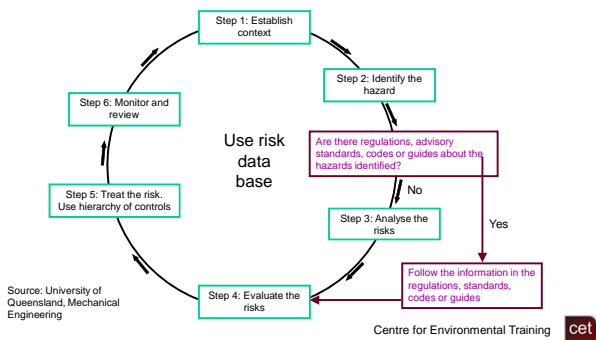


## Risk Assessment

## Risk assessment

- Is a stage in risk management – about *identifying opportunities for avoiding or mitigating losses*.
- Hazard and risk are different.
- A **hazard** is something with the potential to cause harm. This can include chemical substances, plant, work process and/or other aspects of the work environment.
- A **risk** is the likelihood that illness, injury or even death might result because of the hazard.

## Steps in risk management



## Analysing the risk

- Each risk is assessed under existing conditions in terms of the **likelihood** and **consequence** and assigned a level of risk
  - Likelihood
    - Almost Certain
    - Likely
    - Possible
    - Unlikely
    - Rare

## Consequence

Consequence	Description
Insignificant	Insignificant
Minor	Minor impact on a household (e.g. one person with upset stomach)
Moderate	Moderate impact on a household or minor impact on the community
Major	Major impact on a household or moderate impact on the community
Catastrophic	Catastrophic impact on the community (e.g. death)

## Level of risk – risk rating

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	Medium	Undesirable	Unacceptable	Unacceptable
Likely	Low	Medium	Undesirable	Undesirable	Unacceptable
Possible	Low	Low	Medium	Undesirable	Undesirable
Unlikely	Very low	Low	Low	Medium	Undesirable
Rare	Very low	Very low	Low	Medium	Medium

## U of Q - Step 3 Analyse the Risk

Analysing the risk involves determination of the:

**Consequences** – outcome of an incident

**Exposure** – interaction with hazard

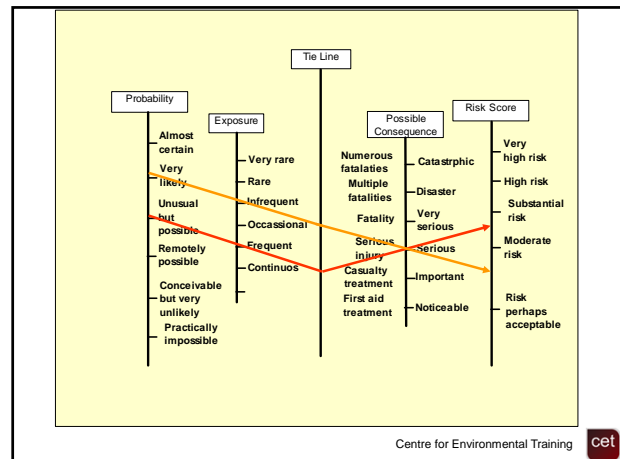
**Probability** – likelihood that consequences will occur once individual is exposed

**Process** - Use the Risk Score calculator for analysing and evaluating risk. The objective of analysing risk is to determine whether the risk is acceptable. It provides a qualitative tool that assists in prioritising risk.

The Risk Score Calculator determines the level of risk by defining consequences, exposure and probability.

**Likelihood**

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## Application to on-site wastewater management

- Step 1 - Context
  - Proposed on-site systems
  - Existing on-site systems
    - Different rules for doing the assessment
- Step 2 - Identify the hazards/risks

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## Objectives for doing risk assessment – different perspectives

On-site wastewater “community”

- Policy and regulators
- Designers
- Technology suppliers
- Installers
- Servicing agents
- End users
- Community and ecosystem advocates

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## Proposed systems: hazards exist at various levels

- Site investigation
- Design
- Construction and installation
- Regulating

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## Hazards for existing systems

- Owner
  - Owner use and management
  - Operation and maintenance
- Technology
- Natural hazards – flooding.....

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## Hazard identification for proposed systems

- Site investigation
- Design
- Construction and installation
- Regulating

**HAZARDS**

Poor quality of data and information  
 Low level capability of personnel involved at all stages  
 Inadequate funding availability  
 Poor quality control  
 Other.....??

## Hazards for existing systems

- Owner
  - Owner use and management
  - Operation and maintenance
- Technology
- Natural hazards – flooding

**HAZARDS**

Disinterested owners  
 Low skill levels  
 Change in owner  
 Change in loading – quantity and quality  
 Unreliable technologies  
 High water table  
 Flooding  
 Other.....??

Who should be involved in the hazard identification process?

## Possible hazard areas

- Social
  - Health
  - Convenience
  - Development
  - Timing – allow consent process
- Cultural
- Ecological
- Technology and physical infrastructure
- Compliance – approval / consentability
- Economic:
  - planning, consent capital, operating and maintenance
  - funding

## Analysing the risks

- Risk rating
- Risk scoring
  - Again - who participates?

## Risk Matrix - assessment categories

Risk category	Social	Cultural	Technical	Management	Ecosystem	Costing /funding	Compliance	Implementation/ timeframe
Service Options								
Option 1								
Option 2								
Option 3								
Option 4								
Option 5								

Technical

Likelihood	Consequence	Risk Rating
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## Risk mitigation - criteria

- Extendibility - the ability of the options to cope with increased loading
- Impact on system performance from stormwater inflow
- Variable loading due to holiday and other seasonal flow peaks
- Land area requirement – both on and off site
- Management requirements – operation and maintenance
- Cost – capital and running
- Approval / consentability in terms of the regulations

## Defining and quantifying failure

- There are a variety of factors that can cause an on-site wastewater management system to 'fail'.
- Throughout this course we will identify and consider these failure modes but.....what constitutes failure of an on-site system?
- We need to start by defining and quantifying this failure before we can talk about managing it.

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## Common on-site wastewater treatment system failures (US EPA, 2002)

Type of Failure	Evidence of Failure
Hydraulic Failure	Untreated or partially treated sewage pooling on ground surfaces, sewage backup in plumbing fixtures, sewage breakouts on hill slopes
Pollutant contamination of groundwater	High nitrate levels in drinking water wells; taste or odour problems in well water caused by untreated, poorly treated, or partially treated wastewater; presence of well water
Microbial contamination of ground and surface water	Shellfish bed bacterial contamination, recreational beach closures due to high bacterial levels, contamination of drinking water wells with faecal bacteria or other faecal indicators
Nutrient contamination of surface water	Algal blooms, high aquatic plant productivity, low dissolved oxygen concentrations

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## On-site System Failure

- How do we quantify failure?
- How significant is failure?
- Should failure be rigidly defined?
- Should failure be determined by the need for protection of the environment or public health?
- Should failure be risk based?


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## On-site System Failure

How do we quantify failure?

Failure can be related to set Performance Criteria (e.g. does treated effluent quality conform to regulatory guidelines?)

Or it can relate to observed, quantifiable impacts (e.g. is system operation resulting in public health risks, unauthorised discharge to drains and waterways, structural damage?)

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## On-site System Failure

How do you define failure when inspecting on-site systems?

What constitutes a failure in a treatment system?

- A leaking tank; and
- Malfunctioning components

Later we will look at what parameters to test to determine if a system is failing.


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## On-site System Failure

What constitutes a failure in a Land Application Area?

- Ponding on the land surface;
- Pollutant export to groundwater;
- Seepage downslope; and
- Malfunctioning componentry.

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## On-site System Failure

- How significant is failure?

To determine this, we need to consider:

- The consequence of failure (public health, environmental and socio-economic impacts);
- The likelihood that consequences will manifest themselves.

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## On-site System Failure

- Typical factors for consideration,
  - Quantity and quality of any effluent discharge
  - Proximity to sensitive receptors such as watercourses, groundwater bores, humans
  - Block size and density of on-site systems in the area.
  - Site and soil characteristics

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## On-site System Failure

- Should failure be risk-based?
- Do you assign a risk category to OSM on the basis of the hazards associated with that system, and audit those with the highest risk?
- What are the benefits of this approach?

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