



Applying the NHMRC Guidelines for Managing Risks in Recreational Water

A guide to implementing the NHMRC Guidelines for Managing Risks in Recreational Waters

Swimming in polluted waters is a well recognised cause of a number of recreational water illnesses including gastroenteritis, skin irritations and ear and eye infections. These can result in a significant burden of disease and economic loss to a community.

In order to reduce the likelihood of recreational water illnesses in a community, it is important that ongoing and up-to-date information about health risks associated with recreational waterways is publicly available.

To assess the health risks of popular recreational waters a microbial monitoring program should be considered to help communicate risks of recreational water contact to the community.

Current Recreational Water Guidelines

The National Health and Medical Research Council (NHMRC) released the *Guidelines for Managing Risks in Recreational Waters* in October 2005. The Guidelines are based on the World Health Organisation (WHO) 'Guidelines for Safe Recreational Water Environments. Volume 1 – Coastal and Fresh Waters'. The NHMRC guidelines are a major revision of previous recreational water guidelines, and provide a mechanism for communicating substantiated information to the public on bacterial risks in popular recreational waters, rather than relying on the traditional percentage compliance.

A risk-management framework is used to provide a beach grade to a beach with the aim of providing generic statements on the level of public health risk a particular water body may pose to a water user.

Why use beach grades?

Beach grades are considered to be the most effective way of providing the public with information about the general state of a beach to allow them to make a more informed decision about the risk of recreational contact.

What do the Guidelines involve?

To effectively manage public health risks in recreational waters according to the guidelines a number of factors need to be considered. These include:

- Microbial monitoring programs
- Microbial assessment categories
- Sanitary inspection categories Follow-up sampling
- Public communication
- Future monitoring
- Beach grades



1. MICROBIAL MONITORING PROGRAM

Where should I monitor?

A health based monitoring program needs to be practical. A monitoring program should not be a strain on resources, should be maintained for the long term, and should focus on recreational water bodies that present a greater risk to public health.

It is not feasible to sample from every recreational water body. Therefore, a monitoring program needs concentrate on popular recreational beaches that are commonly used for whole of body contact activities such as swimming, particularly popular beaches that may be known to have varying water quality.

Factors such as beach access and council facilities that may promote the area as a popular recreational location need to be taken into consideration when choosing a monitoring site e.g. BBQ facilities or toilet blocks. Do not monitor beaches that are rarely used for recreational activities.

How often should I monitor?

A monitoring program needs to concentrate on times when most people are using the water for whole of body contact activities. In Perth metropolitan waterways the November to April bathing season represents the higher risk periods.

Monitoring during winter is not considered necessary as majority of the public do not go swimming during these conditions.

In order to apply the NHMRC Guidelines at least 20 samples need be collected during the monitoring period (this ensures the microbial assessment category can be assigned). As a general guide samples should be collected at least weekly during popular swimming times such as school holidays, and the height of summer (December, January and February), and then reduced to fortnightly during the later part of the bathing season.

Consideration should be given to sharing monitoring responsibilities between agencies and community groups.

What do I monitor?

The NHMRC and WHO advocate the use of enterococci as the single most preferred indicator of faecal contamination. Enterococci are a group of bacteria commonly associated with the intestinal tract of warm blooded animals and humans. They can be used to indicate the presence of possible sewage contamination.

Although enterococci are not pathogenic themselves, they can indicate the possible presence of pathogenic microorganism such as bacteria, viruses and protozoans. Enterococci are also known to survive longer in marine waters.

2. MICROBIAL ASSESSMENT CATEGORY (MAC)

What is a Microbial Assessment Category (MAC)

The first part to classifying a recreational water site is to assign a microbial assessment category (MAC) to each sampling location. The MAC is expressed in terms of the 95th percentile of numbers of enterococci per 100ml. Each microbial assessment category of A, B, C or D represent different levels of health risk to a water user based on the exposure conditions of key epidemiological studies for 'healthy adult bathers'. The values have been determined



using a known relationship between bacterial density in water and illness rates, and the distribution of bacterial levels at a swimming site.

Table 1 summarises the different MAC with the estimated probabilities of a water user experiencing a gastrointestinal illness (GII) or acute febrile respiratory illness (AFRI) when swimming at a site.

Table 1: Microbial Assessment Categories (NHMRC Guidelines, pg 75).

Category	95 th percentile (enterococci)	Basis of derivation	Estimation of probability
A	≤ 40 /100mL	No illness seen in most epidemiological studies	GII risk: <1% AFRI risk: <0.3%
B	41-200 /100mL	200/100mL is above the illness threshold in most epidemiological studies	GII risk: 1-5% AFRI risk: 0.3-1.9%
C	201-500 /100mL	Substantial ↑ in risk of adverse effects where dose-response data available	GII risk: 5-10% AFRI risk: 1.9-3.9%
D	>500 /100mL	Significant risk of high levels of illness transmission	GII risk: >10% AFRI risk: >3.9%

GII: gastrointestinal illness AFRI: acute febrile respiratory illness

How is the 95th percentile calculated?

A number of methods for calculating the 95th percentile are detailed in the NHMRC Guidelines. The method utilised by each regulatory authority is based on data availability, statistical considerations and local resources. The method utilised by the Department of Health has been developed by Dr Richard Lugg using an automated enterococci tester spreadsheet. The method standardises the 95th percentile results to reflect as closely as possible the infection risks shown in Table 1.

A copy of the enterococci tester can be obtained from the Environmental Health Directorate.

How many enterococci values are needed to calculate the 95th percentile?

In order to calculate the 95th percentile a data set of 100 samples within a 5 year roll over period is desired. The more historical data available the more precise the 95th percentile estimate is. Until such time that 100 samples are collected for each site only a provisional MAC can be assigned to a location.

A monitoring program should aim to achieve at least 20 samples each year in order to assign a final MAC.

Are both dry and wet weather results included?

Both dry and wet weather sampling results are included in the 95th percentile calculations. Wet weather results can only be excluded from the data once management interventions have been implemented to prevent people from accessing the water and/or redirect stormwater during rainfall events.



In general, most recreational water sites experience good water quality during dry summer periods. However, during summer rainfall events and subsequent days following heavy rainfall, more susceptible sites (e.g. sites with stormwater drains) may experience elevated bacterial levels.

Anecdotal evidence indicates that most people do not generally go swimming during or immediately after rainfall. However, the purpose of the MAC is to give an indication of general water quality over an extended period, during all variations in summer climatic conditions. Therefore, the 95th percentiles may represent the poorer water quality experienced during summer rainfall.

3. SANITARY INSPECTION CATEGORY (SIC)

What is a sanitary inspection category?

The second part to classifying a water body is to assign a sanitary inspection category (SIC) to each site. A SIC allocates a site into the waters susceptibility to faecal pollution. There are five SIC which include a classification of 'Very low', 'Low', 'Moderate', 'High' or 'Very High'.

How do I assign a SIC?

To assign a SIC you need to complete a sanitary survey of the monitoring location. This involves identifying all sources of faecal contamination which may affect the water such as stormwater drains, native animals, sewage outfalls, septic tanks, and boating activities.

A sanitary survey checklist should be completed for each site to get a better understanding of the sites susceptibility to faecal pollution. Local knowledge is imperative when completing the checklist to help identify all faecal pollutant sources. Discussions with local water managers and local or state authorities are also important to identify all pollutant sources e.g. stormwater drains.

Note: The sanitary survey places more emphasises on identifying human faecal pollution sources entering a site. Due to the species barrier from humans to animals, the range of pathogens of public health importance is generally assumed to be much narrower in animal excreta than in human excreta, thus representing a significantly lower risk to human health.

How do I assign each polluted source into the appropriate SIC?

Different pollutant sources represent different levels of risk to a water user. SIC have been allocated to a number of recognised pollutant sources as outlined in the Sanitary Inspection Category Checklist document. Once you have completed a sanitary survey to identify pollutant sources for each monitoring location, use the SIC checklist to assign a SIC to each pollutant source.

The highest ranked source becomes the overall SIC. E.g. if 'Moderate' is the highest ranked source then 'Moderate' is the assigned SIC.

How often must I do a sanitary survey?

The first sanitary survey will be the most comprehensive. There after the survey should be completed on an annual basis, preferably prior to the start of each bathing season. An annual survey is necessary to assess a site for any new pollutant sources impacting on the water. Additionally, if action has been taken to remove a pollutant source this needs to be included in the new SIC for the year.



4. ASSIGNING BEACH GRADES

How do I assign a beach grade?

Once the microbial assessment category and sanitary inspection category has been determined for each site an overall classification or beach grade can be assigned.

Table 2 can be used to assign a beach grade to a sampling location.

Table 2: Microbial Assessment (NHMRC Guidelines, pg 88)

		Microbiological Assessment Category (Enterococcal 95th percentiles/100mL)				Exceptional circumstances†
		A ≤40	B 41–200	C 201–500	D >500	
Sanitary Inspection Category (susceptibility to faecal influence)	Very low	Very Good	Very Good	Follow up+	Follow up+	
	Low	Very Good	Good	Follow up+	Follow up+	
	Moderate	Good	Good	Poor	Poor	
	High	Good	Fair	Poor	Very Poor	
	Very high	Follow up*	Fair	Poor	Very Poor	
Exceptional circumstances†						Action

What do the different beach grades mean?

Each grade has been defined below:

- **Very Good:** Water is considered satisfactory for swimming at all times. Consistently very good water quality tests and very few potential contamination sources indicate that water quality at this location should be of a high standard.
- **Good:** Conditions are safe for swimming most of the time. Water quality tests are generally good on nearly all occasions and there are few potential faecal pollution sources identified. Standard advisories should be followed such as avoiding swimming 1 days after heavy rainfall in marine waters.
- **Fair:** Conditions are generally okay for swimming, although water quality tests may show times of elevated bacteria mostly due to animal pollutant sources (e.g. bird faeces) and rainfall. Swimming should be avoided during periods of high rainfall events, and if the water is discoloured.
- **Poor:** Conditions may not always be okay for swimming, as indicated by past results. The water can be affected by elevated bacteria, mostly during and after rainfall events or due to animal pollutant sources (e.g. bird faeces). There may be a higher risk of illness if you ingest the water during these times, particularly by the very young, the very old and those with compromised immunity. Swimming or putting your head under the water should be avoided during these times. Other factors such as low dilution, tidal movement, wind direction and stormwater pollution may help pathogens survive longer in these waters.
- **Very Poor:** Avoid swimming at these locations, as there are direct discharges of faecal material. Permanent signage may be erected at the beach stating that swimming is not recommended.



5. FOLLOW-UP SAMPLING

How do I know when to initiate re-sampling?

The enterococci tester spreadsheet features two trigger levels. A one-off trigger level and a two-in-a-row trigger level. The trigger levels are individualised for each site based on historical enterococci data.

One-off Trigger Level: When this enterococci value is exceeded the water should be re-sampled and an investigation initiated to look at reasons for elevated values. This value is calculated using the estimated 99th percentile.

Where the resample indicates an elevated result above the one off trigger level it is recommended that an investigation is initiated to determine causes to elevated levels. Depending on the source of contamination (e.g. suspected animal or human pollution) the public should be notified that the beach is unsuitable for recreational use.

Two-in-a-row Trigger Level: When the enterococci value exceeds this value after two consecutive periods the water should be re-sampled and an investigation initiated to look at reasons for elevated values. This value is calculated using the estimated 90th percentile.

Where the resample indicates an elevated result above the two in a row trigger level it is recommended that an investigation is initiated to determine causes to elevated levels. Depending on the source of contamination (e.g. birds or human pollution) the public should be notified that the beach is unsuitable for recreational use.

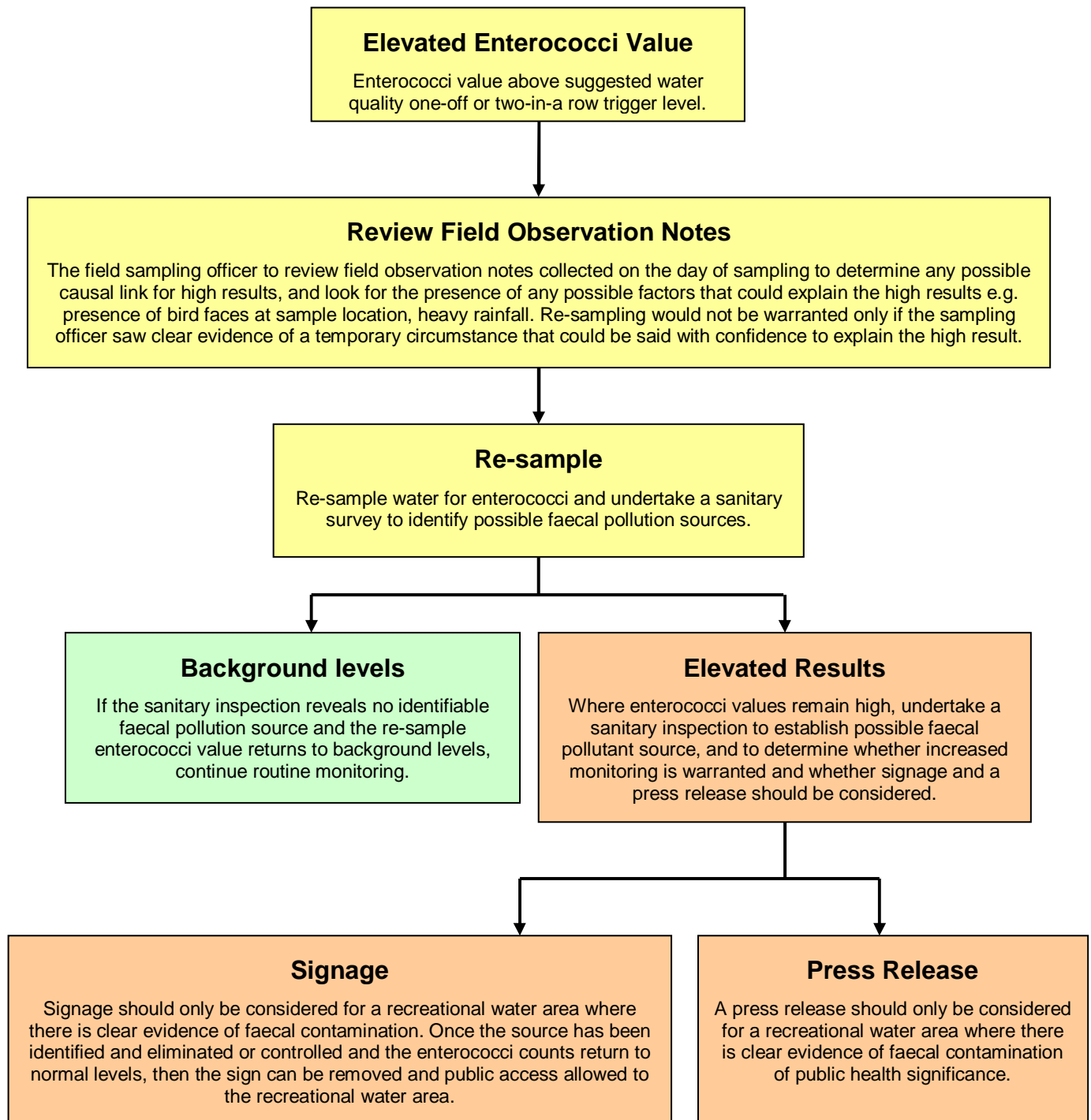
Where the trigger values are lower than the MAC they should be disregarded.

If a wastewater overflow is suspected then the public should be notified as soon as practicable.

A guidance response procedure for elevated enterococci values has been outlined in figure 1 on the following page.



Figure 1: Response plan for responding to elevated results





6. PUBLIC COMMUNICATION




How can this information be presented to the public?

It is important to relay the health risks a water body may present back to the general public. There are a number of practical options to communicate water quality information to the public including:

- Internet (http://www.public.health.wa.gov.au/2/639/2/environmental_waters.pm)
- Public forums and community action groups
- Health Advice signs
- Fact sheets and brochures
- Press releases

The Environmental Health Directorates' Environmental Waters website provides Western Australian water users with information about prevailing bacterial water quality at popular swimming beaches along Perth's coast, the Swan and Canning Rivers and Rottnest Island. Information on regional waterways are also included on the website.

For easier interpretation by the community of the risks a particular beach may pose a traffic light system of green, amber or red has been detailed on maps of popular recreational beaches. Green representing the safer areas to swim, and red representing the higher recreational risk areas.

	<p>Very Good: Water is considered satisfactory for swimming at all times. Consistently very good water quality tests and very few potential contamination sources indicate that water quality at this location should be of a high standard.</p> <p>Good: Conditions are safe for swimming most of the time. Water quality tests are generally good on nearly all occasions and there are few potential faecal pollution sources identified. Standard advisories should be followed such as avoiding swimming 1 day after heavy rainfall in marine waters.</p>
	<p>Fair: Conditions are generally okay for swimming, although water quality tests may show times of elevated bacteria mostly due to animal pollutant sources (e.g. bird faeces) and rainfall. Swimming should be avoided during periods of high rainfall events, and if the water is discoloured.</p>
	<p>Poor: Conditions may not always be okay for swimming, as indicated by past results. The water can be affected by elevated bacteria, mostly during and after rainfall events or due to animal pollutant sources (e.g. bird faeces). There may be a higher risk of illness if you ingest the water during these times, particularly by the very young, the very old and those with compromised immunity. Swimming or putting your head under the water should be avoided during these times. Other factors such as low dilution, tidal movement, wind direction and stormwater pollution may help pathogens survive longer in these waters.</p> <p>Very Poor: Avoid swimming at these locations, as there are direct discharges of faecal material. Permanent signage may be erected at the beach stating that swimming is not recommended.</p>



What do high enterococci values actually mean to public health?

As previously mentioned, enterococci are used to indicate the presence of faecal contamination. Enterococci are not pathogenic themselves, but are used to indicate the presence of disease causing organisms such as bacteria, viruses and protozoan's.

Faecal pollution from human sources represents a greater risk to public health compared to faecal pollution from animal sources due fewer diseases being transmitted from animals to humans. However, animal excreta do represent some degree of risk e.g. faecal pollution from piggeries or cattle farms.

Defining the actual risk of faecal pollutant sources is not possible. The human response to pathogens in water and exposure varies from person to person and the pollutant risks present. This is why the NHMRC Guidelines are based on a defined 'tolerable risk' rather than no risk at all. For most people water conforming to the guideline value will pose only a minimal increase in daily risk. However, water conforming to the guidelines may still pose a potential health risk to high-risk user groups such as the very young, the elderly and those with a compromised immune system.

When are health warning signs required?

Local authorities and water managers should have access to a sufficient number of health warning signs to deal with contamination events in recreational waters e.g. wastewater overflow. An example [Health Warning template](#) can be downloaded from the website.

Consideration is needed to install permanent Health Advice signs at monitoring locations where the water is known to have varying water quality. Such Health Advice signs may include statements such as 'This water may experience poor water quality during and after rainfall events. It is recommended that you avoid swimming during these times as ingestion of water may cause ill effects'.

7. FUTURE MONITORING

After implementing an initial monitoring program and assigning a final MAC and SIC to a recreational water body, the monitoring program can be reduced in future years depending on the risks identified. The recommended monitoring schedule is outlined in table 3.

Table 3: Recommended monitoring schedule

Risk category identified by sanitary inspection	Monitoring schedule	Frequency of sanitary inspection
Very low	Minimum of 5 samples per year, at regular intervals during recording period.	Annual
Low	Minimum of 5 samples per year at regular intervals during recording period.	Annual
Moderate	Annual low-level sampling. 20 samples at regular intervals (e.g. 2 samples x 5 occasions during swimming season) Annual verification of management effectiveness. Additional sampling if abnormal results obtained.	Annual
High	Annual low-level sampling. 20 samples at regular intervals (e.g. 2 samples x 5 occasions during swimming season) Annual verification of management effectiveness. Additional sampling if abnormal results obtained.	Annual
Very high	Minimum of 5 samples per year, but nil if closed to use.	Annual



More Information:

Water Unit
Environmental Health Directorate
Department of Health
PO Box 8172
PERTH BUSINESS CENTRE WA 6849

Telephone: 08 9388 4999
Facsimile: 08 9388 4910

Printed on: 25 October 2010

\\Wsep218fs6\hpg_sect\$\EHD\Water Unit\ENVIRONMENTAL\Publications\Section\Fact Sheet\applying nhmrc recreational waters guidelines\Applying nhmrc recreational waters guidelines.doc

Produced by Environmental Health Directorate
© Department of Health, Western Australia 2010