result in faster street clearing. Site operators can sort debris for recycling or disposal, as well as answer questions from the public.

These sites can be used to store green waste before transferring it to another facility to chip and mulch green waste on site and to distribute mulch or wood to the public. If residents will be asked to transport debris to collection sites, these sites should be included in a disaster communication strategy. Schedules and staffing plans for these sites should reflect the busiest times for residents dropping off household debris (likely to be evenings and weekends).

State or territory environmental agencies may also regulate the opening of a transfer site and impose operating restrictions. Proximity to nearby residents; hours of operation; generation and disposal of leachate; perimeter fencing; characteristics of the waste to be accepted; and road access, all need to be considered in the planning phase and approval may need to be sought from the regulating agency.

5.5 Alternative landfill sites

Following major disasters, established disposal sites might be inaccessible or unusable for a prolonged period and new sites may have to be established. A provision for modification of the existing landfill or a contingency plan to utilise an alternative landfill is an integral part of the risk management process. However, environmental and town planning legislative requirements may result in regulatory hurdles to the establishment of new landfills.

Establishing a landfill during a disaster response phase without prior consideration is problematic, as it could expose the landfill operator or local government to unacceptable levels of risk of producing environmental harm or public concern.

5.6 Modified existing landfill sites

Where possible, modification or addition to existing sites is preferable to opening new landfills. EHPs responsible for landfill management should be aware of the operational specifications, licence conditions and site management plans of landfills in the disaster area. Well-managed landfills can generally operate with a degree of flexibility in many disaster response scenarios with regulatory approval.

Large, centralised landfills are more likely to have established risk management planning practices and may offer greater flexibility. The majority of landfills have existing solid waste management plans approved by State Government Environmental Protection Authorities or their equivalent. Where the solid waste management plan already covers practices and policies to be applied in disaster situations, it may not be necessary to repeat this process in the regional plan.

5.7   Solid waste contract management

Operational specifications, licence conditions and management plans are key tools for consideration in contractual operation extensions and agreements with service providers. The inclusion of flexible provisions within waste management contracts for secondment of machinery and equipment in disaster response situations is important. The additional cost of managing waste produced by a disaster event can be considerable.

Operational performance of contractors and landfill activities needs to be monitored to determine the actual cost of work undertaken. To allow for additional waste management costs, state and Commonwealth reimbursement policies for disaster waste management should be well understood.

EHPs should ensure that the disaster or emergency response strategy meets the terms described in these to allow the financial cost of the disaster response to be met. Recording requirements for disaster debris management (as well as the additional staffing needs required to meet these) should be discussed with the state emergency planning agency.

Any assistance that cannot be provided directly through existing contracts will need to be obtained through establishment of additional contracts. If this seems likely and will need considerable funding, consider an emergency contract for resource intensive activities such as mulching of green waste. Other contract areas that may require extension include management of debris collection, storage, sorting, processing, marketing and disposal.

5.8   Hazardous waste

EHPs may be required to provide input into the handling, storage and disposal procedures for hazardous waste. This will be easier to undertake if the characteristics of the waste are already known through labelling of containers and information supplied by the generator.

The legislative implications of transporting, storing and disposing of hazardous and regulated waste are considerable. Waste shipments that cannot meet landfill licensing requirements should not be accepted. The transportation and storage of hazardous wastes in compliance with the *Australian Dangerous Goods Code* (ADG) can also be particularly problematic in a disaster response situation.

Development of a risk management strategy for handling and disposing of regulated wastes during a disaster response may be appropriate and should involve representatives from state environmental agencies. Referral to a hazardous waste management specialist may be required depending on the situation, quantity and nature of the waste. Some jurisdictions have provision for special powers in the aftermath of disasters that have been exercised for disposal of some hazardous waste. Although this may be a temporary solution, it may be possible to explore this through state level agencies.

Checklist

- **Is there a sub-plan developed for municipal waste management services?**

- **Have risk management processes been included in the planning process and included likely waste and debris types, forecasting amounts of waste and debris and pre-selecting temporary waste and debris storage sites?**

- **Have temporary waste sites been risk-assessed for prior regulatory approval including hours of operation and potential legacy issues?**

- **Is there a debris removal strategy for residential and industrial areas?**

- **Is financial capacity available to offset contractual waste management services, where employed?**

- **Have potential sources of hazardous materials been recognised and prepared a hazardous waste management strategy?**

- **Is there an inventory available of current capacity for waste and debris management and determining waste and debris tracking mechanisms?**

- **Are waste management collection and disposal contracts pre-negotiated to include provisions for rapid up-scaling for disaster response?**

- **Have the needs for domestic and commercial waste collection been considered, including sourcing waste collection receptacles and collection vehicles?**

6   Disposal of dead stock/animals

> **Key points**
> - **Disposal of large numbers of dead animals is often undertaken through a collaborative arrangement with agriculture or environmental departments and local governments.**
> - **The level of EH involvement will vary according to the situation.**
> - **Consideration should be given to the resource requirements to ensure rapid disposal of carcases without adversely affecting the environment or community.**

The primary objective of disposal of carcases, animal products and wastes is to prevent the dissemination of pathogens associated with notifiable or zoonotic diseases. More specifically, the EH objectives are to assist in rapid disposal of carcases without adversely affecting the environment or community and to minimise the risk of disease transmission to human populations and other animals.

Natural disasters or an emergency animal disease outbreak are potential causative factors for large scale disposal of carcases, however the degree of EH involvement will vary according to the type and severity of the situation.

6.1   Management and resource issues of carcass disposal

Disposal of carcases generally becomes an EH priority if the procedure is in close proximity to drinking water catchments, reservoirs or populated areas and if odour, noise, vibration and/or dust management is required.

Disposal of carcases may include production animals in rural areas and companion animals in urban settings or a combination. If carcases cannot be transported to appropriate disposal facilities, burial is often the preferred method. In some cases, incineration may be required. Where EHPs find themselves being more heavily involved in the management of stock disposal, consideration must be given to the resource requirements.

Disposal of carcases is generally the responsibility of local government or the owner/s of the animals however in the event of an emergency animal disease response, the relevant Australian Veterinary Emergency Plan (AUSVETPLAN) must be consulted to identify appropriate management procedures, execute the appropriate disposal method and establish appropriate buffer zones.

Specific requirements may vary depending on the nature of the emergency. AUSVETPLAN is a collaborative arrangement between national, state and local government levels, as well as animal health authorities, livestock industries and emergency management organisations.

Checklist

- **Consider differences in environmental concerns and resource requirements when dealing with disposal management in rural and urban areas.**

- **Consider the general topographical, geological and hydrological characteristics as well as previous uses of the area.**

- **What waste minimisation and management plans apply to disposal of animals?**

- **What are the biohazards posed by the disease organism; and what measures can be used to inactivate these agents?**

- **Can EHPs identify the risks to the local ecosystem or other wildlife, including aquatic life?**

- **Is any legacy of the disposal likely to have an impact on future sustainable use of the area?**

7   Premises of environmental health significance

> **Key points**
>
> - **EHPs must be able to prioritise and be involved with monitoring and surveillance of premises which represent the greatest public health risk post-disaster.**
> - **Business owners will be seeking guidance from EHPs in order to re-establish their business as quickly and as safely as possible.**
> - **To ensure public safety it may be necessary to restrict the operations of a business until the public health premises has been re-established.**

Inspection of registered premises is a core EH activity that can take on particular significance following a disaster. Earthquakes, floods and bushfires can cause structural damage and may also disrupt the support services that operators rely on to maintain hygienic conditions.

The type of premises that EHPs assess in a post-disaster situation vary and may include the following:

- commercial food premises
- hairdressers/beauty salons and commercial skin penetration (tattooists)
- boarding houses/hotels/motels/backpackers
- caravan parks
- childcare centres
- nursing homes/aged care facilities
- public buildings (especially toilet facilities)
- public swimming pools
- pharmacies
- cooling towers
- chemical storage facilities.

7.1   Determining the impact on premises

EH should generate reports covering the inspection of these licensed premises in the disaster affected area. This information can then be used to determine which premises are fit to reopen and under what conditions. In many cases, premises will need to be inspected as soon as possible to determine the level of impact and the likelihood of their being able to continue to operate. If the number of premises located in the disaster zone is large, or EH resources are limited a coordination plan with other EH services may need to be considered with premises of greatest health risk being inspected first. The results of inspections should be centrally coordinated and upwardly reported through the disaster coordination centre. This will enable any specific problems that require actioning to be effectively coordinated. A general report of the condition of premises in the disaster zone outlining the number of premises affected, severity of impact and nature of public health related risks, may be requested by the coordination centre.

7.2 Suspending operation of premises

If a disaster has affected or damaged registered premises, these may require inspecting as to determine the level of impact and the likelihood of continuing to operate. If a premises is unable to operate without posing an unacceptable risk to public health, a closure plan may be required.

State level counter-disaster legislation in Australia often has broad-reaching powers that may allow for the suspension of businesses in the disaster zone. This may be considered singularly or as a blanket suspension in some cases – for example, where a flood has impaired the ability of all food premises to operate in a defined area. Such decisions should be made from a senior level of disaster coordination, but should be reliant upon the input of EH into the decision-making process.

The decision to prevent a business from opening until approval is given should be handled sensitively, even if the need to suspend trade is apparent to the operator. Circulation of educational material that includes specific advice to operators should be part of the initial process.

Checklist

- **Is there an up to date register available of premises of public health significance?**

- **Does the register contain details for contacting owners and operators of each premises?**

- **Is the register available in a format that is secure and accessible remotely?**

- **Can vulnerable populations be identified and assessment of premises prioritised accordingly?**

- **Is information prepared for ready distribution to owners and operators of premises?**

8   Food supply and distribution

> **Key points**
> - **Depending on resources (premises that store perishable foods) should be targeted to determine if the safety/integrity of foodstuffs has been maintained.**
> - **In a disaster situation it is necessary to reinforce that food handlers should have the necessary skills and knowledge to safely prepare food.**
> - **Donation of food from the public should be controlled and only appropriate donations accepted, for example shelf stable non-hazardous foods.**
> - **Food that is donated but unable to be accepted or used should be handled sensitively.**

A large impact disaster or emergency may produce conditions that restrict access to food supplies through disruption to the commercial food supply and distribution network.

In an Australian setting, the most common impact upon food delivery has been short term disruption of food transportation, storage and retail systems, although major disasters may also disrupt food production. The public health consequence in these situations is that shortages can be further exacerbated if food cannot be consumed because appropriate storage and handling techniques have not been observed.

8.1   Food distribution

It is unlikely EHPs will take a lead role in the distribution of food and are more likely to contribute to the process by working with other groups. The role that EHPs may commonly play in a disaster setting will be to ensure that conditions are maintained that promote food that is safe for human consumption.

This may include:

- assessing donated foodstuffs
- application of minimum standards for the transportation of food
- surveying commercial food storage areas and processors
- identifying potential contamination problems
- providing basic food hygiene education.

Specific input may be required on matters related to food storage and handling, including making decisions about fitness for consumption based on a range of food safety criteria including labelling, temperature control and risk of contamination.

8.2   Assessment of premises

Assessment of premises will usually involve making a decision on the suitability to continue to process, store or assist with distribution of foodstuffs and is likely to include recommendations in relation to safe handling and storage practices.

Often assessments will be an extension of a routine food inspection or audit and could require that operators have emergency response provisions in place, such as monitoring temperatures of potentially hazardous foodstuffs in their documentation.

EHPs should also consider and be given clear direction of their role in assessing premises during a disaster or emergency. If serious breaches of food safety standards are observed, EHPs will be required to focus upon risks brought about by the disaster and consider utilising legislative powers.

Common to many disasters or emergencies, is an assessment of the storage conditions of potentially hazardous food storage, including whether use of backup power provides compliance with food safety standards. However the risks associated with disasters may be specific and involve EHPs to undertake a risk assessment and tailor assessment to meet prevailing conditions.

If resources are limited, premises that store or process perishable foods should be targeted to determine if the safety/integrity of foodstuffs has been maintained. Directions may need to be given to operators of these premises to undertake work or carry out certain actions and this can be given under the existing legislative framework.

8.3 Donated food

The need to provide food supplies for people located in an affected area may prompt some groups or individuals to donate food to assist people directly affected by the disaster or emergency.

Although EHPs will need to be vigilant about the quality of food distributed, the genuine desire for people to help others in need should be recognised. If food is not fit for distribution, its disposal should be handled sensitively. Donated food is acceptable provided that it is fully fit for human consumption.

Establishing a central collection point will assist with evaluation and distribution of donated foods. If there are any conditions around what food will be accepted at the collection point, these should be conveyed to people prior to arrival. Such conditions might include not being able to accept any food that requires refrigeration or prohibiting alcoholic beverages.

In some cases there may be a need to make use of the media to inform people about these conditions, or to contact businesses directly prior to delivery. Signage outlining any conditions should be placed at the entrance to the collection point.

Checklist
- **Are there records of donated foods kept at by receiving depots?**
- **Do food premises have documentation in place to cover management of risk in the event that operations are disrupted?**
- **Is information prepared for ready distribution to food handlers?**

9 Insects (vector and vermin control)

Key points

- **Outbreaks of vector-borne disease following disasters in Australia may have the potential to occur and risk-based strategies should be based on vector proliferation.**

- **Mosquito control is a technical field that requires special consideration for areas with risk potential for mosquito breeding.**

- **Fly breeding requires proactive management of areas with large quantities of putrescible waste.**

9.1 Preparedness

The primary goal of vector control is to establish proactive management strategies that will help to prevent potential disease outbreaks from occurring.

Although State Health agencies collate data on notifiable mosquito-borne diseases, it is not appropriate to wait for epidemiological reports to be generated before implementing disaster management strategies. Consequently, developing knowledge of local disease vectors and their breeding sites prior to a disaster event is essential. Implementing a vector control program without any prior planning in a disaster response will be difficult.

Many government authorities, particularly those in coastal areas, have established programs for vector control. These services generally utilise integrated control techniques and should be incorporated into disaster response plans and evaluated within the risk management process. Local governments may need to liaise with state level agencies and disaster management teams to organise contingency support and to discuss equipment and insecticide requirements.

9.2 Mosquito control management

Vector control groups should ensure they have detailed maps indicating potential mosquito breeding sites and accurate surveillance data, together with appropriate chemicals and insecticide application equipment. For example, mosquito breeding sites identified during previous disasters should be highlighted as these may not be part of routine surveillance and control programs.

Equipment commonly used for vector control includes:

- handheld or backpack sprayers for the application of liquid larvicides to ground pools where mosquito larvae breed
- residual barrier sprays to surfaces such as house walls, fences and vegetation around houses and emergency accommodation
- use of Ultra Low Volume (ULV) or thermal foggers, designed to produce aerosols, such as mists and fogs, used for adult mosquito control
- granular spreaders, used to apply granular and pellet forms of larvicides.

Each of these types of pesticide application equipment can either be hand held, motor vehicle mounted, boat mounted or aircraft mounted. Insecticides need to be applied as per label rate using appropriate PPE. In some scenarios, aerial (helicopter) application of adulticides and larvicides may be required. This is usually the case if the treatment area is significantly large or access to the area is difficult but must be noted that the costs associated with aerial application are significant and usually viable without prior knowledge.

Larval mosquito control is the most effective option in minimising disease outbreaks, as it reduces the emergence of potential adult mosquitoes before they have the chance to spread disease. Larvicide application will only be effective if it is applied at an appropriate time in larval development, primarily the second and third instar stage. It is therefore critical that a larval dipping survey be undertaken before deciding on when to apply the treatment.

Mosquito larvae develop more rapidly as the water temperature increases, therefore the timing of the larvicide application after the flooding or tidal inundation will vary and ongoing larval surveillance is required to determine the optimum treatment timing. After mosquito larvae have developed to late fourth instar or pupal stage, larvicide products are no longer effective and the only option is to wait for the adults to emerge and treat using an adulticide.

Barrier spray adulticides kill adult mosquitoes landing on the treated surface. Adulticide fogging targets adult mosquito and should not be carried out in residential areas unless there is a severe nuisance problem or demonstrated high risk of a disease outbreak and rapid reduction of adult mosquitoes is required. It is likely that regular fogging will be required for a number of days or even weeks after the breeding event as the adulticide will only kill adult mosquitoes flying in the immediate vicinity and more mosquitoes will fly in and replace them.

9.3 Fly breeding

Where widespread damage or inundation of housing and commercial premises has occurred, there may be potential for rapid development of fly breeding. Fly larvae can develop rapidly in a wide range of decaying organic matter requiring EHPs to be familiar with the technical aspects of managing fly breeding and the processes for directing others towards prevention.

During disaster scenarios, rubbish accumulation or the exposure of spoiled food and dead animals can produce high numbers of maggots. Consequently, it is crucial to promote correct procedures in regards to the treatment, storage and disposal of household rubbish by the householder or sanitation officers. A shorter period of exposure to rubbish will minimise the explosion of local fly populations.

Control of adult flies or maggots in wheelie bins can be effectively achieved with the purchase and application of 'off the shelf' products, such as impregnated insecticide strips or blocks. Installation of these products in wheelie bins will result in the death

of adult flies within 30 minutes and maggots within a few hours. For effective use of pest strips, the bins should be in a sunny position and the lid left closed.

To reduce the potential for fly breeding, it may be necessary to enter properties and direct work to be undertaken in regards to the removal and disposal of putrescible matter. Where a disaster is widespread and resources are limited, premises considered high risk in their potential to promote fly breeding should be targeted first. For example, commercial centres that store large amounts of putrescible matter such as shopping centres and butcher shops.

EHPs responsible for developing and implementing strategies to reduce fly breeding should work with solid waste collection teams to ensure that resources are effectively managed and directed to areas where they will provide the most significant benefit to public health.

At times EHPs may need to consider enacting legislation that allows them to exercise powers of entry to inspect or issue a direction to abate a nuisance.

The areas that should be considered within the risk management process are those that have a large amount of putrescible matter on site including the following:

- sanitary depots, including unsupervised landfills and transfer stations
- sewerage farms/depots
- damaged food premises, food manufacturers, food warehouses, cold stores, commercial kitchens and food storage areas
- damaged or destroyed poultry sheds, piggeries and stables
- dead stock and other animals
- domestic kitchens (particularly box freezers/refrigeration equipment)
- burst sewerage pipes and flooded sewage pump systems/pits
- damaged or flooded septic tank systems or domestic treatment plants
- areas/properties reduced to rubble/debris.

Many methods may be used to reduce adult flies in and around the home, including screening, fly swats, knock down insecticides, fly traps, electrocution devices, and fly baits.

Fly traps and fly baits, while useful for survey purposes outside the house, usually only harvest a proportion of the large population of flies. They do not clear a residential area of flies and offer little control unless the breeding sites are also removed. These devices are very useful inside buildings by destroying those flies that enter, but offer little in the way of controlling the outside population of flies. Electrocution devices with attracting ultra violet light are excellent devices for killing adult flies in food preparation premises.

9.4 Personal protection

Personal protection measures can be employed by residents to reduce the potential disease risk or nuisance factor posed by mosquitoes or flies.

The following information can be included in communication with the general public:

- Avoid being outside at dawn and dusk when mosquitoes are most active.
- Be aware that in some regions, mosquitoes will bite throughout the day and night, depending on the species.
- If exposure cannot be avoided, dress in loose, long-sleeved clothing, preferably light in colour, to cover as much exposed skin as possible.
- Use an appropriate insect repellent containing DEET (Diethyltoluamide) or Picaridin in a gel, lotion or aerosol formulation. Individuals should spread to product evenly over all areas of exposed skin and refer to the label to ensure they reapply the product appropriately.
- Keep babies and children indoors where possible. If exposure cannot be avoided, dress them in loose, long sleeved clothing, utilise bed or pram netting or apply an insect repellent approved for use in children.
- Ensure fly screens in houses are in good condition.
- Use electric insecticide devices using repellent pads in indoor or enclosed areas.
- Use mosquito coils, or candle heated or gas operated devices using insecticide treated pads or patio and veranda or relatively sheltered or low wind outdoor situations.
- Use bed nets when houses are not screened.
- Empty or cover any water-holding containers around your home or holiday accommodation to reduce potential mosquito breeding.

9.5 Dissemination of information

In the advent of a large outbreak of mosquitoes, flies or biting midges, a public awareness campaign should be conducted to inform the public of the nature of the situation and any associated disease risks. Information on any control measures being undertaken and recommendations on simple measures that individuals can undertake to avoid being bitten should also be included.

Information may be disseminated to the public through appropriate health promotion avenues, including brochures, posters, print media, television, radio, websites and social media, as well as liaising with relevant community groups.

Each local and state government body will have their own media release policies, and these should be strictly adhered to.

Checklist

- **Is there a specific counter disaster sub-plan for the region that addresses vector control?**

- **Does the plan identify high risk mosquito breeding areas and include maps outlining areas that might require biting insect survey and control?**

- **Does the vector control plan coordinate with the regional counter disaster plan to enable resources to be available to provide services to high risk populations such as evacuation centres, schools, senior citizen communities, emergency accommodation etc.?**

- **Does the plan include a communication strategy for vector control information to the media and public?**

- **Are standardised documents and templates available for the rapid dissemination of communication material (e.g. media alerts and fact sheets)?**

- **Are local EHPs familiar with the need and resources for managing a vector control program?**

- **Do EHPs have the tools and proper PPE in providing a response**

- **Are EHPs aware of potential disease vector species, abundance and associated breeding sites in the region, and is there an understanding of the potential risk posed to human and animal populations?**

- **Are protocols available to train personnel in vector surveillance, identification, and control?**

- **Does contingency planning ensure that inventories of insecticides include rapid supply procedures and ability to procure from agencies that undertake vector control activities?**

- **Is there capacity to acquire surveillance equipment at short notice (e.g. dipper, sample containers, dissecting microscope for identification, CO_2 baited EVS traps or BG traps, dry ice or CO_2?**

10 Evacuation and emergency shelter

Key points

- **Emergency shelters generally have less stringent public health requirements than evacuation centres.**

- **Preparedness is fundamental to the success of the operational and occupancy aspects of an evacuation centre. The multi-disciplinary approach to problem-solving provided by the EHPs skill set can be invaluable if they are included in the planning phase.**

10.1 Evacuation planning

Evacuation is a risk management strategy that may be used as a means of mitigating the effects of an emergency or disaster on a community. The EH involvement in an evacuation generally focuses on two areas – emergency shelters and evacuation centres.

Emergency shelters are normally used in the short term as shelter from the impact of a disaster, whereas an evacuation centre is used for a longer duration and requires a higher level of management. If available, consideration should be given to using existing accommodation, (such as schools, sporting venues, motels or established accommodation venues) instead of opening an evacuation centre.

10.2 Emergency shelters

During and in the immediate aftermath of some disasters, emergency shelters are used for short term protection. Emergency shelters are group shelters provided for affected persons and are selected for their ability to provide shelter in a disaster event, such as a cyclone.

Usually, emergency shelters are only required for a short period of time (12 to 24 hours) and accordingly, the facilities provided are fairly basic. It is common for people using shelters to be encouraged by local counter-disaster authorities to take sufficient food and water with them to the shelter.

The suitability of a site for an emergency shelter is normally based on the location and level of construction that can withstand the impact of a disaster. Whilst EHPs are generally not responsible for determining the location of emergency shelters, EHPs may be asked to comment on the suitability of sites in terms of factors such as the availability and functionality of toilets and accessibility of drinking water. The location of shelters should be identified during the planning phase and included within an EH response plan.

There may be times when an EHP is required to provide a report on the condition of an emergency shelter with respect to public health and safety. This is more likely if the use of an emergency shelter is extended into the recovery phase and becomes an evacuation centre.

10.3 Evacuation centres

An evacuation centre is utilised to accommodate displaced people for varying periods of time which may extend into the recovery phase of a disaster.

The need to evacuate can arise as the result of a variety of different types of disasters. After an event such as a flood, cyclone, earthquake or a bushfire, housing in the disaster zone may be totally uninhabitable. In evacuation centres (or other forms of temporary shelter), there may be irregular arrangements for water and food supply, as well as sanitation. It is therefore important that people are made aware of these and the importance of complying with them.

Evacuation centres may need to cater for a wide range of needs including physical shelter, areas for food preparation, clothing, bedding, household items, and security of medications and space for cultural considerations etc. The decision to open an evacuation centre is made at the counter-disaster coordination level in the aftermath of a disaster. EHPs play a role in assisting other responding agencies in the establishment and management of evacuation centres and provide advice to decision-makers about matters of public health.

An evacuation centre may have a complex management structure with which EHPs should be familiar. EH representation at centre coordination meetings provides an opportunity for advice to ensure EH is considered in management practices.

10.4 Siting and assessment of evacuation centres

In the planning phase, the role of the EHP includes assisting authorities in determining the habitability of pre-identified evacuation sites. EHPs should supply any advice in relation to siting and operation of evacuation centres through the disaster coordinator. The disaster coordinator should be advised of matters relating to public health and risk and is responsible for making decisions in relation to evacuation centres. This includes evaluating factors such as:

- availability of potable water
- emergency disposal of sewage and solid waste
- food safety
- monitoring sanitary conditions at centre
- vector control
- personal hygiene.

Other non-EH considerations include provision of information to disaster-affected people, privacy, security, meeting people's cultural needs, providing activities for younger people, and registration of evacuated people.

10.5 Layout and location of a tent evacuation centre

In some situations evacuation tents have been used to rapidly expand available accommodation. 'Tent cities' offer more flexibility to an evacuation scenario because they can easily be expanded to accommodate more people.

The decision to utilise tents is made through a joint disaster planning effort and include a number of matters that require environmental health input.

In choosing a location the following matters should be considered:

- The site should be within reasonable distance of potable water supplies
- The site should be well away from mosquito breeding places and rubbish dumps
- It is preferable for the site to have access to public roads to assist with service delivery
- The topography of the land should permit easy drainage – the subsoil and ground water conditions should also be studied
- The site should be at a higher level than sullage and waste disposal areas
- Land covered with grass will prevent dust, but bushes and excessive vegetation that can harbour insects, rodents and reptiles should be avoided or cleared
- Wherever possible, the area should be naturally protected from adverse weather conditions, such as prevailing winds
- The site should be flood-proof, and, if possible, avoid areas with shallow water tables
- The site should avoid areas which are adjacent to commercial and industrial zones and exposed to noise, odours, air pollution, traffic jams, or other nuisances
- There should be ample space for people to be sheltered and for all necessary public facilities
- Rubbish collection facilities should be provided
- Showers, toilets, latrines and laundries should be located away from residential and food areas and hand washing facilities should be provided in conjunction with toilet facilities
- Water supply points should also have adequate drainage to avoid contamination
- When campsites are in use for long periods, the surface of roads should be treated to suppress dust
- Tents should be waterproof and fitted with insect netting.

Checklist
- **Is there a documented evacuation centre sub-plan that complements the local or regional counter disaster sub-plan?**

- **Is there EH involvement with development of evacuation centre sub-plans?**

- **Are evacuation sites well-known and assessed on a regular basis by authorised EHPs?**

- **Are there documented standards and protocols for evacuation centres that have been endorsed by EH?**

11 Re-establishment of housing and communities

Key points

- **Assessment of infrastructure is a multi-disciplinary role that may include EHPs to address public health threats and provide advice on community needs.**

- **The nature of the response and recovery phase for most disasters is very distinct with respect to housing and community need.**

In the aftermath of a disaster or emergency, EHPs may be required to play a role in the assessment of infrastructure located within the affected zone to report on public health matters.

Re-establishment of infrastructure can be viewed from two perspectives:

i. abating potential public health threats posed by housing damaged in a disaster

ii. ensuring people are able to move back into housing of a sufficient standard.

Where there is a potential threat to public health and safety, EHPs may have a legal responsibility to take measures to address issues.

The involvement that EHPs will have in the re-establishment of housing in communities will vary and may depend on the special needs of subgroups in the community (e.g. aged care centres, remote communities etc.). EHPs should ensure that they understand the reason for their involvement within housing assessment and may often not be required unless requested through the disaster control centre.

11.1 Undertaking community needs survey

Under some circumstances assessments may be required and will generally involve the input of a range of people which may include building professionals, community agencies and primary industry workers. This is due to the wide range of infrastructure involved including schools, water supplies, landfills and sewerage.

Community assessments should consider the broad range of factors that contribute to public health and safety. The aim is to provide information to decision-makers and other technical bodies to ensure that matters related to public health are given due priority.

During the response phase of a disaster or emergency a survey assessment team may be formed to evaluate the impact of the event. This team may comprise a variety of professionals including EHPs, building surveyors, engineers, social workers, welfare officers and disaster management professionals. The role of the EHP within the team would generally focus on community infrastructure assessments in relation to public health matters.

The recovery phase of a disaster or emergency is likely to involve the coordination of a range of groups working together to ensure that housing is in a habitable condition. In some situations, EHPs may be directly involved in managing specific aspects of the relief effort with respect to housing or accommodation, including engagement of cleaning or maintenance contractors.

Checklist

- **Are rapid response assessment tools available for EHPs to access?**
- **Does the regional counter disaster/emergency plan include ability to employ assessment teams and are EHPs included on this?**

12 Control of communicable disease

> **Key points**
> - **In most disasters disease(s) already endemic to the region is/are more common than introduced disease(s).**
> - **EH disaster planning should include a surveillance component for notifiable diseases.**

The role of environmental health in communicable disease prevention includes assisting the relevant agency responsible for communicable disease in investigating and responding to notifications of communicable disease and ensuring conditions which minimise the risk of communicable disease outbreak are maintained. Although this approach is reflective of normal operations in a disaster response, the pattern of disease may be significantly different.

In a contemporary Australian setting, high rates of morbidity or mortality from communicable diseases are rare immediately following disasters. Generally, communicable disease risk is greater from diseases previously endemic to the region whilst other diseases must be introduced or require conditions that promote rapid transmission.

During the immediate aftermath of a disaster, concerns about the risk of non-endemic diseases often arise and may even be broadcasted through the media (cholera outbreak being a significant example following a flood). These may prompt the unnecessary deployment of resources on emotive or political grounds. Within the disaster planning process, the preparation of material for dissemination to the media and other groups is useful to mitigate the risk of this occurring.

12.1 Disease surveillance

The usual pathway for notification of incidences of communicable disease in Australia is through a notifiable disease system. Procedures for EHOs to investigate notifications of disease are often determined by the relevant agency responsible for communicable disease and the nature of the notification and may include inspection of premises and interviews with relevant people. An investigation would typically be multi-disciplinary and include disease control specialists, laboratory services, epidemiologists, doctors, nurses and related professionals.

Disaster management planning at the district and state level should ensure that risks to the disease surveillance system are minimised and that effective contingencies are put in place. Local government and district EHOs should be aware of the contingency plans adopted and base the risk management components of their respective emergency management plans accordingly.

EHPs should be aware of the systems that are in place for notification of communicable disease with the relevant agency responsible for communicable

disease. The first step in management of the communicable disease response during a disaster is to determine the status of this system and whether contingencies have been activated.

12.2 Responding to notifiable diseases

The ability to control a communicable disease outbreak relies on having access to accurate and timely disease data.

Existing systems of disease surveillance should be maintained during and after a disaster (e.g. contact tracing), with the acknowledgement that some systems may need to be enhanced to allow rapid exchange of information. This may include direct contact with the relevant agency responsible for communicable disease, local doctors and health staff in situations where the normal operation of the communicable disease notification system is hampered.

12.3 Infectious disease

In addition to water-borne and vector-borne disease, there may also be the potential for epidemics of highly infectious diseases.

Gastrointestinal disease outbreaks may involve transmission of the disease via contact with contaminated surfaces, and not only through ingestion of contaminated food and water, as in the case of bacterial and parasitic gastrointestinal disease. Viral diseases producing gastrointestinal illness are often easily transmitted and all prevention and mitigation criteria should therefore be actioned.

In the broader context of public health disaster management, infectious disease is often associated with crowding evacuees into evacuation centres without adequate ventilation, acceptable personal space or adequate facilities for personal hygiene and laundry.

The length of time that people spend in temporary accommodation is an important determinant of the risk of disease transmission. The prolonged mass settlement of evacuees in temporary shelters, with only minimal provision for essential personal hygiene, is typical of a situation that may cause epidemic outbreaks of infectious diseases.

Checklist

- **Are there established communications between the relevant agency responsible for communicable disease, EH and local health emergency management coordinators to develop local surveillance and response plans?**

- **Is there designated coordination for public health surveillance and epidemiological activities that is included within disaster response plans?**

- **Have communications been maintained with other agencies responsible for disease surveillance and response plans?**

- **Are regional EH teams in contact with groups that have developed emergency procedures to respond to a biological or chemical incident, including:**

  1. **Emergency or real-time reporting of biological or chemical-related diseases or illness?**

  2. **Immediate notification of surveillance/epidemiologic response personnel, such as state or local epidemiologist, laboratory director, and state health department?**

  3. **Capacity for emergency dissemination of information (e.g. email, website)?**

- **Have exercises been conducted to test the adequacy of the public health surveillance system and epidemiologic response as part of a disaster response?**

- **Are EHPs aware of the limitations of regional counter disaster plans and understand the differences with widespread outbreaks of notifiable or non-endemic disease?**

13 Deceased persons

Although deceased persons are an inevitable consequence of some disasters, this is not a specific EH responsibility. A coronial authority or similar body will usually take exclusive and absolute control over the bodies of deceased persons with their authority often extending to part of or the entire disaster scene.

Additionally, and contrary to a common belief, human bodies pose a low public health risk unless there is a risk of polluting sources of drinking water (thereby increasing risk of gastroenteritis or food poisoning). Bodies will not give rise to communicable diseases that are not endemic in the area; cholera, typhoid fever and plague are examples of diseases not endemic in Australia. However, this is contrast to emergency responses involving outbreaks of exotic human disease (such as Ebola) addressed by a specific action plan by the relevant agency responsible for communicable disease, which may also include an EH component.

EH management of deceased persons may include input into movement, storage and disposal of bodies. This is generally more pronounced where regular facilities such as hospital morgues are overwhelmed or not available. The suitability of alternative storage facilities should include practical considerations such as ensuring the name of owners or company are not displayed on any refrigerated container or vehicle selected for that purpose.

The role of the EHPs may include organising the disposal of contaminated materials, control of flies and other insects and disinfection of premises, clothing and bedding after an investigation into a death is completed.

Checklist

- **Is there a group with identified responsibility and developed protocols for dealing with a large number of casualties?**
- **Does the protocol outline how casualties will be evacuated and transported from the incident site?**
- **Are EHPs aware of how they might need to engage with personnel responsible for handling deceased persons, such as medical experts and the state or territory coroner?**

14 Hygiene promotion

Key points

- **The principles of hygiene promotion are relevant to many operational areas of EH.**
- **Hygiene promotion initiatives should include clear messages that can be coordinated through the disaster coordination centre.**

14.1 Principles of hygiene promotion in disasters and emergencies

Hygiene promotion is important in raising awareness about environmental hazards and reducing the risk of communicable disease and its transmission, in a disaster or emergency situation. However, this is more than just transmission of information; it is also about understanding and promoting the abilities of people to improve their own health.

Hygiene promotion has implications for a broad range of environmental health issues such as water supply, sanitation, vector-borne disease control, and hygiene practice. It is important that it is factored into both disaster planning and response:

- **Disaster preparedness**: awareness raising and training are essential aspects of disaster preparedness. Community involvement is important in assessing risks, promoting awareness of environmental hazards and strengthening community resilience.
- **Disaster response and recovery**: community participation in the response phase and in the communication of specific public health messages immediately following a disaster and ensuring sustainable and incremental improvements in environmental health.

In a disaster management context, hygiene promotion initiatives should work in tandem with other initiatives developed through the disaster coordination chain of command. Although a hygiene promotion program may be well-intentioned, it may not be effective (or may possibly be even counter-productive) to disaster relief efforts if undertaken in isolation. Where a need is identified, hygiene promotion programs should adopt solutions that are realistic and appropriate to people's ways of living, considering:

- best use of existing environmental health conditions, services and facilities
- improvements to environmental health conditions
- behavioural changes to reduce certain environmental risks at the household level.

14.2 Planning a hygiene promotion programme

EHPs are often expected to play a key role in communicating with the affected population about possible health risks and assisting them to respond and will need to quickly understand the health risks faced by the affected population and the services required to reduce those risks. The first stage in commencing a hygiene promotion

initiative is likely to be determined by assessing the risks that were identified in rapid assessments undertaken in the response phase of the disaster.

In terms of mitigating risks, EHPs will need to be able to identify the services required to reduce risks and whether they can be provided by the affected population, or if external assistance is required. Consideration will also need to be given to how external assistance should be organised to best meet the needs and wishes of the affected people.

Consideration should be given to pre-preparing public health information which can be tailored to the needs of the affected population in the event of a disaster. The focus should be on priority issues and preventative actions for each (e.g. promoting hand-washing, ensuring drinking water safety), rather than a broad range of topics. Actions that can have the greatest impact on reducing morbidity and mortality should be emphasised (refer to Appendix B for examples of fact sheets that contain material that could be utilised). Develop clear health messages and choose the educational approach and methods to be used. This can be based on pre-prepared messages and communications systems, but is best done in collaboration with the affected community to ensure that the cultural background and traditional practices and subsequent need for translated messages, as well as the perceptions of the target population are taken into account. Once the message has been formed, a strategy for dissemination can be formulated to pass this through to the target audience (this may include radio, visual materials, newspapers and social media).

Hygiene promotion activities should be coordinated to ensure that messages addressing priority issues are consistent and complementary, and that health education is integrated with measures to improve services and facilities.

Checklist
- **What are the most widespread risk behaviours in the community?**
- **How many people in the community show these risk behaviours and identifying these people?**
- **Which risk behaviours can be altered?**
- **Who uses safe practices and what motivates and influences their use?**
- **What communication channels are available and which are reliable for promoting hygiene?**
- **What facilities or materials do people need in order to engage in safe practices?**
- **How much time, money or effort are people willing to contribute to have access to those facilities/materials?**
- **Where will those facilities/materials be available?**
- **How will the availability of these facilities/materials be communicated to people?**

15 Reference documents

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Department of Health, Government of Western Australia, Factsheet: Emergency treatment of drinking water supplies

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National Strategy for Disaster Resilience Community Engagement Framework.

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16 Appendix A

Environmental Health Rapid Assessment Form

TYPE OF EMERGENCY:			
COMMUNITY NAME:			
REGION:			
GPS COORDINATES:			
Date	Time		Name of contact person in the community, position and contact information
Persons	# Injured	# Dead	# Missing
Homes affected	# Minor damage	# Moderate damage	# Destroyed
Homes flooded	Minor flooding	Major flooding	
Number of homes that can't be inspected		List community areas that can't be inspected	
Number of persons currently displaced/evacuated		Number of persons projected displaced/evacuated	
What are the weather conditions and forecast? Are flood levels rising? Is community affected by tidal movement?			

Community and culture		
How are means of communication functioning? (Landline, mobile phone, Sat Phone, Email, VHF, HF, etc.)		
What is the main source of income for families and will recent event adversely affect family income?		
Are occupants able to attend work or school? If no, why?		
Has the community lost key assets that they need to maintain basic health standards? (e.g. fishing or farming equipment means of transport, tools or equipment, etc.)		
Status of roads and bridges. Indicate best way to access affected area.		
Additional comments on the presence of the following (where applicable):		
Hazardous materials ❑ Yes ❑ No Detail	Radioactive waste ❑ Yes ❑ No Detail	Food spoilage ❑ Yes ❑ No Detail
Toxic spills ❑ Yes ❑ No Detail	Dead animals ❑ Yes ❑ No Detail	Food seizure necessary ❑ Yes ❑ No Detail
Oil spills ❑ Yes ❑ No Detail	Presence of dangerous animals ❑ Yes ❑ No Detail	Domestic waste ❑ Yes ❑ No Detail
Asbestos ❑ Yes ❑ No Detail	Any OH&S issues to be considered ❑ Yes ❑ No Detail	Industrial waste ❑ Yes ❑ No Detail
Clinic/pharmaceutical waste ❑ Yes ❑ No Detail	Floodwater contaminated with sewage ❑ Yes ❑ No Detail	Fuel supply ❑ Yes ❑ No Detail
a) Is the local government active in the disaster response? b) Is the community responding to the disaster? c) Are NGOs responding in the disaster area?	❑ Yes ❑ No ❑ Don't know ❑ Yes ❑ No ❑ Don't know ❑ Yes ❑ No ❑ Don't know	

Contact names and numbers of key personnel

Health

Is there an ongoing public health emergency? ❑ Yes ❑ No Detail What is the nature of it? How is it likely to evolve?

Is the incidence of diarrhoeal diseases above normal? ❑ Yes ❑ No Detail Is it increasing or decreasing?

How can Environmental Health staff assist local staff/ hospital/ health clinic staff in providing ongoing immediate support?

Is any disaster-related problem affecting health facilities? ❑ Yes ❑ No Detail		Equipment:
Number of staff:	Vaccines:	Medicines:
Consumables:	Access:	Disposal of clinical waste:

Food and nutrition

If time and conditions permit, inspect all registered premises (Food, premises and accommodation). Condition of aged care and child care facilities – are they open, and is it safe for them to operate and prepare food?

Is food available in the disaster area? ❑ Yes ❑ No What kind?

How long will current food supply last? Is re-supply going to be a problem?

List names of registered food businesses. What condition are they in and is food safe to eat?

Do people have access to cooking facilities?			
Utensils	❏ None	❏ Few	❏ Many
Fuel	❏ None	❏ Few	❏ Many
Pots	❏ None	❏ Few	❏ Many
Water	❏ None	❏ Few	❏ Many
Wash	❏ None	❏ Few	❏ Many

Do people have access to a safe place to prepare food and eat it? ❏ Yes   ❏ No

Are non-food items (NFI) required for women, men, children and infants, pregnant and lactating women, and older people)?
❏ Yes   ❏ No
Detail

Evacuation centres (longer term) Note: Not emergency shelters (12-24 hours)

Where are the evacuation centres? Are these adequately managed, supplied and functional?

Which ones are operational and for how long? Ablution capacity:

Male: WC 1:50, Urinal 1:100, HWB 1:75, Shower 1:100	Female: As for male except WC 1:25
Area of 2.5 to 3.5m² per person:	Water Supply: 50 L per person/per day

Consider overcrowding and cleaning maintenance of ablutions and other common areas.
Also consider food preparation, storage, animal control, solid waste storage and removal.

Water and sanitation

What type of water supply?	Is reticulation damaged? ❏ Yes ❏ No Detail
Who manages water supply?	Is all equipment working? ❏ Yes ❏ No Detail
When was it last tested?	Is chlorinator/disinfection working? ❏ Yes ❏ No Detail
Has supply been contaminated? ❏ Yes ❏ No Detail	What is chlorine residual in reticulation?
What is existing storage capacity?	

Are people getting enough water for: Drinking: ❑ Yes ❑ No Bathing: ❑ Yes ❑ No Cleaning: ❑ Yes ❑ No Approx:100 L per person per day	Is there a need for a 'Boil or Bottled Water Alert"? ❑ Yes ❑ No If Yes, has a public alert been broadcasted and relevant people advised?
Are people using unsafe water sources? ❑ Yes ❑ No Detail	How is water carried or stored?

Human waste

Is wastewater collection system operational? ❑ Yes ❑ No Detail	Where do people defecate / urinate at present?
Has sewage treatment system been inundated with floodwater? ❑ Yes ❑ No Detail	What is the condition of the wastewater treatment system?
Are there public ablution blocks available? ❑ Yes ❑ No Detail	Are additional ablutions required? (If yes, how many and where)?

Handwashing

Are there adequate hand-washing and or bathing facilities at key points and is there evidence they are being used?
❑ Yes ❑ No
Detail

Is soap and hand drying equipment available?
❑ Yes ❑ No
Detail

Shelter							
What is the physical status of existing structures (other than domestic homes)?							

Impact on people's homes and key services							
Houses:	❏ Low	❏ Med	❏ High	Council office	❏ Low	❏ Med	❏ High
Water:	❏ Low	❏ Med	❏ High	Workshop	❏ Low	❏ Med	❏ High
Sanitation:	❏ Low	❏ Med	❏ High	School	❏ Low	❏ Med	❏ High
Electricity:	❏ Low	❏ Med	❏ High	Airport	❏ Low	❏ Med	❏ High
Health:	❏ Low	❏ Med	❏ High	Barge landing	❏ Low	❏ Med	❏ High
Food store	❏ Low	❏ Med	❏ High	Telephones	❏ Low	❏ Med	❏ High
Evacuation shelter	❏ Low	❏ Med	❏ High	Mobile equipment	❏ Low	❏ Med	❏ High
Rubbish tip	❏ Low	❏ Med	❏ High				

Note: Low   = < 10% adversely effected   Medium =< 30%   High   = > 30%

If homes have been severely damaged or destroyed, where are people living?

With friends or family?
❏ Yes   ❏ No

In evacuation centre?
❏ Yes   ❏ No

Evacuated to another community?
❏ Yes   ❏ No

Is there putrescible waste in the houses? ❏ Yes   ❏ No

Will some houses require cleaning/disinfecting? ❏ Yes   ❏ No

Is there a pest/vector control problem in homes or community?
❏ Yes ❏ No
Detail

How has the disaster affected community services (e.g. rubbish collection, aged care)

Inspect landfill site and assess capacity for domestic rubbish collection.

Appendix B – Example of Factsheets

Emergency treatment of drinking water supplies

To avoid illness, drinking water must be safe to drink.

- On average each person requires at least 20 litres (L) of water per day for drinking, washing and cooking.
- At least 2.5 L of the 20 L is required for drinking and 5 L is required in hotter climates.

What happens when disaster strikes?

If disaster strikes, it is possible that the normal supply of water will be affected.

When the safety of the normal water supply cannot be guaranteed, the Department of Health or your water supplier may issue advice to boil or treat it with chemicals prior to use.

Your local government and/or local or district emergency management committee are usually the best people to advise you on the availability of emergency drinking water and other essential services.

This information is normally given out via:

- Electronic media i.e. radio, television, emergency management websites and increasingly on social media platforms, such as Facebook, twitter etc.
- Printed material i.e. newspapers, circulars, fact sheets, brochures etc.

Extreme caution should be exercised before drinking water from bores, wells and dams. It is likely that contamination may have occurred, especially during times of flooding.

- If unsure, boil all water or use bottled water for drinking, food preparation, cooking, making up infant formula and baby food and for brushing teeth.

Short-term actions

Where clean drinking water is not immediately available it is possible to obtain limited amounts of safe drinking water by:

- draining your hot water tank
- melting ice cubes you have in the freezer.

Disinfection of small quantities of drinking water

You can disinfect small quantities of water in 2 ways:

- boiling vigorously for at least one minute (the simplest and best)
- chemical treatment.

Boiling water

- Vigorous boiling for at least 1 minute will kill any disease-causing micro-organism present in the water.
- The flat taste of boiled water can be improved by pouring it back and forth from one clean container to another.
- Alternatively, allow it to stand for a few hours with a loose fitting cover.

Chemical treatment

- When boiling is not practical, chemical disinfection can be used.
- The simplest, most effective chemicals are chlorine and iodine.
- Chlorine is generally more effective than iodine.

However, while they are both effective against most micro-organisms, including giardia, they may not be effective against cryptosporidium.

Chlorine disinfection

Water may be disinfected using household bleach containing chlorine (but not containing added perfumes or detergents). Look for the percentage of available chlorine on the label and use the information in the following table as a guide to disinfect the water.

Table: Guide to chlorine disinfection of water

Available chlorine	Drops per litre of clear water
1 per cent	10
4 to 6 per cent	2
7 to 10 per cent	1

- The treated water should be mixed thoroughly and allowed to stand for 30 minutes.
- The water should have a slight chlorine odour. If not, repeat the dosage and allow the water to stand for an additional 15 minutes.
- The chlorine taste can be objectionable in treated water.
- The taste can be made more pleasant by allowing the water to be exposed to the air for a few hours. Alternatively, pour it several times from one clean container to another.

Granular calcium hypochlorite

- Another option is to use swimming pool grade granular calcium hypochlorite.
- Add, and completely dissolve, 1 heaped teaspoon of calcium hypochlorite in 7.5 litres of water.
- This mixture will produce a concentrated chlorine solution of approximately 500 mg/L (milligrams per litre).
- The concentrated chlorine solution can then be used to disinfect water in the ratio 1 part concentrated chlorine to 100 parts of water.
- If using swimming pool grade granular calcium hypochlorite, always follow the instructions on the container in relation to safe handling and disposal of the product.

Chlorine tablets

- Chlorine tablets containing the necessary dosage for drinking water disinfection can be purchased from pharmacies and sporting goods stores.
- The tablets should be used in accordance with the manufacturer's instructions.

Tincture of iodine

- Common household iodine from a first aid kit may be used to disinfect water.
- Add 5 drops of 2 per cent tincture of iodine to 1 litre of clear water.
- If the water is cloudy add 10 drops of the tincture.
- Let the solution stand for at least 30 minutes before drinking.

Iodine tablets

- Commercially prepared iodine tablets containing the necessary dosage to treat drinking water can be purchased at a pharmacy or sporting goods store.
- Iodine tables should be used in accordance with the manufacturer's instructions.
- Iodine is only suitable for short-term emergency use.
- It should not be used repetitively or for longer than 1 week in any single emergency situation.

Storage of treated drinking water

Containers for treated water should ideally:

- be clean
- have covers
- be stored above ground
- be in a cool place
- be cleaned periodically
- be mosquito proof.

Disinfection of large quantities of drinking water

Swimming pool chlorine can be used to treat large quantities of water in containers, such as rainwater tanks and vehicle mounted water tanks.

The initial dose of chlorine required to treat any potential contamination is:

- 14 grams (1 level teaspoon and 1 level dessertspoon) of calcium hypochlorite (60 to 70 per cent) per 2000 litres; or
- 40 millilitres (8 teaspoons) of sodium hypochlorite (12 per cent) per 1000 litres.

The water should be stirred then left to stand for at least 24 hours to allow the chlorine taste and smell to dissipate.

To maintain a safe water supply after the initial dosage, each week add:

- 5 grams (1 level teaspoon) of calcium hypochlorite (60 to 70 per cent) per 5000 litres; or
- 8 millilitres (1 dessertspoon) of liquid sodium hypochlorite (12.5 per cent) per 2000 litres

Allow the water to stand for a minimum of 2 hours before drinking.

Please note:

- Do not pour water onto chlorine. Always add chlorine to water.
- Always mix chlorine in the open air.
- Always follow the instructions on the pool chlorine container in relation to safe handling and disposal of the product.

Remember

- To avoid illness, drinking water must be safe to drink.
- Extreme caution should be exercised before consuming water from bores, wells and dams.
- If you are not sure about the quality of the water you should either heat the water to a rolling boil for at least 1 minute or use chemicals to disinfect it.
- Always follow the instructions on pool chlorine containers in relation to safe handling and disposal of the product.

Example of Factsheet - Food safety after cyclones, floods and other disasters

Food safety advice to communities and individuals affected in a disaster is essential to ensure the minimal incidence of food borne illness. Ideally, the community should be self-sufficient for 3 days food supply and ideally for up to 7 days. This will include public health messaging to householders on storing food appropriately and dealing with frozen, chilled and packaged food in the event of an extended power outage.

When disasters cause the power to go out, it generally means the food in your fridge will start to go off.

- Unless cold storage (below 4 °C) is available within 2 hours of a power cut, all potentially hazardous foods like cheese that are typically stored in the fridge need to be placed in alternative cold storage, eaten immediately or disposed of.
- You should wash dishes that have been exposed to flood water in hot soapy water or in a dishwasher. Make sure the dishwasher is safe to use and has been thoroughly cleaned if it has been contaminated by dirty floodwater.
- Golden rule about food safety: If in doubt, then throw it out!

If there is a power outage

- Record the time the power outage starts so you know how long your food has been without refrigeration.
- Keep your fridge and freezer doors closed as much as possible. Only open them when absolutely necessary - this will keep the food colder for longer.
- Place refrigerated foods together to keep them colder for longer.
- Place meat, poultry or fish in the coldest section of your refrigerator, making sure they don't drip onto fresh fruit and vegetables or other ready-to-eat foods.
- If needed, use ice to help keep food cold when the power is out.
- A closed refrigerator should keep your food cool for four to six hours.
- Kept closed, a full freezer should keep your food frozen for up to 48 hours, while a half-full freezer should keep your food frozen for up to 24 hours.
- The rate of thawing depends on the amount of food in the freezer. A full freezer stays colder than one that is partly full.

When the power comes back on

- If the power is restored within four to six hours and your fridge or freezer doors have remained closed, some of your food may still be OK.
- Some foods may look and smell fine, but if they have been warm too long, they may contain enough bacteria to make people ill.
- If raw food - especially meat, poultry and fish - drip juices, clean and disinfect all affected areas in the fridge or freezer, as well as any counter tops, cutting boards and utensils that have been affected.
- The only reliable way to check your food is safe is to check its temperature with a thermometer.

- Food in the freezer can be refrozen or used if it is at 0 degrees Celsius or lower when you check with a thermometer or if ice crystals are visible in the food.
- If the food in your fridge has been above 5 degrees Celsius for less than two hours, it is OK to eat or keep.
- If it has been above 5 degrees Celsius for two to four hours, the food can be used, but must be used immediately.
- If food has been above 5 degrees Celsius for more than four hours or if there is doubt about its safety, then it should be thrown out.
- If commercial businesses have any doubts about the safety of food, contact local Environmental Health Officers and other authorities for advice.

Vegetable gardens

- Floodwater may have contaminated your vegetable or herb garden with bacteria, chemicals or other dangerous substances. Some vegetables may still be all right to eat.
- It is recommended that disinfecting in hot water, peeling and cooking the produce to prevent food borne illness.

Example of Factsheet - Recovering After the Flood – Clean-Up Information for Householders

Before you start

- Use protective clothing including waterproof gloves and sturdy footwear, preferably rubber boots.
- To protect your eyes use a facemask or goggles if you are scrubbing, hosing or pressure-washing.
- Cover and treat any open cuts, scratches, grazes and wounds with antiseptics and waterproof dressings (bandages).
- Be careful with any electrical or gas equipment or lines. Do not switch on electrical or gas equipment until it has been checked by a licensed electrician or gas fitter.
- Keep children and pets away from the flooded building until it has been cleaned and made safe.
- Remember to wash your hands thoroughly after each clean-up session and always before eating or making food.
- Take your time. Do not overdo it when cleaning up. You will be under enough stress and strain from the flooding – your health is critical. Take frequent breaks. Stay warm when it is cold and be careful not to overheat when it is hot.
- Do not wait until you are thirsty to drink. Make sure you drink plenty of fluids.
- As you clean up, take photographs or make a list as you go for your insurance claim.

General clean-up advice

- Wash mud, dirt and debris from your house with a hose, starting at the highest point and work down to ground level.
- Where possible, remove all wet items such as floor coverings, rugs, mats, furniture, bedding, linen and clothing. If floor coverings are removed, thoroughly clean and dry the floor underneath before new material is laid.
- Be alert to snakes, spiders and rats that may have taken refuge in your home.
- Begin drying out the house as soon as floodwaters recede (drop) by opening doors and windows during dry days.
- Draining water away from under the house to increase airflow.
- Check for trapped water and mud in wall or floor cavities.
- Each area affected by floodwater within the house needs to be cleaned, including refrigerators and cupboards (these should be emptied first).
- Use a qualified electrician to assess electrical safety.
- Refer to State and Territory authorities for safe removal of asbestos.

Example of Factsheet – Mosquito control advice for residents

Mosquitoes

While malaria is not endemic to Australia there are a number of other mosquito-borne diseases that could impact on populations, including Ross River virus, Barmah Forest virus, Murray Valley encephalitis, Japanese encephalitis). Occasional outbreaks of dengue fever may also occur. Surveillance should be carried out in endemic areas, but vector eradication is a better prevention strategy.

Personal protection measures can be employed by residents to reduce the potential disease risk or nuisance factor posed by mosquitoes or flies.

The following information can be included in communication with the general public:

- Avoid being outside at dawn and dusk when mosquitoes are most active.
- Be aware that in some regions, mosquitoes will bite throughout the day and night, depending on the species.
- If exposure cannot be avoided, dress in loose, long-sleeved clothing, preferably light in colour, to cover as much exposed skin as possible.
- Use an appropriate insect repellent containing DEET (Diethyltoluamide) or Picaridin in a gel, lotion or aerosol formulation. Individuals should spread to product evenly over all areas of exposed skin and refer to the label to ensure they reapply the product appropriately.
- Keep babies and children indoors where possible. If exposure cannot be avoided, dress them in loose, long sleeved clothing, utilise bed or pram netting or apply an insect repellent approved for use in children.
- Ensure fly screens in houses are in good condition.
- Use electric insecticide devices using repellent pads in indoor or enclosed areas.
- Use mosquito coils, or candle heated or gas operated devices using insecticide treated pads or patio and veranda or relatively sheltered or low wind outdoor situations.
- Use bed nets when houses are not screened.
- Empty or cover any water-holding containers around your home or holiday accommodation to reduce potential mosquito breeding.